

## Metering pumps, components and metering systems

**ProMinent®**



Issued by:

ProMinent GmbH  
Im Schuhmachergewann 5-11  
69123 Heidelberg  
Germany  
Phone +49 6221 842-0  
info@prominent.com  
www.prominent.com



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Heidelberg, January 2015

## Metering Pumps, Components and Metering Systems



### Metering technology for professionals

The heart of metering technology is quite clearly the pump.

With its optimum performance range and functionality adapted to the feed chemical, it is responsible for smooth-running metering processes.

**Chapter 1** focuses on metering pumps that perform all possible metering tasks, ranging from micro-metering pumps to pumps delivering up to 75 l/h at a maximum back pressure of 60 bar.

**Chapter 2** goes on to present durable and easy-to-operate transfer and peristaltic pumps for pure pump capacities, as well as the matching components, like sturdy storage tanks and collecting pans.

Refer to **Chapter 3** for fully ready mounted metering systems. Whether standard or made-to-measure, thanks to their perfect interaction, the precisely coordinated components ensure a safe and immediately ready-to-use complete solution.

### We're there for you!

The selection of a product depends on a number of different factors.

Our team will be happy to be of assistance should you have any questions about our metering technology. Give us a call! We look forward to hearing from you.

Monday to Friday 8:00 - 16:30

#### ProMinent Germany Sales

0049 6221 842-0

info-de@prominent.com

#### Technical Consulting

0049 6221 842-1850

service@prominent.com

### Pump Guide

You can also find information online. Try out our ProMinent Selection Guide on our website. Just enter the required pump capacity and back pressure – and the Pump Guide will present you with a list of suitable metering pumps. It's the quickest and easiest way to track down the right pump for your needs.

[www.pump-guide.com](http://www.pump-guide.com)

**Note:** We can also support you by phone in selecting the right products and, in many cases, optimising entire applications. For more complex requirements, our consultants will hand the task over to a field sales colleague, who will then clarify your requirements in person on site.

### After-sales Service

Our service technicians are on hand to help you. Regardless of whether you need assistance with initial installation or with maintenance and repair – we're happy to help!

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# Step by Step to the Right Product

Metering tasks come in all shapes and sizes! Provide us with your data - we'll deliver the optimum solution!

The following data sheet will help in solving your metering problem. Please enter your requirements and conditions and return it to [info-de@prominent.com](mailto:info-de@prominent.com). Our Service Centre will use your data to reach the optimum result - the optimum metering pump and matching accessories for your application.

## Required Data for Designing Metering Pumps and Accessories

Min./max. required feed rate	l/h _____
Available power supply	_____ V, _____ Hz
Min./max. operating temperature	°C _____
Properties of process chemical	_____
Name, concentration %	_____
Solids content %	_____
Dynamic viscosity mPa (= cP)	_____
Vapour pressure at operating temperature	bar _____
Remarks, e.g. abrasive,	_____
gaseous, flammable,	_____
corrosive towards	_____
<b>Suction conditions:</b>	
Min./max. suction lift	m _____
Min./max. positive suction head	m _____
Pressure in chemical tank	bar _____
Suction line length	m _____
Suction line diameter	mm _____
<b>Discharge conditions:</b>	
Min./max. back pressure	bar _____
Min./max. discharge head	m _____
Min./max. negative discharge head	m _____
Discharge line length	m _____
Discharge line diameter	mm _____
Number of valves and fittings in suction and discharge line	_____
<b>Data required for proportional dosing:</b>	
Water flow Q min./max.	m³/h _____
Required final concentration	g/m³, ppm _____

### Example:

A required dose in mg/l = g/m³ = ppm

(Water flow Q max. 50 m³/h)

Pulse spacing (flow volume per pulse) of water meter 5 l.

Process fluid = sodium hypochlorite solution Na OCl with 12 % chlorine (by weight) = 120 g/kg = 150 g/l = 150 mg/ml

Selected dosing pump GALa 1005 NPB2 with 0.41 ml/per stroke volume, at max. 10800 strokes/h.

Variables: pump type, pulse spacing and concentration. The stroke rate (max. throughput l/h: pulse spacing l/pulse = 50,000 l/h : 5 l/pulse = 10000 pulses/h) must not exceed the max. stroke frequency (10800 strokes/h) of the dosing pump.

$$\text{Feed quantity} = \frac{\text{water throughput Q max. (l/h)} \times \text{stroke volume (l)}}{\text{pulse spacing (l)}} = \frac{50,000 \text{ l} \times 0.00041 \text{ l}}{\text{h} \times 5 \text{ l}} = 4.1 \text{ l/h}$$

$$\begin{aligned} \text{Final dose} &= \frac{\text{concentration (mg/ml)} \times \text{stroke volume (l)}}{\text{pulse spacing (l)}} = \frac{150 \text{ mg} \times 0.41 \text{ ml}}{\text{ml} \times 5 \text{ l}} = 12.3 \text{ mg/l} \\ &= 12.3 \text{ g/m}^3 \\ &= 12.3 \text{ ppm chlorine Cl}_2 \end{aligned}$$



## Free Choice with the Identity Code

Use the identity code to determine the properties and features of your low-pressure metering pump. Simply select, enter the code in the bottom row and you've configured your product!

You've opted for a pump product range. It's now up to you to configure the pump exactly to meet your individual needs.

First determine the **pump type (1)**. This is based on the pump capacity you require and the back pressure present. Enter the result at the very bottom, in the grey row of the identity code.

The medium to be metered is crucial when it comes to the **material of the dosing head (2)** and the **seals (3)**. Once again enter the selected code in the bottom row.

You can now select the features and properties of your product with a few restrictions.

Work through column by column, generating the identity code for your own individual metering pump.

BT4b	Type	Capacity
	bar	l/h
1000	10	0.74
1601	16	1.10
1602	16	2.20
1604	16	3.60
0708	7	7.10
0413	4	12.30
0220	2	19.00
<b>1</b>	<b>BTSb</b>	
	25	2.90
<b>2</b>	<b>0713</b>	
	10	6.80
	7	11.00
	4	17.10
	2	32.00
	<b>S</b>	
	<b>NP</b>	
	<b>PV</b>	
	<b>TT</b>	
	<b>SS</b>	
	<b>Seal/diaphragm material</b>	
	T	PTFE/PTFE coated
<b>4</b>	<b>S</b>	Diaphragm additionally with FKM coating for siliceous media
	<b>Liquid end version</b>	
	0	Non-bleed version, no valve spring, for TT, SS and type 0232 only
	1	Non-bleed version, with valve spring, for TT, SS and type 0232 only
	2	With deaerator, no valve spring, PP, PV, NP only, not type 0232
	3	With deaerator, with valve spring, PP, PV, NP only, not type 0232
	4	version for highly viscous media, only PVT, types 1604, 0708, 1008, 0413, 0713, 0220, 0420
	7	self-bleeding without bypass (SER), only for NP and PV, not for types 1000, 1601 and 0232
	<b>Hydraulic connections</b>	
	0	Standard according to technical data
	5	Connector for 12/6 hose, delivery side only, only with materials PP, NP and PV
	9	Connector for 10/4 hose, delivery side only, only with materials PP, NP and PV
	<b>Version</b>	
	0	Standard
	<b>Logo</b>	
	0	with ProMinent® logo
	<b>Power supply</b>	
	U	100-230 V ± 10 %, 50/60 Hz
	M	12-24 VDC, only for BT4
	N	24 VDC, only for BTS
	<b>Cable and plug</b>	
	A	2 m European
	B	2 m Swiss
	C	2 m Australian
	D	2 m USA
	I	2 m, open-ended
	<b>Relay</b>	
	0	No relay
	1	Fault indicating relay, normally energised, 1 x changeover contact 230 V - 2 A
	3	Fault indicating relay, normally de-energised, 1 x changeover contact 230 V - 2 A
	4	as 1 + pacing relay 2 x normally open contacts 24 V - 100 mA
	5	as 3 + pacing relay 2 x normally open contacts 24 V - 100 mA
	<b>Accessories</b>	
	0	No accessories
	1	With foot and dosing valve, 2 m PVC suction tubing, 5 m PE discharge tubing
	<b>Control type</b>	
	0	No lock
	1	With lock: manual operation locked when external cable plugged in
	<b>Control Variants</b>	
	0	Standard
		Options on request
	0 0	No options
<b>BTsb</b>	<b>0713</b>	<b>NP</b>
		<b>S</b>

**We will be happy to advise you on your metering application.**

**Give us a call should you still have any questions!**

## ProMinent Germany Sales

0049 6221 842-0

info-de@prominent.com

## Technical Consulting

0049 6221 842-1850

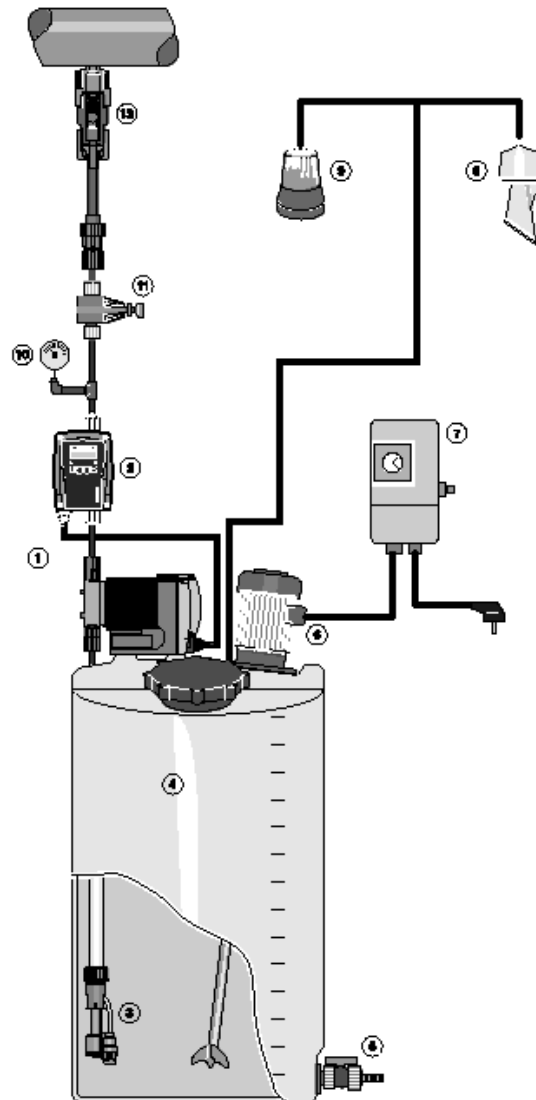
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# Metering Pumps also Need Accessories

Examples of metering tasks illustrate which components and accessories can be used for different metering processes.

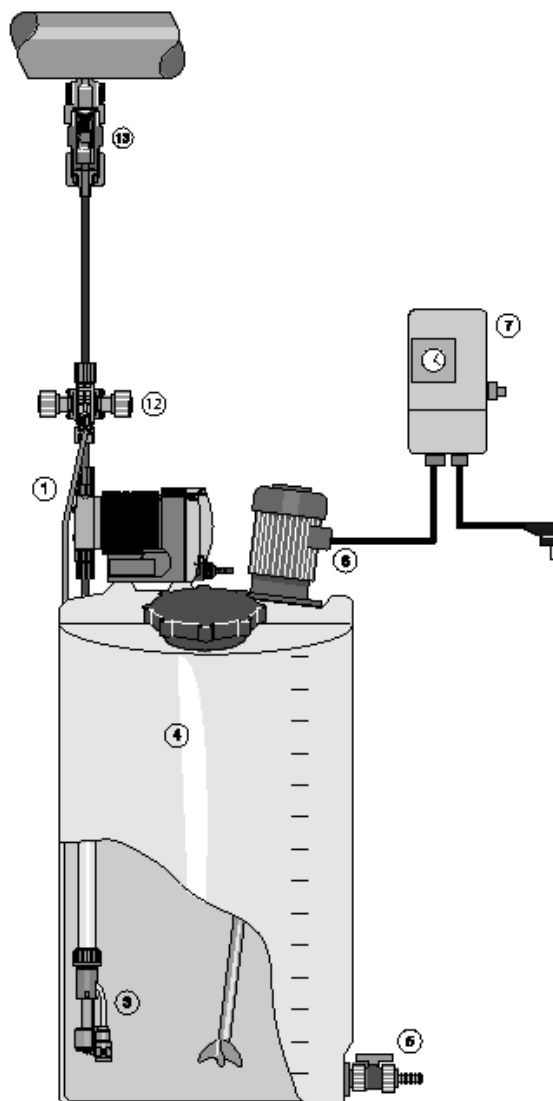
A pump alone is often simply not enough. A metering process requires further **components and accessories**. ProMinent provides all the products you need to guarantee **optimum process flows** for metering liquid media. Expertise and advice are, of course, included!

- 1 Metering pump
- 2 DFMa flow meter with single stroke monitor and feedback to the metering pump
- 3 Suction assembly with level switch
- 4 Chemical tank
- 5 Drain cock
- 6 Stirrer
- 7 Timer for stirrer
- 8 Signal horn
- 9 Display lamp
- 10 Manometer for precise adjustment of the back pressure valve
- 11 Back pressure valve
- 13 Injection valve



# Metering Pumps also Need Accessories

- 1 Metering pump
- 3 Suction assembly with level switch
- 4 Chemical tank
- 5 Drain cock
- 6 Stirrer
- 7 Timer for stirrer
- 12 Multifunctional valve
- 13 Injection valve



AP\_0005\_SW3





## Solenoid Diaphragm Metering Pump gamma/ X

The solenoid diaphragm metering pump gamma incorporates a wealth of eXcellent ingenuity! With integrated pressure measurement, it ensures the smooth running of your metering process. The gamma/ X is ideal for all metering work involving liquid media.

The new solenoid diaphragm metering pump gamma/ X is user-friendly and has an outstandingly long service life, just like its predecessor. An ingenious solenoid control measures the back pressure and protects the system from overload. This technology makes a pressure sensor superfluous, meaning that operating safety can be significantly increased: no additional parts come into contact with the feed chemical, there are no additional sealing surfaces and no electronic components come into contact with the feed chemical. Whether the metering volume fluctuates or hydraulic failures affect the metering process – the gamma/ X keeps everything at your fingertips.

It independently ensures a trouble-free metering process and, should the pump ever need maintenance, its service module draws attention to this.

**Capacity range 2.3 – 45 l/h, 25 – 2 bar**

For more information see page → 1-13

**\* Available from 2nd quarter of 2015.**



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# Overview of Low Pressure Metering Pumps

## How to Find the Right Pump Type?

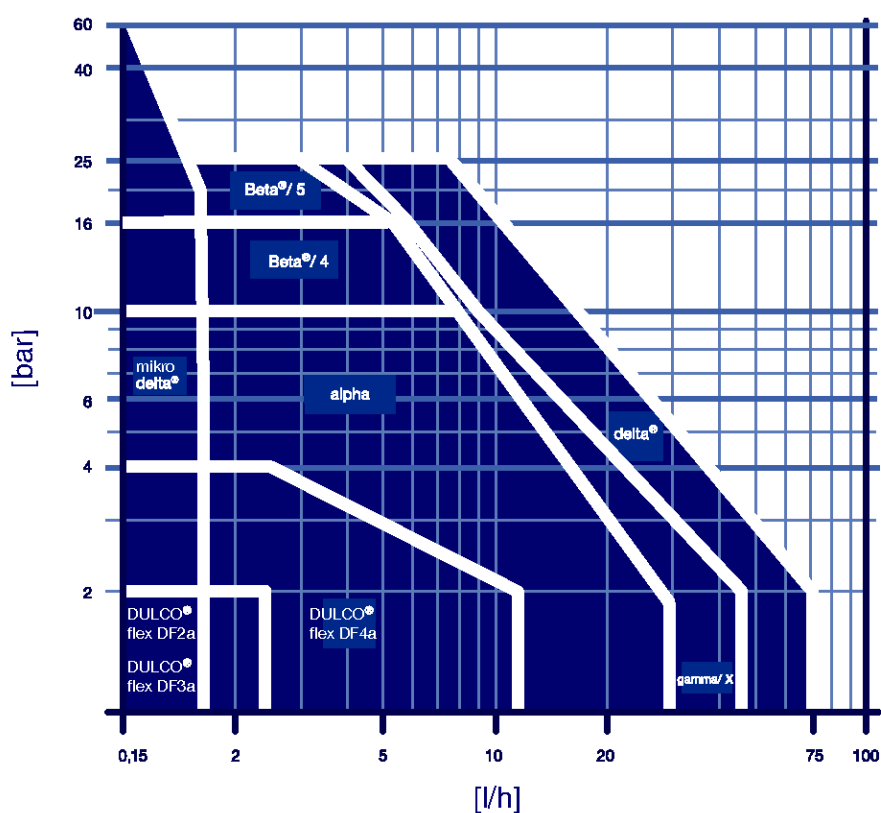
Low-pressure metering pumps for practically all liquid chemicals:

the wide range of materials and extremely reliable function make these pumps veritable all-rounders - even under the toughest conditions. You'll find the optimum metering pump for your application in this broad product range from **0.74 to 75 l/h at a back pressure of 25 - 2 bar**.

### Tip

The performance overview will assist you with rapid pre-selection. Determine the right product range of metering pumps based on a given back pressure (bar) and pump capacity (l/h).

All our low-pressure metering pumps are self-priming!



SG\_0028\_C

Back pressure [bar] as a function of feed rate [l/h]

### Important note

ProMinent<sup>®</sup> metering pumps in the capacity range of **over 75 l/h or over 25 bar**, as well as metering pumps approved for use in premises at risk of gas explosions are included in **volume 3 "Motor-driven and process metering pumps for all capacity ranges"**.

Please use our Pump Guide for assistance in making a quick selection; [www.pump-guide.com](http://www.pump-guide.com).



# 1.1 Motor Driven Metering Pump alpha

## 1.1.1

## Motor Driven Metering Pump alpha



The cost-effective solution for simple applications in the lower performance range.

Capacity range 1.0 - 30.6 l/h, 10 - 2 bar



The motor-driven metering pump alpha is the metering pump for liquid media and the optimum solution for simple applications. Robust, low-noise, chemical-resistant, with precise metering and good suction capacity.

Various pump types are available as a combination of 2 gears and 4 sizes of dosing head in materials PVDF and clear acrylic/PVC, enabling you to match the pump perfectly to your metering process.

### Your benefits

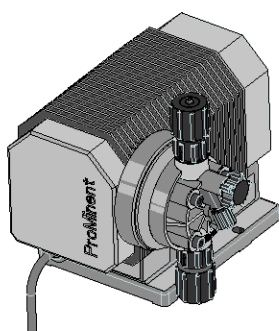
- Precise metering and good suction capacity by soft controlled suction and compression strokes
- Tough plastic housing – shock-proof and chemical-resistant
- Suitable for higher viscosity media, thanks to spring-loaded valves
- Low-noise operation

### Technical details

- Stroke length adjustment by changing the eccentricity on the pump drive when the pump is idle
- Stroke length adjustment in 10% steps
- Diaphragm deflection from the centre position
- Soft controlled suction and compression strokes

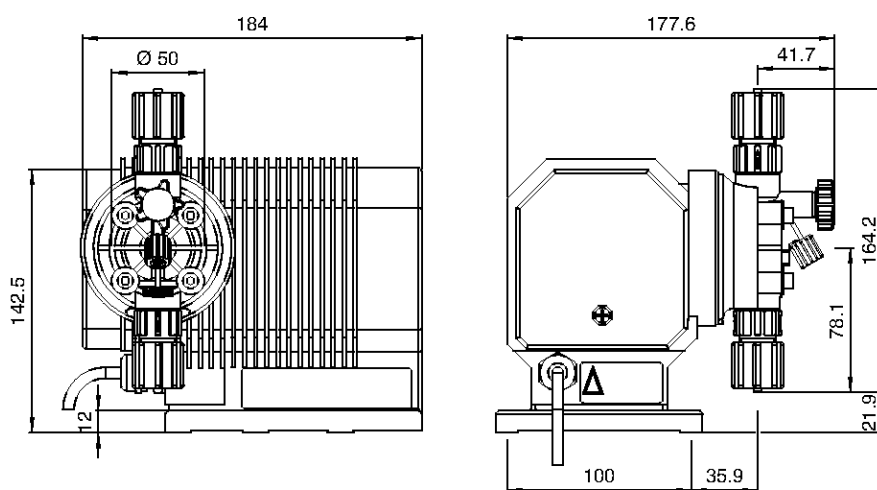
### Field of application

All low capacity applications where constant metering is required.



P\_ALP\_0004\_SW

### Dimensional drawing of the alpha



P\_ALP\_0006\_SW3

Dimension drawing of the alpha - dimensions in mm



# 1.1 Motor Driven Metering Pump alpha

## Technical Data

Pump type	Delivery rate at max. back pressure			Delivery rate at medium back pressure			Number of strokes	Stroke length	Connection size o Ø x i Ø	Suction lift	Shipping weight
	bar	l/h	ml/stroke	bar	l/h	ml/stroke					
50 Hz version											
ALPc 1001	10	1.0	0.29	5	1.1	0.32	30	2	6 x 4	5.1	3.0
ALPc 1002	10	1.8	0.52	5	2.1	0.60	58	2	6 x 4	5.1	3.0
ALPc 1004	10	3.5	1.01	5	3.9	1.12	58	3	8 x 5	5.1	3.0
ALPc 1008	10	7.7	1.00	5	8.6	1.12	128	3	8 x 5	5.1	3.0
ALPc 0707	7	6.9	1.98	3	7.7	2.21	58	3	8 x 5	4.1	3.0
ALPc 0417	4	17.0	2.51	2	18.3	2.76	128	3	8 x 5	4.1	3.0
ALPc 0230	2	30.6	3.98	1	32.7	4.26	128	3	12 x 9	3.1	3.0
60 Hz version											
ALPc 1001	10	1.2	0.29	5	1.3	0.31	36	2	6 x 4	5.1	3.0
ALPc 1002	10	2.2	0.53	5	2.6	0.63	69	2	6 x 4	5.1	3.0
ALPc 1004	10	4.1	0.99	5	4.7	1.14	69	3	8 x 5	5.1	3.0
ALPc 1008	10	8.9	0.96	5	10.4	1.13	154	3	8 x 5	5.1	3.0
ALPc 0707	7	8.3	2.00	3	9.2	2.22	69	3	8 x 5	4.1	3.0
ALPc 0417	4	20.6	2.45	2	21.9	2.75	154	3	8 x 5	4.1	3.0
ALPc 0230	2	34.4	3.72	1	39.2	4.24	154	3	12 x 9	3.1	3.0

All data refers to water at 20 °C.

## Materials in contact with the medium

	Liquid end	Suction/discharge connector	Ball seal	Seals	Balls
PPE	Polypropylene	Polypropylene	EPDM	EPDM	Ceramic
PPB	Polypropylene	Polypropylene	FKM	FKM	Ceramic
NPE	Acrylic glass	PVC	EPDM	EPDM	Ceramic
NPB	Acrylic glass	PVC	FKM	FKM	Ceramic
PVT	PVDF	PVDF	PVDF	PTFE	Ceramic

Metering diaphragm with PTFE coating for all types.

FKM = fluoro rubber

## Motor Data

Type	Split pole motor with integrated thermal overload protection
Electrical connection	220-240 V, 50/60 Hz (version A)
Power	50 W (at 230 V/50 Hz)
Power consumption	0.4 A (at 230 V/50 Hz)



**Warranty:** The warranties listed under "General Terms and Conditions of Sale" apply, although there is a warranty period of 12 months for the alpha pump drive



# 1.1 Motor Driven Metering Pump alpha

## 1.1.2 Identity Code Ordering System

### alpha series, version c

ALPc	Type	Capacity (50 Hz / 60 Hz)			
		l/h	bar	l/h	bar
	1001	1.0	10	1.2	10
	1002	1.8	10	2.2	10
	1004	3.5	10	4.1	10
	1008	7.7	10	8.9	10
	0707	6.9	7	8.3	7
	0417	17.0	4	20.6	4
	0230	30.6	2	34.4	2
		<b>Liquid end material</b>			
	PPE	Polypropylene/polypropylene/EPDM			
	PPB	Polypropylene/polypropylene/FKM			
	NPE	Acrylic/PVC/EPDM			
	NPB	Acrylic/PVC/FKM			
	PVT	PVDF/PVDF/PTFE			
		<b>Valve springs</b>			
	2	without valve spring, with bleeding			
	3	with 2 valve springs approx. 0.1 bar, material 1.4571, with bleeding			
		<b>Hydraulic connectors</b>			
	0	Standard according to technical data			
		<b>Version</b>			
	0	With ProMinent® logo			
		<b>Electrical connection</b>			
	A	230 V, 50/60 Hz, 2 m, Euro. plug			
	B	230 V, 50/60 Hz, 2 m, Swiss plug			
	C	230 V, 50/60 Hz, 2 m, Austral. plug			
	D	115 V, 50/60 Hz, 2 m, USA plug			
		<b>Accessories</b>			
	0	No ancillary equipment			
	1	with foot and metering valve, 2 m PVC suction line, 5 m PE metering line			

FKM = fluoro rubber

# 1.1 Motor Driven Metering Pump alpha

## 1.1.3

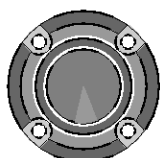
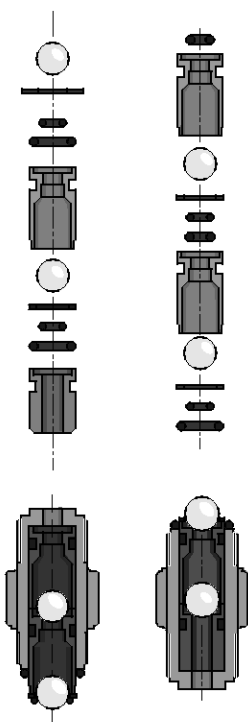
## Spare Parts Kits, Replacement Diaphragms

### Spare parts kits for alpha

#### Spare parts kits for alpha, consisting of

- 1 pump diaphragm
- 1 suction valve compl.
- 1 discharge valve compl.
- 2 valve balls
- 1 set of seals
- 1 connector set

Type		Order no.
for alpha c, type 1001, 1002, 1004, 1008	PPE	1001647
	PPB	1001655
	NPE	1001716
	NPB	1001724
	PVT, PPT, NPT	1023110
for alpha c, type 0707, 0417	PPE	1001649
	PPB	1001657
	NPE	1001718
	NPB	1001726
	PVT, PPT, NPT	1023112
for alpha c, type 0230	PPE	1001650
	PPB	1001658
	NPE	1001719
	NPB	1001727
	PVT, PPT, NPT	1023113



pk\_1\_008

### Replacement diaphragms

Type	Order no.
for alpha c 1001	1000246
for alpha c 1002, 1004, 1008	1039612
for alpha c 0707, 0417	1000249
for alpha c 0230	1000250

### Accessories

- Foot Valves See page → 1-48
- Injection Valves See page → 1-51
- Hoses, Pipes See page → 1-61
- Suction Lances, Suction Kit Without Level Switch See page → 1-66
- Connector Parts/Fittings See page → 1-87

### Spare Parts

- Custom Valve Balls/Valve Springs See page → 1-86



## 1.2 Solenoid Driven Metering Pump Beta®

### 1.2.1

### Solenoid Driven Metering Pump Beta®



Equipped with all the features and properties to guarantee superior process management.

Capacity range 0.74 - 32 l/h, 25 - 2 bar



All-purpose solenoid metering pump for metering liquid media in water treatment and chemical processes: Solenoid driven metering pump Beta®. Cost-effective, overload-proof, adaptable to existing signal transducers.

A range of different pump types and material combinations are available for virtually all metering applications. The virtually wear-free solenoid drive guarantees an exceptionally long service life even under maximum load.

#### Your benefits

- Simple adjustment of metering capacity via stroke rate and stroke length
- Adaptation to existing signal transducers by external control via potential-free contacts with pulse step-up and step-down
- Suitable for use with almost all liquid chemicals thanks to the available material combinations: PP, PVDF, clear acrylic, PTFE and stainless steel
- Self-bleeding dosing head design in clear acrylic/PVC and PP
- Virtually wear-free solenoid drive: economical and overload-proof
- Economical operation with up to 50% energy-savings, thanks to higher pump efficiency
- Everything in sight and under control: 3 LED display for operating, warning and error messages

#### Technical details

- External control via potential-free contacts with pulse step-up and step-down to adapt to existing signal transducers of 64:1 to 1:64
- Stroke rate adjustment in 10% steps of 10 - 100% corresponds to 18 - 180 strokes/minute
- Continuous stroke length adjustment between 0 - 100% (recommended 30 - 100 %)
- Connector for 2-stage level switch
- Wide-ranging electrical connection: 100 - 230 V, 50/60 Hz
- Optional relay module, can also be easily and reliably retrofitted
- Design for low voltage 12-24 V DC

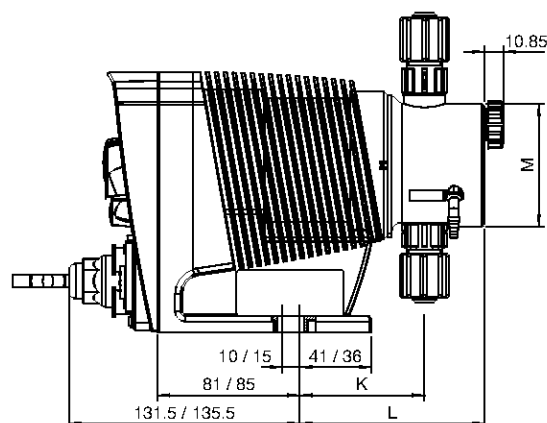
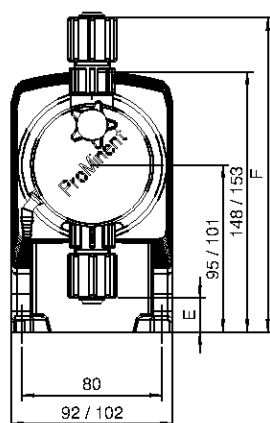
#### Field of application

- Metering liquid media in water treatment and chemical processes

#### Dimensional drawing of Beta® Material design PP

Type	E	F
1000-1604	19.5	179
0708-0220	7	186.5
1008-0420	14	191.5
0232	1.5	200.5

Type	K	L	M
1000-1604	71	105.5	Ø 70
0708-0220	77.5	111	Ø 90
1008-0232	74	107.5	Ø 90
0232	77.5	94.5	Ø 110



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Dimensional drawing of Beta®, Material version PP - dimensions in mm

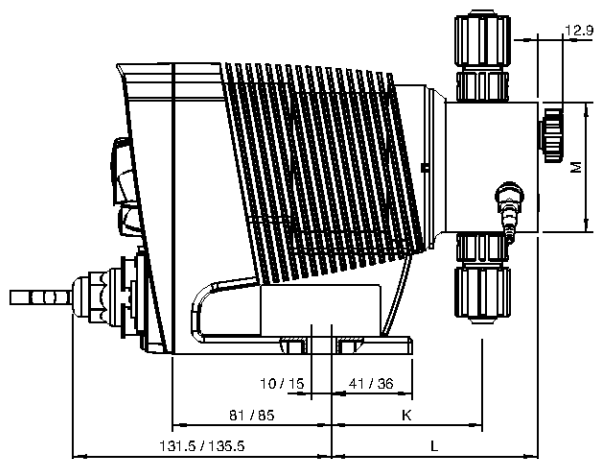
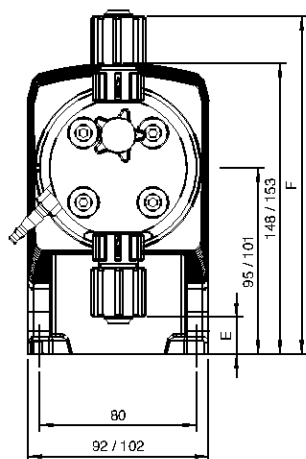


## 1.2 Solenoid Driven Metering Pump Beta®

Dimensional drawing of Beta®  
Material design NP

Type	E	F
1000-1604	19	172
0708-0220	7.2	183
2504	24.5	178.5
1008-0420	14	188
0232	3.2	199

Type	K	L	M
1000-1604	77	105	Ø 70
0708-0220	77.5	105.5	Ø 90
2504	77	105	Ø 70
1008-0420	74	102	Ø 90
0232	76	104.5	Ø 110



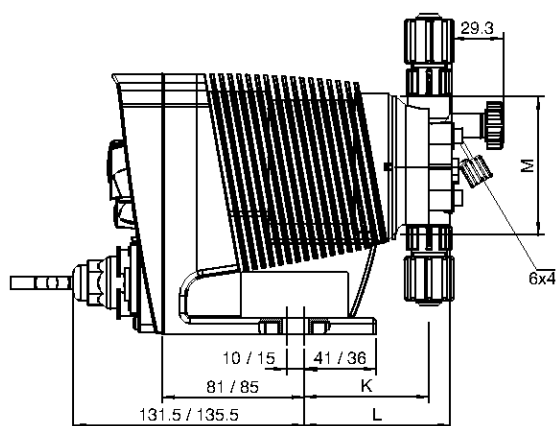
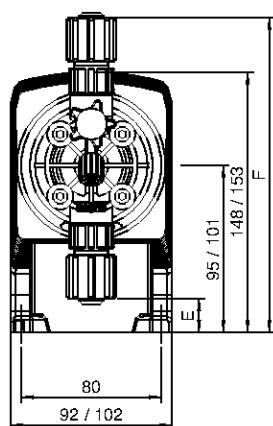
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Dimensional drawing of Beta®, Material version NP - dimensions in mm

Dimensional drawing of Beta®  
Material design PV

Type	E	F
1604	19	179
0708-0220	8	185.5
1008-0420	14	191.5
0232	3.2	199

Type	K	L	M
1604	71	83	Ø 70
0708-0220	73	90	Ø 90
1008-0420	73	90	Ø 90
0232	76	93	Ø 110



P\_BE\_0071\_SW3

Dimensional drawing of Beta®, Material version PV - dimensions in mm

## 1.2 Solenoid Driven Metering Pump Beta®

### Technical Data

Pump type	Delivery rate at max. back pressure			Delivery rate at medium back pressure			Number of strokes	Connection size o Ø x i Ø	Suction lift	Average power consumption	Shipping weight	
	bar	l/h	ml/stroke	bar	l/h	ml/stroke					Strokes/min	mm
Beta® b												
BT4b 1000***	10	0.74	0.07	5.0	0.82	0.08	180	6 x 4	6.0**	7,2	2.9	3.6
BT4b 1601***	16	1.10	0.10	8.0	1.40	0.13	180	6 x 4	6.0**	9,6	2.9	3.6
BT4b 1602***	16	2.20	0.20	8.0	2.50	0.24	180	6 x 4	6.0**	11,2	2.9	3.6
BT4b 1604***	16	3.60	0.33	8.0	4.30	0.40	180	6 x 4	6.0**	15,2	3.1	3.9
BT4b 0708***	7	7.10	0.66	3.5	8.40	0.78	180	8 x 5	6.0**	15,2	3.1	3.9
BT4b 0413	4	12.30	1.14	2.0	14.20	1.31	180	8 x 5	3.0**	15,2	3.1	3.9
BT4b 0220	2	19.00	1.76	1.0	20.90	1.94	180	12 x 9	2.0**	15,2	3.3	4.4
BT5b 2504	25	2.90	0.27	10.0	5.00	0.46	180	8 x 4****	6.0**	19,2	4.5	5.3
BT5b 1008	10	6.80	0.63	5.0	8.30	0.76	180	8 x 5	6.0**	19,2	4.5	5.3
BT5b 0713	7	11.00	1.02	3.5	13.10	1.21	180	8 x 5	4.0**	19,2	4.5	5.3
BT5b 0420	4	17.10	1.58	2.0	19.10	1.77	180	12 x 9	3.0**	19,2	4.7	5.8
BT5b 0232	2	32.00	2.96	1.0	36.20	3.35	180	12 x 9	2.0**	19,2	5.1	6.6
Beta® b metering pumps with self-degassing liquid end												
BT4b 1601	16	0.59	0.06	8.0	0.78	0.07	180	6 x 4	1.8**	9,6	2.9	–
BT4b 1602	16	1.40	0.13	8.0	1.70	0.16	180	6 x 4	2.1**	11,2	2.9	–
BT4b 1604	16	2.70	0.25	8.0	3.60	0.33	180	6 x 4	2.7**	15,2	3.1	–
BT4b 0708	7	6.60	0.61	3.5	7.50	0.69	180	8 x 5	2.0**	15,2	3.1	–
BT4b 0413	4	10.80	1.00	2.0	12.60	1.17	180	8 x 5	2.0**	15,2	3.1	–
BT4b 0220	2	16.20	1.50	1.0	18.00	1.67	180	12 x 9	2.0**	15,2	3.3	–
BT5b 1008	10	6.30	0.58	5.0	7.50	0.69	180	8 x 5	3.0**	19,2	4.5	–
BT5b 0713	7	10.50	0.97	3.5	12.30	1.14	180	8 x 5	2.5**	19,2	4.5	–
BT5b 0420	4	15.60	1.44	2.0	17.40	1.61	180	12 x 9	2.5**	19,2	4.7	–



Beta® b metering pumps with dosing heads for higher-viscosity media have a 10-20 % lower capacity and are not self-priming. G 3/4-DN 10 connector with d 16-DN 10 hose nozzle.

- \* The given performance data constitutes guaranteed minimum values, calculated using water as the medium at room temperature.
  - \*\* Suction lift with a filled dosing head and filled suction line, with a self-bleeding dosing head with air in the suction line.
  - \*\*\* Pressure-reduced pump types are available in the pressure ratings 4, 7 and 10 bar for special applications, for example in the swimming pool sector. More detailed information is available upon request.
  - \*\*\*\* With stainless steel design 6 mm connector width.
- All data refers to water at 20 °C.

### Materials in contact with the medium

	Dosing head	Suction/pressure connector	Ball seat	Seals	Balls
PPE	Polypropylene	Polypropylene	EPDM	EPDM	Ceramic
PPB	Polypropylene	Polypropylene	FPM	FPM	Ceramic
PPT	Polypropylene	PVDF	PVDF	PTFE	Ceramic
NPE	Clear acrylic	PVC	EPDM	EPDM	Ceramic
NPB	Clear acrylic	PVC	FPM	FPM	Ceramic
NPT	Clear acrylic	PVDF	PVDF	PTFE	Ceramic
PVT	PVDF	PVDF	PVDF	PTFE	Ceramic
TTT	PTFE with carbon	PTFE with carbon	Ceramic	PTFE	Ceramic
SST	Stainless steel material no. 1.4404	Stainless steel material no. 1.4404	Ceramic	PTFE	Ceramic

Only the self-bleeding design in material designs PPE, PPB, NPE and NPB with a valve spring made of Hastelloy C, PVDF valve insert. Diaphragm with a PTFE coating.

FKM = fluorine rubber

Metering reproducibility: ± 2% when used according to the operating instructions.

Permissible ambient temperature -10 °C to +45 °C

Degree of protection: IP 65, insulation class F

**Scope of delivery:** Metering pump with mains cable (2 m) and plug, connecting kit for hose/pipe connection as per table.



# 1.2 Solenoid Driven Metering Pump Beta®

## 1.2.2 Identity Code Ordering System

### Beta® Version b

BT4b	Type	Capacity	
BT5b		bar	l/h
	1000	10	0.74
	1601	16	1.10
	1602	16	2.20
	1604	16	3.60
	0708	7	7.10
	0413	4	12.30
	0220	2	19.00
	2504	25	2.90
	1008	10	6.80
	0713	7	11.00
	0420	4	17.10
	0232	2	32.00
	Liquid end/valve material		
PP	Polypropylene/PVDF, for version self-degassing Polypropylene/Polypropylene		
NP	Acrylic glass/PVDF, for version self-degassing Acrylic glass/PVC		
PV	PVDF/PVDF		
TT	PTFE/PTFE		
SS	Stainless steel 1.4404/1.4404		
Seal/diaphragm material			
E	EPDM/PTFE coated, only with PP and NP, self-bleeding		
B	FPM-B/PTFE coated, only with PP and NP, self-bleeding		
T	PTFE/PTFE coated		
S	Diaphragm additionally with FKM coating for siliceous media		
Liquid end version			
0	Non-bleed version, no valve spring, for TT, SS and type 0232 only		
1	Non-bleed version, with valve spring, for TT, SS and type 0232 only		
2	With deaerator, no valve spring, PP, PV, NP only, not type 0232		
3	With deaerator, with valve spring, PP, PV, NP only, not type 0232		
4	version for highly viscous media, only PVT, types 1604, 0708, 1008, 0413, 0713, 0220, 0420		
9	self-bleeding only with PP/NP, not for types 1000 and 0232		
Hydraulic connections			
0	Standard according to technical data		
5	Connector for 12/6 hose, delivery side only		
9	Connector for 10/4 hose, delivery side only		
Version			
0	Standard		
Logo			
0	with ProMinent® logo		
Power supply			
U	100-230 V ± 10 %, 50/60 Hz		
M	12 V DC, only with BT4b		
N	24 V DC		
Cable and plug			
A	2 m European		
B	2 m Swiss		
C	2 m Australian		
D	2 m USA		
1	2 m, open-ended		
Relay			
0	No relay		
1	Fault indicating relay, normally energised, 1 x changeover contact 230 V - 2 A		
3	Fault indicating relay, normally de-energised, 1 x changeover contact 230 V - 2 A		
4	as 1 + pacing relay 2 x normally open contacts 24 V - 100 m		
5	as 3 + pacing relay 2 x normally open contacts 24 V - 100 mA		
Accessories			
0	No accessories		
1	With foot and dosing valve, 2 m PVC suction tubing, 5 m PE discharge tubing		
Control type			
0	No lock		
1	With lock: manual operation locked when external cable plugged in		
Control Variants			
0	Standard		
Options on request			
0 0	No options		





## 1.2 Solenoid Driven Metering Pump Beta®

### 1.2.3

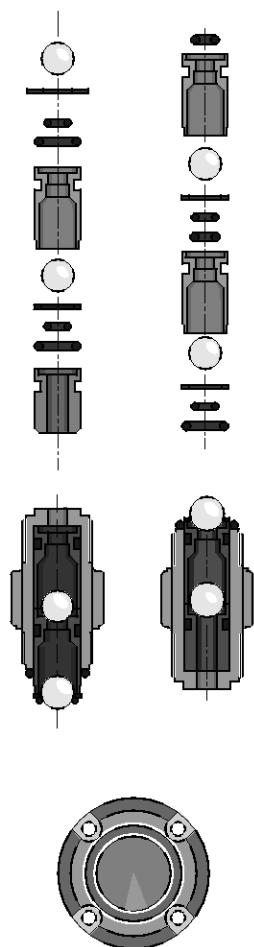
### Spare Parts Kits, Replacement Diaphragms

#### Spare parts kits for Beta®

Spare parts kits for Beta® consisting of:

- 1 pump diaphragm
- 1 suction valve compl.
- 1 discharge valve compl.
- 2 valve balls
- 1 set of seals
- 1 connector set

Suction and discharge valve set not included with stainless steel version.



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Type	Materials in contact with the medium	Order no.
<b>Type 1000</b>	PPT, NPT, PVT	1023107
	TTT	1001737
	SST	1001729
<b>Type 1601</b>	PPT, NPT, PVT	1023108
	TTT	1001738
	SST	1001730
<b>Type 1602</b>	PVT, PPT, NPT	1023109
	TTT	1001739
	SST	1001731
<b>Type 1604 and Type 2504</b>	PPT, NPT, PVT	1035332
	PVT HV	1035342
	TTT	1035330
	SST	1035331
<b>Type 0708 and Type 1008</b>	PVT, PPT, NPT	1023111
	PVT HV	1019067
	TTT	1001741
	SST	1001733
<b>Type 0413 and Type 0713</b>	PVT, PPT, NPT	1023112
	PVT HV	1019069
	TTT	1001742
	SST	1001734
<b>Type 0220 and Type 0420</b>	PVT, PPT, NPT	1023113
	PVT HV	1019070
	TTT	1001754
	SST	1001735
<b>Type 0232</b>	PVT, PPT, NPT	1023124
	TTT	1001755
	SST	1001736

#### Accessories

- Foot Valves See page → 1-48
- Injection Valves See page → 1-51
- Hoses, Pipes See page → 1-61
- Suction Lances, Suction Kit Without Level Switch See page → 1-66
- Connector Parts/Fittings See page → 1-87

#### Spare Parts

- Custom Valve Balls/Valve Springs See page → 1-86

## 1.2 Solenoid Driven Metering Pump Beta®

### Spare parts kit for Beta® with SEK

Spare parts kits for metering pumps with self-bleeding dosing head consisting of:

- 1 Diaphragm
- 1 Suction valve, complete
- 1 Discharge valve, complete
- 1 Bleed valve, complete
- 2 Valve balls
- 1 Set of seals
- 1 Connector kit

Type	Materials in contact with the medium	Order no.
<b>Type 1601</b>	PPE9	1001756
	PPB9	1001762
	NPE9	1001660
	NPB9	1001666
<b>Type 1602</b>	PPE9	1001757
	PPB9	1001763
	NPE9	1001661
	NPB9	1001667
<b>Type 1604</b>	PPE9	1035335
	PPB9	1035336
	NPE9	1035333
	NPB9	1035334
<b>Type 0708 and Type 1008</b>	PPE9	1001759
	PPB9	1001765
	NPE9	1001663
	NPB9	1001669
<b>Type 0413 and Type 0713</b>	PPE9	1001760
	PPB9	1001766
	NPE9	1001664
	NPB9	1001670
<b>Type 0220 and Type 0420</b>	PPE9	1001761
	PPB9	1001767
	NPE9	1001665
	NPB9	1001671

### Replacement diaphragms for Beta® range

Type	Materials in contact with the medium	Order no.
<b>Type 1000</b>	all materials	1000244
<b>Type 1601</b>	all materials	1000245
<b>Type 1602</b>	all materials	1000246
<b>Type 1604 and Type 2504</b>	all materials	1034612
<b>Type 0708 and Type 1008</b>	all materials	1000248
<b>Type 0413 and Type 0713</b>	all materials	1000249
<b>Type 0220 and Type 0420</b>	all materials	1000250
<b>Type 0232</b>	all materials	1000251

## 1.3 Solenoid Diaphragm Metering Pump gamma/ X

### 1.3.1

### Solenoid Diaphragm Metering Pump gamma/ X



**gamma/ X - the proven best-seller intelligently extended**

**Capacity range 2.3 – 45 l/h, 25 – 2 bar**

The solenoid diaphragm metering pump gamma incorporates a wealth of eXcellent ingenuity! With integrated pressure measurement, it ensures the smooth running of your metering process. The gamma/ X is ideal for all metering work involving liquid media.



**NEW**



P\_GX\_001\_SW1

The new solenoid diaphragm metering pump gamma/ X is user-friendly and has an outstandingly long service life, just like its predecessor. An ingenious solenoid control measures the back pressure and protects the system from overload. This technology makes a pressure sensor superfluous, meaning that operating safety can be significantly increased: no additional parts come into contact with the feed chemical, there are no additional sealing surfaces and no electronic components come into contact with the feed chemical. Whether the metering volume fluctuates or hydraulic failures affect the metering process – the gamma/ X keeps everything at your fingertips.

It independently ensures a trouble-free metering process and, should the pump ever need maintenance, its service module draws attention to this.

#### Your benefits

- Simple adjustment of the capacity directly in l/h
- Trouble-free processes by the detection of hydraulic malfunctions or blocked discharge lines
- Integrated pressure measurement and display for greater safety during commissioning and in the process
- Adaptation to existing signal transducers by external control via potential-free contacts with pulse step-up and step-down
- External control via 0/4-20 mA standard signal with adjustable assignment of signal value to stroke rate
- Integrated 7-day timer for timed metering tasks
- Guaranteed metering by means of automatic bleeding
- Connection to process control systems via bus interfaces, such as Profinet, CAN bus, from the 3rd quarter of 2015, others on request
- Organise work processes conveniently with the optional process timer. The alternative to a timer or PLC
- Virtually wear-free solenoid drive, overload-proof and economical
- Suitable for continuous micro-metering from 2 ml/h thanks to the regulated solenoid drive

#### Technical details

- Available material combinations: PP, PVDF, clear acrylic, PTFE and stainless steel
- Special dosing head designs for gaseous and high-viscosity media
- Illuminated LC display and 3-LED display for operating, warning and error messages, visible from all sides
- Factor with external contact control 99:1 - 1:99
- Batch operation with max. 65,536 strokes/start pulse
- Input concentration for simple adjustment with volume-proportional metering tasks
- Stroke rate adjustment in 1 stroke/hour increments from 0 to 12,000 strokes/h
- Continuous electronic stroke length adjustment from 0 - 100% (recommended 30 - 100%)
- Connector for 2-stage level switch
- External control via 0/4-20 mA standard signal with adjustable assignment of signal value to stroke rate
- Optional 4-20 mA output for remote transmission of stroke length and stroke rate
- Universal power supply unit 100 V - 230 V, 50/60 Hz
- Optional 230 V relay module, can also be easily and reliably retrofitted
- Optional 24 V combined relay, can also be easily and reliably retrofitted

#### Field of application

Can be integrated into automated processes and used in all industries. The pump can work as a control unit with the process timer, for example in cooling water treatment

\* Available from 2nd quarter of 2015.

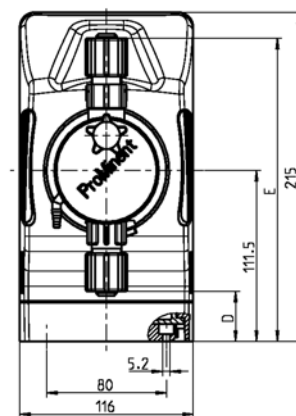
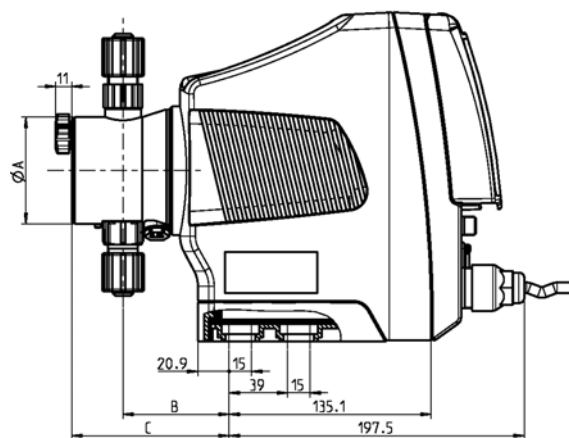


# 1.3 Solenoid Diaphragm Metering Pump gamma/ X

Dimensional drawing for gamma/ X  
Material design PPT

Type	Ø A	B
0245	110	76
0424, 0220	90	76
0715, 0414	90	74
1009, 0708	90	74
1604	70	71
1602	70	71

Type	C	D	E
0245	-	14	209
0424, 0220	110	24	202
0715, 0414	107	24	202
1009, 0708	108	24	202
1604	106	32	198
1602	106	32	198



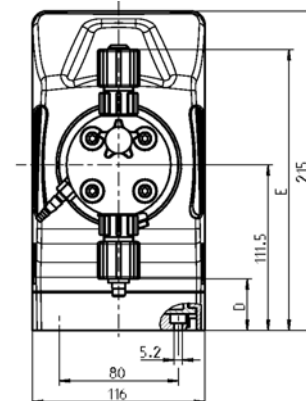
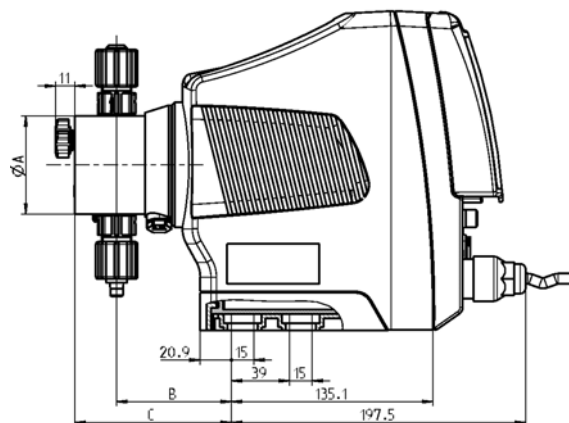
P\_G\_0055\_SW3

Dimensional drawing of gamma/ X, Material design PPT – dimensions in mm

Dimensional drawing of gamma/ X  
Material design NPT

Type	Ø A	B
0245	110	76
0424, 0220	90	76
0715, 0414	90	76
1009, 0708	90	74
1604, 2504	70	77
1602	70	77

Type	C	D	E
0245	105	14	210
0424, 0220	104	23	200
0715, 0414	104	23	200
1009, 0708	102	23	200
1604, 2504	105	33	191
1602	105	33	191



P\_G\_0056\_SW3

Dimensional drawing of gamma/ X, Material design NPT – dimensions in mm



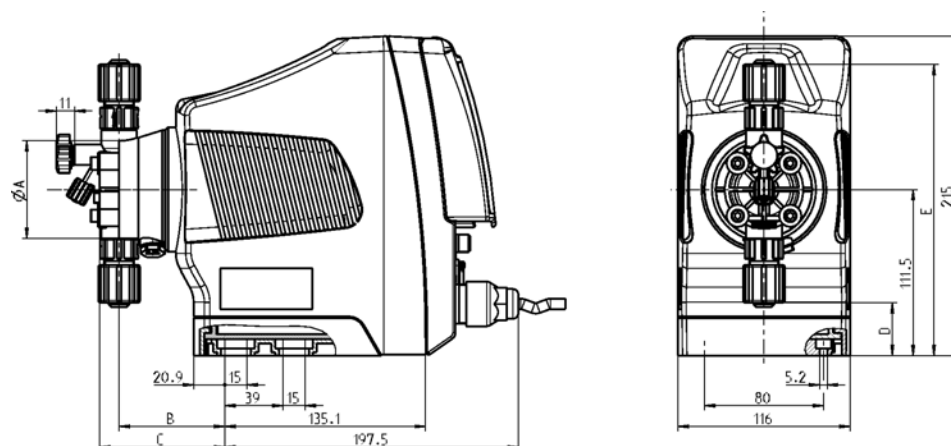


## 1.3 Solenoid Diaphragm Metering Pump gamma/ X

Dimensional drawing of gamma/ X  
Material design PVT

Type	Ø A	B
0245	110	76
0424, 0220	90	79
0715, 0414	90	73
1009, 0708	90	75
1604	70	71
1602	70	71

Type	C	D	E
0245	-	14	209
0424, 0220	90	25	203
0715, 0414	90	25	203
1009, 0708	92	25	203
1604	84	36	196
1602	84	36	196



P\_G\_0057\_SW3

Dimensional drawing of gamma/ X, Material design PVT – dimensions in mm

## 1.3 Solenoid Diaphragm Metering Pump gamma/ X

### Technical Data

Pump type	Delivery rate at max. back pressure			Number of strokes	Connection size o Ø x i Ø	Suction lift	Shipping weight	
	bar	l/h	ml/stroke	Strokes/min	mm	mWC	PP, NP, PV, TT kg	SS kg
<b>gamma/ X</b>								
GMXa 1602	16	2.30	0.19	200	6 x 4	6.0**	3.6	4.1
GMXa 1604	16	3.60	0.30	200	6 x 4	6.0**	3.6	4.1
GMXa 0708	7	7.60	0.63	200	8 x 5	6.0**	3.7	5.0
GMXa 0414	4	14.00	1.17	200	8 x 5	3.0**	3.7	5.0
GMXa 0220	2	19.70	1.64	200	12 x 9	2.0**	3.7	5.0
GMXa 2504	25	3.80	0.32	200	8 x 4***	6.0**	4.9	5.5
GMXa 1009	10	9.00	0.75	200	8 x 5	6.0**	5.1	6.5
GMXa 0715	7	14.50	1.21	200	8 x 5	4.0**	5.1	6.5
GMXa 0424	4	24.00	2.00	200	12 x 9	3.0**	5.1	6.5
GMXa 0245	2	45.00	3.70	200	12 x 9	2.0**	5.2	7.0
<b>gamma/ X metering pumps with self-bleeding dosing head*</b>								
GMXa 1602	16	1.30	0.11	200	6 x 4	2.1**	3.6	–
GMXa 1604	16	2.40	0.21	200	8 x 5	2.7**	3.6	–
GMXa 0708	7	6.80	0.57	200	8 x 5	2.0**	3.7	–
GMXa 0414	4	12.00	1.00	200	8 x 5	2.0**	3.7	–
GMXa 0220	2	18.00	1.50	200	12 x 9	2.0**	3.7	–
GMXa 1009	10	8.00	0.67	200	8 x 5	3.0**	5.1	–
GMXa 0715	7	12.00	1.00	200	8 x 5	2.5**	5.1	–
GMXa 0424	4	20.00	1.67	200	12 x 9	2.5**	5.1	–



gamma/ X metering pumps with dosing heads for high-viscosity media have a 10 – 20% lower capacity and are not self-priming. G 3/4-DN 10 connector with d 16-DN 10 hose nozzle.

- \* The given performance data represents guaranteed minimum values, calculated using water as the medium at room temperature. Bypass connector with self-bleeding dosing head (SEK): 6 x 4 mm.
- \*\* Suction lift with a filled dosing head and filled suction line, with a self-bleeding dosing head with air in the suction line
- \*\*\* With stainless steel design 6 mm connector width
- All data refers to water at 20 °C.

### Materials in contact with the medium

	Dosing head	Suction/pressure connector	Ball seat	Seals	Balls
PPE	Polypropylene	Polypropylene	EPDM	EPDM	Ceramic
PPB	Polypropylene	Polypropylene	FKM	FKM	Ceramic
PPT	Polypropylene	Polypropylene	PVDF	PTFE	Ceramic
NPE	Clear acrylic	PVC	EPDM	EPDM	Ceramic
NPB	Clear acrylic	PVC	FKM	FKM	Ceramic
NPT	Clear acrylic	PVC	PVDF	PTFE	Ceramic
PVT	PVDF	PVDF	PVDF	PTFE	Ceramic
TTT	PTFE with carbon	PTFE with carbon	Ceramic	PTFE	Ceramic
SST	Stainless steel material no. 1.4404	Stainless steel material no. 1.4404	Ceramic	PTFE	Ceramic

Self-bleeding design only in material designs PP and NP with a valve spring made of Hastelloy C and a PVDF valve insert. Diaphragm with a PTFE coating.

FKM = fluorine rubber

Metering reproducibility: ±2% when used according to the operating instructions

Permissible ambient temperature: -10 °C to +45 °C

Mean power consumption: 24/30 W

Degree of protection: IP 65, insulation class F

### Scope of supply

Metering pump with mains cable, connector kit for hose/tube connector as per table.



## Low-pressure Metering Pumps



# 1.3 Solenoid Diaphragm Metering Pump gamma/ X

## 1.3.3

## Spare Parts Kits, Replacement Diaphragms

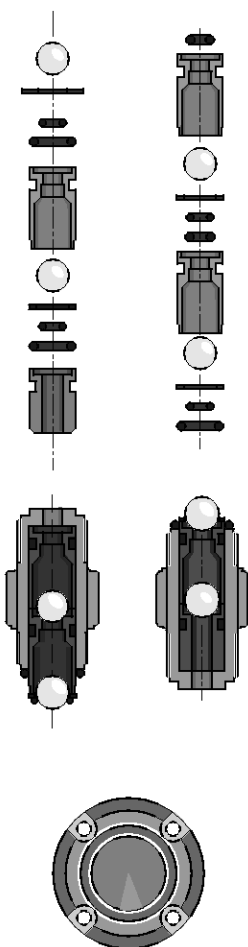
### Spare Parts Kit for gamma/ X

Spare parts kits for gamma/ X, consisting of:

- 1 Diaphragm
- 1 Suction valve, complete
- 1 Discharge valve, complete
- 2 Valve balls
- 1 Set of seals
- 1 Connector kit

Suction and discharge valve set not included with stainless steel version.

Type		Order no.
Type 1602	PVT, PPT, NPT	1023109
	TTT	1001739
	SST	1001731
Type 1604 and Type 2504	PVT, PPT, NPT	1023110
	PVT HV	1019066
	TTT	1001740
	SST	1001732
Type 0708 and Type 1009	PVT, PPT, NPT	1023111
	PVT HV	1019067
	TTT	1001741
	SST	1001733
Type 0414 and Type 0715	PVT, PPT, NPT	1023112
	PVT HV	1019069
	TTT	1001742
	SST	1001734
Type 0220 and Type 0424	PVT, PPT, NPT	1051129
	PVT HV	1051134
	TTT	1051151
	SST	1051139
Type 0245	PVT, PPT, NPT	1051130
	TTT	1051152
	SST	1051140



pk\_1\_008

## 1.3 Solenoid Diaphragm Metering Pump gamma/ X

### Spare parts kit for gamma/ X with SEK

Spare parts kits for gamma/ L with self-bleeding liquid end, consisting of:

- 1 pump diaphragm
- 1 suction valve set
- 1 discharge valve set
- 1 bleed valve set
- 2 valve balls
- 1 set of seals
- 1 connector set

Type	Materials in contact with the medium	Order no.
<b>Type 1602</b>	PPE9	1001757
	PPB9	1001763
	NPE9	1001661
	NPB9	1001667
<b>Type 1604</b>	PPE9	1001758
	PPB9	1001764
	NPE9	1001662
	NPB9	1001668
<b>Type 0708 and Type 1009</b>	PPE9	1001759
	PPB9	1001765
	NPE9	1001663
	NPB9	1001669
<b>Type 0414 and Type 0715</b>	PPE9	1001760
	PPB9	1001766
	NPE9	1001664
	NPB9	1001670
<b>Type 0220 and Type 0424</b>	PPB9	1051102
	NPE9	1051091
	NPB9	1051124
	PPE9	1051113

### Spare Diaphragm for Product Range gamma/ X

Type	Materials in contact with the medium	Order no.
<b>Type 1602</b>	all materials	1000246
<b>Type 1604 and Type 2504</b>	all materials	1039612
<b>Type 0708 and Type 1009</b>	all materials	1000248
<b>Type 0414 and Type 0715</b>	all materials	1000249
<b>Type 0220 and Type 0424</b>	all materials	1045456
<b>Type 0245</b>	all materials	1045443

### Accessories

- Foot Valves See page → 1-48
- Injection Valves See page → 1-51
- Hoses, Pipes See page → 1-61
- Suction Lances, Suction Kit Without Level Switch See page → 1-66
- Connector Parts/Fittings See page → 1-87

### Spare Parts

- Custom Valve Balls/Valve Springs See page → 1-86





## 1.4 Solenoid Driven Metering Pump delta®

### 1.4.1

### Solenoid Driven Metering Pump delta® with Regulated Solenoid Drive



Virtually an all-rounder and just the right solution for exacting requirements. A high-end product with a wide range of settings and control options.

Capacity range 7.5 - 75 l/h, 25 - 2 bar.



A high-end diaphragm metering pump: The solenoid driven metering pump delta® is the first of its kind to have a regulated solenoid drive. Virtually wear-free, extremely economical and with a self-bleeding dosing head design.

A range of different pump types and material combinations are available for virtually all metering applications. The optional 4-week process timer offers a variety of installation options. The pump achieves maximum precision even with fluctuating back pressure thanks to the regulated solenoid drive. This guarantees an exceptionally long service life even under maximum load. The integrated optoGuard® monitoring function reports hydraulic fault statuses, such as excess pressure or ruptured metering line. The large illuminated LC display guarantees good readability of all displayed values. The capacity is shown directly in l/h.

#### Your benefits

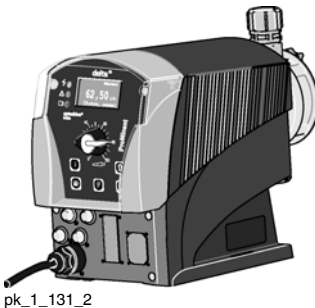
- Adjustment of the capacity directly in l/h
- Adaptation to existing signal transducers by external control via potential-free contacts with pulse step-up and step-down
- External control via 0/4 – 20 mA standard signal with adjustable assignment of signal value to stroke rate
- Organise work processes conveniently with the optional process timer. The alternative to timers or PLCs.
- Optional PROFIBUS® interface for connection to process control systems
- Suitable for use with almost all liquid chemicals, thanks to the available material combinations PVDF, clear acrylic and stainless steel
- Virtually wear-free solenoid drive: overload-proof and economical
- Everything in sight and under control: illuminated LED display and 3-LED display for operating, warning and error messages
- Reporting of hydraulic error statuses, blocked points of injection, ruptured metering lines and air and/or gas in the dosing head, which the integrated monitoring system optoGuard® detects
- Automatic bleed function
- Maximum dosing precision by compensation of pressure fluctuations
- Also ideal for continuous micro-metering from around 6 ml/h

#### Technical details

- External control via potential-free contacts with pulse step-up and step-down to adapt to existing signal transducers of 99:1 to 1:99
- Batch operation with max. 65,536 strokes/start pulse
- External control via 0/4 – 20 mA standard signal with adjustable assignment of signal value to stroke rate
- Stroke rate adjustment in 1 stroke/hour steps of 0 to 12,000 strokes/h and/or 200 strokes/min
- Stroke length continuously adjustable between 0 – 100% (recommended 30 – 100%)
- Connector for 2-stage level switch
- Dosing monitor input with adjustable number of tolerated defective strokes
- Optional optical diaphragm rupture indicator detects droplets behind the diaphragms
- Optional 4 – 20 mA output for remote transmission of stroke length and stroke rate
- "Concentration input" option for volume-proportional metering
- PROFIBUS® or CAN Open interface option
- Control module option with connecting option for chlorine, pH, ORP sensors or flow meter DFMA
- Wide-range electrical connection: 100 – 230 V, 50/60 Hz
- Optional relay module, can also be easily and reliably retrofitted

#### Field of application

They can be used in all industries and integrated into automated processes. Maximum process reliability through the regulated solenoid drive and optoGuard® monitoring function. The pump can work as a control unit with the process timer, for example in cooling water treatment

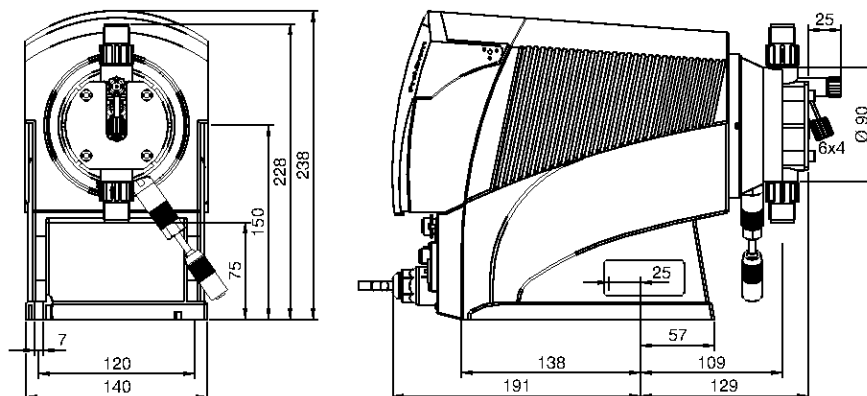


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## 1.4 Solenoid Driven Metering Pump delta®

**Dimensional drawing of delta®  
Material version PV**



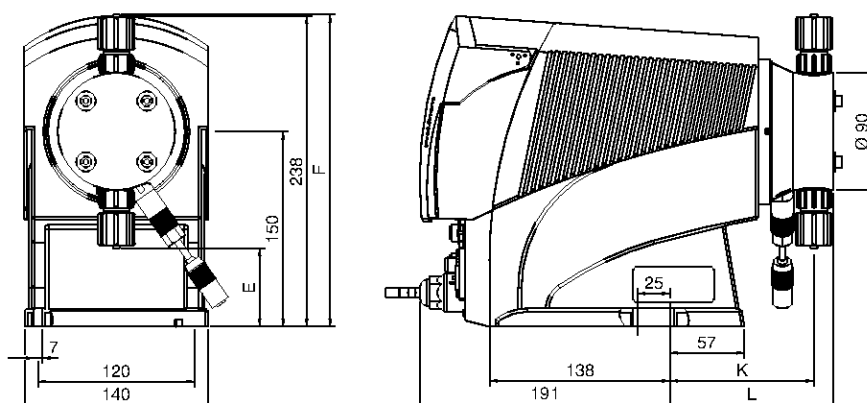
P\_DE\_0042\_SW\_2\_SW3

Dimensional drawing of delta® type 1612-0730, Material version PV - dimensions in mm

**Dimensional drawing of delta®  
Material version NP**

Type	E	F
2508 / 1608	63	235
1612	60	239
1020	54	245
0730	53	246

Type	K	L
2508 / 1608	110	125
1612	110	125
1020	112	127
0730	112	127



P\_DE\_0046\_1\_SW3

Dimensional drawing of delta® without bleed valve, Material version NP - dimensions in mm



## 1.4 Solenoid Driven Metering Pump delta®

### Technical Data

Pump type	Max. pressure bar	Delivery rate l/h	Stroke volume ml/stroke	Max. stroke rate Strokes/min	Connector size outside Ø x inside Ø	Suction lift mWC	Shipping weight NPE, NPB, PVT / SST kg
DLTa 2508	25	7.5	0.62	200	8 x 4** mm	5*	10/11
DLTa 1608	16	7.8	0.65	200	8 x 5** mm	5*	10/11
DLTa 1612	16	11.3	0.94	200	8 x 5 mm	6*	10/11
DLTa 1020	10	19.1	1.59	200	12 x 9 mm	5*	10/11
DLTa 0730	7	29.2	2.43	200	12 x 9 mm	5*	10/11
DLTa 0450	4	49.0	4.08	200	G 3/4 - DN 10	3*	10/11
DLTa 0280	2	75.0	6.25	200	G 3/4 - DN 10	2*	10/11



delta® metering pumps with dosing heads for higher-viscosity media have a 10-20 % lower capacity and are not self-priming. G 3/4 - DN 10 connector with d 16-DN 10 hose nozzle.

\* Suction lift (mWS) = Suction lift with filled dosing head and filled suction line

\*\* With stainless steel design 6 mm connector width

All data refers to water at 20 °C.

### Materials in contact with the medium

Design	Dosing head	Suction/pressure connector	Ball seat	Seals	Valve balls
NPE	Clear acrylic	PVC	EPDM	EPDM	Ceramic
NPB	Clear acrylic	PVC	FKM	FKM	Ceramic
PVT	PVDF	PVDF	PVDF	PTFE	Ceramic
SST (8-12 mm)	Stainless steel 1.4404	Stainless steel 1.4404	Ceramic	PTFE	Ceramic
SST (DN 10)	Stainless steel 1.4404	Stainless steel 1.4404	PTFE with carbon	PTFE	Ceramic

### Design of connectors

<b>Plastic</b>	8-12 mm	Hose squeeze connection
	DN 10	d16 DN 10 hose nozzle
<b>Stainless steel</b>	6-12 mm	Swagelok system
	DN 10	Rp 3/8 insert

Diaphragm with PTFE coating.

Repeatability of metering  $\pm 2$  % when used according to the operating instructions.

Permissible ambient temperature: -10 °C to 45 °C

Mean power consumption 78 W

Degree of protection IP 65, insulation class F



### Scope of supply

Metering pump with mains cable, connector kit for hose/tube connector as per table.



# 1.4 Solenoid Driven Metering Pump delta®

## 1.4.2 Identity Code Ordering System

### delta® series

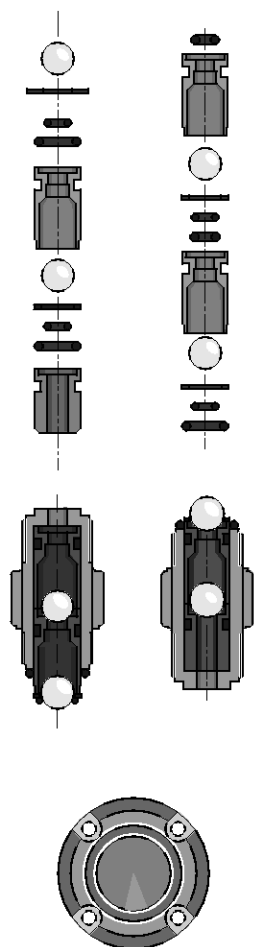
DLTa	Type	Capacity					
		bar	l/h		bar	l/h	
	2508	25	7.5		0730	7	29.2
	1608	16	7.8		0450	4	49.0
	1612	16	11.3		0280	2	75.0
	1020	10	19.1				
Liquid end/valve material							
	PV	PVDF/PVDF not for pump type 2508					
	NP	Acrylic glass/PVC only for pump type 2508, 1608, 1612, 1020, 0730					
	SS	Stainless steel/stainless steel					
Seal/diaphragm material							
	T	Only with PV and SS					
	S	PTFE/diaphragm additionally with FKM coating for silica-laden media, not for types 0450 and 0280					
	B	FKM-B, only with NP					
	E	EPDM, only with NP					
Liquid end version							
	0	Non-bleed, without valve spring, only with material TT and SS					
	1	Non-bleed, with valve spring, only with material TT and SS					
	2	Bleed version, without valve spring, only with material NP and PV					
	3	Bleed version, with valve spring, only with material NP and PV					
	4	HV version for higher-viscosity media, only for types 1608, 1612,1020 and 0730					
Hydraulic connections							
	0	Standard connectors as per technical data					
	5	Discharge-side connector for 12/6 hose, suction-side standard, only with material NP and PV					
	F	Connector on discharge side for 8/4 hose, standard on suction side, only with material NP and PV					
Diaphragm rupture indicator							
	0	Without diaphragm rupture indication					
	1	With diaphragm rupture indicator, optical sensor					
	2	With dual diaphragm system and diaphragm rupture indicator, pressure sensor, only with material SS					
Version							
	0	With ProMinent logo					
Power supply							
	U	Universal controller 100-230 V 50/60 Hz					
Cable and plug							
	A	2 m Europe					
	B	2m Switzerland					
	C	2 m Australia					
	D	2 m USA / 115 V					
	1	2 m without plug					
Relay							
	0	Without relay					
	1	alarm relay normally energised 1 x C/O contact 230 V – 8 A					
	3	alarm relay normally de-energised 1 x C/O contact 230 V – 8 A					
	4	as 1 + pacing relay 2 x N.O. contacts 24 V – 100 mA					
	5	as 3 + pacing relay 2 x N.O. contacts 24 V – 100 mA					
	A	Shutdown and alarm relay normally energised 2 x N.O. contacts 24 V – 100 mA					
	C	as 1 + 4-20 mA output 1 x N.O. contact 24 V – 100 mA					
	F	with automatic bleed valve, 230 V not for pump type 2508					
	G	with automatic bleed valve, 24 V DC and relay output					
Accessories							
	0	Without accessories					
	1	With foot and metering valve, 2m suction line and 5 m discharge line					
	2	As 0 + measuring cup (only for type 2508, 1608, 1612, 1020, and 0730)					
	3	As 1 + measuring cup (only for type 2508, 1608, 1612, 1020, and 0730)					
Control version							
	0	Manual + external contact with pulse control					
	3	Manual + external contact with pulse control + analogue 0/4-20 mA					
	4	as 0 + 4-week process timer					
	5	as 3 + 4-week process timer					
	C	as 3 + CANopen					
	M	As 3 + pH, ORP and chlorine + DFMA control module					
	R	as 3 + PROFIBUS® interface, M12					
Access code							
	0	Without access code					
	1	With access code					
Language							
	DE	german					
	EN	english					
	FR	french					
	ES	spanish					
Pause/level							
	0	Pause N.C. contact level, N.C. contact					



## 1.4 Solenoid Driven Metering Pump delta®

### 1.4.3

### Spare Parts Kits, Replacement Diaphragms



pk\_1\_008

#### Spare parts kits for delta®

Replacement parts kit for delta®, consisting of:

- 1 metering diaphragm
- 1 suction valve compl.
- 1 discharge valve compl.
- 2 valve balls
- 1 set of seals
- 1 connecting kit

Stainless steel version without suction and discharge valve compl.

Type	Materials in contact with the medium	Order no.
<b>Type 2508</b>	NPE	1033172
	NPB	1033171
	SST	1030226
<b>Type 1608</b>	NPE	1030620
	NPB	1030611
	PVT	1030225
	SST	1030226
<b>Type 1612</b>	NPE	1030536
	NPB	1030525
	PVT	1027081
	SST	1027086
<b>Type 1020</b>	NPE	1030537
	NPB	1030526
	PVT	1027082
	SST	1027087
<b>Type 0730</b>	NPE	1030621
	NPB	1030612
	PVT	1027083
	SST	1027088
<b>Type 0450</b>	PVT	1027084
	SST	1027089
<b>Type 0280</b>	PVT	1027085
	SST	1027090

#### Replacement diaphragms for delta® series

Type	Materials in contact with the medium	Order no.
<b>Type 2508/1608</b>	all materials	1030353
<b>Type 1612</b>	all materials	1000248
<b>Type 1020</b>	all materials	1000249
<b>Type 0730</b>	all materials	1000250
<b>Type 0450</b>	all materials	1000251
<b>Type 0280</b>	all materials	1025075

#### Accessories

- Foot Valves See page → 1-48
- Injection Valves See page → 1-51
- Hoses, Pipes See page → 1-61
- Suction Lances, Suction Kit Without Level Switch See page → 1-66
- Connector Parts/Fittings See page → 1-87

#### Spare Parts

- Custom Valve Balls/Valve Springs See page → 1-86



# 1.5 Precision Plunger Metering Pump mikro delta®

## 1.5.1

## Precision Plunger Metering Pump mikro delta®



Continuous, highly precise and safe metering in the micro-litre range. This challenge is met by the latest generation of pumps.

Capacity range 150 - 1500 ml/h, 60 - 20 bar.



The precision plunger metering pump mikro delta® meters reliably, ultra-accurately and constantly in the microlitre range – one of the latest generation of solenoid metering pumps. Higher pressures can be achieved thanks to half the stroke length and double the stroke rate compared to the previous model.

The mikro delta® delivers the same litre outputs as its predecessor model. It does this at half stroke length and double stroke rate. This enables higher pressures to be provided. Double ball valves and an integrated back pressure valve guarantee highly precise and pressure-independent metering in the 0 - 60 bar range. The capacity ranges from 1-250 µl/stroke or 0.001 - 1500 ml/h.

### Your benefits

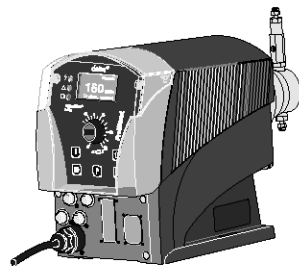
- Ideally suited for continuous micro-metering from approx. 0.2 l/h
- Adaptation to existing signal transducers by external control via potential-free contacts with pulse step-up and step-down
- External control via 0/4 – 20 mA standard signal with adjustable assignment of signal value to stroke rate
- Organise work processes conveniently with the optional process timer - the alternative to timers or PLC
- Optional PROFIBUS® interface for connection to process control systems
- Virtually wear-free solenoid drive: Overload-proof and cost-effective
- Everything in sight and under control: Illuminated LED display and 3-LED display for operating, warning and error messages
- Maximum dosing precision of  $\pm 0.5\%$  by compensation of pressure fluctuations

### Technical details

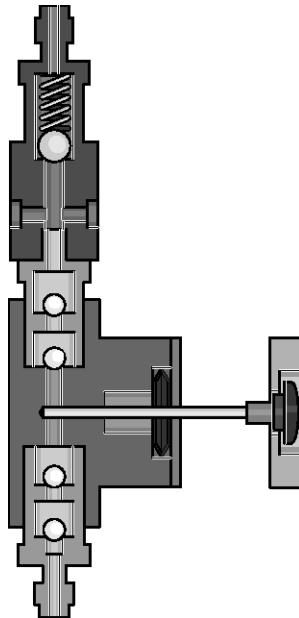
- Adjustment of the capacity directly in ml/h
- External control via potential-free contacts with pulse step-up and step-down to adapt to existing signal transducers of 99:1 to 1:99
- Batch operation with max. 65,536 strokes/start impulse
- External control via 0/4-20 mA standard signal with adjustable assignment of signal value to stroke rate
- Stroke rate adjustment in 1 stroke/hour steps of 0-6.000 strokes/h or 100 strokes/min
- Stroke length continuously adjustable between 0-100 % (recommended 4-100 %)
- Connector for 2-stage level switch
- PROFIBUS® or CAN Open interface option
- Wide-ranging electrical connection: 100-230 V, 50/60 Hz
- Optional relay module, can also be easily and reliably retrofitted

### Field of application

For continuous micro-metering in laboratories and in manufacturing for the addition of very small quantities of liquid.



P\_DE\_0003\_SW1



pk\_1\_010  
Liquid end

### Materials in contact with the medium

Version	Dosing head	Suction/discharge connection	Valve balls	Valve seats	Piston	Valve seals	Plunger gaskets
TTT	PTFE with carbon	PTFE with carbon	ruby	ceramic	ceramic	PTFE	PTFE, white
TTG	PTFE with carbon	PTFE with carbon	ruby	ceramic	ceramic	PTFE	PTFE + graphite
SST	stainless steel 1.4571	stainless steel 1.4571	ruby	ceramic	ceramic	PTFE	PTFE, white
SSG	stainless steel 1.4571	stainless steel 1.4571	ruby	ceramic	ceramic	PTFE	PTFE + graphite

Permissible ambient temperature -10 °C ... +45 °C.



# 1.5 Precision Plunger Metering Pump mikro delta®

## Technical Data

Pump type	Delivery rate at max. back pressure			Plunger Ø	Connection size hose oØ x iØ	Connection size piping oØ	Suction lift	Intake height	Perm. pre-pressure suction side	Back pressure valve holding pressure	Shipping weight
	bar	ml/h	µl/stroke								
Version TT											
100150 TT	10	145	24.17	2.5	1.75 x 1.15	–	6*	0.6**	5	2.5	10
100600 TT	10	580	96.67	5	1.75 x 1.15	–	6*	2.0**	5	2.5	10
101500 TT	10	1,480	246.67	8	3.20 x 2.40	–	4*	2.0**	5	1.5	10
Version SS											
600150 SS	60	145	24.17	2.5	1.75 x 1.15	1.58	6*	0.6**	30	2.5	11
400600 SS	40	580	96.67	5	1.75 x 1.15	1.58	6*	2.0**	20	2.5	11
201500 SS	20	1,480	246.67	8	3.20 x 2.40	3.18	4*	2.0**	10	1.5	11

\* Suction lift with primed liquid end and primed suction line

\*\* Intake height with clean and wetted valves. Feed chemical water at 20 °C. Intake height at 100 % stroke length, open vent screw and suction side as described.

Max. stroke rate 100 rpm.

All data refers to water at 20 °C.

## Electrical connection

Nominal power, approx.	38 W
Nominal current, approx.	0.64 ... 0.42 A
Start-up peak current, easing within 50 ms	8 ... 4 A

## Dimensional drawing of mikro delta® Material version TT and SS

### Material version TT

Type	A	B
100150	243.9	150.1
100600	243.9	150.1
101500	256.2	150.1

### Material version TT

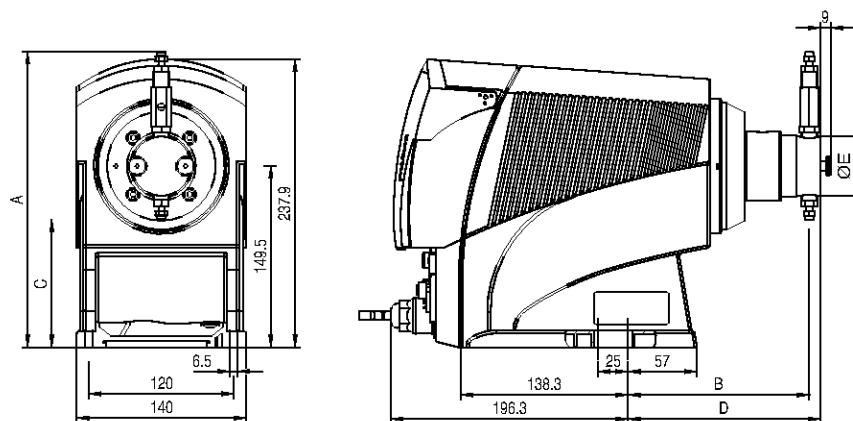
Type	C	D	E
100150	105.1	159.1	Ø 49
100600	105.1	159.1	Ø 49
101500	92.3	161.1	Ø 49

### Material version SS

Type	A	B
600150	256.2	150.1
400600	254.7	150.1
201500	256.2	150.1

### Material version SS

Type	C	D	E
600150	92.3	161.1	Ø 49
400600	99	159.1	Ø 49
201500	92.3	161.1	Ø 49



P\_DE\_0034\_SW\_mikro\_SW3

Dimensional drawing of mikro delta®, Material version TT and SS - dimensions in mm

# 1.5 Precision Plunger Metering Pump mikro delta®

1

## 1.5.2 Identity Code Ordering System

### mikro delta® series, version a

MDLa	Type	Capacity		
		bar	ml/h	
	100150	10	145	(only TT)
	600150	60	145	(only SS)
	100600	10	580	(only TT)
	400600	40	580	(only SS)
	101500	10	1,480	(only TT)
	201500	20	1,480	(only SS)
Dosing head				
	SS	Stainless steel 1.4571		
	TT	PTFE with 25 % carbon		
Sealing material				
	T	PTFE pure white		
	G	PTFE with graphite		
Liquid end version				
	0	no valve spring		
	1	with valve spring (not for type 100150 and 600150)		
Hydraulic connection				
	0	Standard according to technical data		
Logo				
	0	with ProMinent®-Logo		
	2	no ProMinent®-Logo		
Electrical power supply				
	U	100 – 230 V ± 10 %, 50/60 Hz		
Cable and plug				
	A	2 m European		
	B	2 m Swiss		
	C	2 m Australian		
	D	2 m USA		
Relay				
	0	no relay		
	1	Fault indicating relay, normally energised, 1x changeover contact, 230 V - 8 A		
	3	Fault indicating relay, normally de-energised, 1 x changeover contact, 230 V - 8 A		
	4	as 1 + pacing relay, 2 x normally open contact, 24 V - 100 mA		
	5	as 3 + pacing relay, 2 x normally closed contact, 24 V - 100 mA		
Accessories				
	0	no accessories		
Control variants				
	0	manual + external contact with pulse control		
	3	manual + external contact w. pulse control + analogue 0/4-20 mA		
	4	as 0 + Process Timer (1 month)		
	5	as 3 + Process Timer (1 month)		
	C	CANopen		
	R	as 3 + PROFIBUS®-interface, M12		
Acces code				
	0	no acces code		
	1	with acces code		
Language				
	DE	german		
	EN	english		
	FR	french		
	ES	spanish		
Pause / Level				
	0	Pause, n.c., level n.c.		



## 1.5 Precision Plunger Metering Pump mikro delta®

### 1.5.3

#### Spare Parts

##### Spare piston

Type	Order no.
100150/600150	803149
100600/400600	803181
101500/201500	803182

##### Spare piston packing PTFE pure white

Type	Order no.
100150/600150	485431
100600/400600	485430
101500/201500	485432

##### Spare piston packing PTFE with graphite

Type	Order no.
100150/600150	485428
100600/400600	485427
101500/201500	485429

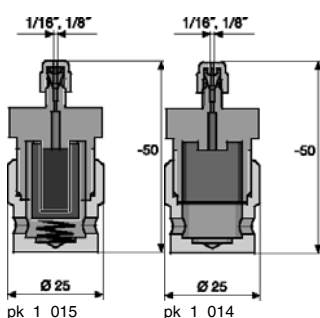






# 1.5 Precision Plunger Metering Pump mikro delta®

## 1.5.4 mikro delta® Installation Accessories



### Stainless steel suction filter

Without check valve, interchangeable filter element. Material: 1.4404/1.4310/SS 316/PTFE

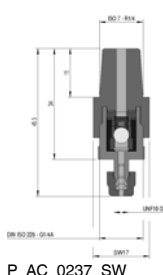
Connection		Order no.
1/16" - 15 µm	(For mikro 50 and 200 ml head) (Fig. pk_1_015) for tube Ø 1.58	803253
1/8" - 15 µm	(For mikro 500 ml head) (Fig. pk_1_015) for tube Ø 3.175	803254
1/8" - 60 µm	(For SK metering pumps) (Fig. pk_1_014) for tube Ø 3.175	803255

### Replacement filter elements for suction filter

		Order no.
Sintered elements	15 µm	403814
Screen mesh	60 µm	404523

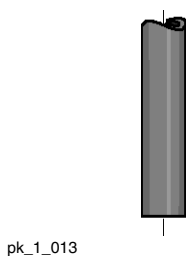
### Stainless steel injection valve

Housing in 1.4404 and springs in 1.4571, PTFE seals.



Size	Connection	Order no.
Ø 20 x 48 mm	1/16" - 1/4" for tube Ø 1.58 and 1.75 mm	803251
Ø 22 x 56 mm	1/8" - 1/4" for tube Ø 3.175 and 3.2 mm	803252

### Suction and discharge pipe

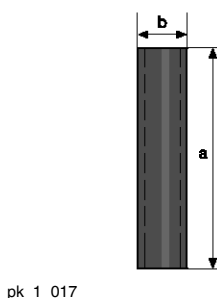


	Permissible pressure bar	Order no.
PTFE 1.75 mm o. Ø x 1.15 mm i. Ø (1/16")	12*	037414
PTFE 3.2 mm o. Ø x 2.4 mm i. Ø (1/8")	8*	037415
Stainless steel pipe 1.4435 1.58 mm o. Ø x 0.9 mm i. Ø (1/16")	400*	1020774
Stainless steel pipe 1.4435 3.175 mm o. Ø x 1.5 mm i. Ø (1/8")	400*	1020775

\* Permitted operating pressure at 20 °C, provided media is compatible and pipe is correctly connected.

### Nipple

1.4571 pipe nipple for mikro g/ 5 and gamma/ 4 SK for connecting 1/16" and 1/8" PTFE tubing.



	Order no.
Nipple 1/16" o. Ø 1.58 mm x i. Ø 0.9 mm, length 25 mm	402315
Nipple 1/8" o. Ø 3.175 mm x i. Ø 1.5 mm, length 30 mm	402316
Nipple 1/8-1/16" o. Ø 3.175 - 1.58 mm, length 45 mm	402317



# 1.6 Pneumatic Metering Pump Pneumados

## 1.6.1

## Pneumatic Metering Pump Pneumados b



The ProMinent® Pneumados is a pneumatically operated diaphragm metering pump

Capacity range 0.76 - 16.7 l/h, 16 - 2 bar.

The metering pump Pneumados has a pneumatic power end and can be used in places without electrical supply voltage, with suction stroke performed by spring force.

The compression stroke is provided by compressed air applied to a diaphragm, which drives the PTFE-coated metering diaphragm. The suction stroke is actuated by a spring-loaded force. The pump capacity is adjusted by the stroke length and stroke rate.

### Your benefits

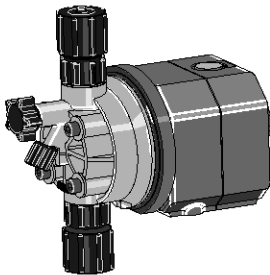
- No electrical supply voltage needed
- Material version PVDF and stainless steel
- Stroke rate of up to 180 strokes/min
- Spring-loaded valves for higher-viscosity media
- Use wherever no electrical supply voltage is available

### Technical details

- Compressed air requirement approx. 50 l/h, non-oiled compressed air preferred
- Length of the compressed air line between the valve and pump max. 1 metre
- Diaphragm deflection from the centre position

### Field of application

- Metering and handling of animal feed
- Use in car wash facilities

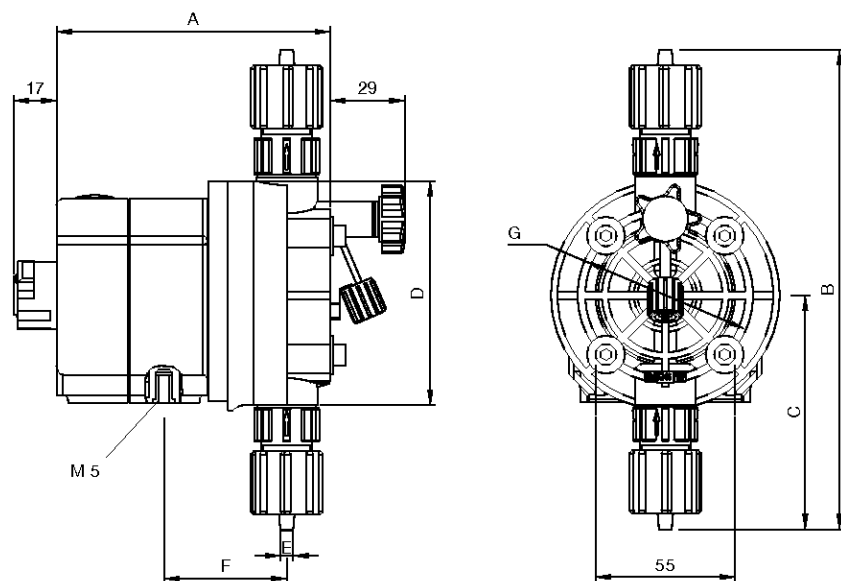


P\_PN\_0005\_SW

### Dimensional drawing for Pneumados b Material design PVDF

Type	A	D	E	F
1000	103	70	6x4	48
1601	105	70	6x4	49
1602	103	70	6x4	48
1005	107	90	8x5	48
0708	109	90	8x5	50
0413	109	90	8x5	50
0220	111	90	12x9	52

Type	B	C	G
1000	164	78	50
1601	176	90	50
1602	172	88	50
1005	189	92	66
0708	190	93	66
0413	181	88	66
0220	181	88	66



P\_PN\_0009\_SW3

Dimensional drawing of Pneumados b, Material version PVC - dimensions in mm



## 1.6 Pneumatic Metering Pump Pneumados

### Technical Data

Pump type	Delivery rate at max. back pressure			Number of strokes	Connector sizes	Suction lift	Shipping weight
	bar	l/h	ml/stroke	Strokes/min		mWC	kg
PNDb 1000	10	0.76	0.07	180	6 x 4	6.0	1.0 - 1.7
PNDb 1601	16	1.00	0.09	180	6 x 4	6.0	1.0 - 1.7
PNDb 1602	16	1.70	0.16	180	6 x 4	6.0	1.0 - 1.7
PNDb 1005	10	3.80	0.35	180	8 x 5*	5.0	1.2 - 1.9
PNDb 0708	7	6.30	0.58	180	8 x 5	4.0	1.2 - 1.9
PNDb 0413	4	10.50	0.97	180	8 x 5	3.0	1.2 - 1.9
PNDb 0220	2	16.70	1.55	180	12 x 9	2.0	1.2 - 1.9

All data refers to water at 20 °C.

\* Stainless steel version 6 x 4 mm

Filtered compressed air 6 bar  $\pm 10\%$

Air consumption at 1 m feed line 47 l/min

Max. stroke rate 180 strokes/min

### Connectors

Material	Øo x Øi	Version
For PV	6, 8 and 12 mm	Hose nozzle with clamping ring
For stainless steel SS	6, 8 and 12 mm	Swagelok system screw connection

### Materials in contact with the medium

Liquid end		Intake/pressure connection	Ball seal	Seals	Balls
PVT	PVDF	PVDF	PVDF	PTFE	Ceramic
SST	Stainless steel M. No. 1.4404	Stainless steel M. No. 1.4404	Ceramic	PTFE	Ceramic

DEVELOPAN® metering diaphragm with PTFE coating.

Metering reproducibility of  $\pm 2\%$  when used in accordance with operating instructions. Permissible ambient temperature -10 °C to +50 °C.



# 1.6 Pneumatic Metering Pump Pneumados

## 1.6.2 Identity Code Ordering System

### Pneumados product range, version b

PNDb	Type	Capacity	
		bar	l/h
	1000	10.0	0.76
	1601	16.0	1.00
	1602	16.0	1.70
	1005	10.0	3.80
	0708	7.0	6.30
	0413	4.0	10.50
	0220	2.0	16.70
Liquid end/Valve material			
	PV	PVDF/PVDF	
	SS	SS Stainless steel 1.4404/1.4404	
Seal/diaphragm material			
	S	Metakorin diaphragm with Viton-B seal	
	T	Standard diaphragm with PTFE seal	
	X	Without delivery unit	
Liquid end version			
	0	Non-bleed, without valve spring only for SS	
	1	Non-bleed, with valve springonly for SS	
	2	With bleed valve, without valve spring only for PV	
	3	With bleed valve, with valve spring only for PV	
	X	Without discharge unit	
Hydraulic connectors			
	0	Standard connection as per technical data	
Version			
	0	With ProMinent logo	
Power connector			
	0	G 1/4 connector, compressed air 6 bar	
	1	6 x 4 connector, compressed air 6 bar	
Control type			
	0	Single-acting (standard), without control valves	
	1	Electropneumatic actuation, with electric clock generator 24 V DC, solenoid valve 24 V DC, wall bracket and mounting material for solenoid valve	
Approvals			
	01	CE	



## 1.6 Pneumatic Metering Pump Pneumados

### 1.6.3 Ordering Example for Installation Accessories

	Order no.
1 x PVC foot valve with filter and Ø 6 back check valve	924557
1 x PVC injection valve with Ø 6 - R 1/2 ball check valve	924680
1 x 5 m suction, discharge and compressed air line, PE 6 x 4 mm	1004492
1 x compressed air connector for Pneumados G 1/4 - 6 mm quick release connector LCK 1/4"	354641
1 x Pneumados wall bracket including fixtures and fittings	1030028

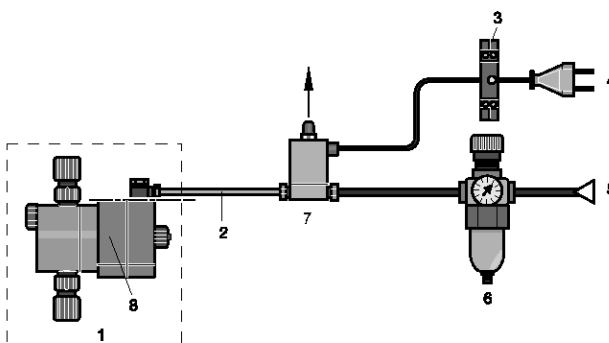
For electrical controller

	Order no.
1 x 3/2-way solenoid valve MHE3, 24 V DC, with connection fittings 6/4mm	1030275
1 x retaining bracket for solenoid valve	1030276
1 x sound absorber for solenoid valve	1030277
1 x electrical pulse generator 30-180 strokes/min., 24Vdc	1030351

### Electrical/Pneumatic controller

Schematic diagram

- 1 Pneumados supply limit
- 2 PE 6x4 max. 1 m
- 3 Electrical pulse generator
- 4 230 V/50-60 Hz mains connector
- 5 Compressed air 6 bar
- 6 Maintenance unit
- 7 3/2 way solenoid valve with sound absorber
- 8 Pneumados



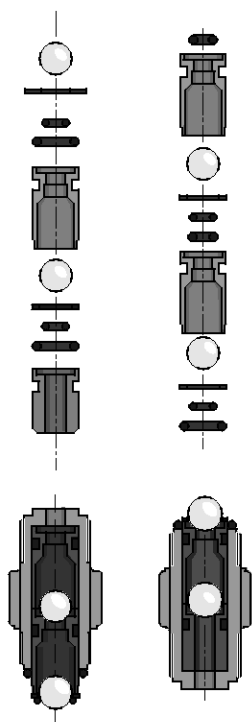
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# 1.6 Pneumatic Metering Pump Pneumados

## 1.6.4

## Spare Parts Kits



Replacement parts kit for Pneumados b consisting of

- 1 Metering diaphragm
- 1 Suction connector compl.
- 1 Discharge connector compl.
- 2 Valve balls
- 1 Set of seals
- 1 Connecting kit

**Stainless steel version without suction and discharge valve compl.**

Type		Order no.
Type 1000	PPT, NPT, PVT	1023107
	SST	1001729
Type 1601	PPT, NPT, PVT	1023108
	SST	1001730
Type 1602	PVT, PPT, NPT	1023109
	SST	1001731
Type 1005	PVT, PPT, NPT	1023110
	SST	1001732
Type 0708	PVT, PPT, NPT	1023111
	SST	1001733
Type 0413	PVT, PPT, NPT	1023112
	SST	1001734
Type 0220	PVT, PPT, NPT	1023113
	SST	1001735

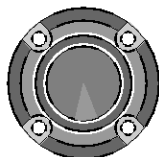
## Accessories

- Foot Valves See page → 1-48
- Injection Valves See page → 1-51
- Hoses, Pipes See page → 1-61
- Suction Lances, Suction Kit Without Level Switch See page → 1-66
- Connector Parts/Fittings See page → 1-87

## Spare Parts

- Custom Valve Balls/Valve Springs See page → 1-86

pk\_1\_008







## 1.7 Peristaltic Pumps DULCO®flex

### 1.7.1

#### Peristaltic Pump DULCO®flex DF2a



The optimum pump product range for use in swimming pools, hot tubs, and spa and wellness facilities

Capacity range 0.4 - 2.4 l/h at max. 1.5 bar back pressure

The peristaltic pump DULCO®flex DF2a meters chemicals functionally, cost-effectively and quietly – ideal for use in swimming pools, hot tubs, and in spa and wellness facilities.



The feed chemical is transported by the rotor squeezing the hose in the direction of flow. This explains why there is no need for valves. The feed chemical is thus handled with care. Typical applications: wherever lower pump pressure is sufficient. For example when metering conditioners in private pools.

#### Your benefits

- Smooth inner wall reduces deposits.
- Hose materials: PharMed® or Viton®
- Virtually silent operation
- Simple handling
- Enhanced service life of the hose due to spring-loaded rollers, which keep the rolling pressure constant
- Robust and protected against spray water from all sides: Housing made of impact-resistant and chemical-resistant PPE

#### Technical details

- Self-priming against max. 1.5 bar
- Control or flow control via ON/OFF power supply
- Degree of protection IP 65
- OEM versions on request

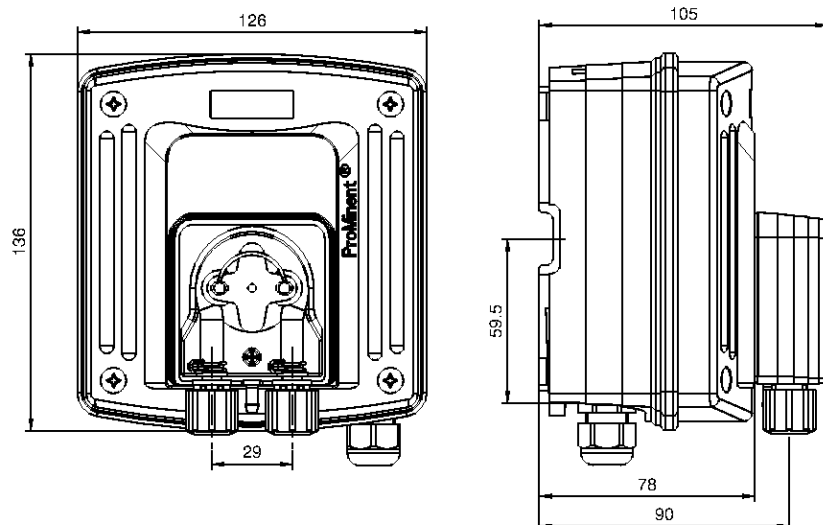
#### Field of application

- Meters conditioners in private pools
- Meters belt lubricants in bottling machines
- Meters cleaning agents in dishwashers



pk\_1\_130

#### Dimensional drawing of DULCO®flex DF2a



P\_DX\_0051\_SW3

Dimensional drawing of DULCO®flex DF2a - dimensions in mm



## 1.7 Peristaltic Pumps DULCO®flex

### 1.7.2 Identity Code Ordering System

**DULCO®flex product range, version DF2a**

DF2a	Type	Capacity
		<b>bar l/h</b>
0204		1.5 0.4
0208		1.5 0.8
0216		1.5 1.6
0224		1.5 2.4
		<b>Hose material</b>
	P	PharMed®
	V	Viton® for fragrances (special version)
		<b>Version</b>
		0 With ProMinent® logo
		1 Without ProMinent® logo
		<b>Hydraulic connectors</b>
		0 Connector for hose 6/4 mm suction and discharge side
		9 Connector for hose 10/4 mm discharge side only
		<b>Power supply</b>
		A 230 V ± 10 %, 50/60 Hz
		<b>Cable and plug</b>
		0 No mains lead
		1 With 2 m mains lead, open ended
		A With mains cable, European plug
		<b>Drive</b>
		0 Mains ON/OFF
		<b>Installation</b>
		W Wall mounted
		<b>Accessories</b>
		0 No accessories

Viton® and PharMed® are registered trademarks.

## Technical Data

Type	Capacity		Frequency	Connector size o dia. x i dia.	Suction lift	Intake head
	bar	l/h			mWC	m WC
0204	1.5	0.4	5	6x4/10x4	4	3
0208	1.5	0.8	10	6x4/10x4	4	3
0216	1.5	1.6	20	6x4/10x4	4	3
0224	1.5	2.4	30	6x4/10x4	4	3

Admissible ambient temperature: 10-45 °C

Power consumption approx.: 5 W

Switching duration: 100 %

Enclosure rating: IP 65

All data refers to water at 20 °C.

## Spare hoses

	Order no.
Spare hose set, complete, PharMed®	1009480
Replacement hose compl. Viton®	1023842



## 1.7 Peristaltic Pumps DULCO®flex

### 1.7.3

#### Peristaltic Pump DULCO®flex DF3a



Provides for the perfect atmosphere in spa and wellness zones, thanks to the metering of a range of different pleasant fragrances

Capacity range 0.4 - 2.4 l/h at max. 1.5 bar back pressure

Fragrance metering in spa and wellness facilities: efficient and high-performance with the peristaltic pump DULCO®flex DF3a. They are used wherever small volumes of fragrances need to be metered.

Meters infusions in saunas, steam rooms and whirlpools. The metering pump is equipped with a time control, which can control two other peristaltic pumps for other essences. As the essences cannot be placed undiluted on the oven in saunas, the DF3a has a relay to control the dilution water. To save essences when the sauna is not in use, the pump has a contact input to which a door contact or motion detector can be connected. Essences are therefore only metered when the sauna is in use.

#### Your benefits

- Employees can therefore operate it quickly: It can be operated simply and reliably with language-neutral user guidance and programming via four buttons on the front
- Quietly operating, does not disturb the spa and wellness experience: Low-noise synchronous motor
- Ideal for retrofitting: Simple to integrate into existing systems
- Efficient operation by economical operation: "Meters only when needed"

#### Technical details

- Viton® hose material, specifically for the metering of fragrances in spa and wellness zones
- Control of dilution water by a solenoid valve
- Spring-mounted rollers for uniform roller pressure and increased service life of the hose
- Three float switch inputs

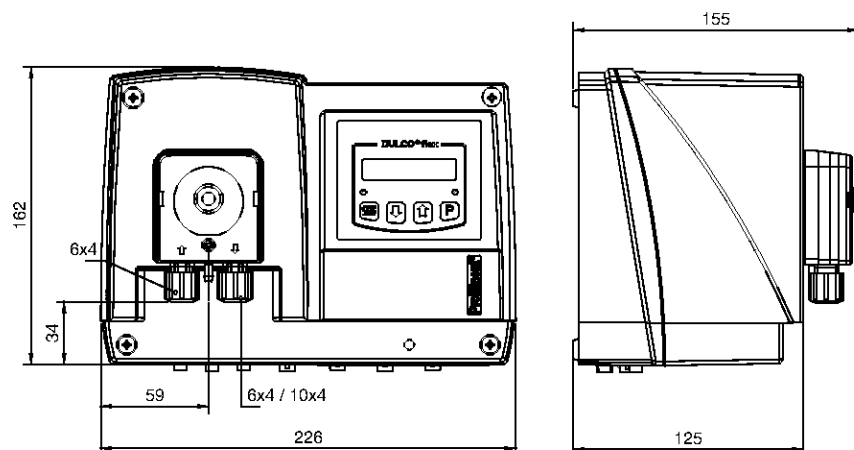
#### Field of application

For saunas, steam rooms and hot tubs



P\_DX\_0003\_SW1

#### Dimensional drawing of DULCO®flex DF3a



P\_DX\_0050\_SW3

Dimensional drawing of DULCO®flex DF3a - dimensions in mm



# 1.7 Peristaltic Pumps DULCO®flex

## 1.7.4 Identity Code Ordering System

### DULCO®flex product range, version DF3a

DF3a	Application
D	Fragrance metering
	<b>Installation</b>
W	Wall mounting
	<b>Version</b>
0	with LCD, with ProMinent® logo
1	with LCD, without ProMinent® logo
	<b>Type Capacity</b>
	<b>bar l/h</b>
0204	1.5 0.4
0208	1.5 0.8
0216	1.5 1.6
0224	1.5 2.4
	<b>Hose material</b>
V	Viton®
	<b>Hydraulic connectors</b>
0	Standard
9	Special connection 10x4 discharge side
	<b>Power supply</b>
A	230 V, 50/60 Hz
	<b>Cable and plug</b>
0	Without cable
1	With cable 2.0 m; open end
A	With cable 2.0 m; Euro connector
B	With cable 2.0 m; Swiss connector
	<b>Accessories</b>
0	Without accessories
1	Metering valve and foot valve; suction and discharge line
	<b>Hardware extension</b>
0	None
	<b>Language</b>
00	Language-neutral
	<b>Relay</b>
0	Without relay
	<b>Application relays</b>
0	None
1	Solenoid valve
2	Solenoid valve + pump 2
3	Solenoid valve + pump 2 + pump 3
	<b>Control versions</b>
0	External contact
	<b>Pause/level</b>
0	Pause break contact + level break contact
1	Pause make contact + level break contact
2	Pause break contact + level make contact
3	Pause make contact + level make contact
	<b>Approvals</b>
01	CE-Symbol

Viton® is a registered trademark.

#### Technical Data

Type	Capacity bar l/h	Frequency rpm	Connector size o dia. x i dia.	Suction lift mWC	Intake head m WC
0204	1.5 0.4	5	6 x 4	4	2
0208	1.5 0.8	10	6 x 4	4	2
0216	1.5 1.6	20	6 x 4	4	2
0224	1.5 2.4	30	6 x 4	4	2

Permissible ambient temperature: 10-45 °C

Approx. power consumption: 24 W

Switching duration: 100 %

Enclosure rating: IP 65

All data refers to water at 20 °C.

#### Spare hoses

Order no.

Replacement hose compl. Viton®

1023842

## 1.7 Peristaltic Pumps DULCO®flex

### 1.7.5

#### Peristaltic Pump DULCO®flex DF4a



The optimum pump for use in swimming pools, hot tubs and spa and wellness facilities.

Capacity range 1.5 - 12 l/h, 4 - 2 bar.



The peristaltic pump DULCO®flex DF4a for metering flocculants and activated charcoal treats water precisely and accurately. It is ideal for use in swimming pools, hot tubs or spa and wellness facilities. An operating pressure up to 4 bar is possible.

There are three designs of DULCO®flex DF4a available.

- 1 Metering chemicals
- 2 Metering activated charcoal
- 3 Metering flocculants

This guarantees that the operating menu, inputs and outputs are always adapted to the respective application.

#### Your benefits

- Language-neutral user navigation
- Continuous adjustment of capacity
- Hose materials in PharMed® and Tygon®
- Full control, as the capacity is shown in l/h in the display
- Safe and reliable operation: flow volume and concentration can be entered reproducibly
- Long service life: spring-loaded rollers stabilise rolling pressure and reduce wear and tear on the hose
- No troubling noise: low-noise stepper motor with ball bearing drive shaft
- Fast to use: simple installation and retrofitting, even with existing systems
- Guaranteed safety: hose rupture monitoring system and fault indicating relay register and report all problems.
- Suitable for use around the clock – 100 % switching-on period
- Operating hour counter for the peristaltic pump - you retain the overview.



P\_DX\_0003\_SW1

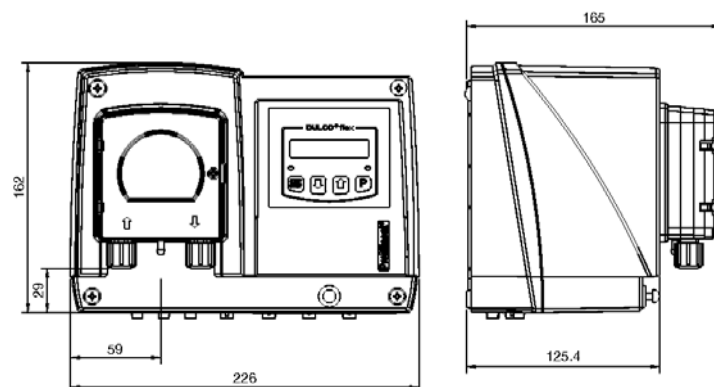
#### Technical details

- Priming function
- Night setback
- Inputs for contacts and analogue signals
- Housing degree of protection IP 65
- One or two-stage float switch input
- Operating hour counter
- CANopen interface

#### Field of application

Swimming pool water treatment

#### Dimensional drawing of DULCO®flex DF4a



DF4a\_SW3

Dimensional drawing of DULCO®flex DF4a - dimensions in mm



# 1.7 Peristaltic Pumps DULCO®flex

## 1.7.6 Identity Code Ordering System

### DULCO®flex product range, version DF4a

DF4a	Application
0	Chemical pump
A	Activated charcoal metering
F	Flocculant metering
<b>Installation</b>	
W	Wall mounting
<b>Version</b>	
0	With ProMinent® logo
1	Without ProMinent® logo
<b>Type Capacity</b>	
	<b>bar l/h</b>
04004	4.0 0.35
04015	4.0 1.50
03060	2.5 6.00
02120	2.0 12.00
<b>Hose material</b>	
P	PharMed®
T	Tygon® not for type 04004
<b>Hydraulic connectors</b>	
0	Standard connector 6x4
9	Special connector 10x4 discharge side
<b>Power supply</b>	
U	100 - 240 VAC, 50/60 Hz
<b>Cable and plug</b>	
0	Without cable
1	With cable 2.0 m; open end
A	With cable 2.0 m; Euro connector
B	With cable 2.0 m; Swiss connector
<b>Accessories</b>	
0	Without accessories
2	With lip-seal metering valve PCB and 10 m PE metering line
<b>Hardware extension</b>	
0	None
<b>Language default</b>	
00	Language-neutral
<b>Relay</b>	
1	Fault signalling relay, drop-out action
3	Fault signalling relay, pick-up action
<b>Control versions</b>	
8	manual + external contact and analogue 0/4 - 20 mA + 0 - 10 V
C	as "8" and CANopen
D	such as "8" and CANopen and CAN connector
<b>Further input</b>	
1	Pause + 2-stage level + AUX1
2	Pause + 1-stage level + AUX1 + AUX2
<b>Pause/level</b>	
0	Pause break contact + level break contact
<b>Approvals</b>	
01	CE-Symbol

Tygon® and PharMed® are registered trademarks.

### Technical Data

Priming lift	3 mWS	Approx. power consumption:	24 W
Suction lift	4 mWS	Switching duration:	100 %
Speed	0 - 85 RPM	Degree of protection:	IP 65
Permissible ambient temperature:	10-45 °C		

All data refers to water at 20 °C.

### Spare hoses

	Order no.
For type 04004 PharMed®	1034997
For type 04015 PharMed®	1030722
For type 04015 Tygon®	1030775
For type 03060 PharMed®	1030723
For type 03060 Tygon®	1030776
For type 02120 PharMed®	1030774
For type 02120 Tygon®	1030777

## 1.8 Flow Meter DulcoFlow®

### 1.8.1

### Flow Meter DulcoFlow®

**Your reliable control unit: unobtrusively measures, monitors and detects faults. A strong team together with the metering unit!**

**For the measurement of pulsating volumetric flows in the range of 0.03 ml/stroke - 5 ml/stroke**



The flow meter DulcoFlow® reliably measures pulsating flows in the range above 0.03 ml/stroke based on the ultrasound measuring principle. The flow meter achieves maximum chemical resistance, as all wetted parts are made of PVDF and PTFE.

The device works on the ultrasound measuring principle. It was developed specifically for measuring small pulsating volumetric flows. It is installed around 30 cm downstream of the metering pump, so that there is still sufficient pulsation in the flow. All liquids that conduct ultrasound waves can be measured.

#### Your benefits

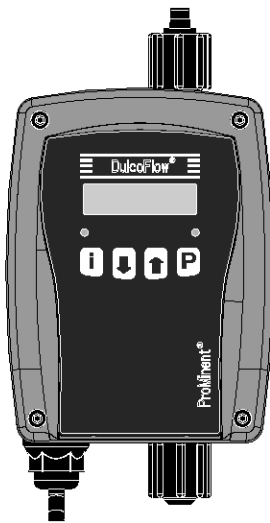
- Maximum chemical resistance by the use of PVDF and PTFE
- No electrical conductivity of the medium is needed
- Measurement above stroke volumes of approx. 30 µl
- Detection of gas bubbles in the feed chemical
- No bottlenecks in the measuring tube. Media with small undissolved particles or with increased viscosity can be measured
- A 0/4 -20 mA current output and a frequency output are available for remote transmission of the measured values.
- Use as a single stroke monitor with feedback to the pump. This ensures that the metering stroke is performed within an adjustable lower and upper limit
- Summation of the metering volume measured with stroke counter
- Intuitive user guidance and simple programming

#### Technical details

- 2 types and/or diameters of the measuring tube are available.
- 2 LEDs for status display and stroke feedback
- 2-line graphic display
- 0/4 – 20 mA standard signal and 0 – 10 kHz frequency output for remote transmission of the measured value
- Compact, chemically-resistant plastic housing
- Measuring accuracy ±2% if the device has been calibrated to the chemical to be measured. Max. operating pressure 16 bar.

#### Field of application

- Measurement of the chemical consumption, for example in surface treatment
- Guaranteed metering, for example in the paper industry
- Measured value transmission and pump control by the central control system
- Measurement of aggressive chemicals
- Not suitable for liquids, which have minimal acoustic conductivity, e.g. sodium hydroxide (NaOH) with a concentration of greater than around 20%
- **We recommend first testing the measurability with emulsions and suspensions**

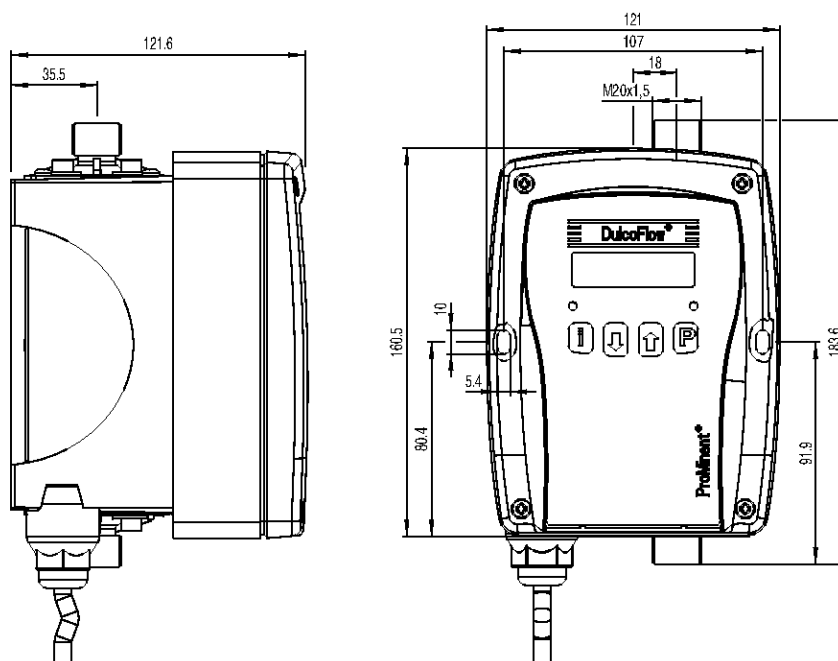


P\_DFI\_0002\_SW1



## 1.8 Flow Meter DulcoFlow®

Dimensional drawing of DulcoFlow®



P\_DFI\_0003\_SW\_Dulcoflow\_SW3

Dimensional drawing of DulcoFlow® - dimensions in mm

### Technical Data

Type	Type 05	Type 08
<b>Max. operating pressure</b>	16 bar	16 bar
<b>Smallest measurable stroke volume</b>	Approx. 0.03 ml/stroke pulsing	Approx. 0.05 ml/stroke pulsing
<b>Contact output with individual stroke detection</b>	Open collector, 1 contact per stroke	Open collector, 1 contact per stroke
<b>Frequency output</b>	Open collector, up to 10 kHz at maximum flow (parametrisable)	Open collector, up to 10 kHz at maximum flow (parametrisable)
<b>Analogue output for series</b>	Parametrisable, max. load 400 Ω Beta®, gamma/ X: 1000 – 0414 / 0715 delta®: 1608 – 1612	Parametrisable, max. load 400 Ω Beta®, gamma/ X: 1604 – 0220/0424 delta®: 1020 – 0450 Sigma/ 1





## 1.8 Flow Meter DulcoFlow®

### Identity code ordering system for DulcoFlow® ultrasound flow meter

DFMa	Type (for pump series)	
05	Beta®, gamma/ X 1000 – 0414/0715 (with the exception of 0220), delta® 1608 – 1612	
08	Beta®, gamma/ X 1604 – 0224, delta® 1020 – 0450, Sigma/ 1	
	Sealant material	
	E	EPDM
	V	FKM
	T	PTFE
	Hydraulic connection	
	1	6/4 mm
	2	8/5 mm
	3	12/9 mm
	Electrical connection, cable	
	A	100 - 230 V AC, 2 m European
	B	100 - 230 V AC, 2 m Swiss
	C	100 - 230 V AC, 2 m Australian
	D	100 – 230 V AC, 2 m USA
	Signal output	
	0	No output
	1	Current output
	2	Contact output
	3	Current output and contact output
	4	Current output for delta® with control module
	Version	
	0	With ProMinent® logo
	Accessories	
	0	Without accessories

# 1.9 Hydraulic/Mechanical Installation Accessories

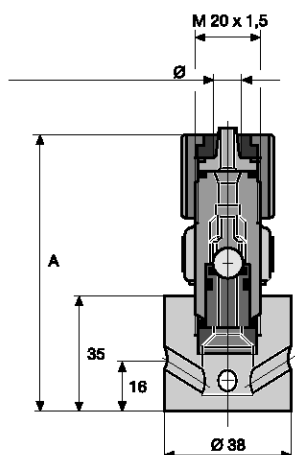
## 1.9.1

## Foot Valves

At the end of the suction line as protection against contamination and vacuum breaker, with filter meshes and ball check. With 6/4, 8/5, 12/6, 12/9 connectors with ceramic weight.

### PPE Foot valve

PP body, EPDM seals

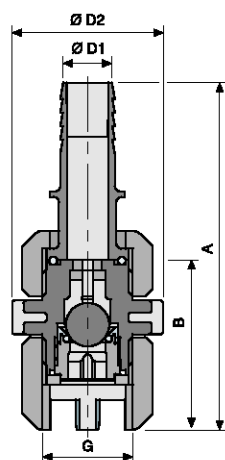


pk\_1\_038

Connector	oØ x iØ mm	A mm	Fig.	Order no.
6/4 for hose	6 x 4	84	pk_1_038	924558
8/5 for hose	8 x 5	84	pk_1_038	809468
12/9 for hose	12 x 9	87	pk_1_038	809470
10/4 for hose	10 x 4	87	pk_1_038	1002916
12/6 for hose	12 x 6	87	pk_1_038	809469
6/4 for hose	6 x 4	57	pk_1_037	914554
G 3/4 - DN 10 for hose	20 x 15 and 24 x 16	93	P_AC_0206_SW	809465

### PPB Foot valve

PP body, FKM (FKM) seals

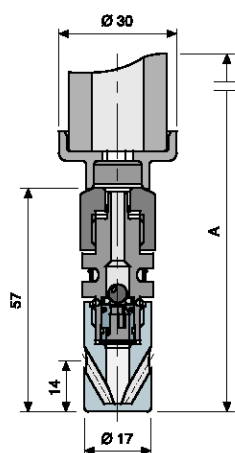


P\_AC\_0206\_SW

Connector	oØ x iØ mm	A mm	Fig.	Order no.
6/4 for hose	6 x 4	84	pk_1_038	924559
8/5 for hose	8 x 5	84	pk_1_038	924683
12/9 for hose	12 x 9	87	pk_1_038	924684
10/4 for hose	10 x 4	87	pk_1_038	1002915
12/6 for hose	12 x 6	87	pk_1_038	924685
G 3/4 - DN 10 for hose	20 x 15 and 24 x 16	93	P_AC_0206_SW	790189

### PCB Foot valve

PVC housing, FKM seals.



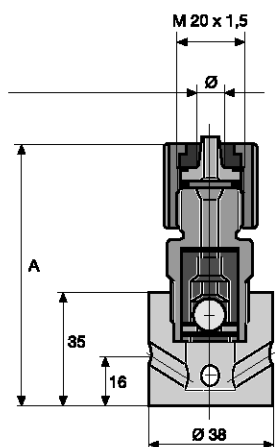
P\_AC\_0207\_SW

Connector	oØ x iØ mm	A mm	Fig.	Order no.
6/4 for hose	6 x 4	84	pk_1_038	924557
8/5 for hose	8 x 5	84	pk_1_038	924562
12/9 for hose	12 x 9	87	pk_1_038	924564
10/4 for hose	10 x 4	87	pk_1_038	1002917
12/6 for hose	12 x 6	87	pk_1_038	924563
6/4 for hose	6 x 4	57	pk_1_037	914505
G 3/4 - DN 10 for hose	20 x 15 and 24 x 16	93	P_AC_0206_SW	809464

## 1.9 Hydraulic/Mechanical Installation Accessories

### PVT Foot valve

PVDF housing, PTFE seals.

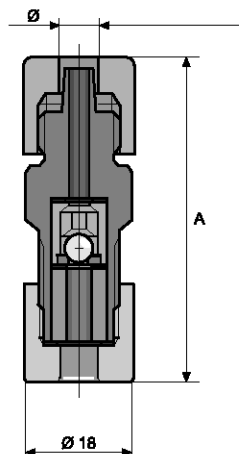


pk\_1\_040

Connector	oØ x iØ mm	A mm	Fig.	Order no.
6/4 for hose	6 x 4	79	pk_1_040	1024705
8/5 for hose	8 x 5	79	pk_1_040	1024706
12/9 for hose	12 x 9	82	pk_1_040	1024707
DN 10 for hose	24 x 16	92	P_AC_0206_SW	1029471

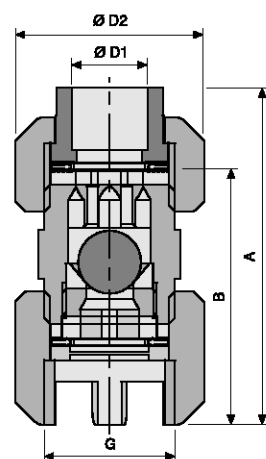
### TT1 Foot valve

PTFE housing and seals, for connections 6/4, 8/5, 12/6, 12/9 with ceramic weight.



pk\_1\_039

Connector	oØ x iØ mm	A mm	Fig.	Order no.
6/4 for hose	6 x 4	79	pk_1_040	809455
8/5 for hose	8 x 5	79	pk_1_040	809471
12/9 for hose	12 x 9	82	pk_1_040	809473
12/6 for hose	12 x 6	82	pk_1_040	809472
6/4 for hose	6 x 4	52	pk_1_039	914349
G 3/4 - DN 10	d16 welding sleeve	93	P_AC_0202_SW	809466



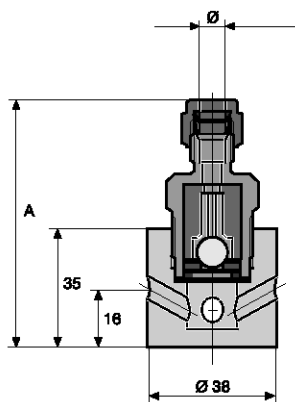
P\_AC\_0202\_SW



## 1.9 Hydraulic/Mechanical Installation Accessories

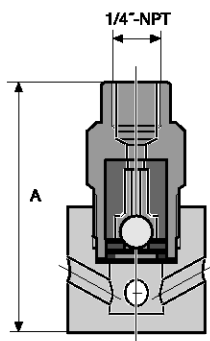
### SS1 Foot valve

Stainless steel 1.4404 housing, PTFE seals. A support sleeve is required for tube connections 6/4, 8/5, 12/9.

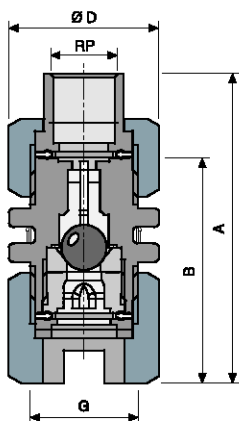


P\_AC\_0229\_SW1

Connector	oØ x iØ mm	A mm	Fig.	Order no.
6/4 for pipe 6 x 5 mm / hose	6 x 4	74	P_AC_0229_SW1	924568
8/5 for pipe 8 x 7 mm / hose	8 x 5	74	P_AC_0229_SW1	809474
12/9 for pipe 12 x 10 mm / hose	12 x 9	77	P_AC_0229_SW1	809475
1/4" NPT for SS2		70	pk_1_031_SW1	924567
G 3/4 - DN 10 with socket Rp 3/8		67	P_AC_0204_SW	809467



pk\_1\_031\_SW1

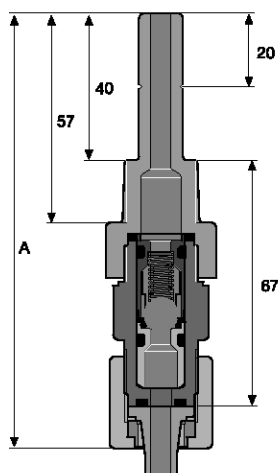


P\_AC\_0204\_SW

# 1.9 Hydraulic/Mechanical Installation Accessories

## 1.9.2

## Injection Valves



pk\_1\_105

For connecting the metering line to the point of injection. Injection valve with check ball, with PP, PVC, PVDF and stainless steel design spring-loaded with Hastelloy C-spring 0.5 bar priming pressure (with R 1/4 spring connector made of stainless steel 1.4571, priming pressure approx. 1 bar) for any fitting position required.

With TT design without spring for vertical installation from below. Valve springs can be retrofitted. Materials used, such as in the pump liquid ends.

**Important:** Injection valves and injection lances are not suitable as absolutely leak-tight shut-off devices.

### PPE Injection valves

PP housing, EPDM seals with non-return ball, spring-loaded with Hastelloy C spring, prepressure approx. 0.5 bar with extended screwed socket.

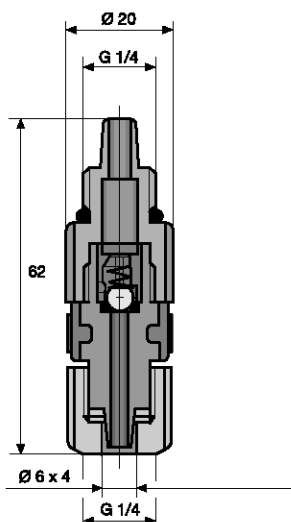
#### Applications when using appropriate metering lines

25 °C - max. operating pressure 16 bar

45 °C - max. operating pressure 9 bar

Connection	oØ x iØ mm	A mm	Fig.	Order no.
6/4 - R 1/2 for PE/PTFE pipe	6 x 4	119	pk_1_105	924681
8/5 - R 1/2 for PE/PTFE pipe	8 x 5	119	pk_1_105	809476
12/9 - R 1/2 for PE/PTFE pipe	12 x 9	119	pk_1_105	809478
10/4 - R 1/2 for PVC hose	10 x 4	119	pk_1_105	1002920
12/6 - R 1/2 for PVC hose	12 x 6	119	pk_1_105	809477
6/4 - G 1/4 for PE/PTFE pipe*	6 x 4	62	pk_1_042	914184
G 3/4 - DN 10 for PVC hose	24 x 16	83	pk_2_029	809461

\* Valve spring from stainless steel 1.4571, priming pressure approx. 0.8 bar



pk\_1\_042

### PPB Injection valves

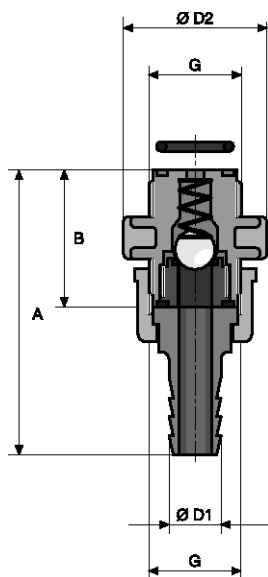
PP housing, FKM seals with spring-loaded non-return ball, prepressure approx. 0.5 bar.

#### Applications when using appropriate metering lines

25 °C - max. operating pressure 16 bar

45 °C - max. operating pressure 9 bar

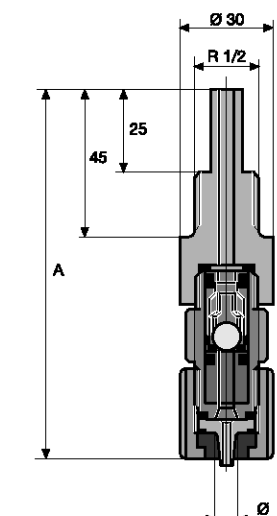
Connection	oØ x iØ mm	A mm	Fig.	Order no.
6/4 - R 1/2 for PE/PTFE pipe	6 x 4	119	pk_1_105	924682
8/5 - R 1/2 for PE/PTFE pipe	8 x 5	119	pk_1_105	924687
12/9 - R 1/2 for PE/PTFE pipe	12 x 9	119	pk_1_105	924688
10/4 - R 1/2 for PVC hose	10 x 4	119	pk_1_105	1002921
12/6 - R 1/2 for PVC hose	12 x 6	119	pk_1_105	924689
G 3/4 - DN 10 for PVC hose	24 x 16	83	pk_2_029	790191



pk\_2\_029



## 1.9 Hydraulic/Mechanical Installation Accessories



pk\_1\_046

### PP/PTFE Injection valves

For prevention of chemical deposits. PP body, PTFE mounting insert, EPDM seals with ball check and Hastelloy C spring approx. 0.5 bar priming pressure. (Fig. pk\_1\_046)

#### Applications when using appropriate metering lines

25 °C - max. operating pressure 16 bar

45 °C - max. operating pressure 9 bar

Connection	oØ x iØ mm	A mm	Fig.	Order no.
6/4 - R 1/2 for PE/PTFE pipe	6 x 4	103	pk_1_046	924588
8/5 - R 1/2 for PE/PTFE pipe	8 x 5	103	pk_1_046	924589
12/9 - R 1/2 for PE/PTFE pipe	12 x 9	106	pk_1_046	924590
10/4 - R 1/2 for PVC hose	10 x 4	106	pk_1_046	1002923
12/6 - R 1/2 for PVC hose	12 x 6	106	pk_1_046	924591

### PVC/PTFE Injection valves

PVC body, PTFE mounting insert, FKM-B seals, spring loaded ball check with Hastelloy C spring, approx. 0.5 bar priming pressure.

#### Applications when using appropriate metering lines

25 °C - max. operating pressure 16 bar

45 °C - max. operating pressure 7 bar

Connector	oØ x iØ mm	Fig.	Order no.
6/4 - R 1/2 for PE/PTFE pipe	6 x 4	pk_1_046	809450
8/5 - R 1/2 for PE/PTFE pipe	8 x 5	pk_1_046	809451
12/9 - R 1/2 for PE/PTFE pipe	12 x 9	pk_1_046	809452
10/4 - R 1/2 for PVC hose	10 x 4	pk_1_046	1002924
12/6 - R 1/2 for PVC hose	12 x 6	pk_1_046	809453

### PCB Injection valves

Housing made of PVC, seals made of FKM with non-return ball spring-loaded with Hastelloy C spring, priming pressure approx. 0.5 bar, with extended screwed socket. Type 8/4 up to 25 bar.

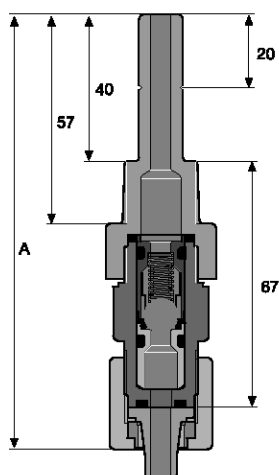
#### Applications when using appropriate metering lines

25 °C - max. operating pressure 16 bar

45 °C - max. operating pressure 7 bar

Connection	oØ x iØ mm	A mm	Fig.	Order no.
6/4 - R 1/2 for PE/PTFE pipe	6 x 4	119	pk_1_105	924680
8/4 - R 1/2 for PTFE line	8 x 4	119	pk_1_105	1034621
8/5 - R 1/2 for PE/PTFE pipe	8 x 5	119	pk_1_105	924592
12/9 - R 1/2 for PE/PTFE pipe	12 x 9	119	pk_1_105	924594
10/4 - R 1/2 for PVC hose	10 x 4	119	pk_1_105	1002919
12/6 - R 1/2 for PVC hose	12 x 6	119	pk_1_105	924593
6/4 - G 1/4 for PE/PTFE pipe*	6 x 4	62	–	914559
G 3/4 - DN 10 for PVC hose	24 x 16	83	pk_2_029	809460

\* Spring made of 1.4571, approx. 0.8 bar priming pressure.



pk\_1\_105

## 1.9 Hydraulic/Mechanical Installation Accessories

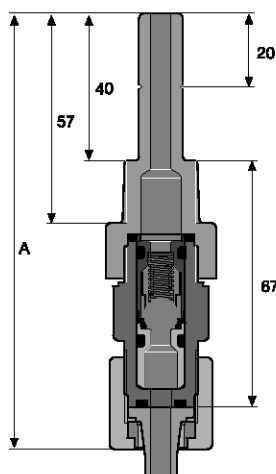
### PVT Injection valves

Housing PVDF, seals PTFE, with non-return ball, spring-loaded with Hast. C spring, approx. 0.5 bar priming pressure, with extended screwed socket. Type 6/3 up to 20 bar, 8/4 up to 25 bar.

#### Applications when using appropriate metering lines

25 °C - max. operating pressure 16 bar

45 °C - max. operating pressure 12 bar



Connection	oØ x iØ mm	A mm	Fig.	Order no.
6/3 - R 1/2 for PTFE pipe	6 x 3	119	pk_1_105	1024713
6/4 - R 1/2 for PE/PTFE pipe	6 x 4	119	pk_1_105	1024708
8/4 - R 1/2 for PTFE line	8 x 4	119	pk_1_105	1034619
8/5 - R 1/2 for PE/PTFE pipe	8 x 5	119	pk_1_105	1024710
12/9 - R 1/2 for PE/PTFE pipe	12 x 9	119	pk_1_105	1024711
10/4 - R 1/2 for PVC hose	10 x 4	119	pk_1_105	1024709
12/6 - R 1/2 for PVC hose	12 x 6	119	pk_1_105	1024712
G 3/4 - DN 10 with pressure hose nozzle d16 - DN 10.	24 x 16	84	pk_2_029	1029476

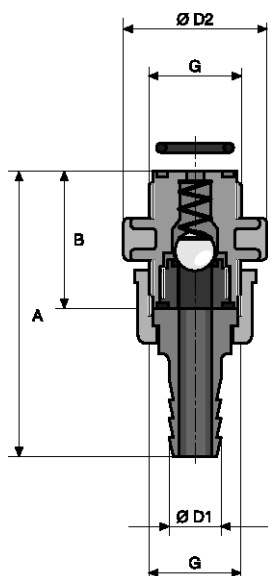
### PVT injection valve with tantalum spring

PVDF housing, PTFE seals with tantalum spring-loaded ball check, priming pressure approx. 0.5 bar, with extra-long screw-in fitting. 6/3 version up to 20 bar, 8/4 up to 25 bar, for metering of sodium-calcium hypochlorite, with universal tube connector set 6x3, 6x4, 8x4, 8x5, 12x9, 10x4 and 12x6 mm.

#### Application range when using appropriate metering line

25 °C - max. operating pressure 16 bar

45 °C - max. operating pressure 12 bar



Connection	A mm	Fig.	Order no.
Universal connector, R 1/2	119	pk_1_105	1044653

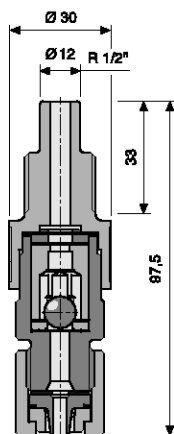
### TT1 Injection valves

Vertical installation from below. With ball check, without spring. Valve spring (Order No. 469404) can be retrofitted. Body and seals made of PTFE.

#### Applications when using appropriate metering lines

25 °C - max. operating pressure 10 bar

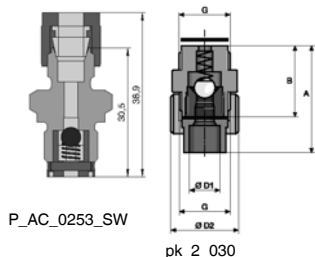
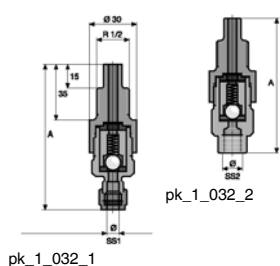
45 °C - max. operating pressure 5 bar



Connection	oØ x iØ mm	A mm	Fig.	Order no.
6/4 - R 1/2 for PE/PTFE pipe	6 x 4	98	P_AC_0184_SW	809488
8/5 - R 1/2 for PE/PTFE pipe	8 x 5	98	P_AC_0184_SW	809479
12/9 - R 1/2 for PE/PTFE pipe	12 x 9	101	P_AC_0184_SW	809481
12/6 - R 1/2 for PVC hose	12 x 6	101	P_AC_0184_SW	809480
G 3/4 - DN 10 with d16 welding sleeve	–	–	pk_2_030	809462



## 1.9 Hydraulic/Mechanical Installation Accessories



### SS1 Injection valve

Stainless steel 1.4404 body and PTFE seals with spring loaded ball check. Spring made of Hastelloy C. with approx. 0.5 bar priming pressure, for 1.4571 R 1/4 spring, approx. 1 bar priming pressure. Ferrule is required for connection with PE/PTFE pipe.

#### Applications when using appropriate metering lines

25 °C - max. operating pressure 30 bar

45 °C - max. operating pressure 30 bar

Connection	oØ x iØ mm	A mm	Fig.	Order no.
6 mm - R 1/2 for pipe	6 x 5	93	pk_1_032_1	809489
8 mm - R 1/2 for pipe	8 x 7	93	pk_1_032_1	809482
12 mm - R 1/2 for pipe	12 x 10	96	pk_1_032_1	809483
1/4" NPT - R 1/2 for pipe	R 1/4" NPT	89	pk_1_032_2	924597
6 mm - R 1/4 for pipe		–	P_AC_0253_SW	914588
G 3/4 - DN 10, sleeve	Rp 3/8	–	pk_2_030	809463

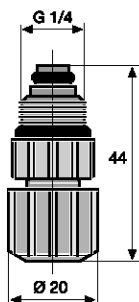
### PPB Injection valves, O-ring loaded

PP body, FKM seals. Priming pressure approx. 0.5 bar.

#### Applications when using appropriate metering lines

25 °C - max. operating pressure 16 bar

45 °C - max. operating pressure 9 bar



Connector	oØ x iØ mm	Fig.	Order no.
6/4 - G 1/4 short	6 x 4	P_AC_0008_SW	914754
6/4 - G 1/4 long	6 x 4	P_AC_0009_SW	741193

P\_AC\_0008\_SW

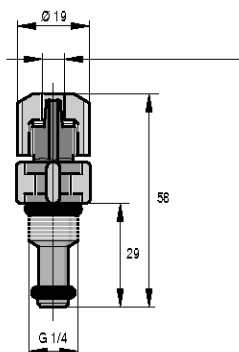
### PCB Injection valves O-ring loaded

PVC body, FKM seals, priming pressure approx. 0.5 bar.

#### Applications when using appropriate metering lines

25 °C - max. operating pressure 16 bar

45 °C - max. operating pressure 7 bar

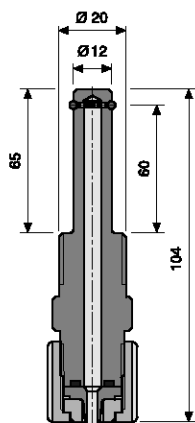


Connector	oØ x iØ mm	Fig.	Order no.
6/4 - G 1/4 short	6 x 4	P_AC_0008_SW	914558
6/4 - G 1/4 long	6 x 4	P_AC_0009_SW	915091

P\_AC\_0009\_SW



## 1.9 Hydraulic/Mechanical Installation Accessories



P\_AC\_0183\_SW

### PTFE Injection valves O-ring loaded

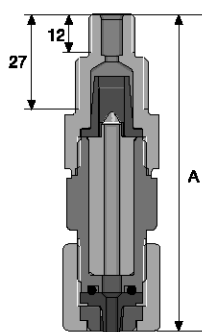
PTFE housing, FKM seals.

#### Applications when using appropriate metering lines

25 °C - max. operating pressure 10 bar

45 °C - max. operating pressure 6 bar

Connection	oØ x iØ mm	A mm	Fig.	Order no.
6/4 – for PE/PTFE line	6 x 4	104	P_AC_0183_SW	809484
8/5 – for PE/PTFE line	8 x 5	104	P_AC_0183_SW	809485
10/4 – for PVC hose	10 x 4	104	P_AC_0183_SW	1002925
12/6 – for PVC hose	12 x 6	104	P_AC_0183_SW	809487
12/9 – for PE/PTFE line	12 x 9	104	P_AC_0183_SW	809486



pk\_1\_070

### Lip seal injection valve PCB

Body PVC, seals FKM, inlet pressure approx. 0.05 bar. For metering sodium hypochlorite and for use in conjunction with the peristaltic pump DF2a.

#### Applications when using appropriate metering lines

25 °C - max. operating pressure 2 bar

45 °C - max. operating pressure 2 bar

Connection	oØ x iØ mm	A mm	Fig.	Order no.
6/4 - R 1/2 - 1/4 for PE/PTFE pipe	6 x 4	90	pk_1_070	1019953
10/4 - R 1/2 - 1/4 for PE/PTFE pipe	10 x 4	90	pk_1_070	1024697



pk\_1\_049

### Metering Connector for Warm Water up to 200 °C

Consists of stainless steel 1.4404 injection valve, 1 m stainless steel 1.4571 discharge line and threaded connector with reinforcing sleeve for connection of PE/PTFE pipe to stainless steel pipe.

Max. operating pressure 30 bar

Connection	Fig.	Order no.
Warm water 6 mm - R 1/4	pk_1_049	913166
Warm water 6 mm - R 1/2	pk_1_049	913167
Warm water 8 mm - R 1/2	pk_1_049	913177
Warm water 12 mm - R 1/2	pk_1_049	913188



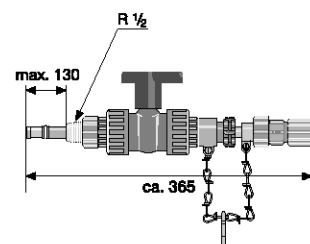
# 1.9 Hydraulic/Mechanical Installation Accessories

## 1.9.3

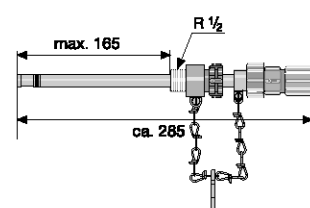
## Injection Lances, Non-Return Valves

### PPE injection lance

For immersion depths of 20 - 165 mm, in large diameter pipe to prevent chemical deposition at the point of injection. Consists of spring-loaded metering valve, Hastelloy C spring, ceramic ball, adjustable immersion rod and hose valve. With connectors for all hose sizes used with solenoid metering pumps: 6/4, 8/5, 12/9, 10/4 and 12/6.



pk\_1\_007



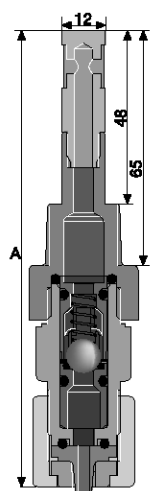
pk\_1\_062

Type	Seal material	Max. pressure at 25 °C bar	Fig.	Order no.
PPE without stopcock	EPDM/silicone	6	pk_1_007	1021530
PPE with stopcock	EPDM/silicone	6	pk_1_062	1021531
PCB without stopcock	FKM/silicone*	6	pk_1_007	1021528
PCB with stopcock	FKM/silicone*	6	pk_1_062	1021529

\* **Caution:** The product contains adhesive joints with Tangit. Please note the resistance of Tangit adhesive.

### Short injection lance

Metering lance with universal connection kit, enabling the connection of different hose sizes of from 6/4 to 12/9. Hastelloy C spring, ceramic ball and silicone hose. Material of screwed socket: PVDF.



P\_AC\_0020\_SW

Type	Material, valve body	Max. pressure at 25 °C bar	Seal material	A mm	Fig.	Order no.
PPE	PP	16	EPDM	126	P_AC_0020_SW	1028383
PCB	PVC	16	FKM-B	126	P_AC_0020_SW	1028363
PVT	PVDF	16	PTFE	126	P_AC_0020_SW	1028081

### PVDF non-return valve for hose installation

With connection kit on both sides for fitting in hose line.

With non-return ball, spring-loaded with Hastelloy C spring, prepressure approx. 0.5 bar.

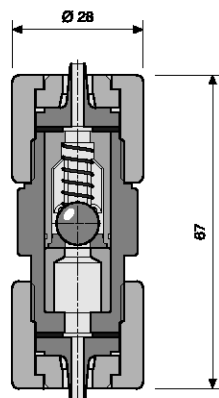
PVDF housing, PTFE seals.

Different hose sizes from 6/4 to 12/9 can be joined using different connection kits.

#### Applications when using appropriate metering lines

25 °C - max. operating pressure 16 bar

45 °C - max. operating pressure 12 bar



P\_AC\_0181\_SW

Connection	oØ x iØ mm	A mm	Fig.	Order no.
6/4 for PE/PTFE line	6 x 4	67	P_AC_0181_SW	1030463
8/5 for PE/PTFE line	8 x 5	67	P_AC_0181_SW	1030975
10/4 for PE/PTFE line	10 x 4	67	P_AC_0181_SW	1030977
12/6 for PVC hose	12 x 6	67	P_AC_0181_SW	1030978
12/9 for PE/PTFE line	12 x 9	67	P_AC_0181_SW	1030976

# 1.9 Hydraulic/Mechanical Installation Accessories

## 1.9.4

## Back Pressure Valves/Relief Valves

Back pressure valves are used to generate a constant back pressure to ensure precise metering and protect against over-metering or metering imprecision through free outlets and priming pressure on the suction side. They are also used in conjunction with pulsation dampers to generate low-pulsation metering. We recommend back pressure valves type DHV-RM with fluctuating back pressure and metering into vacuums.

(For Back Pressure Valves/Relief Valves see volume "Motor-driven and process metering pumps for all capacity ranges" page → 1-52)

The DHV listed below are designed for different applications. Please note the relevant notes for the different mountings.



**Important:** Back pressure valves cannot be used as absolutely leak-tight shut-off devices. Take appropriate precautions when handling hazardous media.

Relief valves are used to protect pumps, pipes and fittings from over pressure, in the event of incorrect operation or blockages in the bypass. In the event of a malfunction, the pump pumps back into the storage tank.

### Multifunctional valve type MFV-DK, PVDF

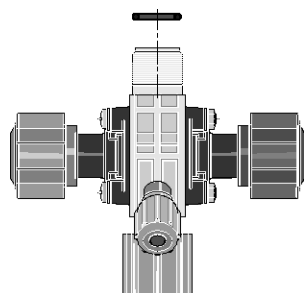


Multifunctional valve for assembly directly onto the liquid end of the pump with the following functions:

- Back pressure valve, opening pressure approx. 1.5 bar, with open discharge or positive pressure on the suction side (black rotary knob)
- Relief valve, opening pressure approx. 6, 10 or 16 bar (red rotary knob)
- Priming aid with pending back pressure, no need to de-pressurise pipes
- Pressure relief, e.g. prior to servicing

The ProMinent® multifunctional valve is simple to operate using smooth action rotary knobs, which return to their initial position on release. This ensures safe operation even under difficult access conditions. The ProMinent® multifunctional valve is made of PVDF and can be used with virtually all chemicals.

**Warning:** Back pressure valves are not intended as completely sealed units!



pk\_1\_053

**Caution:** The bypass line must always be connected.

Valve body	PVDF
Diaphragm	PTFE- coated
Seal	FKM and EPDM (enclosed)

Hoses see page → 1-61

Type	Relief opening pressure*	Connection	Bypass connector	Order no.
Size I	16 bar	6-12	6/4	792011
Size I	10 bar	6-12	6/4	791715
Size I	6 bar	6-12	6/4	1005745
Size II	10 bar	6-12	12/9	792203
Size II	6 bar	6-12	12/9	740427
Size III	10 bar	DN 10	12/9	792215

\* The relief opening pressure given above is the pressure at which the valve begins to open. The pressure can be up to 50 % higher until the valve is fully open depending on the type of pump.

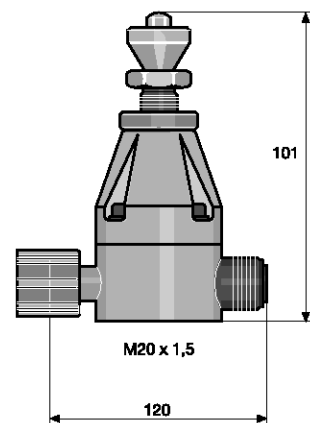
### Application: multifunctional valves

Size I	ALPc 1001, 1002, 1004, 1008, 0708 Beta®, gamma/ L type 1000, 1601, 1602, 1604, 1605, 1005, 1008, 0708, 0413, 0220 gamma/ X type 1602, 1604, 1009, 0708, 0414, 0220 delta® type 1608, 1612
Size II	ALPc 0419, 0230 Beta®, gamma/ L type 1605, 1008, 0713, 0420, 0232 gamma/ X type 1009, 0715, 0424, 0245 delta® type 1020, 0730
Size III	delta® type 0450, 0280
For material design PP, PV, NP, TT	



## 1.9 Hydraulic/Mechanical Installation Accessories

### Back pressure valve type DHV-S-DK, 0-10 bar adjustable



Adjustable back pressure valve for fitting directly onto the dosing head to generate a constant back pressure. For accurate metering with a free outlet and with priming pressure on the suction side.

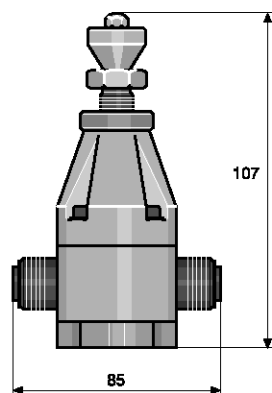
**Caution:** Back pressure valves are not absolutely leak-tight shut-off devices! It is essential that you observe the installation notes in the operating instructions!

**Applications:** Metering pump alpha, Beta®, gamma/ X, Pneumados b, EXtronic® and delta®

Type	Adjustable pressure	Connection	Material	Order no.
DHV-S-DK	0 – 10 bar	6 to 12 mm	PP/EPDM	302320
DHV-S-DK	0 – 10 bar	6 to 12 mm	PC/FKM*	302321
DHV-S-DK	0 – 10 bar	6 to 12 mm	TT/PTFE	302322
DHV-S-DK	0 – 10 bar	6 mm	SS	1003793
DHV-S-DK	0 – 10 bar	8 mm	SS	1003795
DHV-S-DK	0 – 10 bar	12 mm	SS	1003797

\* **Caution:** The product contains adhesive joints with Tangit. Please note the resistance of Tangit adhesive.

### Back pressure valve/relief valve type DHV-S-DL, 0-10 bar adjustable



Adjustable back pressure valve for installation in the metering line to generate a constant back pressure for precise metering with a free outlet and with priming pressure on the suction side.

When used as a back pressure valve in long lines to avoid resonance fluctuations: Install at the end of the metering line or set setting pressure > line pressure loss.

Use in conjunction with pulsation damper only with a free outlet and short metering line. Use type DHV-RM for use with a pulsation damper with back pressure or long lines.

**Caution:** Back pressure valves are not absolutely leak-tight shut-off devices! It is essential that you observe the installation notes in the operating instructions!

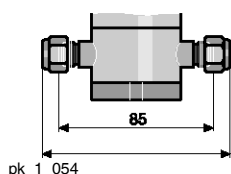
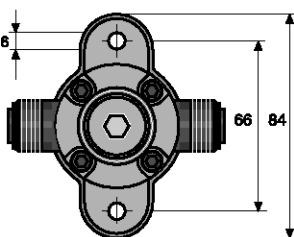
**Applications:** Metering pumps alpha, Beta®, gamma/ X, Pneumados b, EXtronic® and delta®

(For Back Pressure Valves/Relief Valves see volume "Motor-driven and process metering pumps for all capacity ranges" page → 1-52)

Type	Adjustable pressure	Connection	Material	Order no.
DHV-S-DL	0 – 10 bar	6 to 12 mm	PP	302323
DHV-S-DL	0 – 10 bar	6 to 12 mm	PC/FKM*	302324
DHV-S-DL	0 – 10 bar	6 to 12 mm	TT	302325
DHV-S-DL	0 – 10 bar	6 mm	SS	302326
DHV-S-DL	0 – 10 bar	8 mm	SS	302327
DHV-S-DL	0 – 10 bar	12 mm	SS	302328

Order 2 connecting kits in the required hose size separately for the connection.

\* **Caution:** The product contains adhesive joints with Tangit. Please note the resistance of Tangit adhesive.  
(For Connection Kits see page → 1-79)

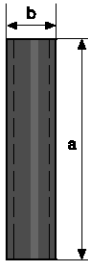


## 1.9 Hydraulic/Mechanical Installation Accessories

### Pipe nipples

For the direct connection of the pressure maintenance valve DHV-S-DL in stainless steel (SS) to the liquid end.

Type	A mm	B mm	Fig.	Order no.
1.4571 pipe nipple	6	40	pk_1_017	818537
	8	40	pk_1_017	818538
	12	40	pk_1_017	818539



pk\_1\_017

### Back pressure valve Type BPV-DM



Adjustable back pressure valve for installation in the metering line to generate a constant back pressure and/or for precise metering with a free outlet and with priming pressure on the suction side.

**Caution:** Back pressure valves are not absolutely leak-tight shut-off devices! It is essential that you observe the installation notes in the operating instructions!

**Applications:** Metering pumps alpha, Beta®, gamma/ X, Pneumados b and delta®

Type	Adjustable pressure	Connection	Material	Order no.
BPV-DM	1 – 10 bar	6 – 12	PP/EPDM	1009884
BPV-DM	1 – 10 bar	6 – 12	PP/FKM-B	1009886
BPV-DM	1 – 10 bar	6 – 12	PVC/EPDM	1009885
BPV-DM	1 – 10 bar	6 – 12	PVC/FKM-B	1026450

\* Order 2 connection kits in the required hose size separately for the connection.

(Connection Kits see page → 1-79)

### Relief valve Type BPV-SM



Adjustable relief valve for installation in the metering line to protect against overpressure. With additional connector for the relief line at the base of the valve body, no T-piece is required for installation.

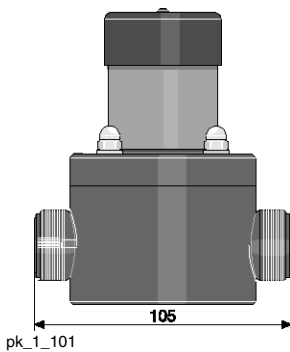
**Caution:** Back pressure valves are not absolutely leak-tight shut-off devices! It is essential that you observe the installation notes in the operating instructions!

**Applications:** Metering pumps alpha, Beta®, gamma/ X, Pneumados b and delta®

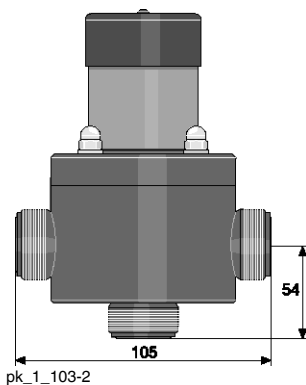
Type	Adjustable pressure	Connection	Material	Order no.
BPV-SM	1 – 10 bar	6 – 12	PPE	1009887
BPV-SM	1 – 10 bar	6 – 12	PPB	1009889
BPV-SM	1 – 10 bar	6 – 12	PCE	1009888
BPV-SM	1 – 10 bar	6 – 12	PCB	1026445

\* Order 3 connection kits in the required hose size separately for the connection.

(Connection Kits see page → 1-79)



pk\_1\_101



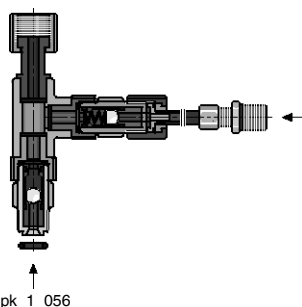
pk\_1\_103-2



# 1.9 Hydraulic/Mechanical Installation Accessories

## 1.9.5

## Fittings



### Flushing Assembly

For flushing and cleaning dosing heads, metering lines and injection valves.

As a manual or automatic, time-controlled design. Installation, even retrospectively, on the suction connector of the metering pump. Supplied with 2 m flushing pipe and R 3/8 connection nipple.

Automatic flushing equipment for the fully automatic flushing of the pump head is possible on request.

### PPE Flushing Assembly

PP material, EPDM seal.

	Fig.	Order no.
For 6/4, 8/5, 12/6, 12/9 connectors	pk_1_056	809909
For G 3/4 -DN 10 connector	pk_1_057	809917
For G 1 -DN 15 connector	pk_1_057	809919

### PCB Flushing Assembly

Material: PVC, FKM seals

	Fig.	Order no.
for 6/4, 8/5, 12/6, 12/9 connectors*	pk_1_056	809925
for G 3/4 - DN 10 connectors*	pk_1_057	809926
for G 1 - DN 15 connectors*	pk_1_057	803960

\* **Caution:** The product contains adhesive joints with Tangit. Please note the resistance of Tangit adhesive.

### Relief Valve Assembly

Consisting of a back pressure valve, which can be set from 1 - 10 bar, type DL, complete with connecting parts, installation directly on the dosing head.

Connector size 6 - 12 mm, depending on the pressure connector on the metering pump.

### Relief Valve Assembly PPE

Material: PP, EPDM seals.

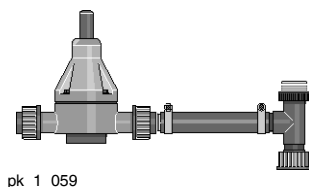
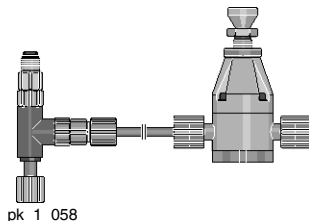
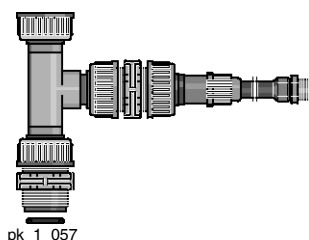
	Fig.	Order no.
For 6/4, 8/5, 12/6, 12/9 connectors	pk_1_058	809990
G 3/4 - DN 10 connector	pk_1_059	809991
G 1 - DN 15 connector	pk_1_059	809992

### Relief Valve Assembly PCB

Material: PVC, FKM seals.

	Fig.	Order no.
for 6/4, 8/5, 12/6, 12/9 connectors*	pk_1_058	809989
for G 3/4 - DN 10 connectors*	pk_1_059	809993
for G 1 - DN 15 connectors*	pk_1_059	914745

\* **Caution:** The product contains adhesive joints with Tangit. Please note the resistance of Tangit adhesive.



# 1.9 Hydraulic/Mechanical Installation Accessories

## 1.9.6

## Hoses, Pipes

### Suction and discharge line

For metering pumps and accessories.

We recommend that only original lines are used so that the mechanical connection of the compression fitting and the pressure rating and chemical resistance are ensured.

### Suction line, soft PVC

Material	Length m	oØ x iØ mm	Permissible pressure bar	Order no.
PVC flexible	5	6 x 4	0.5*	1004520
	5	8 x 5	0.5*	1004521
	5	12 x 9	0.5*	1004522
	10	6 x 4	0.5*	1004523
	10	8 x 5	0.5*	1004524
	10	12 x 9	0.5*	1004525
	25	6 x 4	0.5*	1004526
	25	8 x 5	0.5*	1004527
	25	12 x 9	0.5*	1004528
	50	6 x 4	0.5*	1004529
	50	8 x 5	0.5*	1004530
	50	12 x 9	0.5*	1004531
	Sold in metres		19 x 15	0.5* 037020

\* Admissible operating pressure at 20 °C in accordance with DIN EN ISO 7751, subject to chemical resistance and correct assembly.

### Suction and discharge line, soft PVC with woven fabric core

Material	Length m	oØ x iØ mm	Permissible pressure bar	Order no.
Fabric-reinforced flexible PVC	5	10 x 4	18*	1004533
	5	12 x 6	17*	1004538
	10	10 x 4	18*	1004534
	10	12 x 6	17*	1004539
	25	10 x 4	18*	1004535
	25	12 x 6	17*	1004540
	50	10 x 4	18*	1004536
	50	12 x 6	17*	1004541
	Sold in metres		24 x 16	10* 037040
	Sold in metres		27 x 19	10* 037041

### Soft PVC suction and metering line with woven inner layer approved for food use

Material	Length m	oØ x iØ mm	Permissible pressure bar	Order no.
Soft PVC with woven inner layer approved for food use	5	10 x 4	10*	1037556
	5	12 x 6	10*	1037561
	10	10 x 4	10*	1037557
	10	12 x 6	10*	1037562
	25	10 x 4	10*	1037558
	25	12 x 6	10*	1037563
	50	10 x 4	10*	1037559
	50	12 x 6	10*	1037564

\* Permissible operating pressure at 20 °C in accordance with DIN EN ISO 7751, 1/4 of the bursting pressure subject to chemical resistance and correct assembly.

Use pipes and fittings with a pressure rating of PN 16 or PN 10 bar for socket-welded and PVC-cemented rigid PP and PVDF pipe.

#### Caution:

The resistance of soft PVC hoses is not identical to that of hard PVC. Please note the resistance for PVC soft as well as the cleaning instructions when using the equipment for food uses (see homepage).

pk\_1\_013

pk\_1\_060



## 1.9 Hydraulic/Mechanical Installation Accessories

### Suction and discharge, PE

Material	Length m	oØ x iØ mm	Permissible pressure bar	Order no.
Polyethylene	5	6 x 4	10*	1004492
	5	8 x 5	10*	1004493
	5	12 x 9	7*	1004504
	10	6 x 4	10*	1004505
	10	8 x 5	10*	1004506
	10	12 x 9	7*	1004507
	25	6 x 4	10*	1004508
	25	8 x 5	10*	1004509
	25	12 x 9	7*	1004510
	50	6 x 4	10*	1004511
	50	8 x 5	10*	1004512
	50	12 x 9	7*	1004513

\* Admissible operating pressure at 20 °C in accordance with DIN EN ISO 7751, subject to chemical resistance and correct assembly

### Suction and discharge lines, PTFE

Material	Length m	oØ x iØ mm	Permissible pressure bar	Order no.
PTFE	Sold in metres	1.75 x 1.15	12*	037414
	Sold in metres	3.2 x 2.4	8*	037415
	Sold in metres	6 x 3	20*	1021353
	Sold in metres	6 x 4	14*	037426
	Sold in metres	8 x 4	25*	1033166
	Sold in metres	8 x 5	16*	037427
	Sold in metres	12 x 9	10*	037428
	Meterage, max. 30 m	19 x 16	6*	037430

\* Admissible operating pressure at 20 °C in accordance with DIN EN ISO 7751, subject to chemical resistance and correct assembly

### Stainless steel pipes

Material	Length m	oØ x iØ mm	Permissible pressure bar	Order no.
Stainless steel pipe 1.4435	Sold in metres	1.58 x 0.9	400*	1020774
	Sold in metres	3.175 x 1.5	400*	1020775
	Sold in metres	6 x 5	175*	015738
	Sold in metres	6 x 4	185*	015739
	Sold in metres	8 x 7	160*	015740
	Sold in metres	12 x 10	200*	015743

\* Admissible operating pressure at 20 °C in accordance with DIN EN ISO 7751, subject to chemical resistance and correct assembly

### Hose Cutting Kit

Hose Cutting Set for Plastic Pipes up to a Diameter of 25 mm. Manufacturer: Gedore.

	Order no.
Hose Cutting Kit	1038571



## 1.9 Hydraulic/Mechanical Installation Accessories

### 1.9.7 Pressure Accumulator

#### PP Pressure accumulator

**Caution:** Always install an overflow valve when using pressure accumulators.

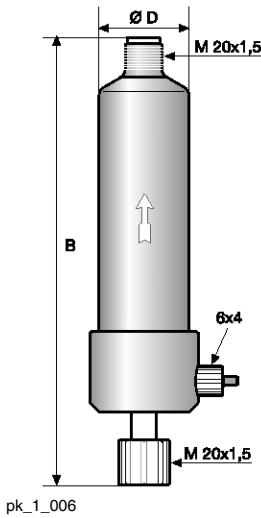
##### Operating range

20 °C - max. operating pressure 10 bar

40 °C - max. operating pressure 6 bar

	Volume I	Permissible stroke volume ml	Connection	Fig.	Order no.
Size 0*	0.15	1.0	M 20 x 1.5	pk_1_006	1021157
Size I	0.35	2.5	DN 8	pk_1_065	243218
Size II	1.00	5.0	d 16–DN 10	pk_1_065	243219
Size II	1.00	5.0	d 20–DN 15	pk_1_065	243220

\* With bleed valve. Install directly at the pressure connector.



	Connection	A	B	Ø D
Size 0	M 20 x 1.5	-	225	49
Size I	DN 8	150	170	75
Size II	DN 10	192	220	110
Size II	DN 15	200	220	110

#### PVC Pressure accumulator

**Caution:** Always install an overflow valve when using pressure accumulators.

##### Operating range

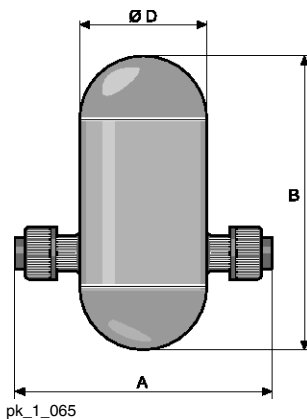
20 °C - max. operating pressure 10 bar

40 °C - max. operating pressure 6 bar

	Volume I	Permissible stroke volume ml	Connection	Fig.	Order no.
Size 0**	0.15	1.0	M 20 x 1.5	pk_1_006	1021120*
Size I	0.35	2.5	DN 8	pk_1_065	243203*
Size II	1.00	5.0	d 16–DN 10	pk_1_065	243204*
Size II	1.00	5.0	d 20–DN 15	pk_1_065	243205*

\* **Caution:** The product contains adhesive joints with Tangit. Please note the resistance of Tangit adhesive.

\*\* With bleed valve. Install directly at the pressure connector.

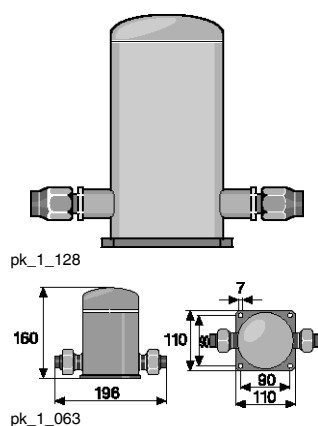


	Connection	A	B	Ø D
Size 0	M 20 x 1.5	-	225	49
Size I	DN 8	150	170	75
Size II	DN 10	192	220	110
Size II	DN 15	200	220	110



## 1.9 Hydraulic/Mechanical Installation Accessories

1

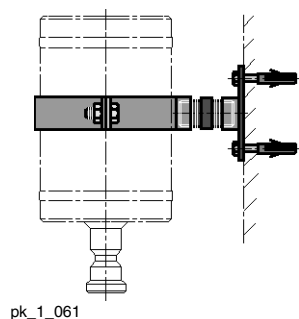


### Stainless steel accumulator

Max. operating pressure 10 bar.

	Volume l	Permissible stroke volume ml	Connection	Fig.	Order no.
<b>Size 0</b>	0.15	2.5	for pipe oØ 6	pk_1_128	914510
<b>Size I</b>	0.35	2.5	for pipe oØ 8	pk_1_128	914511
<b>Size I</b>	1.00	2.5	for pipe oØ 12	pk_1_128	914512
<b>Size II*</b>	1.00	5.0	G 3/4 – DN 10	pk_1_063	914756

\* Threaded sleeve insert G 3/8.



### Wall mounting for accumulator

For PP and PVC versions, consisting of clamping ring, mounting plate and connecting nipple.

			Order no.
<b>For size I accumulator - 0.35 l</b>	0,35 l	Ø 75	818501
<b>For size II accumulator - 1 l</b>	1 l	Ø 110	818502



## 1.9 Hydraulic/Mechanical Installation Accessories

### 1.9.8 Pulsation Dampers (In-line)

Pulsation dampers are used for low-pulsation metering and to reduce the flow resistance with long metering lines.

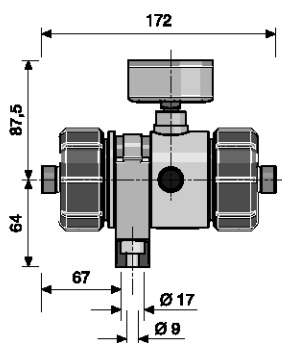
The gas cushion between the housing and hose is compressed when the metering pump has a pressure stroke, at the same time as a partial volume of the medium is metered into the metering line. The over pressure that forms in the gas cushion causes the compressed volume to be transported on at the following suction stroke and the original, relaxed volume of gas is present again.



**Important:** Protect the pulsation dampers in principle with a relief valve.

#### PP In-line damper

**Operating conditions**  
 5 - 30 °C - max. operating pressure 10 bar  
 40 °C - max. operating pressure 8 bar  
 60 °C - max. operating pressure 4 bar



P\_AC\_0180\_SW

	Volume l	Damper diaphragm	Seal material	Connection	Order no.
PPE in-line damper	0.05	CSM*	EPDM	M 20 x 1.5	1026768
PPB in-line damper	0.05	FKM	FKM	M 20 x 1.6	1026771
PPE in-line damper	0.05	CSM*	EPDM	G 3/4 - DN 10	1026769
PPB in-line damper	0.05	FKM	FKM	G 3/4 - DN 10	1026772

\* Chlorosulfonated polyethylene

#### PVC In-line damper

**Operating conditions**  
 5 - 20 °C - max. operating pressure 10 bar  
 40 °C - max. operating pressure 6 bar  
 60 °C - max. operating pressure 2 bar

	Volume l	Damper diaphragm	Seal material	Connection	Order no.
PCE in-line damper	0.05	CSM*	EPDM	M 20 x 1.5	1026774
PCB in-line damper	0.05	FKM	FKM	M 20 x 1.6	1026777
PCE in-line damper	0.05	CSM*	EPDM	G 3/4 - DN 10	1026775
PCB in-line damper	0.05	FKM	FKM	G 3/4 - DN 10	1026778

\* Chlorosulfonated polyethylene

#### Threaded end plug

Threaded end plugs to close off the outlet side of the damper together with T-piece installation.

Material	Connection	Order no.
PP	M 20 x 1.5	1030200
PP	G 3/4 - DN 10	1001352
PVC	M 20 x 1.5	1030458
PVC	G 3/4 - DN 10	1001349

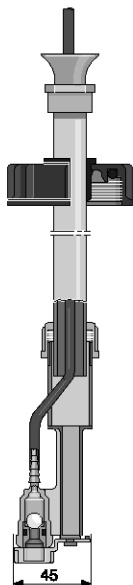
## 1.9 Hydraulic/Mechanical Installation Accessories

### 1.9.9

### Suction Lances, Suction Kit Without Level Switch

#### Variable suction lance without level switch

680 mm long for connection to disposable 5 - 60 litre tank, consisting of foot valve, retaining tube, vertically adjustable screw cap and 2 m intake hose.



pk\_1\_067

#### PPE

Material of retaining tube and foot valve	PP
Seal material	EPDM
Hose material	PE

Material	Hose o Ø x i Ø mm		Fig.	Order no.
PPE	6 x 4	For 50 mm tank opening	pk_1_067	790539
PPE	8 x 5	For 50 mm tank opening	pk_1_067	790540
PPE	12 x 9	For 50 mm tank opening	pk_1_067	790541

#### PCB

Material of retaining tube and foot valve	PVC
Seal material	FKM
Hose material	Soft PVC

Material	Hose o Ø x i Ø mm		Fig.	Order no.
PCB	6 x 4	For 50 mm tank opening	pk_1_067	790536
PCB	8 x 5	For 50 mm tank opening	pk_1_067	790537
PCB	12 x 9	For 50 mm tank opening	pk_1_067	790538

#### Screw cap

For tanks with opening Ø 44, customers need to order the Ø 44 screw cap as a spare part to replace the Ø 50 screw cap.



pk\_1\_066

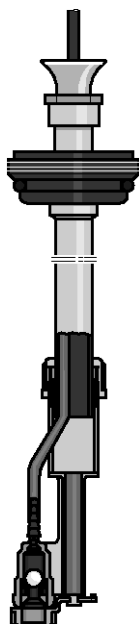
	Order no.
Ø 44 screw cap	811626

## 1.9 Hydraulic/Mechanical Installation Accessories

### Variable suction lance for 200 litre drum without level switch

1000 mm long for connection to a 200-litre drum, with foot valve, support pipe, height-adjustable sealing stopper for S 70x6 (Mauser) thread and 3-metre suction hose.

Adapters for other threads are available on request.



pk\_1\_125

#### PPE

Material of retaining tube and foot valve	PP
Seal material	EPDM
Hose material	PE

Material	Hose o Ø x i Ø mm		Fig.	Order no.
PPE	6 x 4	For 2" tank opening DIN S 70 x 6	pk_1_125	790545
PPE	8 x 5	For 2" tank opening DIN S 70 x 6	pk_1_125	790546
PPE	12 x 9	For 2" tank opening DIN S 70 x 6	pk_1_125	790547

#### PCB

Material of retaining tube and foot valve	PVC
Seal material	FKM
Hose material	Soft PVC

Material	Hose o Ø x i Ø mm		Fig.	Order no.
PCB	6 x 4	For 2" tank opening DIN S 70 x 6	pk_1_125	790542
PCB	8 x 5	For 2" tank opening DIN S 70 x 6	pk_1_125	790543
PCB	12 x 9	For 2" tank opening DIN S 70 x 6	pk_1_125	790544



## 1.9 Hydraulic/Mechanical Installation Accessories

### Variable suction kit without level switch

For ProMinent® solenoid pumps consisting of a foot valve, adjustable retaining tube with screw connection and 2 m metering line.

	Length of retaining tube	
<b>Size I</b>	385 - 550 mm	for 35-60 litre tank
<b>Size II</b>	660 - 1040 mm	for 100-500 litre tank
<b>Size III</b>	1200 - 1350 mm	for 1000 litre tank

### PPE

<b>Material of retaining tube and foot valve</b>	PP
<b>Seal material</b>	EPDM
<b>Hose material</b>	PE

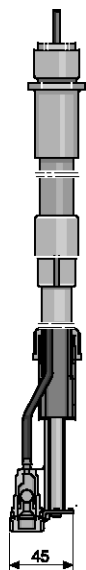
Material	Hose o Ø x i Ø mm	For tank	Fig.	Order no.
PP I	6 x 4	35, 60 l	pk_1_069	790333
PP I	8 x 5	35, 60 l	pk_1_069	790334
PP I	12 x 9	35, 60 l	pk_1_069	790335
PP II	6 x 4	100, 140, 250, 500 l	pk_1_069	790336
PP II	8 x 5	100, 140, 250, 500 l	pk_1_069	790337
PP II	12 x 9	100, 140, 250, 500 l	pk_1_069	790338
PP III	6 x 4	1000 l	pk_1_069	790453
PP III	8 x 5	1000 l	pk_1_069	790454
PP III	12 x 9	1000 l	pk_1_069	790455

### PCB

<b>Material of retaining tube and foot valve</b>	PVC
<b>Seal material</b>	FKM
<b>Hose material</b>	Soft PVC

Material	Hose o Ø x i Ø mm	For tank	Fig.	Order no.
PVC I	6 x 4	35, 60 l	pk_1_069	790327
PVC I	8 x 5	35, 60 l	pk_1_069	790328
PVC I	12 x 9	35, 60 l	pk_1_069	790329
PVC II	6 x 4	100, 140, 250, 500 l	pk_1_069	790330
PVC II	8 x 5	100, 140, 250, 500 l	pk_1_069	790331
PVC II	12 x 9	100, 140, 250, 500 l	pk_1_069	790332
PVC III	6 x 4	1000 l	pk_1_069	790450
PVC III	8 x 5	1000 l	pk_1_069	790451
PVC III	12 x 9	1000 l	pk_1_069	790452

See Vol. 3, Page → 1-55 for suction kits with larger nominal diameters



pk\_1\_069



## 1.9 Hydraulic/Mechanical Installation Accessories

### 1.9.10

### Suction Lances, Suction Assembly with Two Stage Float Switch

#### Variable suction lance with two-stage level switch



680 mm long for connection to disposable 5 - 60 litre tanks, comprising a foot valve, level switch with round plug and support pipe, height adjustable screw head and 2 m long suction hose.

For Beta®, gamma and delta® metering pump product ranges

Switching mode at liquid level low 2 x NC.

#### PPE

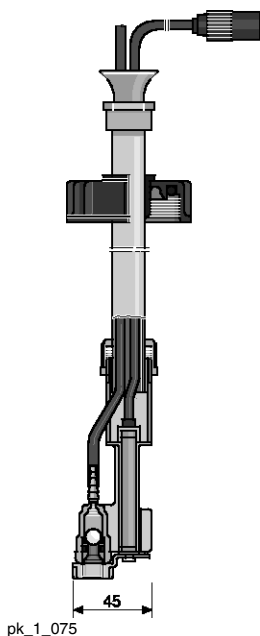
Material of retaining tube and foot valve PP  
 Seal material EPDM  
 Hose material PE

Material	Hose o Ø x i Ø mm		Fig.	Order no.
PP	6 x 4	PP for Ø 50 tank opening, suction hose	pk_1_075	802277
PP	8 x 5	PP for Ø 50 tank opening, suction hose	pk_1_075	802278
PP	12 x 9	PP for Ø 50 tank opening, suction hose	pk_1_075	790372

#### PCB

Material of retaining tube and foot valve PVC  
 Seal material FKM  
 Hose material Soft PVC

Material	Hose o Ø x i Ø mm		Fig.	Order no.
PVC	6 x 4	PVC for Ø 50 tank opening, suction hose	pk_1_075	802077
PVC	8 x 5	PVC for Ø 50 tank opening, suction hose	pk_1_075	802078
PVC	12 x 9	PVC for Ø 50 tank opening, suction hose	pk_1_075	790371



#### Variable suction lance with two-stage level switch



680 mm long for connection to 5 - 60 litre disposable tanks, comprising a foot valve, level switch with support pipe, height adjustable screw head and 2 m long suction hose.

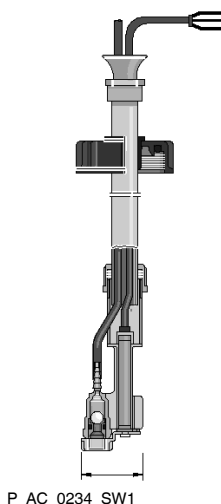
For metering pump product range DF4a.

Switching mode at liquid level low 2 x NC.

#### PCB

Material of retaining tube and foot valve PCB  
 Seal material FPM  
 Hose material Soft PVC

Material	Hose o Ø x i Ø mm		Fig.	Order no.
PCB	6 x 4	PP for Ø 50 tank opening, suction hose	P_AC_0234_SW1	790650



## 1.9 Hydraulic/Mechanical Installation Accessories

### Screw cap

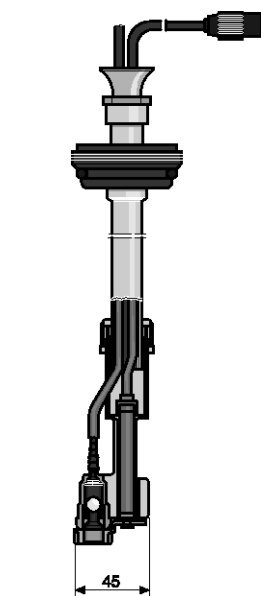


pk\_1\_066

For tanks with opening Ø 44, customers need to order the Ø 44 screw cap as a spare part to replace Ø 50 screw cap.

	Order no.
Ø 44 screw cap	811626

### Variable suction lance for 200 litre drum with two-stage level switch



pk\_1\_076

1000 mm long for connection to a 200-litre drum, with foot valve, level switch with round plug and support pipe, height-adjustable sealing stopper for S 70x6 (Mauser) thread and 3-metre suction hose. Adapters for other threads are available on request.

For Beta®, gamma and delta® metering pump product ranges

Switching mode at liquid level low 2 x NC.

### PPE

Material of retaining tube and foot valve	PP
Seal material	EPDM
Hose material	PE

Material	Hose o Ø x i Ø mm		Fig.	Order no.
PP	6 x 4	PP for tank opening 2" DIN S 70 x 6, suction hose	pk_1_076	802279
PP	8 x 5	PP for tank opening 2" DIN S 70 x 6, suction hose	pk_1_076	802280
PP	12 x 9	PP for tank opening 2" DIN S 70 x 6, suction hose	pk_1_076	790374

### PCB

Material of retaining tube and foot valve	PVC
Seal material	FKM
Hose material	Soft PVC

Material	Hose o Ø x i Ø mm		Fig.	Order no.
PVC	6 x 4	PVC for tank opening 2" DIN S 70 x 6, suction hose	pk_1_076	802079
PVC	8 x 5	PVC for tank opening 2" DIN S 70 x 6, suction hose	pk_1_076	802080
PVC	12 x 9	PVC for tank opening 2" DIN S 70 x 6, suction hose	pk_1_076	790373



## 1.9 Hydraulic/Mechanical Installation Accessories

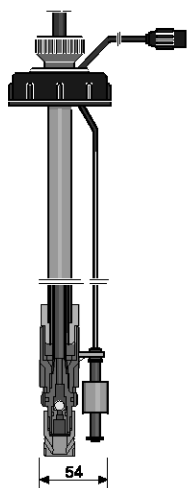
### Suction lance for 60-litre canister, fixed length, gas-tight, with two-stage level switch



560 mm long for connection to 60-litre canister with tank height 600 mm and tank opening Ø 55 mm. Design with vent valve and bleed valve. Consisting of foot valve and support pipe, level switch with round plug and 2 m suction hose.

For metering pump product range Beta®, gamma/ X and delta®

Switching mode at liquid level low 2 x N/C



P\_AC\_0052\_SW

#### PPE

Material of retaining tube and foot valve	PP
Seal material	EPDM
Hose material	PE

Material	Hose o Ø x i Ø mm		Fig.	Order no.
PP	6 x 4	PP for Ø 55 with suction hose	P_AC_0052_SW	802285
PP	8 x 5	PP for Ø 55 with suction hose	P_AC_0052_SW	802286
PP	12 x 9	PP for Ø 55 with suction hose	P_AC_0052_SW	802287

#### PCB

Material of retaining tube and foot valve	PVC
Seal material	FKM
Hose material	Soft PVC

Material	Hose o Ø x i Ø mm		Fig.	Order no.
PVC	6 x 4	PVC for Ø 55 with suction hose	P_AC_0052_SW	802081*
PVC	8 x 5	PVC for Ø 55 with suction hose	P_AC_0052_SW	802082*
PVC	12 x 9	PVC for Ø 55 with suction hose	P_AC_0052_SW	802083*

\* **Caution:** The product contains adhesive joints with Tangit. Please note the resistance of Tangit adhesive.

### PVDF Suction Lance

Fixed length suction lance made of PVDF with two-stage level switch, consisting of PVDF support pipe, foot valve and two-stage level switch with open end. Suction hose PTFE 8 x 6 mm; a suitable connector kit is included in the scope of delivery.



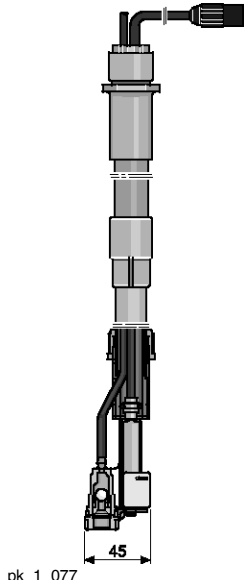
P\_AC\_0250\_SW

	Length mm	Order no.
PVDF Suction Lance	350	1038304
PVDF Suction Lance	650	1038305



## 1.9 Hydraulic/Mechanical Installation Accessories

### PP Adjustable suction assembly with two stage float switch and round plug



Consisting of foot valve, support pipe and threaded connector, level switch, two-stage with 3-pin round plug, suction line.

For Beta®, gamma and delta® metering pump product ranges

Switching mode at liquid level low 2 x NC.

#### Long support pipe

Size I	385 - 550 mm	for storage tanks	35 - 60 litres
Size II	660 - 1040 mm	for storage tanks	100 - 500 litres
Size III	1200 - 1350 mm	for storage tanks	1000 litres

### PPE

Material of retaining tube and foot valve	PP
Seal material	EPDM
Hose material	PE

Material	Hose o Ø x i Ø mm	For tank	Fig.	Order no.
PP I	6 x 4	35, 60 l	pk_1_077	790365
PP I	8 x 5	35, 60 l	pk_1_077	790366
PP I	12 x 9	35, 60 l	pk_1_077	790367
PP II	6 x 4	100, 140, 250, 500 l	pk_1_077	790368
PP II	8 x 5	100, 140, 250, 500 l	pk_1_077	790369
PP II	12 x 9	100, 140, 250, 500 l	pk_1_077	790370
PP III	6 x 4	1000 l	pk_1_077	790465
PP III	8 x 5	1000 l	pk_1_077	790466
PP III	12 x 9	1000 l	pk_1_077	790467

### PCB

Material of retaining tube and foot valve	PVC
Seal material	FKM
Hose material	Soft PVC

Material	Hose o Ø x i Ø mm	For tank	Fig.	Order no.
PVC I	6 x 4	35, 60 l	pk_1_077	790359
PVC I	8 x 5	35, 60 l	pk_1_077	790360
PVC I	12 x 9	35, 60 l	pk_1_077	790361
PVC II	6 x 4	100, 140, 250, 500 l	pk_1_077	790362
PVC II	8 x 5	100, 140, 250, 500 l	pk_1_077	790363
PVC II	12 x 9	100, 140, 250, 500 l	pk_1_077	790364
PVC III	6 x 4	1000 l	pk_1_077	790462
PVC III	8 x 5	1000 l	pk_1_077	790463
PVC III	12 x 9	1000 l	pk_1_077	790464



## 1.9 Hydraulic/Mechanical Installation Accessories

### 1.9.11

### Float Switches

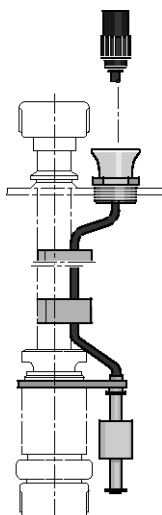
#### Level switch kit complete with PVDF two-phase with round plug



The level switch set can be ordered in conjunction with the DN 10/ DN 15 suction assemblies. Customers are responsible for fixing.

#### For Beta®, gamma/ L and delta® metering pump product ranges

Switching mode: with liquid level low 2 x NC  
 Materials: Level switch PVDF  
 Float PE foamed  
 3 m cable, PE



pk\_1\_079

Connection	Type	Order no.
DN 10/15	with 3-pin round plug	1034879

#### Single stage float switch



For minimum display at the same time as switching off the metering pump.

With flat coupling for direct connection to ProMinent metering pump D\_4a.

#### Technical data

Max. switching voltage 48 V,  
 Switching current 0.5 A,  
 Switching power 5 W/5 VA,  
 Temperature range -10 °C to 65 °C, degree of protection IP 67.  
 Switching mode: at liquid level low 1 x N/O.

#### Material

Body PVDF, float PE foamed, cable PE.



pk\_1\_080

	Lead length	Order no.
PVDF/PE with flat coupling	2 m	1031588
PVDF/PE with flat coupling	5 m	1031590

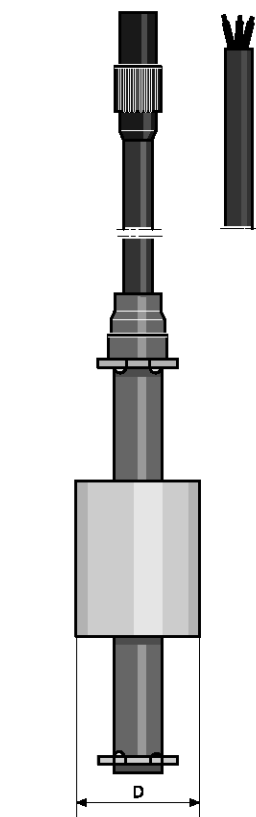
#### Material

Body PVDF, float PVDF, cable PE.

	Lead length	Order no.
PVDF with flat connector	2 m	1034695
PVDF with flat connector	5 m	1034696

## 1.9 Hydraulic/Mechanical Installation Accessories

### Two stage float switch



For level monitoring in the storage tank, two-stage with pre-warning alarm message and switch-off of the metering pump after a further 30 mm reduction in level

**With 3-pin round plug for direct connection to Beta®, gamma/ L and delta®**

With 3 leads, for example in conjunction with relay control, part no. 914768

#### Technical data

Max. switching voltage: 48 V, Switching current: 0.5 A, Switching power: 5 W/5 VA,

Temperature range: -10 °C to 65 °C, degree of protection IP 67.

**Switching mode at liquid level low 2 x N/C.**

#### Material

Body PVDF, float foamed PE, cable PE

	Lead length	Order no.
PVDF/PE with 3-pin round plug	2 m	1031604
PVDF/PE with 3-pin round plug	5 m	1031606
PVDF/PE with 3 wires	2 m	1031607
PVDF/PE with 3 wires	5 m	1031609

#### Material

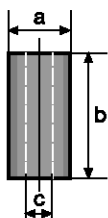
Body PVDF, float PVDF, cable PE.

	Lead length	Order no.
PVDF with 3-pin round plug	2 m	1034697
PVDF with 3-pin round plug	5 m	1034698
PVDF with 3 wires	2 m	1034699
PVDF with 3 wires	5 m	1034700

#### Cable assignment on 3-wire cable:

Colour	Function
black	Earth
blue	Minimum pre-warning
brown	Minimum limit stop

### Ceramic weight for vertical fixing of float switch



	Ø A mm	B mm	Ø C mm	Weight g	Type	Order no.
Size 1	25	50	10	60	For round and latch plug	1019244
Size 2	39	32	*	65	For round plug/flat connector	404004
Size 3	40	50	24	70	For round plug/flat connector	1030189

\* Slot 13 x 27 mm

With the two stage float switch with round plug, the weight is pushed up when float is attached.



## 1.9 Hydraulic/Mechanical Installation Accessories

### PVDF/PE level switch with hard PVC retaining pipe

For use in chemicals which would attack the float switch PE cable and/or for stable mounting in conjunction with electronic stirrers, FKM seal.

#### Adjustable length

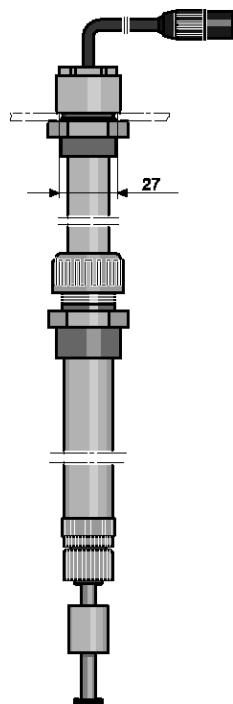
Size I	350 - 550 mm	for 35 and 60 litres tank
Size II	660 - 1,160 mm	for 100 to 1,000 litres tank

Size	Float switch	Order no.
Size I	two-stage with round plug	802010
Size II	two-stage with round plug	802011
Size I	one-stage with flat connector	801727
Size II	one-stage with flat connector	801728

#### Switching mode:

2-stage: 2 x N/C for low fluid levels

1-stage: 1 x N/O for low fluid levels



pk\_1\_084



pk\_1\_126

### Extension lead, 3-core

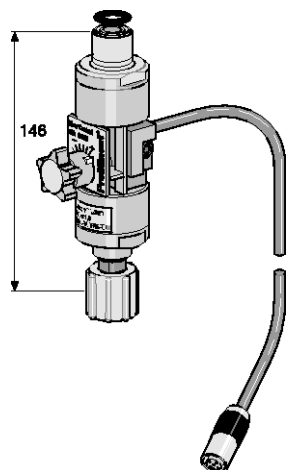
	Fig.	Order no.
For 2-stage float switch with round plug and coupler, length, 3 m	pk_1_126	1005559

## 1.9 Hydraulic/Mechanical Installation Accessories

### 1.9.12

### Metering Monitor, Signal Cable

#### Flow Control adjustable flow monitor



pk\_1\_086\_2

Suitable for the gamma/ X product range in material designs PP, PC, NP and TT. Complete with connector cable for assembly directly on the dosing head.

For monitoring the individual strokes based on the floating body principle. The adjustment screw is used to match the partial flow flowing past the float to the respective stroke volume so that an alarm is emitted if the level is transgressed by approx. 20%. The gamma/ L enables the permitted number of incompletely performed strokes to be selected between 1 to 127, ensuring optimum adaptation to process requirements.

#### Materials

Housing:	PVDF
Float:	PTFE-coated
Seals:	FKM/EPDM

#### Flow Control for Discharge Side Installation

Flow Control	For pump type	Material	Order no.
Size I	1602	PVDF/EPDM	1009229
	1602	PVDF/FKM	1009335
Size II	1604, 0708, 1009, 0414, 0220, 0715, 0220, 0424	PVDF/EPDM	1009336
	1604, 0708, 1009, 0414, 0220, 0715, 0220, 0424	PVDF/FKM	1009338

Note the minimum values for the stroke length.

Pump type	Medium operating pressure	Stroke length (scale division)	Max. permissible operating pressure	Stroke length (scale division)
1602	8 bar	> 30 %	16 bar	> 40 %
1604	5 bar	> 30 %	16 bar	> 50 %
0708	4 bar	> 30 %	7 bar	> 40 %
1009	5 bar	> 30 %	10 bar	> 40 %
0414	2 bar	> 30 %	4 bar	> 30 %
0715	4 bar	> 30 %	7 bar	> 30 %
0220	1 bar	> 30 %	2 bar	> 30 %
0424	2 bar	> 30 %	4 bar	> 30 %

#### Flow Control for Suction Side Installation



Suitable for the delta® series with slow discharge stroke version. Individual strokes are detected on the suction side where the flow velocity is sufficiently high. With water as the medium, the minimum stroke length is 30%, normal suction stroke version, HV1 or HV2.

Flow Control	For pump type	Material	Order no.
Size II	1608 – 0730	PVDF/EPDM	1036407
	1608 – 0730	PVDF/FKM	1036409
Size III	0450 – 0280	PVDF/EPDM	1036439
	0450 – 0280	PVDF/FKM	1036440

## 1.9 Hydraulic/Mechanical Installation Accessories

### Universal signal cable



pk\_1\_085



For controlling the metering pump via contacts - external control, standard signals - analog control and for potential-free ON/OFF connection - connection function.

For Beta®, gamma and delta® with 5-pin round plastic plug and 5-wire open-ended cable.

	Lead length	Order no.
5-core universal cable, 5-pin round plug	2 m	1001300
5-core universal cable, 5-pin round plug	5 m	1001301
5-core universal cable, 5-pin round plug	10 m	1001302

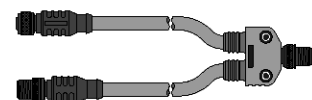
### External signal cable



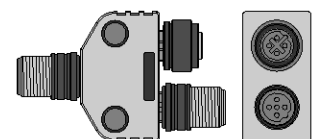
Only for external control of Beta®, gamma/ X and delta® via contacts. With 5-pin round plug, internally bridged and 2-wire cable with open end.

	Lead length	Order no.
2-core external cable, 5-pin round plug	2 m	707702
2-core external cable, 5-pin round plug	5 m	707703
2-core external cable, 5-pin round plug	10 m	707707

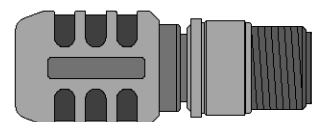
### PROFIBUS® adapter, enclosure rating IP 65



P\_AC\_0245\_SW



P\_AC\_0230\_SW\_1



P\_AC\_0239\_SW

		Fig.	Order no.
Y-adapter 2 x M12 x 1 male/female	M12 x 1 male	P_AC_0245_SW	1040956
PROFIBUS® termination assembly, comprising a Y-plug and terminating resistance	M12	–	1040955
PROFIBUS® Y-adapter	M 12 x 1	P_AC_0230_SW	1036621
PROFIBUS® termination resistor, plug-in	M 12 x 1	P_AC_0239_SW	1036622

### USB adaptor

To connect a laptop to gamma and Sigma series metering pumps.

The USB adaptor can be used to transfer timer programmes created using ProTime software to the pump. You will find the ProTime software on our homepage.

	Order no.
USB adaptor	1021544

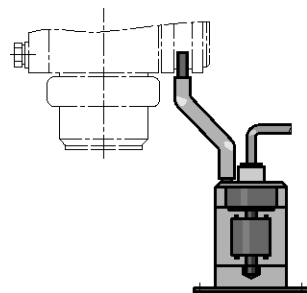


# 1.9 Hydraulic/Mechanical Installation Accessories

## 1.9.13

## Safety Equipment

### Diaphragm rupture indicator



pk\_1\_087

To trigger an alarm and switch off the metering pump in the event of diaphragm rupture. Consisting of PVC/PE level switch, clear acrylic storage tank, connecting sockets and connecting hose. Potential-free N/O switch, max. contact load 60 V AC, 300 mA, 18 W.

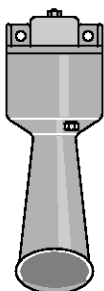
**To fit all types of Beta® and gamma.**

Retrofitting is also possible.

	Order no.
Diaphragm rupture indicator	803640

### Horn

HUW 55, 230 V, 50-60 Hz, 165 x 60 x 65, 85 phon, for use indoors  
(e.g. in connection with fault signalling relay)



pk\_1\_088

	Order no.
HUW 55 Horn	705002

### Indicator lamp

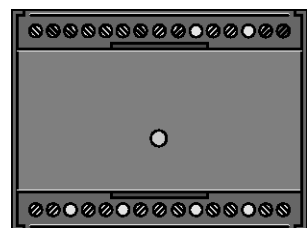
Red for wall mounting 230 V, 50-60 Hz (e.g. in connection with fault signalling relay, relay control or clock generator relay)

	Order no.
Indicator lamp, red	914780

### Fourfold contact repeater

Contact repeater with four reed relays for externally controlled simultaneous pulse pacing of up to four metering pumps of any type or of other devices, e.g. summing counters.

In plastic snap in housing for C bar or wall mounting.



pk\_2\_050

<b>Mains connection:</b>	230 V, 50/60 Hz
<b>Max. contact rating</b>	24 V, 50 mA
<b>Dimensions H x W x D</b>	76 x 112 x 114
<b>Enclosure rating</b>	IP 40

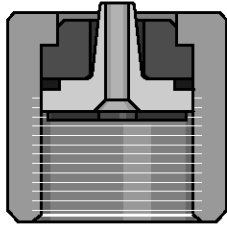
	Order no.
Fourfold contact repeater	914753



## 1.9 Hydraulic/Mechanical Installation Accessories

### 1.9.14

### Connection Kits



pk\_1\_089

Connection kit for fitting hoses of different sizes to the suction and pressure connector of the dosing head of alpha, Beta, gamma, delta®, Pneumados b and accessories, consisting of hose nozzle, clamp ring, union nut and seal for one or two connectors.

#### Single Connector Set

Material		oØ x iØ mm	Order no.
PP/EPDM (PPE)	for hose	6 x 4	817160
PP/EPDM (PPE)	for hose	8 x 5	817161
PP/EPDM (PPE)	for hose	12 x 9	817162
PP/EPDM (PPE)	for hose	10 x 4	1002587
PP/EPDM (PPE)	for hose	12 x 6	817163
PP/FKM (PPB)	for hose	6 x 4	817173
PP/FKM (PPB)	for hose	8 x 5	817174
PP/FKM (PPB)	for hose	12 x 9	817175
PP/FKM (PPB)	for hose	10 x 4	1002588
PP/FKM (PPB)	for hose	12 x 6	817176
PVC/EPDM (PCE)	for hose	6 x 4	791161
PVC/EPDM (PCE)	for hose	8 x 5	792058
PVC/EPDM (PCE)	for hose	12 x 9	790577
PVC/EPDM (PCE)	for hose	10 x 4	1002590
PVC/EPDM (PCE)	for hose	12 x 6	792062
PVC/FKM (PCB)	for hose	6 x 4	817065
PVC/FKM (PCB)	for hose	8 x 5	817066
PVC/FKM (PCB)	for hose	12 x 9	817067
PVC/FKM (PCB)	for hose	10 x 4	1002589
PVC/FKM (PCB)	for hose	12 x 6	817068
PVDF (PVT)	for hose	6 x 3	1024583
PVDF (PVT)	for hose	6 x 4	1024619
PVDF (PVT)	for hose	8 x 4	1033148
PVDF (PVT)	for hose	8 x 5	1024620
PVDF (PVT)	for hose	12 x 9	1024618
PVDF (PVT)	for hose	10 x 4	1024585
PVDF (PVT)	for hose	12 x 6	1024617
PTFE (TTT)	for hose	6 x 4	817205
PTFE (TTT)	for hose	8 x 5	817206
PTFE (TTT)	for hose	12 x 9	817207
PTFE (TTT)	for hose	12 x 6	817208

#### Double Connector Set

Material		oØ x iØ mm	Order no.
PP/EPDM (PPE)	for hose	6 x 4	817150
PP/EPDM (PPE)	for hose	8 x 5	817153
PP/EPDM (PPE)	for hose	12 x 9	817151
PP/EPDM (PPE)	for hose	12 x 6	817152
PP/FKM (PPB)	for hose	6 x 4	817166
PP/FKM (PPB)	for hose	8 x 5	817167
PP/FKM (PPB)	for hose	12 x 9	817168
PP/FKM (PPB)	for hose	12 x 6	817169
PVC/EPDM (PCE)	for hose	6 x 4	817060



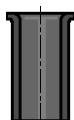
## 1.9 Hydraulic/Mechanical Installation Accessories

Material		oØ x iØ mm	Order no.
PVC/EPDM (PCE)	for hose	8 x 5	817048
PVC/EPDM (PCE)	for hose	12 x 9	817049
PVC/EPDM (PCE)	for hose	12 x 6	791040
PVC/FKM (PCB)	for hose	6 x 4	817050
PVC/FKM (PCB)	for hose	8 x 5	817053
PVC/FKM (PCB)	for hose	12 x 9	817051
PVC/FKM (PCB)	for hose	12 x 6	817052
PVDF (PVT)	for hose	6 x 4	1023246
PVDF (PVT)	for hose	8 x 5	1023247
PVDF (PVT)	for hose	12 x 9	1023248
PVDF (PVT)	for hose	12 x 6	1024586
PTFE (TTT)	for hose	6 x 4	817201
PTFE (TTT)	for hose	8 x 5	817204
PTFE (TTT)	for hose	12 x 9	817202
PTFE (TTT)	for hose	12 x 6	817203

### Stainless steel support insert 1.4571

For connection of PE or PTFE pipe to stainless steel connectors using Swagelock and Serto systems.

pk\_1\_090

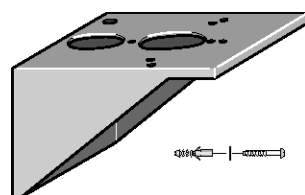


	oØ x iØ mm	Order no.
for hose	6 x 4	359365
for hose	8 x 5	359366
for hose	12 x 9	359368
for hose	8 x 6	359362
for hose	12 x 10	359363

### 1.9.15

### Wall Brackets for Metering Pumps

#### PPE wall mounting bracket



pk\_1\_092

With fittings, for mounting a metering pump of size Beta®/ 4, Beta®/ 5, gamma/ X and alpha.

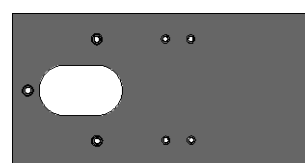
The Beta®/ 4, gamma/ X can either be mounted parallel or diagonally to each other.

Dimensions L x W x H: 208 x 120 x 140 mm

**Material** Fibreglass-reinforced plastic PPE

	Fig.	Order no.
for BT4, BT5, gamma/ X, G/ 4, G/ 5, D_4a	pk_1_092	810164

#### PP adapter plate



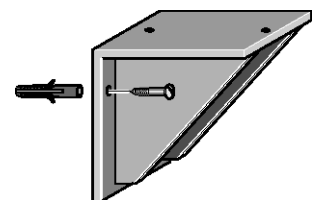
pk\_1\_121

With fixing materials for vertical wall-mounting of Beta® or gamma pumps with self-degassing liquid ends. Used with PPE wall bracket.

	Fig.	Order no.
for BT4, BT5, gamma/ X	pk_1_121	1003030

## 1.9 Hydraulic/Mechanical Installation Accessories

### PP wall bracket



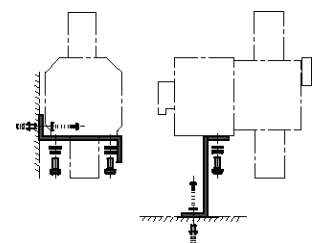
pk\_2\_036

PP wall bracket, holds pump parallel to the wall, includes fixings.

Dimensions L x W x H: 230 x 220 x 220 mm

	Fig.	Order no.
for delta®	pk_2_036	1001906

### Wall/Floor bracket for Pneumados

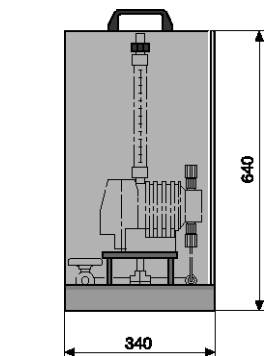


pk\_1\_095

To hold Pneumados metering pump. Floor or wall mounted, made of coated aluminium. Includes fittings.

	Fig.	Order no.
Dimensions: L x W x H 92 x 80 x 30	pk_1_095	790605

### Portable plastic pump stand



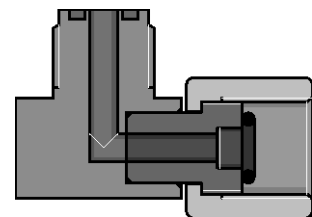
pk\_1\_093

To accommodate a metering pump of the product range beta® or gamma/ X. The pump stand can either be designed in PP or black PE. It is prepared for accommodating a fixed pipe and has collector equipment for escaping feed chemical, e.g. in the event of a leakage on the suction line or a rupture of the diaphragm.

Supplied with carrying handle, but without pump and pipework

	Fig.	Order no.
Light grey PP	pk_1_093	1000180
Black PE	pk_1_093	1000181

### Right-angled PVC threaded connector



pk\_1\_083

For mounting multifunctional valve onto Beta® or gamma/ L models, self-degassing liquid end version.

	Material	Fig.	Order no.
PCE Version	PVC/EPDM*	pk_1_083	1003472
PCB Version	PVC/FKM*	pk_1_083	1003318

\* **Caution:** The product contains adhesive joints with Tangit. Please note the resistance of Tangit adhesive.



## 1.9 Hydraulic/Mechanical Installation Accessories

### 1.9.16

### Contact Water Meters for Use in Potable Water and Accessories

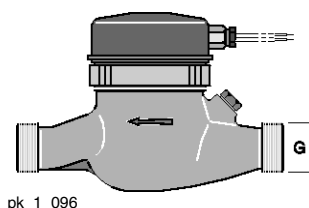
#### DIN Version contact water meter

PN 10 bar, readable, type series MNR-K, operating temp. 40 °C,

contact load max. 100 mA, 24 V, NG - nominal size.

$Q_{max}$  = maximum load,  $Q_d$  = permanent load

$Q_n$  = nominal load (1/2  $Q_d$  according to calibration regulations)



$Q_{max} / Q_d / Q_n$	Threaded connector width	Connector thread	Length without thread	Pulse interval	Order no.
NG - m³/h	R DN/mm	G	mm	I	
5/5/2.5	3/4 – DN 20	1	190	0.05	304467
5/5/2.5	3/4 – DN 20	1	190	0.10	304432
5/5/2.5	3/4 – DN 20	1	190	0.25	304455
5/5/2.5	3/4 – DN 20	1	190	0.30	304428
5/5/2.5	3/4 – DN 20	1	190	0.50	304431
5/5/2.5	3/4 – DN 20	1	190	1.00*	304434
5/5/2.5	3/4 – DN 20	1	190	1.50*	304433
5/5/2.5	3/4 – DN 20	1	190	2.50	304458
5/5/2.5	3/4 – DN 20	1	190	10.00	304453
5/5/2.5	3/4 – DN 20	1	190	100.00	304444
12/12/6	1 – DN 25	1 1/4	260	0.25	1004550
12/12/6	1 – DN 25	1 1/4	260	0.50	1004548
12/12/6	1 – DN 25	1 1/4	260	1.00*	1039764
12/12/6	1 – DN 25	1 1/4	260	1.50*	1004549
12/12/6	1 – DN 25	1 1/4	260	2.00*	1004546
12/12/6	1 – DN 25	1 1/4	260	10.00*	1004547
12/12/6	1 – DN 25	1 1/4	260	100.00	1004545
20/20/10	1 1/2 – DN 40	2	300	2.00*	1039765
20/20/10	1 1/2 – DN 40	2	300	3.00	1004552
20/20/10	1 1/2 – DN 40	2	300	4.00	1004553
20/20/10	1 1/2 – DN 40	2	300	10.00	1004554
20/20/10	1 1/2 – DN 40	2	300	100.00	1004555
30/30/15	2 – DN 50	2 1/2	270	3.00	1020551
30/30/15	2 – DN 50	2 1/2	270	4.00*	1020552
30/30/15	DN 50	Flange	270	6.00*	1020553
30/30/15	2 – DN 50	2 1/2	270	10.00	1020550
30/30/15	DN 50	Flange	270	100.00	304450

\*Standard storage tank

## 1.9 Hydraulic/Mechanical Installation Accessories

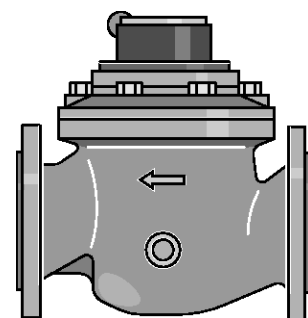
### DIN Version contact water meter

Readable, series WS-K, operating temp. 40 °C, contact load max. 30 mA, 30 V, DIN 2501 flange, PN 16 bar.

$Q_{\max}$  = Maximum load

$Q_d$  = Continuous load

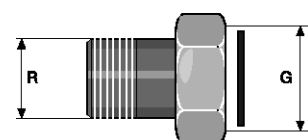
$Q_n$  = Nominal load



pk\_1\_097

$Q_{\max} / Q_d / Q_n$ NG - m <sup>3</sup> /h	Connector width DN/mm	Lower working limit l/h	Length mm	Pulse interval l	Order no.
110/55/40	DN 80	275	300	10.00*	1004560
110/55/40	DN 80	275	300	25.00	1004558
110/55/40	DN 80	275	300	100.00	1004559
180/90/60	DN 100	300	360	10.00	1004567
180/90/60	DN 100	300	360	25.00*	1004556
180/90/60	DN 100	300	360	50.00	1004557
350/200/150	DN 150	800	500	50.00*	1004568

\*Standard storage tank



pk\_1\_098

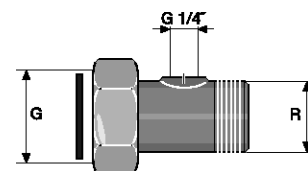
### Union assembly set with seal

For threaded water meter, brass.

		Order no.
R 3/4	G 1	359029
R 1	G 1 1/4	801322
R 1 1/4	G 1 1/2 – (turboDOS®)	359034
R 1 1/2	G 2	359037
R 2	G 2 1/2	359039

### Union assembly set with seal

For threaded water meter with G 1/4 connector for injection valve, brass.



P\_AC\_0249\_SW

		Order no.
R 3/4	G 1 – 1/4	359030
R 1	G 1 1/4 – 1/4	359032
R 1 1/2	G 2 – 1/4	359038
R 2	G 2 1/2 – 1/4	801321



## 1.9 Hydraulic/Mechanical Installation Accessories

### O-ring loaded injection valve

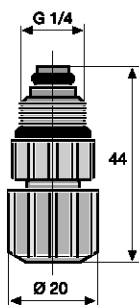
For use with threaded connectors on water meters.

Short design for R 3/4 and R 1 threaded connectors, long design for R 1 1/2 and R 2 threaded connectors.

#### Applications when using appropriate metering lines

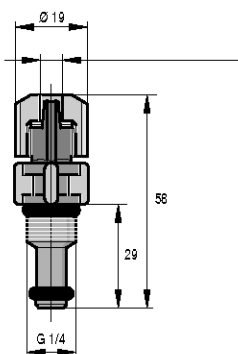
25 °C - max. operating pressure 16 bar

45 °C - max. operating pressure 9 bar



P\_AC\_0008\_SW

Connector		Material	oØ x iØ mm	Fig.	Order no.
6/4 - G 1/4 short	for hose	PP/FKM	6 x 4	P_AC_0008_SW	914754
6/4 - G 1/4 long	for hose	PP/FKM	6 x 4	P_AC_0009_SW	741193
6/4 - G 1/4 short	for hose	PVC/FKM	6 x 4	P_AC_0008_SW	914558
6/4 - G 1/4 long	for hose	PVC/FKM	6 x 4	P_AC_0009_SW	915091



P\_AC\_0009\_SW

## 1.10 Mechanical/Hydraulic Special Accessories

### 1.10.1 Pump Diaphragms

#### PTFE/FKM diaphragm

ProMinent® EPDM diaphragm with woven fabric core, one PTFE and one FKM layer on the side in contact with the medium. Particularly suitable for metered media containing microcrystals, e.g. silicate. Suitable for Beta® and gamma/ L pumps\*.

Pump type	Order no.
1601	1024168
1602	1024169
1604	1034618
1005/1605	1024170
0708/1008	1024171
0413/0713	1024172
0220/0420	1024173

\* Identity code letter "S", e.g. BT4A1002PPS...

#### EPDM diaphragm

ProMinent® diaphragms made of EPDM with woven inner layer.

Max. operating pressure 6 bar.

Pump type	Order no.
1000	1001444
1601	1001445
1602	1001446
1005/1605	1001447
0708/1008	1001448
0413/0713	1001449
0220/0420	1001450
0232	1001451

\* Identity code letter "P", e.g. BT4A1002PPP...



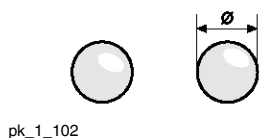
# 1.10 Mechanical/Hydraulic Special Accessories

## 1.10.2

## Custom Valve Balls/Valve Springs

For on-site retrofitting of metering pumps and accessories, for applications where standard materials are unsuitable. Supplied loose only, not fitted.

### Valve balls

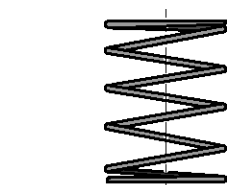


pk\_1\_102

Material	Ø mm		Order no.
PTFE	4.7	for valve Ø 6 mm	404255
PTFE	9.5	for valve Ø 8 and 12 mm	404258
PTFE	11.0	for valve DN 10	404260
PTFE	16.0	for valve DN 15	404259
Ceramic	4.7	for valve Ø 6 mm	404201
Ceramic	9.2	for valve Ø 8 and 12 mm	404281
Ceramic	11.0	for valve DN 10	404277
Ceramic	16.0	for valve DN 15	404275

### Valve springs for liquid ends

With approx. 0.1 bar priming pressure for spring loading of the valve balls in the liquid end. Recommended to improve the valve function and increase metering accuracy, in particular for viscous metering media above 50 m Pas.

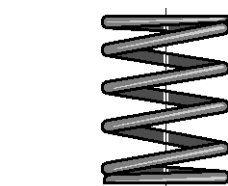


pk\_1\_103

Material	Prepressure bar		Order no.
1.4571	0.1	for valve 4.7	469406
1.4571	0.1	for valve 9.2	469403
1.4571	0.1	for mikro g/ 5	469437
1.4571	0.1	for mikro g/ 5	469438
1.4571	0.1	for mikro g/ 5	469439
Hast. C	0.1	for valve DN 10	469114
Hast. C	0.1	for valve DN 15	469107

### Valve springs for injection valves

Approx. 0.5/1/2 bar prepressure for increasing metering accuracy and preventing suction and siphoning effect.



pk\_1\_104

Material	Prepressure bar		Order no.
1.4571	1.0	for R 1/4" - Ø 6 mm connector	469401
Hast. C	0.5	for R 1/2" - Ø 6, 8 and 12 mm connector	469404
Hast. C	1.0	for R 1/2" - Ø 6, 8 and 12 mm connector	469413
Hast. C	2.0	for R 1/2" - Ø 6, 8 and 12 mm connector	469410
Hast. C	0.5	for DN 10	469115
Hast. C	1.0	for DN 10	469119
Hast. C	0.5	for DN 15	469108
Hast. C	1.0	for DN 15	469116

### Valve spring made of Hastelloy C with FEP coating

Material	Prepressure bar		Order no.
Hast. C/FEP	0.5	for R 1/2" - Ø 6, 8 and 12 mm connector	818590
Hast. C/FEP	1.0	for R 1/2" - Ø 6, 8 and 12 mm connector	818536
Hast. C/FEP	0.5	for DN 10	818515
Hast. C/FEP	0.5	for DN 15	818516

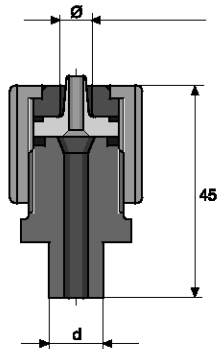


# 1.10 Mechanical/Hydraulic Special Accessories

## 1.10.3 Connector Parts/Fittings

### PVC\* hose/adhesive nipple

With union nut, for connection of PE tubing to rigid PVC fittings for on-site construction of connector system.

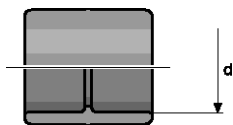


pk\_1\_107

	d mm		oØ x iØ mm	Fig.	Order no.
Nozzle/solvent union	12	for hose	6 x 4	pk_1_107	817088
	12	for hose	8 x 5	pk_1_107	817089
	12	for hose	12 x 9	pk_1_107	817090
	12	for hose	12 x 6	pk_1_107	817091
	16	for hose	6 x 4	pk_1_107	817092
	16	for hose	8 x 5	pk_1_107	817093
	16	for hose	12 x 9	pk_1_107	817094
	16	for hose	12 x 6	pk_1_107	817095

\* **Caution:** The product contains adhesive joints with Tangit. Please note the resistance of Tangit adhesive.

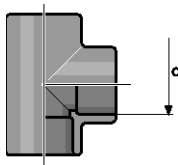
### PVC straight solvent union



pk\_1\_109

	d mm		Fig.	Order no.
PVC straight solvent union	12	DN 8	pk_1_109	356608
	16	DN 10	pk_1_109	356609
	20	DN 15	pk_1_109	356610
	25	DN 20	pk_1_109	356611

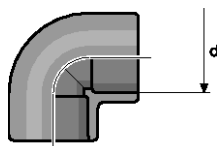
### PVC T-joint



pk\_1\_113

	d mm		Fig.	Order no.
PVC T-joint	12	DN 8	pk_1_113	356406
	16	DN 10	pk_1_113	356407
	20	DN 15	pk_1_113	356408
	25	DN 20	pk_1_113	356409

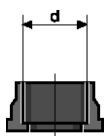
### 90° PVC elbow joint



pk\_1\_108

	d mm		Fig.	Order no.
90° PVC elbow joint	12	DN 8	pk_1_108	356315
	16	DN 10	pk_1_108	356316
	20	DN 15	pk_1_108	356317
	25	DN 20	pk_1_108	356318

### PVC insert (straight solvent union)



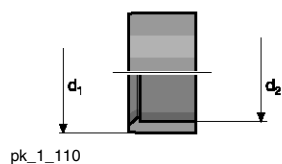
pk\_1\_115

	d mm		Fig.	Order no.
PVC insert (straight solvent union)	12	DN 8	pk_1_115	356571
	16	DN 10	pk_1_115	356572
	20	DN 15	pk_1_115	356573
	25	DN 20	pk_1_115	356574



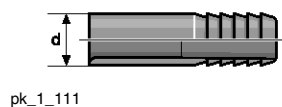
# 1.10 Mechanical/Hydraulic Special Accessories

## PVC short reducing union



	d1 mm	d2 mm	Fig.	Order no.
PVC short reducing union	12	8	pk_1_110	357025
	16	10	pk_1_110	357026
	20	16	pk_1_110	357027
	25	20	pk_1_110	357028

## PVC hose connection nozzle



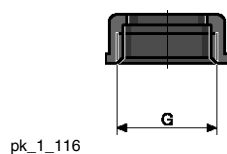
	d mm		Fig.	Order no.
PVC hose connection nozzle	12	DN 8	pk_1_111	356655
	16	DN 10	pk_1_111	356656
	20	DN 15	pk_1_111	356657
	25	DN 20	pk_1_111	356658

## Hose nozzle with seal



Material	d mm		Fig.	Order no.
PVC	16	DN 10	pk_2_046	800554
PVC	20	DN 15	pk_2_046	811407
PVC	25	DN 20	pk_2_046	811408
PP	16	DN 10	pk_2_046	800657
PP	20	DN 15	pk_2_046	800655
PP	25	DN 20	pk_2_046	800656

## Union nuts

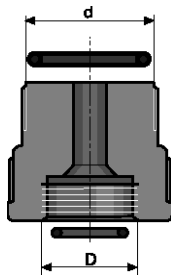


Material	Connection	Fig.	Order no.
PP	G 5/8 – DN 8	pk_1_116	800665
PP	G 3/4 – DN 10	pk_1_116	358613
PP	G 1 – DN 15	pk_1_116	358614
PP	G 1 1/4 – DN 20	pk_1_116	358615
PVC	G 5/8 – DN 8	pk_1_116	800565
PVC	G 3/4 – DN 10	pk_1_116	356562
PVC	G 1 – DN 15	pk_1_116	356563
PVC	G 1 1/4 – DN 20	pk_1_116	356564
PVDF	G 3/4 – DN 10	pk_1_116	358813

## 1.10 Mechanical/Hydraulic Special Accessories

### Single adapter kit

For connection of system + GF+ threaded connectors to metering pumps and accessories.

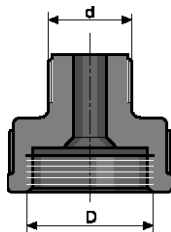


pk\_1\_114

Material	Size	Internal thread D	External thread d	Order no.
PP/EPDM	For DN 8 threaded connector	M20 x 1,5	G 5/8	817164
PP/FKM	For DN 8 threaded connector	M20 x 1,5	G 5/8	740604
PVC/EPDM	For DN 8 threaded connector	M20 x 1,5	G 5/8	740583
PVC/FKM	For DN 8 threaded connector	M20 x 1,5	G 5/8	817069
PVDF/PTFE	For DN 8 threaded connector	M20 x 1,5	G 5/8	1031073
PP/EPDM	For DN 10 threaded connector	M20 x 1,5	G 3/4	817165
PP/FKM	For DN 10 threaded connector	M20 x 1,5	G 3/4	817178
PVC/EPDM	For DN 10 threaded connector	M20 x 1,5	G 3/4	740585
PVC/FKM	For DN 10 threaded connector	M20 x 1,5	G 3/4	740601
PVDF/PTFE	For DN 10 threaded connector	M20 x 1,5	G 3/4	1028409

### Single adapter kit

For fitting series A, B, C and E accessories to current metric M20 x 1.5 connectors.

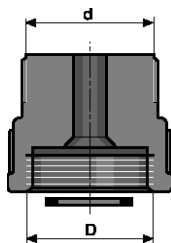


pk\_1\_124

Material	Size	Internal thread D	External thread d	Order no.
PP	6-8 mm connector	M20 x 1.5	G 1/4	811904
PVC	6-8 mm connector	M20 x 1.5	G 1/4	811902

### Double adapter kit

For fitting laboratory type GL connectors, manufactured by Bola or Schott.

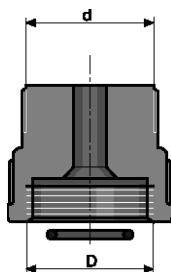


pk\_1\_127

Material	Size	Internal thread D	External thread d	Order no.
PTFE	GL 18	M20 x 1.5	GL 18	1000990

### Single adapter kit

For fittings of current accessories with metric M20 x 1.5 connectors to series A, B, C and E.

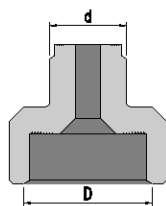


pk\_1\_122

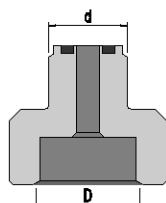
Material	Size	Internal thread D	External thread d	Order no.
PP/EPDM	6-8 mm connector	G 1/4	M20 x 1.5	741088
PVC/FKM	6-8 mm connector	G 1/4	M20 x 1.5	741087
PTFE	6-8 mm connector	G 1/4	M20 x 1.5	741091
PP/EPDM	12 mm connector	G 3/8	M20 x 1.5	741090
PVC/FKM	12 mm connector	G 3/8	M20 x 1.5	741089
PTFE	12 mm connector	G 3/8	M20 x 1.5	741092



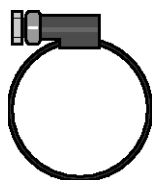
# 1.10 Mechanical/Hydraulic Special Accessories



P\_AC\_0254\_SW



P\_AC\_0255\_SW



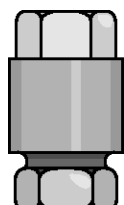
pk\_1\_068



pk\_1\_028



pk\_1\_117



pk\_1\_118

## Adapter

Fits connector set for 12 x 9 hose.

Material	Fig.	Internal thread D	External thread d	Order no.
PP	P_AC_0255	DN 10, G 3/4	M20 x 1.5	800815
PVC	P_AC_0255	DN 10, G 3/4	M20 x 1.5	800816
PVDF	P_AC_0254	DN 10, G 3/4	M20 x 1.5	1017406
PVDF	P_AC_0254	DN 15, G 1	M20 x 1.5	1028530

## Stainless steel threaded clip

For connection of suction and discharge tubing to pressure nozzles.

	Clamping range mm	Order no.
DN 10 clamping ring	16 – 25	359703
DN 15 clamping ring	20 – 32	359705

## Stainless steel straight threaded male adapter

Swagelock system, stainless steel SS 316 (1.4401) for fitting tubing to dosing heads and valves with inner threads and for SB versions.

	Order no.
6 mm - ISO 7 R 1/4	359526
8 mm - ISO 7 R 1/4	359527
12 mm - ISO 7 R 1/4	359528
12 mm - ISO 7 R 3/8	359520
16 mm - ISO 7 R 3/8	359521
16 mm - ISO 7 R 1/2	359529

## Stainless steel clamping ring sets

For use with stainless steel threaded connectors for metering pumps and Swagelock accessories. Both parts must be replaced at the same time. Set consists of back and front clamping rings.

	oØ mm	Order no.
Set of rings Ø 6 for pipe	6	104232
Set of rings Ø 8 for pipe	8	104236
Set of rings Ø 12 for pipe	12	104244

## Stainless steel threaded connector

Serto system for connecting PE or PTFE discharge line to stainless steel pipe, made from stainless steel with clamping ring, but without support insert (parts in contact with chemicals stainless steel 1.4571).

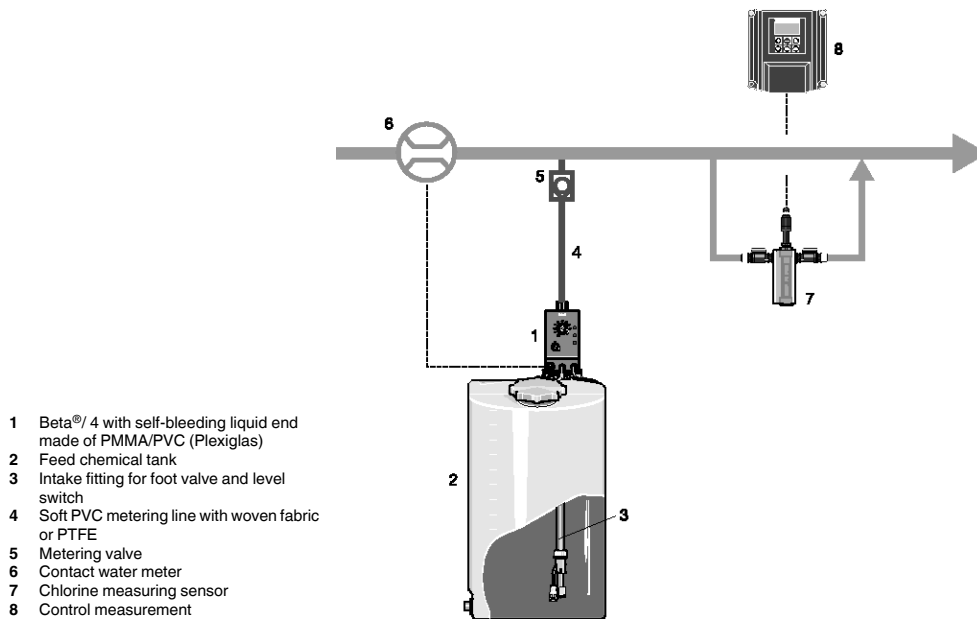
	Order no.
6 mm outer diameter to 6 mm outer diameter stainless steel pipe	359317
8 mm outer diameter to 8 mm outer diameter stainless steel pipe	359318
12 mm outer diameter to 12 mm outer diameter stainless steel pipe	359320

## 1.11 Application Examples

### 1.11.1

### Volume-proportional Metering of Chlorine Bleach Solution in Potable Water

Product: **Beta®**  
 Metered medium: **NaOCl**  
 Sector: **Potable water**  
 Application: **Disinfection**



pk\_1\_132

#### Task and requirements

- Volume-proportional feed of chlorine bleach solution into the main water flow
- Monitoring of chlorine content after metering

#### Operating conditions

- Variable flow
- Installation in closed buildings

#### Application information

- The metered medium emits gas, therefore after a relatively long period of pump idleness, an air (gas) bubble may have formed in the metering line causing an interruption in metering operation.
- Metering is to be fully automatic and without malfunctions as operating personnel are not always present in the waterworks or water supply.

#### Solution

- Beta® solenoid-driven metering pump with self-bleeding liquid end
- Contact water meter in main line for pump activation
- DULCOMETER® measuring and control technology for final inspection

#### Benefits

- High degree of reliability provided by self-bleeding liquid end
- Reliable protection against overmetering and undermetering with downstream final inspection

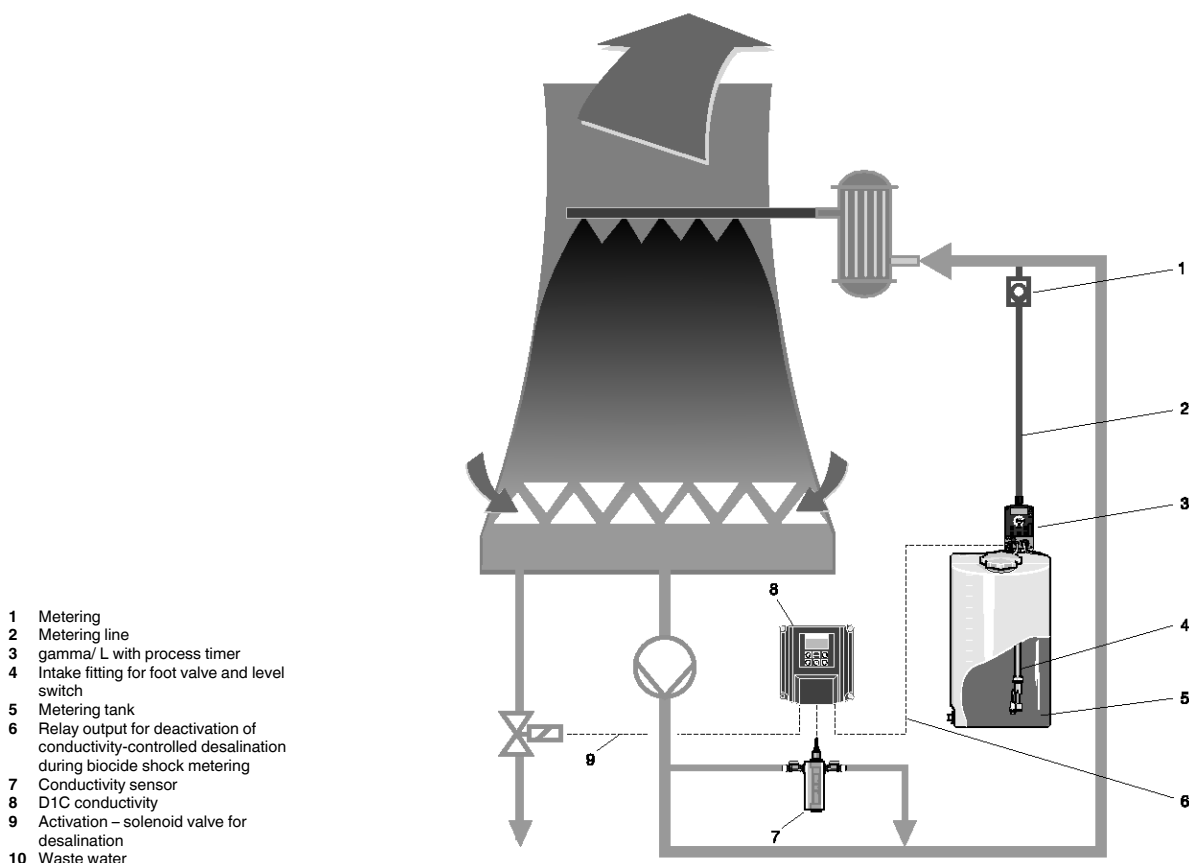


# 1.11 Application Examples

## 1.11.2

## Shock Metering of Biocide in Cooling Water Circuit

Product: **gamma/ L**  
 Metering medium: **biocide**  
 Industry: **cooling water treatment**  
 Application: **disinfection**



pk\_1\_133

### Tasks and requirements

- Increasing the biocide content e.g. at weekly intervals destroys all biological substances in the cooling water.
- Local increases in concentration may occur resulting in conductivity-controlled desalination. They disappear again after full dispersion in the cooling water circuit.
- Conductivity-controlled desalination must therefore be deactivated during shock metering and for an appropriate time afterwards.

### Operating conditions

- Aggressive chemicals (oxidising)
- Installation of the metering pump in the building

### Notes on application

- Shock metering takes place at defined intervals, e.g. weekly.
- In smaller cooling circuits, the metering pump with the integrated process timer replaces the PLC.
- Irrespective of the set metering times, conductivity-controlled desalination must be deactivated via a potential-free contact.
- In some cases, desalination is performed before each shock metering cycle. This procedure must be controlled by means of a second relay contact in the pump.

## 1.11 Application Examples

### Solution

- gamma/L with process timer and corresponding relay outputs
- The relays can be assigned to the process timer as needed and execute the necessary switching functions.
- The pump itself operates at the specified metering times.
- The metering program can be set up on a PC and downloaded on site to the pump.
- Metering programs can be sent by e-mail.
- Liquid end made of PVDF for excellent chemical resistance

### Benefits

- High IP rating of IP 75 for the control by integration in the pump.
- Cost savings as no PLC required
- Saving of installation costs thanks to compact design
- Simple and safe setting up of programs on the PC
- Fast downloading to the pump, especially in cases where several pumps run with the same program.







## 2.0 Overview of Tanks and Transfer Pumps

### 2.0.1

#### Selection Guide

The right accessories offer even more: They increase the performance range, application options or the feed rates.

This chapter includes storage tanks, transfer and peristaltic pumps, with which you can define the pump capacity precisely and store liquids safely.

The table will assist with quick selection. It is sorted by relevant key figures and details.



#### Selection Guide - Tanks:

	Shape	WHG approval	Effective volume
PE Metering Tanks	Cylindrical	–	35 – 1,000 l
PE Storage Tank With General WHG Approval	Cylindrical	x	0.5 - 50 m <sup>3</sup>
PP/PE Storage Tanks, Custom-built	Cylindrical or rectangular	–	0.5 - 50 m <sup>3</sup>

#### Selection Guide - Transfer Pumps:

Pump type	Priming	Drive	Capacity range
Spectra Eccentric Screw Pump	Self-priming	Electric	to 12,000 l/h
Centrifugal Pump von Taine®	Not self-priming (infeed necessary)	Electric	Up to 22,500 l/h
Air-operated diaphragm pump Duodos	Self-priming	Compressed air	Up to 6,700 l/h, 7 bar
Barrel Pump DULCO®Trans	Self-priming	Electric	to 4,800 l/h

#### Selection Guide - Peristaltic Pumps

Pump type	Priming	Drive	Capacity range
Peristaltic Pumps DULCO®flex	Self-priming	Electric	Up to 15,000 l/h, max. 15 bar

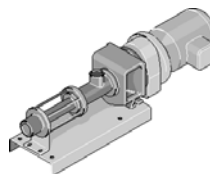
#### Dosing and storage tanks

See page → 2-2



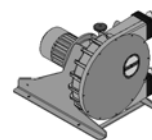
#### Transfer pumps

See page → 2-19



#### Peristaltic pumps

See page → 2-32



## 2.1 PE Metering Tanks and Collecting Pans

### 2.1.1 Metering Tanks

Anyone who works with chemicals, needs to store them safely. ProMinent® dosing tanks are tough and ideal for working with metering pumps.

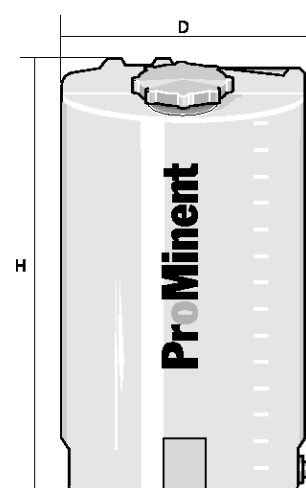
Capacity 35 – 1,000 litres

PE storage tanks produced in a rotation process. They can be enhanced with ProMinent® metering pumps, suction lances and stirrers. The stackable PE collection pans are available in matching sizes.

#### Your benefits

- Environmentally-friendly storage of liquid chemicals
- Robust and durable: tough design in UV-stabilised PE (polyethylene).
- Scale for litres and US gallons.
- Simple to install: sintered threaded sockets for fixing ProMinent® metering pumps onto storage tanks.
- Safe storage: If the contents are not needed, a screw-on lid keeps them tightly secure (push-on lid for 35-litre storage tanks).
- Flat sides to secure the storage tank.
- Mounting flange with sintered threaded sockets for fixing a manual or electric stirrer.
- Standard colours: natural, black, blue, yellow, and red.

#### Natural coloured/transparent PE dosing tank



pk\_3\_0001\_1a

Usable capacity l	D mm	H mm	Threaded bush for metering pumps	Weight kg	Order no.
35	350	485	without threaded bushes	3.5	791993
60	410	590	gamma/ L / X, Beta®	5.0	791994
100	500	760	alpha, Beta®, gamma/ L / X	7.0	1001490
140	500	860	alpha, Beta®, gamma/ L / X	9.5	791995
250	650	1,100	alpha, Beta®, gamma/ L / X, Sigma/ 1/ 2/ 3, delta®	17.5	1023175
500	820	1,190	2 x gamma/ L / X, 2 x Sigma/ 1, 2 x delta®, 2 x Beta®	24.5	791997
1,000	1,070	1,260	2 x gamma/ L / X, 2 x Sigma/ 1/ 2/ 3, 2 x delta®, 2 x Beta®	51.0	1010909

#### Natural coloured/transparent PE dosing tank

Designed for the installation of a manually operated or electric stirrer.

Usable capacity l	with an opening for	Order no.
60	manually operated stirrer	792104
60	electric stirrer	792105
100	manually operated stirrer	1002034
100	electric stirrer	1002033
140	manually operated stirrer	792106
140	electric stirrer	792107
250	manually operated stirrer	792108
250	electric stirrer	792109
500	manually operated stirrer	792110
500	electric stirrer	792111
1,000	manually operated stirrer	1010910
1,000	electric stirrer	1010911

An R 3/4" threaded sleeve is moulded on 35-1,000 litre storage tanks for drainage, which requires drilling (Ø 10 mm) on site if necessary. An R 3/4" PE sealing stopper with a seal is screwed in (Accessory part no. 200692).

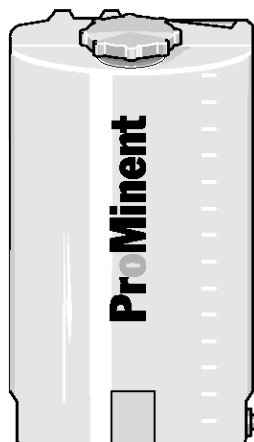
Dosing tanks without ProMinent® logo are available on request.



## 2.1 PE Metering Tanks and Collecting Pans

### Black PE dosing tank

For light sensitive media.



pk\_3\_001\_1

Usable capacity l	Order no.
35	791998
60	791999
100	1001322
140	792000
250	1023176
500	792002
1,000	1010912

### Blue PE dosing tank

Usable capacity l	Order no.
35	1003812
60	1003813
100	1003814
140	1003815
250	1023177
500	1003817
1,000	1010913

### Yellow PE dosing tank

Usable capacity l	Order no.
35	1003818
60	1003819
100	1003820
140	1003821
250	1023178
500	1003823
1,000	1010914

### Red PE dosing tank

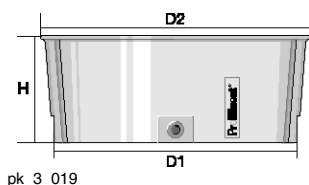
Usable capacity l	Order no.
35	1003824
60	1003825
100	1003826
140	1003827
250	1023179
500	1003829
1,000	1010915

Dosing tanks without ProMinent® logo are available on request.

## 2.1 PE Metering Tanks and Collecting Pans

### 2.1.2 PE Stackable Collecting Pans for Dosing Tanks

Made of UV-stabilised polyethylene in a stackable design with ProMinent® logo. 2 flat sides for fixing the collecting pan.



#### PE colourless/transparent stackable collecting pans

Usable capacity l	D2 mm	D1 mm	H mm	Weight kg	Order no.
35	565	507	220	3.0	1010879
60	680	607	270	4.3	1010880
100	802	727	320	6.5	1010881
140	811	727	370	7.0	1010882
250	917	807	520	11.0	1010883
500	1,155	1,009	670	16.0	1010884

#### PE black stackable collecting pans

Usable capacity l	D2 mm	D1 mm	H mm	Weight kg	Order no.
35	565	507	220	3.0	1010885
60	680	607	270	4.3	1010886
100	802	727	320	6.5	1010887
140	811	727	370	7.0	1010888
250	917	807	520	11.0	1010889
500	1,155	1,009	670	16.0	1010890

#### PE blue stackable collecting pans

Usable capacity l	D2 mm	D1 mm	H mm	Weight kg	Order no.
35	565	507	220	3.0	1010891
60	680	607	270	4.3	1010892
100	802	727	320	6.5	1010893
140	811	727	370	7.0	1010894
250	917	807	520	11.0	1010895
500	1,155	1,009	670	16.0	1010896

#### PE yellow stackable collecting pans

Usable capacity l	D2 mm	D1 mm	H mm	Weight kg	Order no.
35	565	507	220	3.0	1010897
60	680	607	270	4.3	1010898
100	802	727	320	6.5	1010899
140	811	727	370	7.0	1010900
250	917	807	520	11.0	1010901
500	1,155	1,009	670	16.0	1010902

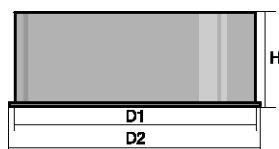
## 2.1 PE Metering Tanks and Collecting Pans

### PE red stackable collecting pans

Usable capacity l	D2 mm	D1 mm	H mm	Weight kg	Order no.
35	565	507	220	3.0	1010903
60	680	607	270	4.3	1010904
100	802	727	320	6.5	1010905
140	811	727	370	7.0	1010906
250	917	807	520	11.0	1010907
500	1,155	1,009	670	16.0	1010908



An R 3/4" threaded sleeve is moulded on 35-500 litre collecting pans for drainage, which requires drilling (Ø 10 mm) on site if necessary. An R 3/4" PE sealing stopper with a seal is screwed in (Accessory part no. 200692).



pk\_3\_018a

### Collecting pan PE, natural

Usable capacity l	D2 mm	D1 mm	H mm	Weight kg	Order no.
1,000	1,280	1,200	980	34.0	740719

### Collecting pan PE, black

Usable capacity l	D2 mm	D1 mm	H mm	Weight kg	Order no.
1,000	1,280	1,200	980	34.0	740726

### 2.1.3

### Spare Parts

	Order no.
Push cap for 35 l tank	740708
Screw cap with seal for 60/100/140/250	1031429
Screw cap with seal for 500/1000	1030910
Sealing plugs with 3/4" PE seal	200692



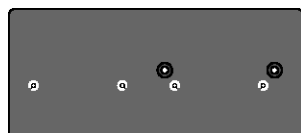
## 2.2 Accessories for Metering Tanks

### 2.2.1 Fittings and Detachable Parts

#### Attachment of pumps to dosing tanks

##### PP mounting plate

For mounting metering pumps onto metering tanks (including screws for attachment of mounting plates to the metering tank).



pk\_3\_003

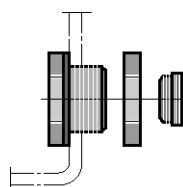
	Order no.
Mounting plate, Sigma/ 1/ 2/ 3	740476
Mounting plate, alpha	790850
Mounting plate for Beta®, gamma/ L / X, D_4a	801575
Mounting plate 3 x gamma/ L / X, 3 x Beta®	801580
Mounting plate 2 x gamma/ L / X, 2 x Beta®	801583

Please refer to the following table for the order numbers for the mounting plates.

Metering pumps	Dosing tanks						
	35 l	60 l	100 l	140 l	250 l	500 l	1000 l
alpha	790850	790850	x	x	x	2x790850	2x790850
Beta®, gamma/ L / X	801575	x	x	x	x	2x	2x
delta®	-	801569	801569	801569	x	2x	2x
Sigma/ 1	-	801569	740476	740476	x	2x	2x
Sigma/ 2, Sigma/ 3	-	-	-	-	x	2x740476	2x
2xBeta® or 2xgamma/ L / X	-	801583	801583	801583	801583	2x801583	2x801583
3xBeta® or 3xgamma/ L / X	-	-	801580	801580	801580	2x801580	2x801580

- x = Direct installation of a pump on a storage tank
- 2x = Direct installation of 2 pumps on a storage tank (500 and 1000 litres only)
- - = Pump cannot be installed on the storage tank

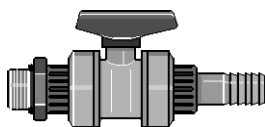
#### Tank connectors with PE plugs



pk\_3\_004

	Order no.
R 1/2" as an additional connection for PE metering tanks 35-1,000 l	809755
R 3/4" as an additional connection for PE metering tanks 35-1,000 l	809756

#### PP discharge tap



pk\_3\_005

	Order no.
For metering tanks with d 20, Ø 20 mm hose nozzle and 3/4" nipple for direct connection to the threaded connector on the tank.	809714

#### PVC discharge tap

	Order no.
For metering tanks with d 16, Ø 16 mm hose nozzle and 3/4" nipple for direct connection to the threaded connector on the tank.	809745

#### Screw cap lock

	Order no.
Lock with key for screw cap	200683

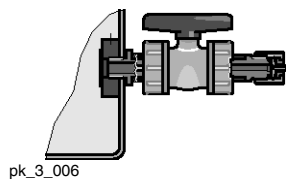


## 2.2 Accessories for Metering Tanks

### PP Tank connector with strainer

A laboratory ball tap and hose connector made of PP for connecting the metering pump at the base of the metering tank.

A 17 mm Ø hole must be provided on-site.



pk\_3\_006

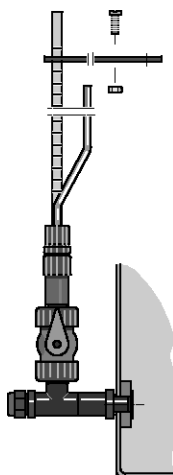
Material	oØ x iØ mm	Order no.
PP	6 x 4	809947
PP	8 x 5	809948
PP	10 x 4	1002933
PP	12 x 9	809949
PP	12 x 6	809950

### PVC Tank connector with strainer

Material	oØ x iØ mm	Order no.
PVC	6 x 4	814566
PVC	8 x 5	814567
PVC	10 x 4	1002934
PVC	12 x 9	814568
PVC	12 x 6	814569

### PVC Calibration assembly

For checking metering volumes and indicating the fluid level; with a graduated measuring tube with 1 ml graduations, foot valve, multi-way valve and the necessary fittings. (Specific information should be given when ordering if there are differing hose and tank sizes).



pk\_1\_091

Suction pipe Ø mm	Tank contents Litres	Order no.
6	35, 60	914740
8	60	914741
8	100, 140	914742
12	250	914743
12	500, 1,000	914744

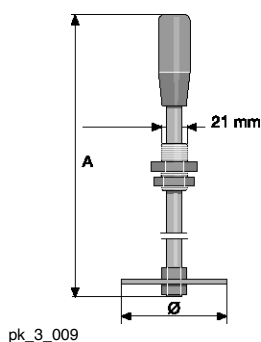
## 2.2 Accessories for Metering Tanks

### 2.2.2

### Stirrers

#### PP Hand mixer

Fully assembled.

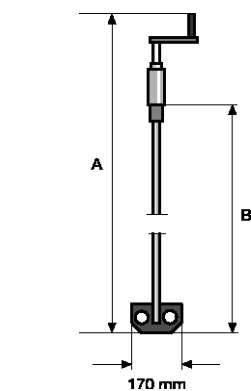


pk\_3\_009

	A mm	Ø mm	Order no.
for 35 und 60 l storage tanks	515	90	741118
for 100 and 140 l tanks	715	90	741119
for 250 and 500 l tanks	1,040	130	741120

#### PP Hand stirrer

With crank, fully assembled.



pk\_3\_007

	A mm	B mm	Order no.
for 60 l tanks	670	465	914701
for 100 l tanks	855	650	914738
for 140 l tanks	965	765	914702
for 250 and 500 l tanks	1,175	965	914703
for 1000 l tanks	1,240	1,040	914705

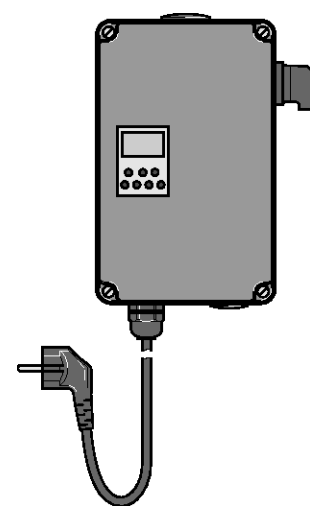
#### Timer with digital clock

Order no.

In plastic housing for the control of a stirrer or a metering pump, 230 V, 50 Hz, max. 6A, IP 65. Day and week programs, shortest switching time 1 min. with 2 m power cable and euro plug.

1005561

Stirrers should only be operated via the motor protection switch!



pk\_3\_010\_1





## 2.2 Accessories for Metering Tanks

### Stainless steel electric stirrer

**For the batching and mixing of liquids up to max. 500 mPas viscosity. Intermittent operation using timer recommended.**

Wide-range motor providing 1400 rpm, insulation class F, insulated for use in hot climates, stainless steel 1.4571 shaft, polypropylene stirring blades, for 1000 litres made of PVDF

The 0.02 - 0.25 kW motors are operated single-phase with an AC power supply 230 V/50 – 60 Hz.

The 0.75 kW motor is operated three-phase with an AC power supply 380 – 415 V/50 – 60 Hz.

Fit a motor protection switch on all motors.



Not suitable for gaseous media.

	Elec. connection	Enclosure rating	Order no.
for 60 l tank	20 W/230 V/0.38 A	IP55	818576
for 100 l tank	180 W/230 V/1.90 A	IP55	1001566
for 140 l tank	180 W/230 V/1.90 A	IP55	791502
for 250 l tank	180 W/230 V/1.90 A	IP55	791503
for 500 l tank	250 W/230 V/1.80 A	IP55	791504
for 1000 l tank	750 W/400 V/2.00 A	IP55	791458

### Chemical resistant electric stirrer

Wide-range motor providing 1,400 rpm, insulation class F, insulated for use in hot climates, stainless steel shaft with PVDF coating, polypropylene stirring blades, for 1000 litres made of PVDF.

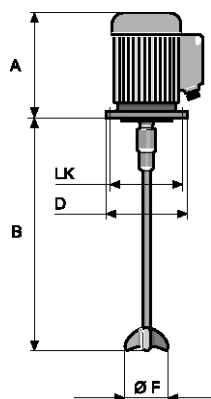
The 0.02 - 0.25 kW motors are operated single-phase with an AC power supply 230 V/50 – 60 Hz.

The 0.75 kW motor is operated three-phase with an AC power supply 380 – 415 V/50 – 60 Hz.

Fit a motor protection switch on all motors.

Not suitable for gaseous media.

	Elec. connection	Enclosure rating	Order no.
for 60 l tank	20 W/230 V/0.38 A	IP55	818577
for 100 l tank	180 W/230 V/1.90 A	IP55	1002035
for 140 l tank	180 W/230 V/1.90 A	IP55	791454
for 250 l tank	180 W/230 V/1.90 A	IP55	791455
for 500 l tank	250 W/230 V/1.80 A	IP55	791456
for 1000 l tank	750 W/400 V/2.00 A	IP55	791457



pk\_3\_008

Size	A	B	Ø D	Ø LK	Ø F
60	195	490	115	100	70
100	200	675	160	130	70
140	200	780	160	130	70
250	200	950	160	130	70
500	200	950	160	130	70
1000	230	1190	200	165	130

## 2.3 Storage Tanks

### 2.3.1 PE/PP Tanks and Apparatus

**Safe and reliable handling of chemicals. Protects, stores and guarantees compliance with legal specifications.**

**Capacity 500 litres to 50 m<sup>3</sup>**



All storage tanks comply with internationally applicable manufacturing approvals and are suitable for installation outdoors and indoors.

ProMinent storage tanks all meet the requirements of the German Water Management Act (WHG), the Directive on Systems for Handling Substances Harmful to Water (VAWS) and the Approval Marks Ordinance. They also comply with the strict legal requirements governing the construction and operation of systems in which substances hazardous to the environment are stored and transported.

#### Your benefits

- Design and production are in compliance with the construction and test regulations as laid down by the German Institute for Building Technology (DIBT)
- Made of polyethylene PE-HD: Very good resistance to chemicals
- For chemicals as per the DIBT media list

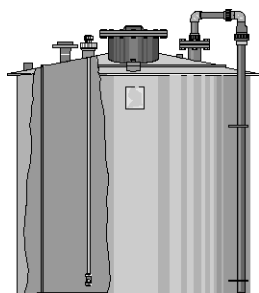
#### Technical details

- Approval mark Z-40.21-229 as per the WHG Section 19
- For operation at atmospheric pressure at an operating temperature of up to a maximum of 30 °C

#### Field of application

Suitable for the storage of chemicals. Applications include: Waste water engineering, electroplating, exhaust air treatment, building services, potable water or process water treatment, swimming pools. For installation outdoors or indoors.

### 2.3.2 PE Storage Tank With General WHG Approval



pk\_3\_014

**The storage of chemicals hazardous for water (Water Hazard Class (WGK) 0-3) is subject to strict, regulatory requirements.**

We supply storage tanks that comply with WHG §19 I, suitable for installation indoors and outdoors, up to a storage volume of 50 m<sup>3</sup>. The storage tanks are available with monitoring accessories, filling level devices, filling equipment, heating equipment, extraction and feeder assemblies.

#### PE-HD Storage tanks

- Approval mark Z-40.21-229 in compliance with the WHG § 19 (Water Resource Management Act)
- Design and manufacture carried out in accordance with the construction and test principles of the DIBT (German Institute of Building Technology)
- For operation at atmospheric pressure up to a max. operating temperature of 30 °C
- Material: polyethylene PE-HD
- For indoor or outdoor installation
- For chemicals in accordance with the DIBT media list

Usable volume 95 % fill level l	Internal diameter mm	External diameter mm	Height of cylindrical section mm	Overall height mm	Weight empty kg
500	800	860	1,050	1,300	50
750	1,000	1,060	1,050	1,300	60
1,000	1,000	1,060	1,350	1,600	70
1,250	1,200	1,260	1,150	1,400	80
1,500	1,200	1,260	1,400	1,650	90
2,000	1,400	1,480	1,400	1,650	100
2,500	1,400	1,480	1,700	1,950	130
3,000	1,600	1,680	1,550	1,800	170
3,500	1,700	1,780	1,550	1,800	190
4,000	1,700	1,780	1,850	2,100	220
5,000	1,900	1,980	1,850	2,100	280



## 2.3 Storage Tanks

Usable volume 95 % fill level l	Internal diameter mm	External diameter mm	Height of cylindrical section mm	Overall height mm	Weight empty kg
6,000	2,000	2,080	1,950	2,250	350
7,000	2,150	2,250	1,950	2,250	400
8,000	2,150	2,250	2,250	2,550	500
10,000	2,150	2,250	2,900	3,200	600
12,000	2,150	2,250	3,400	3,700	700

Other sizes available on request.

### PE-HD Collecting Pans

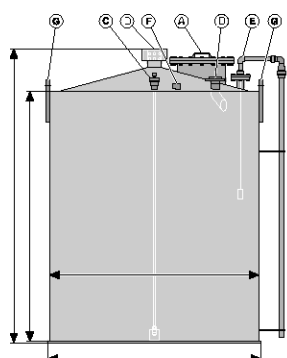
Usable volume 95 % fill level l	Internal diameter mm	External diameter mm	Height of cylindrical section mm	Overall height mm	Weight empty kg
500	1,050	1,150	1,030	1,050	40
750	1,250	1,350	1,030	1,050	45
1,000	1,250	1,350	1,280	1,300	50
1,250	1,450	1,550	1,080	1,100	55
1,500	1,450	1,550	1,330	1,350	60
2,000	1,650	1,750	1,280	1,300	70
2,500	1,650	1,750	1,600	1,620	90
3,000	1,850	1,950	1,470	1,500	105
3,500	1,950	2,050	1,470	1,500	120
4,000	1,950	2,050	1,750	1,780	140
5,000	2,150	2,250	1,750	1,780	160
6,000	2,250	2,350	1,900	1,950	200
7,000	2,390	2,490	1,910	1,960	220
8,000	2,390	2,490	2,200	2,250	270
10,000	2,390	2,490	2,750	2,800	350
12,000	2,390	2,490	3,300	3,350	450

Other sizes available on request.

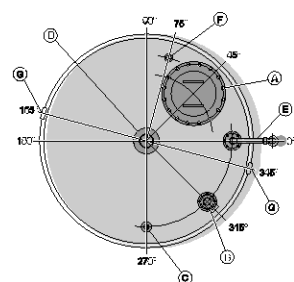
## 2.3 Storage Tanks

Our standard equipped storage tanks and collecting pans with approval marks

For indoor or outdoor installation; other internal fittings/accessories on request.



Item	Quantity	Name	500 l - 1,250 l	1,500 l - 2,000 l	2,500 l - 3,500 l	4,000 l - 12,000 l
A	1	Handhole/manhole, bolted 1.4301	DN 250	DN 250	DN 500	DN 500
B	1	Filling connection with 45° inlet elbow	DN 32	DN 50	DN 50	DN 50
C	1	Sampling pipe PVC/EPDM	DN 15	DN 15	DN 15	DN 20
D	1	Vent pipe with dome	DN 80	DN 100	DN 100	DN 100
E	1	Cable-operated level indicator	DN 80/40	DN 80/40	DN 80/40	DN 80/40
F	1	Screw socket for overfill protection	Rp 2"	Rp 2"	Rp 2"	Rp 2"
G	2	Crane lifting eye	-	yes	yes	yes



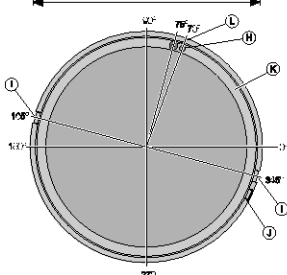
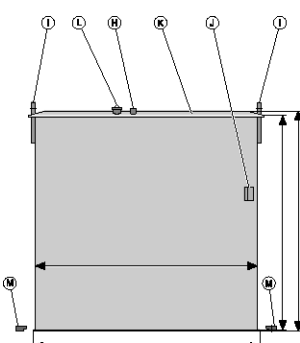
pk\_3\_046

### Collecting Pans for external installation

Item	Quantity	Name	500 l - 1,250 l	1,500 l - 12,000 l
H	1	Leakage sensor support	Rp 2"	Rp 2"
I	2	Crane lifting eye	-	yes
J	1	Rating plate	yes	yes
K	1	Rain collar	yes	yes
L	1	Inspection port	yes	yes
M	1	Floor claw set	yes	yes

### Collecting Pans for installation

Item	Quantity	Name	500 l - 1,250 l	1,500 l - 12,000 l
H	1	Leakage sensor support	Rp 2"	Rp 2"
I	2	Crane lifting eye	-	yes
J	1	Rating plate	yes	yes



pk\_3\_047

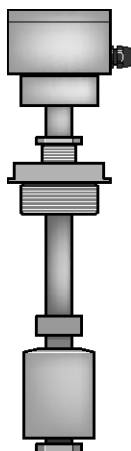


## 2.3 Storage Tanks

### Accessories Meeting The Requirements Of WHG § 19 and VAWS (Directive On Systems For Storage And Handling Of Water-Endangering Substances)

#### Overfill protection with approval mark

T200 level gauge with float as max. level limit switch, without downstream transmitter, see below. Length 500 mm.



pk\_3\_037

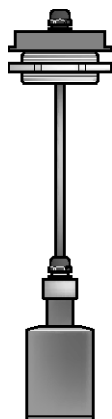
Order no.

Overfill protection with approval mark

1009334

#### Leakage sensor with approval mark

T200 leakage detection system consisting of level detector with float, without downstream transmitter, see below. Length 3,000 mm.



pk\_3\_038

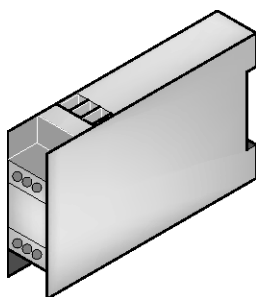
Order no.

Leakage sensor with approval mark

1009340

#### Transmitter with approval mark

For installation in control cabinets by others, suitable for leakage and overfill protection.



pk\_3\_040

Order no.

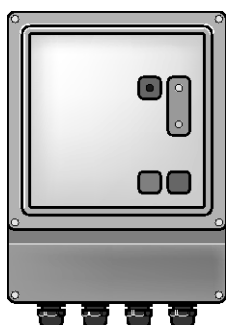
Transmitter with approval mark

1009348

#### Alarm indicator unit

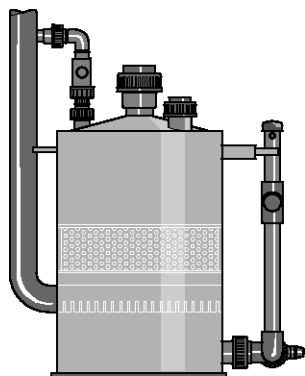
For overfill protection and leakage sensor with approval mark, complete with signal horn and two transmitters.

Price on request.



pk\_3\_039

## 2.3 Storage Tanks

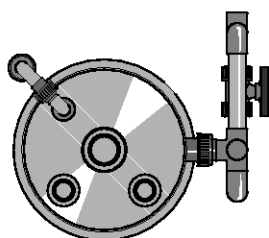


### Absorption tank

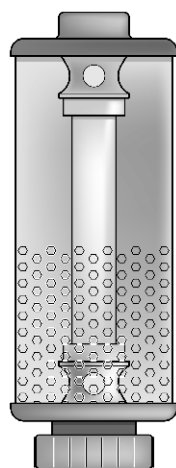
For ventilation of sealed storage tanks.

Material: polyethylene PE-HD complete with connections, PVC/EPDM ball valve and fixed pipework to storage tank; sizes and prices according to tank volume and stored medium.

Price on request.



pk\_3\_041



pk\_3\_042

### Acid vapour separator

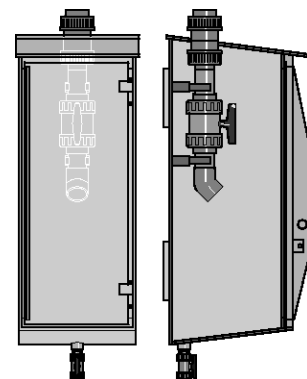
Size and combining agent according to tank volume and stored medium.

Price on request.

## 2.3 Storage Tanks

### Other Accessories

#### Chemical filling station



pk\_3\_043

Suitable for third-party wall mounting.

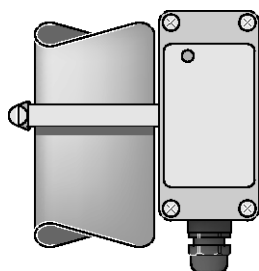
Material: polyethylene PE-HD.

Size: approx. 420x420x1000 mm (LxWxH), complete with DN 50 PVC/EPDM ball valve, threaded connector and drip tray with ball valve DN 25

PVC/EPDM connection: Rp 20 (parallel female thread)

Other internal fittings such as tanker couplings, automatic valves, heater, etc. are possible; prices on request.

#### Bistable changeover contact

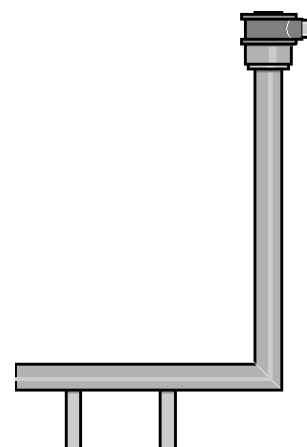


pk\_3\_044

With approval mark for fitting on cable-operated level indicator.

	Order no.
Bistable changeover contact	1009349

#### Storage tank heater



pk\_3\_045

With temperature and level control for run-dry protection; on request, according to stored medium and tank volume.

Optional in addition to insulation of the storage tank.

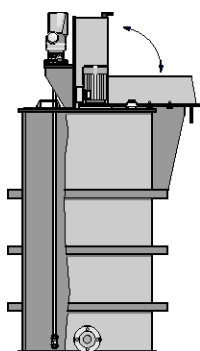
Price on request.



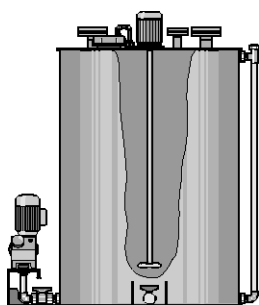
## 2.3 Storage Tanks

### 2.3.3

### PP/PE Storage Tanks, Custom-built



pk\_3\_015



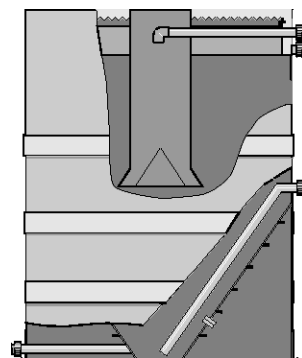
pk\_3\_016

Often the available space or technical system requirements preclude the use of conventional chemical tanks. We solve this problem with panel-welded PE/PP storage tanks. They are perfectly adapted to cope with the individual problem.

Additional internal and add-on equipment, like salt dissolving baskets, sack feed-in equipment, absorption containers, angled and hopper bases, can enhance and extend the operation of the storage tank.

Whether sedimentation tank or grease separator, neutralisation tank or electroplating pickling bath. The optional uses of PE and PP plate material are many and varied.

We supply storage tanks up to a storage volume of 50 m<sup>3</sup>.



pk\_3\_017

#### Circular tanks

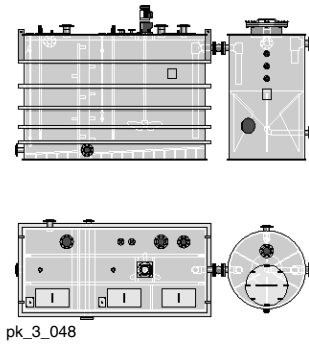
- Material: polyethylene PE-HD or polypropylene PP
- Base design: flat base, tapered base, sloping base
- Roof design: flat roof, tapered roof or open, suitable for atmospheric pressure operation at operating temperatures of up to 80 °C
- Standard equipment: 2 crane lifting eyes on circular tanks with usable volumes above 2000 litres
- Prices on request according to application

Usable volume 95 % fill level l	Internal diameter mm	External diameter mm	Height of cylindrical section mm	Overall height mm
500	800	860	1,050	1,070
750	1,000	1,060	1,050	1,070
1,000	1,000	1,060	1,350	1,370
1,250	1,200	1,260	1,150	1,170
1,500	1,200	1,260	1,400	1,425
2,000	1,400	1,480	1,400	1,425
2,500	1,400	1,480	1,700	1,730
3,000	1,600	1,680	1,550	1,580
3,500	1,700	1,780	1,550	1,580
4,000	1,700	1,780	1,850	1,880
5,000	1,900	1,980	1,850	1,880
6,000	2,000	2,080	1,950	1,980
7,000	2,150	2,250	1,950	1,990
8,000	2,150	2,250	2,250	2,290
10,000	2,150	2,250	2,900	2,950
12,000	2,150	2,250	3,400	3,450

Other sizes available on request.



## 2.3 Storage Tanks



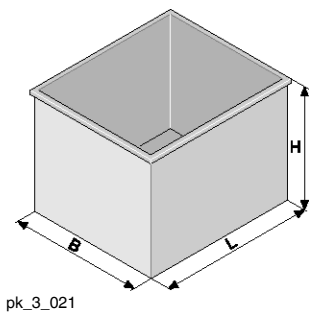
### Rectangular tanks

- Material: polyethylene PE-HD or polypropylene PP
- Base design: flat base or sloping base, full-face contact with foundation
- Roof design: flat roof or open, suitable for operation at atmospheric pressure at operating temperatures of up to 80 °C
- Surrounding steel tube reinforcement, PE or PP coated
- Standard equipment: 4 crane lifting eyes on rectangular tanks with usable volumes above 2,000 litres.
- Prices on request according to application

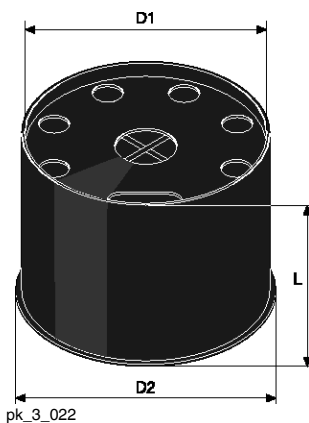
Usable volume 95 % fill level	Internal dimensions (L x W x H) mm	External dimensions (L x W x H) mm
500	950 x 750 x 750	1,100 x 900 x 770
750	1,000 x 1,000 x 800	1,150 x 1,150 x 820
1,000	1,000 x 1,000 x 1,060	1,150 x 1,150 x 1,080
1,250	1,250 x 1,000 x 1,060	1,400 x 1,150 x 1,080
1,500	1,500 x 1,000 x 1,060	1,750 x 1,250 x 1,090
2,000	1,500 x 1,250 x 1,130	1,750 x 1,500 x 1,160
2,500	1,750 x 1,250 x 1,210	2,000 x 1,500 x 1,240
3,000	1,750 x 1,250 x 1,450	2,000 x 1,500 x 1,480
3,500	1,750 x 1,500 x 1,410	2,000 x 1,750 x 1,440
4,000	2,000 x 1,500 x 1,410	2,250 x 1,750 x 1,440
5,000	2,500 x 1,500 x 1,410	2,750 x 1,750 x 1,440
6,000	2,500 x 1,750 x 1,450	2,750 x 2,000 x 1,480
7,000	2,500 x 1,750 x 1,700	2,750 x 2,000 x 1,730
8,000	2,500 x 2,000 x 1,700	2,750 x 2,250 x 1,730
10,000	3,000 x 2,000 x 1,760	3,350 x 2,350 x 1,800
12,000	3,500 x 2,000 x 1,810	3,850 x 2,350 x 1,850
15,000	4,000 x 2,000 x 2,000	4,350 x 2,350 x 2,050

Other sizes available on request.

### 2.3.4 Drip Trays for PE Supply Drums



Usable capacity l	Material	External dimensions (L x W x H) mm	Internal dimensions (L x W x H) mm	Order no.
40	PE black	500 x 400 x 266	450 x 350 x 260	791726
70	PE black	500 x 430 x 378	470 x 400 x 370	740309



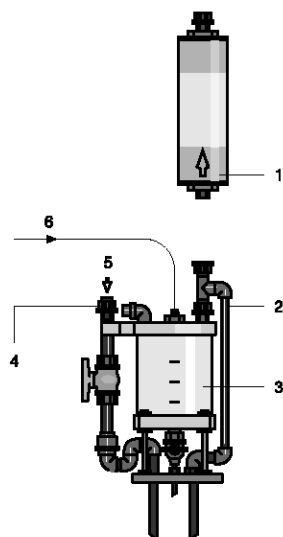
Usable capacity l	Material	D2 mm	D1 mm	L mm	Order no.
250	PE-neutral	840	800	508	791727



## 2.3 Storage Tanks

### 2.3.5 PVC Batch Box

For concentrated fluid metering solutions, e. g. hydrazine, ammonia, caustic soda, etc. The batch box is designed for attachment to our 140 and 250/500 litre metering tanks.



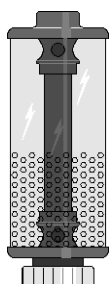
pk\_3\_023

- 1 Activated charcoal filter
- 2 Bleed line
- 3 Batch box
- 4 Gas displacement tubing
- 5 Water intake
- 6 Fluid concentrate

Batch Box	Usable capacity l	Tanks	Order no.
Disposable drums	2	140 l	1020438
Disposable drums	5	250/500 l	1020441
Reusable drums	2	140 l	1020443
Reusable drums	5	250/500 l	1020455

	Order no.
Activated charcoal filter with bracket	1020442

### 2.3.6 Chemical Vapour Lock



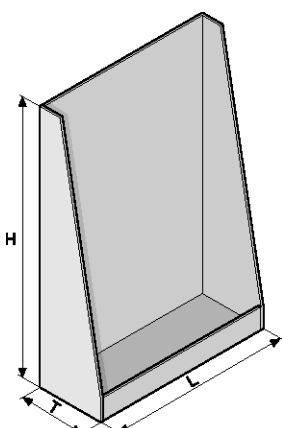
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Compact chemical vapour lock with screw attachment for installation on a gas-tight storage tank. The chemical vapour lock is filled with the binder Cosa C and is ideal for the storage of aluminium chloride, ferric chloride, ferrous chloride, potassium hypochlorite, sodium hypochlorite and hydrochloric acid up to a maximum of 30%. The lifetimes of the binder should be noted. Other chemicals and concentrations are available on request.

	Usable capacity l	Exhaust air, max. l/min	Connector nominal diameter	Order no.
SDA-90	0.8	25	DN 25	1020457
SDA-160	7.0	158	DN 65	1020458

### 2.3.7 PP Mounting Rack

With integrated drip tray for mounting the metering station.



pk\_3\_025

Dimensions H x W x D mm	Order no.
1,200 x 800 x 300	1008779
1,200 x 800 x 400	1008780



## 2.4 Eccentric Screw Pump Spectra

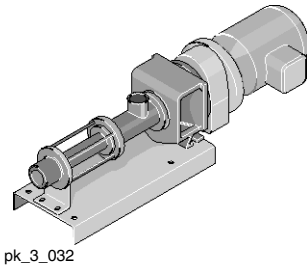
### 2.4.1

### Eccentric Screw Pump Spectra for Pumping Polymer Solutions

Pump ultra-gently, meter precisely and with a wealth of applications.

Capacity range 2.4 to 12,000 l/h, 12 - 3 bar

The eccentric screw pump Spectra meters liquid polyelectrolytes in concentrated and dilute form. It can be used, for example, in waste water treatment or sludge dewatering.



The eccentric screw pump Spectra has been designed for the transport of polymer solutions with a viscosity of up to 5,000 mPas. It is low-maintenance and can even be used if polymer solutions containing oil are to be metered.

The pumps are equipped with gear motors and external fans and can be operated via an external frequency converter. Protect the pump from running dry.

#### Your benefits

- Low-pulsation pumping
- Feed rate is proportional to the speed
- Reversible pumping direction

#### Technical details

- FPM stator
- Stainless steel (Cr-Ni-Mo 17-12-2) rotor
- Stainless steel housing for 12/2 - 12/100
- Grey cast iron housing for 6/300 - 3/12000
- Axial face seal
- Voltage: 3-phase, 230/400 VAC
- Degree of protection: IP55

#### Field of application

Waste water treatment, sludge dewatering

The frequency converters do not form part of the Spectra scope of supply.

#### Without base plate

	Delivery rate at 3 bar	Maximum back pressure bar	Power uptake kW	Order no.
<b>Spectra 12/2 F</b>	0.24...2.4 l/h	12	0.37	1025284
<b>Spectra 12/13 F</b>	1.3...13.2 l/h	12	0.37	1025285
<b>Spectra 12/33 F</b>	3.3...33 l/h	12	0.37	1025286
<b>Spectra 12/100 F</b>	10...100 l/h	12	0.37	1025287
<b>Spectra 6/300 F</b>	30...300 l/h	6	0.37	1025288
<b>Spectra 6/650 F</b>	65...650 l/h	6	0.55	1025289
<b>Spectra 5/1400 F</b>	140...1,400 l/h	5	0.75	1025290
<b>Spectra 3/3000 F</b>	300...3,000 l/h	3	0.75	1025291
<b>Spectra 3/6500 F</b>	650...6,500 l/h	3	1.50	1025292
<b>Spectra 3/12000 F</b>	1,200...12,000 l/h	3	2.20	1025293

#### With base plate

	Delivery rate at 3 bar	Maximum back pressure bar	Power uptake kW	Order no.
<b>Spectra 12/2 FB</b>	0.24...2.4 l/h	12	0.37	1025294
<b>Spectra 12/13 FB</b>	1.3...13.2 l/h	12	0.37	1025295
<b>Spectra 12/33 FB</b>	3.3...33 l/h	12	0.37	1025296
<b>Spectra 12/100 FB</b>	10...100 l/h	12	0.37	1025297
<b>Spectra 6/300 FB</b>	30...300 l/h	6	0.37	1025298
<b>Spectra 6/650 FB</b>	65...650 l/h	6	0.55	1025299
<b>Spectra 5/1400 FB</b>	140...1,400 l/h	5	0.75	1025300
<b>Spectra 3/3000 FB</b>	300...3,000 l/h	3	0.75	1025301
<b>Spectra 3/6500 FB</b>	650...6,500 l/h	3	1.50	1025302
<b>Spectra 3/12000 FB</b>	1,200...12,000 l/h	3	2.20	1025303

## 2.4 Eccentric Screw Pump Spectra

### Frequency converters for Spectra

		Recommended for pumps up to	Order no.
<b>SK500E – 550</b>	0.55 kW, 1 ph, 230 V, incl. control panel	0.37 kW	1010980
<b>SK500E – 750</b>	0.75 kW, 1 ph, 230 V, incl. control panel	0.55 kW	1010981
<b>SK500E – 111</b>	1.10 kW, 1 ph, 230 V, incl. control panel	0.75 kW	1025304
<b>SK500E – 151</b>	1.50 kW, 1 ph, 230 V, incl. control panel	1.10 kW	1010982
<b>SK500E – 221</b>	2.20 kW, 3 ph, 400 V, incl. control panel	2.20 kW	1025305

The frequency converters do not form part of the Spectra scope of supply.

### 2.4.2 Motor Data

Electrical connection	Frequency	Enclosure rating	Overheating protection	Cooling
230/400 VAC, 3 ph	4 - 89 Hz	IP 55	3 PTC thermistors in winding	external fan 1~, 230 VAC, 50 Hz

### 2.4.3 Technical Data

	Weight kg	Dimensions L x W x H (mm)	Housing material	Material rot. parts	Suction/discharge connection
<b>Spectra 12/2 F</b>	24	739 x 200 x 182	Cr Ni Mo 17 – 12 – 2	Cr Ni Mo 17 – 12 – 2	1/2", female
<b>Spectra 12/13 F</b>	24	739 x 200 x 182	Cr Ni Mo 17 – 12 – 2	Cr Ni Mo 17 – 12 – 2	1/2", female
<b>Spectra 12/33 F</b>	24	739 x 200 x 182	Cr Ni Mo 17 – 12 – 2	Cr Ni Mo 17 – 12 – 2	1/2", female
<b>Spectra 12/100 F</b>	24	739 x 200 x 182	Cr Ni Mo 17 – 12 – 2	Cr Ni Mo 17 – 12 – 2	1/2", female
<b>Spectra 6/300 F</b>	26	874 x 223 x 192	Grey cast iron	Cr Ni Mo 17 – 12 – 2	1 1/4", female
<b>Spectra 6/650 F</b>	26	874 x 223 x 192	Grey cast iron	Cr Ni Mo 17 – 12 – 2	1 1/4", female
<b>Spectra 5/1400 F</b>	26	874 x 223 x 192	Grey cast iron	Cr Ni Mo 17 – 12 – 2	1 1/4", female
<b>Spectra 3/3000 F</b>	36	950 x 223 x 193	Grey cast iron	Cr Ni Mo 17 – 12 – 2	1 1/4", female
<b>Spectra 3/6500 F</b>	56	1,172 x 237 x 224	Grey cast iron	Cr Ni Mo 17 – 12 – 2	DN 50, flange
<b>Spectra 3/12000 F</b>	81	1,487 x 264 x 244	Grey cast iron	Cr Ni Mo 17 – 12 – 2	DN 65, flange
<b>Spectra 12/2 FB</b>	28	739 x 220 x 232	Cr Ni Mo 17 – 12 – 2	Cr Ni Mo 17 – 12 – 2	1/2", female
<b>Spectra 12/13 FB</b>	28	739 x 220 x 232	Cr Ni Mo 17 – 12 – 2	Cr Ni Mo 17 – 12 – 2	1/2", female
<b>Spectra 12/33 FB</b>	28	739 x 220 x 232	Cr Ni Mo 17 – 12 – 2	Cr Ni Mo 17 – 12 – 2	1/2", female
<b>Spectra 12/100 FB</b>	28	739 x 220 x 232	Cr Ni Mo 17 – 12 – 2	Cr Ni Mo 17 – 12 – 2	1/2", female
<b>Spectra 6/300 FB</b>	33	874 x 230 x 242	Grey cast iron	Cr Ni Mo 17 – 12 – 2	1 1/4", female
<b>Spectra 6/650 FB</b>	33	874 x 230 x 242	Grey cast iron	Cr Ni Mo 17 – 12 – 2	1 1/4", female
<b>Spectra 5/1400 FB</b>	33	874 x 230 x 242	Grey cast iron	Cr Ni Mo 17 – 12 – 2	1 1/4", female
<b>Spectra 3/3000 FB</b>	44	950 x 230 x 242	Grey cast iron	Cr Ni Mo 17 – 12 – 2	1 1/4", female
<b>Spectra 3/6500 FB</b>	67	1,172 x 237 x 274	Grey cast iron	Cr Ni Mo 17 – 12 – 2	DN 50, flange
<b>Spectra 3/12000 FB</b>	96	1,487 x 265 x 294	Grey cast iron	Cr Ni Mo 17 – 12 – 2	DN 65, flange



## 2.4 Eccentric Screw Pump Spectra

### 2.4.4

### Spare Parts

	Order no.
Stator FKM for Spectra 12/2	1025306
Stator FKM for Spectra 12/13	1025307
Stator FKM for Spectra 12/30, 12/33	1025308
Stator made of FKM for Spectra 12/100	1025309
Stator FKM for Spectra 6/300, 6/650	1025310
Stator FKM for Spectra 5/1400	1025312
Stator FKM for Spectra 3/3000	1025313
Stator made of FKM for Spectra 3/6500	1025314
Stator FKM for Spectra 3/12000	1025315
Rotor Cr Ni Mo 17-12-2 for Spectra 12/2	1025316
Rotor Cr Ni Mo 17-12-2 for Spectra 12/13	1025317
Rotor Cr Ni Mo 17-12-2 for Spectra 12/30, 12/33	1025318
Rotor made of Cr Ni Mo 17-12-2 for Spectra 12/100	1025319
Rotor Cr Ni Mo 17-12-2 for Spectra 6/300, 6/650	1025320
Rotor Cr Ni Mo 17-12-2 for Spectra 5/1400	1025322
Rotor Cr Ni Mo 17-12-2 for Spectra 3/3000	1025323
Rotor made of Cr Ni Mo 17-12-2 for Spectra 3/6500	1025324
Rotor Cr Ni Mo 17-12-2 for Spectra 3/12000	1025325
Spare parts kit for axial face seal for Spectra 12/2 - 12/100	1025326
Spare parts kit for mech. seal for Spectra 6/300 - 5/1400	1025330
Spare parts kit for mech. seal for Spectra 3/3000	1025333
Spare parts kit for axial face seal for Spectra 3/6500	1025334
Spare parts kit for mech. seal for Spectra 3/12000	1025335
Spare parts kit for pin joint for Spectra 12/2 - 12/100	1025346
Pin joints spare parts kit for Spectra 6/300 - 5/1400	1025350
Pin joints spare parts kit for Spectra 3/3000	1025353
Spare parts kit for pin joint for Spectra 3/6500	1025354
Pin joints spare parts kit for Spectra 3/12000	1025355

## 2.5 Centrifugal Pump von Taine®

### 2.5.1 Centrifugal Pump von Taine®

The safe and high-quality solution when liquid media need to be pumped leak-free.

Capacity range up to 22,500 l/h, discharge lift up to 23.5 mWs



The solenoid-coupled centrifugal pump vonTaine® for the pumping of liquid media works safely and reliably: liquid media are pumped leak-free.

The von Taine® pump is a solenoid-coupled centrifugal pump. Thanks to the solenoid coupling, the pump transports the liquid medium from storage tank to storage tank without any leaks or even from a tank to a discharge line. The von Taine® centrifugal pump transports media at up to 22,500 l/h and up to a discharge lift of 23.5 metres. As the pump capacity is highly dependent on the back pressure, always observe the performance curve.

#### Important note

Check the material tolerability when selecting your pump. Take into consideration the density, viscosity and temperature of the medium to be transported. Please also note: The transported media should not contain any solid fractions. The pump is not self-priming and requires a feed.

#### Your benefits

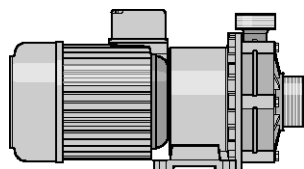
- Safe and reliable: Leak-free pumping of liquid chemicals
- Coupling between motor and impeller via magnetic coupling

#### Technical details

- Pump head made of PP or PVDF
- FPM or EPDM housing seal
- The pump is not self-priming and requires a feed
- Protect the pump from running dry
- Hydraulic connectors with pipe threadings as per DIN ISO 228-1

#### Field of application

Leak-free pumping of liquid chemicals



pk\_3\_026

#### von Taine®, PP/FKM version

	Feed rate at max. pressure l/h	Feed lift max. m	Power uptake kW	Voltage/frequency	Weight	Order no.
von Taine® 0502 PP/FKM	1,800	4.5	0.06	1~/230 V/50 Hz	2.7 kg	1023089
von Taine® 0807 PP/FKM	6,600	7.9	0.25	3~/400 V/50 Hz	5.0 kg	1023090
von Taine® 1010 PP/FKM	9,600	10.0	0.37	3~/400 V/50 Hz	7.6 kg	1023091
von Taine® 1313 PP/FKM	13,200	13.2	0.65	3~/400 V/50 Hz	8.7 kg	1023092
von Taine® 1820 PP/FKM	19,500	18.1	1.10	3~/400 V/50 Hz	16.0 kg	1023093
von Taine® 2323 PP/FKM	22,500	23.5	1.50	3~/400 V/50 Hz	17.0 kg	1023094

#### von Taine®, PVDF/FKM version

	Feed rate at max. pressure l/h	Feed lift max. m	Power uptake kW	Voltage/frequency	Weight	Order no.
von Taine® 0502 PVDF/FKM	1,800	4.5	0.06	1~/230 V/50 Hz	2.8 kg	1023095
von Taine® 0807 PVDF/FKM	6,600	7.9	0.25	3~/400 V/50 Hz	5.2 kg	1023096
von Taine® 1010 PVDF/FKM	9,600	10.0	0.37	3~/400 V/50 Hz	8.0 kg	1023097
von Taine® 1313 PVDF/FKM	13,200	13.2	0.65	3~/400 V/50 Hz	9.0 kg	1023098
von Taine® 1820 PVDF/FKM	19,500	18.2	1.10	3~/400 V/50 Hz	16.7 kg	1023099
von Taine® 2323 PVDF/FKM	22,500	23.5	1.50	3~/400 V/50 Hz	17.7 kg	1023100



## 2.5 Centrifugal Pump von Taine®

### von Taine®, PP/EPDM version

	Feed rate at max. pressure l/h	Feed lift max. m	Power uptake kW	Voltage/frequency	Weight	Order no.
von Taine® 0502 PP/EPDM	1,800	4.5	0.06	1~/230 V/50 Hz	2.7 kg	1028551
von Taine® 0807 PP/EPDM	6,600	7.9	0.25	3~/400 V/50 Hz	5.0 kg	1028552
von Taine® 1010 PP/EPDM	9,600	10.0	0.37	3~/400 V/50 Hz	7.6 kg	1028553
von Taine® 1313 PP/EPDM	13,200	13.2	0.65	3~/400 V/50 Hz	8.7 kg	1028564
von Taine® 1820 PP/EPDM	19,500	18.1	1.10	3~/400 V/50 Hz	16.0 kg	1028565
von Taine® 2323 PP/EPDM	22,500	23.5	1.50	3~/400 V/50 Hz	17.0 kg	1028566

### von Taine®, PVDF/EPDM version

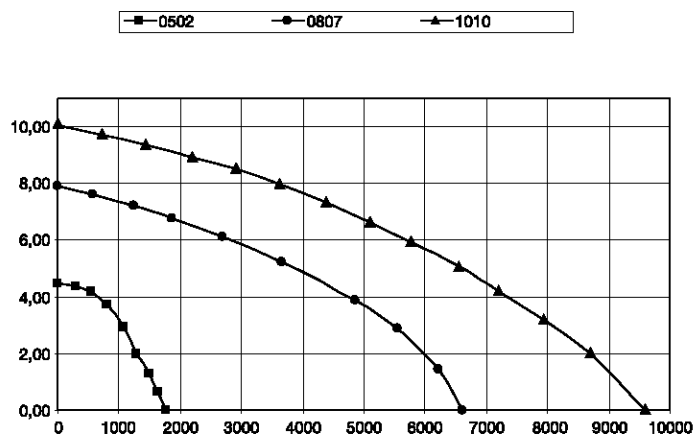
	Feed rate at max. pressure l/h	Feed lift max. m	Power uptake kW	Voltage/frequency	Weight	Order no.
von Taine® 0502 PVDF/EPDM	1,800	4.5	0.06	1~/230 V/50 Hz	2.8 kg	1028567
von Taine® 0807 PVDF/EPDM	6,600	7.9	0.25	3~/400 V/50 Hz	5.2 kg	1028568
von Taine® 1010 PVDF/EPDM	9,600	10.0	0.37	3~/400 V/50 Hz	8.0 kg	1028569
von Taine® 1313 PVDF/EPDM	13,200	13.2	0.65	3~/400 V/50 Hz	9.0 kg	1028570
von Taine® 1820 PVDF/EPDM	19,500	18.1	1.10	3~/400 V/50 Hz	16.7 kg	1028571
von Taine® 2323 PVDF/EPDM	22,500	23.5	1.50	3~/400 V/50 Hz	17.7 kg	1028572

### Parameters For Use

	Medium temperature max. °C	Maximum density kg/dm³	Max. viscosity mPas	Max. system pressure at 20° C bar
von Taine® 0502 PP	80	1.25...1.35	20	1.0
von Taine® 0807 PP	80	1.20...1.80	20	2.5
von Taine® 1010 PP	80	1.60...2.00	20	2.5
von Taine® 1313 PP	80	1.60...1.90	20	2.5
von Taine® 1820 PP	80	1.10...1.80	20	5.0
von Taine® 2323 PP	80	1.00...2.00	20	5.0
von Taine® 0502 PVDF	95	1.25...1.35	20	1.0
von Taine® 0807 PVDF	95	1.20...1.80	20	2.5
von Taine® 1010 PVDF	95	1.60...2.00	20	2.5
von Taine® 1313 PVDF	95	1.60...1.90	20	2.5
von Taine® 1820 PVDF	95	1.10...1.80	20	5.0
von Taine® 2323 PVDF	95	1.00...2.00	20	5.0

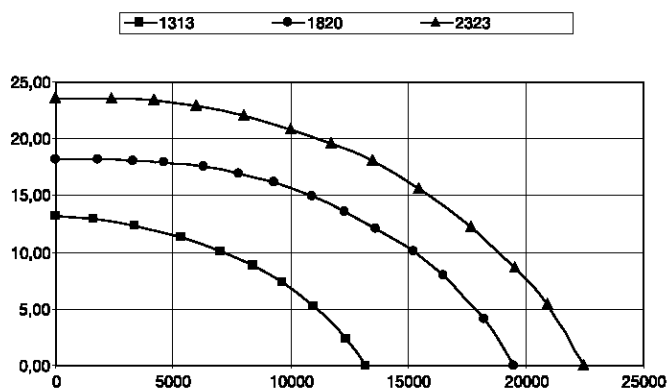
## 2.5 Centrifugal Pump von Taine®

### Characteristic Curves



pk\_2\_080\_1

Delivered quantity [l/h] as a function of the delivery head [mWC]



pk\_2\_115

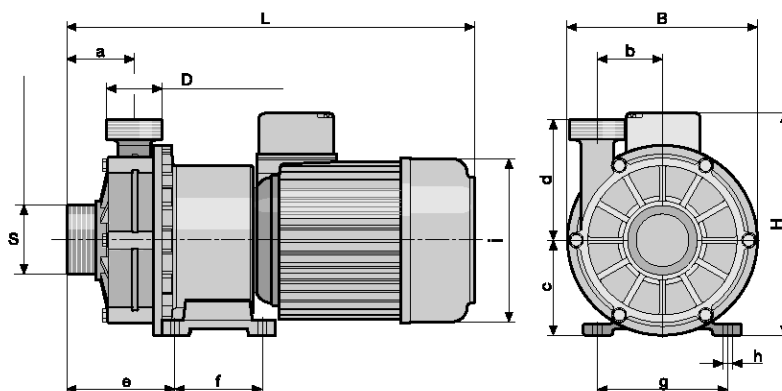
Delivered quantity [l/h] as a function of the delivery head [mWC]





## 2.5 Centrifugal Pump von Taine®

### Dimensions



pk\_3\_027

		von Taine® 0502 PVDF	von Taine® 0807 PVDF	von Taine® 1010 PVDF	von Taine® 1313 PVDF	von Taine® 1820 PVDF	von Taine® 2323 PVDF
<b>Discharge connector (D)</b>		G 1"	G 1 1/4"	G 1 1/2"	G 1 1/2"	G 2"	G 2"
<b>Suction connector (S)</b>		G 1 1/4"	G 1 1/4"	G 2"	G 2"	G 2 1/4"	G 2 1/4"
<b>L</b>	mm	240	283	346	350	455	455
<b>B</b>	mm	120	138	163	163	205	205
<b>H</b>	mm	145	185	181	191	216	216
<b>a</b>	mm	37.0	45.0	58.5	58.5	70.0	70.0
<b>b</b>	mm	29.5	29.5	56.0	56.0	70.0	70.0
<b>c</b>	mm	60.0	70.0	82.0	82.0	104.5	104.5
<b>d</b>	mm	65.5	86.0	104.0	104.0	134.5	134.5
<b>e</b>	mm	129	50	106	106	115	115
<b>f</b>	mm	78	71	74	74	100	100
<b>g</b>	mm	91	91	114	114	130	130
<b>h</b>	mm	6.5	8.5	8.5	8.5	10.0	10.0
<b>i</b>	mm	92	135	136.5	135	160	160
<b>Enclosure rating</b>		IP 55	IP 55	IP 55	IP 55	IP 55	IP 55
<b>Min. flow</b>	l/h	30	60	60	60	90	120

## 2.5 Centrifugal Pump von Taine®

### 2.5.2

### Spare Parts Kits

	Order no.
PP/FKM liquid end for von Taine® 0502	1023978
PP/FKM liquid end for von Taine® 0807	1023979
PP/FKM liquid end for von Taine® 1010	1023980
PP/FKM liquid end for von Taine® 1313	1023981
PP/FKM liquid end for von Taine® 1820	1023982
PP/FKM liquid end for von Taine® 2323	1023983
PVDF/FKM liquid end for von Taine® 0502	1023994
PVDF/FKM liquid end for von Taine® 0807	1023995
PVDF/FKM liquid end for von Taine® 1010	1023996
PVDF/FKM liquid end for von Taine® 1313	1023997
PVDF/FKM liquid end for von Taine® 1820	1023998
PVDF/FKM liquid end for von Taine® 2323	1023999
	Order no.
PP/EPDM liquid end for von Taine® 0502	1028573
PP/EPDM liquid end for von Taine® 0807	1028574
PP/EPDM liquid end for von Taine® 1010	1028575
PP/EPDM liquid end for von Taine® 1313	1028576
PP/EPDM liquid end for von Taine® 1820	1028577
PP/EPDM liquid end for von Taine® 2323	1028578
PVDF/EPDM liquid end for von Taine® 0502	1028579
PVDF/EPDM liquid end for von Taine® 0807	1028580
PVDF/EPDM liquid end for von Taine® 1010	1028581
PVDF/EPDM liquid end for von Taine® 1313	1028582
PVDF/EPDM liquid end for von Taine® 1820	1028583
PVDF/EPDM liquid end for von Taine® 2323	1028584
	Order no.
Motor for von Taine® 0502	1024000
Motor for von Taine® 0807	1024001
Motor for von Taine® 1010	1024002
Motor for von Taine® 1313	1024003
Motor for von Taine® 1820	1024004
Motor for von Taine® 2323	1024005

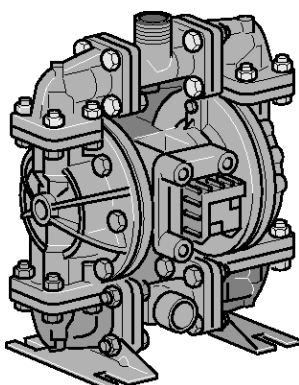




## 2.6 Air-operated Diaphragm Pump Duodos

### 2.6.1

### Air-operated Diaphragm Pump Duodos



pk\_2\_062

Duodos pumps are air-driven double diaphragm transfer pumps. No electrical components are required because the pumps are air-driven. Duodos pumps are run-dry safe and self-priming. The pump capacity of the pump can be controlled by changing the pressure in the air supply. The air control is designed for oil-free operation. Duodos pumps are ideally suited for the transport of liquid chemicals. Duodos pumps transport media at up to 6,700 l/h and up to a discharge lift of 70 m. As the pump capacity is highly dependent on the back pressure, the performance curve must always be observed. At the same time, the differential pressure between the hydraulic and pneumatic sides should not exceed 2 bar. Higher values reduce the service life of the pump. When selecting pumps, check the material compatibility. In addition, consider the density, viscosity and temperature of the transported medium.

The following materials are available:

- PP pump chambers with Santoprene® diaphragms and valves
- PVDF pump chambers with PTFE diaphragms and valves

#### Duodos PP

	Housing material	Diaphragms/ valves	Delivery rate (2 bar differential pressure) l/h	Order no.
<b>Duodos 10 PP</b>	PP	Santoprene®	0...650*	1010793
<b>Duodos 15 PP</b>	PP	Santoprene®	0...2,000*	1010794
<b>Duodos 20 PP</b>	PP	Santoprene®	0...3,000*	1010795
<b>Duodos 25 PP</b>	PP	Santoprene®	0...6,700*	1010796

\* Delivery rate at a differential pressure of 2 bar (0.5 bar back pressure, 2.5 bar air pressure).

Santoprene® is a registered trademark of the Monsanto Corporation.

#### Duodos PVDF

	Housing material	Diaphragms/ valves	Delivery rate (2 bar differential pressure) l/h	Order no.
<b>Duodos 10 PVDF</b>	PVDF	Teflon	0...650*	1010797
<b>Duodos 15 PVDF</b>	PVDF	Teflon	0...2,000*	1010798
<b>Duodos 20 PVDF</b>	PVDF	Teflon	0...3,000*	1010799
<b>Duodos 25 PVDF</b>	PVDF	Teflon	0...6,700*	1010800

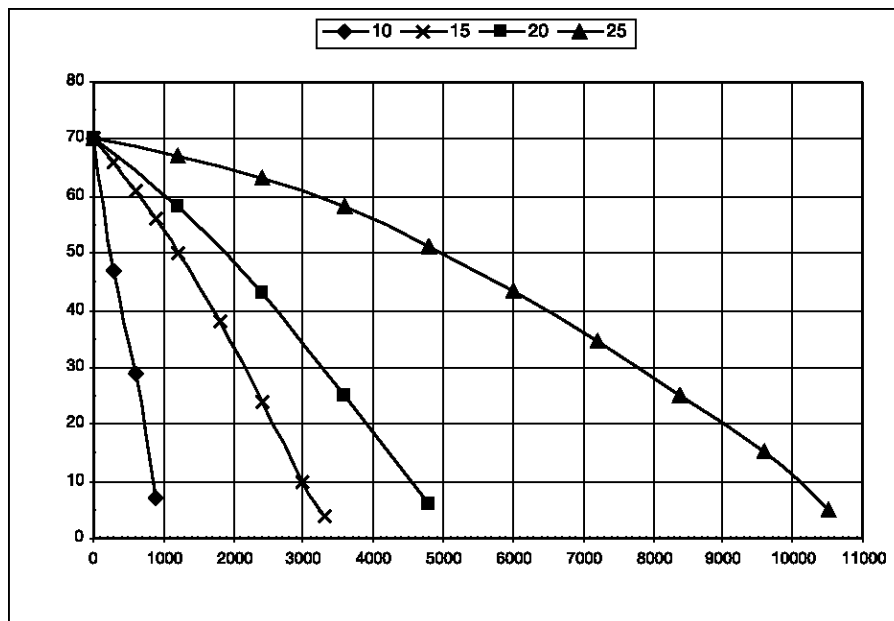
\* Delivery rate at a differential pressure of 2 bar (0.5 bar back pressure, 2.5 bar air pressure).

#### Parameters For Use

	Min. temperature °C	Max. temperature °C	Max. viscosity mPas
<b>Duodos 10 PP</b>	5	65	200
<b>Duodos 10 PVDF</b>	-13	93	200
<b>Duodos 15 PP</b>	5	65	200
<b>Duodos 15 PVDF</b>	-13	93	200
<b>Duodos 20 PP</b>	5	65	200
<b>Duodos 20 PVDF</b>	-13	93	200
<b>Duodos 25 PP</b>	5	65	200
<b>Duodos 25 PVDF</b>	-13	93	200

## 2.6 Air-operated Diaphragm Pump Duodos

Characteristic Curves



pk\_2\_114

Feed lift [m WC] over feed rate [l/h] at 7 bar air supply

### 2.6.2

### Spare Parts Kits

#### Spare part kits for pneumatics comprising

- Seals
- O-rings
- Clamp collars
- Air control valve

	Order no.
Spare parts kit, pneumatics for Duodos 10 PP/PVDF	1010810
Spare parts kit, pneumatics for Duodos 15/20 PP/PVDF	1010811
Spare parts kit, pneumatics for Duodos 25 PP/PVDF	1010813

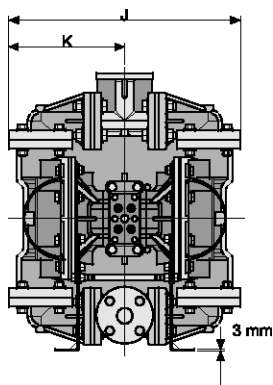
#### Spare part kits for the liquid end comprising

- Diaphragms
- Valve balls
- Seals

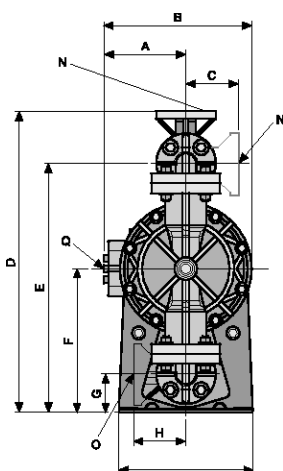
	Order no.
Spare parts kit, liquid end for Duodos 10 PP	1010801
Spare parts kit, liquid end for Duodos 15 PP	1010802
Spare parts kit, liquid end for Duodos 20 PP	1010803
Spare parts kit, liquid end for Duodos 25 PP	1010804
Spare parts kit, liquid end for Duodos 10 PVDF	1010806
Spare parts kit, liquid end for Duodos 15 PVDF	1010807
Spare parts kit, liquid end for Duodos 20 PVDF	1010808
Spare parts kit, liquid end for Duodos 25 PVDF	1010809

## 2.6 Air-operated Diaphragm Pump Duodos

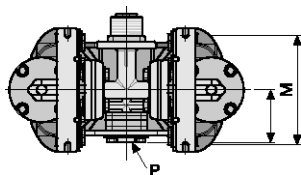
### Dimensions



pk\_2\_072



pk\_2\_106



pk\_2\_107

		Duodos 10	Duodos 15	Duodos 20	Duodos 25
<b>A</b>	mm	79	103	103	172
<b>B</b>	mm	140	179	179	296
<b>C</b>	mm	32	44	60	92
<b>D</b>	mm	198	287	339	527
<b>E</b>	mm	167	243	279	435
<b>F</b>	mm	87	140	163	249
<b>G</b>	mm	19	35	46	64
<b>H</b>	mm	32	44	60	92
<b>I</b>	mm	78	143	143	130
<b>J</b>	mm	178	258	300	433
<b>K</b>	mm	89	129	150	216
<b>L</b>	mm	33	46	57	123
<b>M</b>	mm	66	143	143	102
<b>Discharge connector</b>		1/2"NPT	1" BSP	1 1/2"BSP	1"ANSI flange
<b>Suction connector</b>		1/2"NPT	1" BSP	1 1/2"BSP	1"ANSI flange
<b>Air consumption</b>	m³/h	0.5...11	3.5...27	7.0...34	8.5...77
<b>Differential pressure</b>	bar	2	2	2	2
<b>Air connection</b>		1/4"NPT	1/4"NPT	1/4"NPT	1/2"NPT
<b>Weight (PP)</b>	kg	2	8	9	24
<b>Weight (PVDF)</b>	kg	2.5	9.0	9.5	29.0



## 2.7 Barrel Pump DULCO®Trans

### 2.7.1 Barrel Pump DULCO®Trans

Barrel pumps are the ideal solution for moving liquids.

Pump capacity according to size 900, 2800 or 3750 l/h.

The application range of the DULCO®Trans depends on the chemical resistance of the materials used.

DULCO®Trans is used for bottling, draining and transferring liquids from canisters, hobboscks, drums, storage tanks and containers.

Included in the scope of supply: Metering hose with pump nozzle.

#### Field of application

Barrel pump for bottling, emptying and transferring liquids from canisters, drums and containers.

The following components come into contact with the liquids:

	PP version	PVDF version
External and internal pipe, tap	Polypropylene	PVDF
Drive shaft	Hastelloy C	Hastelloy C
Rotor	ETFE	ETFE
Mechanical seal	ceramic oxide/PTFE/carbon	ceramic oxide/PTFE/carbon
O-rings	FKM	FKM
Metering hose	PVC	PVC

#### DULCO®Trans, PP version

	Feed rate max. *	Feed lift max. m	Order no.
DULCO®Trans 25/700 PP	900 l/h *	5.0	1023085
DULCO®Trans 40/1000 PP	3500 l/h *	9.6	1034225
DULCO®Trans 50/1200 PP	4800 l/h *	12.4	1023087

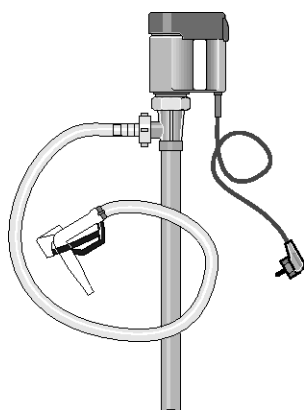
#### DULCO®Trans, PVDF version

	Feed rate max. *	Feed lift max. m	Order no.
DULCO®Trans 25/700 PVDF	1260 l/h *	5.4	1036145
DULCO®Trans 40/1000 PVDF	3500 l/h *	9.6	1036146
DULCO®Trans 50/1200 PVDF	4800 l/h *	12.4	1036147

\* The specified delivery rate includes hose and tap.

#### Spare parts kit for DULCO®Trans

	Order no.
Spare parts kit for DULCO®Trans 25/700 PP	1024179
Spare parts kit for DULCO®Trans 25/700 PVDF	1036149
Spare parts kit for DULCO®Trans 40/1000 PP/PVDF	1034712
Spare parts kit for DULCO®Trans 50/1200 PP/PVDF	1024181



pk\_3\_029

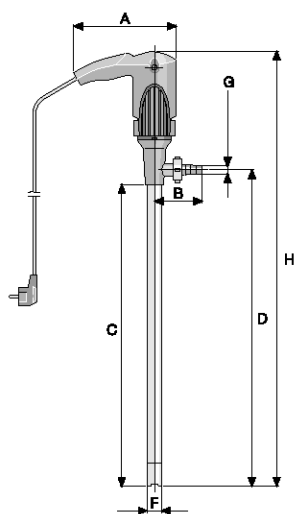
## 2.7 Barrel Pump DULCO®Trans

### Technical Data

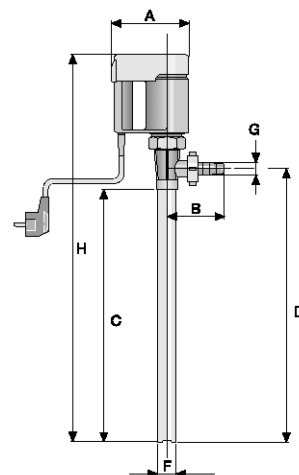
Type		DULCO®Trans 25/700	DULCO®Trans 40/1000	DULCO®Trans 50/1200
Max. density	kg/dm <sup>3</sup>	1.2	1.5	1.8
Max. viscosity	mPas	150	500	500
Media temperature PP	°C	45	50	50
Media temperature PVDF	°C	60	60	60
Suction pipe outer diameter	mm	25	40	50
Hose connection	d	13	19	25
Discharge hose		1.5 m, PVC, 13/18 mm	2.0 m, PVC, 19/27 mm	3.0 m, PVC, 25/34 mm
Motor rating	W	230	500	800
Enclosure rating		IP 24	IP 24	IP 24
Voltage/frequency		230 V/1~/50/60 Hz	230 V/1~/50/60 Hz	230 V/1~/50/60 Hz
Under-voltage cut-out		none	with	with
Overvoltage safety switch		with	with	with
Temperature monitoring		none	with	none
Speed control		2-stage	Continuous	none
Connection cable		5 m, with EUR plug	5 m, with EUR plug	5 m, with EUR plug
Drum adapter		none	G 2"	G 2"
Weight PP/PVDF	kg	2.4/2.6	5.1/5.4	7.4/8.2
Dimensions H x W x D	mm	927 x 197 x 83	1,272 x 185 x 95	1,489 x 217 x 115

### Dimensions

Type		DULCO®Trans 25/700	DULCO®Trans 40/1000	DULCO®Trans 50/1200
A	mm	197	185	217
B	mm	83	113	113
C	mm	672	961	1,161
D	mm	700	1,006	1,206
F	mm	25	40	50
G	d	13	19	25
H	mm	927	1,272	1,489



pk\_3\_028



pk\_3\_029\_1



## 2.8 Peristaltic Pumps DULCO®flex

### 2.8.1 Peristaltic Pumps DULCO®flex

The virtually universal pump for many applications.

Capacity range up to 15,000 l/h, up to 15 bar



ProMinent® peristaltic pumps operate on a simple functional principle and stand out thanks to their compact and robust design. They are self-priming and operate without seals and valves.

The peristaltic pumps of product range DULCO®flex are ideal for almost all metering and pumping tasks in laboratories and industry. The reason: their extensive pump capacity range and the large number of different hose materials.

This is how they work: The feed chemical is pumped by the rotor clamping the hose in the direction of flow. No valves are needed. Abrasive, viscous and gaseous media can thereby be gently conveyed.

The pumping process is triggered by an elastomer hose, pressed by two rotating rollers or shoes against the pump housing. Once the rollers or shoes have passed by, the hose immediately returns to its original shape and creates a vacuum at the pump inlet. Atmospheric pressure causes the medium to flow in. The feed rate is proportional to the pump speed. A vacuum device can optionally be used to assist the hose to return to its position on product range DFCa and DFDa pumps, improving their suction behaviour and ensuring the even feed of viscous media.

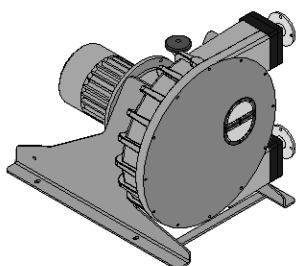
Whereas the pumps are fitted with roller technology for low pressures of up to 8 bar, they have shoes for higher pressures of up to 15 bar.

#### Your benefits

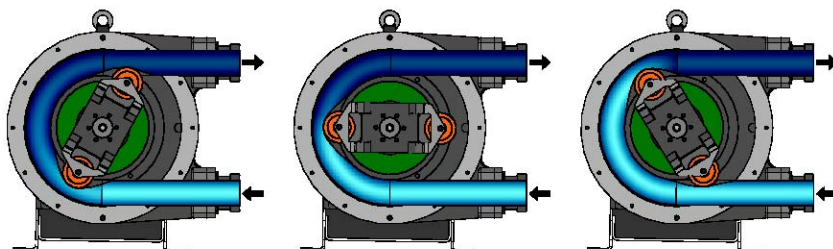
- Simple to operate
- Reversible pumping direction
- Hose materials suitable for various chemicals
- Simple and quick hose change
- Safeguarded against running dry
- Self-priming
- Ideal for pumping pasty, viscous, abrasive and gaseous media

#### Field of application

Chemical industry, clarification plants, mining



P\_DX\_0010\_SW1



P\_DX\_0028\_SW3

DULCO®flex peristaltic pumps can be used to convey media with the following properties:

- pasty and solid-containing
- viscous
- abrasive
- shear-sensitive
- outgassing
- corrosive

The pumps can be selected with the aid of an identity code:

#### Overview:

Type	Application	Feed rate at max. pressure l/h	Max. pressure bar	Rollers/shoes
DFAa	Laboratory	105	2	Rollers
DFBa	Industry	650	8	Rollers
DFCa	Industry	8,900	8	Rollers
DFDa	Industry	15,000	15	Shoes





## 2.8 Peristaltic Pumps DULCO®flex

### 2.8.2

#### Peristaltic Pump DULCO®flex DFA



##### Precise metering of the smallest volumes

##### Feed rates of up to 105 l/h at 2 bar

The peristaltic pump DULCO®flex DFAa (designed as a low-pressure pump) is suitable for metering the smallest volumes in laboratories.

It can be used for the precise metering of low feed rates of up to 105 l/h at 2 bar. The rotor is equipped with 3 rollers to reduce pulsation. A quick-release connector aids fast hose replacement.

##### Your benefits

- Simple to operate
- Reversible pumping direction
- Hose materials suitable for various chemicals
- Simple and quick hose change
- Safeguarded against running dry
- Self-priming
- Ideal for pumping pasty, high-viscosity, abrasive and gaseous media

##### Technical details

- Hose diameter: 3.2 to 8 mm
- Feed rates: 1.6 to 10 ml/rev
- Hose materials: SOLVA, silicone, Norprene A60G, Norprene A60F
- Self-priming up to 8 m
- Back pressure up to 2 bar

##### Options

- Stainless steel base plate
- Single phase motor
- Two pump heads

##### Field of application

- Laboratory applications

## 2.8 Peristaltic Pumps DULCO®flex

### DULCO®flex DFAa 003 peristaltic pump

DFAa	Type	
	003	DFAa, with 3.2 mm hose, wall thickness 2.4 mm (1.66 ml/revolution)
		<b>Drive unit</b>
	000	without drive unit
	A10	0.12 kW, 14 rpm, 1.4 l/h, 2 bar (fixed speed)
	A11	0.12 kW, 35 rpm, 3.5 l/h, 2 bar (fixed speed)
	A12	0.12 kW, 70 rpm, 7.0 l/h, 2 bar (fixed speed)
	A13	0.18 kW, 93 rpm, 9.3 l/h, 2 bar (fixed speed)
	A14	0.18 kW, 140 rpm, 13.9 l/h, 2 bar (fixed speed)
	A21	0.12 kW, 10.9 - 57 rpm, 1,1-5.7 l/h, 2 bar (manual adjustment gears)
	A22	0.25 kW, 34 - 176 rpm, 3.4-17.5 l/h, 2 bar (manual adjustment gears)
	A31	0.18 kW, 13 - 130 rpm, 1.3-12.9 l/h, 7-70 Hz, 2 bar (Gear motor with integral frequency converter)
	A41	0.18 kW, 4 - 105 rpm, 0.4-10.5 l/h, 3-75 Hz, 2 bar (Gear motor, external frequency converter required)
		<b>Hose material</b>
	B	Norprene A60F (food grade)
	C	Solva
	D	Silicone
		<b>Base plate</b>
	0	Base plate, painted steel
	1	Base plate, stainless steel
		<b>Batch controller</b>
	0	Without controller
		<b>Special motor</b>
	0	Standard (3 phase)
	D	Single phase motor, 0.12 kW (only for A10-A13)
	E	Single phase motor, 0.18 kW (only for A14, A15)
		<b>Pump head</b>
	0	with one pump head
		<b>Approvals</b>
	01	CE

### DULCO®flex DFAa 008 peristaltic pump

DFAa	Type	
	008	DFAa with 8.0 mm hose, wall thickness 2.4 mm (10 ml/revolution)
		<b>Drive unit</b>
	000	without drive unit
	B10	0.12 kW, 14 rpm, 8.4 l/h, 2 bar (fixed speed)
	B11	0.12 kW, 35 rpm, 21 l/h, 2 bar (fixed speed)
	B12	0.12 kW, 70 rpm, 42 l/h, 2 bar (fixed speed)
	B13	0.18 kW, 93 rpm, 55.8 l/h, 2 bar (fixed speed)
	B14	0.18 kW, 140 rpm, 84 l/h, 2 bar (fixed speed)
	B21	0.12 kW, 10.9 - 57 rpm, 6.5-34.2 l/h, 2 bar (manual adjustment gears)
	B22	0.25 kW, 34 - 176 rpm, 20.4-105 l/h, 2 bar (manual adjustment gears)
	B31	0.18 kW, 13 - 130 rpm, 7.8-78 l/h, 7-70 Hz, 2 bar (Gear motor with integral frequency converter)
	B41	0.18 kW, 4 - 105 rpm, 2.4-63 l/h, 3-75 Hz, 2 bar (Gear motor, external frequency converter required)
		<b>Hose material</b>
	A	Norprene A60G
	B	Norprene A60F (food grade)
	C	Solva
	D	Silicone
		<b>Base plate</b>
	0	Base plate, painted steel
	1	Base plate, stainless steel
		<b>Batch controller</b>
	0	Without controller
		<b>Special motor</b>
	0	Standard (3 phase)
	D	Single phase motor, 0.12 kW (only for B10-B13)
	E	Single phase motor, 0.18 kW (only for B14, B15)
		<b>Pump head</b>
	0	With one pump head
		<b>Approvals</b>
	01	CE



## 2.8 Peristaltic Pumps DULCO®flex

### 2.8.3

#### Peristaltic Pump DULCO®flex DFB



##### Low and medium pump capacities

##### Feed rates of up to 649 l/h at 8 bar

The peristaltic pump DULCO®flex DFBa is designed for low and medium pump capacities of up to 649 l/h at 8 bar.

The peristaltic pump DULCO®flex DFBa is equipped with rollers and fabric-reinforced hoses for tough industrial use. Pumps with a Halar-coated pump housing can be produced for use in the chemical industry.

##### Your benefits

- Simple to operate
- Reversible pumping direction
- Hose materials suitable for various chemicals
- Simple and quick hose change
- Safeguarded against running dry
- Self-priming
- Ideal for pumping pasty, high-viscosity, abrasive and gaseous media

##### Technical details

- Connector sizes 3/8 - 1"
- Feed rates of 0.023 - 0.24 l/rev
- Hose materials NR, NBR, EPDM, NR-A, Norprene, NBR-A, Hypalon, Tygon
- Self-priming up to 8 m
- Back pressure up to 8 bar

##### Options

- Stainless steel base plate
- Available as a mobile unit
- Various connectors, such as BSP, NPT, Tri-Clamp and DIN 11851
- Pulsation damper
- Leakage sensor
- Housing with Halar coating
- Food approval EU 1935/2004

##### Field of application

- Chemical industry
- Waste water
- Mining

## 2.8 Peristaltic Pumps DULCO®flex

### DULCO®flex DFBa 010 peristaltic pump

DFBa	Type	
	010	DFBa 010, 0.023 l/revolution
		<b>Drive unit</b>
	000	without drive unit
	A10	0.12 kW, 15 rpm, 21 l/h, 8 bar (fixed speed)
	A11	0.12 kW, 20 rpm, 28 l/h, 8 bar (fixed speed)
	A12	0.18 kW, 29 rpm, 40 l/h, 8 bar (fixed speed)
	A13	0.18 kW, 46 rpm, 64 l/h, 4 bar (fixed speed)
	A14	0.25 kW, 57 rpm, 79 l/h, 4 bar (fixed speed)
	A15	0.25 kW, 70 rpm, 97 l/h, 2 bar (fixed speed)
	A21	0.12 kW, 3 - 16 rpm, 4-22 l/h, 8 bar (manual adjustment gears)
	A22	0.25 kW, 5 - 29 rpm, 7-40 l/h, 8 bar (manual adjustment gears)
	A23	0.25 kW, 10 - 53 rpm, 14-73 l/h, 4 bar (manual adjustment gears)
	A24	0.25 kW, 15 - 80 rpm, 21-110 l/h, 2 bar (manual adjustment gears)
	A31	0.37 kW, 9 - 34 rpm, 12-47 l/h, 20-75 Hz, 8 bar (Gear motor with integral frequency converter)
	A32	0.37 kW, 16 - 60 rpm, 22-83 l/h, 20-75 Hz, 4 bar (Gear motor with integral frequency converter)
	A41	0.18 kW, 1-34 rpm, 1-47 l/h, 3-75 Hz, 8 bar (Gear motor, external frequency converter required)
	A42	0.18 kW, 2-44 rpm, 3-60 l/h, 3-75 Hz, 8 bar (Gear motor, external frequency converter required)
	A43	0.25 kW, 3-69 rpm, 4-95 l/h, 3-75 Hz, 4 bar (Gear motor, external frequency converter required)
		<b>Hose material</b>
	0	NR
	B	NBR
	E	EPDM
	R	NR-A
	N	Norprene (max. 2 bar)
	A	NBR-A
	H	Hypalon
		<b>Hydraulic connections</b>
	A	VA BSP 3/8"
	B	VA NPT 3/8"
	C	PP BSP 3/8"
	D	PVDF BSP 3/8"
	E	PVDF NPT 3/8"
	F	PVC NPT 3/8"
	G	Tri-Clamp, VA, 1/2"
	H	DIN 11851, VA, NW10
		<b>Base plate</b>
	0	Base plate, painted steel
	1	Base plate, stainless steel
	2	Portable unit + painted steel base plate
	3	Portable unit + stainless steel base plate
		<b>Leakage sensor</b>
	0	Without leakage sensor
	L	With leakage sensor
	M	As "L" + relay output
		<b>Rotor</b>
	0	Rotor with 2 rollers
		<b>Batch controller</b>
	0	Without controller
		<b>Special version</b>
	0	Standard
	H	Halar-coated housing
		<b>Vacuum system</b>
	0	Without
		<b>Approvals</b>
	01	CE
	02	CE+Food approval EU 1935/2004





## 2.8 Peristaltic Pumps DULCO®flex

### DULCO®flex DFBa 013 peristaltic pump

DFBa	Type
013	DFBa 013, 0.039 l/revolution
<b>Drive unit</b>	
000	without drive unit
B10	0.12 kW, 15 rpm, 35 l/h, 8 bar (fixed speed)
B11	0.12 kW, 20 rpm, 46 l/h, 8 bar (fixed speed)
B12	0.18 kW, 29 rpm, 67 l/h, 8 bar (fixed speed)
B13	0.18 kW, 46 rpm, 107 l/h, 4 bar (fixed speed)
B14	0.25 kW, 57 rpm, 133 l/h, 4 bar (fixed speed)
B15	0.25 kW, 70 rpm, 163 l/h, 2 bar (fixed speed)
B21	0.12 kW, 3 - 16 rpm, 7-37 l/h, 8 bar (manual adjustment gears)
B22	0.25 kW, 5 - 29 rpm, 11-67 l/h, 8 bar (manual adjustment gears)
B23	0.25 kW, 10 - 53 rpm, 23-124 l/h, 4 bar (manual adjustment gears)
B24	0.25 kW, 15 - 80 rpm, 35-187 l/h, 2 bar (manual adjustment gears)
B31	0.37 kW, 9 - 34 rpm, 21-79 l/h, 20-75 Hz, 8 bar (Gear motor with integral frequency converter)
B32	0.37 kW, 16 - 60 rpm, 37-140 l/h, 20-75 Hz, 4 bar (Gear motor with integral frequency converter)
B41	0.18 kW, 1-34 rpm, 2-78 l/h, 3-75 Hz, 8 bar (Gear motor, external frequency converter required)
B42	0.18 kW, 2-44 rpm, 5-100 l/h, 3-75 Hz, 8 bar (Gear motor, external frequency converter required)
B43	0.25 kW, 3-69 rpm, 7-157 l/h, 3-75 Hz, 4 bar (Gear motor, external frequency converter required)
<b>Hose material</b>	
0	NR
B	NBR
E	EPDM
R	NR-A
N	Norprene (max. 2 bar)
A	NBR-A
H	Hypalon
<b>Hydraulic connections</b>	
A	VA BSP 3/8"
B	VA NPT 3/8"
C	PP BSP 3/8"
D	PVDF BSP 3/8"
E	PVDF NPT 3/8"
F	PVC NPT 3/8"
G	Tri-Clamp, VA, 3/4"
H	DIN 11851, VA, NW15
<b>Base plate</b>	
0	Base plate, painted steel
1	Base plate, stainless steel
2	Portable unit + painted steel base plate
3	Portable unit + stainless steel base plate
<b>Leakage sensor</b>	
0	Without leakage sensor
L	With leakage sensor
M	As "L" + relay output
<b>Rotor</b>	
0	Rotor with 2 rollers
<b>Batch controller</b>	
0	Without controller
<b>Special version</b>	
0	Standard
H	Halar-coated housing
<b>Vacuum system</b>	
0	Without
<b>Approvals</b>	
01	CE
02	CE+Food approval EU 1935/2004

## 2.8 Peristaltic Pumps DULCO®flex

### DULCO®flex DFBa 016 peristaltic pump

DFBa	Type	
	016	DFBa 016, 0.092 l/revolution
		<b>Drive unit</b>
	000	without drive unit
	C10	0.18 kW, 14 rpm, 77 l/h, 8 bar* (fixed speed)
	C11	0.18 kW, 20 rpm, 110 l/h, 8 bar* (fixed speed)
	C12	0.25 kW, 32 rpm, 176 l/h, 8 bar* (fixed speed)
	C13	0.25 kW, 46 rpm, 253 l/h, 4 bar (fixed speed)
	C14	0.37 kW, 57 rpm, 314 l/h, 4 bar (fixed speed)
	C15	0.37 kW, 70 rpm, 386 l/h, 2 bar (fixed speed)
	C21	0.37 kW, 8 - 50 rpm, 44-276 l/h, 4 bar (manual adjustment gears)
	C22	0.37 kW, 10 - 61 rpm, 55-336 l/h, 2 bar (manual adjustment gears)
	C23	0.37 kW, 16 - 91 rpm, 88-502 l/h, 1 bar (manual adjustment gears)
	C31	0.37 kW, 9 - 34 rpm, 49-187 l/h, 20-75 Hz, 8 bar* (Gear motor with integral frequency converter)
	C32	0.37 kW, 16 - 60 rpm, 88-331 l/h, 20-75 Hz, 2 bar (Gear motor with integral frequency converter)
	C41	0.25 kW, 1-34 rpm, 5-188 l/h, 3-75 Hz, 8 bar* (Gear motor, external frequency converter required)
	C42	0.25 kW, 2-48 rpm, 11-265 l/h, 3-75 Hz, 4 bar (Gear motor, external frequency converter required)
	C43	0.37 kW, 3-69 rpm, 16-381 l/h, 3-75 Hz, 2 bar (Gear motor, external frequency converter required)
		<b>Hose material</b>
	0	NR
	B	NBR
	E	EPDM
	R	NR-A
	N	Norprene (max. 2 bar)
	A	NBR-A
	H	Hypalon
		<b>Hydraulic connections</b>
	A	VA BSP 3/4"
	B	VA NPT 3/4"
	C	PP BSP 3/4"
	D	PVDF BSP 3/4"
	E	PVDF NPT 3/4"
	F	PVC NPT 3/4"
	G	Tri-Clamp, VA, 1"
	H	DIN 11851, VA, NW20
		<b>Base plate</b>
	0	Base plate, painted steel
	1	Base plate, stainless steel
	2	Portable unit + painted steel base plate
	3	Portable unit + stainless steel base plate
		<b>Leakage sensor</b>
	0	Without leakage sensor
	L	With leakage sensor
	M	As "L" + relay output
		<b>Rotor</b>
	0	Rotor with 2 rollers
		<b>Batch controller</b>
	0	Without controller
		<b>Special version</b>
	0	Standard
	H	Halar-coated housing
		<b>Vacuum system</b>
	0	Without
		<b>Approvals</b>
	01	CE
	02	CE+Food approval EU 1935/2004



## 2.8 Peristaltic Pumps DULCO®flex

### DULCO®flex DFBa 019 peristaltic pump

DFBa	Type
	019 DFBa 019, 0.123 l/revolution
	<b>Drive unit</b>
000	Without drive unit
D10	0.18 kW, 15 rpm, 110 l/h, 2 bar (fixed speed)
D11	0.18 kW, 20 rpm, 148 l/h, 2 bar (fixed speed)
D12	0.25 kW, 32 rpm, 236 l/h, 2 bar (fixed speed)
D13	0.25 kW, 46 rpm, 339 l/h, 2 bar (fixed speed)
D14	0.37 kW, 57 rpm, 421 l/h, 2 bar (fixed speed)
D15	0.37 kW, 70 rpm, 517 l/h, 2 bar (fixed speed)
D21	0.37 kW, 8 - 50 rpm, 59-369 l/h, 2 bar (manual adjustment gears)
D22	0.37 kW, 10 - 61 rpm, 74-450 l/h, 2 bar (manual adjustment gears)
D23	0.37 kW, 16 - 91 rpm, 118-671 l/h, 2 bar (manual adjustment gears)
D31	0.37 kW, 9 - 34 rpm, 66-251 l/h, 20-75 Hz, 2 bar (Gear motor with integral frequency converter)
D32	0.37 kW, 16 - 60 rpm, 118-443 l/h, 20-75 Hz, 2 bar (Gear motor with integral frequency converter)
D41	0.25 kW, 1-34 rpm, 7-251 l/h, 3-75 Hz, 2 bar (Gear motor, external frequency converter required)
D42	0.25 kW, 2-48 rpm, 15-354 l/h, 3-75 Hz, 2 bar (Gear motor, external frequency converter required)
D43	0.37 kW, 3-69 rpm, 22-509 l/h, 3-75 Hz, 2 bar (Gear motor, external frequency converter required)
	<b>Hose material</b>
N	Norprene (max. 2 bar)
T	TYGON (max. 2 bar)
	<b>Hydraulic connections</b>
A	VA BSP 1"
B	VA NPT 1"
C	PP BSP 1"
D	PVDF BSP 1"
E	PVDF NPT 1"
F	PVC NPT 1"
G	Tri-Clamp, VA, 1"
H	DIN 11851, VA, NW25
	<b>Base plate</b>
0	Base plate, painted steel
1	Base plate, stainless steel
2	Portable unit + painted steel base plate
3	Portable unit + stainless steel base plate
	<b>Leakage sensor</b>
0	Without leakage sensor
L	With leakage sensor
M	As "L" + relay output
	<b>Rotor</b>
0	Rotor with 2 rollers
	<b>Batch controller</b>
0	Without controller
	<b>Special version</b>
0	Standard
H	Halar-coated housing
	<b>Vacuum system</b>
0	Without
	<b>Approvals</b>
01	CE
02	CE+Food approval EU 1935/2004

## 2.8 Peristaltic Pumps DULCO®flex

### DULCO®flex DFBa 022 peristaltic pump

DFBa	Type
	022 DFBa 022, 0.246 l/revolution
<b>Drive unit</b>	
000	Without drive unit
E10	0.25 kW, 17 rpm, 251 l/h, 8 bar (fixed speed)
E11	0.37 kW, 23 rpm, 339 l/h, 8 bar (fixed speed)
E12	0.55 kW, 38 rpm, 561 l/h, 4 bar (fixed speed)
E13	0.55 kW, 45 rpm, 664 l/h, 4 bar (fixed speed)
E14	0.55 kW, 54 rpm, 797 l/h, 2 bar (fixed speed)
E15	0.75 kW, 66 rpm, 974 l/h, 2 bar (fixed speed)
E21	0.37 kW, 4-20 rpm, 59-295 l/h, 8 bar (manual adjustment gears)
E22	0.55 kW, 6-32 rpm, 89-472 l/h, 4 bar (manual adjustment gears)
E23	0.75 kW, 9-48 rpm, 133-708 l/h, 2 bar (manual adjustment gears)
E31	0.55 kW, 12-44 rpm, 177-649 l/h, 20-75 Hz, 4 bar (Gear motor with integral frequency converter)
E32	0.75 kW, 18-67 rpm, 266-989 l/h, 20-75 Hz, 2 bar (Gear motor with integral frequency converter)
E41	0.55 kW, 2-44 rpm, 30-649 l/h, 3-75 Hz, 8 bar (Gear motor, external frequency converter required)
E42	0.75 kW, 2-57 rpm, 30-841 l/h, 3-75 Hz, 4 bar (Gear motor, external frequency converter required)
E43	1.1 kW, 3-81 rpm, 44-1196 l/h, 3-75 Hz, 2 bar (Gear motor, external frequency converter required)
<b>Hose material</b>	
0	NR (natural rubber=Naturkautschuk)
B	NBR
E	EPDM
R	NR-A
N	Norprene (max. 2 bar back pressure)
A	NBR-A
H	Hypalon
<b>Hydraulic connections</b>	
A	VA BSP 1"
B	VA NPT 1"
C	PP BSP 1"
D	PVDF BSP 1"
E	PVDF NPT 1"
F	PVC NPT 1"
G	Tri-Clamp, VA, 1"
H	DIN 11851, VA, NW25
<b>Base plate</b>	
0	Base plate, painted steel
1	Base plate, stainless steel
2	Portable unit + painted steel base plate
3	Portable unit + stainless steel base plate
<b>Leakage sensor</b>	
0	Without leakage sensor
L	With leakage sensor
M	As "L" + relay output
<b>Rotor</b>	
0	Rotor with 2 rollers
<b>Batch controller</b>	
0	Without controller
<b>Special version</b>	
0	Standard
H	Halar-coated housing
<b>Vacuum system</b>	
0	Without
<b>Approvals</b>	
01	CE
02	CE+Food approval EU 1935/2004







## 2.8 Peristaltic Pumps DULCO®flex

### 2.8.4

#### Peristaltic Pump DULCO®flex DFC



##### High pump capacities and long service life

##### Feed rates of up to 8,900 l/h at 8 bar

High pump capacities are not a problem with the peristaltic pump DULCO®flex DFCa. It is equipped with extra rollers and fabric-reinforced hoses for industrial use.

It is ideal for heavy-duty industrial applications and pump capacities of up to 8,900 l/h at 8 bar back pressure.

A ball-bearing mounted rotor ensures extremely smooth running and a long service life.

Pumps with a Halar-coated pump housing can be produced for use in the chemical industry.

A vacuum unit can optionally be used to help the hose to return to its original shape with pumps of the product range DFCa, thereby improving their suction behaviour and ensuring the even feed of high-viscosity media.

##### Your benefits

- Simple to operate
- Reversible pumping direction
- Hose materials suitable for various chemicals
- Simple and quick hose change
- Safeguarded against running dry
- Self-priming
- Ideal for pumping pasty, high-viscosity, abrasive and gaseous media

##### Technical details

- Connector sizes 1 1/4"- DN 80
- Feed rates of 0.43 - 13.44 l/rev
- Hose materials NR, NBR, EPDM, Norprene, NR-A, NBR-A
- Self-priming up to 8 m
- Back pressure up to 8 bar

##### Options

- Stainless steel base plate
- Available as a mobile unit
- Various connectors, such as BSP, NPT, Tri-Clamp, DIN 11851 and flange
- Pulsation damper
- Leakage sensor
- Housing with Halar coating
- Vacuum system
- Food approval EU 1935/2004

##### Field of application

- Chemical industry
- Waste water
- Mining

## 2.8 Peristaltic Pumps DULCO®flex

### DULCO®flex DFCa 030 peristaltic pump

DFCa	Type	
	030	DFCa 030, 0.433 l/revolution
		<b>Drive unit</b>
	000	Without drive unit
	A11	0.25 kW, 18 rpm, 468 l/h, 8 bar (fixed speed)
	A12	0.37 kW, 29 rpm, 753 l/h, 8 bar (fixed speed)
	A13	0.55 kW, 38 rpm, 987 l/h, 4 bar (fixed speed)
	A14	0.55 kW, 55 rpm, 1429 l/h, 2 bar (fixed speed)
	A31	0.55 kW, 11 - 39 rpm, 286-1013 l/h, 20-75 Hz, 4 bar (Gear motor with integral frequency converter)
	A32	0.75 kW, 18 - 63 rpm, 468 - 1637 l/h, 20-75 Hz, 2 bar (Gear motor with integral frequency converter)
	A41	0.37 kW, 2 - 28 rpm, 52-727 l/h, 3-50 Hz, 8 bar (Gear motor, external frequency converter required)
	A42	0.75 kW, 3 - 59 rpm, 78-1533 l/h, 3-65 Hz, 2 bar (Gear motor, external frequency converter required)
		<b>Hose material</b>
	0	NR
	B	NBR
	E	EPDM
	R	NR-A
	A	NBR-A
	N	Norprene (max. 2 bar)
		<b>Hydraulic connections</b>
	A	VA BSP 1 1/4"
	B	VA NPT 1 1/4"
	C	PP BSP 1 1/4"
	D	PVDF/PTFE BSP 1 1/4"
	F	PVC NPT 1 1/4"
	G	Tri-Clamp, VA, 1 1/2"
	H	DIN 11851, VA, NW32
	I	DIN flange VA DN32
	L	ANSI flange VA, 1 1/4"
	P	ANSI flange PVC, 1 1/4"
		<b>Base plate</b>
	0	Base plate, painted steel
	1	Base plate, stainless steel
	2	Portable unit + painted steel base plate
	3	Portable unit + stainless steel base plate
		<b>Leakage sensor</b>
	0	without leakage sensor
	L	with leakage sensor
	M	As "L" + relay output
		<b>Rotor</b>
	0	Rotor with 2 rollers
		<b>Batch controller</b>
	0	without controller
		<b>Special version</b>
	0	Standard
	H	Halar-coated housing
		<b>Vacuum system</b>
	0	Without
	V	With vacuum system
		<b>Approvals</b>
	01	CE
	02	CE+Food approval EU 1935/2004



## 2.8 Peristaltic Pumps DULCO®flex

### DULCO®flex DFCa 040 peristaltic pump

DFCa	Type
	040 DFCa 040, 0.86 l/revolution
	<b>Drive unit</b>
	000 Without drive unit
	B11 0.55 kW, 18 rpm, 928 l/h, 8 bar (fixed speed)
	B12 0.55 kW, 29 rpm, 1495 l/h, 8 bar (fixed speed)
	B13 0.75 kW, 38 rpm, 1960 l/h, 4 bar (fixed speed)
	B14 1.1 kW, 54 rpm, 2786 l/h, 2 bar (fixed speed)
	B31 1.1 kW, 12 - 36 rpm, 619-1857 l/h, 20-70 Hz, 4 bar (Gear motor with integral frequency converter)
	B32 1.5 kW, 15 - 53 rpm, 774-2735 l/h, 20-70 Hz, 2 bar (Gear motor with integral frequency converter)
	B41 1.1 kW, 2 - 49 rpm, 103-2528 l/h, 3-65 Hz, 2 bar (Gear motor, external frequency converter required)
	B42 1.5 kW, 3 - 53 rpm, 154-2735 l/h, 3-65 Hz, 2 bar (Gear motor, external frequency converter required)
	<b>Hose material</b>
	0 NR
	B NBR
	E EPDM
	R NR-A
	A NBR-A
	N Norprene (max. 2 bar)
	<b>Hydraulic connections</b>
	A VA BSP 1 1/2"
	B VA NPT 1 1/2"
	C PP BSP 1 1/2"
	D PVDF/PTFE BSP 1 1/2"
	G Tri-Clamp, VA, 1 1/2"
	H DIN 11851, VA, NW40
	I DIN flange VA DN40
	L ANSI flange VA, 1 1/2"
	P ANSI flange PVC, 1 1/2"
	<b>Base plate</b>
	0 Base plate, painted steel
	1 Base plate, stainless steel
	2 Portable unit + painted steel base plate
	3 Portable unit + stainless steel base plate
	<b>Leakage sensor</b>
	0 without leakage sensor
	L with leakage sensor
	M As "L" + relay output
	<b>Rotor</b>
	0 Rotor with 2 rollers
	<b>Batch controller</b>
	0 Without controller
	<b>Special version</b>
	0 Standard
	H Halar-coated housing
	<b>Vacuum system</b>
	0 Without
	V With vacuum system
	<b>Approvals</b>
	01 CE
	02 CE+Food approval EU 1935/2004

## 2.8 Peristaltic Pumps DULCO®flex

### DULCO®flex DFCa 050 peristaltic pump

DFCa	Type	
	050	DFCa 050, 1.47 l/revolution
		<b>Drive unit</b>
	000	Without drive unit
	C11	0.55 kW, 14 rpm, 1235 l/h, 8 bar (fixed speed)
	C12	0.75 kW, 21 rpm, 1852 l/h, 8 bar (fixed speed)
	C13	1.1 kW, 30 rpm, 2646 l/h, 4 bar (fixed speed)
	C14	1.5 kW, 38 rpm, 3352 l/h, 4 bar (fixed speed)
	C15	1.5 kW, 48 rpm, 4234 l/h, 2 bar (fixed speed)
	C16	2.2 kW, 58 rpm, 5116 l/h, 2 bar (fixed speed)
	C31	1.5 kW, 8 - 29 rpm, 706-2558 l/h, 20-70 Hz, 4 bar (Gear motor with integral frequency converter)
	C32	2.2 kW, 17 - 60 rpm, 1499-5292 l/h, 20-70 Hz, 2 bar (Gear motor with integral frequency converter)
	C41	1.5 kW, 1 - 27 rpm, 88-2381 l/h, 3-65 Hz, 4 bar (Gear motor, external frequency converter required)
	C42	2.2 kW, 3 - 55 rpm, 265-4851 l/h, 3-65 Hz, 2 bar (Gear motor, external frequency converter required)
		<b>Hose material</b>
	0	NR
	B	NBR
	E	EPDM
	R	NR-A
	A	NBR-A
	N	Norprene (max. 2 bar)
		<b>Hydraulic connections</b>
	I	DIN flange VA DN40
	G	Tri-Clamp, VA, 2"
	H	DIN 11851, VA, NW50
	J	DIN flange PP DN40
	K	DIN flange PVDF/PTFE DN40
	L	ANSI flange VA, 1 1/2"
	M	ANSI flange PP 1 1/2"
	N	ANSI flange PVDF/PTFE 1 1/2"
		<b>Base plate</b>
	0	Base plate, painted steel
	1	Base plate, stainless steel
	2	Portable unit + painted steel base plate
	3	Portable unit + stainless steel base plate
		<b>Leakage sensor</b>
	0	without leakage sensor
	L	with leakage sensor
	M	As "L" + relay output
		<b>Rotor</b>
	0	Rotor with 2 rollers
		<b>Batch controller</b>
	0	Without controller
		<b>Special version</b>
	0	Standard
	H	Halar-coated housing
		<b>Vacuum system</b>
	0	Without
	V	With vacuum system
		<b>Approvals</b>
	01	CE
	02	CE+Food approval EU 1935/2004





## 2.8 Peristaltic Pumps DULCO®flex

### DULCO®flex DFCa 060 peristaltic pump

DFCa	Type
	060 DFCa 060, 3.16 l/revolution
	<b>Drive unit</b>
000	Without drive unit
D11	2.2 kW, 18 rpm, 3.4 m³/h, 8 bar (fixed speed)
D12	2.2 kW, 22 rpm, 4.2 m³/h, 8 bar (fixed speed)
D13	3.0 kW, 27 rpm, 5.1 m³/h, 8 bar (fixed speed)
D14	3.0 kW, 33 rpm, 6.3 m³/h, 4 bar (fixed speed)
D15	3.0 kW, 42 rpm, 8.0 m³/h, 4 bar (fixed speed)
D16	3.0 kW, 47 rpm, 8.9 m³/h, 2 bar (fixed speed)
D31	3.0 kW, 7 - 25 rpm, 1,3-4.7 m³/h, 8 bar (Gear motor with integral frequency converter)
D32	4.0 kW, 17 - 59 rpm, 3,2-11.2 m³/h, 2 bar (Gear motor with integral frequency converter)
D41	3.0 kW, 1 - 24 rpm, 0,2-4.5 m³/h, 8 bar (gear motor, external FC necessary)
D42	4.0 kW, 2 - 55 rpm, 0,4-10.4 m³/h, 2 bar (gear motor, external FC necessary)
	<b>Hose material</b>
0	NR
B	NBR
E	EPDM
R	NR-A
A	NBR-A
N	Norprene (max. 2 bar)
	<b>Hydraulic connections</b>
I	DIN flange VA DN50
G	Tri-Clamp, VA, 2 1/2"
H	DIN 11851, VA, NW50
J	DIN flange PP DN50
K	DIN flange VA, Halar coated + PVDF inserts DN50
L	ANSI flange VA 2"
M	ANSI flange PP 2"
N	ANSI flange VA, Halar coated + PVDF inserts 2"
	<b>Base plate</b>
0	Base plate, painted steel
1	Base plate, stainless steel
2	Portable unit + painted steel base plate
3	Portable unit + stainless steel base plate
	<b>Leakage sensor</b>
0	without leakage sensor
L	with leakage sensor
M	As "L" + relay output
	<b>Rotor</b>
0	Rotor with 2 rollers
	<b>Batch controller</b>
0	Without controller
	<b>Special version</b>
0	Standard
H	Halar-coated housing
	<b>Vacuum system</b>
0	Without
V	With vacuum system
	<b>Approvals</b>
01	CE
02	CE+Food approval EU 1935/2004

## 2.8 Peristaltic Pumps DULCO®flex

### DULCO®flex DFCa 070 peristaltic pump

DFCa	Type	
	070	DFCa 070, 6.72 l/revolution
		<b>Drive unit</b>
	000	Without drive unit
	E11	2.2 kW, 13 rpm, 5.2 m³/h, 8 bar (fixed speed)
	E12	3.0 kW, 22 rpm, 8.9 m³/h, 8 bar (fixed speed)
	E13	4.0 kW, 26 rpm, 10.5 m³/h, 4 bar (fixed speed)
	E14	4.0 kW, 32 rpm, 12.9 m³/h, 4 bar (fixed speed)
	E15	5.5 kW, 37 rpm, 14.9 m³/h, 4 bar (fixed speed)
	E16	5.5 kW, 46 rpm, 18.5 m³/h, 2 bar (fixed speed)
	E31	5.5 kW, 8 - 27 rpm, 3.2 - 10.9 m³/h, 20-60 Hz, 4 bar (Gear motor with integral frequency converter)
	E32	7.5 kW, 13 - 38 rpm, 5.2 - 15.3 m³/h, 20-60 Hz, 2 bar (Gear motor with integral frequency converter)
	E41	5.5 kW, 1 - 25 rpm, 0.4 - 10.1 m³/h, 3-65 Hz, 4 bar (gear motor, external FC necessary)
	E42	7.5 kW, 2 - 42 rpm, 0.8 - 16.9 m³/h, 3-65 Hz, 2 bar (gear motor, external FC necessary)
		<b>Hose material</b>
	0	NR
	B	NBR
	E	EPDM
	R	NR-A
	A	NBR-A
		<b>Hydraulic connections</b>
	I	DIN flange VA DN65
	G	Tri-Clamp, VA, 3"
	H	DIN 11851, VA, NW65
	J	DIN flange PP DN65
	L	ANSI flange VA, 2 1/2"
	M	ANSI flange PP 2 1/2"
	Q	DIN flange VA Halar coated DN65
	R	ANSI flange VA Halar coated 2 1/2"
		<b>Base plate</b>
	0	Base plate, painted steel
	1	Base plate, stainless steel
	2	Portable unit + painted steel base plate
	3	Portable unit + stainless steel base plate
		<b>Leakage sensor</b>
	0	Without leakage sensor
	L	With leakage sensor
	M	As "L" + relay output
		<b>Rotor</b>
	0	Rotor with 2 rollers
		<b>Batch controller</b>
	0	Without controller
		<b>Special version</b>
	0	Standard
	H	Halar-coated housing
		<b>Vacuum system</b>
	0	Without
	V	With vacuum system
		<b>Approvals</b>
	01	CE
	02	CE+Food approval EU 1935/2004



## 2.8 Peristaltic Pumps DULCO®flex

### DULCO®flex DFCa 070D peristaltic pump

DFCa	Type		
	70D	DFCa 70D, 13.44 l/revolution, double head version	
		<b>Drive unit</b>	
	F11	5.5 kW, 15 rpm, 12.1 m³/h, 4 bar (fixed speed)	
	F12	7.5 kW, 22 rpm, 17.7 m³/h, 2 bar (fixed speed)	
	F13	7.5 kW, 31 rpm, 25 m³/h, 2 bar (fixed speed)	
	F14	9.2 kW, 40 rpm, 32.2 m³/h, 2 bar (fixed speed)	
		<b>Hose material</b>	
	0	NR	
	B	NBR	
	E	EPDM	
	R	NR-A	
	A	NBR-A	
		<b>Hydraulic connections</b>	
	I	DIN flange VA DN80	
	G	Tri-Clamp, VA, 4"	
	H	DIN 11851, VA, NW80	
	L	ANSI flange VA 3"	
		<b>Base plate</b>	
	0	Base plate, painted steel	
	1	Base plate, stainless steel	
		<b>Leakage sensor</b>	
	0	Without leakage sensor	
	L	With leakage sensor	
	M	As "L" + relay output	
		<b>Rotor</b>	
	0	Rotor with 2 rollers	
		<b>Batch controller</b>	
	0	Without controller	
		<b>Special version</b>	
	0	Standard	
		<b>Vacuum system</b>	
	0	Without	
		<b>Approvals</b>	
	01	CE	

## 2.8 Peristaltic Pumps DULCO®flex

### 2.8.5

### Peristaltic Pump DULCO®flex DFD



#### Maximum pump capacities and high pressures

#### Feed rates of up to 15,000 l/h at 15 bar

The peristaltic pump DFDa is designed for maximum pump capacities and high pressures and is winning customers over with its noiselessness and long service life. It is fitted with shoes and fabric-reinforced hoses – perfect for industrial use.

The pump housing is filled with glycerine to reduce friction. A ball-bearing mounted rotor ensures extremely smooth running and a long service life. In tough industrial use, the DFDa conveys volumes of up to 15,000 l/h with back pressures of up to 15 bar.

A vacuum unit can optionally be used to help the hose to return to its original shape with pumps of the product range DFDa, thereby improving their suction behaviour and ensuring the even feed of high-viscosity media.

#### Your benefits

- Simple to operate
- Reversible pumping direction
- Hose materials suitable for various chemicals
- Simple and quick hose change
- Safeguarded against running dry
- Self-priming
- Ideal for pumping pasty, high-viscosity, abrasive and gaseous media

#### Technical details

- Connector sizes DN 25 – DN 100
- Feed rates of 0.3 - 20.0 l/rev
- Hose materials NR, NBR, EPDM
- Self-priming up to 8 m
- Back pressure up to 15 bar

#### Options

- Stainless steel base plate
- Available as a mobile unit
- Various connectors, such as Tri-Clamp, DIN 11851 and flange
- Pulsation damper
- Leakage sensor
- Vacuum system

#### Field of application

- Chemical industry
- Waste water
- Mining







## 2.8 Peristaltic Pumps DULCO®flex

### DULCO®flex DFDa 025 peristaltic pump

DFDa	Type
	025 DFDa 025, 0.3 l/revolution
	<b>Drive unit</b>
000	Without drive unit
A11	0.55 kW, 18 rpm, 324 l/h, 15 bar (fixed speed)
A12	0.75 kW, 28 rpm, 504 l/h, 15 bar (fixed speed)
A13	0.75 kW, 39 rpm, 702 l/h, 10 bar (fixed speed)
A14	0.75 kW, 45 rpm, 810 l/h, 5 bar (fixed speed)
A15	1.1 kW, 55 rpm, 990 l/h, 5 bar (fixed speed)
A31	1.1 kW, 16 - 55 rpm, 288-990 l/h, 20-70 Hz, 5 bar (Gear motor with integral frequency converter)
A32	1.5 kW, 18 - 63 rpm, 324-1134 l/h, 20-70 Hz, 5 bar (Gear motor with integral frequency converter)
A41	0.75 kW, 4 - 36 rpm, 72-648 l/h, 7-65 Hz, 15 bar (Gear motor, external frequency converter required)
A42	1.1 kW, 6 - 58 rpm, 108-1044 l/h, 7-65 Hz, 5 bar (Gear motor, external frequency converter required)
A43	1.5 kW, 9 - 86 rpm, 162-1548 l/h, 7-65 Hz, 5 bar (Gear motor, external frequency converter required)
	<b>Hose material</b>
0	NR
B	NBR
E	EPDM
	<b>Hydraulic connections</b>
I	DIN flange VA DN25
J	DIN flange PP DN25
K	DIN flange PVDF DN25
L	ANSI flange VA DN25
	<b>Base plate</b>
0	Base plate, painted steel
1	Base plate, stainless steel
2	Portable unit + painted steel base plate
3	Portable unit + stainless steel base plate
	<b>Leakage sensor</b>
0	Without leakage sensor
L	With leakage sensor
M	As "L" + relay output
	<b>Rotor</b>
0	Rotor with 2 shoes
	<b>Batch controller</b>
0	Without controller
	<b>Special version</b>
0	Standard
H	Halar-coated housing
	<b>Vacuum system</b>
0	Without
V	With vacuum system
	<b>Approvals</b>
01	CE

## 2.8 Peristaltic Pumps DULCO®flex

### DULCO®flex DFDa 032 peristaltic pump

DFDa	Type	
	032	DFDa 032, 0.625 l/revolution
		<b>Drive unit</b>
	000	Without drive unit
	B11	0.75 kW, 21 rpm, 787 l/h, 10 bar (fixed speed)
	B12	1.1 kW, 21 rpm, 787 l/h, 15 bar (fixed speed)
	B13	1.1 kW, 30 rpm, 1125 l/h, 15 bar (fixed speed)
	B14	1.1 kW, 38 rpm, 1425 l/h, 10 bar (fixed speed)
	B15	1.5 kW, 47 rpm, 1762 l/h, 5 bar (fixed speed)
	B16	1.5 kW, 58 rpm, 2175 l/h, 5 bar (fixed speed)
	B31	1.5 kW, 12 - 42 rpm, 450-1575 l/h, 20-70 Hz, 10 bar (Gear motor with integral frequency converter)
	B32	2.2 kW, 19 - 66 rpm, 712-2475 l/h, 20-70 Hz, 5 bar (Gear motor with integral frequency converter)
	B41	1.1 kW, 4 - 39 rpm, 150-1462 l/h, 7-65 Hz, 10 bar (Gear motor, external frequency converter required)
	B42	1.5 kW, 5 - 49 rpm, 190-1837 l/h, 7-65 Hz, 10 bar (Gear motor, external frequency converter required)
	B43	2.2 kW, 8 - 75 rpm, 300-2812 l/h, 7-65 Hz, 5 bar (Gear motor, external frequency converter required)
		<b>Hose material</b>
	0	NR
	B	NBR
	E	EPDM
		<b>Hydraulic connections</b>
	I	DIN flange VA DN32
	J	DIN flange PP DN32
	K	DIN flange PVDF/PTFE DN 32
	L	ANSI flange VA, 1 1/4"
		<b>Base plate</b>
	0	Base plate, painted steel
	1	Base plate, stainless steel
	2	Portable unit + painted steel base plate
	3	Portable unit + stainless steel base plate
		<b>Leakage sensor</b>
	0	Without leakage sensor
	L	With leakage sensor
	M	As "L" + relay output
		<b>Rotor</b>
	0	Rotor with 2 shoes
		<b>Batch controller</b>
	0	Without controller
		<b>Special version</b>
	0	Standard
	H	Halar-coated housing
		<b>Vacuum system</b>
	0	Without
	V	With vacuum system
		<b>Approvals</b>
	01	CE





## 2.8 Peristaltic Pumps DULCO®flex

### DULCO®flex DFDa 040 peristaltic pump

DFDa	Type
	040 DFDa 040, 1.33 l/revolution
	<b>Drive unit</b>
000	Without drive unit
C11	1.1 kW, 21 rpm, 1676 l/h, 10 bar (fixed speed)
C12	1.1 kW, 26 rpm, 2075 l/h, 5 bar (fixed speed)
C13	1.5 kW, 21 rpm, 1676 l/h, 15 bar (fixed speed)
C14	1.5 kW, 26 rpm, 2075 l/h, 15 bar (fixed speed)
C15	1.5 kW, 38 rpm, 3032 l/h, 10 bar (fixed speed)
C16	1.5 kW, 43 rpm, 3431 l/h, 5 bar (fixed speed)
C17	2.2 kW, 48 rpm, 3830 l/h, 5 bar (fixed speed)
C31	2.2 kW, 17 - 60 rpm, 1356-4788 l/h, 20-70 Hz, 5 bar (Gear motor with integral frequency converter)
C41	1.5 kW, 4 - 34 rpm, 320-2713 l/h, 7-65 Hz, 5 bar (Gear motor, external frequency converter required)
C42	2.2 kW, 4 - 34 rpm, 320-2713 l/h, 7-65 Hz, 10 bar (Gear motor, external frequency converter required)
C43	2.2 kW, 4 - 49 rpm, 400-3910 l/h, 7-65 Hz, 5 bar (Gear motor, external frequency converter required)
C44	3.0 kW, 7 - 62 rpm, 239-4948 l/h, 7-64 Hz, 5 bar (Gear motor, external frequency converter required)
	<b>Hose material</b>
0	NR
B	NBR
E	EPDM
	<b>Hydraulic connections</b>
I	DIN flange VA DN40
G	Tri-Clamp, VA, 2"
H	DIN 11851, VA, NW50
J	DIN flange PP DN40
K	DIN flange PVDF DN40
L	ANSI flange VA, 1 1/2"
M	ANSI flange PP 1 1/2"
N	ANSI flange PVDF/PTFE 1 1/2"
	<b>Base plate</b>
0	Base plate, painted steel
1	Base plate, stainless steel
2	Portable unit + painted steel base plate
3	Portable unit + stainless steel base plate
	<b>Leakage sensor</b>
0	Without leakage sensor
L	With leakage sensor
M	As "L" + relay output
	<b>Rotor</b>
0	Rotor with 2 shoes
	<b>Batch controller</b>
0	Without controller
	<b>Special version</b>
0	Standard
H	Halar-coated housing
	<b>Vacuum system</b>
0	Without
V	With vacuum system
	<b>Approvals</b>
01	CE

## 2.8 Peristaltic Pumps DULCO®flex

### DULCO®flex DFDa 060 peristaltic pump

DFDa	Type
	060 DFDa 060, 3.16 l/revolution
	<b>Drive unit</b>
000	Without drive unit
D11	2.2 kW, 22 rpm, 4.2 m³/h, 5 bar (fixed speed)
D12	3.0 kW, 26 rpm, 4.9 m³/h, 5 bar (fixed speed)
D13	4.0 kW, 22 rpm, 4.2 m³/h, 15 bar (fixed speed)
D14	4.0 kW, 26 rpm, 4.9 m³/h, 10 bar (fixed speed)
D15	4.0 kW, 32 rpm, 6.9 m³/h, 5 bar (fixed speed)
D16	4.0 kW, 37 rpm, 8.0 m³/h, 5 bar (fixed speed)
D17	5.5 kW, 47 rpm, 10.2 m³/h, 5 bar (fixed speed)
D31	5.5 kW, 10 - 36 rpm, 2.2 - 7.8 m³/h, 20-70 Hz, 5 bar (Gear motor with integral frequency converter)
D32	7.5 kW, 19 - 66 rpm, 4.1 - 14.3 m³/h, 20-70 Hz, 5 bar (Gear motor with integral frequency converter)
D41	5.5 kW, 4 - 34 rpm, 0.9 - 7.4 m³/h, 7-65 Hz, 5 bar (gear motor, external FC necessary)
D42	7.5 kW, 7 - 61 rpm, 1.5 - 13.2 m³/h, 7-65 Hz, 5 bar (gear motor, external FC necessary)
	<b>Hose material</b>
0	NR
B	NBR
E	EPDM
	<b>Hydraulic connections</b>
I	DIN Flansch VA DN65
L	ANSI flange VA DN65
J	DIN flange PP DN65
M	ANSI flange PP DN65
U	DIN flange VA, Halar coated + PVDF inserts DN65
V	ANSI flange VA, Halar coated + PVDF inserts DN65
	<b>Base plate</b>
0	Base plate, painted steel
1	Base plate, stainless steel
2	Portable unit + painted steel base plate
	<b>Leakage sensor</b>
0	Without leakage sensor
L	With leakage sensor
M	As "L" + relay output
	<b>Rotor</b>
0	Rotor with 2 shoes
	<b>Batch controller</b>
0	Without controller
	<b>Special version</b>
0	Standard
H	Halar-coated housing
	<b>Vacuum system</b>
0	Without
V	With vacuum system
	<b>Approvals</b>
01	CE



## 2.8 Peristaltic Pumps DULCO®flex

### DULCO®flex DFDa 070 peristaltic pump

DFDa	Type
	070 DFDa 070, 6.7 l/revolution
	<b>Drive unit</b>
000	Without drive unit
E11	3.0 kW, 13.5 rpm, 5.4 m³/h, 5 bar (fixed speed)
E12	4.0 kW, 18 rpm, 7.2 m³/h, 5 bar (fixed speed)
E13	5.5 kW, 13.5 rpm, 5.4 m³/h, 15 bar (fixed speed)
E14	5.5 kW, 26 rpm, 10.4 m³/h, 5 bar (fixed speed)
E15	7.5 kW, 18 rpm, 7.2 m³/h, 15 bar (fixed speed)
E16	7.5 kW, 26 rpm, 10.4 m³/h, 10 bar (fixed speed)
E17	7.5 kW, 32 rpm, 12.8 m³/h, 5 bar (fixed speed)
E18	7.5 kW, 40 rpm, 16 m³/h, 5 bar (fixed speed)
E31	7.5 kW, 10 - 36 rpm, 4 - 14.4 m³/h, 20-70 Hz, 5 bar (gear motor with integrated frequency converter)
E41	7.5 kW, 4 - 34 rpm, 1.6 - 13.7 m³/h, 7-65 Hz, 5 bar (gear motor, external FC necessary)
	<b>Hose material</b>
0	NR
B	NBR
E	EPDM
	<b>Hydraulic connections</b>
I	DIN flange VA DN65
J	DIN flange PP DN65
L	ANSI flange VA, 2 1/2"
M	ANSI flange PP 2 1/2"
Q	DIN flange VA Halar coated DN65
R	ANSI flange VA Halar coated 2 1/2"
	<b>Base plate</b>
0	Base plate, painted steel
1	Base plate, stainless steel
	<b>Leakage sensor</b>
0	Without leakage sensor
L	With leakage sensor
M	As "L" + relay output
	<b>Rotor</b>
0	Rotor with 2 shoes
	<b>Batch controller</b>
0	Without controller
	<b>Special version</b>
0	Standard
H	Halar-coated housing
	<b>Vacuum system</b>
0	Without
V	With vacuum system
	<b>Approvals</b>
01	CE

## 2.8 Peristaltic Pumps DULCO®flex

### DULCO®flex DFDa 080 peristaltic pump

DFDa	Type	
	080	DFDa 080, 11.7 l/revolution
		<b>Drive unit</b>
	000	Without drive unit
	G11	4 kW, 12.5 rpm, 8.7 m³/h, 5 bar (Reduction gear system)
	G12	5.5 kW, 17.6 rpm, 12.3 m³/h, 5 bar (Reduction gear system)
	G13	7.5 kW, 12.5 rpm, 8.7 m³/h, 15 bar (Reduction gear system)
	G14	7.5 kW, 17.6 rpm, 12.3 m³/h, 10 bar (Reduction gear system)
	G15	7.5 kW, 20 rpm, 14 m³/h, 7.5 bar (Reduction gear system)
	G16	7.5 kW, 27.7 rpm, 19.4 m³/h, 5 bar (Reduction gear system)
	G17	11 kW, 30 rpm, 21 m³/h, 5 bar (Reduction gear system)
		<b>Hose material</b>
	0	NR
	B	NBR
	E	EPDM
		<b>Hydraulic connections</b>
	I	DIN flange VA DN80
	J	DIN flange PP DN80
	L	ANSI flange VA 3"
	M	ANSI flange PP 3"
	Q	DIN flange VA Halar coated DN80
	R	ANSI flange VA Halar coated 3"
		<b>Base plate</b>
	0	Base plate, painted steel
		<b>Leakage sensor</b>
	0	Without leakage sensor
	L	With leakage sensor
	M	As "L" + relay output
		<b>Rotor</b>
	0	Rotor with 2 shoes
		<b>Batch controller</b>
	0	Without controller
		<b>Special version</b>
	0	Standard
		<b>Vacuum system</b>
	0	Without
	V	With vacuum system
		<b>Approvals</b>
	01	CE



## 2.8 Peristaltic Pumps DULCO®flex

### DULCO®flex DFDa 100 peristaltic pump

DFDa	Type
100	DFDa 100, 20.0 l/revolution
<b>Drive unit</b>	
000	Without drive unit
F11	7.5 kW, 12.5 rpm, 15 m³/h, 5 bar (fixed speed)
F12	11 kW, 17.6 rpm, 21.1 m³/h, 5 bar (fixed speed)
F13	15 kW, 12.5 rpm, 15 m³/h, 15 bar (fixed speed)
F14	15 kW, 17.6 rpm, 21.1 m³/h, 10 bar (fixed speed)
F15	15 kW, 23 rpm, 27.6 m³/h, 7.5 bar (fixed speed)
F16	15 kW, 27.7 rpm, 33 m³/h, 5 bar (fixed speed)
F17	18.5 kW, 30 rpm, 36 m³/h, 5 bar (fixed speed)
<b>Hose material</b>	
0	NR
B	NBR
E	EPDM
<b>Hydraulic connections</b>	
I	DIN flange VA DN100
J	DIN flange PP DN100
L	ANSI flange VA 4"
M	ANSI flange PP 4"
Q	DIN flange VA Halar coated DN100
R	ANSI flange VA Halar coated 4"
<b>Base plate</b>	
0	Base plate, painted steel
<b>Leakage sensor</b>	
0	Without leakage sensor
L	With leakage sensor
M	As "L" + relay output
<b>Rotor</b>	
0	Rotor with 2 shoes
<b>Batch controller</b>	
0	Without controller
<b>Special version</b>	
0	Standard
<b>Vacuum system</b>	
0	Without
V	With vacuum system
<b>Approvals</b>	
01	CE

## 2.8 Peristaltic Pumps DULCO®flex

### 2.8.6

#### Spare Parts

##### Spare Parts for DFAa 003

	Order no.
DFAa 003 silicone tube	1037107
DFAa 003 Norprene tube A-60-F	1037144
DFAa 003 Solva tube	1037145

##### Spare Parts for DFAa 008

	Order no.
DFAa 008 silicone tube	1037146
DFAa 008 Norprene tube A-60-G	1037147
DFAa 008 silicone tube	1037148
DFAa 008 Solva tube	1037149

##### Spare Parts for DFBa 010

	Order no.
DFBa 010 NR tube	1037150
DFBa 010 NBR tube	1037151
DFBa 010 EPDM tube	1037152
DFBa 010 NR-A tube	1037153
DFBa 010 NBR-A tube	1037154
DFBa 010 NORPRENE tube	1037155
DFBa 010 HYPALON tube	1037156

##### Spare Parts for DFBa 013

	Order no.
DFBa 013 NR tube	1037157
DFBa 013 NBR tube	1037158
DFBa 013 EPDM tube	1037159
DFBa 013 NR-A tube	1037160
DFBa 013 NBR-A tube	1037161
DFBa 013 NORPRENE tube	1037162
DFBa 013 HYPALON tube	1037163

##### Spare Parts for DFBa 016

	Order no.
DFBa 016 NR tube	1037164
DFBa 016 NBR tube	1037165
DFBa 016 EPDM tube	1037166
DFBa 016 NR-A tube	1037167
DFBa 016 NBR-A tube	1037168
DFBa 016 NORPRENE tube	1037169
DFBa 016 HYPALON tube	1037171

##### Spare Parts for DFBa 019

	Order no.
DFBa 019 TYGON tube	1037172
DFBa 019 NORPRENE tube	1037173







## 2.8 Peristaltic Pumps DULCO®flex

### Spare Parts for DFBa 022

	Order no.
DFBa 022 NR tube	1037175
DFBa 022 NBR tube	1037176
DFBa 022 EPDM tube	1037178
DFBa 022 NR-A tube	1037179
DFBa 022 NBR-A tube	1037180
DFBa 022 NORPRENE tube	1037181
DFBa 022 HYPALON tube	1037182

### Spare Parts for DFCa 030

	Order no.
DFCa 030 NR tube	1037183
DFCa 030 NBR tube	1037184
DFCa 030 EPDM tube	1037185
DFCa 030 NR-A tube	1037186
DFCa 030 NBR-A tube	1037187
DFCa 030 tube NORPRENE	1045073

### Spare Parts for DFCa 040

	Order no.
DFCa 040 NR tube	1037192
DFCa 040 NBR tube	1037193
DFCa 040 EPDM tube	1037194
DFCa 040 NR-A tube	1037195
DFCa 040 NBR-A tube	1037196
DFCa 040 NORPRENE tube	1037198

### Spare Parts for DFCa 050

	Order no.
DFCa 050 NR tube	1037199
DFCa 050 NBR tube	1037201
DFCa 050 EPDM tube	1037202
DFCa 050 NR-A tube	1037203
DFCa 050 NBR-A tube	1037204
DFCa 050 tube NORPRENE	1045084

### Spare Parts for DFCa 060

	Order no.
DFCa 060 NR tube	1037206
DFCa 060 NBR tube	1037208
DFCa 060 EPDM tube	1037209
DFCa 060 NR-A tube	1037210
DFCa 060 NBR-A tube	1037211
DFCa 060 tube NORPRENE	1045085

## 2.8 Peristaltic Pumps DULCO®flex

### Spare Parts for DFCa 070/70D

	Order no.
DFCa 070/70D NR tube	1037213
DFCa 070/70D NBR tube	1037214
DFCa 070/70D EFDM tube	1037215
DFCa 070/70D NR-A tube	1037216
DFCa 070/70D NBR-A tube	1037217

### Spare Parts for DFDa 025

	Order no.
DFDa 025 NR tube	1037219
DFCa 025 NBR tube	1037220
DFDa 025 EPDM tube	1037221

### Spare Parts for DFDa 032

	Order no.
DFDa 032 NR tube	1037225
DFCa 032 NBR tube	1037226
DFDa 032 EPDM tube	1037227

### Spare Parts for DFDa 040

	Order no.
DFDa 040 NR tube	1037230
DFCa 040 NBR tube	1037231
DFDa 040 EPDM tube	1037232

### Spare Parts for DFDa 060

	Order no.
DFDa 060 NR tube	1037236
DFCa 060 NBR tube	1037237
DFDa 060 EPDM tube	1037238

### Spare Parts for DFDa 070

	Order no.
DFDa 070 NR tube	1037241
DFCa 070 NBR tube	1037242
DFDa 070 EPDM tube	1037243

### Spare Parts DFDa 080

	Order no.
DFDa 080 hose NR	1041677
DFDa 080 hose NBR	1041678
DFDa 080 hose EPDM	1041679

### Spare Parts for DFDa 100

	Order no.
DFDa 100 NR tube	1037247
DFCa 100 NBR tube	1037248
DFDa 100 EPDM tube	1037249



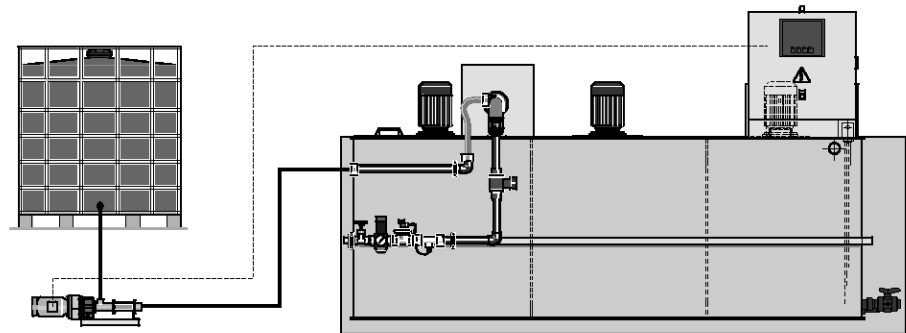
## 2.9 Application Examples

### 2.9.1

### Metering Polymers

Product:	<b>Spectra eccentric screw pump</b>
Metering medium:	<b>Polymer, liquid concentrate</b>
Industry:	<b>Waste water</b>
Application:	<b>Treatment of flocculants</b>

Production of a 0.5% polymer solution with the Ultromat® AFT 2000 and Spectra 12/33 F. The Spectra pump feeds the polymer concentrate from the disposable tank to the Ultromat®.



AP\_0001\_SW3

#### Task and requirements

Preparation of a 0.1 – 0.5 % polymer solution.

#### Operating conditions

- Fluctuating water feed
- Automatic activation of progressive cavity pump
- Highly viscous medium

#### Application information

- Gauge capacity of progressive cavity pump during initial operation
- Provide dry-running protection facility for progressive cavity pump
- Proportional metering of liquid polymer as a function of water feed
- Activation of progressive cavity pump by means of a frequency converter

#### Solution

- Spectra 12/33 F progressive cavity pump for metering liquid concentrate
- ULFa 2000 Ultromat for preparing a 0.1 – 0.5 % polymer solution

#### Benefits

- Constant solution concentration also in connection with fluctuating water feed
- Fully automatic operation with minimum personnel and maintenance requirements
- Flexible process configuration by adapting the pump to different concentration requirements

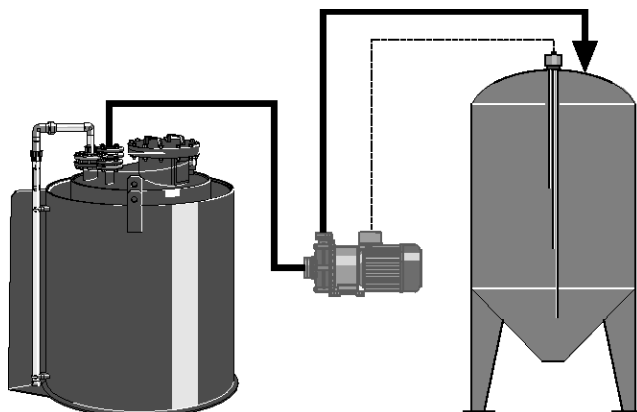


## 2.9 Application Examples

### 2.9.2 Filling a Day Tank

Product:	<b>von Taine® centrifugal pump</b>
Metered medium:	<b>32 % hydrochloric acid solution</b>
Sector:	<b>Food</b>
Application:	<b>Chemical transfer</b>

The von Taine® centrifugal pump is switched on and off automatically by the level control facility in the day tank.



pk\_3\_050

#### Task and requirements

- Automatically filling service tanks with 32 % hydrochloric acid solution

#### Operating conditions

- Indoor operation
- Automatic activation of pump

#### Application information

- Centrifugal pump controlled by level control facility in metering tank
- The centrifugal pump is not self-priming and requires feed
- Hydrochloric acid compatibility of materials must be ensured (PP, PVDF; EPDM)
- Provide dry-running protection facility for centrifugal pump

#### Solution

- vonTaine® 1820 PP centrifugal pump
- Service tank with level control

#### Benefits

- Safe handling of hydrochloric acid
- Fully automatic operation with minimum personnel and maintenance requirements

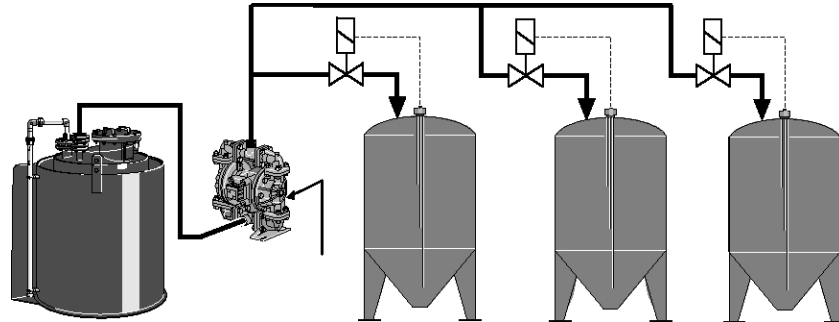
## 2.9 Application Examples

### 2.9.3

#### Filling Day Tanks

Product:	<b>Duodos air-operated diaphragm pump</b>
Metered medium:	<b>Detergent</b>
Sector:	<b>Laundry</b>
Application:	<b>Chemical transfer</b>

The level control facility for the day tanks opens the solenoid valves when the level drops below minimum. With decreasing back pressure, the Duodos pump automatically begins to pump medium into the metering line and switches off when the maximum level in the tank is reached and the solenoid valve is switched off.



pk\_3\_051

#### Task and requirements

- Automatic filling of day tanks with detergent

#### Operating conditions

- Compressed air necessary for operating compressed air diaphragm pump
- Automatic filling of day tanks

#### Application information

- Compressed air diaphragm-type pump controlled by level control facility in metering tank
- The compressed air diaphragm pump is self-priming
- Also suitable for viscous media
- The level control facility for the day tanks opens the solenoid valves when the level drops below minimum. With decreasing back pressure, the compressed air diaphragm-type pump automatically begins to pump medium into the metering line and switches off when the maximum level in the tank is reached and the solenoid valve is switched off

#### Solution

- Duodos air-operated diaphragm pump
- Day tank with level control

#### Benefits

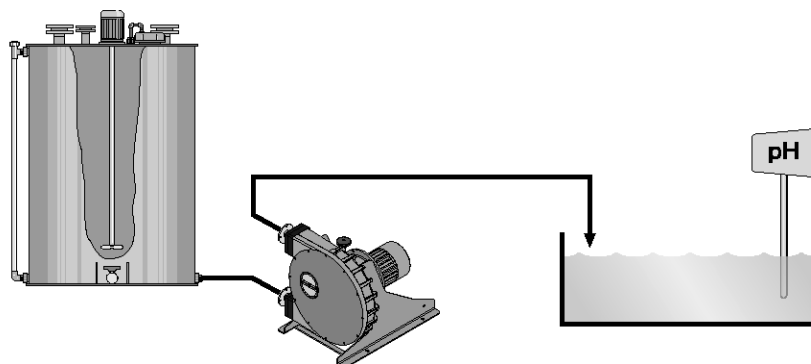
- Simplified logistics through central storage
- Fully automatic operation with minimum personnel and maintenance requirements



## 2.9 Application Examples

### 2.9.4 Deacidification of Potable Water

Product	<b>DULCO®flex peristaltic pump</b>
Feed chemical	<b>Lime milk 10 %</b>
Sector:	<b>Potable water</b>
Application	<b>Feed of abrasive chemicals</b>



AP\_PTW\_0001\_SW

#### Problems and requirements

- Feed of abrasive lime milk into potable water tanks
- Deacidification of the potable water

#### Operating conditions

- The lime milk comes as a 10% suspension
- The pH in the application tank is continuously measured

#### Notes on use

- The peristaltic pump is self-priming
- The pump is controlled by a pH measuring unit
- Speed reduction to extend the service life of the hose

#### Solution

- DULCO®flex DFCa 040 type peristaltic pump
- Hose material: NR (natural rubber)

#### Benefits

- Reliable feed of lime milk
- Fully automatic operation with minimum personnel and maintenance requirements



# 3.0 Overview of DULCODOS® and Ultromat® Metering Systems

## 3.0.1 Selection Guide

Metering systems are ready mounted complete solutions, which are immediately available and ready for use for the most important applications. Whether standard or customised – you'll find the right solution here. The Ultromat® models in the product range are the right choice for metering liquid polymer solutions.

**Tip:** The table provides a good overview.



### Selection Guide for DULCODOS® Metering Systems

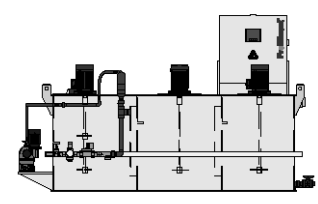
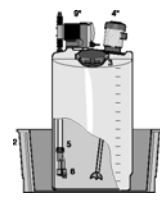
Type	Function	Applications	Capacity range
DULCODOS® eco	Storing, metering	General	35 – 1,000 litres
DULCODOS® panel	Metering	General	0.74 – 1,000 l/h
DULCODOS® Hydrazin	Preparing, metering	Boiler feed water	up to 11 l/h
DULCODOS® PPLA	Mixing, metering	Animal food	–
DULCODOS® custom	Customer-specific	any	–

### Selection Guide for Ultromat® Metering Systems

Type	Application	Polymers	Capacity range
Ultromat® ULFa continuous flow system	Waste water	Liquid + powder	400 – 8,000 l/h
Ultromat® ULPa oscillating system	Waste water, paper	Liquid + powder	400 – 4,000 l/h
Ultromat® ULDa double-deck system	Waste water, paper	Liquid + powder	400 – 2,000 l/h
Ultromat® ATR continuous flow system, with round tanks	Waste water	Powder	400 – 2,000 l/h
Ultromat® MT manual mixing station	Waste water	Powder	120 – 3800 l/h
POLYMORE	Waste water, paper	Liquid	120 – 18,000 l/h
PolyRex	Waste water, paper	Liquid + powder	240 - 3820 l/h

**DULCODOS® metering systems**  
See page → 3-2

**Ultromat® metering systems**  
See page → 3-23



## 3.1 Metering System DULCODOS® eco

### 3.1.1

### Metering System DULCODOS® eco

Choose from a range of different components and adapt the metering station to your requirements.

For storing and metering liquid chemicals Use a selection guide (identity code) to quickly and flexibly adapt your metering station to your metering task.

Two hydraulic connection points guarantee simple installation of the metering system. The ready mounted system consists of components that have been perfectly matched to each other to ensure problem-free operation. You obtain a complete system. Individually configure your metering system at the time of ordering. A simple selection system makes ordering easy and guarantees maximum efficiency even at the time of ordering.

#### Your benefits

- One to three metering pumps mounted on a storage tank, ready for connection with all the necessary accessories
- Short delivery time
- Outstanding value for money
- Compact construction
- Fast commissioning
- Versatile use
- All the components are perfectly matched to each other and fit precisely
- Environmentally-friendly handling of chemicals

#### Technical details

- Chemical tank: PE, various colours, 35 – 1000 litres
- Collecting pan: PE, various colours, 35 – 1000 litres
- Lock for screw top
- Hand mixer / stirrer PP, PVDF or stainless steel, various outputs
- Suction assembly: PP, PVC, various connectors
- Level switch for suction assembly 1-stage, 2-stage
- Drain tap: PP, PVC, with ball valve
- Metering equipment
- Metering pump: alpha, Beta®, gamma/ L, D\_4a, EXtronic®, Sigma/ 1, Sigma/ 2, Sigma/ 3

#### Field of application

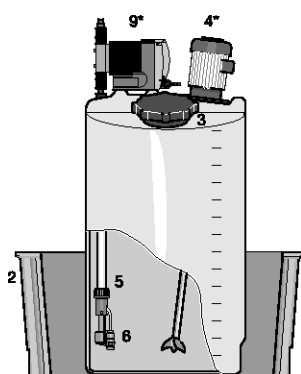
Treatment of cooling, process and swimming pool water

ProMinent® metering systems with PE storage tanks can be selected and ordered with the help of an identity code system. First select the metering pump using the separate pump identity code.

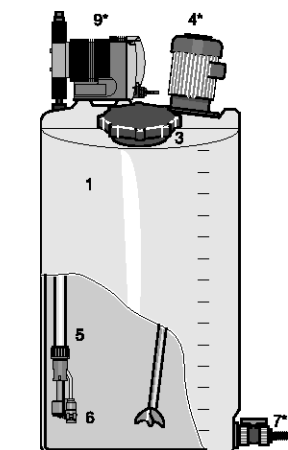
#### Selectable components

1. PE chemical tank (35 – 1,000 litres)
2. Stackable collecting pans (35 – 1,000 litres)
3. Lock for tank screw top
4. Hand mixer / stirrer (\*)
5. Suction assembly
6. Level switch for suction assembly
7. Drain tap for storage tank (\*)
8. Metering equipment (\*)
9. Order metering pump (\*) separately  
(Order the pump separately due to the large number of possible pumps that can be installed on storage tanks. Use the identity code for the pump you require listed in chapters 1, 2 and 5.)

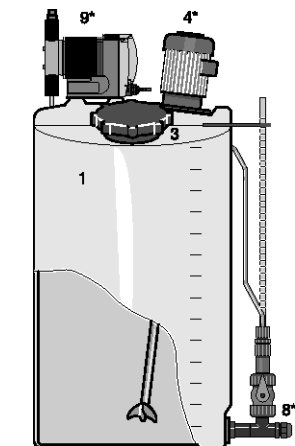
\* These components are ready for subsequent installation, but are supplied separately to avoid damage in transit. Customers should fully install the system on site.



pk\_3\_033



pk\_3\_034



pk\_3\_035





## 3.1 Metering System DULCODOS® eco

The following table shows the combination option of metering pump and storage tank:

Metering pumps	Storage tanks						
	35 l	60 l	100 l	140 l	250 l	500 l	1000 l
alpha	X+	X+	X	X+	X	X+	X+
Beta®	X+	X	X	X	X	X	X
gamma/ L / X	X+	X	X	X	X	X	X
D_4a	X+	X	X	X	X	X	X
Sigma/ 1	–	X+	X+	X+	X	X	X
Sigma/ 2	–	–	–	–	X	X+	X
Sigma/ 3	–	–	–	–	X	X+	X
delta®	–	X+	X+	X+	X	X	X

x = Direct assembly of the pump without mounting plate  
 x+ = Assembly of the pump with mounting plate

### 3.1.2 Identity Code Ordering System, 35 Litres

#### Metering system with storage tank, 35 litres

DSBa	PE tank
	0035N 35 l PE metering tank, neutral colour
	0035S 35 l PE metering tank, black
	0035B 35 l PE metering tank, blue
	0035G 35 l PE metering tank, yellow
	0035R 35 l PE metering tank, red
	<b>Collecting pan</b>
	0 without collecting pan
	1 with collecting pan, neutral colour
	2 with collecting pan, coloured (the same colour as the tank)
	<b>Version</b>
	0 with ProMinent® Logo
	<b>Lock for tank screw top</b>
	0 without lock
	<b>Hand mixer, stirrer</b>
	0 none
	A with PP hand mixer
	<b>Metering pump mounting</b>
	0 without pump
	D for alpha
	E for Beta®, gamma/ L / X, D_4a
	<b>Suction assembly selection</b>
	0 without suction assembly
	1 suction assembly with 6x4 suction hose
	2 suction assembly with 8x5 suction hose
	3 suction assembly with 12x9 suction hose
	<b>Suction assembly material</b>
	0 none
	1 PVC
	2 PP
	<b>Suction assembly float switch</b>
	0 without float switch
	1 2-stage, round plug, (6 x 4, 8 x 5, 12 x 9) for Beta®, gamma/ L / X
	3 1-stage, flat plug (6x4, 8x5, 12x9) for D_4a
	<b>Accessories - discharge tap for tank</b>
	0 without accessories
	1 with ball valve PVC, hose grommet d16 **
	2 with ball valve PP, hose grommet d20 **
	<b>Calibration assembly</b>
	0 without calibration assembly
	1 with metering gauge d6 35/60 l ***
	<b>Info - pump*</b>
	e.g.: BT4a 1005 PPE 300AA000

\* Please enter the Identity code of the selected pump

\*\* Ball valve can only be selected if the metering station is ordered without drip pan.

\*\*\* Metering gauge can only be selected if the metering station is ordered without drip pan and without suction fitting.

## 3.1 Metering System DULCODOS® eco

### 3.1.3 Identity Code Ordering System, 60 Litres

#### Metering system with storage tank, 60 litres

DSBa	PE tank
0060N	60 l PE metering tank, neutral colour
0060S	60 l PE metering tank, black
0060B	60 l PE metering tank, blue
0060G	60 l PE metering tank, yellow
0060R	60 l PE metering tank, red
<b>Collecting pan</b>	
0	without collecting pan
1	with collecting pan, neutral colour
2	with collecting pan, coloured (the same colour as the tank)
<b>Version</b>	
0	with ProMinent® Logo
<b>Lock for tank screw top</b>	
1	with lock
<b>Hand mixer, stirrer</b>	
0	none
A	with PP hand mixer
B	with PP hand stirrer
H	with stainless steel 0.02 kW electric stirrer
P	with PVDF 0.02 kW electric stirrer
<b>Metering pump mounting</b>	
0	without pump
A	for Beta®, gamma/ L / X, D_4a
D	for alpha
F	for Sigma/ 1
P	for delta®
<b>Suction assembly selection</b>	
0	without suction assembly
1	suction assembly with 6x4 suction hose
2	suction assembly with 8x5 suction hose
3	suction assembly with 12x9 suction hose
4	suction assembly DN 10
5	suction assembly DN 15
<b>Suction assembly material</b>	
0	none
1	PVC
2	PP
<b>Suction assembly float switch</b>	
0	without float switch
1	2-stage, round plug, (6 x 4, 8 x 5, 12 x 9) for Beta®, gamma/ L / X, delta®
2	2-stage, round plug, (DN 10-32) for Sigma/ 1/ 2/ 3, delta®
3	1-stage, flat plug, (6x4, 8x5, 12x9) for D_4a
<b>Accessories - discharge tap for tank</b>	
0	without accessories
1	with ball valve PVC, hose grommet d16 **
2	with ball valve PP, hose grommet d20 **
<b>Calibration assembly</b>	
0	without calibration assembly
1	with calibration assembly d6 35/60 l
2	with metering gauge d8 60 l ***
<b>Info - pump*</b>	
e.g.: BT4a 1005 PPE 300AA000	

\* Please enter the Identity code of the selected pump

\*\* Ball valve can only be selected if the metering station is ordered without drip pan.

\*\*\* Metering gauge can only be selected if the metering station is ordered without drip pan and without suction fitting.



## 3.1 Metering System DULCODOS® eco

### 3.1.4 Identity Code Ordering System, 100 litres

#### Metering system with storage tank, 100 litres

DSBa	PE tank
0100N	100 l PE metering tank, neutral colour
0100S	100 l PE metering tank, black
0100B	100 l PE metering tank, blue
0100G	100 l PE metering tank, yellow
0100R	100 l PE metering tank, red
<b>Collecting pan</b>	
0	without collecting pan
1	with collecting pan, neutral colour
2	with collecting pan, coloured (the same colour as the tank)
<b>Version</b>	
0	with ProMinent® Logo
<b>Lock for tank screw top</b>	
1	with lock
<b>Hand mixer, stirrer</b>	
0	none
A	with PP hand mixer
C	with PP hand stirrer
I	with stainless steel 0.18 kW electric stirrer
R	with PVDF 0.18 kW electric stirrer
<b>Metering pump mounting</b>	
0	without pump
A	for Beta®, gamma/ L / X, D_4a
L	for Sigma/ 1
N	for alpha
P	for delta®
<b>Suction assembly selection</b>	
0	without suction assembly
1	suction assembly with 6x4 suction hose
2	suction assembly with 8x5 suction hose
3	suction assembly with 12x9 suction hose
4	suction assembly DN 10
5	suction assembly DN 15
<b>Suction assembly material</b>	
0	none
1	PVC
2	PP
<b>Suction assembly float switch</b>	
0	without float switch
1	2-stage, round plug, (6 x 4, 8 x 5, 12 x 9) for Beta®, gamma/ L / X, delta®
2	2-stage, round plug, (DN 10-32) for Sigma/ 1/ 2/ 3, delta®
3	1-stage, flat plug, (6x4, 8x5, 12x9) for D_4a
<b>Accessories - discharge tap for tank</b>	
0	without accessories
1	with ball valve PVC, hose grommet d16 **
2	with ball valve PP, hose grommet d20 **
<b>Calibration assembly</b>	
0	without calibration assembly
3	with metering gauge d8 100/140 l ***
<b>Info - pump*</b>	
e.g.: BT4a 1005 PPE 300AA000	

\* Please enter the Identity code of the selected pump

\*\* Ball valve can only be selected if the metering station is ordered without drip pan.

\*\*\* Metering gauge can only be selected if the metering station is ordered without drip pan and without suction fitting.

## 3.1 Metering System DULCODOS® eco

### 3.1.5 Identity Code Ordering System, 140 litres

#### Metering system with storage tank, 140 litres

DSBa	PE tank
0140N	140 l PE metering tank, neutral colour
0140S	140 l PE metering tank, black
0140B	140 l PE metering tank, blue
0140G	140 l PE metering tank, yellow
0140R	140 l PE metering tank, red
<b>Collecting pan</b>	
0	without collecting pan
1	with collecting pan, neutral colour
2	with collecting pan, coloured (the same colour as the tank)
<b>Version</b>	
0	with ProMinent® Logo
<b>Lock for tank screw top</b>	
1	with lock
<b>Hand mixer, stirrer</b>	
0	none
A	with PP hand mixer
D	with PP hand stirrer
K	with stainless steel 0.18 kW electric stirrer
S	with PVDF 0.18 kW electric stirrer
<b>Metering pump mounting</b>	
0	without pump
A	for Beta®, gamma/ L / X, D_4a
D	for alpha
H	for Sigma/ 1
P	for delta®
<b>Suction assembly selection</b>	
0	without suction assembly
1	suction assembly with 6x4 suction hose
2	suction assembly with 8x5 suction hose
3	suction assembly with 12x9 suction hose
4	suction assembly DN 10
5	suction assembly DN 15
<b>Suction assembly material</b>	
0	none
1	PVC
2	PP
<b>Suction assembly float switch</b>	
0	without float switch
1	2-stage, round plug, (6 x 4, 8 x 5, 12 x 9) for Beta®, gamma/ L / X, delta®
2	2-stage, round plug, (DN 10-32) for Sigma/ 1/ 2/ 3, delta®
3	1-stage, flat plug, (6x4, 8x5, 12x9) for D_4a
<b>Accessories - discharge tap for tank</b>	
0	without accessories
1	with ball valve PVC, hose grommet d16 **
2	with ball valve PP, hose grommet d20 **
<b>Calibration assembly</b>	
0	without calibration assembly
3	with metering gauge d8 100/140 l ***
<b>Info - pump*</b>	
e.g.: BT4a 1005 PPE 300AA000	

\* Please enter the Identity code of the selected pump

\*\* Ball valve can only be selected if the metering station is ordered without drip pan.

\*\*\* Metering gauge can only be selected if the metering station is ordered without drip pan and without suction fitting.



## 3.1 Metering System DULCODOS® eco

### 3.1.6 Identity Code Ordering System, 250 litres

#### Metering system with storage tank, 250 litres

DSBa	PE tank
	0250N 250 l PE metering tank, neutral colour
	0250S 250 l PE metering tank, black
	0250B 250 l PE metering tank, blue
	0250G 250 l PE metering tank, yellow
	0250R 250 l PE metering tank, red
	<b>Collecting pan</b>
	0 without collecting pan
	1 with collecting pan, neutral colour
	2 with collecting pan, coloured (the same colour as the tank)
	<b>Version</b>
	0 with ProMinent® Logo
	<b>Lock for tank screw top</b>
	1 with lock
	<b>Hand mixer, stirrer</b>
	0 none
	A with PP hand mixer
	E with PP hand stirrer
	L with stainless steel 0.18 kW electric stirrer
	T with electric stirrer PVDF 0.18 kW
	<b>Metering pump mounting</b>
	0 without pump
	A for Beta®, gamma/ L / X, D_4a
	B for Sigma/ 2/ 3
	C for Sigma/ 1
	N for alpha
	P for delta®
	<b>Suction assembly selection</b>
	0 without suction assembly
	1 suction assembly with 6x4 suction hose
	2 suction assembly with 8x5 suction hose
	3 suction assembly with 12x9 suction hose
	4 suction assembly DN 10
	5 suction assembly DN 15
	7 suction assembly DN 25
	8 suction assembly DN 32
	<b>Suction assembly material</b>
	0 none
	1 PVC
	2 PP
	<b>Suction assembly float switch</b>
	0 without float switch
	1 2-stage, round plug, (6 x 4, 8 x 5, 12 x 9) for Beta®, gamma/ L / X, delta®
	2 2-stage, round plug, (DN 10-32) for Sigma/ 1/ 2/ 3, delta®
	3 1-stage, flat plug, (6x4, 8x5, 12x9) for D_4a
	<b>Accessories - discharge tap for tank</b>
	0 without accessories
	1 with ball valve PVC, hose grommet d16 **
	2 with ball valve PP, hose grommet d20 **
	<b>Calibration assembly</b>
	0 without calibration assembly
	4 with metering gauge d12 250 l ***
	<b>Info - pump*</b>
	e.g.: BT4a 1005 PPE 300AA000

\* Please enter the Identity code of the selected pump

\*\* Ball valve can only be selected if the metering station is ordered without drip pan.

\*\*\* Metering gauge can only be selected if the metering station is ordered without drip pan and without suction fitting.

## 3.1 Metering System DULCODOS® eco

### 3.1.7 Identity Code Ordering System, 500 litres

#### Metering system with storage tank, 500 litres

DSBa	PE tank
0500N	500 l PE metering tank, neutral colour
0500S	500 l PE metering tank, black
0500B	500 l PE metering tank, blue
0500G	500 l PE metering tank, yellow
0500R	500 l PE metering tank, red
<b>Collecting pan</b>	
0	without collecting pan
1	with collecting pan, neutral colour
2	with collecting pan, coloured (the same colour as the tank)
<b>Version</b>	
0	with ProMinent® Logo
<b>Lock for tank screw top</b>	
1	with lock
<b>Hand mixer, stirrer</b>	
0	none
A	with PP hand mixer
F	with PP hand stirrer
M	with stainless steel 0.25 kW electric stirrer
U	with PVDF 0.25 kW electric stirrer
<b>Metering pump mounting</b>	
0	without pump
A	for Beta®, gamma/ L / X, D_4a
C	for Sigma/ 1, delta®
D	for alpha
J	for Sigma/ 2/ 3
P	for delta®
<b>Suction assembly selection</b>	
0	without suction assembly
1	suction assembly with 6x4 suction hose
2	suction assembly with 8x5 suction hose
3	suction assembly with 12x9 suction hose
4	suction assembly DN 10
5	suction assembly DN 15
7	suction assembly DN 25
8	suction assembly DN 32
<b>Suction assembly material</b>	
0	none
1	PVC
2	PP
<b>Suction assembly float switch</b>	
0	without float switch
1	2-stage, round plug, (6 x 4, 8 x 5, 12 x 9) for Beta®, gamma/ L / X, delta®
2	2-stage, round plug, (DN 10-32) for Sigma/ 1/ 2/ 3, delta®
3	1-stage, flat plug, (6x4, 8x5, 12x9) for D_4a
<b>Accessories - discharge tap for tank</b>	
0	without accessories
1	with ball valve PVC, hose grommet d16 **
2	with ball valve PP, hose grommet d20 **
<b>Calibration assembly</b>	
0	without calibration assembly
5	with metering gauge d12 500/1,000 l ***
<b>Info - pump*</b>	
e.g.: BT4a 1005 PPE 300AA000	

\* Please enter the Identity code of the selected pump

\*\* Ball valve can only be selected if the metering station is ordered without drip pan.

\*\*\* Metering gauge can only be selected if the metering station is ordered without drip pan and without suction fitting.



## 3.1 Metering System DULCODOS® eco

### 3.1.8 Identity Code Ordering System, 1000 litres

#### Metering system with storage tank, 1000 litres

DSBa	PE tank
1000N	1000 l PE metering tank, neutral colour
1000S	1000 l PE metering tank, black
1000B	1000 l PE metering tank, blue
1000G	1000 l PE metering tank, yellow
1000R	1000 l PE metering tank, red
<b>Collecting pan</b>	
0	without collecting pan
1	with collecting pan, neutral colour
2	with collecting pan, black
<b>Version</b>	
0	with ProMinent® Logo
<b>Lock for tank screw top</b>	
1	with lock
<b>Hand mixer, stirrer</b>	
0	none
G	with hand mixer PP
N	with stainless steel 0.75 kW electric stirrer
W	with PVDF 0.75 kW electric stirrer
<b>Metering pump mounting</b>	
0	without pump
A	for Beta®, gamma/ L / X, D_4a
B	for Sigma/ 2/ 3
C	for Sigma/ 1, delta®
D	for alpha
P	for delta®
<b>Suction assembly selection</b>	
0	without suction assembly
1	suction assembly with 6x4 suction hose
2	suction assembly with 8x5 suction hose
3	suction assembly with 12x9 suction hose
4	suction assembly DN 10
5	suction assembly DN 15
7	suction assembly DN 25
8	suction assembly DN 32
<b>Suction assembly material</b>	
0	none
1	PVC
2	PP
<b>Suction assembly float switch</b>	
0	without float switch
1	2-stage, round plug, (6 x 4, 8 x 5, 12 x 9) for Beta®, gamma/ L / X, delta®
2	2-stage, round plug, (DN 10-32) for Sigma/ 1/ 2/ 3, delta®
3	1-stage, flat plug, (6x4, 8x5, 12x9) for D_4a
<b>Accessories - discharge tap for tank</b>	
0	without accessories
1	with ball valve PVC, hose grommet d16 **
2	with ball valve PP, hose grommet d20 **
<b>Calibration assembly</b>	
0	without calibration assembly
5	with metering gauge d12 500/1,000 l ***
<b>Info - pump*</b>	
e.g.: BT4a 1005 PPE 300AA000	

\* Please enter the Identity code of the selected pump

\*\* Ball valve can only be selected if the metering station is ordered without drip pan.

\*\*\* Metering gauge can only be selected if the metering station is ordered without drip pan and without suction fitting.

## 3.2 Metering System DULCODOS® panel

### 3.2.1 Metering System DULCODOS® panel

A large number of metering tasks are similar or are repeated. This modular system offers a complete ready mounted solution.



Metering systems are immediately available and ready for use for the most important applications. Sensors, controller and metering pumps form a single unit with the required storage tanks, which can take over your work without any installation effort.

Two hydraulic connection points guarantee simple installation of the metering system. The ready mounted systems consist of components that have been perfectly matched to each other to ensure problem-free operation. You obtain a complete system. Individually configure your metering systems at the time of ordering. A simple selection system makes ordering easy and guarantees maximum efficiency even at the time of ordering.

#### Your benefits

- DULCODOS® panel plate-mounted metering systems Ready assembled on a mounting plate, with pipework fitted and complete with all hydraulic and electrical accessories
- Compact construction
- Fast project planning
- Flexible thanks to modular construction
- Proven many times over

#### Field of application

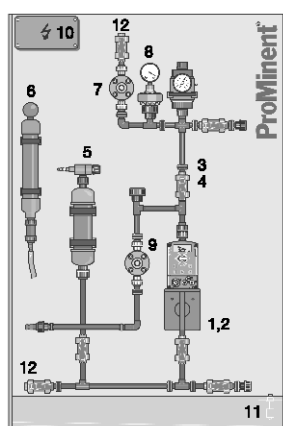
- Metering of biocides and inhibitors in cooling water
- Metering of lyes and acids for pH regulation
- Metering of coagulants (iron-III-chloride) for waste water treatment
- Metering of detergents (CIP (cleaning in place) systems and bottle washing machines)

Panel-mounted metering systems can be selected and ordered with the help of an identity code system.

First of all, select and order the metering and standby pump using the separate pump identity code.

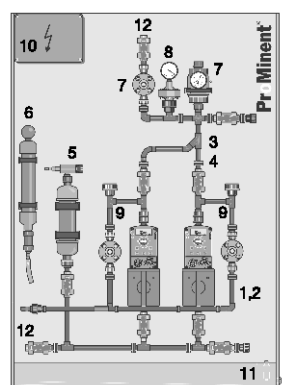
#### The following options can be selected:

1. Assembly frame with pipework for installation of a metering pump
2. Extension for installation of a standby pump (same type as the metering pump)
3. Pipework material
4. Seal material
5. Vacuum cylinder
6. Vacuum pump
7. Pulsation damper
8. Manometer
9. Overflow device
10. Terminal box
11. Leakage sensor
12. Connections for the suction and discharge side



pk\_7\_070

Metering system with simple pump



pk\_7\_061

Metering system with stand-by pump

#### Technical Data

Type		B410	B510	GL10	S110	S115	S215	S220	S325	S332
Nominal width of pipework		DN 10	DN 10	DN 10	DN 10	DN 15	DN 15	DN 20	DN 25	DN 32
Nominal width of flushing connector		DN 10	DN 10	DN 10	DN 10	DN 10	DN 10	DN 15	DN 20	DN 25
Connector return line		DN 10	DN 10	DN 10	DN 10	DN 10	DN 10	DN 15	DN 20	DN 25
Dimensions H x W x D	mm	1,200 x 800 x 300	1,200 x 800 x 300	1,200 x 800 x 300	1,400 x 900 x 450	1,400 x 900 x 450	1,400 x 900 x 450	1,400 x 900 x 450	1,600 x 900 x 500	1,600 x 900 x 500
Dimensions H x W x D with 2 pumps	mm	1,400 x 1,000 x 300	1,400 x 1,000 x 300	1,400 x 1,000 x 300	1,600 x 1,200 x 450	1,600 x 1,200 x 450	1,600 x 1,200 x 450	1,600 x 1,200 x 450	1,600 x 1,200 x 500	1,600 x 1,200 x 500
Max. capacity	l/h	19	32	32	65	120	130	350	324	1,000
Max. operating pressure (25 °C)	bar	10	10	10	10	10	10	10	10	8*/10
Max. operating pressure (40 °C)	bar	6	6	6	6	6	6	6	6	6

\* with pulsation damper option





## 3.2 Metering System DULCODOS® panel

### 3.2.2 Identity Code Ordering System for Beta® and gamma/ L, DN 10

#### Panel-mounted metering systems for Beta® and gamma/ L, DN 10

DSWa	Mounting frame with pipework for installation of one metering pump (order metering pump separately)									
B410	For Beta®, DN 10 (BT4b 1000 - 0220: 0.74 - 19 l/h)									
B510	For Beta®, DN 10 (BT5b 1605 - 0232: 4.1 - 32 l/h)									
GL10	For gamma/ L, DN 10 (GALa 1000 - 0232: 0.74 - 32 l/h)									
Extension for installation of a standby pump (order standby pump separately)										
0	none									
1	with extension for standby pump (same type as metering pump)									
Pipe material										
PC	PVC									
PP	PP									
Seal material										
E	EPDM									
A	FKM									
Vacuum cylinder										
0	none									
1	with vacuum cylinder									
Vacuum pump										
0	none									
1	with vacuum pump									
Pulsation damper										
0	none									
1	with pulsation damper (incl. back pressure valve)									
Pressure gauge										
0	none									
1	with pressure gauge and diaphragm seal unit									
Relief valve assembly										
0	with multifunctional valve (for 1 pump of Type: 1000 - 1605)									
1	with multifunctional valve (for 1 pump of Type: 0708 - 0232)									
2	with back pressure valve (for 1 pump)									
3	with multifunctional valve (for 2 pumps of Type: 1000 - 1605)									
4	with multifunctional valve (for 2 pumps of Type: 0708 - 0232)									
5	with back pressure valves (for 2 pumps)									
Terminal box										
0	without terminal box									
1	with terminal box for 1 pump									
2	with terminal box for 2 pumps									
3	with terminal box + master switch for 1 pump									
4	with terminal box + 2 master switches for 2 pumps									
Leakage sensor in drip tray										
0	without leakage sensor									
1	with leakage sensor									
Suction/discharge side connection parts										
0	with solvent/fusion weld sockets									
1	with 6x4 hose barb									
2	with 8x5 hose barb									
3	with 12x6 hose barb									
4	with 12x9 hose barb									
5	with DN 10 hose barb									
Info - pump*										
	e.g.: BT4b 1005 PPE 300AA000									

\* Please enter the Identity code for your chosen pump

## 3.2 Metering System DULCODOS® panel

### 3.2.3 Identity Code Ordering System for Sigma/ 1, DN 10

#### Panel-mounted metering systems for Sigma/ 1, DN 10

DSWa	Mounting frame with pipework for installation of one metering pump (order metering pump separately)									
	S110	Sigma/ 1, DN 10 (S1Cb/S1Ba 12017 - 07065: 20 - 65 l/h)								
		Extension for installation of a standby pump (order standby pump separately)								
		0	none							
		2	with extension for standby pump (same type as metering pump)							
		Pipe material								
		PC	PVC							
		PP	PP							
		Seal material								
		E	EPDM							
		A	FKM							
		Vacuum cylinder								
		0	none							
		2	with vacuum cylinder							
		Vacuum pump								
		0	none							
		1	with vacuum pump							
		Pulsation damper								
		0	none							
		2	with pulsation damper (incl. back pressure valve)							
		Pressure gauge								
		0	none							
		1	with pressure gauge and diaphragm seal unit							
		Relief valve assembly								
		6	with relief valve assembly							
		Terminal box								
		0	without terminal box							
		1	with terminal box for 1 pump							
		2	with terminal box for 2 pumps							
		3	with terminal box + master switch for 1 pump							
		4	with terminal box + 2 master switches for 2 pumps							
		Leakage sensor in drip tray								
		0	without leakage sensor							
		1	with leakage sensor							
		Suction/discharge side connection parts								
		0	with straight solvent/fusion sockets							
		6	with DN 10 hose connector							
		Info - pump*								
			e.g.: S1Ba H12017 PVT0110M000							

\* Please enter the Identity code for your chosen pump



## 3.2 Metering System DULCODOS® panel

### 3.2.4 Identity Code Ordering System for Sigma/ 1, DN 15

#### Panel-mounted metering systems for Sigma/ 1, DN 15

DSWa	Mounting frame with pipework for installation of one metering pump (order metering pump separately)									
S115	Sigma/ 1, DN 15 (S1Cb/S1Ba 07042 - 04120: 50 - 120 l/h)									
	Extension for installation of a standby pump (order standby pump separately)									
	0	none								
	3	with extension for standby pump (same type as metering pump)								
	Pipe material									
	PC	PVC								
	PP	PP								
	Seal material									
	E	EPDM								
	A	FKM								
	Vacuum cylinder									
	0	none								
	3	with vacuum cylinder								
	Vacuum pump									
	0	none								
	1	with vacuum pump								
	Pulsation damper									
	0	none								
	3	with pulsation damper (incl. back pressure valve)								
	Pressure gauge									
	0	none								
	1	with pressure gauge and diaphragm seal unit								
	Relief valve assembly									
	6	with relief valve assembly								
	Terminal box									
	0	without terminal box								
	1	with terminal box for 1 pump								
	2	with terminal box for 2 pumps								
	3	with terminal box + master switch for 1 pump								
	4	with terminal box + 2 master switches for 2 pumps								
	Leakage sensor in drip tray									
	0	without leakage sensor								
	1	with leakage sensor								
	Suction/discharge side connection parts									
	0	with straight solvent/fusion sockets								
	7	with DN 15 hose connector								
	Info - pump*									
		e.g.: S1Ba H07042 PVT0110M000								

\* Please enter the Identity code for your chosen pump

## 3.2 Metering System DULCODOS® panel

### 3.2.5 Identity Code Ordering System for Sigma/ 2, DN 15

#### Panel-mounted metering systems for Sigma/ 2, DN 15

DSWa	Mounting frame with pipework for installation of one metering pump (order metering pump separately)									
	S215	Sigma/ 2, DN 15 (S2Cb/S2Ba 16050 – 16130: 60 – 130 l/h)								
		Extension for installation of a standby pump (order standby pump separately)								
		0	none							
		4	with extension for standby pump (same type as metering pump)							
		Pipe material								
		PC	PVC							
		PP	PP							
		Seal material								
		E	EPDM							
		A	FKM							
		Vacuum cylinder								
		0	none							
		4	with vacuum cylinder							
		Vacuum pump								
		0	none							
		1	with vacuum pump							
		Pulsation damper								
		0	none							
		4	with pulsation damper (incl. back pressure valve)							
		Pressure gauge								
		0	none							
		1	with pressure gauge and diaphragm seal unit							
		Relief valve assembly								
		6	with relief valve assembly							
		Terminal box								
		0	without terminal box							
		1	with terminal box for 1 pump							
		2	with terminal box for 2 pumps							
		3	with terminal box + master switch for 1 pump							
		4	with terminal box + 2 master switches for 2 pumps							
		Leakage sensor in drip tray								
		0	without leakage sensor							
		1	with leakage sensor							
		Suction/discharge side connection parts								
		0	with straight solvent/fusion sockets							
		8	with DN 15 hose connector							
		Info - pump*								
			e.g.: S2Ba HM16050 PVT0110M000							

\* Please enter the Identity code for your chosen pump



## 3.2 Metering System DULCODOS® panel

### 3.2.6 Identity Code Ordering System for Sigma/ 2, DN 20

#### Panel-mounted metering systems for Sigma/ 2, DN 20

DSWa	Mounting frame with pipework for installation of one metering pump (order metering pump separately)									
S220	Sigma/ 2, DN 20 (S2Cb/S2Ba 07120 – 04350: 120 – 350 l/h)									
	Extension for installation of a standby pump (order standby pump separately)									
	0	none								
	5	with extension for standby pump (same type as metering pump)								
	Pipe material									
	PC	PVC								
	PP	PP								
	Seal material									
	E	EPDM								
	A	FKM								
	Vacuum cylinder									
	0	none								
	5	with vacuum cylinder								
	Vacuum pump									
	0	none								
	1	with vacuum pump								
	Pulsation damper									
	0	none								
	5	with pulsation damper (incl. back pressure valve)								
	Pressure gauge									
	0	none								
	1	with pressure gauge and diaphragm seal unit								
	Relief valve assembly									
	6	with relief valve assembly								
	Terminal box									
	0	without terminal box								
	1	with terminal box for 1 pump								
	2	with terminal box for 2 pumps								
	3	with terminal box + master switch for 1 pump								
	4	with terminal box + 2 master switches for 2 pumps								
	Leakage sensor in drip tray									
	0	without leakage sensor								
	1	with leakage sensor								
	Suction/discharge side connection parts									
	0	with straight solvent/fusion sockets								
	9	with DN 20 hose connector								
	Info - pump*									
		e.g.: S2Ba HM07120 PVT0110M000								

\* Please enter the Identity code for your chosen pump

## 3.2 Metering System DULCODOS® panel

### 3.2.7 Identity Code Ordering System for Sigma/ 3, DN 25

#### Panel-mounted metering systems for Sigma/ 3, DN 25

DSWa	Mounting frame with pipework for installation of one metering pump (order metering pump separately)									
	S325	Sigma/ 3, DN 25 (S3Cb 120145 - 120330: 174 - 324 l/h)								
		Extension for installation of a standby pump (order standby pump separately)								
		0	none							
		6	with extension for standby pump (same type as metering pump)							
		Pipe material								
		PC	PVC							
		PP	PP							
		Seal material								
		E	EPDM							
		A	FKM							
		Vacuum cylinder								
		0	none							
		6	with vacuum cylinder							
		Vacuum pump								
		0	none							
		1	with vacuum pump							
		Pulsation damper								
		0	none							
		6	with pulsation damper (incl. back pressure valve)							
		Pressure gauge								
		0	none							
		1	with pressure gauge and diaphragm seal unit							
		Relief valve assembly								
		6	with relief valve assembly							
		Terminal box								
		0	without terminal box							
		1	with terminal box for 1 pump							
		2	with terminal box for 2 pumps							
		3	with terminal box + master switch for 1 pump							
		4	with terminal box + 2 master switches for 2 pumps							
		Leakage sensor in drip tray								
		0	without leakage sensor							
		1	with leakage sensor							
		Suction/discharge side connection parts								
		0	with straight solvent/fusion sockets							
		A	with DN 25 hose connector							
		Info - pump*								
			e.g.: S3Ba H120145 PVT0110M000							

\* Please enter the Identity code for your chosen pump



## 3.2 Metering System DULCODOS® panel

### 3.2.8 Identity Code Ordering System for Sigma/ 3, DN 32

#### Panel-mounted metering systems for Sigma/ 3, DN 32

DSWa	Mounting frame with pipework for installation of one metering pump (order metering pump separately)									
S332	Sigma/ 3, DN 32 (S3Cb 070410 - 041030: 492 - 1000 l/h)									
	Extension for installation of a standby pump (order standby pump separately)									
	0	none								
	7	with extension for standby pump (same type as metering pump)								
	Pipe material									
	PC	PVC								
	PP	PP								
	Seal material									
	E	EPDM								
	A	FKM								
	Vacuum cylinder									
	0	none								
	7	with vacuum cylinder								
	Vacuum pump									
	0	none								
	1	with vacuum pump								
	Pulsation damper									
	0	none								
	7	with pulsation damper (incl. back pressure valve)								
	Pressure gauge									
	0	none								
	1	with pressure gauge and diaphragm seal unit								
	Relief valve assembly									
	6	with relief valve assembly								
	Terminal box									
	0	without terminal box								
	1	with terminal box for 1 pump								
	2	with terminal box for 2 pumps								
	3	with terminal box + master switch for 1 pump								
	4	with terminal box + 2 master switches for 2 pumps								
	Leakage sensor in drip tray									
	0	without leakage sensor								
	1	with leakage sensor								
	Suction/discharge side connection parts									
	0	with straight solvent/fusion sockets								
	B	with DN 32 hose connector								
	Info - pump*									
		e.g.: S3Ba H070410 PVT0110M000								

\* Please enter the Identity code for your chosen pump

## 3.3 DULCODOS® Hydrazin Metering Systems

### 3.3.1 Metering System DULCODOS® Hydrazin

**Corrosion is the last thing you need with the majority of applications. That is why Hydrazin protects hot water and steam boilers.**

**Chemical tank ranging from 140 to 250 litres**



DULCODOS® Hydrazin batching and metering systems are used for manual batching and automatic metering of diluted hydrazine solutions. And, of course, they also comply with all environmental and safety requirements.

Hydrazine acts as an oxygen binding agent, is volatile in steam and prevents corrosion. As it is carcinogenic, the dispensing and metering systems need to be gas-tight so that no hydrazine vapours can escape. Our systems comply with these requirements.

#### Your benefits

- Gas-tight design
- Precise metering
- Protects the environment

#### Field of application

- Steam circuits
- Power plants

**Hydrazine is used as an oxygen binding agent in the process water sector, predominantly with steam generation. It is a carcinogenic agent and special care is therefore needed when handling it.**

It therefore has to be ensured that the activation threshold for hydrazine is not exceeded with correct and proper use of closed and gas-tight systems.

#### Design

Ready-to-use assembled metering system essentially consisting of:

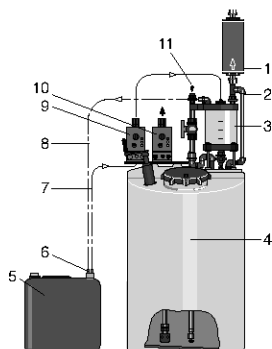
- Gas-tight chemical tank made of PE with a litre scale, with lockable screw lid and manual stirrer
- Each with a dispensing and metering pump with suction assembly, level switch, as well as complete rigid PVC pipework with two ball valves, the measuring tank and activated charcoal filter

#### Accessories

5 m metering line 8/12 mm Ø and stainless steel metering valve 8 mm Ø/1/2"

Electrical connection 230 V ±10 %, 50...60 Hz

The metering system is supplied with a hose connection, which fits on a conventional drain system. This drain system is produced by MicroMatic, Gräfelfing/Munich.



pk\_7\_078

- 1 Activated charcoal filter
- 2 Bleed/vent line
- 3 Apportioning unit
- 4 Metering tank
- 5 Hydrazin 15 returnable canister
- 6 Quick release coupling
- 7 Metering line
- 8 Gas shuttle line
- 9 Refilling pump
- 10 Metering pump
- 11 Fill water

### Hydrazine dispensing and metering system, completely ready mounted

Metering Tank Contents	Metering pump Capacity	Metering pump Feed Rate	Transfer Pump Discharge Flow	Order no.
130 l	7.1 l/h	7.0 bar	17 l/h	913018
250 l	11.0 l/h	7.0 bar	32 l/h	913019

#### Accessories

	Order no.
Sampling set, stainless steel	1003964



## 3.4 DULCODOS® PPLA Liquid Enzyme Metering Systems

### 3.4.1

### Metering System DULCODOS® PPLA

**For the animal feed industry: Ensuring pet food is further enriched with essential nutrients.**



DULCODOS® PPLA systems "enhance" animal feeds: Liquid additives are coated on the pressed feed pellets. The systems operate on a modular principle: extensions and additions are possible at all times. And at the same time a complete solution for storage, dispensing and application of all types of additives.

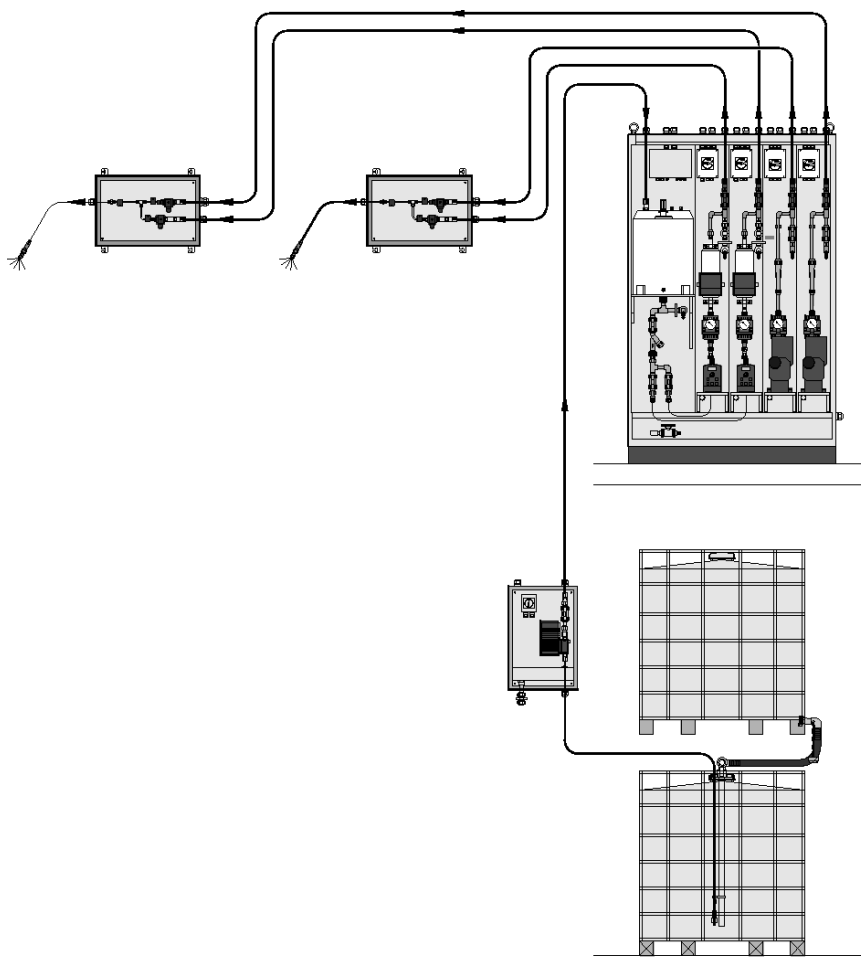
The metering of liquid products plays a decisive role in the production of animal feed. Vitamins and enzymes are probably the best known types of liquid additives. The raw materials for the feed are milled, mixed and then pressed into pellets. DULCODOS® PPLA metering stations apply liquid additives to the feed after pelleting. The liquid products are stored in a container and transported by means of a filling pump into the metering station's daily storage tanks. Water is used as a carrier substance to guarantee the necessary even distribution of additives in the feed. One pump is used for the additives, a second pump for the dilution water. The additives and the water are combined in the mixing station and thoroughly mixed by a static mixer. The diluted additives are sprayed onto the animal feed through a nozzle. Standard solutions within a range of less than 50 ppm to over 1000 ppm are possible.

#### Your benefits

- Fast project planning
- Precise metering

#### Field of application

- Continuous flow processes
- Batch processes



pk\_4\_PPLA

Prices and delivery time on request



## 3.5 Metering System DULCODOS® custom

### 3.5.1

### Metering System DULCODOS® custom

ProMinent supplies customer-specifically designed, complete ready-to-use systems.



On request, ProMinent can equip the systems with measuring and control technology, terminal boxes, control cabinets or, with larger systems, PLC programmable logic controllers. We would be happy to meet your process requirements with tailor-made functional blocks.

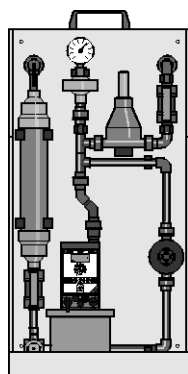
Every system is hydraulically and electrically tested in the factory. A team of experts would be happy to offer you advice.

#### Your benefits

- In addition to the standard PVC, PP, PVDF and stainless steel materials, non-standard materials like PFA are also possible.

#### Portable metering systems

Metering system with pumps and accessories, portable.

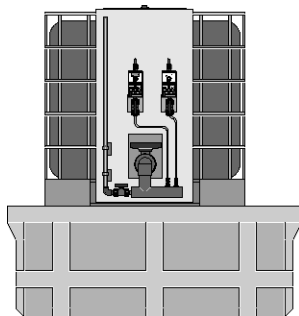


pk\_7\_035

Fig. A: Portable metering stations

#### Metering systems on gutter boxes

Metering system with pumps and accessories, can be suspended from a gutter box.

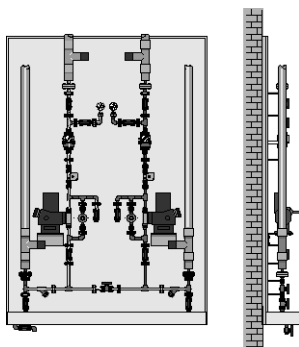


pk\_7\_036

Fig. B: Metering stations, can be suspended from wire frame

#### Panel-mounted metering systems

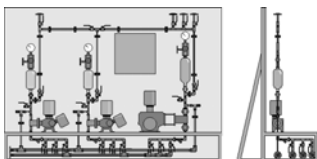
Metering system with pumps and accessories, mounted on a plate for wall mounting.



pk\_7\_038

Fig. C: Panel mounted system

## 3.5 Metering System DULCODOS® custom

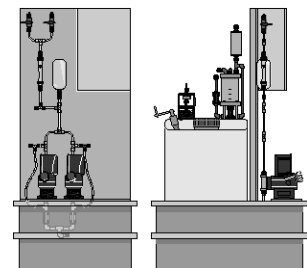


pk\_7\_040

Fig. D: Frame mounted metering systems

### Frame-mounted metering systems

Metering system with pumps and accessories, mounted on a frame.

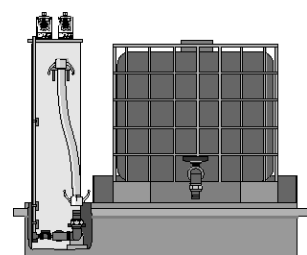


pk\_7\_037

Fig. E: Metering stations mounted onto metering tanks

### Metering systems on storage tanks

Metering system with pumps and accessories, mounted on a storage tank.

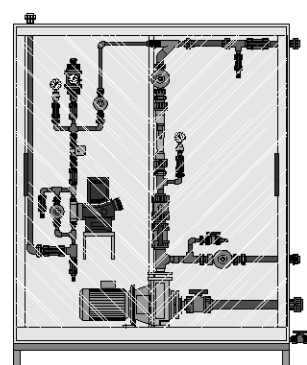


pk\_7\_041

Fig. F: Metering system with collecting pan and chemical feed tank

### Metering systems with collecting pan and storage tank

Metering system with pumps and accessories, with collecting pan and storage tank.



pk\_7\_039

Fig. G: Metering system in metering cabinet

### Metering systems accommodated in a metering cabinet

Metering system with pumps and accessories, mounted in a cabinet.



## 3.6 Modular Metering System DULCODOS®

### 3.6.1

#### Modular Metering System DULCODOS®



##### Modular and flexible for precise metering

**Capacity: 40 to 1,000 l/h, other capacities on request**

The ready-wired modular metering system DULCODOS® is used for the ultra-precise metering of chemicals. It has a modular design and can be flexibly integrated into the most varied applications.

The modular construction of the modular metering systems DULCODOS® enables them to be practically and flexibly coordinated with your process. The metering systems are delivered ready mounted and can be quickly and easily installed. Metering systems DULCODOS® are winning customers over with their precise output all by themselves!

##### Your benefits

- Simple and quick to install, thanks to ready-wired design
- Modular construction for flexible, practical process integration
- Minimal stock of spare parts and short delivery times due to the use of standard parts and components
- Minimal space requirements due to compact construction
- Metering is controlled by pump electronics

##### Technical details

###### Basic design

- Modular configuration options
- Plastic or stainless steel brackets
- Pipework: PP, PVC or PVDF
- Motor-driven metering pump Sigma
- Other capacities on request
- Extensive optional accessories
- Relief valve and non-return valve
- Shut-off device with flushing connector (discharge side)
- Repair switch

###### Options for advanced design

- Pulsation damper with back pressure valve
- Manometer
- Routed pipework for suction and relief lines
- Terminal box with repair switch
- Splash guard

##### Field of application

Metering of chemicals: Cleaning agents, disinfectants, additives and auxiliary agents



## 3.7 Polymer Batching and Metering Systems Ultromat®

### 3.7.1

#### Metering Systems Ultromat® for the Metering of Liquid Polymer Solutions

Ultromat® systems have been designed specifically for the production of ordinary or standard solutions of synthetic polyelectrolytes and have proved themselves many times over. The use of polyelectrolytes as flocculation aids have a very wide range of applications. They can be used in all applications where colloidal solids need to be economically separated from liquids.

Preferred fields of application include:

- Potable water treatment
- Waste water treatment
- Sludge de-watering
- Treatment of process water and circulation water
- Paper production
- Chemical industry, power plants etc.

3 different automatic system concepts are available:

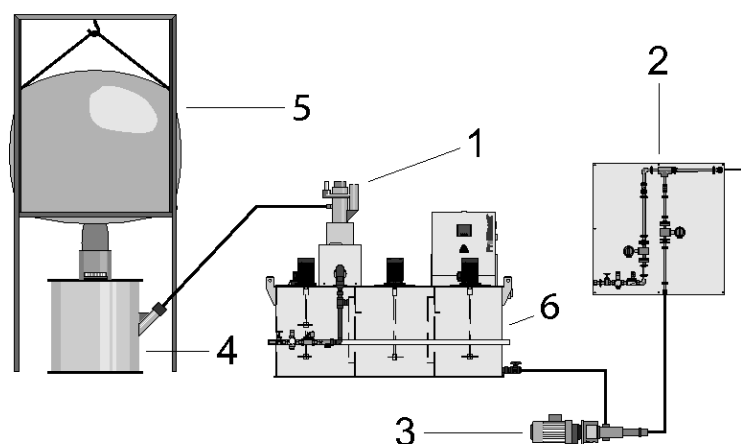
- Continuous flow system (identity code ULFa)
- Oscillating system (identity code ULPa)
- Double-decker system (identity code ULDa)

The systems differ primarily due to the construction of the storage tank. The storage tank in the continuous flow system is sub-divided into 3 chambers, largely preventing the mixing of fresh and matured polymer. The oscillating and double-decker systems consist of two completely separate storage tanks, preventing the mixing of fresh and matured polymer.

Powder metering units and liquid concentrate pumps can be freely selected by means of the identity code. Powdered or liquid polymers can therefore be prepared depending on the application.

Ultromat® unit types ULFa, ULPa and ULDa are equipped with a PLC compact controller and touch screen. Optionally the PLC compact controller can be fitted with a PROFIBUS® or PROFINET module. Input of the solvent concentration, as well as calibration of the powder metering unit and liquid concentrate pump is user-managed. Alarm messages and warnings are shown on the display. The feed of dilution water is continuously detected by a flow meter and shown on the display. The control calculates the polymer requirement based on the set solvent concentration and proportionately controls the powder metering unit or concentrate pump so that the concentration of polymer solution is always kept constant even if there are fluctuations in the water supply.

#### Application examples for complete polymer dissolving systems



- 1 Powder delivery unit
- 2 Re-dilution
- 3 Transfer pump
- 4 Powder storage tank
- 5 Big-Bag
- 6 Ultromat®

AP\_0002\_SW



## 3.7 Polymer Batching and Metering Systems Ultromat®

### 3.7.2

### Continuous Flow Systems Ultromat® ULFa

Many applications are unthinkable without polymers. Practical when production is integrated directly in the workflow: The Ultromat® ULFa continuous flow system ends the process chain.

Extraction rates of up to 8,000 l/h



Polymer batching station Ultromat® ULFa (continuous flow system): This metering system can be used to batch flocculation aids for the preparation of a ready-to-use polymer solution. The system was designed for the fully automatic batching of polymer solutions.

These systems can be used to process both liquid and powdered polymers. The storage tank, which is subdivided into three chambers, largely prevents the carry-over of freshly batched polymer.

Ultromat® ULFa systems are equipped with a PLC Programmable Logic Controller S7-1200 and touch panel.

#### Your benefits

- Processing of liquid polymer (0.05 - 1.0%) and powdered polymer (0.05 - 0.5%)
- Minimal carry-over of product and thus higher-quality results
- Extraction of the polymer solution and drainage of the chambers through the front of the storage tank
- Operator-controlled input of solvent concentration and calibration of powder metering unit and liquid concentrate pump
- Version with terminal box available on request
- Gentle mixing of the polymer solution (electric stirrer)

#### Technical details

Siemens S7-1200 compact control system and KTP 400 touch panel

- Optionally fitted with PROFIBUS® and DP/DP coupler
- Optionally fitted with Profinet and PN/PN coupler

#### Field of application

Many different uses, for example in water treatment, waste water treatment or in paper production.

The following types of polymer can be processed:

- Liquid polymer (0.05 – 1.0 %)
- Powdered polymer (0.05 – 0.5 %)

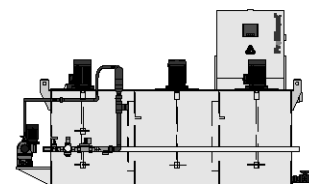
Quickly and flexibly adapt your continuous flow system to your metering task using the ULFa identity code.

#### Selectable components:

- Storage tank size / Extraction rate
- Construction (normal or mirror image)
- Electrical connection
- S7-1200 control (with and without PROFIBUS / PROFINET)
- Options
- Powder metering unit
- Vibrator for powder metering units (promotes the movement of polymer)
- FG205 powder feeder / Top hopper (for filling and feeding the powder metering unit)
- Liquid concentrate pump
- Monitor for liquid concentrate pump (float switch/flow monitor)
- Flush valve (Y-flush inlet or wetting cone)
- Stirrer for 3rd chamber
- Language (pre-set language for the control panel)

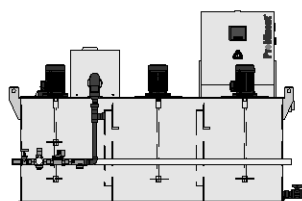
#### The standard scope of supply contains among other things:

- S7-1200 control and KTP 400 touch panel
- Pressure sensor for measuring the liquid level
- Pause function/operating message
- Monitoring of the re-dilution unit
- Lifting lugs for transport
- Socket for FG205 feeder unit (only when powder metering unit is selected)



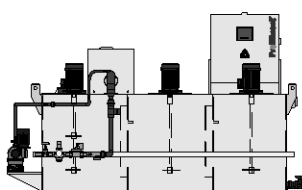
P\_UL\_0024\_SW1

Ultromat® ULFa for liquid polymers



P\_UL\_0022\_SW1

Ultromat® ULFa for powder polymers



P\_UL\_0023\_SW1

Ultromat® ULFa for powder and liquid polymers

## 3.7 Polymer Batching and Metering Systems Ultromat®

### Technical Data

<b>Discharge volume</b>	<b>l/h</b>	<b>400</b>	<b>1,000</b>	<b>2,000</b>	<b>4,000</b>	<b>6,000</b>	<b>8,000</b>
<b>Tank volume</b>	<b>l</b>	400	1,000	2,000	4,000	6,000	8,000
<b>Diluent water max.</b>	<b>l/h</b>	1,500	1,500	3,000	6,000	9,000	12,000
<b>Water pressure</b>	<b>bar</b>	3 – 5	3 – 5	3 – 5	3 – 5	3 – 5	3 – 5
<b>Powdered polymer</b>	<b>kg/h</b>	0.5–11	0.5–11	0.8–18	3.6–55	3.6–55	4.8–110
<b>Length</b>	<b>mm</b>	1,999	2,643	3,292	3,301	4,120	4,605
<b>Width</b>	<b>mm</b>	918	1,002	1,186	1,456	1,651	1,910
<b>Height</b>	<b>mm</b>	1,390	1,740	1,890	2,182	2,182	2,290
<b>Water connection</b>	<b>"</b>	1	1	1	1 1/2	1 1/2	2
<b>Discharge nozzle DN</b>	<b>mm</b>	25	25	32	40	40	50
<b>Concentrate feed DN</b>	<b>mm</b>	15	15	15	20	20	20
<b>Voltage/Frequency</b>	<b>VAC/Hz</b>	400/50	400/50	400/50	400/50	400/50	400/50
<b>Power uptake</b>	<b>kW</b>	1.5	2.6	3.2	5.0	5.0	9.5









## 3.7 Polymer Batching and Metering Systems Ultromat®

### 3.7.3

#### Metering System Ultromat® ULPa

A good solution when microscopically small substances need to be separated for further processing – and this is no longer possible mechanically: Polymer solutions can help here as flocculation aids.

Extraction rates from 400 to 4,000 l/h

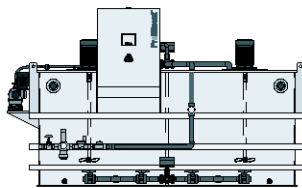


The metering system Ultromat® ULPa (oscillating system) is ideal for batching flocculation aids for the preparation of a ready-to-use polymer solution.

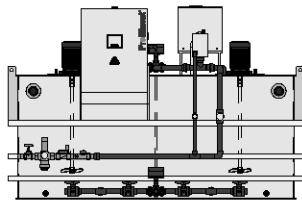
Ultromat® ULPa units consist of two separate chambers, which can be successively filled with polymer solution, eliminating the risk of product carry-over. Both liquid and powdered polymers can be processed depending on the product range.

#### Your benefits

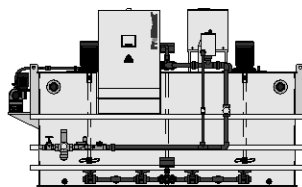
- Processing of liquid polymer (0.05-1.0 %) and powdered polymer (0.05-0.5 %).
- No mixing of fresh and matured polymer.
- Operator-controlled input of the solvent concentration and the calibration of powder metering unit and liquid concentrate pump.
- Gentle mixing of the polymer solution (electric stirrer).
- Version with terminal box available on request.



P\_UL\_0026\_SW1  
Ultromat® ULPa for liquid polymers



P\_UL\_0027\_SW1  
Ultromat® ULPa for powder polymers



P\_UL\_0028\_SW1  
Ultromat® ULPa for powder and liquid polymers

#### Technical details

Siemens S7-1200 compact control system and KTP 400 touch panel.

- Optionally fitted with PROFIBUS® and (DP/DP coupler)
- Optionally fitted with Profinet and PN/PN coupler

#### Field of application

Many different uses, for example in water treatment, waste water treatment or in paper production.

#### The following types of polymer can be processed:

- Liquid polymer (0.05 – 1.0 %)
- Powdered polymer (0.05 – 0.5 %)

#### Selectable components:

- Storage tank size / Extraction rate
- Construction (normal or mirror image)
- Electrical connection
- S7-1200 control (with and without PROFIBUS / PROFINET)
- Options
- Powder metering unit
- Vibrator for powder metering unit (promotes the movement of polymer)
- FG205 powder feeder / Top hopper (for filling and feeding the powder metering unit)
- Liquid concentrate pump
- Monitor for liquid concentrate pump (float switch/flow monitor)
- Flush valve
- Language (pre-set language for the control panel)

#### The standard scope of supply contains among other things:

- S7-1200 control + KTP 400 touch panel
- Pressure sensor for measuring the liquid level
- Pause function/operating message
- Monitoring of the re-dilution unit
- Lifting lugs for transport
- Socket for FG205 feeder unit (only when powder metering unit is selected)

## 3.7 Polymer Batching and Metering Systems Ultromat®

### Technical Data

Discharge volume	l/h	400	1,000	2,000	4,000
Tank volume	l	2 x 400	2 x 1,000	2 x 2,000	2 x 4,000
Diluent water max.	l/h	1,600	4,000	8,000	14,000
Water pressure	bar	3 – 5	3 – 5	3 – 5	3 – 5
Powdered polymer	kg/h	0.5–11	0.8–18	3.6–55	4.8–110
Length	mm	2,040	2,840	3,340	4,540
Width	mm	1,253	1,733	1,918	2,583
Height	mm	1,635	1,739	2,178	2,384
Water connection	"	1	1 1/4	1 1/2	2
Discharge nozzle DN	mm	25	32	40	50
Concentrate feed DN	mm	15	15	20	20
Voltage/Frequency	VAC/Hz	400/50	400/50	400/50	400/50
Power uptake	kW	2.5	3.2	5.5	7.0





## 3.7 Polymer Batching and Metering Systems Ultromat®

### Identity Code Ordering System for Oscillating Systems Ultromat® ULPa

ULPa	Type / Tank size / Discharge volume
0400	Oscillating system / 2x400 l / 400 l/h
1000	Oscillating system / 2x1,000 l / 1,000 l/h
2000	Oscillating system / 2x2,000 l / 2,000 l/h
4000	Oscillating system / 2x4,000 l / 4,000 l/h
<b>Construction</b>	
N	standard
S	mirror-imaged
<b>Electrical connection</b>	
A	400 VAC, 50/60 Hz (3ph, N, PE)
<b>Control</b>	
0	PLC S7-1200
1	PLC S7-1200 with PROFIBUS® (DP/DP coupler)
2	PLC Programmable Logic Controller S7-1200 with PROFINET (PN/PN coupler)
<b>Options</b>	
0	none
<b>Dry feeder</b>	
P0	none
P1	Dry feeder (0400)
P2	Dry feeder (1000)
P3	Dry feeder (2000)
P4	Dry feeder (4000)
<b>Vibrator for dry feeder</b>	
0	none
1	with vibrator for dry feeder
<b>Dry feeder FG205, add-on hopper</b>	
0	none
1	with add-on hopper 50 l (0400, 1000)
2	with add-on hopper 75 l (2000)
3	with add-on hopper 100 l (4000)
4	with add-on hopper 50 l + powder delivery unit FG205 (0400, 1000)
5	with add-on hopper 75 l + powder delivery unit (2000)
6	with add-on hopper 100 l + powder delivery unit (4000)
7	with adapter cover + powder delivery unit
<b>Liquid concentrate pump</b>	
L0	none
L1	with Sigma
L2	with Spectra
L3	prepared for Sigma
L4	prepared for Spectra
<b>Monitor for liquid concentrate pump</b>	
0	none
1	with float switch for concentrate tank
2	with flow monitor (only Spectra)
3	with float switch and flow monitor (only Spectra)
<b>Water pipework with wetting fitting</b>	
0	without wetting cone (liquid version)
1	Wetting cone, PVC (0400)
2	Wetting cone, PVC (1000, 2000)
3	Wetting cone, PVC (4000)
4	Wetting cone, PP (0400)
5	Wetting cone, PP (1000, 2000)
6	Wetting cone, PP (4000)
<b>Language</b>	
BG	bulgarian
CN	chinese
CZ	czech
DA	danish
DE	german
EL	greek
EN	english
ES	spanish
ET	estonian
FI	finnish
FR	french
HR	croatian
HU	hungarian
IT	italian
LT	lithuanian
LV	latvian
MS	malay
NL	dutch
NO	norwegian
PL	polish
PT	portuguese
RO	romanian
RU	russian
SK	slovakian
SL	slovenian
SV	swedish
TR	turkish

## 3.7 Polymer Batching and Metering Systems Ultromat®

### 3.7.4

### Metering Systems Ultromat® ULDa

A good solution when microscopically small substances need to be separated for further processing – and this is no longer possible mechanically: Polymer solutions can help here as flocculation aids.

Extraction rates of up to 2,000 l/h

The ProMinent metering system Ultromat® ULDa is an automatic polyelectrolyte preparation system. It is useful wherever polymers need to be automatically prepared as polymer solutions to act as flocculation aids.

Ultromat® ULDa double-decker systems are used to process liquid and powdered polymers. The system consists of two separate PP storage tanks, stacked above each other, preventing product carry-over. The polymer solution is batched in the upper storage tank and can be transferred to the lower storage tank once the maturing time has elapsed.

#### Your benefits

- Processing of liquid polymer (0.05-1.0 %) and powdered polymer (0.05-0.5 %).
- No mixing of fresh and matured polymer.
- Wide range of versions for specific applications.
- Operator-controlled input of the solvent concentration and calibration of powder metering unit and liquid concentrate pump.
- Water fitting with flow meter and fitting set for the dilution water.
- Gentle mixing of the polymer solution (electric stirrer).
- Version with terminal box available on request.

#### Technical details

- Siemens S7-1200 compact control system and KTP 400 touch panel.
- PLC Programmable Logic Controller optionally fitted with PROFIBUS® and DP/DP coupler.

#### Field of application

Many different uses, for example in water treatment, waste water treatment or in paper production.

#### The following types of polymer can be processed:

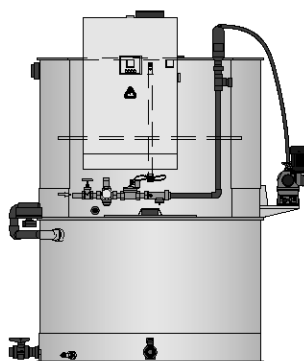
- Liquid polymer (0.05 – 1.0 %)
- Powdered polymer (0.05 – 0.5 %)

#### Selectable components:

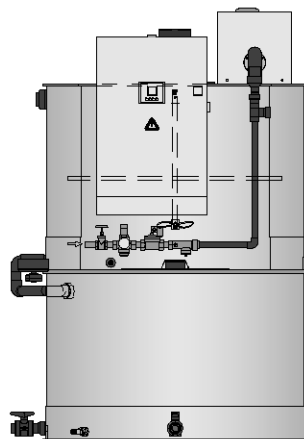
- Storage tank size / Extraction rate
- Construction (normal or mirror image)
- Electrical connection
- S7-1200 control (with and without PROFIBUS / PROFINET)
- Options
  - Powder metering unit
  - Vibrator for powder metering units (promotes the movement of polymer)
  - FG205 powder feeder / Top hopper (for filling and feeding the powder metering unit)
  - Liquid concentrate pump
  - Monitor for liquid concentrate pump (float switch/flow monitor)
  - Flush valve (Y-flush inlet or wetting cone)
  - Language (pre-set language for the control panel)

#### The standard scope of supply contains among other things:

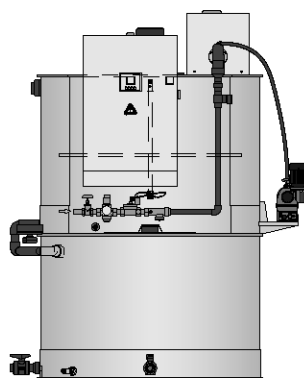
- S7-1200 control + KTP 400 touch panel
- Pressure sensor for measuring the liquid level
- Pause function/operating message
- Monitoring of the re-dilution unit
- Lifting lugs
- Socket for FG205 feeder unit when the powder metering unit is selected



P\_UL\_0029\_SW1  
Ultromat® ULDa for liquid polymers



P\_UL\_0030\_SW1  
Ultromat® ULDa for powder polymers



P\_UL\_0031\_SW1  
Ultromat® ULDa for powder and liquid polymers

### 3.7 Polymer Batching and Metering Systems Ultromat®

#### Technical Data

Discharge volume	l/h	400	1,000	2,000
Tank volume	l	2 x 400	2 x 1,000	2 x 2,000
Diluent water max.	l/h	1,600	4,000	8,000
Water pressure	bar	3 – 5	3 – 5	3 – 5
Powdered polymer	kg/h	0.5–11	0.8–18	3.6–55
Length	mm	1,638	1,902	2,288
Width	mm	1,351	1,615	2,005
Height	mm	2,030	2,514	3,149
Water connection	"	1	1 1/4	1 1/2
Discharge nozzle DN	mm	25	32	40
Concentrate feed DN	mm	15	15	20
Voltage/Frequency	VAC/Hz	400/50	400/50	400/50
Power uptake	kW	1.5	2.6	3.2



### 3.7 Polymer Batching and Metering Systems Ultromat®

## Identity Code Ordering System for Double-deck System Ultramat® ULDa

ULDa	Type / Tank size / Discharge volume										
	0400	Double-deck system / 2x400 l / 400 l/h									
	1000	Double-deck system / 2x1,000 l / 1,000 l/h									
	2000	Double-deck system / 2x2,000 l / 2,000 l/h									
	<b>Construction</b>										
	N	standard									
	S	mirror-imaged									
	<b>Electrical connection</b>										
	A	400 VAC, 50/60 Hz (3ph, N, PE)									
	<b>Control</b>										
	0	PLC S7-1200									
	1	PLC S7-1200 with PROFIBUS® (DP/DP coupler)									
	2	PLC Programmable Logic Controller S7-1200 with PROFINET (PN/PN coupler)									
	<b>Options</b>										
	0	none									
	<b>Dry feeder</b>										
	P0	none									
	P1	Dry feeder (0400)									
	P2	Dry feeder (1000)									
	P3	Dry feeder (2000)									
	<b>Vibrator for dry feeder</b>										
	0	none									
	1	with vibrator for dry feeder									
	<b>Dry feeder FG205, add-on hopper</b>										
	0	none									
	1	with add-on hopper 50 l									
	2	with add-on hopper 75 l									
	3	with add-on hopper 100 l									
	4	with add-on hopper 50 l + powder delivery unit									
	5	with add-on hopper 75 l + powder delivery unit									
	6	with add-on hopper 100 l + powder delivery unit									
	7	with adapter cover + powder delivery unit									
	<b>Liquid concentrate pump</b>										
	L0	none									
	L1	with Sigma									
	L2	with Spectra									
	L3	prepared for Sigma									
	L4	prepared for Spectra									
	<b>Monitor for liquid concentrate pump</b>										
	0	none									
	1	with float switch for concentrate tank									
	2	with flow monitor (only Spectra)									
	3	with float switch and flow monitor (only Spectra)									
	<b>Language</b>										
	BG	bulgarian									
	CN	chinese									
	CZ	czech									
	DA	danish									
	DE	german									
	EL	greek									
	EN	english									
	ES	spanish									
	ET	estonian									
	FI	finnish									
	FR	french									
	HR	croatian									
	HU	hungarian									
	IT	italian									
	LT	lithuanian									
	LV	latvian									
	MS	malay									
	NL	dutch									
	NO	norwegian									
	PL	polish									
	PT	portuguese									
	RO	romanian									
	RU	russian									
	SK	slovakian									
	SL	slovenian									
	SV	swedish									
	TR	turkish									

## 3.7 Polymer Batching and Metering Systems Ultromat®

### 3.7.5

#### Metering System Ultromat® ATR

**The complete solution: Produces polymer solutions. Automated and reliable.**

**Extraction rates of up to 2,000 l/h**



The metering system Ultromat® ATR (continuous flow system with round tank) is used for processing powdered polymers into ready-to-use polymer solutions.

Ready-mounted, automatic triple chamber batching systems for powdered flocculants to prepare a 0.05 to 0.5% polymer solution. The Ultromat® consists of 3 individual cylindrical PP storage tanks that serve as batching, maturing and storage tanks. The cylindrical storage tanks are hydraulically coupled via overflow channels. The storage tanks are extremely stable and do not require any additional reinforcement. The shipping weight of the Ultromat® ATR metering system is thus considerably reduced.

#### Your benefits

- Ready-for-use assembled systems
- Three individual cylindrical PP cylindrical tanks serve as batching, maturing and storage tanks
- Cylindrical storage tanks are hydraulically coupled via overflow channels
- Dry feeder with drive motor, metering pipe heating and powder funnel with seal tight lid
- Flushing system for flushing and wetting of the powder
- Gentle mixing of the polymer solution with two electric stirrers

#### Technical details

Control cabinet for automatic control of the entire system Reliable and precise: Siemens LOGO control

#### Field of application

Many different uses, for example in water treatment, waste water treatment or in paper production.

#### The Ultromat® basically consists of the following components:

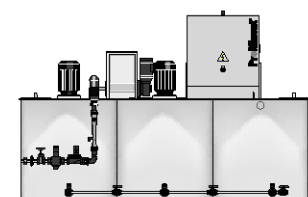
- Ultromat storage tanks made of 3 individual cylindrical PP storage tanks that serve as batching, maturing and storage tanks.
- Dry feeder with drive motor, metering pipe heater and powder funnel with seal tight lid
- Flushing system for flushing and wetting the powder with flush valve, flow meter and fitting set for the dilution water.
- Two slow-running electric stirrers
- Control cabinet for the automatic control of the entire system

#### Ultromat® ATR

	Process solution l/h	Order no.
Ultromat® ATR 400	400	1033810
Ultromat® ATR 1000	1,000	1033811
Ultromat® ATR 2000	2,000	1033812

#### Options

	Order no.
3 <sup>rd</sup> stirrer for 0.18 kW for ATR 400	1033794
3 <sup>rd</sup> stirrer for 0.55 kW for ATR 1000	1033795
3 <sup>rd</sup> stirrer for 0.75 kW for ATR 2000	1033803
Overflow sensor for Ultromat® tank	1021604
Vibrator for powder feeder	1033808



P\_UL\_0020\_SW



## 3.7 Polymer Batching and Metering Systems Ultromat®

### Technical Data

Discharge volume	l/h	400	1,000	2,000
Tank volume	l	400	1,000	2,000
Diluent water max.	l/h	1,500	1,500	3,000
Water pressure	bar	3 – 5	3 – 5	3 – 5
Powdered polymer	kg/h	0.8–18	0.8–18	0.8–18
Length	mm	2,164	2,464	2,950
Width	mm	883	983	1,157
Height	mm	1,216	1,566	1,716
Water connection	"	1	1	1
Discharge nozzle DN	mm	25	25	32
Voltage/Frequency	VAC/Hz	400/50	400/50	400/50
Power uptake	kW	1.5	2.6	3.2





## 3.7 Polymer Batching and Metering Systems Ultromat®

### 3.7.6

### Metering Systems POLYMORE

The POLYMORE in-line batching station creates homogeneous and ready-to-use polymer solutions.

Capacity range of up to 18,000 l/h



The metering system POLYMORE is the inline batching station in which the liquid polymer is introduced into the pressure-encapsulated multi-zone mixing equipment through a peristaltic pump. The result is a prepared and homogeneous polymer solution.

The POLYMORE metering system is an inline polymer batching system for processing liquid polymers. The unit was designed for wall-mounting and requires little space. Only water, liquid polymer and supply voltage need to be connected to the unit for commissioning. If the maturing time is not sufficient for certain applications, a maturing tank with stirrer and metering pump can be fitted downstream.

#### Your benefits

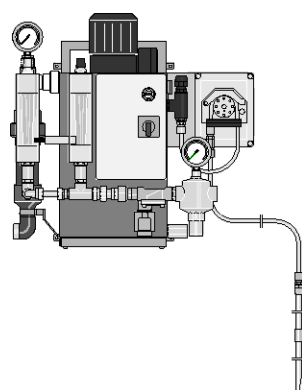
- Wall mounting: Saves space
- Low-maintenance peristaltic pump for metering the liquid polymer
- Simple and quick to connect Requires only water, liquid polymer and power
- Downstream installation of a maturing tank with stirrer and metering pump is possible if the maturing time is insufficient for certain applications
- Automatic control
- Pressure-encapsulated mixing system for the effective production of polymer solutions
- Waterside equipment includes pressure reducer and solenoid valve
- Re-dilution unit with static mixer and manometer
- Manual or 4-20 mA control of the peristaltic pump

#### Technical details

- Peristaltic pump for metering liquid polymer
- Water apparatus includes pressure reducer and solenoid valve
- Pressure-encapsulated mixing system for the effective production of polymer solution
- Re-dilution unit with static mixer and manometer
- Controller for the automated control of the device. Manual or 4-20 mA control of the peristaltic pump

#### Field of application

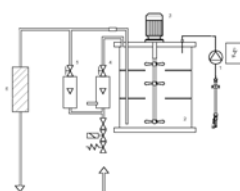
- Waste water treatment
- Sludge de-watering
- Paper production



pk\_7\_091

	Diluent water max. l/h	Metering output liquid polymer kg/h	Order no.
<b>POLYMORE mini 2-0.08</b>	120	0.08	1029568
<b>POLYMORE mini 3-0.6</b>	180	0.60	1029570
<b>POLYMORE mini 5-0.6</b>	300	0.60	1029571
<b>POLYMORE mini 5-1.2</b>	300	1.20	1029572
<b>POLYMORE mini 10-1.2</b>	600	1.20	1029574
<b>POLYMORE mini 10-2.4</b>	600	2.40	1029575
<b>POLYMORE mini 30-3.0</b>	1,800	3.00	1029576
<b>POLYMORE duo 40-6.0</b>	2,400	4.00	1029577
<b>POLYMORE duo 65-9.0</b>	3,900	8.00	1029579
<b>POLYMORE midi 100-12</b>	6,000	12.00	1029580
<b>POLYMORE midi 160-24</b>	9,600	20.00	1029581
<b>POLYMORE maxi 300-54</b>	18,000	50.00	1029584

- 1 Peristaltic pump
- 2 Mixer unit
- 3 Stirrer
- 4 Diluent water
- 5 Diluent water
- 6 Static mixer



AP\_UL\_0002\_SW



## 3.7 Polymer Batching and Metering Systems Ultromat®

### 3.7.7

#### Metering System PolyRex

**PolyRex can do more: Processes liquid and powdered polymers.**

**Capacity range of up to 3,820 l/h**



The metering system PolyRex is a double-decker batching station for the processing of liquid and powdered polymers. It consists of the feed and mixer unit and the two stainless steel double-decker tanks. The polymers used are ideally utilised.

The upper storage tank is the batching/maturing tank. The lower tank is the storage tank for the prepared polymer solution. The powdered polymer is transported to the powder metering unit by a vacuum conveyor and mixed with water in the underlying mixer unit. The solution is then transferred to the upper storage tank (batching/maturing tank) using the water pressure of the diluting water. After maturing, the solution can be transferred to the bottom storage tank via the motorised valve. If liquid polymers are used, a switch is made to the Spectra eccentric screw pump. The system is automatically controlled by a Siemens PLC Programmable Logic Controller S7.

#### Your benefits

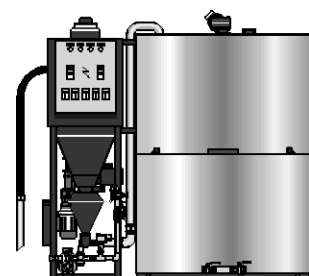
- Optimum utilisation of the polymer used
- Double screw metering unit enables low-pulsation metering with a high level of metering precision
- Optimal re-dilution with highly effective static mixers
- Optional: Automatic filling of the powder silo by vacuum filler
- Pressure reducer provides for a constant water supply
- Effective mixing of the polymer solution with the stainless steel design
- The system is automatically controlled by a Siemens PLC Programmable Logic Controller S7.

#### Technical details

- Vacuum conveyor and powder metering unit for the metering of powdered polymers and an eccentric screw pump to meter liquid polymers
- Water apparatus with wetting cone and injector to produce an effective and homogeneous polymer solution from powdered polymers (modified apparatus when using liquid polymers)
- Double-decker storage tank made of stainless steel for maturing and storing the polymer solution
- Motorised valve to dispense the solution into the storage tank
- Stirrer in the upper storage tank for the gentle mixing of the polymer solution
- Control cabinet with S7 control for the automatic control of the system

#### Field of application

- Waste water treatment
- Sludge de-watering
- Paper production



pk\_7\_092

	Tank volume	Discharge volume	Metering output liquid polymer
	m <sup>3</sup>	l/h	kg/h
<b>PolyRex 0.6</b>	2 x 0.3	240	1.2
<b>PolyRex 1.0</b>	2 x 0.6	460	2.3
<b>PolyRex 2.0</b>	2 x 1.0	940	4.7
<b>PolyRex 3.0</b>	2 x 1.5	1,280	6.4
<b>PolyRex 4.0</b>	2 x 2.0	1,900	9.5
<b>PolyRex 5.4</b>	2 x 2.7	2,400	12.0
<b>PolyRex 6.6</b>	2 x 3.3	3,200	16.0
<b>PolyRex 8.4</b>	2 x 4.2	3,820	19.2



## 3.7 Polymer Batching and Metering Systems Ultromat®

### 3.7.8

#### Metering System Ultromat® MT

This manual polymer batching station is worthwhile if you only work with small quantities or only prepare polymer solutions now and again.

Capacity range from 120 to 3800 l/h



Manual polymer batching station Ultromat® MT: Perfect metering system for the processing of small quantities of liquid and powdered polymers: extremely robust and cost-effective.

The Ultromat® MT is ideal for individually batching polymer solutions where there is no need for automatic operation. The powdered polymer is added manually through the wetting cone to the maturing tank and mixed by the stirrer. After the maturing time, the flocculant solution can then be metered into the application.

##### Your benefits

- Ideal for use where there is no need for continuous operation
- Manual addition of flocculants
- Robust and cost-effective
- Round polypropylene batching tank
- Flushing system with wetting cone and injector
- Gentle mixing of the polymer solution

##### Technical details

- Slowly-running stirrer
- Flushing system
- Level switch (Low flow, Min, Max contact)
- Terminal box

##### Field of application

Waste water treatment, sludge dewatering

##### The systems consist of:

- 1 PP batching tank
- 1 Flushing system for flushing and wetting the powder with wetting cone, injector and fitting set for the dilution water
- 1 Slow-running electric stirrer
- 1 Level switch with three switching points
- 1 Terminal box

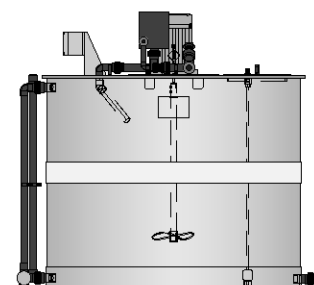
#### Ultromat® MT

	Order no.
MT 140, stirrer 0.18 kW	1037073
MT 250, stirrer 0.55 kW	1037094
MT 500, stirrer 0.75 kW	1037095
MT 1000, stirrer 1.1 kW	1037096
MT 2000, stirrer 2.2 kW	1037097
MT 3000, stirrer 2.2 kW	1037098
MT 4000, stirrer 3 kW	1037099

#### Technical Data

Type		MT 140	MT 250	MT 500	MT 1000	MT 2000	MT 3000	MT 4000
Discharge volume	l/h	120	210	440	920	1,890	2,850	3,800
Tank volume	l	120	210	440	920	1,890	2,850	3,800
Diameter of tank	mm	640	650	850	1,260	1,460	1,770	1,650
Height of tank	mm	714	1,116	1,018	1,016	1,518	1,620	2,072
Height	mm	1,003	1,405	1,309	1,320	1,875	1,998	2,496
Water connection DN	mm	20	20	20	25	32	40	40
Discharge nozzle DN	mm	20	20	20	25	32	40	40
Voltage/Frequency	VAC/Hz	400/50	400/50	400/50	400/50	400/50	400/50	400/50
Power uptake	kW	0.18	0.55	0.75	1.10	2.20	2.20	3.00

The systems are also available with flushing water fitting, level indicator and switchgear.

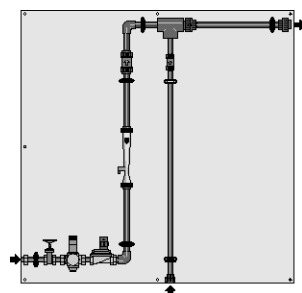


P\_UL\_0025\_SW1

## 3.7 Polymer Batching and Metering Systems Ultromat®

### 3.7.9

### Ultromat® Accessories



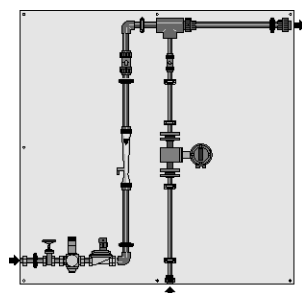
pk\_7\_030

#### Ultromat® VS dilution unit

Ultromat® dilution units are pre-assembled turnkey units for the dilution of polymer solutions, essentially comprising:

- 1 Water fitting for the dilution water with manual stop tap, pressure release valve, solenoid valve 24 V DC and flow meter float including minimum contact
- 1 Pipe for the polymer solution to be diluted including non-return valve
- 1 Static mixer for mixing stock solution with the dilution water

	Process solution	Order no.
<b>VS 1000</b>	1,000 l/h	1021386
<b>VS 2000</b>	2,000 l/h	1021387
<b>VS 5000</b>	5,000 l/h	1021388
<b>VS 10000</b>	10,000 l/h	1021389
<b>VS 20000</b>	20,000 l/h	1021390
<b>VS 30000</b>	30,000 l/h	1021391
<b>VS 50000</b>	50,000 l/h	1021392



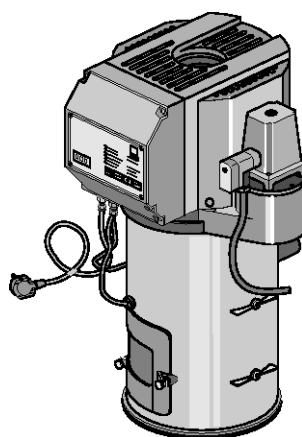
pk\_7\_031

#### Ultromat® VS-IP dilution unit with flow meter

The Ultromat® dilution units are pre-assembled turnkey units for the dilution of polymer solutions, essentially comprising:

- 1 Water fitting for the dilution water with manual stop tap, pressure release valve, solenoid valve 24 V DC and flow meter float including minimum contact
- 1 Pipe for the polymer solution to be diluted including non-return valve and inductive flow meter
- 1 Static mixer for mixing stock solution with the dilution water

	Process solution	Order no.
<b>VS 1000 IP</b>	1,000 l/h	1021490
<b>VS 2000 IP</b>	2,000 l/h	1021491
<b>VS 5000 IP</b>	5,000 l/h	1021492
<b>VS 10000 IP</b>	10,000 l/h	1021493
<b>VS 20000 IP</b>	20,000 l/h	1021494
<b>VS 30000 IP</b>	30,000 l/h	1021495
<b>VS 50000 IP</b>	50,000 l/h	1021496



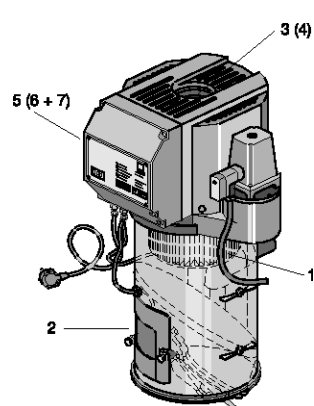
pk\_3\_032

#### Ultromat® hopper loader FG 205

The Ultromat® hopper loader 205 is used to refill the dry feeder in Ultromat® systems with commercially available powdered polymers. With the aid of a suction hose and suction lance, the powder is sucked out of the storage container (Big-Bag, powder storage tank) into the powder conveyor and via a flap into the powder feed screw of the polymer diluting station. The powder conveyor is self-operating and simply requires a 230 V DC terminal. External control contacts are not necessary. Depending upon the powder quality, approx. 75-90 kg of powder polymer can be conveyed per hour. The 4 m feed tube and suction nozzle are included as standard.

	Feed rate	Order no.
<b>Hopper loader FG 205</b>	75 – 90 kg/h	1000664

## 3.7 Polymer Batching and Metering Systems Ultromat®

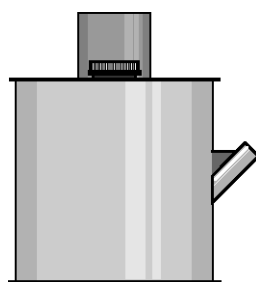


pk\_2\_105

- 1 Filter cartridge
- 2 Filter mat
- 3 Fan
- 4 Carbon brushes, set
- 5 Control

### Spare parts for the FG 205 hopper loader

	Order no.
Filter cartridge 0.2 m <sup>2</sup>	1010773
Filter insert	1010774
Fan	1036770
Set of carbon brushes	1036771
Control	1050453
Set of carbon brushes (till 2012/08)	1010769

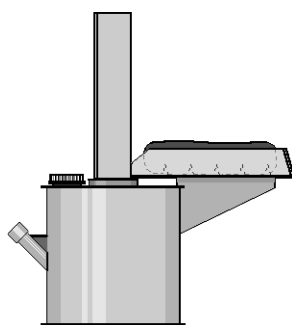


pk\_7\_033

### Powder pre-storage tank

The powder pre-storage tank is used for interim storage of powdered polymers that are delivered in Big-Bags. The Big-Bag is suspended over the tank on a frame and emptied into the powder pre-storage tank.

	Tank volume	Order no.
Powder pre-storage tank	280 l	1005573

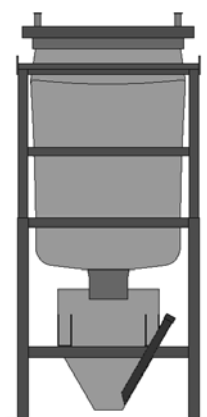


pk\_7\_060

### Powder pre-storage tank with sack tipper

The powder pre-storage tank with sack tipper is used for interim storage of powdered polymers delivered in 25 kg sacks.

	Tank volume	Order no.
Powder pre-storage tank with sack tipper	280 l	1025137



P\_UL\_0021\_SW

### Big Bag Emptying Unit

This emptying unit is used to accommodate and empty Big Bags weighing up to 1,000 kg. The Big Bags are suspended in the frame with the aid of a lifting cross bar. The 30-litre powder storage tank is used to transfer the powder into a feed unit.

The emptying unit consists of the following components:

- Frame 1570 x 1300 x 2540 mm (WxLxH). The height can be adjusted up to 2040 mm
- Suspension cross bar
- Powder storage tank with powder filling sensor, 30-litre content

	Tank volume	Order no.
Big Bag Emptying Unit	30 l	–

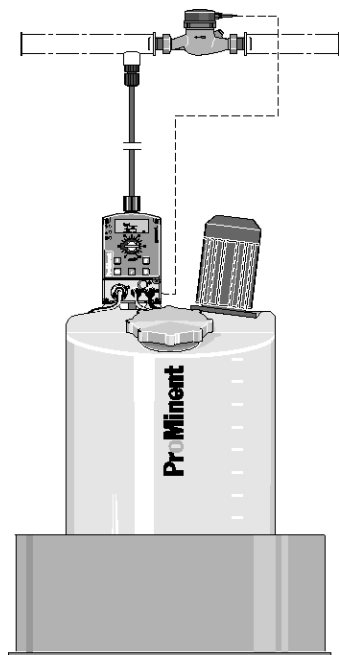


## 3.8 Application Examples

### 3.8.1 Proportional Metering of Phosphate

Product: **DULCODOS® eco**  
 Feed chemical: **Phosphate**  
 Industry: **Potable water**  
 Application: **Potable water conditioning**

The liquid phosphate is added to the potable water proportional to the volume. The flow meter sends pulses to the gamma/ L pump. The metering volume is adjusted by increasing or decreasing the incoming pulses.



pk\_7\_093

#### Tasks and requirements

Metering of phosphate to potable water to prevent lime deposits and corrosion in the piping

#### Operating conditions

- Treatment of potable water
- Fluctuating water demand
- Water temperature between 4 – 30 °C

#### Application information

- Proportional metering of phosphate depending on the water supply
- Control of the metering pump by a contact water meter
- Measurement of the metering pump capacity during commissioning

#### Solution

- DULCODOS® eco with 140-litre metering tank and drip pan
- gamma/ L with contact input and pulse control
- Contact water meter

#### Benefits

- Constant solution concentration even minimal fluctuating water supply
- Fully-automatic operation with minimal staff and maintenance
- Flexible process design thanks to adaptation of the pump to various concentration demands

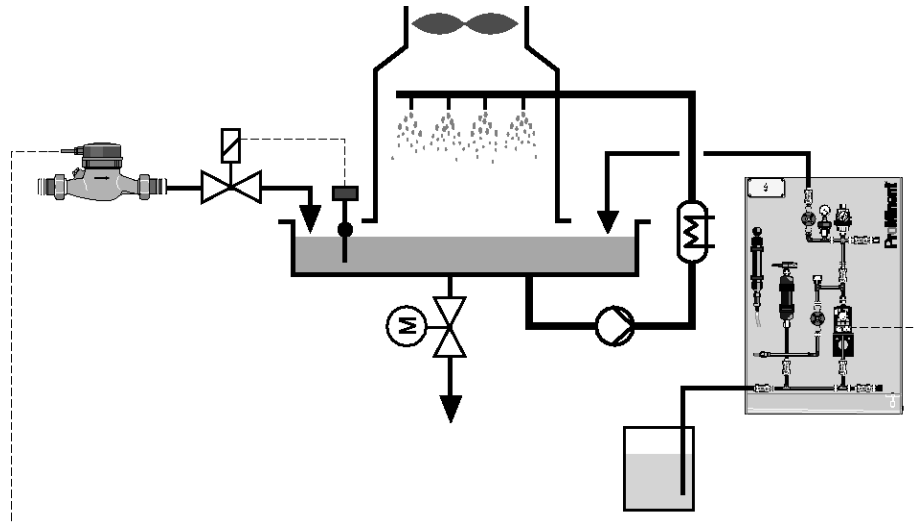


## 3.8 Application Examples

### 3.8.2 Inhibitor Metering in Cooling Water

Product: **DULCODOS® panel**  
 Feed chemical: **Corrosion inhibitor**  
 Industry: **Process industry, power stations**  
 Application: **Cooling water conditioning**

The corrosion inhibitor is added to the fresh water in proportion to the volume. The water meter detects the supply water volume and sends the pulses to the gamma/ L pump.



pk\_7\_060\_1

#### Tasks and requirements

Metering of corrosion inhibitors to supply water to prevent lime deposits and corrosion in the cooling water circuit.

#### Operating conditions

- Treatment of flow water
- Fluctuating water demand
- Water temperature between 4 – 20 °C

#### Application information

- Proportional metering of inhibitor depending on the water supply
- Control of the metering pump by a contact water meter
- Calibration of the metering pump capacity during commissioning

#### Solution

- DULCODOS® panel including standby pump
- gamma/ L with contact input and pulse control
- Contact water meter

#### Benefits

- Protection against corrosion in the pipework and heat exchanger
- Constant solution concentration even with fluctuating water supply
- Fully-automatic operation with minimal staff and maintenance
- Flexible process design thanks to adaptation of the pump to various concentration demands

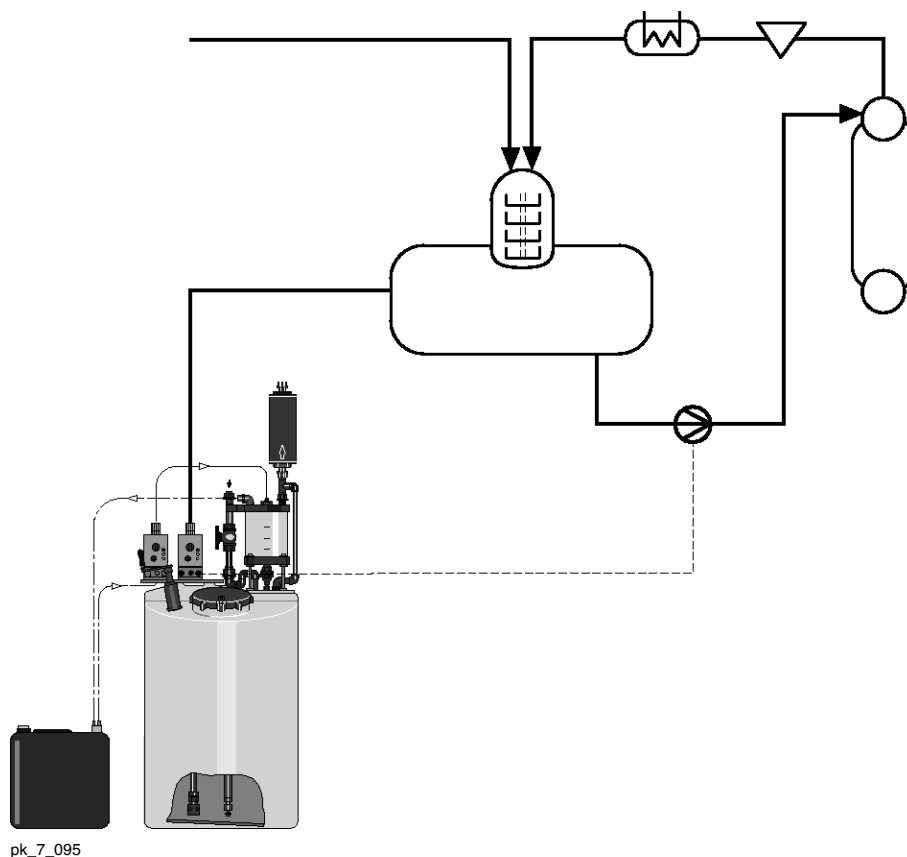


## 3.8 Application Examples

### 3.8.3 Inhibitor Metering in Boiler Feed Water

Product: **DULCODOS® Hydrazin**  
 Feed chemical: **Oxygen binding agent**  
 Industry: **Process industry, power stations**  
 Application: **Boiser feed water treatment**

The oxygen binding agent is added to the fresh water in proportion to the volume. The water meter detects the supply water volume and sends pulses to the gamma/ L pump on the hydrazine unit.



#### Tasks and requirements

Metering of oxygen binding agent to the boiler feed water to prevent oxygen corrosion in the boiler area.

#### Operating conditions

- Fully desalinated potable water
- Continuous operation

#### Application information

- Proportional metering of oxygen binding agent depending on the boiler feed water
- The 15 % concentrate is metered by a metering pump using a measuring unit into the metering tank and is diluted with water to produce a 1 % metering solution
- Measurement of the metering pump capacity during commissioning

#### Solution

- DULCODOS® Hydrazin with 250-litre metering tank

#### Benefit

- Semi-automatic operation
- Flexible process design thanks to adaptation of the pump to various concentration demands







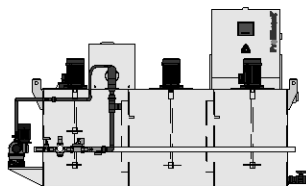
## 3.8 Application Examples

### 3.8.4

### Sludge Dewatering

Product: **Ultromat®**  
 Feed chemical: **Polymer solution**  
 Industry: **Waste water**  
 Application: **Sludge dewatering**

The Ultromat® prepares a 0.2 % polymer solution that is metered into the sludge through the Spectra eccentric screw pump. The centrifuge dewateres the sludge to a dry matter content of 30 %.



P\_UL\_0023\_SW1

Ultromat® ULFa for powder and liquid polymers

#### Problems and requirements

Dewatering of sludge by the addition of polymer solution

#### Operating conditions

- Sludge max. 12 m<sup>3</sup>/h with a dry matter content of approx. 3 %
- Temperature up to 60 °C

#### Notes on use

- The Spectra eccentric screw pump is controlled proportionally to the sludge pump
- Gauge the capacity of the eccentric screw pump during commissioning
- Protect the eccentric screw pump against running dry

#### Solution

- Ultromat® ULFa 4000 for the preparation of a 0.2 % polymer solution
- Eccentric screw pump of the Spectra 3/3000 FB type

#### Benefits

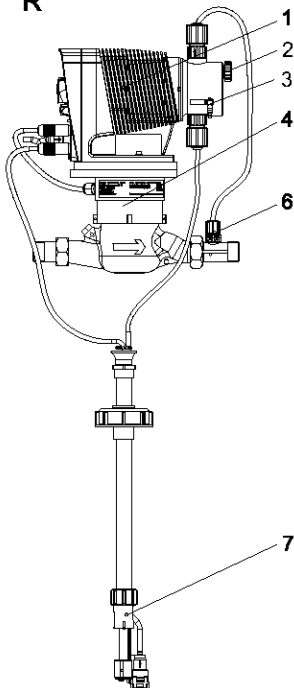
- Fully automatic operation with minimum personnel and maintenance requirements
- Flexible process configuration by adapting the pump to different concentration requirements
- Reduction of sludge disposal costs by higher dewatering ratios (high dry matter content)



# 4.0 Systems for Domestic Water Installations

## 4.0.1 Proportional Flow Dosing System for Liquid Dosing

"R"



- P\_NM\_0004\_SW1
- 1 Metering pump
  - 2 Bleed valve
  - 3 Bypass hose sleeve
  - 4 Contact water meter
  - 5 Wall bracket
  - 6 Injection valve
  - 7 Suction lance with level switch



### Promatik®

Metering units protect pipework, fittings, and appliances, such as boilers, washing machines and dishwashers, from corrosion and limescale. Active substances, like silicate, phosphate or silicate phosphate mixtures, can be metered here. These active substances form a protective layer in the pipework and reduce aggressiveness and sedimentation in the water.

### Silicate

As a corrosion inhibitor to prevent rust formation: "brownish water" in galvanised piping systems, "pitting": needle-like holes in the pipework. Applications include soft, corrosive types of water with a high percentage of aggressive carbonic acid. The silicate is used to raise the pH value closer to a lime-carbonic acid equilibrium. Hydrolysis produces a silica gel that forms a thin protective layer in the pipework and fittings and thus prevents corrosion.

### Phosphate

As ortho and polyphosphate to prevent limescale and corrosion in hard water up to max. 20 CH (carbonate hardness). Hard water salts, such as calcium and magnesium ions, responsible for limescale are thereby stabilised, i.e. these ions remain dissolved in the water and do not form limescale on the pipe walls. Growth on the pipes is thus prevented and there are no deposits of limescale on heating coils, dramatically reducing their efficiency. A thin, solid protective layer is formed. Mixtures containing silicate and phosphate act as corrosion and limescale inhibitors for soft and medium-hard water. The continuous top-up of the feed chemical is required to maintain this protective layer, otherwise it will degrade within a few days.

### EXACTAPHOS®

EXACTAPHOS® metering solutions are matched to the capacity of the Promatik® and DULCodos® units. This ensures that the percentages of max 40 mg/l SiO<sub>2</sub> of silicate and/or 6.7 mg/l of phosphate PO<sub>4</sub> (5mg/l P<sub>2</sub>O<sub>5</sub>) are adhered to, as laid down by the "Drinking Water Ordinance".

### Function of the systems

In a flow of water, the contact water meter transmits pulses with a fixed pulse interval corresponding to the pulses to the metering pump in line with the flow. Each of these pulses results in a metering stroke of the metering pump, thereby feeding the metering solution. The metering volume per stroke can thus be adjusted continuously between 100 and 50 % using the stroke adjustment dial. Because of the very low starting limit and the short pulse interval, a constant volume-proportional addition of chemicals can always be maintained, from minimum water flow rate to maximum load, guaranteeing the best process result.

### Promatik® proportional flow dosing system

Consisting of a Beta® metering pump with sound insulation plate, contact water meter, suction assembly with foot valve and 2-phase level switch with pre-warning, acting as a low flow contact and empty signal, injection valve and metering line. In the "R" design of the compact metering unit, the metering pump is fitted on the contact water meter; with the "W" design of split system there are wall brackets for mounting the metering pump. Horizontal fitting position of the contact water meter. DVGW-tested in conjunction with the EXACTAPHOS® metering solution. DVGW No. NW-9101 CM 0179.

## 4.1 Promatik® Metering Unit

### 4.1.1

### Promatik®

Protects pipework, fittings, and appliances, such as boilers, washing machines and dishwashers, from corrosion and limescale.

For flows of 5 – 27 m³/h

The proportional metering system Promatik® is used in the potable water sector for the flow-dependent, adjustable metering of liquid media, like the EXACTAPHOS®. It consists of the metering pump Beta®, a contact water meter, a suction assembly with foot valve and level switch and an injection valve and metering line.

In a flow of water, the contact water meter transmits pulses with a fixed pulse interval corresponding to the pulses to the metering pump in line with the flow. Each of these pulses results in a metering stroke of the metering pump, thereby feeding the metering solution. The metering volume per stroke can thus be adjusted continuously between 100 and 50 % using the stroke adjustment dial. Because of the very low starting limit and short pulse interval, a constant volume-proportional addition of chemicals can always be maintained from minimum water flow rate to maximum load, thereby guaranteeing the best process result

#### Your benefits

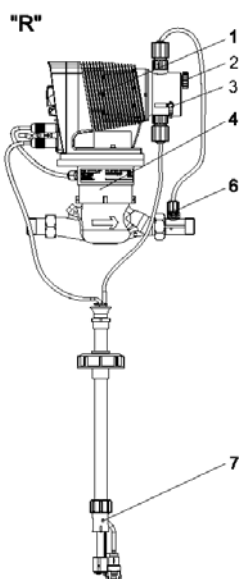
- DVGW-tested in conjunction with the EXACTAPHOS® metering solution. DVGW No. NW-9101 CM 0179.
- The EXACTAPHOS® metering solutions are matched to the capacity of the ProMatik® metering units.

#### Technical details

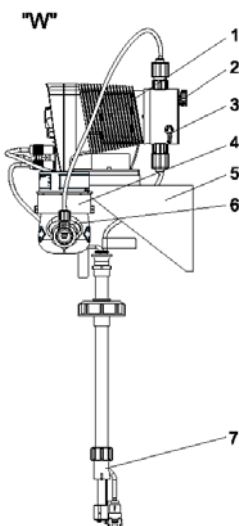
- Consisting of a Beta® metering pump, contact water meter, suction assembly with foot valve and 2-phase level switch with pre-warning as low flow contact and empty signal, injection valve and metering line.
- In the "R" design compact metering system, the metering pump is built onto the contact water meter.
- In the "W" design split system there are wall brackets for accommodating the metering pump. Contact cable and PE metering line 2 m long. Horizontal fitting position of the contact water meter.

#### Field of application

Potable water treatment



P\_NM\_0004\_SW1



P\_NM\_0005\_SW1

- 1 Metering pump
- 2 Bleed valve
- 3 Bypass hose sleeve
- 4 Contact water meter
- 5 Wall bracket
- 6 Injection valve
- 7 Suction lance with level switch

Promatik® type		NG 5	NG 10	NG 20	NG 30
<b>Maximum flow Q max.</b>	m³/h	5	11	16	27
<b>Lower working limit</b>	m³/h	0.05	0.08	0.13	0.24
<b>Metering interval approx.</b>	l/stroke	0.7	1.1	1.8	2.8
<b>Feed rate 50-100 %</b>	ml/m³	50 – 165	50 – 165	50 – 165	50 – 165
<b>Operating pressure</b>	bar	1 – 10	1 – 10	1 – 10	1 – 10
<b>Metering pump type</b>		BT4b 1000 PPT2	BT4b 1601 PPT2	BT4b 1602 PPT2	BT4b 1604 PPT2
<b>Meter connecting thread</b>		G 1 B	G 1 1/4 B	G 2 B	G 2 1/2 B
<b>Screw connector width</b>		R 3/4	R 1	R 1 1/2	R 2
<b>Length without thread</b>	mm	190	260	300	270

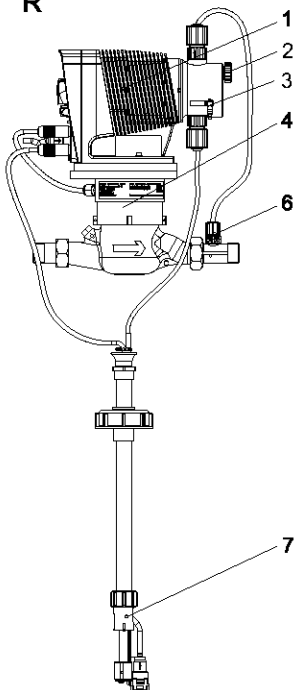


## 4.1 Promatik® Metering Unit

### 4.1.2

### Promatik®

"R"



P\_NM\_0004\_SW1

- 1 Metering pump
- 2 Bleed valve
- 3 Bypass hose sleeve
- 4 Contact water meter
- 5 Wall bracket
- 6 Injection valve
- 7 Suction lance with level switch

Shipping weight approx.      Order no.  
kg

NG 5 R compact metering system	6	1036414
NG 5 W split metering system	6	1036415
NG 10 R compact metering system	7	1036416
NG 10 W split metering system	7	1036417
NG 20 R compact metering system	9	1036418
NG 20 W split metering system	9	1036419
NG 30 R compact metering system	11	1038104
NG 30 W split metering system	11	1038105

### Materials

Dosing head/valves: Polypropylene (PP)  
 Metering diaphragm EPDM with PTFE insert  
 Seals: EPDM  
 Valve balls: ceramic  
 Float switches: PP  
 Suction assembly: flexible PVC  
 Discharge tube: PE

## 4.2 Chemicals for Water Treatment

### 4.2.1

### Chemicals

#### EXACTAPHOS® SP 210

Silicate phosphate liquid metering solution. Drinking water treatment for soft water. Promatik® compact metering system.

	Volume l	Order no.
EXACTAPHOS® SP 210	20	950097
EXACTAPHOS® SP 210	200	950043

#### EXACTAPHOS® P 612

Phosphate liquid metering solution. Drinking water treatment for medium hard water. Promatik® compact metering system.

	Volume l	Order no.
EXACTAPHOS® P 612	20	950098
EXACTAPHOS® P 612	200	950048

#### EXACTAPHOS® P 1020

Phosphate liquid metering solution. Drinking water treatment for hard water. Promatik® compact metering system.

	Volume l	Order no.
EXACTAPHOS® P 1020	20	950099
EXACTAPHOS® P 1020	200	950053



# ProMinent® Chemical Resistance List

## Resistance of Materials Used in Liquid Ends to the Chemicals Most Frequently Used

The data apply to standard conditions (20 °C, 1,013 mbar).

s	=	saturated solution in water
+	=	resistant
+/o	=	largely resistant
o	=	conditionally resistant
-	=	not resistant
n	=	resistance not known
=>	=	see
*	=	For bonded connections, the resistance of the adhesive (e.g. Tangit) is to be considered. (Materials of the types 'o' and '-' are not recommended !)
**	=	does not apply to glass fibre reinforced material

Concentration data are stated in weight percent, referred to aqueous solutions. If percentages are stated for the level of resistance, this level of resistance is only valid up to this concentration.

### NOTE:

The elastomers **CSM (Hypalon®)** and **IIR (butyl rubber)** used as diaphragm materials in pulsation dampers have properties similar to **EPDM**.

**PTFE** is resistant to all chemicals in this list.

**PTFE filled with carbon**, however, is attacked by strong oxidants such as bromine (anhydrous) or concentrated acids (phosphoric acid, sulphuric acid, chromic acid).

The resistance of PVC-U adhesive joints with Tangit deviates from the list below with regard to the following chemicals:

Medium	Concentration range
Sulfochromic acid	≥ 70 % H <sub>2</sub> SO <sub>4</sub> + 5 % K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> /Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>
Chromic acid	≥ 10 % CrO <sub>3</sub>
Hydrochloric acid	≥ 25 % HCl
Hydrogen peroxide	≥ 5 % H <sub>2</sub> O <sub>2</sub>
Hydrofluoric acid	≥ 0 % HF

### Explanation of abbreviations used as column headings:

<b>Acrylic:</b>	Acrylic resistance
<b>PVC:</b>	PVC, rigid, (PVC-U) resistance
<b>PP:</b>	Polypropylene resistance
<b>PVDF:</b>	PVDF resistance
<b>1.4404:</b>	Stainless steel 1.4404 & 1.4571 resistance
<b>FKM:</b>	Fluorine Rubber (e.g. Viton® A & B) resistance
<b>EPDM:</b>	Ethylene-Propylene-Dien-rubber resistance
<b>Tygon:</b>	Tygon® R-3603 resistance
<b>Pharmed:</b>	Pharmed® resistance
<b>PE:</b>	Polyethylene resistance
<b>2.4819:</b>	Hastelloy C-276 resistance
<b>WGK:</b>	water endangering class

Viton® is a registered trademark of DuPont Dow Elastomers

### Water endangering classes (WGK):

1	=	slightly hazardous to water
2	=	hazardous to water
3	=	severely hazardous to water
(X)	=	No classification. Classification according to conclusion by analogy. To be used under reserve.

### Safety data sheets

Safety data sheets on our products in a number of different languages are provided on our website.

[www.prominent.com/MSDS](http://www.prominent.com/MSDS)



# ProMinent® Chemical Resistance List

The data is taken from relevant manufacturer's documentation and our own tests. Resistance of materials is also dependant on other factors, e.g. operating conditions, conditions of surfaces etc, and so this list must be treated as an initial guide only. It cannot claim to offer any guarantees. It should be taken into consideration in particular that usual dosing media are compounds, and their corrosiveness cannot be deducted simply by adding the corrosiveness of each single component. In such cases the chemical producers' data of the material compatibility are to be considered as a matter of prime importance for the material choice. A safety data sheet does not give this data and therefore cannot take the place of the technical documentation on the application.

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Acetaldehyde	CH <sub>3</sub> CHO	100%	-	-	o	-	+	-	+/-	-	-	+	+	2
Acetamide	CH <sub>3</sub> CONH <sub>2</sub>	s	+	+	+	+	+	o	+	-	+/-	+	+	1
Acetic Acid	CH <sub>3</sub> COOH	100%	-	50%	+	+	+	-	o	60%	60%	70%	+	1
Acetic Anhydride	(CH <sub>3</sub> CO) <sub>2</sub> O	100%	-	-	o	-	+	-	+/-	-	+	o	+	1
Acetic Ether => Ethyl Acetate														
Acetone	CH <sub>3</sub> COCH <sub>3</sub>	100%	-	-	+	-	+	-	+	-	-	+	+	1
Acetophenone	C <sub>6</sub> H <sub>5</sub> COCH <sub>3</sub>	100%	-	n	+	-	+	-	+	n	n	+	+	
Acetyl Chloride	CH <sub>3</sub> COCl	100%	-	+	n	-	o	+	-	-	o	n	+	1
Acetylacetone	CH <sub>3</sub> COCH <sub>2</sub> COCH <sub>3</sub>	100%	-	-	+	-	+	-	+	n	n	+	+	1
Acetylene Dichloride => Dichloro Ethylene														
Acetylene Tetrachloride => Tetrachloro Ethane														
Acrylonitril	CH <sub>2</sub> =CH-CN	100%	-	-	+	+	+	-	-	-	-	+	+	3
Adipic Acid	HOOC(CH <sub>2</sub> ) <sub>4</sub> COOH	s	+	+	+	+	+	+	+	-	+/-	+	+	1
Allyl Alcohol	CH <sub>2</sub> CHCH <sub>2</sub> OH	96%	-	o	+	+	+	-	+	-	o	+	+/-	2
Aluminium Acetate	Al(CH <sub>3</sub> COO) <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+/-	1
Aluminium Bromide	AlBr <sub>3</sub>	s	+	+	+	+	n	+	+	+	+	+	+	2
Aluminium Chloride	AlCl <sub>3</sub>	s	+	+	+	+	-	+	+	+	+	+	+	1
Aluminium Fluoride	AlF <sub>3</sub>	10%	+	+	+	+	-	+	+	+	+	+	+/-	1
Aluminium Hydroxide	Al(OH) <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Aluminium Nitrate	Al(NO <sub>3</sub> ) <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Aluminium Phosphate	AlPO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Aluminium Sulphate	Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Ammonium Acetate	CH <sub>3</sub> COONH <sub>4</sub>	s	+	+/-	+	+	+	+	+	+	+	+	+	1
Ammonium Bicarbonate	NH <sub>4</sub> HCO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Ammonium Carbonate	(NH <sub>4</sub> ) <sub>2</sub> CO <sub>3</sub>	40%	+	+	+	+	+	+	+	+	+	+	+	1
Ammonium Chloride	NH <sub>4</sub> Cl	s	+	+	+	+	-	+	+	+	+	+	+/-	1
Ammonium Fluoride	NH <sub>4</sub> F	s	+	o	+	+	o	+	+	+	+	+	+	1
Ammonium Hydroxide	"NH <sub>4</sub> OH"	30%	+	+	+	+	+	-	+	+	+	+	+	2
(25 °C)														
Ammonium Nitrate	NH <sub>4</sub> NO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Ammonium Oxalate	(COONH <sub>4</sub> ) <sub>2</sub> * H <sub>2</sub> O	s	+	+	+	+	+	+	+	+	+	+	+	1
Ammonium Perchlorate	NH <sub>4</sub> ClO <sub>4</sub>	10%	+	+	+	+	+	+	+	+	+	+	+	1
Ammonium Peroxodisulphate	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>8</sub>	s	+	+	+	+	5%	+	+	+	+	+	5%	2
Ammonium Phosphate	(NH <sub>4</sub> ) <sub>3</sub> PO <sub>4</sub>	s	+	+	+	+	10%	+	+	+	+	+	10%	1
Ammonium Sulphate	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	s	+	+	+	+	10%	+	+	+	+	+	10%	1
Ammonium Sulphide	(NH <sub>4</sub> ) <sub>2</sub> S	s	+	+	+	+	n	+	+	n	n	+	n	2
Ammoniumaluminium Sulphate	NH <sub>4</sub> Al(SO <sub>4</sub> ) <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Amyl Alcohol	C <sub>5</sub> H <sub>11</sub> OH	100%	+	+	+	+	+	-	+	-	-	+	+	1
Aniline	C <sub>6</sub> H <sub>5</sub> NH <sub>2</sub>	100%	-	-	+	+	+	-	+/-	-	o	+	+	2
Aniline Hydrochloride	C <sub>6</sub> H <sub>5</sub> NH <sub>2</sub> * HCl	s	n	+	+	+	-	+/-	+/-	-	o	+	+	2
Antimony Trichloride	SbCl <sub>3</sub>	s	+	+	+	+	-	+	+	+	+	+	n	2
Aqua Regia	3 HCl + HNO <sub>3</sub>	100%	-	+	-	+	-	-	o	-	-	-	-	2
Arsenic Acid	H <sub>3</sub> AsO <sub>4</sub>	s	+	+	+	+	+	+	+	20%	o	+	+	3
Barium Carbonate	BaCO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Barium Chloride	BaCl <sub>2</sub>	s	+	+	+	+	-	+	+	+	+	+	+	1
Barium Hydroxide	Ba(OH) <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Barium Nitrate	Ba(NO <sub>3</sub> ) <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Barium Sulphate	BaSO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Barium Sulphide	BaS	s	+	+	+	+	+	+	+	+	+	+	+	(1)
Benzaldehyde	C <sub>6</sub> H <sub>5</sub> CHO	100%	-	-	+	-	+	+	+	-	-	o	+	1
Benzene	C <sub>6</sub> H <sub>6</sub>	100%	-	-	o	+	+	o	-	-	-	o	+	3
Benzene Sulphonic Acid	C <sub>6</sub> H <sub>5</sub> SO <sub>3</sub> H	10%	n	n	+	+	+	+	-	-	-	n	+	2
Benzoic Acid	C <sub>6</sub> H <sub>5</sub> COOH	s	+	+	+	+	+	+	+	-	+/-	+	+	1
Benzoyl Chloride	C <sub>6</sub> H <sub>5</sub> COCl	100%	-	n	o	n	o	+	+	n	n	o	+	2





# ProMinent® Chemical Resistance List

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Benzyl Alcohol	$C_6H_5CH_2OH$	100%	-	-	+	+	+	+	-	-	+	+	+	1
Benzyl Benzoate	$C_6H_5COOC_7H_7$	100%	-	-	+	o	+	+	-	-	-	+	+	2
Benzyl Chloride	$C_6H_5CH_2Cl$	90%	-	n	o	+	+	+	-	-	-	o	+	2
Bitter Salt => Magnesium Sulphate														
Bleach => Sodium Hypochlorite														
Blue Vitriol => Copper Sulphate														
Borax => Sodium Tetraborate														
Boric Acid	$H_3BO_3$	s	+	+	+	+	+	+	+	+	+	+	+	1
Brine		s	+	+/o	+	+	+/o	+	+	+	+	+	+	1
Bromine (dry)	$Br_2$	100%	-	-	-	+	-	-	-	-	-	-	+	2
Bromine Water	$Br_2 + H_2O$	s	-	+	-	+	-	-	n	n	-	n	(2)	
Bromo Benzene	$C_6H_5Br$	100%	n	n	o	+	+	o	-	-	-	o	+	2
Bromochloro Methane	$CH_2BrCl$	100%	-	-	-	+	+	n	+/o	-	-	o	+	2
Bromochlorotrifluoro Ethane	$HCClBrCF_3$	100%	-	-	o	+	+	+	-	+	+	o	+	(3)
Butanediol	$HOC_4H_8OH$	10%	n	+	+	+	+	o	+	+	+	+	+	1
Butanetriol	$C_4H_{10}O_3$	s	+	+	+	+	+	o	+	+	+	+	+	1
Butanol	$C_4H_9OH$	100%	-	+	+	+	+	o	+/o	-	-	+	+	1
Butyl Acetate	$C_7H_{13}O_2$	100%	-	-	+	+	+	-	-	-	+/o	+	+	1
Butyl Acetate	$CH_3COOC_4H_9$	100%	-	-	o	+	+	-	+/o	-	+/o	-	+	1
Butyl Alcohol => Butanol														
Butyl Amine	$C_4H_9NH_2$	100%	n	n	n	-	+	-	-	n	n	+	+	1
Butyl Benzoate	$C_6H_5COOC_4H_9$	100%	-	-	o	n	+	+	+	-	-	o	+	2
Butyl Mercaptane	$C_4H_9SH$	100%	n	n	n	+	n	+	-	n	n	n	n	3
Butyl Oleate	$C_{22}H_{42}O_2$	100%	n	n	n	+	+	+	+/o	n	n	n	+	1
Butyl Stearate	$C_{22}H_{44}O_2$	100%	o	n	n	+	+	+	-	n	n	n	+	1
Butyraldehyde	$C_3H_7CHO$	100%	-	n	+	n	+	-	+/o	-	-	+	+	1
Butyric Acid	$C_3H_7COOH$	100%	5%	20%	+	+	+	+	+	-	+/o	+	+	1
Calcium Acetate	$(CH_3COO)_2Ca$	s	+	+	+	+	+	+	+	+	+	+	+	1
Calcium Bisulphite	$Ca(HSO_3)_2$	s	+	+	+	+	+	+	+	+	+	+	+	(1)
Calcium Carbonate	$CaCO_3$	s	+	+	+	+	+	+	+	+	+	+	+	1
Calcium Chloride	$CaCl_2$	s	+	+	+	+	-	+	+	+	+	+	+	1
Calcium Cyanide	$Ca(CN)_2$	s	+	+	+	+	n	+	+	+	+	+	n	3
Calcium Hydroxide	$Ca(OH)_2$	s	+	+	+	+	+	+	+	+	+	+	+	1
Calcium Hypochlorite	$Ca(OCI)_2$	s	+	+	o	+	-	o	+	+	+	+	+	2
Calcium Nitrate	$Ca(NO_3)_2$	s	+	50%	50%	+	+	+	+	+	+	+	+	1
Calcium Phosphate	$Ca_3(PO_4)_2$	s	+	+	+	+	+	+	+	+	+	+	+	1
Calcium Sulphate	$CaSO_4$	s	+	+	+	+	+	+	+	+	+	+	+	1
Calcium Sulphide	$CaS$	s	+	+	+	+	n	+	+	+	+	+	+	(2)
Calcium Sulphite	$CaSO_3$	s	+	+	+	+	+	+	+	+	+	+	+	(1)
Calcium Thiosulphate	$CaS_2O_3$	s	+	+	+	+	-	+	+	+	+	+	+	1
Carbolic Acid => Phenole														
Carbon Disulphide	$CS_2$	100%	-	-	o	+	+	+	-	-	-	o	+	2
Carbon Tetrachloride	$CCl_4$	100%	-	-	-	+	+	+	-	-	-	o	+	3
Carbonic Acid	" $H_2CO_3$ "	s	+	+	+	+	+	+	+	+	+	+	+	1
Caustic Potash => Potassium Hydroxide														
Caustic Soda => Sodium Hydroxide														
Chloric Acid	$HClO_3$	20%	+	+	-	+	-	o	o	+	+	10%	+	2
Chlorinated Lime => Calcium Hypochlorite														
Chlorine Dioxide Solution	$ClO_2 + H_2O$	0.5%	o	+	o	+	-	o	-	o	-	o	+	
Chlorine Water	$Cl_2 + H_2O$	s	+	+	o	+	-	+	+	o	-	o	+	
Chloro Benzene	$C_6H_5Cl$	100%	-	-	+	+	+	+	-	-	-	o	+	2
Chloro Ethanol	$ClCH_2CH_2OH$	100%	-	-	+	o	+	-	o	-	+	+	+	3
Chloro Ethylbenzene	$C_6H_4ClC_2H_5$	100%	-	-	o	n	+	o	-	-	-	o	+	(2)
Chloro Phenole	$C_6H_4OHCl$	100%	-	n	+	+	+	n	-	-	-	+	+	2
Chloro Toluene	$C_7H_8Cl$	100%	-	-	n	+	+	+	-	-	-	n	+	2
Chloroacetone	$ClCH_2COCH_3$	100%	-	-	n	n	+	-	+	-	-	n	+	3
Chlorobutadiene	$C_4H_5Cl$	100%	-	-	n	n	+	+	-	-	-	n	+	1
Chloroform	$CHCl_3$	100%	-	-	o	+	+	+	-	-	o	-	+	2
Chlorohydrin	$C_3H_5OCl$	100%	-	n	+	-	+	+	o	-	+	+	+	3
Chloroprene => Chlorobutadiene														
Chlorosulphonic Acid	$SO_2(OH)Cl$	100%	-	o	-	+	-	-	-	-	-	-	o	1
Chrome-alum => Potassium Chrome Sulphate														
Chromic Acid	$H_2CrO_4$	50%	-	+	o	+	10%	+	-	o	o	+	10%	3



## ProMinent® Chemical Resistance List

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Chromic-Sulphuric Acid	$K_2CrO_4 + H_2SO_4$	s	-	+	-	+	n	n	n	-	-	-	n	3
Chromium Sulphate	$Cr_2(SO_4)_3$	s	+	+	+	+	+	+	+	+	+	+	+	1
Citric Acid	$C_6H_8O_7$	s	+	+	+	+	+	+	+	+	+	+	+	1
Cobalt Chloride	$CoCl_2$	s	+	+	+	+	-	+	+	+	+	+	+	2
Copper-II-Acetate	$Cu(CH_3COO)_2$	s	+	+	+	+	+	+	+	+	+	+	+	3
Copper-II-Arsenite	$Cu_3(AsO_3)_2$	s	+	+	+	+	+	+	+	+	+	+	+	3
Copper-II-Carbonate	$CuCO_3$	s	+	+	+	+	+	+	+	+	+	+	+	2
Copper-II-Chloride	$CuCl_2$	s	+	+	+	+	1%	+	+	+	+	+	+	2
Copper-II-Cyanide	$Cu(CN)_2$	s	+	+	+	+	+	+	+	+	+	+	+	(3)
Copper-II-Fluoride	$CuF_2$	s	+	+	+	+	+	+	+	+	+	+	+	(2)
Copper-II-Nitrate	$Cu(NO_3)_2$	s	+	+	+	+	+	+	+	+	+	+	+/o	2
Copper-II-Sulphate	$CuSO_4$	s	+	+	+	+	+	+	+	+	+	+	+	2
Cresols	$C_6H_4CH_3OH$	100%	o	o	+	+	+	+	-	-	-	+	+	2
Crotonaldehyde	$CH_3C_2H_2CHO$	100%	n	-	+	+	+	-	+	-	-	+	+	3
Cubic Nitre => Sodium Nitrate														
Cumene => Isopropyl Benzene														
Cyclo Hexane	$C_6H_{12}$	100%	+	-	+	+	+	+	-	-	-	+	o	1
Cyclohexanole	$C_6H_{11}OH$	100%	o	+/o	+	+	+	+	-	-	-	+	+	1
Cyclohexanone	$C_6H_{10}O$	100%	-	-	+	-	+	-	+/o	-	-	+	+	1
Cyclohexyl Alcohol => Cyclohexanol														
Cyclohexylamine	$C_6H_{11}NH_2$	100%	n	n	n	n	+	-	n	n	n	n	+	2
Decahydronaphthalene	$C_{10}H_{18}$	100%	-	+/o	o	+	n	o	-	-	-	o	+	2
Decaline => Decahydronaphthalene														
Dextrose => Glucose														
Diacetonalcohol	$C_6H_{12}O_2$	100%	-	-	+	o	+	-	+	-	-	+	+	1
Dibromoethane	$C_2H_4Br_2$	100%	-	-	n	+	+	+	-	-	-	-	+	3
Dibutyl Ether	$C_4H_9OC_4H_9$	100%	-	-	+	+	+	-	o	-	-	+	+	2
Dibutyl Phthalate	$C_{16}H_{22}O_4$	100%	-	-	+	+	+	+	+/o	o	+	o	+	2
Dibutylamine	$(C_4H_9)_2NH$	100%	n	n	+	+	+	-	-	n	n	+	+	1
Dichloro Acetic Acid	$Cl_2CHCOOH$	100%	-	+	+	+	+	-	+	-	o	+	+	1
Dichloro Benzene	$C_6H_4Cl_2$	100%	-	-	o	+	+	+	-	-	-	o	+	2
Dichloro Butan	$C_4H_8Cl_2$	100%	-	-	o	+	+	+	-	-	-	o	+	3
Dichloro Butene	$C_4H_6Cl_2$	100%	-	-	o	+	+	o	-	-	-	o	+	3
Dichloro Ethane	$C_2H_4Cl_2$	100%	-	-	o	+	+	+	-	-	o	-	+	3
Dichloro Ethylene	$C_2H_2Cl_2$	100%	-	-	o	+	+	o	-	-	o	-	+	2
Dichloro Methane	$CH_2Cl_2$	100%	-	-	o	o	o	+	-	-	o	-	+	2
Dichloroisopropyl Ether	$(C_3H_7Cl)_2O$	100%	-	-	o	n	+	o	o	-	-	o	+	(2)
Dicyclohexylamine	$(C_6H_{12})_2NH$	100%	-	-	o	n	+	-	-	-	-	o	+	2
Diethyleneglycol	$C_4H_{10}O_3$	s	+	+	+	+	+	+	+	+	+	+	+	1
Diethyleneglycolethyl Ether	$C_8H_{18}O_3$	100%	n	n	+	+	+	n	+/o	-	o	+	+	1
Diethylether	$C_2H_5OC_2H_5$	100%	-	-	o	+	+	-	-	-	o	o	+	1
Diglycolic Acid	$C_4H_6O_5$	30%	+	+	+	+	+	+	n	+	+/o	+	+	3
Dihexyl Phthalate	$C_{20}H_{26}O_4$	100%	-	-	+	+	+	-	n	o	+	+	+	(1)
Diisobutylketone	$C_9H_{18}O$	100%	-	-	+	+	+	-	+	-	-	+	+	1
Di-iso-nonyl Phthalate	$C_{26}H_{42}O_4$	100%	-	-	+	+	+	n	n	o	+	+	+	1
Diisopropylketone	$C_7H_{14}O$	100%	-	-	+	+	+	-	+	-	-	+	+	1
Dimethyl Carbonate	$(CH_3O)_2CO$	100%	n	n	+	+	+	+	-	n	n	+	+	1
Dimethyl Ketone => Acetone														
Dimethyl Phthalate	$C_{10}H_{10}O_4$	100%	-	-	+	+	+	-	+/o	o	+	+	+	1
Dimethylformamide	$HCON(CH_3)_2$	100%	-	-	+	-	+	-	+	-	+/o	+	+	1
Dimethylhydrazine	$H_2NN(CH_3)_2$	100%	n	n	+	n	+	-	+	n	n	+	+	3
Diocetyl Phthalate	$C_{44}H_{88}O_4$	100%	-	-	+	+	+	-	+/o	o	+	+	+	1
Dioxane	$C_4H_8O_2$	100%	-	-	o	-	+	-	+/o	-	-	+	+	1
Disodium Hydrogenphosphate	$Na_2HPO_4$	s	+	+	+	+	+	+	+	+	+	+	+	1
Disulfur Acid -- Oleum														
Disulphur Dichloride	$S_2Cl_2$	100%	n	n	n	+	n	+	-	-	-	n	n	
DMF => Dimethylformamide														
Engine Oils		100 %	n	+/o	+	+	+	+	-	-	-	+	+	2
Epsom salts => Magnesium Sulphate														
Ethanol	$C_2H_5OH$	100%	-	+	+	+	+	-	+	-	+	+	+	1
Ethanol Amine	$HOC_2H_4NH_2$	100%	o	n	+	-	+	-	+/o	-	o	+	+	1
Ethyl Acetate	$CH_3COOC_2H_5$	100%	-	-	35%	+	+	-	+/o	-	+/o	+	+	1
Ethyl Acrylate	$C_2H_3COOC_2H_5$	100%	-	-	+	o	+	-	+/o	-	-	+	+	2



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Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Ethyl Benzene	$C_6H_5-C_2H_5$	100%	-	-	o	+	+	o	-	-	-	o	+	1
Ethyl Benzoate	$C_6H_5COOC_2H_5$	100%	n	-	+	o	+	+	-	-	-	+	+	1
Ethyl Bromide	$C_2H_5Br$	100%	-	n	+	+	n	+	-	-	o	+	+	2
Ethyl Chloroacetate	$ClCH_2COOC_2H_5$	100%	-	o	+	+	+	+	-	-	-	+	+	2
Ethyl Chlorocarbonate	$ClCO_2C_2H_5$	100%	n	n	n	n	n	+	-	n	n	n	n	(2)
Ethyl Cyclopentane	$C_5H_4C_2H_5$	100%	+	+	+	+	+	+	-	-	-	+	+	(1)
Ethylacetacetate	$C_6H_{10}O_3$	100%	n	-	+	+	+	-	+/o	-	+/o	+	+	1
Ethylacrylic Acid	$C_4H_7COOH$	100%	n	n	+	+	+	n	+/o	n	n	+	+	(1)
Ethylene Diamine	$(CH_2NH_2)_2$	100%	o	o	+	-	o	-	+	n	n	+	o	2
Ethylene Dibromide => Dibromoethane														
Ethylene Dichloride => Dichloro Ethane														
Ethylene Glycol => Glycol														
Ethylenglycol Ethylether	$HOC_2H_4OC_2H_5$	100%	n	n	+	+	+	n	+/o	-	o	+	+	1
Ethylhexanol	$C_8H_{16}O$	100%	n	+/o	+	+	+	+	+	-	-	+	+	2
Fatty Acids	$R-COOH$	100%	+	+	+	+	+	+	o	-	o	+	+	1
Ferric Chloride	$FeCl_3$	s	+	+	+	+	-	+	+	+	+	+	+/o	1
Ferric Nitrate	$Fe(NO_3)_3$	s	+	+	+	+	+	+	+	+	+	+	+	1
Ferric Phosphate	$FePO_4$	s	+	+	+	+	+	+	+	+	+	+	+	1
Ferric Sulphate	$Fe_2(SO_4)_3$	s	+	+	+	+	o	+	+	+	+	+	+	1
Ferrous Chloride	$FeCl_2$	s	+	+	+	+	-	+	+	+	+	+	+/o	1
Ferrous Sulphate	$FeSO_4$	s	+	+	+	+	+	+	+	+	+	+	+	1
Fixing Salt => Sodium Thiosulphate														
Fluoro Benzene	$C_6H_5F$	100%	-	-	+	+	+	o	-	-	-	o	+	2
Fluoroboric Acid	$HBF_4$	35%	+	+	+	+	o	+	+	+	-	+	+	1
Fluorosilicic Acid	$H_2SiF_6$	100%	+	30%	30%	+	o	+	+	25%	o	40%	+/o	2
Formaldehyde	$CH_2O$	40%	+	+	+	+	+	-	+/o	-	-	+	+	2
Formalin => Formaldehyde														
Formamide	$HCONH_2$	100%	+	-	+	+	+	+	+	n	n	+	+	1
Formic Acid	$HCOOH$	s	-	+/o	+	+	+	-	-	+/o	+/o	+	+	1
Furane	$C_4H_4O$	100%	-	-	+	-	+	-	n	-	-	+	+	3
Furane Aldehyde	$C_5H_4O_2$	100%	n	n	n	o	+	-	+/o	-	-	n	n	2
Furfuryl Alcohol	$OC_4H_3CH_2OH$	100%	-	-	+	o	+	n	+/o	-	-	+	+	1
Gallic Acid	$C_6H_2(OH)_3COOH$	5%	+	+	+	+	+	+	+/o	+	+	+	+	1
Gasoline		100 %	-	-	+	+	+	+	-	-	-	+	+	2
Glauber's Salt => Sodium Sulphate														
Glucose	$C_6H_{12}O_6$	s	+	+	+	+	+	+	+	+	+	+	+	1
Glycerol	$C_3H_5(OH)_3$	100%	+	+	+	+	+	+	+	+	+	+	+	1
Glycerol Triacetate	$C_3H_5(CH_3COO)_3$	100%	n	n	+	+	+	-	+	n	n	+	+	1
Glycine	$NH_2CH_2COOH$	10%	+	+	+	+	+	+	+	+	+	+	+	1
Glycol	$C_2H_4(OH)_2$	100%	+	+	+	+	+	+	+	+	+	+	+	1
Glycolic Acid	$CH_2OHCOOH$	70%	+	37%	+	+	+	+	+	+	+/o	+	+	1
Gypsum => Calcium Sulphate														
Heptane	$C_7H_{16}$	100%	+	+	+	+	+	+	-	-	-	+	+	1
Hexachloroplatinic Acid	$H_2PtCl_6$	s	n	+	+	+	-	n	+	n	n	+	-	
Hexanal	$C_5H_{11}CHO$	100%	n	n	+	+	+	-	+/o	-	-	+	+	1
Hexane	$C_6H_{14}$	100%	+	+	+	+	+	+	-	-	-	+	+	1
Hexanol	$C_6H_{13}OH$	100%	-	-	+	+	+	n	+	-	o	+	+	1
Hexantriol	$C_6H_9(OH)_3$	100%	n	n	+	+	+	+	+	n	n	+	+	1
Hexene	$C_6H_{12}$	100%	n	+	+	+	+	+	-	-	-	+	+	1
Hydrazine Hydrate	$N_2H_4 \cdot H_2O$	s	+	+	+	+	+	n	+	-	o	+	+	3
Hydrobromic Acid	$HBr$	50%	+	+	+	+	-	-	+	+	-	+	o	1
Hydrochloric Acid	$HCl$	38%	32%	+	+	+	-	+	o	+	o	+	o	1
Hydrofluoric Acid	$HF$	80%	-	40% *	40% **	+	-	+	o	40%	-	40%	+/o	1
Hydrogen Cyanide	$HCN$	s	+	+	+	+	+	+	+	+	+	+	+	3
Hydrogen Peroxide	$H_2O_2$	90%	40%	40%*	30%	+	+	30%	30%	30%	+	+	+	1
Hydroiodic Acid	$HI$	s	+	+	+	+	-	-	n	+	-	+	n	1
Hydroquinone	$C_6H_4(OH)_2$	s	o	+	+	+	+	+	-	+	+/o	+	+	2
Hydroxylamine Sulphate	$(NH_2OH)_2 \cdot H_2SO_4$	10%	+	+	+	+	+	+	+	+	+	+	+	2
Hypochlorous Acid	$HOCl$	s	+	+	o	+	-	+	+/o	+	+	o	+	(1)
Iodine	$I_2$	s	o	-	+	+	-	+	+/o	+	+	o	+/o	
Iron Vitriol => Ferrous Sulphate														
Isobutanol => Isobutyl Alcohol														
Isobutyl Alcohol	$C_2H_5CH(OH)CH_3$	100%	-	+	+	+	+	+	+	-	o	+	+	1



# ProMinent® Chemical Resistance List

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Isopropanol => Isopropyl Alcohol														
Isopropyl Acetate	$\text{CH}_3\text{COOCH}(\text{CH}_3)_2$	100%	-	-	+	+	+	-	+/-	-	+/-	+	+	1
Isopropyl Alcohol	$(\text{CH}_3)_2\text{CHOH}$	100%	-	+/-	+	+	+	+	+	-	o	+	+	1
Isopropyl Benzene	$\text{C}_6\text{H}_5\text{CH}(\text{CH}_3)_2$	100%	-	-	o	+	+	+	-	-	-	o	+	1
Isopropyl Chloride	$\text{CH}_3\text{CHClCH}_3$	80%	-	-	o	+	+	+	-	-	o	o	+/-	2
Isopropyl Ether	$\text{C}_6\text{H}_{14}\text{O}$	100%	-	-	o	+	+	-	-	-	o	o	+	1
Kitchen Salt => Sodium Chloride														
Lactic Acid	$\text{C}_3\text{H}_6\text{O}_3$	100%	-	+	+	+	+/-	+	10%	-	+/-	+	+	1
Lead Acetate	$\text{Pb}(\text{CH}_3\text{COO})_2$	s	+	+	+	+	+	+	+	+	+	+	+	2
Lead Nitrate	$\text{Pb}(\text{NO}_3)_2$	50%	+	+	+	+	+	+	+	+	+	+	+	2
Lead Sugar => Lead Acetate														
Lead Sulphate	$\text{PbSO}_4$	s	+	+	+	+	+	+	+	+	+	+	+	(2)
Lead Tetraethyl	$\text{Pb}(\text{C}_2\text{H}_5)_4$	100%	+	+	+	+	+	+	-	n	n	+	+	3
Lime Milk => Calcium Hydroxide														
Liquid Ammonia => Ammonium Hydroxide														
Lithium Bromide	LiBr	s	+	+	+	+	+	+	+	+	+	+	+	1
Lithium Chloride	LiCl	s	+	+	+	+	-	+	+	+	+	+	n	1
Lunar Caustic => Silver Nitrate														
Magnesium Carbonate	$\text{MgCO}_3$	s	+	+	+	+	+	+	+	+	+	+	+/-	1
Magnesium Chloride	$\text{MgCl}_2$	s	+	+	+	+	o	+	+	+	+	+	+	1
Magnesium Hydroxide	$\text{Mg}(\text{OH})_2$	s	+	+	+	+	+	+	+	+	+	+	+	1
Magnesium Nitrate	$\text{Mg}(\text{NO}_3)_2$	s	+	+	+	+	+	+	+	+	+	+	+	1
Magnesium Sulphate	$\text{MgSO}_4$	s	+	+	+	+	+	+	+	+	+	+	+/-	1
Maleic Acid	$\text{C}_4\text{H}_4\text{O}_4$	s	+	+	+	+	+	+	+	-	o	+	+	1
Malic Acid	$\text{C}_4\text{H}_6\text{O}_5$	s	+	+	+	+	+	+	+	+	+	+	+	1
Manganese-II-Chloride	$\text{MnCl}_2$	s	+	+	+	+	-	+	+	+	+	+	+	1
Manganese-II-Sulphate	$\text{MnSO}_4$	s	+	+	+	+	+	+	+	+	+	+	+	1
MEK => Methyl Ethyl Ketone														
Mercury	Hg	100%	+	+	+	+	+	+	+	+	+	+	+	3
Mercury-II-Chloride	$\text{HgCl}_2$	s	+	+	+	+	-	+	+	+	+	+	+	3
Mercury-II-Cyanide	$\text{Hg}(\text{CN})_2$	s	+	+	+	+	+	+	+	+	+	+	+	3
Mercury-II-Nitrate	$\text{Hg}(\text{NO}_3)_2$	s	+	+	+	+	+	+	+	+	+	+	+	3
Mesityl Oxide	$\text{C}_6\text{H}_{10}\text{O}$	100%	-	-	n	n	+	-	+/-	-	-	n	+	1
Methacrylic Acid	$\text{C}_3\text{H}_5\text{COOH}$	100%	n	n	+	+	+	o	+/-	-	+/-	+	+	1
Methanol	$\text{CH}_3\text{OH}$	100%	-	-	+	+	+	o	+	-	+/-	+	+	1
Methoxybutanol	$\text{CH}_3\text{O}(\text{CH}_2)_4\text{OH}$	100%	-	-	+	+	+	+	o	-	o	+	+	(1)
Methyl Acetate	$\text{CH}_3\text{COOCH}_3$	60%	-	-	+	+	+	-	+/-	-	+/-	+	+	2
Methyl Acrylate	$\text{C}_2\text{H}_3\text{COOCH}_3$	100%	-	-	+	+	+	-	+/-	-	o	+	+	2
Methyl Benzoate	$\text{C}_6\text{H}_5\text{COOCH}_3$	100%	-	-	+	o	+	+	-	-	-	+	+	2
Methyl Catechol	$\text{C}_6\text{H}_3(\text{OH})_2\text{CH}_3$	s	+	+	+	+	+	+	-	+	+o	+	+	(1)
Methyl Cellulose		s	+	+	+	+	+	+	+	+	+	+	+	1
Methyl Chloroacetate	$\text{ClCH}_2\text{COOCH}_3$	100%	-	o	+	+	+	o	-	-	-	+	+	2
Methyl Cyclopentane	$\text{C}_5\text{H}_9\text{CH}_3$	100%	+	+	+	+	+	+	-	-	-	+	+	(1)
Methyl Dichloroacetate	$\text{Cl}_2\text{CHCOOCH}_3$	100%	-	-	+	n	+	-	n	-	-	+	+	2
Methyl Ethyl Ketone	$\text{CH}_3\text{COC}_2\text{H}_5$	100%	-	-	+	-	+	-	+	-	-	+	+	1
Methyl Glycol	$\text{C}_3\text{H}_8\text{O}_2$	100%	+	+	+	+	+	-	+/-	+	+	+	+	1
Methyl Isobutyl Ketone	$\text{CH}_3\text{COC}_4\text{H}_9$	100%	-	-	+	-	+	-	o	-	-	+	+	1
Methyl Isopropyl Ketone	$\text{CH}_3\text{COC}_3\text{H}_7$	100%	-	-	+	-	+	-	+/-	-	-	+	+	1
Methyl Methacrylate	$\text{C}_3\text{H}_5\text{COOCH}_3$	100%	-	-	+	+	+	-	-	-	-	+	+	1
Methyl Oleate	$\text{C}_{17}\text{H}_{33}\text{COOCH}_3$	100%	n	n	+	+	+	+	+/-	n	n	+	+	1
Methyl Salicylate	$\text{HOC}_6\text{H}_4\text{COOCH}_3$	100%	-	-	+	+	+	n	+/-	-	-	+	+	1
Methylacetyl Acetate	$\text{C}_5\text{H}_8\text{O}_3$	100%	-	-	+	+	+	-	+/-	-	o	+	+	2
Methylamine	$\text{CH}_3\text{NH}_2$	32%	+	o	+	o	+	-	+	+	+	+	+	2
Methylene Chloride => Dichloro Methane														
Mirabilite => Sodium Sulphate														
Morpholine	$\text{C}_4\text{H}_9\text{ON}$	100%	-	-	+	-	+	n	n	-	-	+	+	2
Muriatic Acid => Hydrochloric Acid														
Natron => Sodium Bicarbonate														
Nickel-II-Acetate	$(\text{CH}_3\text{COO})_2\text{Ni}$	s	+	+	+	+	+	-	+	+	+	+	+	(2)
Nickel-II-Chloride	$\text{NiCl}_2$	s	+	+	+	+	-	+	+	+	+	+	+	2
Nickel-II-Nitrate	$\text{Ni}(\text{NO}_3)_2$	s	+	+	+	+	+	+	+	+	+	+	+/-	2
Nickel-II-Sulphate	$\text{NiSO}_4$	s	+	+	+	+	+	+	+	+	+	+	+/-	2
Nitrate of Lime => Calcium Nitrate														



# ProMinent® Chemical Resistance List

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Nitric Acid	HNO <sub>3</sub>	99%	10%	10%*	50%	65%	50%	65%	10%	35%	35%	50%	65%	1
Nitro Methane	CH <sub>3</sub> NO <sub>2</sub>	100%	-	-	+	o	+	-	+/-	-	-	+	+	2
Nitro Propane	(CH <sub>3</sub> ) <sub>2</sub> CHNO <sub>2</sub>	100%	-	-	+	n	+	-	+/-	-	-	+	+	2
Nitro Toluene	C <sub>6</sub> H <sub>4</sub> NO <sub>2</sub> CH <sub>3</sub>	100%	-	-	+	+	+	o	-	-	-	+	+	2
Octane	C <sub>8</sub> H <sub>18</sub>	100%	o	+	+	+	+	+	-	-	-	+	+	1
Octanol	C <sub>8</sub> H <sub>17</sub> OH	100%	-	-	+	+	+	+	+	-	-	+	+	1
Octyl Cresol	C <sub>15</sub> H <sub>24</sub> O	100%	-	-	+	+	+	o	n	-	-	+	+	(1)
Oil => Engine Oils														
Oleum	H <sub>2</sub> SO <sub>4</sub> + SO <sub>3</sub>	s	n	-	-	-	+	+	-	+	+	-	+	2
Orthophosphoric Acid => Phosphoric Acid														
Oxalic Acid	(COOH) <sub>2</sub>	s	+	+	+	+	10%	+	+	+/-	+/-	+	+/-	1
Pentane	C <sub>5</sub> H <sub>12</sub>	100%	+	+	+	+	+	+	-	-	-	+	+	1
Pentanol => Amyl Alcohol														
Perchloric Acid	HClO <sub>4</sub>	70%	n	10%	10%	+	-	+	+/-	o	+	+	n	1
Perchloroethylene => Tetrachloro Ethylene														
Perhydrol => Hydrogen Peroxide														
Petroleum Ether	C <sub>n</sub> H <sub>2n+2</sub>	100%	+	+/-	+	+	+	+	-	-	-	+	+	1
Phenole	C <sub>6</sub> H <sub>5</sub> OH	100%	-	-	+	+	+	+	-	10%	+	+	+	2
Phenyl Ethyl Ether	C <sub>6</sub> H <sub>5</sub> OC <sub>2</sub> H <sub>5</sub>	100%	-	-	+	n	+	-	-	-	-	+	+	2
Phenyl Hydrazine	C <sub>6</sub> H <sub>5</sub> NNH <sub>2</sub>	100%	-	-	o	+	+	o	-	-	-	o	+	2
Phosphoric Acid	H <sub>3</sub> PO <sub>4</sub>	85%	50%	+	+	+	+	+	+	+	+	+	+	1
Phosphorous Oxychloride	POCl <sub>3</sub>	100%	-	-	+	+	n	+	+	n	n	+	+	1
Phosphorous Trichloride	PCl <sub>3</sub>	100%	-	-	+	+	+	o	+	+	+/-	+	+	1
Phthalic Acid	C <sub>6</sub> H <sub>4</sub> (COOH) <sub>2</sub>	s	+	+	+	+	+	+	+	-	+	+	+	1
Picric Acid	C <sub>6</sub> H <sub>2</sub> (NO <sub>3</sub> ) <sub>3</sub> OH	s	+	+	+	+	+	+	+	+	-	+	+	2
Piperidine	C <sub>5</sub> H <sub>11</sub> N	100%	-	-	n	n	+	-	-	-	-	n	+	2
Potash Alum => Potassium Aluminium Sulphate														
Potassium Acetate	CH <sub>3</sub> COOK	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Aluminium Sulphate	KAl(SO <sub>4</sub> ) <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Bicarbonate	KHCO <sub>3</sub>	40%	+	+	+	+	+	+	+	+	+	+	+/-	1
Potassium Bifluoride	KHF <sub>2</sub>	s	n	+	+	+	+	+	+	+	+	+	+	1
Potassium Bisulphate	KHSO <sub>4</sub>	5%	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Bitartrate	KC <sub>4</sub> H <sub>5</sub> O <sub>6</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Borate	KBO <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	(1)
Potassium Bromate	KBrO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	2
Potassium Bromide	KBr	s	+	+	+	+	10%	+	+	+	+	+	0,1	1
Potassium Carbonate	K <sub>2</sub> CO <sub>3</sub>	s	+	+	+	+	+	+	+	55%	55%	+	+	1
Potassium Chlorate	KClO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	2
Potassium Chloride	KCl	s	+	+	+	+	-	+	+	+	+	+	+/-	1
Potassium Chromate	K <sub>2</sub> CrO <sub>4</sub>	10%	+	+	+	+	+	+	+	+	+	+	+	3
Potassium Chrome Sulphate	KCr(SO <sub>4</sub> ) <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Cyanate	KOCN	s	+	+	+	+	+	+	+	+	+	+	+	2
Potassium Cyanide	KCN	s	+	+	+	+	5%	+	+	+	+	+	5%	3
Potassium Cyanoferate II	K <sub>4</sub> Fe(CN) <sub>6</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Cyanoferate III	K <sub>3</sub> Fe(CN) <sub>6</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Dichromate	K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	s	+	+	+	+	25%	+	+	+	+	+	10%	3
Potassium Fluoride	KF	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Hydroxyde	KOH	50%	+	+	+	+	(25 °C)	-	+	10%	10%	+	+	1
Potassium Iodide	KI	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Nitrate	KNO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Perchlorate	KClO <sub>4</sub>	s	+	+	+	+	n	+	+	+	+	+	+	1
Potassium Permanganate	KMnO <sub>4</sub>	s	+	+	+	+	+	+	+	6%	6%	+	+	2
Potassium Persulphate	K <sub>2</sub> S <sub>2</sub> O <sub>8</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Phosphate	KH <sub>2</sub> PO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Pyrochromate => Potassium Dichromate														
Potassium Sulphate	K <sub>2</sub> SO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Sulphite	K <sub>2</sub> SO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Propionic Acid	C <sub>2</sub> H <sub>5</sub> COOH	100%	o	+	+	+	+	+	+	-	+/-	+	+	1
Propionitrile	CH <sub>3</sub> CH <sub>2</sub> CN	100%	n	n	+	+	+	+	-	-	-	+	+	2
Propyl Acetate	CH <sub>3</sub> COOC <sub>3</sub> H <sub>7</sub>	100%	-	-	+	+	+	-	+/-	-	-	+	+	1
Propylene Glycol	CH <sub>3</sub> CHOHCH <sub>2</sub> OH	100%	+	+	+	+	+	+	+	+	+	+	+	1
Prussic Acid => Hydrogen Cyanide														
Pyridine	C <sub>5</sub> H <sub>5</sub> N	100%	-	-	o	-	+	-	-	-	o	+	+	2



# ProMinent® Chemical Resistance List

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Pyrrole	C <sub>4</sub> H <sub>4</sub> NH	100%	n	n	+	n	+	-	-	-	-	+	+	2
Roman Vitriol => Copper Sulphate														
Salicylic Acid	HOC <sub>6</sub> H <sub>4</sub> COOH	s	+	+	+	+	+	+	+	+	+	+	+/o	1
Salmiac => Ammonium Chloride														
Saltpeter => Potassium Nitrate														
Silic Acid	SiO <sub>2</sub> * x H <sub>2</sub> O	s	+	+	+	+	+	+	+	+	+	+	+	1
Silver Bromide	AgBr	s	+	+	+	+	+/o	+	+	+	+	+	+	1
Silver Chloride	AgCl	s	+	+	+	+	-	+	+	+	+	+	+/o	1
Silver Nitrate	AgNO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+/o	3
Slaked Lime => Calcium Hydroxide														
Soda => Sodium Carbonate														
Sodium Acetate	NaCH <sub>3</sub> COO	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Benzoate	C <sub>6</sub> H <sub>5</sub> COONa	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Bicarbonate	NaHCO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Bisulphate	NaHSO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Bisulphite	NaHSO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Borate	NaBO <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Bromate	NaBrO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	3
Sodium Bromide	NaBr	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Carbonate	Na <sub>2</sub> CO <sub>3</sub>	s	+	+	+	+	+/o	+	+	+	+	+	+	1
Sodium Chlorate	NaClO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	2
Sodium Chloride	NaCl	s	+	+	+	+	-	+	+	+	+	+	+	1
Sodium Chlorite	NaClO <sub>2</sub>	24%	+	+	+	+	10%	+	+	+	+	+	10%	2
Sodium Chromate	Na <sub>2</sub> CrO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	3
Sodium Cyanide	NaCN	s	+	+	+	+	+	+	+	+	+	+	+	3
Sodium Dichromate	Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	s	+	+	+	+	+	+	+	+	+	+	+	3
Sodium Dithionite	Na <sub>2</sub> S <sub>2</sub> O <sub>4</sub>	s	+	10%	10%	+	+	n	n	+	+	10%	+/o	1
Sodium Fluoride	NaF	s	+	+	+	+	10%	+	+	+	+	+	+	1
Sodium Hydrogen Sulphate => Sodium Bisulphate														
Sodium Hydroxide	NaOH	50%	+	+	+	+	+	-	+	10%	30%	+	+	1
(60%/ 25 °C)														
Sodium Hypochlorite	NaOCl + NaCl	12%	+	+	o	+	-	+	+	+	+	o	> 10%	2
Sodium Iodide	NaI	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Metaphosphate	(NaPO <sub>3</sub> ) <sub>n</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Nitrate	NaNO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Nitrite	NaNO <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	2
Sodium Oxalate	Na <sub>2</sub> C <sub>2</sub> O <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Perborate	NaBO <sub>2</sub> *H <sub>2</sub> O <sub>2</sub>	s	+	+/o	+	+	+	+	+	+	+	+	+/o	1
Sodium Perchlorate	NaClO <sub>4</sub>	s	+	+	+	+	10%	+	+	+	+	+	10%	1
Sodium Peroxide	Na <sub>2</sub> O <sub>2</sub>	s	+	+	+	+	+	+	+	n	n	-	+	1
Sodium Persulphate	Na <sub>2</sub> S <sub>2</sub> O <sub>8</sub>	s	n	+	+	+	+	+	+	+	+	+	+	1
Sodium Pyrosulphite	Na <sub>2</sub> S <sub>2</sub> O <sub>5</sub>	s	+	+	+	+	+	n	n	+	+	+	+	1
Sodium Salicylate	C <sub>6</sub> H <sub>4</sub> (OH)COONa	s	+	+/o	+	+	+	+	+	+	+	+	+	1
Sodium Silicate	Na <sub>2</sub> SiO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Sulphate	Na <sub>2</sub> SO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Sulphide	Na <sub>2</sub> S	s	+	+	+	+	+	+	+	+	+	+	+	2
Sodium Sulphite	Na <sub>2</sub> SO <sub>3</sub>	s	+	+	+	+	50%	+	+	+	+	+	50%	1
Sodium Tetraborate	Na <sub>2</sub> B <sub>4</sub> O <sub>7</sub> * 10 H <sub>2</sub> O	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Thiosulphate	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub>	s	+	+	+	+	25%	+	+	+	+	+	25%	1
Sodium Tripolyphosphate	Na <sub>5</sub> P <sub>3</sub> O <sub>10</sub>	s	+	+	+	+	+	+/o	+	+	+	+	+	1
Starch	(C <sub>6</sub> H <sub>10</sub> O <sub>5</sub> ) <sub>n</sub>	s	+	+	+	+	+	+	n	+	+	+	+	1
Starch Gum		s	+	+	+	+	+	+	+	+	+	+	+	1
Styrene	C <sub>6</sub> H <sub>5</sub> CHCH <sub>2</sub>	100%	-	-	o	+	+	o	-	-	-	o	+	2
Sublimate => Mercury-II-Chloride														
Succinic Acid	C <sub>4</sub> H <sub>6</sub> O <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sugar Syrup		s	+	+	+	+	+	+	+	+	+	+	+	1
Sulphur Chloride => Disulphur Dichloride														
Sulphuric Acid	H <sub>2</sub> SO <sub>4</sub>	98%	30%	50%	85%	+	20%	+	+	30%	30%	80%	+	1
Sulphuric Acid, fuming --> Oleum														
Sulphurous Acid	H <sub>2</sub> SO <sub>3</sub>	s	+	+	+	+	10%	+	+	+	+	+	+	(1)
Sulphuryl Chloride	SO <sub>2</sub> Cl <sub>2</sub>	100%	-	-	-	o	n	+	o	-	-	-	n	1
Tannic Acid	C <sub>76</sub> H <sub>52</sub> O <sub>46</sub>	50%	+	+	+	+	+	+	+	+	+	+	+	1
Tartaric Acid	C <sub>4</sub> H <sub>6</sub> O <sub>6</sub>	s	50%	+	+	+	+	+	+/o	+	+	+	+	1



# ProMinent® Chemical Resistance List

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Tetrachloro Ethane	$C_2H_2Cl_4$	100%	-	-	o	+	+	o	-	-	o	o	+	3
Tetrachloro Ethylene	$C_2Cl_4$	100%	-	-	o	+	+	o	-	-	o	o	+	3
Tetrachloromethane => Carbon Tetrachloride														
Tetrahydro Furane	$C_4H_8O$	100%	-	-	o	-	+	-	-	-	-	o	+	1
Tetrahydro Naphthalene	$C_{10}H_{12}$	100%	-	-	-	+	+	+	-	-	-	o	+	3
Tetralin => Tetrahydro Naphthalene														
THF => Tetrahydrofuran														
Thionyl Chloride	$SOCl_2$	100%	-	-	-	+	n	+	+	+	+	-	n	1
Thiophene	$C_4H_4S$	100%	n	-	o	n	+	-	-	-	-	o	+	3
Tin-II-Chloride	$SnCl_2$	s	+	o	+	+	-	+	+	+	+	+	+/o	1
Tin-II-Sulphate	$SnSO_4$	s	n	+	+	+	+	+	+	+	+	+	+/o	(1)
Tin-IV-Chloride	$SnCl_4$	s	n	+	+	+	-	+	+	+	+	+	+	1
Titanium Tetrachloride	$TiCl_4$	100%	n	n	n	+	n	o	-	n	n	n	n	1
Toluene	$C_6H_5CH_3$	100%	-	-	o	+	+	o	-	-	-	o	+	2
Toluene Diisocyanate	$C_7H_3(NCO)_2$	100%	n	n	+	+	+	-	+/o	n	n	+	+	2
Tributyl Phosphate	$(C_4H_9)_3PO_4$	100%	n	-	+	+	+	-	+	o	+	+	+	1
Trichloro Ethane	$CCl_3CH_3$	100%	-	-	o	+	+	+	-	-	o	o	+	3
Trichloro Ethylene	$C_2HCl_3$	100%	-	-	o	+	+/o	o	-	-	o	o	+	3
Trichloro Methane => Chloroform														
Trichloroacetaldehyde Hydrate	$CCl_3CH(OH)_2$	s	-	-	o	-	+	o	o	n	n	+	+	2
Trichloroacetic Acid	$CCl_3COOH$	50%	-	+	+	+	-	-	o	+	+/o	+	+	1
Tricresyl Phosphate	$(C_7H_7)_3PO_4$	90%	-	-	+	n	+	o	+	o	+	+	+	2
Triethanol Amine	$N(C_2H_4OH)_3$	100%	+	o	+	n	+	-	+/o	-	o	+	+	1
Trilene => Trichloro Ethane														
Trioctyl Phosphate	$(C_8H_{17})_3PO_4$	100%	n	-	+	+	+	o	+	o	+	+	+	2
Trisodium Phosphate	$Na_3PO_4$	s	+	+	+	+	+	+	+	+	+	+	+	1
Urea	$CO(NH_2)_2$	s	+	+/o	+	+	+	+	+	20%	20%	+	+	1
Vinyl Acetate	$CH_2=CHOOCCH_3$	100%	-	-	+	+	+	n	n	-	+/o	+	+	2
Water Glass => Sodium Silicate														
Xylene	$C_6H_4(CH_3)_2$	100%	-	-	-	+	+	o	-	-	-	o	+	2
Zinc Acetate	$(CH_3COO)_2Zn$	s	+	+	+	+	+	-	+	+	+	+	+	1
Zinc Chloride	$ZnCl_2$	s	+	+	+	+	-	+	+	+	+	+	n	1
Zinc Sulphate	$ZnSO_4$	s	+	+	+	+	+	+	+	+	+	+	+/o	1



# ProMinent® Chemical Resistance List

## Overview of the Resistance of Soft PVC Hoses (Guttasyn®) to the Most Common Chemicals

This data applies to standard conditions (20 °C, 1013 mbar).

+	=	resistant
o	=	conditionally resistant
-	=	not resistant

The data is taken from relevant manufacturers' literature and supplemented by our own tests and experience. As the resistance of a material also depends on other factors, especially pressure and operating conditions etc, this list should merely be regarded as an initial guide and does not claim to offer any guarantees. Take into consideration the fact that conventional dosing agents are largely compounds, the corrosiveness of which cannot simply be calculated by adding together the corrosiveness of each individual component. In cases such as these the material compatibility data produced by the chemical manufacturer must be read as a matter of priority when selecting a material. Safety data sheets do not provide this information and cannot therefore replace application-specific documentation.

Corrosive agent	Concentration in %	Evaluation
Acetic acid	50	o
Acetic acid (wine vinegar)		o
Acetic acid anhydride	100	-
Acetic acid, aqueous	10	+
Acetic ester	100	-
Acetone	all	-
Acetylene tetrabromide	100	-
Aluminium salts, aqueous	all	+
Alums of all kinds, aqueous	all	+
Ammonium salts	all	+
Ammonium, aqueous	15	-
Ammonium, aqueous	saturated	-
Aniline	100	-
Benzene	100	-
Bisulphite, aqueous	40	+
Borax solution	all	+
Boric acid, aqueous	10	+
Bromine, vaporous and liquid		-
Butanol	100	+
Butyl acetate	100	-
Butyric acid, aqueous	20	+
Butyric acid, aqueous	conc.	-
Calcium chloride, aqueous	all	+
Carbon disulphide	100	-
Carbonic acid	all	+
Caustic potash	15	+
Chlorinated hydrocarbons	all	-
Chrome-alum, aqueous	all	+
Chromic acid, aqueous	50	-
Copper sulphate, aqueous	all	+
Creosote		-
Dextrin, aqueous	saturated	+
Diesel oils, compressed oils	100	o
Diethyl ether	100	-
Difluorodichloromethane	100	-
Ethanol	96	-
Ethyl acetate	100	-
Ethylene glycol	30	+
Ferric chloride, aqueous	all	+
Fertilizing manure salt, aqueous	all	+
Formaldehyde, aqueous	30	o
Glacial acetic acid	100	-
Glucose, aqueous	saturated	+
Glycerol	100	-
Halogens	all	-





# ProMinent® Chemical Resistance List

Corrosive agent	Concentration in %	Evaluation
Hydrochloric acid	15	+
Hydrogen bromide	10	+
Hydrogen peroxide	to 10	+
Hydrogen sulphide, gaseous	100	-
Ink		+
Magnesium salts, aqueous	all	+
Methyl alcohol	100	+
Methylene chloride	100	-
Nitric acid, aqueous	25	+
Oils => fats, diesel oil, Lubricating oil and similar		
Perchloric acid	all	o
Phenol, aqueous	all	o
Phosphoric acid, aqueous	100	-
Potassium bichromate, aqueous	saturated	+
Potassium persulphate, aqueous	saturated	+
Silver nitrate	10	+
Sodium chloride, aqueous	all	+
Sodium hydroxide	aqueous	+
Sodium hypochlorite	15	+
Sodium salts => sodium chloride		
Sulphur dioxide, gaseous	all	+
Sulphuric acid	30	+
Tetrachloromethane	100	-
Toluene	100	-
Trichloroethylene	100	-
Urea, aqueous	all	+
Xylene	100	-
Zinc salts	all	+







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Issued by:

ProMinent GmbH  
Im Schuhmachergewann 5-11  
69123 Heidelberg  
Germany  
Phone +49 6221 842-0  
info@prominent.com  
www.prominent.com



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Heidelberg, January 2015

## Measuring, Control and Sensor Technology



### Precision by design

Precise sensor technology and high-performance measuring and control technology are the guarantee of process safety when metering liquid media.

We deal with it in detail in **Chapter 1!** Discover a huge range of DULCOTEST® sensors for precise recording of different parameters in real time.

The measuring and control devices in **Chapter 2** will introduce consistent quality into your process. From the simple conversion of measuring signals to controllers optimised for complex, application-specific control tasks - the optimum product for every task awaits you here!

**Chapter 3** includes fully assembled metering and control systems, designed for the measurement of potable water, cooling water and waste water. The ready-wired plug-and-play modules, with perfectly matched components, are ready for fast and easy installation.

### We're there for you!

We're there to help with the selection of your products. We'd be pleased to advise you on the integration of individual components into your individual metering processes.

Give us a call! We look forward to hearing from you.

Monday to Friday 8:00 - 16:30

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We can also support you by phone in selecting the right products and, in many cases, optimising entire applications. For more complex requirements, our consultants will hand the task over to a field sales colleague, who will then clarify your requirements in person on site.

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## Ozone Sensor OZR 1-mA

- Measured variable: Ozone, without cross sensitivity to chlorine, hydrogen peroxide
- Diaphragm-covered sensor (encapsulated) minimises faults caused by changing flow or ingredients in the water
- Suitable also for monitoring the absence of ozone (rupture monitoring on filters) and for discontinuous ozone treatment processes
- Resistance to films of dirt by pore-free diaphragm

For more information see page → 1-78



## Measuring and Control System DULCOTROL® Potable Water/F&B, DULCOTROL® Waste Water

### DULCOTROL® DWCa\_P potable water/F&B

Treatment of potable water, water similar to potable water and treatment of rinsing water, industrial and process water in the food and beverage industry

- Disinfection
- Cleaning In Place (CIP)
- pH adjustment
- Monitoring

### DULCOTROL® DWCa\_W waste water

Treatment of industrial and municipal waste water

- pH neutralisation
- Disinfection
- Detoxification
- Desalination of process water
- Control of dissolved oxygen
- Monitoring

For more information see page → 3-3

## Installation fitting for chlorine sensor CLO

The installation valve permits the installation of the sensor for free chlorine types CLO (part no. 1033870, 1033871, 1033878) for operation in the process line (G 1") or in the bypass to the process line. Use either with a free outlet or return of the sample water to the process line. Sample water temperature up to 70 °C/ 2 bar and 40 °C/7 bar. Keep the flow constant.

For more information see page → 1-128



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# 1.0 Overview of Sensor Technology DULCOTEST®

1

## 1.0.1 Selection Guide

### DULCOTEST® pH Sensor Selection Guide

Medium	Temperature/pressure	Sensor type	Typical application
Clear, pH 3 – 14	Max. 100 °C/3 bar	PHEP-H	Chemical processes
	Max. 25 °C/6 bar		
Clear, pH 2 – 12	Max. 80 °C/ no overpressure	PHEN	Chemically contaminated water, low-conductivity water < 50 µS/cm
	Max. 60 °C/3 bar	PHES	Swimming pool water, potable water, glass shaft
		PHEK	Swimming pool, aquarium, plastic shaft
	Max. 80 °C/6 bar	PHEP/PHEPT	Process water
	Max. 80 °C/8 bar	PHED	Chemically contaminated water, e.g. Cr <sup>6+</sup> , CN <sup>-</sup>
Solid matter, turbidity	Max. 80 °C/6 bar	PHER	Cooling water, waste water
Solid matter, non-translucent	Max. 100 °C/16 bar	PHEX	Suspensions, sludge, emulsions
Clear to turbid, containing fluoride, pH 0 - 7	Max. 50 °C/7 bar	PHEF	Exhaust air scrubber, semiconductor industry, electroplating

### DULCOTEST® ORP sensor selection guide

Medium	Temperature / pressure	Sensor type	Typical applications
Clear, pH 2 - 12	Max. 80 °C / no overpressure	RHEN	Chemically contaminated water, low-conductivity water < 50 µS/cm
	Max. 60 °C / 3 bar	RHES	Swimming pool water, potable water, glass shafts
		RHEK	Swimming pools, aquaria, plastic shafts
	Max. 80 °C / 6 bar	RHEP-Pt	Process water
		RHEP-Au	Chemically contaminated water, e.g. CN <sup>-</sup> , ozone treatment
Solid matter, turbidity	Max. 80 °C / 6 bar	RHER	Cooling water, waste water
Solid matter, non-translucent	Max. 100 °C / 16 bar	RHEX	Suspensions, sludge, emulsions

**Important note:** All DULCOTEST® pH and ORP sensors are made from lead-free glass (RoHS-compliant)



# 1.0 Overview of Sensor Technology DULCOTEST®

## Selection guide for DULCOTEST® amperometric sensors

Measured variable	Applications	Graduated measuring range	Connection to DULCOMETER®	Sensor type	See page
<b>Free chlorine</b>	Potable water, swimming pools	0.01–100 mg/l	D1C, DACa	CLE 3-mA-xppm, CLE 3.1-mA-xppm	→ 1-51
<b>Free chlorine</b>	Process and waste water	10 - 200 mg/l	D1C, DACa	CLR 1-mA	→ 1-61
<b>Free chlorine</b>	Potable water, swimming pool water	0.01 - 10 mg/l	DULCOMARIN® II	CLE 3-CAN-xppm, CLE 3.1-CAN-xppm	→ 1-54
<b>Free chlorine</b>	Potable water, swimming pool water, in situ electrolysis (without diaphragm)	0.02-10 mg/l	D1C, DACa	CLO 1-mA-xppm	→ 1-56
<b>Free chlorine</b>	Hot water up to 70 °C (legionella), in situ electrolysis (without diaphragm)	0.02-2 mg/l	D1C, DACa	CLO 2-mA-2ppm	→ 1-57
<b>Free chlorine</b>	Potable water, swimming pools	0.01–50 mg/l	DMT	CLE 3-DMT-xppm	→ 1-53
<b>Free chlorine</b>	Potable water, swimming pools	0.05-5 mg/l	COMPACT	CLB 2-µA-xppm	→ 1-58
<b>Free chlorine</b>	Potable water, swimming pool water	0.05-5 mg/l	COMPACT	CLB 3-µA-xppm	→ 1-59
<b>Free chlorine</b>	Cooling, industrial and waste water, water with higher pH values (stable); seawater (free chlorine exists as bromine)	0.01-10 mg/l	D1C, DACa	CBR 1-mA-xppm	→ 1-60
<b>Total available chlorine</b>	Swimming pool water with chlorine-organic disinfectants	0.02–10 mg/l	D1C, DACa	CGE 3-mA-xppm	→ 1-62
<b>Total available chlorine</b>	Swimming pool water with organic chlorine disinfectants, in situ electrolysis (without diaphragm)	0.02 - 10 mg/l	D1C, DACa	CGE 3-mA	→ 1-62
<b>Total available chlorine</b>	Swimming pool water with chlorine-organic disinfectants	0.01–10 mg/l	DULCOMARIN® II	CGE 2-CAN*-xppm	→ 1-63
<b>Total chlorine</b>	Potable, industrial, process and waste water	0.01–10 mg/l	D1C, DACa	CTE 1-mA-xppm	→ 1-64
<b>Total chlorine</b>	Potable, industrial, process and waste water	0.01–10 mg/l	DMT	CTE 1-DMT-xppm	→ 1-65
<b>Total chlorine</b>	Potable, industrial, process and waste water	0.01–10 mg/l	DULCOMARIN® II	CTE 1-CAN-xppm	→ 1-66
<b>Combined chlorine</b>	Swimming pool water	0.02–2 mg/l	DACa	CTE 1-mA-2 ppm + CLE 3.1-mA-2 ppm	→ 1-66
<b>Combined chlorine</b>	Swimming pool water	0.01–10 mg/l	DULCOMARIN® II	CTE 1-CAN-xppm + CLE 3.1-CAN-xppm	→ 1-66
<b>Total available bromine</b>	Cooling water, waste water, swimming pool water, whirlpool water, bromine with BCDMH	0.01-10 mg/l	D1C, DACa	BCR 1-mA (replaces earlier type BRE 1)	→ 1-68
<b>Total available bromine</b>	Cooling water, swimming pool water, whirlpool water with organic or inorganic bromine compounds	0.02-10 mg/l	DULCOMARIN® II	BRE 3-CAN-10 ppm	→ 1-69
<b>Free and bound bromine</b>	Cooling, industrial, waste water, water with higher pH values (stable); seawater	0.02-20 mg/l	D1C, DACa	CBR 1-mA-xppm	→ 1-60
<b>Chlorine dioxide</b>	Potable water	0.01–10 mg/l	D1C, DACa	CDE 2-mA-xppm	→ 1-71
<b>Chlorine dioxide</b>	Bottle washer systems	0.02–2 mg/l	D1C, DACa	CDP 1-mA	→ 1-72
<b>Chlorine dioxide</b>	Hot water up to 60 °C, cooling water, waste water, irrigation water	0.01-10 mg/l	D1C, DACa, DULCOMARIN® II	CDR 1-mA-xppm, CDR 1-CAN-xppm	→ 1-73
<b>Chlorite</b>	Potable, wash water	0.02–2 mg/l	D1C, DACa, DULCOMARIN® II	CLT 1-mA-xppm, CLT 1-CAN-xppm	→ 1-75
<b>Ozone</b>	Potable water, swimming pool water	0.02–2 mg/l	D1C, DACa	OZE 3-mA	→ 1-77
<b>Ozone</b>	Process, service or cooling water	0.02–2 mg/l	D1C, DACa	OZR 1-mA-2 ppm*	→ 1-78
<b>Dissolved oxygen</b>	Potable, surface water	2–20 mg/l	D1C, DACa	DO 1-mA-xppm	→ 1-79
<b>Dissolved oxygen</b>	Activated sludge tank, sewage treatment plants	0.1–10 mg/l	D1C, DACa	DO 2-mA-xppm	→ 1-80
<b>Peracetic acid</b>	CIP, antiseptic food filling process	1–2,000 mg/l	D1C, DACa	PAA 1-mA-xppm	→ 1-81
<b>Hydrogen peroxide</b>	Clear water, fast control	1–2,000 mg/l	DACa	PEROX sensor PEROX-H2.10 P	→ 1-83
<b>Hydrogen peroxide</b>	Process, swimming pool water	2–20,000 mg/l	D1C, DACa	PER1-mA-xppm	→ 1-83

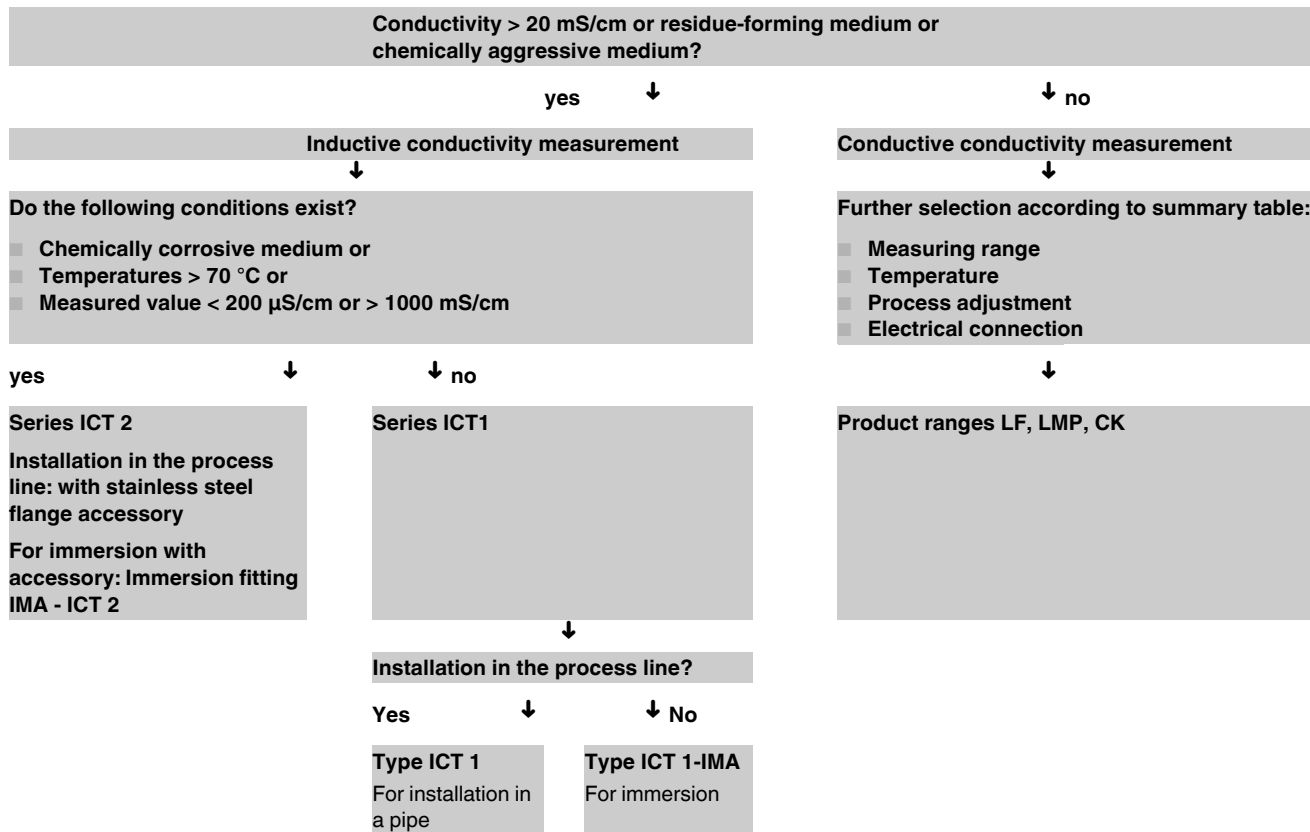
\* Available from 2nd quarter of 2015.





# 1.0 Overview of Sensor Technology DULCOTEST®

## Conductivity sensor selection guide



# 1.1 Sensor Technology DULCOTEST® Measuring Principles

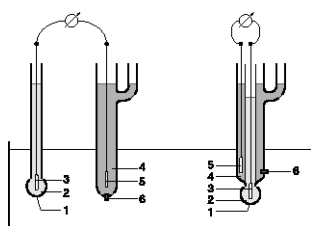
## 1.1.1

### Three Measurement Principles for Reliable Water Treatment

- Potentiometry is used to determine: pH value, ORP and fluoride concentration
- Amperometry is used to determine: chlorine, bromine, chlorine dioxide, ozone, hydrogen peroxide, peracetic acid
- Conductometry is used to determine electrolytic conductivity

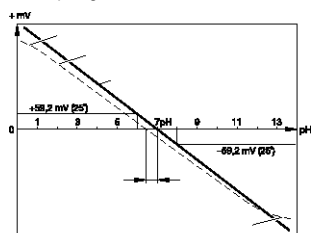
## 1.1.2

### Potentiometry - Measures an Electrode's Potential in a Sample Solution



pk\_6\_001

- 1 Glass membrane
- 2 Internal pH buffer
- 3 Internal derivation
- 4 Electrolyte
- 5 External derivation
- 6 Diaphragms



pk\_6\_002

- 1 Acid error
- 2 Exponential (in practice)
- 3 Theoretical (nominal slope)
- 4 Zero point deviation (asymmetrical potential)
- 5 Alkali error
- 6 Voltage of probe

As the measurement of the potential of a sensor (half chain) is not possible, a measuring chain is used that comprises two half chains. Their potential difference can be measured using a very high resistance voltmeter, i.e. nearly without any current.

A measuring chain always comprises:

A measuring electrode, which reacts as specifically as possible to concentration changes for a particular reactant and a reference electrode (reference), which supplies, as constantly as possible, a voltage that is dependent on the concentration of the reactant.

An example of a measuring system, such as this, is the pH measuring sensor, designed as a two-rod sensor or single rod sensor (Fig. pk\_6\_001).

#### pH = -log a<sub>H</sub><sup>+</sup>

As hydrogen ion concentrations occur in a wide range of less than 10<sup>-14</sup> g/l up to more than 10 g/l (or mol/l) in aqueous solutions and the exponential nomenclature is unwieldy, the pH scale is defined as:

$$\text{pH} = -\log a_{\text{H}^+}$$

For concentrations that are not too high, activity and concentration can be set equally.

Then a concentration of 10<sup>-14</sup> corresponds to a pH value of 14 and a concentration of 10<sup>0</sup> = 1 corresponds to a pH value of 0.

pH value 7 is identified as neutral. This means that the effective concentrations of H<sup>+</sup> and OH<sup>-</sup> ions here, which originate from the dissociation of water (H<sub>2</sub>O → H<sup>+</sup> + OH<sup>-</sup>), are the same size.

If the hydrogen ions are in a majority due to the addition of acid (e.g. HCl) then the pH values are less than 7. If a base (alkali) is added (e.g. NaOH) then the values are greater than 7 and the solution becomes alkaline.

Each change in the pH value by 1 corresponds to a factor of 10 concentration change and results from the logarithmic relationship.

Fig. pk\_6\_002 shows the theoretical voltage curve for pH glass electrodes. In practice glass electrodes exhibit a greater or lesser deviation from the theoretical curve.

The electrode system generally exhibits a zero-point deviation (asymmetry potential), which is smaller than ± 0.5 pH, however. The electrode slope (mV/pH) may also deviate from the theoretical value U<sub>N</sub> (59.2 mV/pH at 25 °C), which is particularly the case for used glass electrodes.

Other deviations occur at very low pH values, the so-called acid error, while at high pH values allowance must be made for the so-called alkali error (or Na error).

#### pH measuring amplifiers must be matched to the respective measuring chain by means of zero point and slope calibration

Here the zero point is calibrated using a buffer solution, the value of which is about pH 7 while the slope is calibrated using a buffer in an acidic or alkaline range that has a pH value 2 or 3 above or below the neutral point.

With pH measurements that differ from pH 7, the fluctuating temperature of the measuring medium may result in a need for temperature compensation.

In this respect three questions must be answered:

- 1 What pH value is to be measured?
- 2 How large are the temperature deviations?
- 3 How accurate must the measurements be?

Example of the influence of temperature without compensation:

At pH 10, an incorrect indication of approximately + 0.1 pH occurs for a temperature increase of about 10 °C. This effect is greater the greater the pH value differs from pH 7.

# 1.1 Sensor Technology DULCOTEST® Measuring Principles

## Measurement of the redox (ORP) voltage is also a potentiometric measurement

The term "redox" (or ORP - oxidation/reduction potential) stands for the reduction and oxidation that occur alongside each other in aqueous solutions. In general, oxidation involves the removal of electrons with an oxidising agent acting as an electron acceptor. Reduction is the opposite with electrons being taken up, with the reducing agent acting as an electron donor.

The redox (ORP) voltage is measured with a precious metal electrode, generally platinum. In an oxidising agent containing liquid (e.g. chlorine) there is a positive redox (ORP) voltage, in a reducing agent (e.g. sodium bisulphite) a negative redox (ORP) voltage.

The level of the redox (ORP) voltage gives an indication of how strongly oxidising or reducing a solution is. Where disinfection is concerned, the redox (ORP) voltage gives an indication of how great the germicidal effect of, for example, chlorine or ozone is.

Consequently the redox (ORP) voltage can be considered as a hygiene parameter in water treatment.

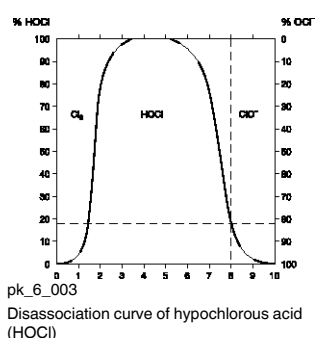
It should be noted that the redox (ORP) voltage varies with the pH value so that qualitative conclusions need to be made at a constant pH value.

## Examples of typical applications for redox (ORP) measurements

- Cyanide detoxification at a high pH value by oxidation using gold electrodes.
- Chromate detoxification at a low pH value by oxidation using platinum electrodes.
- Monitoring of the disinfection effect during oxidising agent metering (chlorine/bromine) using platinum electrodes.

### 1.1.3

## Amperometry - A Current Measurement Used to Determine the Concentration of Predetermined Dissolved Solids in Aqueous Solutions



This type of current measurement concentrates on the nA ( $10^{-9}$  A) or  $\mu$ A ( $10^{-6}$  A) range. With operating measurements in this range, open or diaphragm-covered 2 or 3-electrode sensors are used. The amperometric sensor product range makes determining the concentration of chlorine, bromine, chlorine dioxide, chlorite, ozone, hydrogen peroxide, peracetic acid and dissolved oxygen possible.

## Our amperometric DULCOTEST® sensors represent proven diaphragm covered 2-electrodes sensors.

By separating the electrode chamber from the measurement medium using a special diaphragm, clear metrological conditions are created and disturbing influences excluded.

ProMinent® DULCOTEST® systems use 2-electrode sensors of gold or platinum as a working electrode (cathode). The counter electrode (anode) is silver with a special coating.

In contrast to open, fault-prone sensors, diaphragm-covered sensors exhibit hardly any flow dependency above a minimum flow (approx. 30 l/h). Consequently there is no need for costly measures to maintain the flow at a constant rate.

## The pH value has a decisive influence on the chlorine measurement

It is important to know, in what forms chlorine is present in aqueous solutions. It is only at a very low pH value that chlorine occurs as dissolved chlorine gas  $\text{Cl}_2$  in water and above a pH of about 3 as hypochlorous acid HOCl, which with a further rise in the pH value dissociates into hypochlorite (see Fig. pk\_6\_003).

Compared with hypochlorous acid, hypochlorite is about 100 times less powerful as a disinfectant, therefore it makes no sense to measure it with the chlorine sensor. Yet both hypochlorous acid and hypochlorite are considered to be "free chlorine" and, as such, are also measured by the DPD 1 measuring method, generally used as a comparison measurement.

A corresponding example:

At pH 8 (see Fig. pk\_6\_003), only some 20 % is in the effective HOCl form, while 80 % is in the nearly ineffective form  $\text{OCl}^-$ . However, to obtain a value corresponding to the DPD comparison measurement on the measuring device display, this can be set up using a sensitivity (slope) comparison.

For a worthwhile measurement, the pH value must be kept constant. If not, a new slope calibration must be carried out. The maximum permissible pH value is pH 8.0 for inorganic chlorine and pH 9.5 for organic chlorine.



# 1.1 Sensor Technology DULCOTEST® Measuring Principles

**The influence of temperature on chlorine measurement is significant, therefore automatic temperature compensation occurs in DULCOTEST® chlorine sensors**

While there are no problems with chlorine measurements involving inorganic chlorine (chlorine gas  $\text{Cl}_2$ , sodium-calcium hypochlorite  $\text{NaOCl}$  or calcium hypochlorite  $\text{Ca}(\text{OCl})_2$ ) provided the pH value remains constant, if organic chlorine additives are used (isocyanuric acid) then difficulties may occur, which can be easily overcome using the organic chlorine sensor (CGE).

If organic chlorine stabilisers are added, then not only does hypochlorous acid form, but also chlorine bound to isocyanuric acid. Both species are detected by the organic chlorine sensor (CGE).

If a measurement is made using the DPD 1 method, organic chlorine is also measured in the same way as the practically ineffective hypochlorite (at high pH values). In this case, the DPD measurement can indicate false hygienic safety, which is not in fact the case.

**Typical applications for DULCOTEST® chlorine sensors include swimming pool water (also sea water), potable water and process water**

The chlorine measurement can be disrupted by bromine, iodine, ozone and chlorine dioxide, but not, however, by dissolved oxygen. The presence of surfactants will block the working of the CLE sensor diaphragm for free chlorine. The sensor cannot then be used, by contrast, however, the CTE combined chlorine sensor can be used in applications such as this.

A sensor that functions according to the same principle as for the inorganic chlorine measurement is used to measure chlorine dioxide. The chlorine dioxide measurement is independent of the pH value and its temperature dependency is compensated. Dissolved oxygen and chlorite do not interfere with the measurement results. The presence of surfactants causes problems with CDE sensors. By contrast, CDP sensors can also be used in media containing surfactants.

In addition amperometric sensors can also be used to measure bromine and ozone dissolved in water.

## 1.1.4

### Advantages of DULCOTEST® Amperometric Sensors at a Glance

#### Simple to use

- No zero point calibration necessary
- Sample liquid need not be de-chlorinated with active carbon filter
- Installation and calibration is very quick

#### Reliable measurement in real-time

- No cross-sensitivity because of turbidity and colouration
- The DULCOTEST® chlorine measurement can also be used in sea water and brine baths
- The measured value is largely unaffected by the flow rate
- Online measurement

#### Minimum maintenance

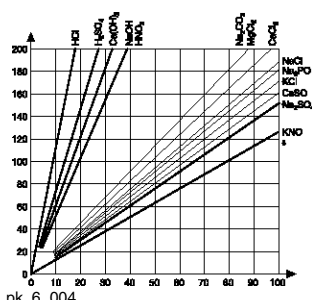
- Maintenance is limited to the 6-12 month replacement of the membrane cap and electrolyte
- Long-term operating costs are therefore low



# 1.1 Sensor Technology DULCOTEST® Measuring Principles

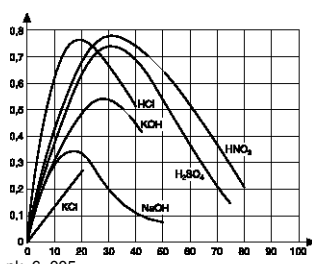
## 1.1.5

## Conductometry – The Measurement of Electrolytic Conductivity



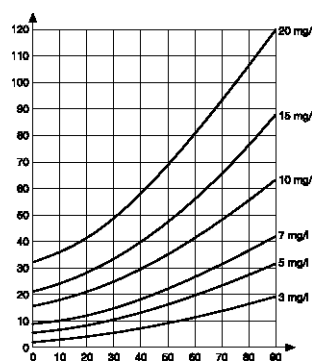
pk\_6\_004

Dependence of electrolytic conductivity on the concentration of dissolved acids, alkalis and salt solutions



pk\_6\_005

Dependence of specific conductivity on the concentration in percentage weight of concentrated acids, alkalis and salt solutions



pk\_6\_006

Conductivity of aqueous solutions of NaCl depending on the temperature of different concentrations

In contrast to metallic conductivity where the electric charge is carried by electrons, in electrolytic conductivity, ions are responsible for carrying the charge, that is positively or negatively charged atoms or groups of atoms which are primarily created by dissolving in or dissociation in aqueous solutions. Conductivity sensors are differentiated according to the following criteria:

### ■ The cell constant as a distinguishing feature

An arrangement in which the conductivity of an electrolyte would be measured in a tube of length  $l = 1$  cm and cross section  $q = 1$  cm<sup>2</sup> has a cell constant of  $k = 1$  cm<sup>-1</sup>. If the length  $l = 10$  cm (or if the cross section  $q = 0.1$  cm<sup>2</sup>), then the cell constant would be  $k = 10$  cm<sup>-1</sup>. By contrast, if the cross section was increased to  $q = 10$  cm<sup>2</sup> (or  $l$  reduced to 0.1 cm), then a cell constant of  $k = 0.1$  cm<sup>-1</sup> is obtained. It can easily be seen that a conductivity sensor with a smaller cell constant is used for measurements of lower conductivity while a cell with a larger cell constant is used for higher conductivities. This is done to increase the measurement sensitivity at lower conductivities (e.g.  $k = 0.1$  cm<sup>-1</sup>) – or to reduce it at higher conductivities (e.g.  $k = 10$  cm<sup>-1</sup>).

### ■ Sensor materials

The selection of the correct cell constant is just as important as selection of a suitable electrode material. Stainless steel has shown its suitability in the lower range, up to approximately 500 μS/cm. By contrast in the upper range, where, because of the occurrence of polarisation effects, stainless steel is less suitable, special graphite is primarily used. As errors due to polarisation effects have to be avoided during electrolytic conductivity measurements, measurements can only be carried out using AC voltage. At low conductivities, frequencies of about 50 Hz are favoured and in the higher range up to approximately 5 kHz. Both at very low and also very high conductivities, long measuring lines can result in incorrect results, in the lower range caused by line capacities and in the upper range by line resistance. Therefore the distance between the sensor and measurement amplifier should be kept as short as possible.

### Every conductivity measurement is temperature-dependent

Different dissolved substances mostly have different temperature coefficients  $\alpha$  (alpha), leading to a particular temperature curve that can change depending on the concentration and temperature. (Fig. pk\_6\_006)

As, in general, conductivity measurements are used because we want to draw conclusions about substance concentrations, temperature compensation is used for exact measurements, even with a measured value compensated to an international standard reference temperature of 25 °C. Suitable transducers for temperature compensation are NTC or Pt 100 temperature sensors with the Pt 100 being significantly superior because of its linearity and hence accuracy.

### Inductive conductivity measurement

While errors can occur due to polarisation effects and deposits on the electrode surfaces, with open conductivity measurements, errors can be avoided using inductive conductivity measurement where no electrodes are used. Regular cleaning is therefore not necessary and measuring reliability is significantly higher.



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

The following generally applicable points should be noted for optimum functioning of pH and ORP sensors:

- The sensors should never dry out
- The insertion angle must be > 15 ° from the horizontal (except with PHEK-L)
- Maximum flow < 0.8 m/s
- Use of suitable measuring lines
- Measuring lines should be as short as possible
- Use of suitable measuring devices/transducers (high resistance input)
- Calibration using quality buffer solutions
- Selection of electrode type according to the application
- The storage duration should be as short as possible

For Signal leads for pH/ORP measurement see page → 1-113, and for pH quality buffer solutions see page → 1-116

### pH sensor selection guide

Medium	Temperature/pressure	Sensor type	Typical application
Clear, pH 3 – 14	Max. 100 °C/3 bar	PHEP-H	Chemical processes
	Max. 25 °C/6 bar		
Clear, pH 2 – 12	Max. 80 °C/no overpressure	PHEN	Chemically contaminated water, low-conductivity water < 50 µS/cm
	Max. 60 °C/3 bar	PHES	Swimming pool water, potable water, glass shaft
		PHEK	Swimming pool, aquarium, plastic shaft
	Max. 80 °C/6 bar	PHEP/PHEPT	Process water
	Max. 80 °C/8 bar	PHED	Chemically contaminated water, e.g. Cr <sup>6+</sup> , CN <sup>-</sup>
Solid matter, turbidity	Max. 80 °C/6 bar	PHER	Cooling water, waste water
Solid matter, non-translucent	Max. 100 °C/16 bar	PHEX	Suspensions, sludge, emulsions
Clear to turbid, containing fluoride, pH 0 - 7	Max. 50 °C/7 bar	PHEF	Exhaust air scrubber, semiconductor industry, electroplating

**Important note:** All DULCOTEST® pH and ORP sensors are made from lead-free glass (RoHS-compliant)





## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

DULCOTEST® ORP sensor selection guide

Medium	Temperature / pressure	Sensor type	Typical applications
Clear, pH 2 - 12	Max. 80 °C / no overpressure	RHEN	Chemically contaminated water, low-conductivity water < 50 µS/cm
	Max. 60 °C / 3 bar	RHES	Swimming pool water, potable water, glass shafts
		RHEK	Swimming pools, aquaria, plastic shafts
	Max. 80 °C / 6 bar	RHEP-Pt	Process water
		RHEP-Au	Chemically contaminated water, e.g. CN-, ozone treatment
Solid matter, turbidity	Max. 80 °C / 6 bar	RHER	Cooling water, waste water
Solid matter, non-translucent	Max. 100 °C / 16 bar	RHEX	Suspensions, sludge, emulsions

**Important note:** All DULCOTEST® pH and ORP sensors are made from lead-free glass (RoHS-compliant)

## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

### 1.2.1 pH Sensors With SN6 or Vario Pin Plug-in Head

pH sensors with plug-in heads are connected to a shielded coaxial cable with the appropriate socket. The rotatable sensor head sleeve prevents the cable from twisting when inserting and dismantling the sensor (e.g. when calibrating). The cable can therefore remain connected. This avoids the penetration of troublesome water onto the plug-in contacts.

Series			
PHE	pH sensor		
	<b>Properties</b>		
X	With solid electrolyte and circular gap diaphragm		
K	With insensitive plastics shaft		
N	KCl refillable sensor		
E	Plug-in sensor		
R	With PTFE circular diaphragm		
P	Pressure-tight up to 6 bar		
D	2 ceramics diaphragms (double junction)		
S	Swimming pool sensor		
F	Resistant to hydrofluoric acid		
	Without specification: standard gel sensor		
	<b>Special equipment</b>		
T	With integral temperature gauge		
H	Temperature up to 100 °C, alkali-resistant		
L	Vertical to horizontal installation		
	<b>pH measuring range</b>		
112	pH measuring range: 1 - 12		
	<b>Electrical connection at the sensor</b>		
S	Plug for coax connector SN6		
V	Vario Pin plug		
	<b>Internal thread</b>		
E	Internal thread PG 13.5 for installation		
L	None, laboratory sensor refillable with KCl		
	<b>Diaphragm</b>		
3D	3 ceramic diaphragms		





## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

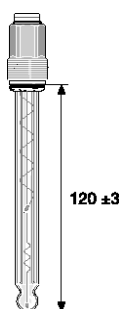
### pH Sensor PHES 112 SE

pH sensor optimised for use in potable water treatment, swimming pools/hot tubs at up to 60 °C/3 bar



#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for use in swimming pools and for potable water
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to the material, which is inert to aggressive disinfectants
- Stable reference system
- Twist protection for the sensor cable connected. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding troublesome moisture on the connector contacts
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



pk\_6\_016

<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 60 °C
<b>Max. pressure</b>	3.0 bar
<b>Min. conductivity</b>	150 µS/cm
<b>Electrolyte</b>	Gel containing potassium chloride
<b>Diaphragm</b>	Ceramic
<b>Sensor shaft</b>	Glass
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head, rotatable with a ProMinent cable
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	Swimming pools, whirlpools, potable water
<b>Resistance to</b>	Disinfectant
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm, separate temperature measurement for temperature compensation needed

	<b>Fitting length</b>	<b>Order no.</b>
<b>PHES 112 SE</b>	120 ± 3 mm	150702
<b>PHES 112 SE</b>	225 ± 3 mm	150092



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

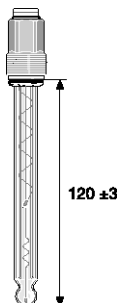


### pH Sensor PHES 112 SE 3D

pH sensor optimised for use in potable water treatment, swimming pools/hot tubs and at low electrolytic conductivities of up to 60 °C/3 bar

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for use in swimming pools
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Three ceramic diaphragms optimised for low electrolytic conductivities
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to the material, which is inert to aggressive disinfectants
- Stable reference system
- Twist protection for the sensor cable connected. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding troublesome moisture on the connector contacts
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



pk\_6\_016

<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 60 °C
<b>Max. pressure</b>	3.0 bar
<b>Min. conductivity</b>	50 µS/cm
<b>Electrolyte</b>	Gel containing potassium chloride
<b>Diaphragm</b>	3 Ceramic diaphragms
<b>Sensor shaft</b>	Glass
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head, rotatable with a ProMinent cable
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	Low conductivity water
<b>Resistance to</b>	Disinfectant
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm, separate temperature measurement for temperature compensation needed

	<b>Fitting length</b>	<b>Order no.</b>
<b>PHES 112 SE 3D</b>	120 ± 3 mm	1045759



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

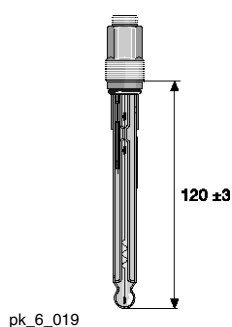
### pH Sensor PHEP 112 SE

pH sensor optimised for use with clear process water and conditions of up to 80 °C/6 bar



#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for exacting process requirements
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to the material, which is inert to aggressive disinfectants
- Stable reference system for high pressure/temperature requirements
- Twist protection for the sensor cable connected. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding troublesome moisture on the connector contacts
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 80 °C
<b>Max. pressure</b>	6.0 bar
<b>Min. conductivity</b>	150 µS/cm
<b>Electrolyte</b>	Gel containing potassium chloride
<b>Diaphragm</b>	Ceramic
<b>Sensor shaft</b>	Glass
<b>Shaft diameter</b>	15 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head, rotatable with a ProMinent cable
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	Swimming pools during pressurisation for higher temperatures and pressures, potable and industrial water, electroplating, chemical industries
<b>Resistance to</b>	Disinfectant
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm, separate temperature measurement for temperature compensation needed

	<b>Order no.</b>
<b>PHEP 112 SE</b>	150041



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

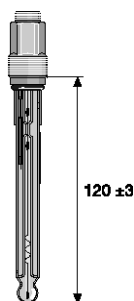


### pH Sensor PHEP-H 314 SE

pH sensor optimised for use with clear process water, specifically for alkaline process solutions at high temperatures of up to 100 °C

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for exacting process requirements
- Optimised pH-sensitive glass for high alkali content and high temperatures
- Long service life / excellent precision: Measurement at a high pH value of up to 14
- Long service life: at high temperatures of up to 100 °C
- Stable reference system for high pressure / temperature requirements
- Twist protection for the sensor cable connected. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding troublesome moisture on the connector contacts
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



pk\_6\_019

<b>pH range</b>	3 ... 14 (Note: use below pH 3 shortens the service life)
<b>Temperature</b>	0 ... 100 °C
<b>Max. pressure</b>	6.0 bar up to 25 °C, 3.0 bar up to 100 °C
<b>Min. conductivity</b>	150 µS/cm
<b>Electrolyte</b>	Gel containing potassium chloride
<b>Diaphragm</b>	Ceramic
<b>Sensor shaft</b>	Glass
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head, rotatable with a ProMinent cable
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	Monitoring or control of chemical processes with neutral to highly-alkaline media and temperatures up to 100 °C
<b>Resistance to</b>	Disinfectant, high alkalinity
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, highly alkaline tempered glass, ceramic diaphragm, gel electrolyte, separate temperature measurement for temperature compensation needed

	Order no.
PHEP-H 314 SE	1024882



# 1.2 pH, ORP, Fluoride and Temperature Sensors

## DULCOTEST®

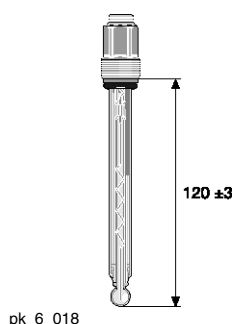
### pH Sensor PHER 112 SE



pH sensor optimised for use in contaminated water containing solids and for low conductivity of  $> 50 \mu\text{S}/\text{cm}$  at up to  $80^\circ\text{C}/6 \text{ bar}$

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- The large dirt-repellent Teflon® diaphragm prevents the reference system from becoming blocked up
- Long service life when solids are present
- High-viscosity electrolyte combined with a salt reservoir prevents the electrolyte from "bleeding"
- Long service life without drifts when there is clear water with low conductivity
- Twist protection for the sensor cable connected. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding troublesome moisture on the connector contacts
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... $80^\circ\text{C}$
<b>Max. pressure</b>	6.0 bar
<b>Min. conductivity</b>	$50 \mu\text{S}/\text{cm}$
<b>Electrolyte</b>	With KCl supply (salt rings in the reference electrolyte)
<b>Diaphragm</b>	PTFE ring diaphragm
<b>Sensor shaft</b>	Glass
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	$120 \pm 3 \text{ mm}$
<b>Fitting position</b>	Vertical up to $+25^\circ$
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head, rotatable with a ProMinent cable
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	Municipal and industrial waste water, cooling water, industrial water, water in chemicals industry and paper production, generally for water with a solid matter fraction, water with low conductivity, e.g. from reverse osmosis.
<b>Resistance to</b>	Disinfectant, Solids content (turbid types of water)
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, Teflon ring diaphragm, Polymer electrolyte, separate temperature measurement for temperature compensation needed

#### Order no.

PHER 112 SE

1001586



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

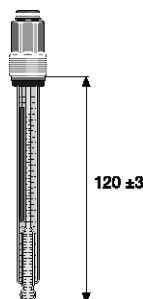


### pH Sensor PHEX 112 SE

pH sensor optimised for use with contaminated water with a high solids content at 6 bar/100 °C or 16 bar/25 °C

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for extremely high solids content
- The solid electrolyte makes the diaphragm redundant and prevents the reference system from becoming blocked up
- Long service life when sludge is present due to lack of a diaphragm
- Long service life as the solid electrolyte prevents the electrolyte from "bleeding"
- Stable reference system
- Twist protection for the sensor cable connected. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding troublesome moisture on the connector contacts
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



pk\_6\_017

<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 100 °C
<b>Max. pressure</b>	16.0 bar up to 25 °C, 6.0 bar up to 100 °C
<b>Min. conductivity</b>	500 µS/cm
<b>Electrolyte</b>	Polymer containing potassium chloride (solid)
<b>Diaphragm</b>	Circular gap diaphragm (solid electrolyte)
<b>Sensor shaft</b>	Glass
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head, rotatable with a ProMinent cable
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	Waste water, industrial water, process chemistry, emulsions, suspensions, protein-containing media, in general for water with a high solid fraction, not suitable for use in clear water. Not suitable for media with oxidation agents
<b>Resistance to</b>	Solids content (turbid types of water), sludge, emulsions
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, no diaphragm, polymer electrolyte, separate temperature measurement for temperature compensation needed

	<b>Fitting length</b>	<b>Order no.</b>
<b>PHEX 112 SE</b>	120 ± 3 mm	305096
<b>PHEX 112 SE</b>	225 ± 3 mm	150061

ex HD works



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

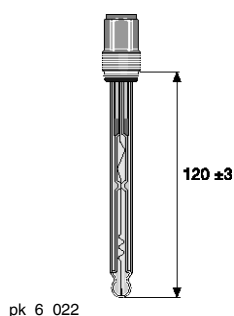
### pH Sensor PHED 112 SE

pH sensor optimised for use with chemically contaminated but clear water at up to 80 °C/8 bar



#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for use in chemically contaminated but clear water
- Double junction: two coupled ceramic diaphragms protect the reference system
- Long service life when chemical pollutants are present
- Special construction permits a maximum pressure of 8 bar
- Twist protection for the sensor cable connected. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding troublesome moisture on the connector contacts
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 80 °C
<b>Max. pressure</b>	8.0 bar
<b>Min. conductivity</b>	150 µS/cm
<b>Electrolyte</b>	Gel containing potassium chloride
<b>Diaphragm</b>	Double junction
<b>Sensor shaft</b>	Glass
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head, rotatable with a ProMinent cable
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	Chemically loaded waste water, industrial water, cooling water
<b>Resistance to</b>	Disinfectant, water-soluble chemicals
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, double junction, gel electrolyte, separate temperature measurement for temperature compensation needed

<b>PHED 112 SE</b>	<b>Order no.</b> 741036
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## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

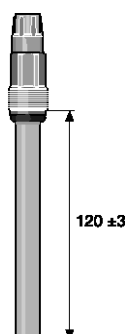


### pH Sensor PHEF 012 SE

pH sensor optimised for use with acidic water containing fluoride and abrasive water containing solids at up to 50 °C/7 bar

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Optimised pH glass for use in the presence of glass-corroding hydrofluoric acid (HF). HF is formed primarily in the presence of fluoride (F<sup>-</sup>) at a pH of < 4. Glass corrosion is promoted by a constant concentration of fluoride, a falling pH value and a rising temperature. The glass composition and structure of the PHEF type reduce the release of SiF<sub>4</sub>. Extended service life in the presence of fluoride (F<sup>-</sup>) at a pH of < 7
- Twist protection for the sensor cable connected. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding troublesome moisture on the connector contacts
- The flat shape of the glass diaphragm and large ring diaphragm facilitate use in contaminated water, which also contains abrasive solids



<b>pH range</b>	0 ... 12
<b>Temperature</b>	0 ... 50 °C
<b>Max. pressure</b>	7.0 bar
<b>Min. conductivity</b>	150 µS/cm
<b>Electrolyte</b>	Gel containing potassium chloride
<b>Diaphragm</b>	HDPE ring diaphragm, flat (Double Junction)
<b>Sensor shaft</b>	Epoxy
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head, rotatable with a ProMinent cable
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube

**Measuring and control equipment** All DULCOMETER® controllers and solenoid metering pumps types D\_4a and delta®

**Typical applications** A significantly longer service life can be achieved compared with standard pH sensors in media containing hydrofluoric acid, e.g. waste water from the semiconductor industry or electroplating applications and air scrubbers

**Resistance to** Disinfectant, Solids content (turbid types of water), Hydrofluoric acid (HF), abrasive particles

**Measuring principle, technology** Direct potentiometric measurement, 2 electrodes, PE ring diaphragm, HF-compatible flat glass diaphragm, gel electrolyte, separate temperature measurement for temperature compensation needed

	<b>Order no.</b>
<b>PHEF 012 SE</b>	1010511



## 1.2 pH, ORP, Fluoride and Temperature Sensors

### DULCOTEST®

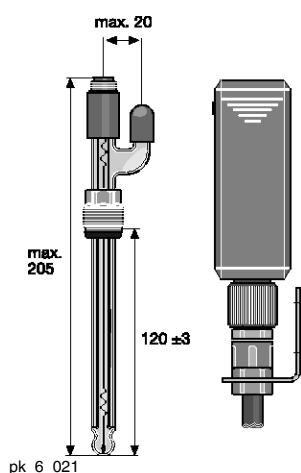
#### pH Sensor PHEN 112 SE



Refillable pH sensor optimised for use with chemically contaminated water at up to 80 °C/without excess pressure

##### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Renewable liquid electrolyte by continuous replenishment from an electrolyte bottle installed above the electrode
- 1 ceramic diaphragm made of special material and with an optimised size / with optimised pore diameter
- Twist protection for the sensor cable connected. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding troublesome moisture on the connector contacts
- Long service life in the presence of chemicals dissolved in the water, which could contaminate the reference system
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



##### pH range

1 ... 12

##### Temperature

0 ... 80 °C

##### Max. pressure

Atmospheric pressure

##### Min. conductivity

150 µS/cm

##### Electrolyte

KCL electrolyte, refillable

##### Diaphragm

Ceramic

##### Sensor shaft

Glass

##### Shaft diameter

12 mm

##### Fitting length

120 ± 3 mm

##### Fitting position

Vertical up to +25°

##### Thread

PG 13.5

##### Electrical connection

SN6 plug-in head, rotatable with a ProMinent cable

##### Enclosure rating

IP 65

##### Installation

Bypass: open outlet or return of the sample water into the process line  
 Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting)  
 Tank, channel: Immersion in the immersion tube

##### Measuring and control equipment

All DULCOMETER® controllers and solenoid metering pumps types D\_4a and delta®

##### Typical applications

Waste water, cooling waterchemically contaminated water

##### Resistance to

Disinfectant, only for clear types of water

##### Measuring principle, technology

Direct potentiometric measurement, 2 electrodes, liquid electrolyte, 1 ceramic diaphragm, separate temperature measurement for temperature compensation needed

	Order no.
<b>PHEN 112 SE</b>	305090

Supplied without PE storage tank and tube

	Order no.
<b>PE storage tank with connectors and tube</b>	305058

We recommend installation approx. 0.5-1 m above the sample fluid level

	Capacity ml	Order no.
<b>KCl solution, 3 molar</b>	250	791440
<b>KCl solution, 3 molar</b>	1,000	791441



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®



### pH Sensor PHEN 112 SE 3D

Refillable pH sensor optimised for use in contaminated water containing solids and water with a low conductivity of > 50 µS/cm at up to 80 °C/without overpressure

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Renewable liquid electrolyte by continuous replenishment from an electrolyte bottle installed above the electrode
- 3 ceramic diaphragms made of special material, with optimised size and optimised pore diameter
- Twist protection for the sensor cable connected. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding troublesome moisture on the connector contacts
- Long service life in water with low conductivity > 50 µS/cm and where solids are present
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)

<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 80 °C
<b>Max. pressure</b>	Atmospheric pressure
<b>Min. conductivity</b>	50 µS/cm
<b>Electrolyte</b>	3 molar potassium chloride solution, refillable
<b>Diaphragm</b>	3 ceramic diaphragms
<b>Sensor shaft</b>	Glass
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head, rotatable with a ProMinent cable
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	Waste water, water with low conductivity, e.g. from reverse osmosis.
<b>Resistance to</b>	Disinfectant, Solids content (turbid types of water)
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, liquid electrolyte, 1 ceramic diaphragm, separate temperature measurement for temperature compensation needed

PHEN 112 SE 3D

Order no.

150078



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

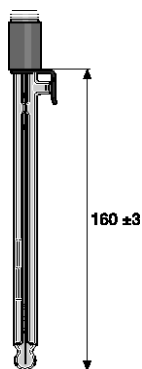
### pH Sensor PHEN 012 SL



Refillable pH sensor for use with manual measuring instruments, optimised for clear and also chemically contaminated water at up to 80 °C/without overpressure

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Renewable liquid electrolyte by continuous replenishment from an electrolyte bottle installed above the electrode
- 1 ceramic diaphragm made of special material and with an optimised size / with optimised pore diameter
- Long service life in the presence of dissolved chemicals, which could contaminate the reference system
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



pk\_6\_020

<b>pH range</b>	0 ... 12
<b>Temperature</b>	0 ... 80 °C
<b>Max. pressure</b>	Atmospheric pressure
<b>Min. conductivity</b>	150 µS/cm
<b>Electrolyte</b>	KCl electrolyte, refillable
<b>Diaphragm</b>	Ceramic
<b>Sensor shaft</b>	Glass
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	160 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	None
<b>Electrical connection</b>	SN6 plug-in head
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Immersion by tripod or manually

**Measuring and control equipment** All DULCOMETER® controllers and solenoid metering pumps types D\_4a and delta®

**Typical applications** Manual measurements in laboratories

**Resistance to** Disinfectant, water-soluble chemicals

**Measuring principle, technology** Direct potentiometric measurement, 2 electrodes, liquid electrolyte, 1 ceramic diaphragm, separate temperature measurement for temperature compensation needed

#### Order no.

PHEN 012 SL

305078



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®



### pH Sensor PHEN 012 SL 3D

Refillable pH sensor for use with manual measuring instruments, optimised for contaminated water containing solids and with a low conductivity of  $> 50 \mu\text{S}/\text{cm}$  at up to  $80^\circ\text{C}$ /without overpressure

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Renewable liquid electrolyte by continuous replenishment from an electrolyte bottle installed above the electrode
- 3 ceramic diaphragms made of special material and with an optimised size / with optimised pore diameter
- Long service life in water with low conductivity  $> 50 \mu\text{S}/\text{cm}$  and where solids are present
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)

<b>pH range</b>	0 ... 12
<b>Temperature</b>	0 ... $80^\circ\text{C}$
<b>Max. pressure</b>	Atmospheric pressure
<b>Min. conductivity</b>	$50 \mu\text{S}/\text{cm}$
<b>Electrolyte</b>	3 molar potassium chloride solution, refillable
<b>Diaphragm</b>	3 ceramic diaphragms
<b>Sensor shaft</b>	Glass
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	$160 \pm 3 \text{ mm}$
<b>Fitting position</b>	Vertical up to $+25^\circ$
<b>Thread</b>	None
<b>Electrical connection</b>	SN6 plug-in head
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Immersion by tripod or manually
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	Laboratories, water with low conductivity, e.g. from reverse osmosis. Waste water
<b>Resistance to</b>	Disinfectant, solids content (turbid types of water)
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, liquid electrolyte, 3 ceramic diaphragms, separate temperature measurement for temperature compensation needed

#### Order no.

PHEN 012 SL 3D

791508



# 1.2 pH, ORP, Fluoride and Temperature Sensors

## DULCOTEST®

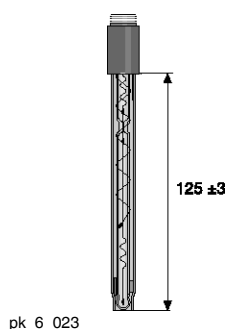
### pH Sensor PHEK 112 S



pH sensor for use with manual measuring instruments, with plastic shaft, optimised for use in potable water treatment, swimming pools/hot tubs at up to 80 °C/3 bar

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for use in swimming pools and for potable water
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- With plastic shaft to prevent glass breakage
- Mechanical protection of the glass diaphragm
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to the material, which is inert to aggressive disinfectants
- Stable reference system
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 60 °C
<b>Max. pressure</b>	3.0 bar
<b>Min. conductivity</b>	150 µS/cm
<b>Electrolyte</b>	Gel containing potassium chloride
<b>Diaphragm</b>	Ceramic
<b>Sensor shaft</b>	Polycarbonate
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	None
<b>Electrical connection</b>	SN6 plug-in head
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Immersion by tripod or manually
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	Hand-held measurement in swimming pools, potable water
<b>Resistance to</b>	Disinfectant
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm, separate temperature measurement for temperature compensation needed

#### Order no.

PHEK-112-S

305051



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

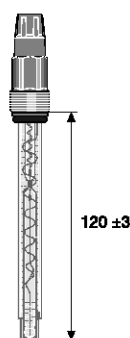


### pH Sensor PHEK 112 SE

pH sensor with plastic shaft, optimised for use in potable water treatment, swimming pools/hot tubs at up to 60 °C/3 bar

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for use in swimming pools and for potable water
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- With plastic shaft to prevent glass breakage
- Mechanical protection of the glass diaphragm
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to the material, which is inert to aggressive disinfectants
- Stable reference system
- Twist protection for the sensor cable connected. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding troublesome moisture on the connector contacts
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



pk\_6\_090

<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 60 °C
<b>Max. pressure</b>	3.0 bar
<b>Min. conductivity</b>	150 µS/cm
<b>Electrolyte</b>	Gel containing potassium chloride
<b>Diaphragm</b>	Ceramic
<b>Sensor shaft</b>	Polycarbonate
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head, rotatable with a ProMinent cable
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	Swimming pools, potable water, aquaria
<b>Resistance to</b>	Disinfectant
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm, separate temperature measurement for temperature compensation needed

#### Order no.

**PHEK 112 SE**

**1028457**

ex HD works





## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®



### pH Sensor PHEK-L 112 SE

pH sensor with plastic shaft, optimised for use in potable water treatment, swimming pools/hot tubs, horizontal installation possible, at up to 60 °C/3 bar

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- With plastic shaft to prevent glass breakage
- Horizontal (level) installation possible (90° angle) (usually limited to 0 - 75° angle)
- Diaphragm and reference system optimised for use in swimming pools and for potable water
- Ceramic diaphragm with special material and optimised size / optimised pore diameter
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Twist protection for the sensor cable connected. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding troublesome moisture on the connector contacts
- Long service life due to the material, which is inert to aggressive disinfectants
- Stable reference system

<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 60 °C
<b>Max. pressure</b>	3.0 bar
<b>Min. conductivity</b>	150 µS/cm
<b>Electrolyte</b>	Gel containing potassium chloride
<b>Diaphragm</b>	Ceramic
<b>Sensor shaft</b>	Polycarbonate
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertically to horizontally
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head, rotatable with a ProMinent cable
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	Swimming pools, potable water, aquaria. Horizontal installation possible.
<b>Resistance to</b>	Disinfectant
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm, separate temperature measurement for temperature compensation needed

#### Order no.

PHEK-L 112 SE

1034918

## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

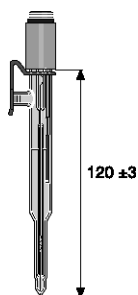


### pH Sensor PHEE 112 S

pH sensor for use with manual measuring instruments as a puncture sensor for samples that can be punctured

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- pH measuring prod for inserting into solids into which a prod can be inserted
- 3 ceramic diaphragms made of special material for measurement after insertion
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



pk\_6\_025

<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 60 °C
<b>Max. pressure</b>	Atmospheric pressure
<b>Min. conductivity</b>	150 µS/cm
<b>Electrolyte</b>	Gel containing potassium chloride
<b>Diaphragm</b>	3 ceramic diaphragms
<b>Sensor shaft</b>	Glass
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	None
<b>Electrical connection</b>	SN6 plug-in head
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Manual insertion
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	pH measurement in foodstuffs, e.g. meat, cheese, non sterilisable
<b>Resistance to</b>	Mechanical stress when inserting
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm, separate temperature measurement for temperature compensation needed, mechanically loadable measuring prod

	<b>Order no.</b>	
<b>PHEE 112 S</b>	791094	
	<b>Capacity ml</b>	<b>Order no.</b>
<b>Cleaning fluid Pepsin/hydrochloric acid</b>	250	791443





## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

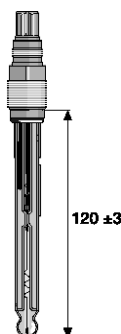
### pH Sensor PHEPT 112 VE



pH sensor with integral temperature measurement, optimised for use with clear process water and changing process temperature of up to 80 °C/6 bar

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for exacting process requirements
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to the material, which is inert to aggressive chemicals
- Stable reference system for high pressure / temperature requirements
- Integrated Pt 100 temperature sensor for temperature compensation of the pH measurement in higher-order measuring instruments eliminates the need for an additional sensor housing and external temperature sensor
- Vario Pin plug-in head with IP 67 specification
- Twist protection for the sensor cable connected. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding troublesome moisture on the connector contacts
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



pk\_6\_068

<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 80 °C
<b>Max. pressure</b>	6.0 bar
<b>Min. conductivity</b>	150 µS/cm
<b>Electrolyte</b>	Gel containing potassium chloride
<b>Diaphragm</b>	Ceramic
<b>Sensor shaft</b>	Glass
<b>Shaft diameter</b>	15 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	Vario Pin plug-in head
<b>Enclosure rating</b>	IP 67
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta
<b>Typical applications</b>	Swimming pools during pressurisation for higher temperatures and pressures, potable and industrial water, electroplating, chemical industry, processes with a temperature change.
<b>Resistance to</b>	Disinfectant
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm, integrated temperature measurement for temperature compensation

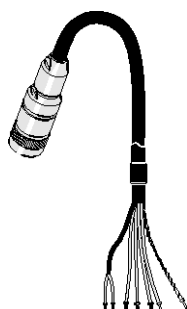
#### Order no.

PHEPT 112 VE

1004571

### Accessories: Measuring line for sensors with Vario Pin plug-in head

Ready-made 6-wire measuring line with Vario Pin plug for connection to sensor type PHEPT 112 VE.



pk\_6\_069

	Length	Order no.
Vario Pin signal lead VP 6-ST/ 2 m	2 m	1004694
Vario Pin signal lead VP 6-ST/ 5 m	5 m	1004695
Vario Pin signal lead VP 6-ST/10 m	10 m	1004696



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

### 1.2.2 pH Sensors with Fixed Cable

pH sensors with fixed cable contain a shielded coaxial cable, which is firmly connected to the sensor head by a rotating sleeve, thereby preventing the cable from twisting when inserting and dismantling the sensor.

Series	
PHE	pH sensor
Properties	
X	With solid electrolyte and annular gap diaphragms
K	With insensitive plastic shaft
N	KCl refillable sensor
R	With PTFE ring diaphragms
P	Pressure-tight up to 6 bar
D	With double diaphragm (double junction)
S	Swimming pool sensor
Special equipment	
T	With integral temperature gauge
pH measuring range	
112	pH measuring range: 1...12
Electrical connection at the sensor	
F	Fixed cable sensor
Internal thread	
E	Internal thread
L	None, laboratory sensor refillable
Cable diameter	
3	Cable diameter 3 mm
5	Cable diameter 5 mm
Cable length	
01	Cable length in metres
Electrical connection at device	
S	SN6
D	DIN
B	BNC
O	Without connector
M	SN6 male

The technical data corresponds to pH sensors with SN6 plug-in head (see page → 1-28)

#### pH Sensor PHES 112 F



pH sensor for use with manual measuring instruments, optimised for use in potable water treatment, swimming pools/hot tubs at up to 60 °C/3 bar

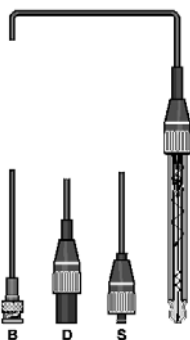
##### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for use in swimming pools and for potable water
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to the material, which is inert to aggressive disinfectants
- Stable reference system
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)

pH sensor, gel-filled, with fixed coaxial cable and device plug, without screw-in thread.

	Cable length m	Device plug	Order no.
PHES 112 F 301 S	1	SN6	304976
PHES 112 F 301 B	1	BNC	304980
PHES 112 F 303 B	3	BNC	304981

Further types on request.



pk\_6\_024

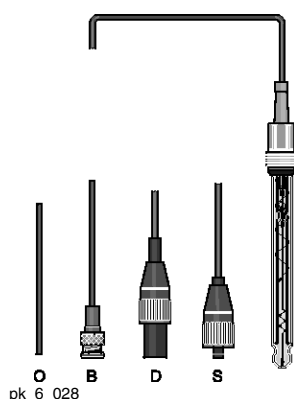
## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

### pH Sensor PHES 112 FE

pH sensor optimised for use in potable water treatment, swimming pools/hot tubs at up to 60 °C/3 bar

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for use in swimming pools and for potable water
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to the material, which is inert to aggressive disinfectants
- Stable reference system
- Rotating sensor head sleeve prevents the cable twisting when inserting and dismantling the sensor
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



	Cable length m	Device plug	Order no.
PHES 112 FE 303 S	3	SN6	304984
PHES 112 FE 310 S	10	SN6	304985
PHES 112 FE 503 D	3	DIN	304986
PHES 112 FE 303 B	3	BNC	304988
PHES 112 FE 310 O	10	without	304990
PHES 112 FE 301 B	1	BNC	150079
PHES 112 FE 301 S	1	SN6	150926
PHES 112 FE 303 O	1	without	150101

Further types on request.

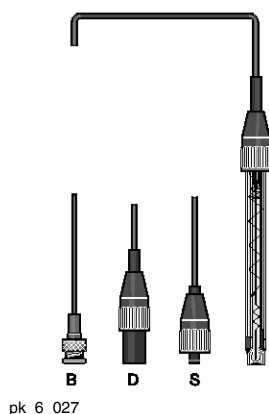
### pH Sensor PHEK 112 F

pH sensor for use with manual measuring instruments, with plastic shaft, optimised for use in potable water treatment, swimming pools/hot tubs at up to 80 °C/3 bar

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for use in swimming pools and for potable water
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- With plastic shaft to prevent glass breakage
- Mechanical protection of the glass diaphragm
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to the material, which is inert to aggressive disinfectants
- Stable reference system
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)

pH sensor with polycarbonate plastic shaft, glass membrane protection, with fixed coaxial cable and device plug, without screw-in thread.



	Cable length m	Device plug	Order no.
PHEK 112 F 301 S	1	SN6	304994
PHEK 112 F 501 D	1	DIN	304995
PHEK 112 F 301 B	1	BNC	304996

Further types on request.



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®



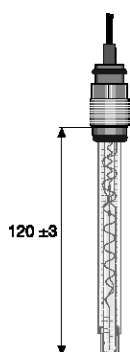
### pH Sensor PHEK 112 FE

pH sensor with plastic shaft, optimised for use in potable water treatment, swimming pools/hot tubs at up to 60 °C/3 bar

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for use in swimming pools and for potable water
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- With plastic shaft to prevent glass breakage
- Mechanical protection of the glass diaphragm
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to the material, which is inert to aggressive disinfectants
- Stable reference system
- Rotating sensor head sleeve prevents the cable twisting when inserting and dismantling the sensor
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)

pH sensor with polycarbonate plastic shaft, glass membrane protection, with fixed coaxial cable and device plug, with screw-in thread.



pk\_6\_090\_1

	Cable length m	Device plug	Order no.
<b>PHEK 112 FE 303 B</b>	3	BNC	1028458

Other types on request.

### pH Sensor PHEP 112 FE

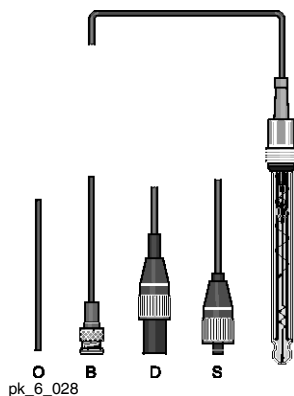
pH sensor optimised for use with clear process water and conditions of up to 80 °C/6 bar

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for exacting process requirements
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to the material, which is inert to aggressive disinfectants
- Stable reference system for high pressure/temperature requirements
- Rotating sensor head sleeve prevents the cable twisting when inserting and dismantling the sensor
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)

	Cable length m	Device plug	Order no.
<b>PHEP 112 FE 303 S</b>	3	SN 6	150673
<b>PHEP 112 FE 305 O</b>	5	without	150689
<b>PHEP 112 FE 510 O</b>	10	without	150929

Further types on request.



pk\_6\_028

## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

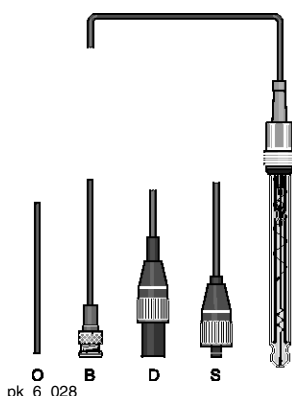
### pH Sensor PHER 112 FE



pH sensor optimised for use in contaminated water containing solids and for low conductivity of  $> 50 \mu\text{S}/\text{cm}$  at up to  $80^\circ\text{C}/6 \text{ bar}$

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- The large dirt-repellent Teflon® diaphragm prevents the reference system from becoming blocked up
- Long service life when solids are present
- High-viscosity electrolyte combined with a salt reservoir prevents the electrolyte from "bleeding"
- Long service life without drifts when there is clear water with low conductivity
- Rotating sensor head sleeve prevents the cable twisting when inserting and dismantling the sensor
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



	Cable length m	Device plug	Order no.
Type PHER 112 FE 503 O	3	without	150878
Type PHER 112 FE 510 O	10	without	150874

Other types on request.

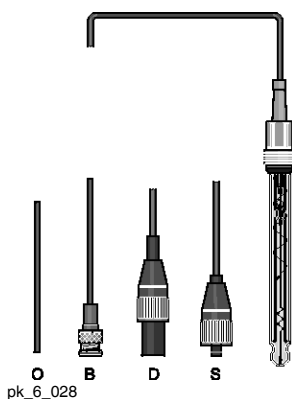
### pH Sensor PHEX 112 FE



pH sensor optimised for use with contaminated water with a high solids content at  $6 \text{ bar}/100^\circ\text{C}$  or  $16 \text{ bar}/25^\circ\text{C}$

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for extremely high solids content
- The solid electrolyte makes the diaphragm redundant and prevents the reference system from becoming blocked up
- Long service life when sludge is present due to lack of a diaphragm
- Long service life as the solid electrolyte prevents the electrolyte from "bleeding"
- Stable reference system
- Rotating sensor head sleeve prevents the cable twisting when inserting and dismantling the sensor
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



	Cable length m	Device plug	Order no.
Type PHEX 112 FE 510 S	10	SN 6	150025
Type PHEX 112 FE 510 O	10	without	150084
Type PHEX 112 FE 303 S	3	SN 6	150739
Type PHEX 112 FE 302 O	2	without	150086

Further types on request.



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

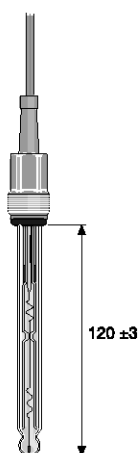


### pH Sensor PHED 112 FE

pH sensor optimised for use with chemically contaminated but clear water at up to 80 °C/8 bar

#### Your benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for use in chemically contaminated but clear water
- Double junction: two coupled ceramic diaphragms protect the reference system
- Long service life when chemical pollutants are present
- Special construction permits a maximum pressure of 8 bar
- Rotating sensor head sleeve prevents the cable twisting when inserting and dismantling the sensor
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



	Cable length m	Device plug	Order no.
PHED 112 FE 303 B	3	BNC	741038

Further types on request.

# 1.2 pH, ORP, Fluoride and Temperature Sensors

## DULCOTEST®

### 1.2.3

### ORP Sensors with SN6 Plug-in Head

ORP sensors with SN6 plug-in head are connected to a shielded coaxial cable with the appropriate socket. The rotating sensor head sleeve prevents the cable from twisting when inserting and dismantling the sensor. The cable can therefore remain connected. This avoids moisture from contacting the plug-in contacts.

Series	
RHE	ORP sensor
Properties	
X	with solid electrolyte and circular gap diaphragm
K	with insensitive plastic shaft
P	pressure tight up to 6 bar
R	with PTFE circular diaphragm
N	KCl refillable sensor
S	swimming pool sensor
Special equipment	
L	vertical to horizontal installation
Sensor material	
Pt	Platinum (pin)
Au	Gold (pin)
Electrical connection at the sensor	
S	Plug for coax connector SN6
Internal thread	
E	PG 13.5

DULCOTEST® ORP sensor selection guide see page → 1-1

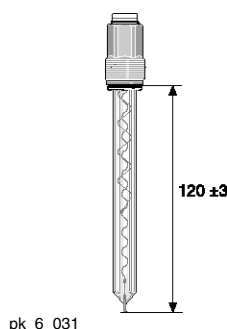
### ORP Sensor RHES-Pt-SE

ORP sensor optimised for use in potable water treatment, swimming pools/hot tubs at up to 60 °C/3 bar



#### Your benefits

- Electrochemical combination electrode: ORP and reference electrode integrated
- Diaphragm and reference system optimised for use in swimming pools and for potable water
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to the material, which is inert to aggressive disinfectants
- Stable reference system
- Rotating sensor head sleeve. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding moisture on the plug-in contacts
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 60 °C
<b>Max. pressure</b>	3.0 bar
<b>Min. conductivity</b>	150 µS/cm
<b>Electrolyte</b>	Gel containing potassium chloride
<b>ORP electrode</b>	Platinum
<b>Diaphragm</b>	Ceramic
<b>Sensor shaft</b>	Glass
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head, rotatable with a ProMinent cable
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

**Typical applications**  
**Resistance to**  
**Measuring principle, technology**

Swimming pools, whirlpools, potable water  
Disinfectant  
Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm

**Order no.**

**RHES-Pt-SE**

150703

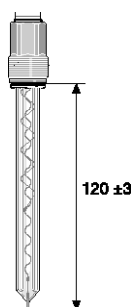
### ORP Sensor RHES-Au-SE



ORP sensor optimised for use in potable water treatment, swimming pools/hot tubs when electrolysis processes are used for disinfection and with ozone treatment at up to 60 °C/3 bar

#### Your benefits

- Electrochemical combination electrode: ORP and reference electrode integrated
- Gold electrode to prevent faults by products from electrolysis processes where the electrodes are immersed directly into the sample water
- Diaphragm and reference system optimised for use in swimming pools and for potable water
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to material, which is inert to aggressive disinfectants
- Stable reference system
- Rotating sensor head sleeve. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding moisture on the plug-in contacts
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



pk\_6\_031

<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 60 °C
<b>Max. pressure</b>	3.0 bar
<b>Min. conductivity</b>	150 µS/cm
<b>Electrolyte</b>	Gel containing potassium chloride
<b>ORP electrode</b>	Gold
<b>Diaphragm</b>	Ceramic
<b>Sensor shaft</b>	Glass
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head, rotatable with a ProMinent cable
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	Swimming pools, whirlpools, potable water, with disinfectants from electrolysis processes (electrodes directly in the process water)
<b>Resistance to</b>	Disinfectant, by-products from electrolysis process and from ozone treatment process
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm

**Order no.**

**RHES-Au-SE**

1044544



# 1.2 pH, ORP, Fluoride and Temperature Sensors

## DULCOTEST®

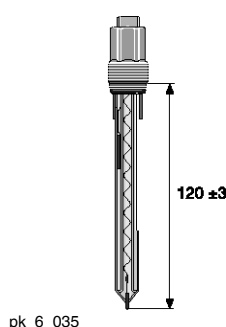
### ORP Sensor RHEP-Pt-SE

ORP sensor optimised for use with clear process water and conditions of up to 80 °C/6 bar



#### Your benefits

- Electrochemical combination electrode: ORP and reference electrode integrated
- Diaphragm and reference system optimised for exacting process requirements
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to material, which is inert to aggressive chemicals
- Stable reference system for high pressure / temperature requirements
- Rotating sensor head sleeve. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding moisture on the plug-in contacts
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



pk\_6\_035

<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 80 °C
<b>Max. pressure</b>	6.0 bar
<b>Min. conductivity</b>	150 µS/cm
<b>Electrolyte</b>	Gel containing potassium chloride
<b>ORP electrode</b>	Platinum
<b>Diaphragm</b>	Ceramic
<b>Sensor shaft</b>	Glass
<b>Shaft diameter</b>	15 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head, rotatable with a ProMinent cable
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	Swimming pools during pressurisation for higher temperatures and pressures, potable and industrial water, electroplating,
<b>Resistance to</b>	Disinfectant, not suitable for media containing ozone, cyanides, electrolysis processes (electrodes directly in the sample water)
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm

RHEP-Pt-SE

Order no.

150094



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®



### ORP Sensor RHEP-Au-SE

ORP sensor optimised for use with clear process water when electrolysis processes are used for disinfection and with ozone treatment and with cyanide detoxification at conditions of up to 80 °C/6 bar

#### Your benefits

- Electrochemical combination electrode: ORP and reference electrode integrated
- Gold electrode to prevent faults by products from electrolysis processes where the electrodes are immersed directly into the sample water
- Diaphragm and reference system optimised for exacting process requirements
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to the material, which is inert to aggressive chemicals
- Stable reference system for high pressure / temperature requirements
- Rotating sensor head sleeve. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding moisture on the plug-in contacts
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)

<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 80 °C
<b>Max. pressure</b>	6.0 bar
<b>Min. conductivity</b>	150 µS/cm
<b>Electrolyte</b>	Gel containing potassium chloride
<b>ORP electrode</b>	Gold
<b>Diaphragm</b>	Ceramic
<b>Sensor shaft</b>	Glass
<b>Shaft diameter</b>	15 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head, rotatable with a ProMinent cable
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	Cyanide detoxification, ozone monitoring
<b>Resistance to</b>	Disinfectant, by-products from electrolysis process and from ozone treatment process, cyanides
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm

#### Order no.

RHEP-Au-SE

1003875



# 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

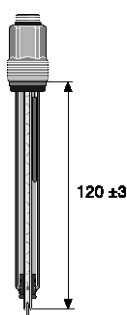
## ORP Sensor RHER-Pt-SE



ORP sensor optimised for use in contaminated water containing solids and for low conductivity of  $> 50 \mu\text{S}/\text{cm}$  at up to  $80^\circ\text{C}/6 \text{ bar}$

### Your benefits

- Electrochemical combination electrode: ORP and reference electrode integrated
- The large dirt-repellent Teflon® diaphragm prevents the reference system from becoming blocked up
- Long service life when solids are present
- High-viscosity electrolyte combined with a salt reservoir prevents the electrolyte from "bleeding"
- Long service life without drifts when there is clear water with low conductivity
- Rotating sensor head sleeve. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding moisture on the plug-in contacts
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



pk\_6\_034

<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... $80^\circ\text{C}$
<b>Max. pressure</b>	6.0 bar
<b>Min. conductivity</b>	$50 \mu\text{S}/\text{cm}$
<b>Electrolyte</b>	Electrolyte with KCl supplement (salt rings in the reference electrolyte)
<b>ORP electrode</b>	Platinum
<b>Diaphragm</b>	PTFE ring diaphragm
<b>Sensor shaft</b>	Glass
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	$120 \pm 3 \text{ mm}$
<b>Fitting position</b>	Vertical up to $+25^\circ$
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head/other versions on request
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube

**Measuring and control equipment** All DULCOMETER® controllers and solenoid metering pumps types D\_4a and delta®

**Typical applications** Municipal and industrial waste water, cooling water, process water, chemical applications, paper manufacturing. In general for water with a noticeable solid fraction.

**Resistance to** Disinfectant, solids content (turbid types of water)  
**Measuring principle, technology** Direct potentiometric measurement, 2 electrodes, teflon ring diaphragm, polymer electrolyte

<b>RHER-Pt-SE</b>	<b>Order no.</b> 1002534
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## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

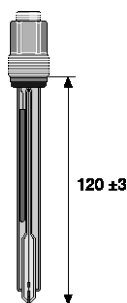


### ORP Sensor RHEX-Pt-SE

ORP sensor optimised for use with contaminated water with a high solids content at 6 bar/100 °C or 16 bar/25 °C

#### Your benefits

- Electrochemical combination electrode: ORP and reference electrode integrated
- Diaphragm and reference system optimised for extremely high solids content
- The solid electrolyte makes the diaphragm redundant and prevents the reference system from becoming blocked up
- Long service life when sludge is present due to lack of a diaphragm
- Long service life as the solid electrolyte prevents the electrolyte from "bleeding"
- Stable reference system
- Rotating sensor head sleeve. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding moisture on the plug-in contacts
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



pk\_6\_033

<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 100 °C
<b>Max. pressure</b>	16.0 bar up to 25 °C, 6.0 bar up to 100 °C
<b>Min. conductivity</b>	500 µS/cm
<b>Electrolyte</b>	polymer containing potassium chloride (solid)
<b>ORP electrode</b>	Platinum
<b>Diaphragm</b>	Circular gap (solid electrolyte)
<b>Sensor shaft</b>	Glass
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head/other versions on request
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	Waste water, industrial water, process chemistry, emulsions, suspensions, protein-containing media, In general for water with a high solid fraction. Not suitable for clear media. not suitable for media with oxidation agents.
<b>Resistance to</b>	Solids content (turbid types of water), sludge, emulsions
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, no diaphragm, polymer electrolyte

#### Order no.

RHEX-Pt-SE

305097

## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

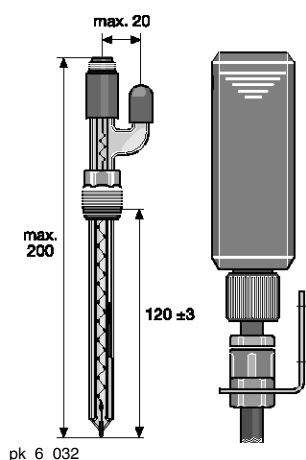
### ORP Sensor RHEN-Pt-SE



Refillable ORP sensor optimised for use with chemically contaminated water at up to 80 °C/without excess pressure

#### Your benefits

- Electrochemical combination electrode: ORP and reference electrode integrated
- Renewable liquid electrolyte by continuous replenishment from an electrolyte bottle installed above the electrode
- 1 ceramic diaphragm made of special material, with an optimised size and with optimised pore diameter
- Long service life in the presence of chemicals dissolved in the water, which could contaminate the reference system
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 80 °C
<b>Max. pressure</b>	Operation at atmospheric pressure
<b>Min. conductivity</b>	150 µS/cm
<b>Electrolyte</b>	KCl electrolyte, refillable
<b>ORP electrode</b>	Platinum
<b>Diaphragm</b>	Ceramic
<b>Sensor shaft</b>	Glass
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head/other versions on request
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	By tripod or manually

**Measuring and control equipment** All DULCOMETER® controllers and solenoid metering pumps types D\_4a and delta®

**Typical applications** Waste water, cooling water, chemically contaminated water, only clear types of water

**Resistance to** Disinfectant, chemicals dissolved in water  
**Measuring principle, technology** Direct potentiometric measurement, 2 electrodes, liquid electrolyte, 1 ceramic diaphragm

	<b>Order no.</b>
<b>RHEN-Pt-SE</b>	305091

Supplied without PE storage tank and tube

#### Accessories

	<b>Capacity ml</b>	<b>Order no.</b>
<b>PE storage tank with connectors and tube</b>	–	305058
<b>KCl solution, 3 molar</b>	250	791440
<b>KCl solution, 3 molar</b>	1,000	791441

We recommend installation approx. 0.5-1 m above the sample fluid level.



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

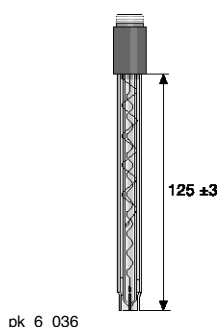


### ORP Sensor RHEK-Pt-S

ORP sensor with plastic shaft for use with manual measuring instruments, optimised for use in potable water treatment, swimming pools/hot tubs at up to 60 °C/3 bar

#### Your benefits

- Electrochemical combination electrode: ORP and reference electrode integrated
- Diaphragm and reference system optimised for use in swimming pools and for potable water
- With plastic shaft to prevent glass breakage
- Mechanical protection of the glass diaphragm
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to the material, which is inert to aggressive disinfectants
- Stable reference system
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 60 °C
<b>Max. pressure</b>	Operation at atmospheric pressure
<b>Min. conductivity</b>	150 µS/cm
<b>Electrolyte</b>	Gel containing potassium chloride
<b>ORP electrode</b>	Platinum
<b>Diaphragm</b>	Ceramic
<b>Sensor shaft</b>	Polycarbonate
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	125 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	None
<b>Electrical connection</b>	SN6 plug-in head, rotatable with a ProMinent cable
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	by tripod or manually
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	Manual measurement e.g. swimming pools, potable water, aquarium water
<b>Resistance to</b>	Disinfectant
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm

	Order no.
RHEK-Pt-S	305052

# 1.2 pH, ORP, Fluoride and Temperature Sensors

## DULCOTEST®

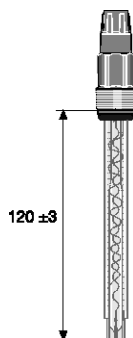
### ORP Sensor RHEK-Pt-SE



ORP sensor with plastic shaft, optimised for use in potable water treatment, swimming pools/hot tubs at up to 60 °C/3 bar

#### Your benefits

- Electrochemical combination electrode: ORP and reference electrode integrated
- Diaphragm and reference system optimised for use in swimming pools and for potable water
- With plastic shaft to prevent glass breakage
- Mechanical protection of the glass diaphragm
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to the material, which is inert to aggressive disinfectants
- Stable reference system
- Rotating sensor head sleeve. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding moisture on the plug-in contacts
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



pk\_6\_091

<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 60 °C
<b>Max. pressure</b>	3.0 bar
<b>Min. conductivity</b>	150 µS/cm
<b>Electrolyte</b>	Gel containing potassium chloride
<b>ORP electrode</b>	Platinum
<b>Diaphragm</b>	Ceramic
<b>Sensor shaft</b>	Polycarbonate
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical up to +25°
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head, rotatable with a ProMinent cable
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	Swimming pool, potable water, aquariums,
<b>Resistance to</b>	Disinfectant
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm

RHEK-Pt-SE

**Order no.**  
1028459



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

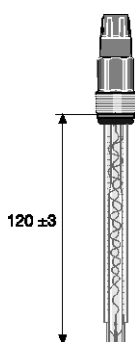


### ORP Sensor RHEK-L Pt-SE

ORP sensor with plastic shaft, optimised for vertical to horizontal installation position for use in potable water treatment, swimming pools/hot tubs at up to 60 °C/3 bar

#### Your benefits

- Electrochemical combination electrode: ORP and reference electrode integrated
- With plastic shaft to prevent glass breakage
- Horizontal (level) installation possible (90° angle) (usually limited to 0 - 75° angle)
- Diaphragm and reference system optimised for use in swimming pools and for potable water
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Rotating sensor head sleeve. This means that the cables can remain connected during installation and dismantling of the sensor, avoiding moisture on the plug-in contacts
- Long service life due to the material, which is inert to aggressive disinfectants
- Stable reference system



pk\_6\_091

<b>pH range</b>	1 ... 12
<b>Temperature</b>	0 ... 60 °C
<b>Max. pressure</b>	3.0 bar
<b>Min. conductivity</b>	150 µS/cm
<b>Electrolyte</b>	Gel containing potassium chloride
<b>ORP electrode</b>	Platinum
<b>Diaphragm</b>	Ceramic
<b>Sensor shaft</b>	Polycarbonate
<b>Shaft diameter</b>	12 mm
<b>Fitting length</b>	120 ± 3 mm
<b>Fitting position</b>	Vertical to horizontal
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head, rotatable with a ProMinent cable
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube
<b>Measuring and control equipment</b>	All DULCOMETER® controllers and solenoid metering pumps types D_4a and delta®
<b>Typical applications</b>	Swimming pools, potable water, aquariums, horizontal installation possible.
<b>Resistance to</b>	Disinfectant
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm

	<b>Order no.</b>
<b>RHEK-L Pt-SE</b>	1034919



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

### 1.2.4 ORP Sensors with Fixed Cable

All ORP sensors with fixed cable contain a shielded coaxial cable, which is firmly connected to the sensor head by a rotating sleeve. This prevents the cable from twisting when inserting and dismantling the sensor.

Series			
RHE	ORP sensor		
	Properties		
	K	Plastic shaft	
	S	Swimming pool sensor	
	Sensor material		
	Pt	Platinum	
	Electrical connection at the sensor		
	F	Fixed cable sensor	
	Internal thread		
	E	internal thread PG 13.5	
	Cable diameter		
	3	cable diameter 3 mm	
	5	cable diameter 5 mm	
	Cable length		
	01	cable length in metres	
	Electrical connection at device		
	S	SN6	
	D	DIN	
	B	BNC	

The technical data corresponds to pH sensors with SN6 plug-in head (see page → 1-33)

#### ORP Sensor RHES-Pt-FE



ORP sensor optimised for use in potable water treatment, swimming pools/hot tubs at up to 60 °C/3 bar

##### Your benefits

- Electrochemical combination electrode: ORP and reference electrode integrated
- Diaphragm and reference system optimised for use in swimming pools
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to the material, which is inert to aggressive disinfectants
- Stable reference system
- Anti-twist mechanism on the fixed cable prevents the cable from twisting when inserting and removing the sensor
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)

	Cable length m	Device plug	Order no.
<b>RHES-Pt-FE 301 B</b>	1	BNC	150758
<b>RHES-Pt-FE 303 B</b>	3	BNC	150038
<b>RHES-Pt-FE 301 S</b>	3	SN6	304949

Other types on request.



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

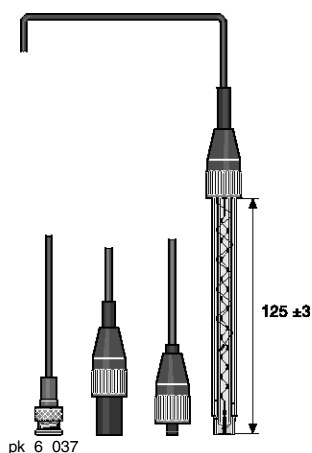


### ORP Sensor RHES-Pt-F

ORP sensor for use with manual measuring instruments, optimised for use in swimming pools / hot tubs at up to 60 °C / 3 bar

#### Your benefits

- Electrochemical combination electrode: ORP and reference electrode integrated
- Diaphragm and reference system optimised for use in swimming pools
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to the material, which is inert to aggressive disinfectants
- Stable reference system
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



	Cable length m	Device plug	Order no.
<b>RHES-Pt-F 303 B</b>	3	BNC	304983

Other types on request.

### ORP Sensor RHEK-Pt-F

ORP sensor with plastic shaft for use with manual measuring instruments, optimised for use in potable water treatment, swimming pools/hot tubs at up to 60 °C/3 bar

#### Your benefits

- Electrochemical combination electrode: ORP and reference electrode integrated
- Diaphragm and reference system optimised for use in swimming pools
- With plastic shaft to prevent glass breakage
- Mechanical protection of the glass diaphragm
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ("bleeding") of the electrolyte
- Long service life due to the material, which is inert to aggressive disinfectants
- Stable reference system
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)

	Cable length m	Device plug	Order no.
<b>RHEK-Pt-F 301 S</b>	1	SN 6	304997
<b>RHEK-Pt-F 501 D</b>	1	DIN	304998

Further types on request.

## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

### 1.2.5

### Fluoride Sensors

DULCOTEST® fluoride sensors are ion selective sensors, which function according to the potentiometric measuring principle and are suitable for determining the concentration of fluoride anions in aqueous solutions. The measuring point with the FPV1 type measuring transducer was optimised for use in monitoring the fluoridation of potable water in waterworks (measurement range up to 10 ppm). The measuring point with the measuring transducer FP 100 V1 with a measurement range up to 100 ppm is used for clear waste water free of solid material.

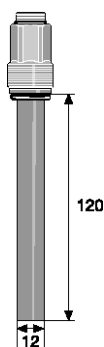
#### Fluoride Sensor FLEP 010-SE / FLEP 0100-SE



Highly selective, online fluoride sensor, optimised for the fluoridation of potable water and monitoring of waste water with a pH of up to 9.5

- Highly selective measurement of fluoride by  $\text{LaF}_3$  single crystal silicon
- Unique pH range of up to pH 9.5 by optimisation of the electrolyte
- Two measuring ranges available: 0.05 -10 ppm for potable water; 0.5 -100 ppm for waste water

A 4-20 mA measuring transducer, a reference electrode and a temperature sensor for temperature compensation are required as well as the fluoride sensor.



pk\_6\_095

<b>Measured variable</b>	Fluoride ion concentration
<b>Reference method</b>	Photometrically, see chapter 2.7.3: Photometer DT2C
<b>Measuring range</b>	<b>With measuring transducer FPV1:</b> 0.05...10 mg/l <b>With measuring transducer FP100V1:</b> 0.5...100 mg/l
<b>pH range</b>	5.5 ... 9.5
<b>Temperature</b>	1 ... 35 °C
<b>Max. pressure</b>	7.0 bar, (no pressure surges)
<b>Min. conductivity</b>	100 µS/cm
<b>Shaft diameter</b>	12.0 mm
<b>Fitting length</b>	120 mm
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6 plug-in head
<b>Enclosure rating</b>	IP 65
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting) Tank, channel: Immersion in the immersion tube
<b>Intake flow</b>	10...200 l/h
<b>Flow</b>	20 l/h (recommended)
<b>Response time T95 max.</b>	30 s (for conc. > 0.5 ppm)
<b>Shelf life</b>	6 months
<b>In-line probe fitting</b>	Bypass fitting DLG IV
<b>Measuring and control equipment</b>	D1C/DAC/DULCOMARIN® II

#### Order no.

**FLEP 010-SE / FLEP 0100-SE**

**1028279**

<b>Typical applications</b>	Monitoring the fluoridation of potable water in waterworksWaste water
<b>Resistance to</b>	Disinfectant, solids content (turbid types of water)
<b>Measuring principle, technology</b>	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm, separate temperature measurement for temperature compensation needed



## 1.2 pH, ORP, Fluoride and Temperature Sensors DULCOTEST®

### Accessories

	Order no.
Measuring transducer 4-20 mA FPV1	1028280
Measuring transducer 4-20 mA FP 100 V1	1031331
Signal cable, sold by the metre 2 x 0.25 mm <sup>2</sup> Ø 4 mm	725122
Reference electrode, REFP-SE	1018458
Pt 100 SE	305063
Polishing paste	559810

### Panel-mounted fluoride measuring station

The panel-mounted measuring stations that could be ordered to date with part no. 1010602 (230 V) and 1010603 (115 V) can now be ordered as measuring stations of the DULCOTROL® DWCa product line.

DULCOTROL® Ordering System for Potable Water/F&B See page → 3-3

### 1.2.6

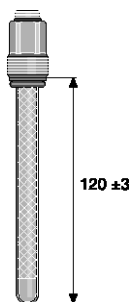
### Temperature Sensors



Robust Pt 100/Pt 1000 temperature sensor, compatible with bypass, immersion and installation fittings, for temperature monitoring or temperature compensation of sensors for other measured variables

#### Your benefits

- Mechanically stable and chemically inert glass surround
- Simple process connection together with all the sensors needed for the overall solution with suitable fittings
- Transmitter with display/operation and without display/operation for transmission/conversion of the primary signal into a 4-20 mA signal and for transmission to a central control unit (PLC)
- Control units with graded performance properties, coordinated to requirements



pk\_6\_026

<b>Temperature</b>	0 ... 100 °C
<b>Max. pressure</b>	10.0 bar
<b>Thread</b>	PG 13.5
<b>Electrical connection</b>	SN6
<b>Typical applications</b>	Temperature measurement and pH temperature correction

	Order no.
Pt 100 SE	305063
Pt 1000 SE	1002856



## 1.3 Amperometric Sensors DULCOTEST®

### 1.3.1 Amperometric Sensors for Chlorine, Bromine, Chlorine Dioxide, Chlorite, Ozone, Dissolved Oxygen, Peracetic Acid and Hydrogen Peroxide

#### The advantages at a glance:

- 12 measuring parameters available with analogue construction, each for simple installation to the same fittings and controllers
- Application-specific sensor models permit optimum operation with varying process conditions
- Efficient process management by precise measurement in real-time
- Amperometric measuring principle means no interference by turbidity or discolouration
- Diaphragm-covered measuring electrodes ensure reliable operation and long service life even under adverse and variable process conditions

Note the following points for optimum operation of amperometric sensors:

- Use of DULCOMETER® controllers
- Installation only in ProMinent fittings type DGM or DLG III
- Specified flow between 30...60 l/h
- Chlorine measurement only with a steady pH: if not possible, see Chapter 3.4
- Regular calibration with a photometer (e.g. type DT)

#### Important:

No amperometric sensors are galvanically isolated. When using with external devices (e.g. PLC), ensure that the supply voltage and analogue input signal are galvanically isolated.

#### Selection guide for DULCOTEST® amperometric sensors

Measured variable	Applications	Graduated measuring range	Connection to DULCOMETER®	Sensor type	See page
Free chlorine	Potable water, swimming pools	0.01–100 mg/l	D1C, DACa	CLE 3-mA-xppm, CLE 3.1-mA-xppm	→ 1-51
Free chlorine	Process and waste water	10 - 200 mg/l	D1C, DACa	CLR 1-mA	→ 1-61
Free chlorine	Potable water, swimming pool water	0.01 - 10 mg/l	DULCOMARIN® II	CLE 3-CAN-xppm, CLE 3.1-CAN-xppm	→ 1-54
Free chlorine	Potable water, swimming pool water, in situ electrolysis (without diaphragm)	0.02-10 mg/l	D1C, DACa	CLO 1-mA-xppm	→ 1-56
Free chlorine	Hot water up to 70 °C (legionella), in situ electrolysis (without diaphragm)	0.02-2 mg/l	D1C, DACa	CLO 2-mA-2ppm	→ 1-57
Free chlorine	Potable water, swimming pools	0.01–50 mg/l	DMT	CLE 3-DMT-xppm	→ 1-53
Free chlorine	Potable water, swimming pools	0.05-5 mg/l	COMPACT	CLB 2-µA-xppm	→ 1-58
Free chlorine	Potable water, swimming pool water	0.05-5 mg/l	COMPACT	CLB 3-µA-xppm	→ 1-59
Free chlorine	Cooling, industrial and waste water, water with higher pH values (stable); seawater (free chlorine exists as bromine)	0.01-10 mg/l	D1C, DACa	CBR 1-mA-xppm	→ 1-60
Total available chlorine	Swimming pool water with chlorine-organic disinfectants	0.02–10 mg/l	D1C, DACa	CGE 3-mA-xppm	→ 1-62
Total available chlorine	Swimming pool water with organic chlorine disinfectants, in situ electrolysis (without diaphragm)	0.02 - 10 mg/l	D1C, DACa	CGE 3-mA	→ 1-62
Total available chlorine	Swimming pool water with chlorine-organic disinfectants	0.01–10 mg/l	DULCOMARIN® II	CGE 2-CAN*-xppm	→ 1-63
Total chlorine	Potable, industrial, process and waste water	0.01–10 mg/l	D1C, DACa	CTE 1-mA-xppm	→ 1-64
Total chlorine	Potable, industrial, process and waste water	0.01–10 mg/l	DMT	CTE 1-DMT-xppm	→ 1-65
Total chlorine	Potable, industrial, process and waste water	0.01–10 mg/l	DULCOMARIN® II	CTE 1-CAN-xppm	→ 1-66
Combined chlorine	Swimming pool water	0.02–2 mg/l	DACa	CTE 1-mA-2 ppm + CLE 3.1-mA-2 ppm	→ 1-66
Combined chlorine	Swimming pool water	0.01–10 mg/l	DULCOMARIN® II	CTE 1-CAN-xppm + CLE 3.1-CAN-xppm	→ 1-66



## 1.3 Amperometric Sensors DULCOTEST®

Measured variable	Applications	Graduated measuring range	Connection to DULCOMETER®	Sensor type	See page
<b>Total available bromine</b>	Cooling water, waste water, swimming pool water, whirlpool water, bromine with BCDMH	0.01-10 mg/l	D1C, DACa	BCR 1-mA (replaces earlier type BRE 1)	→ 1-68
<b>Total available bromine</b>	Cooling water, swimming pool water, whirlpool water with organic or inorganic bromine compounds	0.02-10 mg/l	DULCOMARIN® II	BRE 3-CAN-10 ppm	→ 1-69
<b>Free and bound bromine</b>	Cooling, industrial, waste water, water with higher pH values (stable); seawater	0.02-20 mg/l	D1C, DACa	CBR 1-mA-xppm	→ 1-60
<b>Chlorine dioxide</b>	Potable water	0.01–10 mg/l	D1C, DACa	CDE 2-mA-xppm	→ 1-71
<b>Chlorine dioxide</b>	Bottle washer systems	0.02–2 mg/l	D1C, DACa	CDP 1-mA	→ 1-72
<b>Chlorine dioxide</b>	Hot water up to 60 °C, cooling water, waste water, irrigation water	0.01-10 mg/l	D1C, DACa, DULCOMARIN® II	CDR 1-mA-xppm, CDR 1-CAN-xppm	→ 1-73
<b>Chlorite</b>	Potable, wash water	0.02–2 mg/l	D1C, DACa, DULCOMARIN® II	CLT 1-mA-xppm, CLT 1-CAN-xppm	→ 1-75
<b>Ozone</b>	Potable water, swimming pool water	0.02–2 mg/l	D1C, DACa	OZE 3-mA	→ 1-77
<b>Ozone</b>	Process, service or cooling water	0.02–2 mg/l	D1C, DACa	OZR 1-mA-2 ppm*	→ 1-78
<b>Dissolved oxygen</b>	Potable, surface water	2–20 mg/l	D1C, DACa	DO 1-mA-xppm	→ 1-79
<b>Dissolved oxygen</b>	Activated sludge tank, sewage treatment plants	0.1–10 mg/l	D1C, DACa	DO 2-mA-xppm	→ 1-80
<b>Peracetic acid</b>	CIP, antiseptic food filling process	1–2,000 mg/l	D1C, DACa	PAA 1-mA-xppm	→ 1-81
<b>Hydrogen peroxide</b>	Clear water, fast control	1–2,000 mg/l	DACa	PEROX sensor PEROX-H2.10 P	→ 1-83
<b>Hydrogen peroxide</b>	Process, swimming pool water	2–20,000 mg/l	D1C, DACa	PER1-mA-xppm	→ 1-83

\* Available from 2nd quarter of 2015.





## 1.3 Amperometric Sensors DULCOTEST®

### 1.3.2 Sensors for Chlorine

Different forms of dissolved chlorine are present in water:

<b>Free (effective) chlorine:</b>	Recommended sensors for $\text{Cl}_2$ , HOCl (hypochlorous acid), $\text{OCl}^-$ (hypochlorite): <b>Types CLE, CLO, CLB, CBR, reference method: DPD1</b>
<b>Combined chlorine:</b>	Mono-, di-, trichloroamine. The measuring result of type CLE (free chlorine) is subtracted from the measurement result of type CTE (total chlorine). Reference method: DPD4 minus DPD1
<b>Total chlorine:</b>	Total of free and combined chlorine; recommended sensor: <b>Type CTE, reference method DPD4</b>
<b>Total available chlorine (organic combined chlorine):</b>	Chlorine bound to (iso)cyanic acid/isocyanurate and the free (effective) chlorine resulting from it; recommended sensor: <b>Type CGE, reference method DPD1</b>
<b>Applications:</b>	Chlorine measurement in potable, swimming pool, cooling, service, process and waste water or water of comparable quality, as well as salt water/seawater with up to 15% chloride content. For chlorine measurements at high pH values (8...9.5), we recommend chlorine sensors CGE and CTE for total chlorine and total available chlorine. We recommend the sensor type CBR or the system for metering pH buffer solution into the sample water bypass (see Chapter 3.4) for measuring free chlorine at high pH values
<b>Unit connection:</b>	Do not use sensors CLE CLO, CLB and CBR in the presence of isocyanuric acid/chlorine stabilisers! Types CLE 3.1, CBR, CTE and CGE 2 operate incorrectly when chlorinating using electrolysis processes without diaphragm. Sensors with the designation -mA are used for controllers D1Cb, DAC and DULCOMARIN®. Sensors with the designation -4P are used for the former WS controllers and for metering pumps with integral chlorine controllers. Sensors with the designation DMT are used for DMT transducers. Sensors with the designation CAN are used with the swimming pool controller DULCOMARIN® II. Sensors CLB 1 and CLB 2 with the designation -µA do not have a signal transformer and function solely with the Compact Controller.

## 1.3 Amperometric Sensors DULCOTEST®

### Selection Guide

		CLE 3/ [CLR 1]	CLE 3.1	CLO 1	CLO 2	CLB 2/ CLB 3	CBR 1	CGE 2/ [CGE 3]	CTE 1	BCR 1
<b>Measured variable</b>	Free chlorine	x, [x]	x	x	x	x	x <sup>1)</sup>			
	Total available chlorine (cyanuric acid derivatives)							x, [x]		
	Total chlorine								x	x <sup>2)</sup>
<b>Selectivity of free chlorine</b>	Raised		x							
	Yes	x, [x]		x	x	x	x	[x]		
	No							x	x	x
<b>Application</b>	Public swimming pools	x	x	(x)		(x)	(x)	x, [x]		
	Private swimming pools	x	x	x		x		x, [x]		
	Potable water	x			x	x	x		x	
	Cooling water						x			x
	Waste water	[x]					x		x	x
<b>Disinfectant</b>	Chlorine gas, hypochlorite, electrolysis (with diaphragm)	x, [x]	x	x	x	x	x		x	
	Electrolysis (without membrane)			x	x	x		[x]		
	Chlorine-containing cyanuric acid derivatives					(x)		x, [x]		
	BCDMH									x
<b>Specifications</b>	Measuring range [ppm]	0.01-100, [10-200]	0.01-10	0.02-10	0.02-2	0.05-5	0.01-10	0.00-0.0 [0.02-10]	0.01-10	0.01 - 10
	pH range	5.5-8.0	5.5-8.0	5.0-9.0	5.0-9.0	5.0-9.0	5.0-9.5	0.0-0.0	5.5-9.5	5.0 - 9.5
	Temperature [°C]	5-45	5-45	5-45	5-70	5-45	5-45	0.0-0.0	5-45	5 - 45
	Max. pressure [bar]	1	1	8	8	3	1	0.0	3	1
<b>Installation</b>	Open outlet	x	x	x	x	x	x	x	x	x
	Direct installation in the circuit			x	x	x				

\* 1) As well as free and combined bromine (see Chap. 1.3.3: "Bromine Sensors")

2) As well as total available bromine (see Chap. 1.3.3: "Bromine Sensors")







## 1.3 Amperometric Sensors DULCOTEST®

### 1.3.3

### Sensors for Free Chlorine

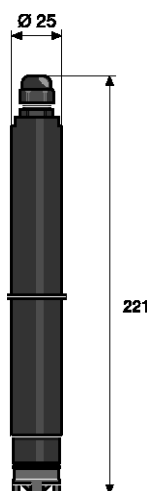
#### Sensor for Free Chlorine CLE 3-mA



Standard sensor for measuring free chlorine in clear water. For operation on controllers with 4-20 mA input

#### Your benefits

- Measured variable: free chlorine, no significant cross sensitivity to combined chlorine (chloramines)
- Diaphragm-covered sensor (encapsulated) minimises faults caused by changing flow or ingredients in the water



pk\_6\_039

<b>Measured variable</b>	Free chlorine (hypochlorous acid HOCl)
<b>Reference method</b>	DPD1
<b>pH range</b>	5.5 ... 8.0
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM or DLG III)
<b>Supply voltage</b>	16...24 V DC (two-wire technology)
<b>Output signal</b>	4...20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated
<b>Selectivity</b>	Free chlorine as against combined chlorine, even if there is not an excess of it
<b>Disinfection process</b>	Chlorine gas, hypochlorite, electrolysis with diaphragm. Disinfectants with organic chlorine, e.g. based on cyanuric acid, are unsuitable
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	D1Cb, DAC, delta® solenoid diaphragm metering pump
<b>Typical applications</b>	CLE 3-mA-0,5 ppm: potable water; CLE 3-mA-2.0/10 ppm: swimming pools (surfactant-free)
<b>Resistance to</b>	Salts, acids, alkalis. Not surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
<b>CLE 3-mA-0.5 ppm</b>	0.01...0.5 mg/l	792927
<b>CLE 3-mA-2 ppm</b>	0.02...2.0 mg/l	792920
<b>CLE 3-mA-5 ppm</b>	0.01...5.0 mg/l	1033392
<b>CLE 3-mA-10 ppm</b>	0.10...10.0 mg/l	792919
<b>CLE 3-mA-20 ppm</b>	0.20...20.0 mg/l	1002964
<b>CLE 3-mA-50 ppm</b>	0.50...50.0 mg/l	1020531
<b>CLE 3-mA-100 ppm</b>	1.00...100.0 mg/l	1022786

Chlorine sensors complete with 100 ml of electrolyte

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.

## 1.3 Amperometric Sensors DULCOTEST®



### Sensor for Free Chlorine CLE 3.1-mA

Sensor for the measurement of free chlorine in clear water with higher selectivity towards combined chlorine. For use on controllers with 4-20 mA input

#### Your benefits

- Measured variable: free chlorine, no cross sensitivity to combined chlorine (chloramines), even if there is an excess of it
- Diaphragm-covered sensor (encapsulated) minimises faults caused by changing flow or ingredients in the water

#### Measured variable

Free chlorine (hypochlorous acid HOCl) with high levels of combined chlorine; for determining the combined chlorine with a DAC controller and sensor for total chlorine type CTE 1-mA

#### Reference method

DPD1

#### pH range

5.5 ... 8.0

#### Temperature

5 ... 45 °C

#### Max. pressure

1.0 bar

#### Intake flow

30...60 l/h (in DGM or DLG III)

#### Supply voltage

16...24 V DC (two-wire technology)

#### Output signal

4...20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated

#### Selectivity

Free chlorine as against combined chlorine, even if there is an excess of it

#### Disinfection process

Chlorine gas, hypochlorite, electrolysis with diaphragm. Disinfectants with organic chlorine, e.g. based on cyanuric acid, are unsuitable

#### Installation

Bypass: open sample water outlet

#### Sensor fitting

DGM, DLG III

#### Measuring and control equipment

D1Cb, DAC, delta® solenoid diaphragm metering pump

#### Typical applications

Potable water with higher volumes of combined chlorine. Swimming pools. To determine the combined chlorine from the difference: Total chlorine minus free chlorine in the controller DACa

#### Resistance to

Salts, acids, alkalis. Not surfactants

#### Measuring principle, technology

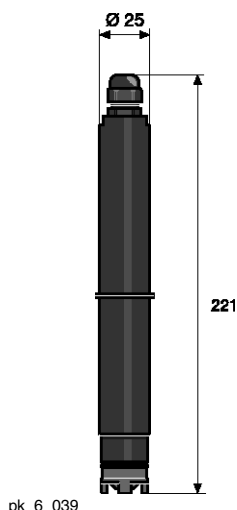
Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
CLE 3.1-mA-0.5 ppm	0.01...0.5 mg/l	1020530
CLE 3.1-mA-2 ppm	0.02...2.0 mg/l	1018369
CLE 3.1-mA-5 ppm	0.01...5.0 mg/l	1019398
CLE 3.1-mA-10 ppm	0.10...10.0 mg/l	1018368

Chlorine sensors complete with 100 ml of electrolyte

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.

Signal leads see Sensor Accessories, p. → 1-113



## 1.3 Amperometric Sensors DULCOTEST®

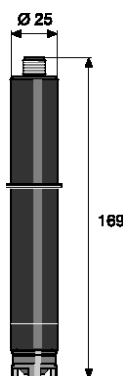
### Sensor for Free Chlorine CLE 3-DMT



Standard sensor for measuring free chlorine in clear water. For operation on ProMinent transmitters type DMT

#### Your benefits

- Measured variable: free chlorine, no significant cross sensitivity to combined chlorine (chloramines)
- Diaphragm-covered sensor (encapsulated) minimises faults caused by changing flow or ingredients in the water



pk\_6\_038

<b>Measured variable</b>	Free chlorine (hypochlorous acid HOCl)
<b>Reference method</b>	DPD1
<b>pH range</b>	5.5 ... 8.0
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM or DLG III)
<b>Supply voltage</b>	3.3 V DC (5 P)
<b>Output signal</b>	0...1 V DC, uncalibrated, not temperature compensated, not electrically isolated
<b>Temperature measurement</b>	About the integrated Pt 1000. The temperature compensation is carried out in DMT.
<b>Selectivity</b>	Free chlorine as against combined chlorine, even if there is not an excess of it
<b>Disinfection process</b>	Chlorine gas, hypochlorite, electrolysis with diaphragm. Disinfectants with organic chlorine, e.g. based on cyanuric acid, are unsuitable
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	DMT
<b>Typical applications</b>	CLE 3-mA-0,5 ppm: potable water; CLE 3-mA-2.0/10 ppm: swimming pools (surfactant-free)
<b>Resistance to</b>	Salts, acids, alkalis. Not surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
<b>CLE 3-DMT-5 ppm</b>	0.01...5.0 mg/l	1005511
<b>CLE 3-DMT-50 ppm</b>	0.05...50.0 mg/l	1005512

Chlorine sensors complete with 100 ml of electrolyte

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.

Signal leads see Sensor Accessories, p. → 1-113



## 1.3 Amperometric Sensors DULCOTEST®



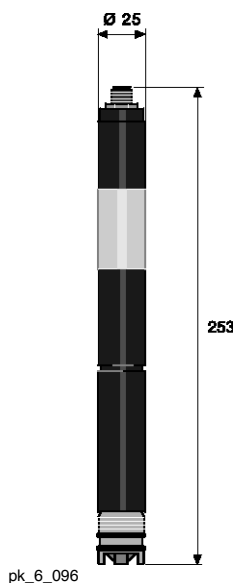
### Sensor for Free Chlorine CLE 3-CAN

Standard sensor for measuring free chlorine in clear water. For use on controllers with CAN-bus connection

#### Your benefits

- Measured variable: free chlorine, no significant cross sensitivity to combined chlorine (chloramines)
- Diaphragm-covered sensor (encapsulated) minimises faults caused by changing flow or ingredients in the water
- Operation on the CAN-bus with all the associated benefits

<b>Measured variable</b>	Free chlorine (hypochlorous acid HOCl)
<b>Reference method</b>	DPD1
<b>pH range</b>	5.5 ... 8.0
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	30...60 l/h (in the DGM or DLG III)
<b>Supply voltage</b>	Via CAN interface (11 - 30 V)
<b>Output signal</b>	Uncalibrated, temperature compensated, electrically isolated
<b>Selectivity</b>	Free chlorine as against combined chlorine, even if there is not an excess of it
<b>Disinfection process</b>	Chlorine gas, hypochlorite, electrolysis with diaphragm. Disinfectants with organic chlorine, e.g. based on cyanuric acid, are unsuitable
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	DULCOMARIN® II
<b>Typical applications</b>	CLE 3-mA-0,5 ppm: potable water; CLE 3-mA-2.0/10 ppm: swimming pools (surfactant-free)
<b>Resistance to</b>	Salts, acids, alkalis. Not surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, diaphragm-covered



	Measuring range	Order no.
<b>CLE 3-CAN-10 ppm</b>	0.01...10.0 mg/l	1023425

Chlorine sensors complete with 100 ml of electrolyte

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.



## 1.3 Amperometric Sensors DULCOTEST®

### Sensor for Free Chlorine CLE 3.1-CAN



Sensor for the measurement of free chlorine in clear water with higher selectivity towards combined chlorine. For use on controllers with CAN-bus connection

#### Your benefits

- Measured variable: free chlorine, no cross sensitivity to combined chlorine (chloramines) even if there is an excess of it
- Diaphragm-covered sensor (encapsulated) minimises faults caused by changing flow or ingredients in the water
- Operation on the CAN-bus with all the associated benefits

#### Measured variable

Free chlorine (hypochlorous acid HOCl) with large proportions of bound chlorine; to detect bound chlorine using DULCOMARIN® II and Sensor for Total Chlorine type CTE 1-CAN

#### Reference method

DPD1

#### pH range

5.5 ... 8.0

#### Temperature

5 ... 45 °C

#### Max. pressure

1.0 bar

#### Intake flow

30...60 l/h (in DGMa or DLG III)

#### Supply voltage

Via CAN interface (11 – 30 V)

#### Output signal

Uncalibrated, temperature compensated, electrically isolated

#### Selectivity

Free chlorine

#### Disinfection process

Chlorine gas, hypochlorite, electrolysis with diaphragm. Disinfectants with organic chlorine, e.g. based on cyanuric acid, are unsuitable

#### Installation

Bypass: open sample water outlet

#### Sensor fitting

DGM, DLG III

#### Measuring and control equipment

DULCOMARIN® II

#### Typical applications

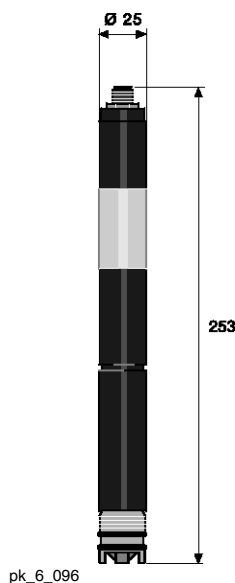
Potable water with higher volumes of combined chlorineSwimming pools, To determine the combined chlorine from the difference: Total chlorine minus free chlorine in the controller DULCOMARIN® II

#### Resistance to

#### Measuring principle, technology

Salts, acids, alkalis. Not surfactants

Amperometric, 2 electrodes, diaphragm-covered



pk\_6\_096

	Measuring range	Order no.
CLE 3.1-CAN-10 ppm	0.01...10.0 mg/l	1023426

Chlorine sensors complete with 100 ml of electrolyte

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.



## 1.3 Amperometric Sensors DULCOTEST®

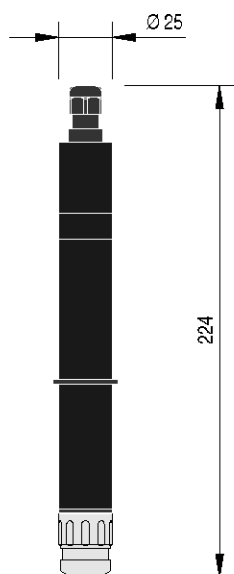


### Sensor for Free Chlorine CLO 1-mA

Sensor for the measurement of free chlorine in clear water even when using electrolysis processes for disinfection, up to 45 °C or 8 bar (25 °C). For use with controllers with 4-20 mA input

#### Your benefits

- Measured variable: free chlorine, no significant cross sensitivity to combined chlorine (chloramines)
- Use with return of the sample water to the process line
- Use at higher pressures
- Minimisation of faults by electrolysis systems in which the electrodes are immersed directly into the sample water (without diaphragm) by open sensor (no diaphragm) and gold electrodes
- Measurement of free chlorine up to pH 9 and use at high pressure of up to 8 bar is possible



P\_DT\_0072\_SW1

<b>Measured variable</b>	Free chlorine (hypochlorous acid HOCl)
<b>Reference method</b>	DPD1
<b>pH range</b>	5.0 ... 9.0
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	8.0 bar (25 °C)
<b>Intake flow</b>	30...60 l/h (in DGM or DLG III), constant flow as flow-dependent signal
<b>Supply voltage</b>	16...24 V DC (2-wire)
<b>Output signal</b>	4...20 mA = Measuring range, temperature-compensated, uncalibrated, not electrically isolated
<b>Selectivity</b>	Free chlorine as against combined chlorine
<b>Disinfection process</b>	Chlorine gas, hypochlorite, electrolysis with diaphragm. Electrolysis without diaphragm with electrodes in the process
<b>Installation</b>	Bypass: open sample water outlet. Inline: direct installation into the tubes with the INLI fitting
<b>Sensor fitting</b>	DLG up to 1 bar/55 °C; DGM up to 6 bar/30 °C; INLI up to 7 bar/40 °C
<b>Measuring and control equipment</b>	D1Cb, DAC, delta® solenoid diaphragm metering pump
<b>Typical applications</b>	Swimming pools, uncontaminated potable water and industrial service water, and can also be used together with diaphragm-free electrolysis processes
<b>Resistance to</b>	Surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, diaphragm-covered

	<b>Measuring range</b>	<b>Order no.</b>
CLO 1-mA-2 ppm	0.02...2.0 mg/l	1033871
CLO 1-mA-10 ppm	0.10...10.0 mg/l	1033870



## 1.3 Amperometric Sensors DULCOTEST®

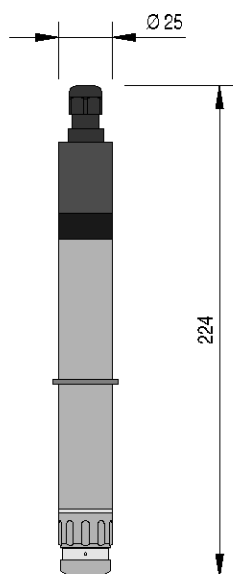
### Sensor for Free Chlorine CLO 2-mA



Sensor for the measurement of free chlorine in clear water even when using electrolysis processes for disinfection, up to 70 °C or 8 bar (25 °C). For use with controllers with 4-20 mA input

#### Your benefits

- Measured variable: free chlorine, no significant cross sensitivity to combined chlorine (chloramines)
- Use with return of the sample water to the process line
- Use at higher pressures/temperatures
- Minimisation of faults by electrolysis systems in which the electrodes are immersed directly into the sample water (without diaphragm) by open sensor (no diaphragm) and gold electrodes
- Measurement of free chlorine up to pH 9 and use at high pressure of up to 8 bar is possible



P\_DT\_0073\_SW1

<b>Measured variable</b>	Free chlorine (hypochlorous acid HOCl)
<b>Reference method</b>	DPD1
<b>pH range</b>	5.0 ... 9.0
<b>Temperature</b>	5 ... 70 °C
<b>Max. pressure</b>	8.0 bar (25 °C)
<b>Intake flow</b>	30...60 l/h (in DGM or DLG III), constant flow as flow-dependent signal
<b>Supply voltage</b>	16...24 V DC (2-wire)
<b>Output signal</b>	4...20 mA = Measuring range, temperature-compensated, uncalibrated, not electrically isolated
<b>Selectivity</b>	Free chlorine as against combined chlorine
<b>Disinfection process</b>	Chlorine gas, hypochlorite, electrolysis with diaphragm. Electrolysis without diaphragm with electrodes in the process
<b>Installation</b>	Bypass: open sample water outlet. Inline: direct installation into the tubes with the INLI fitting
<b>Sensor fitting</b>	DLG up to 1 bar/55 °C; DGM up to 1 bar/60 °C; INLI up to 2 bar/70 °C. Prerequisite: constant flow
<b>Measuring and control equipment</b>	D1Cb, DAC, delta® solenoid diaphragm metering pump
<b>Typical applications</b>	Hot water up to 70 °C, combating legionella, uncontaminated potable water and industrial service water, can also be used together with diaphragm-free electrolysis processes
<b>Resistance to</b>	Surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
CLO 2-mA-2 ppm	0.02...2.0 mg/l	1033878

## 1.3 Amperometric Sensors DULCOTEST®

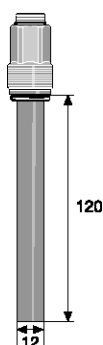


### Sensor for Free Chlorine CLB 2-µA

Cost-effective, simple sensor for the measurement of free chlorine in clear water, even with a changing media temperature. Use even when electrolysis processes are used for disinfection at up to 45 °C/3 bar. For operation with the Compact controller DCCa

#### Your benefits

- Measured variable: free chlorine, no significant cross sensitivity to combined chlorine (chloramines)
- Cost-effective due to its simple construction without separate wear parts
- Simple, cost-effective maintenance without handling of the diaphragm caps
- Minimisation of faults by electrolysis systems without diaphragm in which the electrodes are immersed directly into the sample water by an open sensor (no diaphragm)
- Measurement of free chlorine up to pH 9 and use at high pressure of up to 8 bar by the absence of a diaphragm



pk\_6\_095

<b>Measured variable</b>	Free chlorine (hypochlorous acid HOCl)
<b>Measuring range</b>	0.05 – 5.0 mg/l, can be used for short-term shock chlorination up to 10 mg/l
<b>Reference method</b>	DPD1
<b>pH range</b>	5.0 ... 9.0
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	3.0 bar
<b>Intake flow</b>	30...60 l/h (in DGMA), constant flow needed as flow-dependent signal
<b>Supply voltage</b>	Only for compact controllers
<b>Output signal</b>	Non-amplified primary current signal, not temperature-compensated, uncalibrated, not electrically isolated
<b>Temperature measurement</b>	Pt 1000, integrated, calculation in the compact controller
<b>Selectivity</b>	Free chlorine as against combined chlorine
<b>Disinfection process</b>	Chlorine gas, hypochlorite, electrolysis with diaphragm. Electrolysis without diaphragm with electrodes in the process
<b>Installation</b>	Bypass: open sample water outlet. Inline: direct installation into the pipework
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	Compact controller
<b>Typical applications</b>	Swimming pools, potable water, can also be used with membrane-free chlorine production electrolysis processes, even with varying media temperatures
<b>Resistance to</b>	Surfactants
<b>Measuring principle, technology</b>	Amperometric, 3 electrodes, without diaphragm

	<b>Measuring range</b>	<b>Order no.</b>
<b>CLB 2-µA-5 ppm</b>	0.05...5.0 mg/l	1038902







## 1.3 Amperometric Sensors DULCOTEST®

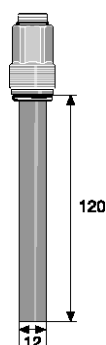
### Sensor for Free Chlorine CLB 3-μA



Cost-effective, simple sensor for the measurement of free chlorine in clear water when the media temperature is constant. Use even when electrolysis processes are used for disinfection at up to 45 °C/ 3 bar. For operation with the Compact controller DCCa

#### Your benefits

- Measured variable: free chlorine, no significant cross sensitivity to combined chlorine (chloramines)
- Cost-effective due to its simple construction without separate wear parts
- Simple, cost-effective maintenance without handling of the diaphragm caps
- Minimisation of faults by electrolysis systems without diaphragm in which the electrodes are immersed directly into the sample water by an open sensor (no diaphragm)
- Measurement of free chlorine up to pH 9 and use at high pressure of up to 8 bar by the absence of a diaphragm



pk\_6\_095

<b>Measured variable</b>	Free chlorine (hypochlorous acid HOCl)
<b>Measuring range</b>	0.05 - 5.0 mg/l: linear, can be used for shock chlorination up to 10.0 mg/l
<b>Reference method</b>	DPD1
<b>pH range</b>	5.0 ... 9.0
<b>Temperature</b>	5 ... 45 °C constant temperature needed, as temperature-dependent signal
<b>Max. pressure</b>	3.0 bar
<b>Intake flow</b>	30...60 l/h (in DGMA), constant flow necessary, as flow-dependent signal
<b>Supply voltage</b>	Only for compact controllers
<b>Output signal</b>	Non-amplified primary current signal, not temperature-compensated, uncalibrated, not electrically isolated
<b>Temperature measurement</b>	None
<b>Selectivity</b>	Free chlorine as against combined chlorine
<b>Disinfection process</b>	Chlorine gas, hypochlorite, electrolysis with diaphragm. Electrolysis without diaphragm with electrodes in the process
<b>Installation</b>	Bypass: open sample water outlet. Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting)
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	Compact controller
<b>Typical applications</b>	Swimming pools, potable water, can also be used with membrane-free chlorine production electrolysis processes
<b>Resistance to</b>	Surfactants
<b>Measuring principle, technology</b>	Amperometric, 3 electrodes, without diaphragm

	Measuring range	Order no.
CLB 3-μA-5 ppm	0.05...5.0 mg/l	1041696

## 1.3 Amperometric Sensors DULCOTEST®



### Sensor for Free Chlorine CBR 1-mA

Sensor for free chlorine and bromine in contaminated water, also suitable for high pH values of up to 9.5.  
For use with controllers with 4-20 mA input

#### Your benefits

- Measured variable: free chlorine as well as free and combined bromine (bromamines)
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water
- Resistance to films of dirt and biofilms by electrolyte with antimicrobial effect and large-pore diaphragm
- Use at high pH value of up to 9.5 by optimisation of the electrolyte diaphragm system

<b>Measured variable</b>	Free chlorine (hypochlorous acid, HOCl, OCl <sup>-</sup> ), free bromine, bound bromine BCDMH (1,3-dibrom-5,5-dimethyl-hydantoin)
<b>Reference method</b>	DPD1
<b>pH range</b>	5.0 ... 9.5
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM, DLG II)
<b>Supply voltage</b>	16...24 V DC (2-wire)
<b>Output signal</b>	4...20 mA = Measuring range, temperature-compensated, uncalibrated, not electrically isolated
<b>Selectivity</b>	Free chlorine as against combined chlorine
<b>Disinfection process</b>	Chlorine gas, hypochlorite, electrolysis with diaphragm. Bromide + hypochlorite, DBDMH
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	D1Cb, DAC, delta® solenoid diaphragm metering pump
<b>Typical applications</b>	Cooling water, process water, waste water, Water with higher pH values (stable pH), Seawater
<b>Resistance to</b>	Films of dirt, Biofilms, Surfactants
<b>Measuring principle, technology</b>	amperometric, 2 electrodes, diaphragm-covered

	<b>Measuring range</b>	<b>Order no.</b>
<b>CBR 1-mA-0,5 ppm</b>	0.01...0.5 mg/l...*	1038016
<b>CBR 1-mA-2 ppm</b>	0.02...2.0 mg/l...*	1038015
<b>CBR 1-mA-10 ppm</b>	0.10...10.0 mg/l...*	1038014

\* Measuring range based on chlorine. When measuring bromine, the lower and upper limit of the measuring range are increased by the factor 2.25, therefore for example CBR 1-mA-0.5ppm: 0.02 ...1.1 ppm.





## 1.3 Amperometric Sensors DULCOTEST®

### Sensor for Free Chlorine CLR 1-mA

Sensor for free chlorine above 10 ppm in contaminated washing water for use with controllers with 4-20 mA input



#### Your benefits

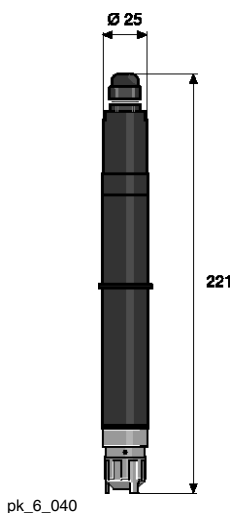
- Measured variable free chlorine for high concentrations of up to 1,000 ppm
- Diaphragm-covered sensor prevents faults caused by changing flow or ingredients in the water
- Resistance to films of dirt by pore-free diaphragm

<b>Measured variable</b>	Free chlorine (hypochlorous acid HOCl)
<b>Reference method</b>	DPD1
<b>pH range</b>	5.5 ... 8.0
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM, DLG II)
<b>Supply voltage</b>	16...24 V DC (2-wire)
<b>Output signal</b>	4...20 mA = Measuring range, temperature-compensated, uncalibrated, not electrically isolated
<b>Selectivity</b>	Free chlorine as against combined chlorine
<b>Disinfection process</b>	Chlorine gas, hypochlorite, electrolysis with diaphragm
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DLG III

**Measuring and control equipment** D1Cb, DAC, delta® solenoid diaphragm metering pump

**Typical applications** Salad, vegetable and poultry washing water, contaminated process and waste water

**Resistance to** Salts, acids, alkalis, films of dirt, surfactants  
**Measuring principle, technology** Amperometric, 2 electrodes, diaphragm-covered



	Measuring range	Order no.
CLR 1-mA-200 ppm	10.0...200 mg/l	1047978

**Important note:** Measuring range from 10.0 ... 1,000 mg/l on request

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.

## 1.3 Amperometric Sensors DULCOTEST®

### 1.3.4

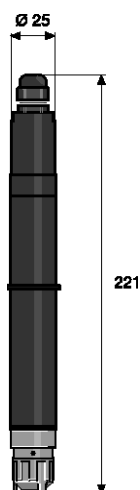
### Sensors for Total Available Chlorine

#### Sensor for Total Available Chlorine CGE 3-mA

✓ Sensor for total available chlorine, such as derivatives of chloro(iso)cyanuric acid trouble-free when disinfection is provided by electrolysis processes when used in swimming pools. For operation with controllers with 4-20 mA input

##### Your benefits

- Measured variable: total available chlorine, for instance disinfectant with organic chlorine, such as derivatives of chloro(iso)cyanuric acid
- Gold electrode to prevent faults by products from electrolysis processes where the electrodes are immersed directly into the sample water (without diaphragm)
- Diaphragm-covered sensor (encapsulated) minimises faults caused by changing flow or ingredients in the water
- Hydrophilic diaphragm guarantees the permeability of chloro(iso)cyanuric acid derivatives towards the measuring electrodes
- The special reaction system of the electrolyte allows the total available chlorine to be determined and use at a high pH of up to 9.5



pk\_6\_040

##### Measured variable

Total available chlorine: Total of organic combined chlorine (e.g. bound to cyanuric acid) and free chlorine

##### Reference method

DPD1

##### pH range

5.5 ... 9.5

##### Temperature

5 ... 45 °C

##### Max. pressure

3.0 bar

##### Intake flow

30...60 l/h (in DGM or DLG III)

##### Supply voltage

16...24 V DC (2-wire system)

##### Output signal

4-20 mA ≈ Measuring range, temperature-compensated, uncalibrated, not electrically isolated

##### Selectivity

Total available chlorine as against combined chlorine (chloramines)

##### Disinfection process

Disinfectants with organic chlorine, e.g. based on cyanuric acid

##### Installation

Bypass: open sample water outlet

##### Sensor fitting

DGM, DLG III

##### Measuring and control equipment

D1C, DAC, delta® solenoid diaphragm metering pump

##### Typical applications

Swimming pool water, combined disinfection processes with chloro(iso)cyanuric acid derivatives and diaphragm-free electrolysis

##### Resistance to

Surfactants

##### Measuring principle, technology

Amperometric, 2 electrodes, membrane-covered

	Measuring range	Order no.
CGE 3-mA-2 ppm	0.02...2.0 mg/l	1047959
CGE 3-mA-10 ppm	0.10...10.0 mg/l	1047975

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.

## 1.3 Amperometric Sensors DULCOTEST®



### Sensor for Total Available Chlorine CGE 2-CAN

Sensor for total available chlorine, such as derivatives of chloro(iso)cyanuric acid when used in swimming pools. For use on controllers with CAN-bus connection

#### Your benefits

- Measured variable: total available chlorine, for instance disinfectant with organic chlorine, such as derivatives of chloro(iso)cyanuric acid
- Diaphragm-covered sensor (encapsulated) minimises faults caused by changing flow or ingredients in the water
- Hydrophilic diaphragm guarantees the permeability of chloro(iso)cyanuric acid derivatives towards the measuring electrodes
- The special reaction system of the electrolyte allows the total available chlorine to be determined and use at a high pH of up to 9.5
- Operation on the CAN-bus with all the associated benefits

<b>Measured variable</b>	Total available chlorine: Total of organic combined chlorine (e.g. bound to cyanuric acid) and free chlorine
<b>Reference method</b>	DPD1
<b>pH range</b>	5.5 ... 9.5
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	3.0 bar
<b>Intake flow</b>	30...60 l/h (in the DGM or DLG III)
<b>Supply voltage</b>	Via CAN interface (11 – 30 V DC)
<b>Output signal</b>	Uncalibrated, temperature-compensated, electrically isolated
<b>Selectivity</b>	Only limited against combined chlorine (chloramines)
<b>Disinfection process</b>	Disinfectants with organic chlorine, e.g. based on cyanuric acid
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	DULCOMARIN® II
<b>Typical applications</b>	Swimming pool water, disinfection processes with chloro(iso)cyanuric acid derivatives
<b>Resistance to</b>	Surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	<b>Measuring range</b>	<b>Order no.</b>
<b>CGE 2-CAN-10 ppm</b>	0.01...10.0 mg/l	1024420

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.



## 1.3 Amperometric Sensors DULCOTEST®

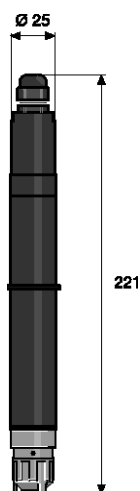
### 1.3.5 Sensors for Total Chlorine

#### Sensor for Total Chlorine CTE 1-mA

Sensor for total chlorine, including, for example, free chlorine, chloramines etc. even with high pH values in different kinds of water. For use on controllers with mA input

##### Your benefits

- Measured variable: Total chlorine, chlorine compounds, in which chlorine acts as an oxidising agent, e.g. free chlorine (HOCl and OCl<sup>-</sup>), chloramines etc.
- Diaphragm-covered sensor (encapsulated) prevents faults caused by changing flow or ingredients in the water
- Hydrophilic diaphragm guarantees permeability for different water-soluble oxidising agents towards the measuring electrodes
- The special reaction system of the electrolyte allows components containing oxidising chlorine to be determined and used at a high pH of up to 9.5



pk\_6\_040

<b>Measured variable</b>	Total chlorine
<b>Reference method</b>	DPD4
<b>pH range</b>	5.5 ... 9.5
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	3.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM or DLG III)
<b>Supply voltage</b>	16...24 V DC (two-wire technology)
<b>Output signal</b>	4...20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated
<b>Selectivity</b>	Not selective, cross-sensitive towards many oxidation agents
<b>Disinfection process</b>	Chlorine gas, hypochlorite, electrolysis with diaphragm, Monochloramine
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	D1C, DAC, delta® solenoid diaphragm metering pump
<b>Typical applications</b>	Potable, industrial, process, waste water
<b>Resistance to</b>	Surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	Measuring range	Order no.
CTE 1-mA-0.5 ppm	0.01...0.5 mg/l	740686
CTE 1-mA-2 ppm	0.02...2.0 mg/l	740685
CTE 1-mA-5 ppm	0.05...5.0 mg/l	1003203
CTE 1-mA-10 ppm	0.10...10.0 mg/l	740684

Chlorine sensors complete with 50 ml of electrolyte

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.



## 1.3 Amperometric Sensors DULCOTEST®

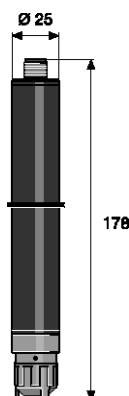
### Sensor for Total Chlorine CTE 1-DMT



Sensor for total chlorine, including, for example, free chlorine, chloramines etc. even with high pH values in different kinds of water. For operation with the transmitter DMT

#### Your benefits

- Measured variable: Total chlorine, chlorine compounds, in which chlorine acts as an oxidising agent, e.g. free chlorine (HOCl and OCl<sup>-</sup>), chloramines etc.
- Diaphragm-covered sensor (encapsulated) prevents faults caused by changing flow or ingredients in the water
- Hydrophilic diaphragm guarantees permeability for different water-soluble oxidising agents towards the measuring electrodes
- The special reaction system of the electrolyte allows components containing oxidising chlorine to be determined and used at a high pH of up to 9.5



pk\_6\_015

<b>Measured variable</b>	total chlorine
<b>Reference method</b>	DPD4
<b>pH range</b>	5.5 ... 9.5
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	3.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM or DLG III)
<b>Supply voltage</b>	3.3 V DC (5 P)
<b>Output signal</b>	Uncalibrated, not temperature-compensated, not electrically isolated
<b>Selectivity</b>	Not selective, cross-sensitive towards many oxidation agents
<b>Disinfection process</b>	Chlorine gas, hypochlorite, electrolysis with diaphragm, Monochloramine
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	DMT
<b>Typical applications</b>	Potable, industrial, process, waste water
<b>Resistance to</b>	Surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	Measuring range	Order no.
<b>CTE 1-DMT-10 ppm</b>	0.01...10.0 mg/l	1007540

Chlorine sensors complete with 50 ml of electrolyte

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.

Signal leads see Sensor Accessories, p. → 1-113

## 1.3 Amperometric Sensors DULCOTEST®



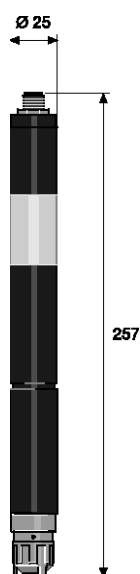
### Sensor for Total Chlorine CTE 1-CAN

Sensor for total chlorine, including, for example, free chlorine, chloramines etc. even with high pH values in different kinds of water. For use on controllers with CAN-bus connection

#### Your benefits

- Measured variable: Total chlorine, chlorine compounds, in which chlorine acts as an oxidising agent, e.g. free chlorine (HOCl and OCl<sup>-</sup>), chloramines etc.
- Diaphragm-covered sensor (encapsulated) prevents faults caused by changing flow or ingredients in the water
- Hydrophilic diaphragm guarantees permeability for different water-soluble oxidising agents towards the measuring electrodes
- The special reaction system of the electrolyte allows components containing oxidising chlorine to be determined and used at a high pH of up to 9.5
- Operation on the CAN-bus with all the associated benefits

Sensor for connection to a CAN interface (e.g. DULCOMARIN® II swimming pool controller)



pk\_6\_084

<b>Measured variable</b>	Total chlorine
<b>Reference method</b>	DPD4
<b>pH range</b>	5.5 ... 9.5 (up to pH 8.5 with D1C pH correction)
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	3.0 bar
<b>Intake flow</b>	30...60 l/h (in DGMa or DLG III)
<b>Supply voltage</b>	Via CAN interface (11 - 30 V)
<b>Output signal</b>	Uncalibrated, temperature-compensated, electrically isolated
<b>Selectivity</b>	Not selective, cross-sensitive towards many oxidation agents
<b>Disinfection process</b>	Chlorine gas, hypochlorite, electrolysis with diaphragm, Monochloramine
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	DULCOMARIN® II
<b>Typical applications</b>	CTE 1-mA-0.5 ppm: potable water; CTE 1-mA-2/5/10 ppm: potable, industrial, process, waste water. In swimming pools combined with CLE 3.1 to detect combined chlorine
<b>Resistance to</b>	Surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	<b>Measuring range</b>	<b>Order no.</b>
<b>CTE 1-CAN-10 ppm</b>	0.01...10.0 mg/l	1023427

Chlorine sensors complete with 100 ml of electrolyte

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.



## 1.3 Amperometric Sensors DULCOTEST®

### 1.3.6

### Sensors for Bromine

#### Bromination agents

The following stabilised bromination agents are frequently used for disinfection during water treatment:

- BCDMH (1-**B**romo-3-**C**hloro-5,5-**D**imethyl-**H**ydantoin), marketed under trade names such as Brom-Sticks®
- DBDMH (1,3-**D**ibromo-5,5-**D**imethyl-**H**ydantoin) marketed under trade names such as Albrom 100®
- N-bromamide sulfonate

These bromination agents are initially available as solids (tablets, sticks, pellets) and are transferred via "bromine chutes" into a saturated aqueous solution, that contains the free bromine (HOBr, OBr<sup>-</sup>) and the carrier molecule. The free bromine and the halogen (bromine, chlorine) still available in the carrier molecule is jointly referred to as "Total available bromine". This solution is metered during the process.

Free bromine is generated directly without a carrier by metering of sodium-calcium hypochlorite + acid + sodium bromide, e.g. the Acti-Brom® process (Nalco company) or through the metering of sodium-calcium hypochlorite into seawater (bromide containing).

Bromamines are designated as combined bromine, which are more reactive when compared with chloramines (combined chlorine).

#### Applications

Typical applications are in swimming pools, whirlpools, seawater and cooling circuits. Particular attention must be paid to the quality of the sample water in cooling circuits and, where necessary, compatibility with other chemicals used (e.g. corrosion inhibitors) must be checked.

The photometric DPD measurement method recommends itself as a comparison method (e.g. with DT 1B), calculated and displayed as bromine. If the photometric DPD measurement for "chlorine" is used, the measured value must be multiplied by a factor of 2.25 for conversion into "bromine".

#### Sensor selection

- The sensor type BCR 1 and its calibration/checking using the DPD4 method, is recommended for the measurement of stabilised bromination agents, such as BCDMH and N-bromamide sulfonate.
- The sensor type CBR 1 and its calibration/checking using the DPD1 method, is recommended for the measurement of free bromine from sodium-calcium hypochlorite and bromide or of free bromine from DBDMH (solely splits off free bromine), or of bromine compounds, which are produced during disinfection (using sodium-calcium hypochlorite or ozone) of seawater. The CBR 1 can likewise be used to measure combined bromine (bromamines), calibrated and checked using the DPD1 method.
- It is essential that the sensor type BRE 3-CAN, calibrated and checked using the DPD4 method, is used to measure bromination agents using the control system DULCOMARIN® II.



## 1.3 Amperometric Sensors DULCOTEST®

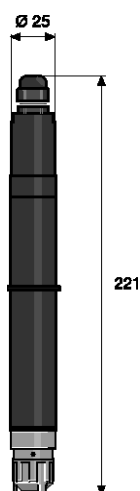


### Sensor for Total Available Bromine BCR 1-mA (Replaces Earlier Type BRE 1)

Sensor for the disinfectant BCDMH and other oxidative-acting bromine-organic disinfectants even in contaminated water and/or for high pH values of up to 9.5. For use on controllers with mA input

#### Your benefits

- Measured variable: total available bromine from BCDMH (1-bromo-3-chloro-5,5-dimethylhydantoin)
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water, N-bromamide sulfonate
- Resistance to blocking is achieved by the use of an electrolyte with an antimicrobial effect (less blocking by biofilms) and by a large-pored diaphragm (less blocking by solid particles/dirt)
- Use with high pH values by optimisation of the electrolyte diaphragm system



pk\_6\_040

<b>Measured variable</b>	Total available bromine from <b>BCDMH</b> (bromo-3-chloro-5,5-dimethylhydantoin) and <b>N-bromamide sulfonate</b>
<b>Reference method</b>	DPD4
<b>pH range</b>	5.0 ... 9.5
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM, DLG III)
<b>Supply voltage</b>	16...24 V DC (two wire)
<b>Output signal</b>	4...20 mA = Measuring range, temperature-compensated, uncalibrated, not electrically isolated
<b>Selectivity</b>	Not selective, cross-sensitive towards many oxidation agents
<b>Disinfection process</b>	BCDMH (1-bromo-3-chloro-5,5-dimethyl-hydantoin), N-bromamide sulfonate
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	D1C, D2C, DAC
<b>Typical applications</b>	Cooling water, process water, waste water, water with higher pH values (stable pH)
<b>Resistance to</b>	
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	<b>Measuring range</b>	<b>Order no.</b>
<b>BCR 1-mA-0.5 ppm</b>	0.01...0.5 mg/l	1041697
<b>BCR 1-mA-2 ppm</b>	0.02...2.0 mg/l	1040115
<b>BCR 1-mA-10 ppm</b>	0.10...10.0 mg/l	1041698





## 1.3 Amperometric Sensors DULCOTEST®

### Sensor for Total Available Bromine BRE 3-CAN



Sensor for free and combined bromine, also for use with slightly contaminated water. For use on controllers with CAN-bus connection

#### Your benefits

- Measured variable: total available bromine from BCDMH and other oxidative-acting bromine organic disinfectants
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water
- Use with high pH values by optimisation of the electrolyte diaphragm system
- Operation on the CAN-bus with all the associated benefits

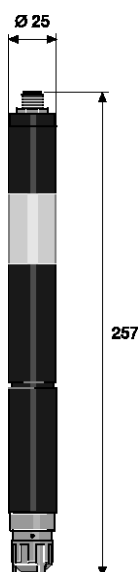
Sensor for connection to a CAN interface (e.g. DULCOMARIN® II swimming pool controller)

<b>Measured variable</b>	Total available bromine
<b>Reference method</b>	For DBDMH, free bromine: DPD1. For BCDMH: DPD4
<b>pH dependence</b>	If the pH changes from pH 7 to pH 8, the sensor sensitivity is reduced a) in the case of DBDMH and free bromine by approx. 10 % b) in the case of BCDMH by approx. 25 %
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	3.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM or DLG III)
<b>Supply voltage</b>	Via CAN interface (11 – 30 V)
<b>Output signal</b>	Uncalibrated, temperature-compensated, electrically isolated
<b>Selectivity</b>	Not selective, cross-sensitive towards many oxidation agents
<b>Disinfection process</b>	DBDMH (1,3-dibromo-5,5-dimethyl-hydantoin), BCDMH (1-bromo-3-chloro-5,5-dimethyl-hydantoin), Free bromine (HOBr, OBr)
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	DULCOMARIN® II
<b>Typical applications</b>	Swimming pools/whirlpools and cooling water; can also be used in sea water
<b>Resistance to</b>	Surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	Measuring range	Order no.
<b>BRE 3-CAN-10 ppm</b>	0.02...10.0 mg/l	1029660

**Note:** a mounting kit (order no. 815079) is required for initial fitting of the bromine sensors in the in-line probe housing DLG III.

Signal leads see Sensor Accessories, p. → 1-113



pk\_6\_084

## 1.3 Amperometric Sensors DULCOTEST®



### Sensor for Free and Combined Bromine CBR 1-mA (Replaces Earlier Type BRE 2)

Sensor for free chlorine and bromine in contaminated water, also suitable for high pH values of up to 9.5.  
For use with controllers with 4-20 mA input

#### Your benefits

- Measured variable: free chlorine as well as free and combined bromine (bromamines)
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water
- Resistance to films of dirt and biofilms by electrolyte with antimicrobial effect and large-pore diaphragm
- Use at high pH value of up to 9.5 by optimisation of the electrolyte diaphragm system

<b>Measured variable</b>	Free chlorine (hypochlorous acid, HOCl, OCl <sup>-</sup> ), free bromine, bound bromine BCDMH (1,3-dibrom-5,5-dimethyl-hydantoin)
<b>Reference method</b>	DPD1
<b>pH range</b>	5.0 ... 9.5
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM, DLG II)
<b>Supply voltage</b>	16...24 V DC (2-wire)
<b>Output signal</b>	4...20 mA = Measuring range, temperature-compensated, uncalibrated, not electrically isolated
<b>Selectivity</b>	Free chlorine as against combined chlorine
<b>Disinfection process</b>	Chlorine gas, hypochlorite, electrolysis with diaphragm. Bromide + hypochlorite, DBDMH
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	D1Cb, DAC, delta® solenoid diaphragm metering pump
<b>Typical applications</b>	Cooling water, process water, waste water, water with higher pH values (stable pH), seawater
<b>Resistance to</b>	Films of dirt, Biofilms, Surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, diaphragm-covered

	<b>Measuring range</b>	<b>Order no.</b>
<b>CBR 1-mA-0.5 ppm</b>	0.01...0.5 mg/l...*	1038016
<b>CBR 1-mA-2 ppm</b>	0.02...2.0 mg/l...*	1038015
<b>CBR 1-mA-10 ppm</b>	0.10...10.0 mg/l...*	1038014

\* Measuring range based on chlorine. When measuring bromine, the lower and upper limit of the measuring range are increased by the factor 2.25, therefore for example CBR 1-mA-0.5ppm: 0.02 ...1.1 ppm.





## 1.3 Amperometric Sensors DULCOTEST®

### 1.3.7 Sensors for Chlorine Dioxide

Sensor type		CDE 2-mA	CDP 1-mA	CDR 1-mA
Application		Potable water	Bottle washer system	Cooling water, waste water, agriculture, hot water
Measuring range		0.01-10.0	0.02-2.00	0.01-10.0
Temperature	°C	5 ... 45	10 ... 45	1 ... 55
Temperature compensation		internal	external	internal
Max. pressure	bar	1.0	3.0	3.0
pH range		4.0 ... 11.0	5.5 ... 10.5	1.0 ... 10.0
Response time	s	120	60	180
Run-in time	h	2-6	4-12	2-6
Surfactant-resistance		no	yes	yes
Contamination resistance		no	under certain conditions	yes
Cross sensibility		Ozone	Ozone, chlorine	Ozone

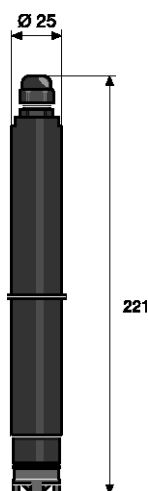
#### Chlorine Dioxide Sensor CDE 2-mA



Standard sensor for the measurement of chlorine dioxide without cross-sensitivity by free chlorine. For operation on controllers with 4-20 mA input

##### Your benefits

- Measured variable: Chlorine dioxide, no cross-sensitivity towards free chlorine
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water



pk\_6\_039

<b>Measured variable</b>	Chlorine dioxide (ClO <sub>2</sub> )
<b>Reference method</b>	DPD1
<b>pH range</b>	4.0 ... 11.0 ClO <sub>2</sub> stability range
<b>Cross sensibility</b>	Ozone
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM or DLG III)
<b>Supply voltage</b>	16...24 V DC (two-wire technology)
<b>Output signal</b>	4...20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated
<b>Response time sensor</b>	120 s
<b>Selectivity</b>	Chlorine dioxide selective towards free chlorine, chlorite and chlorate
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	D1C, DAC
<b>Typical applications</b>	Uncontaminated drinking water (surfactant-free)
<b>Resistance to</b>	Salts, acids, alkalis. Not surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	Measuring range	Order no.
CDE 2-mA-0.5 ppm	0.01 ... 0.5 mg/l	792930
CDE 2-mA-2 ppm	0.02 ... 2.0 mg/l	792929
CDE 2-mA-10 ppm	0.10 ... 10.0 mg/l	792928

Chlorine dioxide sensors complete with 100 ml of electrolyte

**Note:** a mounting kit (order no. 815079) is required for initial fitting of the chlorine dioxide sensors in the in-line probe housing DLG III.

## 1.3 Amperometric Sensors DULCOTEST®

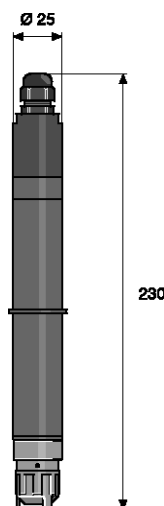


### Chlorine Dioxide Sensor CDP 1-mA

Sensor for the measurement of chlorine dioxide with a fast response time, for example in bottle-washing systems. For operation on controllers with 4-20 mA input

#### Your benefits

- Measured variable: Chlorine dioxide without interference caused by surfactants
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water
- Fast response time through open-pored diaphragm and external temperature measurement



pk\_6\_047

<b>Measured variable</b>	Chlorine dioxide ( $\text{ClO}_2$ )
<b>Reference method</b>	DPD1
<b>pH range</b>	5.5 ... 10.5
<b>Cross sensibility</b>	Ozone, chlorine
<b>Temperature</b>	10 ... 45 °C
<b>Max. pressure</b>	3.0 bar
<b>Intake flow</b>	30...60 l/h
<b>Supply voltage</b>	16...24 V DC (two-wire technology)
<b>Output signal</b>	4...20 mA $\approx$ measuring range, not temperature-compensated, uncalibrated, not electrically isolated
<b>Temperature measurement</b>	Separate temperature measurement needed for compensation
<b>Response time sensor</b>	60 s
<b>Selectivity</b>	Chlorine dioxide as against chlorite and chlorate
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	ProMinent recommends installing the sensor in the DLG II in-line probe fitting with upstream flow monitoring together with a Pt 100 temperature sensor
<b>Measuring and control equipment</b>	D1C and DACa with automatic temperature correction only
<b>Typical applications</b>	Process water containing surfactants (bottle washing machines)
<b>Resistance to</b>	Surfactants, slight films of dirt
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	Measuring range	Order no.
CDP 1-mA-2 ppm	0.02...2.0 mg/l	1002149

Chlorine dioxide sensors complete with 100 ml of electrolyte

**Note:** a mounting kit (order no. 815079) is required for initial fitting of the chlorine dioxide sensors in the in-line probe housing DLG III.





## 1.3 Amperometric Sensors DULCOTEST®

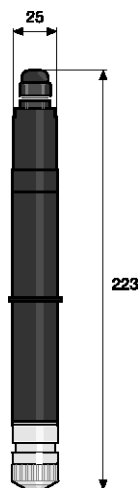
### Chlorine Dioxide Sensor CDR 1-mA



Sensor for the measurement of chlorine dioxide for all kinds of water, including hot and contaminated water. Without cross-sensitivity by free chlorine. For operation on controllers with 4-20 mA input

#### Your benefits

- Measured variable: Chlorine dioxide, without cross-sensitivity towards free chlorine
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water
- Resistance to films of dirt by pore-free diaphragm
- Operating temperature up to 60 °C (short term) by appropriate sensor materials



pk\_6\_083

<b>Measured variable</b>	Chlorine dioxide (ClO <sub>2</sub> )
<b>Reference method</b>	DPD1
<b>pH range</b>	1.0 ... 10.0
<b>Cross sensibility</b>	Ozone
<b>Temperature</b>	1 ... 55 °C (short-term period 60 °C)
<b>Max. pressure</b>	3.0 bar, (30 °C, in DGMA)
<b>Intake flow</b>	30...60 l/h (in DGM or DLG III)
<b>Supply voltage</b>	16...24 V DC
<b>Output signal</b>	4...20 mA temperature-compensated, uncalibrated, not electrically isolated
<b>Response time sensor</b>	t <sub>90</sub> ~ 3 min.
<b>Selectivity</b>	Chlorite, Chlorate, Free chlorine
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGMA/DLGIII
<b>Measuring and control equipment</b>	D1C, DAC
<b>Typical applications</b>	Contaminated industrial, process water, containing surfactants, cooling water, irrigation water, slightly contaminated waste water, warm water
<b>Resistance to</b>	Surfactants, slight films of dirt, water-soluble chemicals, solids/dirt, Biofilms
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	Measuring range	Order no.
<b>CDR 1-mA-0.5 ppm</b>	0.01...0.5 mg/l	1033762
<b>CDR 1-mA-2 ppm</b>	0.02...2.0 mg/l	1033393
<b>CDR 1-mA-10 ppm</b>	0.10...10.0 mg/l	1033404

**Note:** a mounting kit (order no. 815079) is required for initial fitting of the chlorine dioxide sensors in the in-line probe housing DLG III.

## 1.3 Amperometric Sensors DULCOTEST®



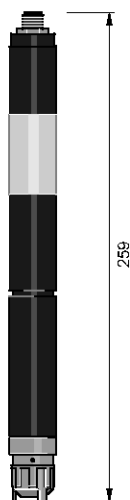
### Chlorine Dioxide Sensor CDR 1-CAN

Sensor for the measurement of chlorine dioxide for all kinds of water, including hot and contaminated water. Without cross-sensitivity by free chlorine. For operation on controllers with 4-20 mA input

#### Your benefits

- Measured variable: Chlorine dioxide, without cross sensitivity to free chlorine
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water
- Resistance to films of dirt by pore-free diaphragm
- Operating temperature up to 60 °C (short term) by appropriate sensor materials
- Operation on the CAN-bus with all the associated benefits

Sensors for connection to a CAN interface (e.g. Disinfection Controller)



P\_DT\_0071\_SW1

<b>Measured variable</b>	Chlorine dioxide ( $\text{ClO}_2$ )
<b>Reference method</b>	DPD1
<b>pH range</b>	1.0 ... 10.0
<b>Cross sensibility</b>	Ozone
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM or DLG III)
<b>Supply voltage</b>	Via CAN interface (11-30 V)
<b>Output signal</b>	Uncalibrated, temperature-compensated, electrically isolated
<b>Response time sensor</b>	$t_{90} \sim 3$ min.
<b>Selectivity</b>	Chlorite, Chlorate, Free chlorine
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGMa/DLGIII

<b>Measuring and control equipment</b>	DULCOMARIN® II
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**Typical applications** Contaminated industrial, process water, containing surfactants, cooling water, irrigation water, slightly contaminated waste water, warm water

**Resistance to** Surfactants, water-soluble pollutants, solids/dirt, biofilms  
**Measuring principle, technology** Amperometric, 2 electrodes, membrane-covered

	<b>Measuring range</b>	<b>Order no.</b>
<b>CDR 1-CAN-10 ppm</b>	0.01...10.0 mg/l	1041155

\* Complete with 100 ml of electrolyte, connecting cable - CAN M12 5-pin 0.5 m, T-distributor M12 5-pin CAN





## 1.3 Amperometric Sensors DULCOTEST®

### 1.3.8

### Sensors for Chlorite

#### Chlorite Sensor CLT 1-mA



Sensor for monitoring the disinfection by-product chlorite in compliance with potable water regulations. Without cross-sensitivity towards chlorine dioxide, chlorate and chlorine. For operation on controllers with 4-20 mA input

#### Your benefits

- Online monitoring of the disinfection by-product chlorite
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water
- No interference by chlorine dioxide/chlorine/chlorate
- Online monitoring improves process reliability
- Online monitoring replaces expensive laboratory analysis

#### Measured variable

Chlorite anion ( $\text{ClO}_2^-$ )

#### Reference method

DPD method, chlorite in the presence of chlorine dioxide

#### pH range

6.5 ... 9.5

#### Cross sensibility

Ozone

#### Temperature

1 ... 40 °C

#### Max. pressure

1.0 bar

#### Intake flow

30...60 l/h (in DGM or DLG III)

#### Supply voltage

16...24 V DC (two-wire technology)

#### Output signal

4...20 mA  $\approx$  measuring range, temperature-compensated, uncalibrated, not electrically isolated

#### Selectivity

Chlorite selective towards chlorine dioxide, chlorate and free chlorine

#### Installation

Bypass: open sample water outlet

#### Sensor fitting

DGM, DLG III

#### Measuring and control equipment

D1C, DAC

#### Typical applications

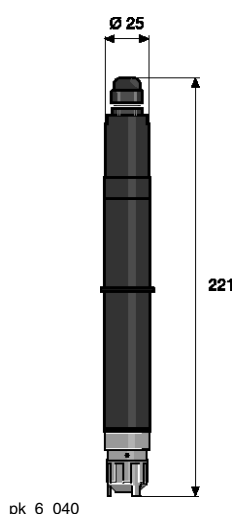
Monitoring of chlorine dioxide treated potable water or similar water. The selective measurement of chlorite alongside chlorine dioxide, chlorine and chlorate is possible.

#### Resistance to

Surfactants

#### Measuring principle, technology

Amperometric, 2 electrodes, membrane-covered



**DVGW  
recommended**

	Measuring range	Order no.
CLT 1-mA-0.5 ppm	0.02...0.50 mg/l	1021596
CLT 1-mA-2 ppm	0.10...2.00 mg/l	1021595

Chlorite sensors complete with 50 ml of electrolyte.

**Note:** A mounting kit (order no. 815079) is required for initial fitting of the chlorite sensors in the in-line probe housing DLG III.

The DT4 photometer is recommended for calibration of the chlorite sensor.



## 1.3 Amperometric Sensors DULCOTEST®



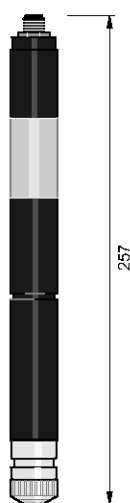
### Chlorite Sensor CLT 1-CAN

Sensor for monitoring the disinfection by-product chlorite in compliance with potable water regulations. Without cross-sensitivity towards chlorine dioxide, chlorate and chlorine. For use on controllers with CAN-bus connection

#### Your benefits

- Online monitoring of the disinfection by-product chlorite
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water
- No interference by chlorine dioxide/chlorine/chlorate
- Online monitoring improves process reliability
- Online monitoring replaces expensive laboratory analysis
- Operation on the CAN-bus with all the associated benefits

Sensors for connection to a CAN interface (e.g. Disinfection Controller)



P\_DT\_0070\_SW1

<b>Measured variable</b>	Chlorite anion ( $\text{ClO}_2^-$ )
<b>Reference method</b>	DPD method, chlorite together with chlorine dioxide
<b>pH range</b>	6.5 ... 9.5
<b>Cross sensibility</b>	Ozone
<b>Temperature</b>	1 ... 40 °C
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM or DLG III)
<b>Supply voltage</b>	Via CAN interface (11-30 V)
<b>Output signal</b>	Uncalibrated, temperature-compensated, electrically isolated
<b>Response time sensor</b>	3 min.
<b>Selectivity</b>	Chlorite selective towards chlorine dioxide, chlorate and free chlorine
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	DULCOMARIN® II
<b>Typical applications</b>	Monitoring of potable water or similar water treated with chlorine dioxide. Selective measurement of chlorite and chlorine dioxide, chlorine and chlorate is also possible.
<b>Resistance to</b>	Surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	Measuring range	Order no.
CLT 1-CAN-2 ppm	0.05...2.00 mg/l	1041156

\* Complete with 100 ml of electrolyte, connecting cable - CAN M12 5-pin 0.5 m, T-distributor M12 5-pin CAN





## 1.3 Amperometric Sensors DULCOTEST®

### 1.3.9

### Sensors for Ozone

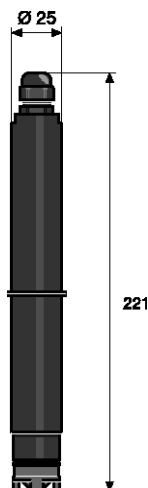
#### Ozone Sensor OZE 3-mA



Standard sensor for measuring ozone in clear water. For operation on controllers with 4-20 mA input

##### Your benefits

- Measured variable: Ozone, without cross sensitivity to chlorine, hydrogen peroxide
- Diaphragm-covered sensor (encapsulated) minimises faults caused by changing flow or ingredients in the water



pk\_6\_039

<b>Measured variable</b>	Ozone (O <sub>3</sub> )
<b>Reference method</b>	DPD4
<b>pH range</b>	4.0 ... 11.0 Ozone stability range
<b>Cross sensibility</b>	Chlorine dioxide
<b>Temperature</b>	5 ... 40 °C
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM or DLG III)
<b>Supply voltage</b>	16...24 V DC (two-wire technology)
<b>Output signal</b>	4...20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated
<b>Selectivity</b>	Ozone as against free chlorine, combined chlorine, hydrogen peroxide
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	D1C, DAC
<b>Typical applications</b>	Potable water and swimming pool water
<b>Resistance to</b>	Salts, acids, alkalis. Not surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	Measuring range	Order no.
<b>OZE 3-mA-2 ppm</b>	0.02...2.00 mg/l	792957

Ozone sensor complete with 100 ml of electrolyte.

**Note:** A mounting kit (order no. 815079) is required for initial fitting of the ozone sensors in the in-line probe housing DLG III.

## 1.3 Amperometric Sensors DULCOTEST®

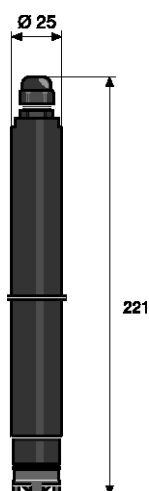


### Ozone Sensor OZR 1-mA

Sensor for measuring and monitoring the absence of ozone. For operation on controllers with 4-20 mA input

#### Your benefits

- Measured variable: Ozone, without cross sensitivity to chlorine, hydrogen peroxide
- Diaphragm-covered sensor (encapsulated) minimises faults caused by changing flow or ingredients in the water
- Suitable also for monitoring the absence of ozone (rupture monitoring on filters) and for discontinuous ozone treatment processes
- Resistance to films of dirt by pore-free diaphragm



pk\_6\_039

<b>Measured variable</b>	Ozone (O <sub>3</sub> )
<b>Reference method</b>	DPD4
<b>pH range</b>	4.0 ... 11.0 Stability range of ozone
<b>Cross sensibility</b>	Chlorine dioxide, chlorine, bromine
<b>Temperature</b>	5 ... 40 °C
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	30...60 l/h (in the DGM or DLG III)
<b>Supply voltage</b>	16...24 V DC (two-wire system)
<b>Output signal</b>	4...20 mA ≈ Measuring range, temperature-compensated, uncalibrated, not electrically isolated
<b>Selectivity</b>	Not selective
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	D1C, DAC

<b>Typical applications</b>	Process, service or cooling water, monitoring the ozone breakdown of filters
<b>Resistance to</b>	Salts, acids, alkalis, surfactants, films of dirt
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	<b>Measuring range</b>	<b>Order no.</b>
<b>OZR 1-mA-2 ppm*</b>	0.02...2.0 mg/l	1051647

\* Available from 2nd quarter of 2015.

**Important note:** A mounting kit (order no. 815079) is required for initial fitting of the ozone sensors in the in-line probe housing DLG III.



## 1.3 Amperometric Sensors DULCOTEST®

### 1.3.10

### Sensors for Dissolved Oxygen

The measured variable "Dissolved oxygen" indicates the volume of gaseous oxygen physically dissolved in the aqueous phase in mg/l (ppm).

"Dissolved oxygen" is therefore an important parameter for assessing the quality of surface water and water that has to be treated for the breeding of livestock with the addition of oxygen. Dissolved oxygen is also used for controlling processes in clarification plants and waterworks.

The following sensors are assigned to the different applications and can be offered separately as 4 - 20 mA encoders to central controls or as a decentralised solution along with D1C and DAC (measured variable: "Dissolved oxygen": X).

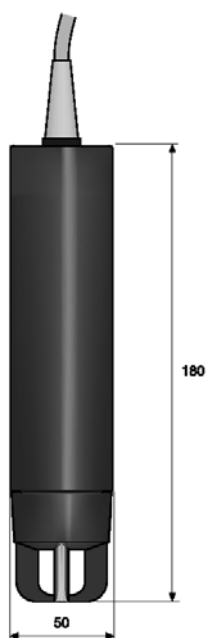
#### Oxygen Sensor DO 1-mA



Sensor for the measurement of the dissolved oxygen above 2 ppm to oxygen saturation. For installation in standard immersion pipes or in the bypass line. Use in waterworks, in fish breeding or to monitor surface water

#### Your benefits

- Measured variable: dissolved oxygen, no interference by turbidity or discolouration by the amperometric measuring principle
- Rod-shaped construction for simple installation into standard immersion pipes and bypass lines
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water
- Minimal maintenance and long service life due to encapsulated transducer (easily replaceable thanks to bayonet fitting)
- Measuring electrodes protected by pore-free, dirt-repellent diaphragm
- Long service life of the electrolyte at high oxygen concentrations through optimised membrane thickness
- Stable zero point by means of large diaphragm-covered electrodes



<b>Measured variable</b>	Dissolved oxygen
<b>Calibration</b>	Of oxygen in air
<b>Measuring accuracy</b>	±0.5 % relative to final value of measuring range
<b>Response time sensor</b>	110 s
<b>Temperature</b>	0 ... 50 °C
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	Minimum: 0.05 m/s
<b>Supply voltage</b>	12...30 V DC
<b>Electrical connection</b>	Fixed lead, 10 m
<b>Output signal</b>	4...20 mA ≈ measuring range, calibrated, temperature-compensated and electrically isolated

<b>Enclosure rating</b>	IP 68
<b>Measuring and control equipment</b>	D1Cb, DAC

#### Process integration

- a) Immersion, suspended on cable with or without cable bracket (see accessories)
- b) Immersion with immersion pipe
  1. Immersion pipe with 50 mm outside diameter and 1-1/4 inch internal thread (provided by the customer). The connection is possible via an immersion pipe adapter (see accessories).
  2. PVC immersion pipe with 50 mm outside diameter (provided by the customer). The connection is made by adhesion via a standard PVC union (provided by the customer).
- c) In-flow operation on request

<b>Measuring and control equipment</b>	D1Cb, DAC
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#### Typical applications

Fish and shrimp farming, conditioning of water in large aquaria in zoological parks, control of the oxygen input in waterworks, appraisal of the biological status of surface waters.

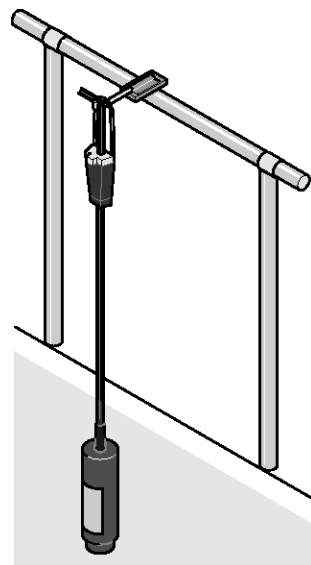
#### Resistance to

Ingredients in the water, dirt films

#### Measuring principle, technology

Amperometric, 2 electrodes, membrane-covered, encapsulated transducer

pk\_6\_050\_1



pk\_6\_011

	<b>Measuring range</b>	<b>Order no.</b>
<b>DO 1-mA-20 ppm</b>	2.00...20.0 mg/l	1020532



## 1.3 Amperometric Sensors DULCOTEST®

### Oxygen Sensor DO 2-mA

Sensor for the measurement of the dissolved oxygen, specifically optimised for control above 0.1 ppm in the aeration tanks of clarification plants. Integrated in a floating ball with a cleaning function

#### Your benefits

- Measured variable: dissolved oxygen, no interference by turbidity or discolouration by the amperometric measuring principle
- Integration of the encapsulated transducer in a specially-shaped floating ball., creating a Venturi flow, which helps to clean the sensor membrane
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water
- Minimal maintenance and long service life due to encapsulated transducer (easily replaceable thanks to bayonet fitting)
- Measuring electrodes protected by pore-free, dirt-repellent diaphragm
- Long service life of the electrolyte at low to medium oxygen concentrations, as occur in the aeration tanks of clarification plants, by means of optimised membrane thickness
- Stable zero point by means of large diaphragm-covered electrodes

#### Measured variable

Dissolved oxygen

#### Calibration

Of oxygen in air

#### Measuring accuracy

±0.5 % relative to final value of measuring range

#### Response time sensor

22 s

#### Temperature

0 ... 50 °C

#### Max. pressure

1.0 bar

#### Intake flow

Minimum: 0.05 m/s

#### Supply voltage

12...30 V DC

#### Electrical connection

Fixed lead, 10 m

#### Output signal

4...20 mA measuring range calibrated, temperature-corrected and electrically isolated

#### Enclosure rating

IP 68

#### Measuring and control equipment

D1Cb, DAC

#### Process integration

As a float with venturi grooves to increase the flow of sample water for the self-cleaning of the sensor part.  
Supplied with adapter for connection to PVC pipes with outside diameter: 50 mm and railing bracket, also for PVC pipes with outside diameter: 50 mm (see accessories).  
The customer must provide the straight PVC tube and a 45 ° standard elbow for gluing to PVC pipes (outside diameter 50 mm).

#### Measuring and control equipment

D1Cb, DAC

#### Typical applications

Control of the oxygen input in activated sludge pools (sewage plant) for the purpose of energy conservation.

#### Resistance to

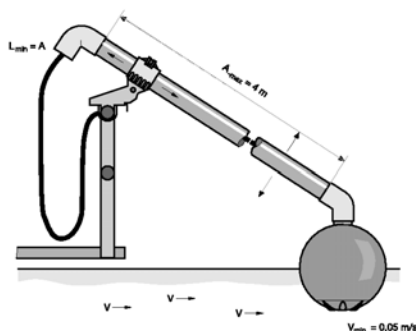
Ingredients in the water, dirt films

#### Measuring principle, technology

Amperometric, 2 electrodes, membrane-covered, encapsulated transducer integrated in ball float

For further information: Immersion Sensor Fittings/Adaptors see page → 1-126

	Measuring range	Order no.
DO 2-mA-10 ppm	0.10...10.0 mg/l	1020533



pk\_6\_012

## 1.3 Amperometric Sensors DULCOTEST®

### 1.3.11 Sensors for Peracetic Acid

DULCOTEST® sensors of type PAA 1 are diaphragm-covered, amperometric 2-electrode sensors for the selective measurement of peracetic acid. Peracetic acid is particularly used in the food and beverage industry, but also for disinfection in the cosmetics, pharmaceutical and medical sectors. The continuous measurement and control of peracetic acid is therefore required when there are high demands in terms of disinfection and quality assurance. Commissioning and maintenance are significantly simplified. The sensor can also be used where there are surfactants.

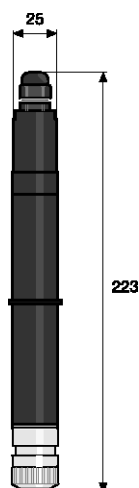
#### Peracetic Acid Sensor PAA 1-mA



Sensor for the measurement of peracetic acid without cross-sensitivity towards hydrogen peroxide. For use in contaminated washing and waste water

##### Your benefits

- Measured variable: Peracetic acid, without cross-sensitivity towards the accompanying chemical, hydrogen peroxide
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water
- Resistance to films of dirt by pore-free diaphragm



pk\_6\_083

<b>Measured variable</b>	Peracetic acid
<b>Reference method</b>	Titration
<b>pH range</b>	1.0 ... 9.0 (peracetic acid stability range)
<b>Cross sensibility</b>	Ozone, chlorine dioxide, chlorine, bromine
<b>Temperature</b>	1 ... 45 °C
<b>Admissible temperature fluctuation</b>	0.3 °C/min
<b>Response time sensor</b>	≈ 3 min
<b>Max. pressure</b>	3.0 bar, (30 °C, in DGM)
<b>Intake flow</b>	30...60 l/h (in in-line probe housing DGM or DLG III)
<b>Supply voltage</b>	16...24 V DC (two-wire technology)
<b>Output signal</b>	4...20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated
<b>Selectivity</b>	Peracetic acid selective towards hydrogen peroxide
<b>Installation</b>	Bypass: open sample water outlet
<b>In-line probe fitting</b>	DGM, DLG
<b>Measuring and control equipment</b>	D1C, DAC

<b>Typical applications</b>	Scouring in Cleaning in Place (CIP), rinsers, also suitable in the presence of cationic and anionic tensides. The selective measurement of peracetic acid and hydrogen peroxide is possible.
<b>Resistance to</b>	Salts, acids, alkalis, surfactants, dirt films
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	Measuring range	Order no.
PAA 1-mA-200 ppm	1...200 mg/l	1022506
PAA 1-mA-2000 ppm	10...2,000 mg/l	1022507

**Note:** a mounting kit (order no. 815079) is required for initial fitting of the sensors in the in-line probe housing DLG III.



## 1.3 Amperometric Sensors DULCOTEST®

### 1.3.12 Sensors for Hydrogen Peroxide

DULCOTEST® sensors PEROX and PER1 are membrane-covered, amperometric sensors for the online concentration measurement of hydrogen peroxide. Due to its complete biodegradability, hydrogen peroxide is a disinfectant and oxidising agent frequently used in water treatment and production:

- chemical bleach in the wood, paper, textile and mineral compounds industries,
- organic synthesis in the chemical, pharmaceutical and cosmetics industries,
- oxidation of potable water, landfill seepage water, contaminated ground water,
- disinfection of cooling, process and production water in the pharmaceutical, food and beverage industries as well as in swimming pools,
- deodorisation (gas scrubbers) in municipal and industrial clarification plants,
- dechlorination in chemical processes.

Sensors are selected according to the following decision-making table:

Requirement	Type PER1	PEROX
<b>Sample matrix loaded with dirt and chemicals</b>	Suitable due to water-impermeable membrane, however sensitive to the presence of hydrogen sulphide (H <sub>2</sub> S)	Failure-prone due to water-permeable membrane
<b>Electrical influence due to interference potential in the measurement medium</b>	Insensitive because the counter electrode is separated from the process	More sensitive because counter electrode is in the medium
<b>Temperature range</b>	Up to 50 °C	Up to 40 °C
<b>Simple handling during installation and maintenance</b>	Suitable due to temperature compensation and measuring transducer integrated in the sensor	Separate temperature sensor and measuring transducer
<b>Response time as t90</b>	480 s	20 s
<b>Quick temperature changes</b>	Slow due to integrated temperature sensor	Fast due to separate temperature sensor
<b>Measuring intervals in the absence of H<sub>2</sub>O<sub>2</sub></b>	Unsuitable	Suitable due to pulsed polarisation technology
<b>Measuring range can vary in phased approach due to orders of magnitude or is not clear in the order</b>	Selection of a suitable sensor is necessary	Suitable because the measuring range can be manually switched on the sensor transducer







## 1.3 Amperometric Sensors DULCOTEST®

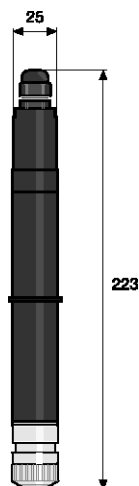
### Hydrogen Peroxide Sensor PER1



Sensor for the measurement of hydrogen peroxide even in chemically contaminated and polluted water. Available with measuring ranges for extremely low or very high concentrations

#### Your benefits

- Measured variable hydrogen peroxide, with measuring ranges from 0.5 ppm to 100,000 ppm (10%) available
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water
- Resistance to films of dirt by pore-free diaphragm
- Operating temperature up to 50 °C



pk\_6\_083

<b>Measured variable</b>	Hydrogen peroxide
<b>Calibration</b>	Photometric with manual DT3B photometer
<b>pH range</b>	2.5 ... 11.0
<b>Cross sensibility</b>	Ozone, chlorine dioxide, peracetic acid, chlorine, bromine
<b>Temperature</b>	0 ... 50 °C
<b>Admissible temperature fluctuation</b>	< 0.3 °C/min
<b>Response time sensor</b>	T <sub>90</sub> approx. 480 sec
<b>Measuring accuracy</b>	≥ 1 ppm or better than ± 5 % of measured value
<b>Min. conductivity</b>	0.05 ... 5.00 mS/cm
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	20...100 l/h
<b>Supply voltage</b>	16...24 V DC (two-wire system)
<b>Output signal</b>	4...20 mA temperature-compensated, uncalibrated, not electrically isolated
<b>Selectivity</b>	Hydrogen peroxide selective towards sulphite
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line
<b>In-line probe fitting</b>	DGM, DLG
<b>Measuring and control equipment</b>	D1Cb, DAC
<b>Typical applications</b>	Swimming pools, treatment of contaminated waste waters, treatment of process media from production
<b>Resistance to</b>	Salts, acids, alkalis, surfactants, dirt films, not against hydrogen sulphide (H <sub>2</sub> S)
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	Measuring range	Order no.
PER 1-mA-50 ppm	0.50...50.0 mg/l	1030511
PER 1-mA-200 ppm	2.00...200.0 mg/l	1022509
PER 1-mA-2000 ppm	20.00...2,000.0 mg/l	1022510

**Important note:** Measuring ranges up to 100,000 ppm on request

Photometer → 2-100

#### Accessories

	Order no.
Photometer DT3B (for calibration)	1039317

**Note:** a mounting kit (order no. 815079) is required for initial fitting of the sensors in the in-line probe housing DLG III.

## 1.3 Amperometric Sensors DULCOTEST®

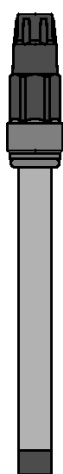


### Hydrogen Peroxide sensor PEROX

Sensor for the measurement of hydrogen peroxide without cross-sensitivity to chlorine. Can also be used for fast control processes in clear water

#### Your benefits

- Measured variable hydrogen peroxide without cross sensitivity to chlorine
- Diaphragm-covered sensor minimises faults caused by changing flow
- Control of fast processes through rapid response time by the sensor in conjunction with fast external temperature measurement for temperature correction
- Reliable measurement even after periods of absence of hydrogen peroxide by pulsed, self-regenerating measuring electrode



P\_DT\_0075\_SW

<b>Measured variable</b>	Hydrogen peroxide
<b>Calibration</b>	Photometric with manual DT3B photometer
<b>Measuring range</b>	1... 20/10 ... 200/100 ... 2000 mg/l switchable
<b>pH range</b>	2.5 ... 10.0
<b>Temperature</b>	0 ... 40 °C
<b>Admissible temperature fluctuation</b>	< 1 °K/min (for external temp. measurement) see operating instructions
<b>Response time sensor</b>	T <sub>90</sub> approx. 20 sec
<b>Measuring accuracy</b>	Better than 2 % referred to range full scale value
<b>Min. conductivity</b>	With 20 mg/l range: 5 µS/cm With 200 mg/l range: 200 µS/cm Up to 1,000 mg/l: 500 µS/cm Up to 2,000 mg/l: 1 mS/cm
<b>Max. pressure</b>	2.0 bar
<b>Intake flow</b>	30...60 l/h
<b>Supply voltage</b>	16...24 V DC (3-wire system)
<b>Output signal</b>	4...20 mA not temperature-compensated, uncalibrated, not electrically isolated
<b>Selectivity</b>	Hydrogen peroxide selective towards free chlorine
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line
<b>In-line probe fitting</b>	DGM, DLG
<b>Measuring and control equipment</b>	DAC
<b>Typical applications</b>	Treatment of clear and chemically uncontaminated waters, control with necessary short response times
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	Order no.
PEROX sensor PEROX-H2.10 P	792976
PEROX transducer V1 for D1Ca	1034100
PEROX transducer V2 for DACa	1047979

Photometer → 2-100

#### Accessories

	Order no.
Photometer DT3B (for calibration)	1039317





## 1.4 Conductivity Sensors

### 1.4.1

### Conductivity Sensors

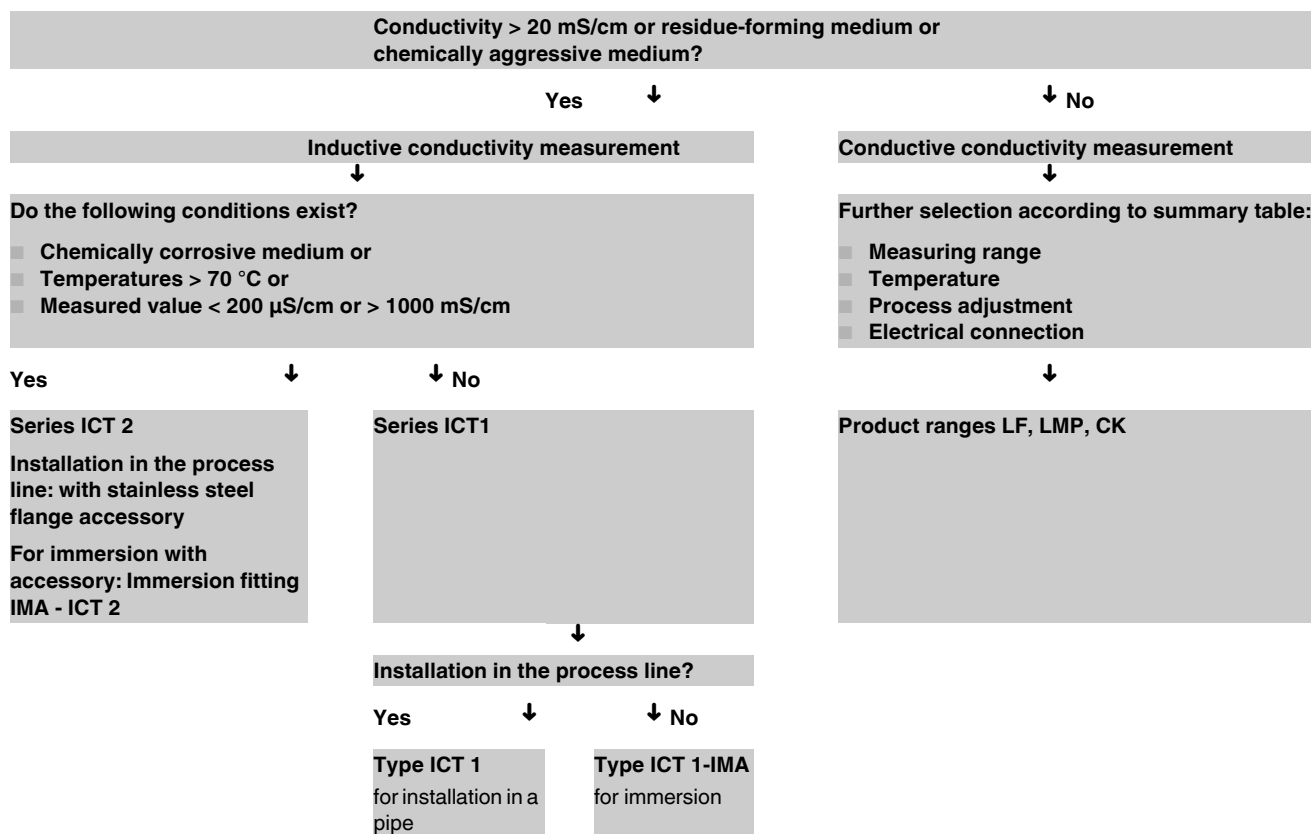
#### The advantages at a glance:

- Large range of sensor types tailored to meet different requirements offering excellent value for money.
- Precise and reliable online measurement enables efficient processes and outstanding process reliability.
- Long service lives and short maintenance intervals reduce downtime and increase the availability of the measured information.
- Complete pre-assembled sets containing fittings and sensors for simple, fast and trouble-free installation.

#### Note the following points for optimum functioning of conductivity sensors:

- Install the sensors so that the electrodes are always covered by the measuring liquid.
- Keep measuring lines as short as possible
- Temperature compensation with fluctuating temperatures
- Regular cleaning depending on the application
- Ensure that the cell constant and measuring range match each other

#### Conductivity sensor selection guide



## 1.4 Conductivity Sensors

Overview Table for Conductivity Sensors

Type	Measuring range	Cell constant k cm <sup>-1</sup>	Medium temperature max. °C	Max. pressure bar	Shaft material	Temperature compensation	Process integration	Electrical connection on the measuring device
LMP 001 → 1-88	0.01...50 µS/cm	0.01 ±5 %	70	16	PP	Pt 100	Flow, 3/4" outer thread	DIN 4-pin angle plug, on Compact; DMTa
LMP 001-HT → 1-89	0.01...50 µS/cm	0.01 ±5 %	120	16	PVDF	Pt 100	Flow, 3/4" outer thread	DIN 4-pin angle plug, on Compact; DMTa
LMP 01 → 1-90	0.1...500 µS/cm	0.1 ±5 %	70	16	PP	Pt 100	Flow, 3/4" outer thread	DIN 4-pin angle plug, on Compact; DMTa
LMP 01-HT → 1-92	0.1...500 µS/cm	0.1 ±5 %	120	16	PVDF	Pt 100	Flow, 3/4" outer thread	DIN 4-pin angle plug, on Compact; DMTa
LMP 01-TA → 1-91	0.1...500 µS/cm	0.1 ±5 %	70	16	PP	Pt 100	Immersion, including immersion fitting 1 m	5 m fixed cable, on Compact; DMTa
LFT 1FE → 1-93	0.01...20 mS/cm	1 ±5 %	80	16	Epoxy	Pt 100	PG 13.5, flow (length: 120 mm) or immersion	5 m fixed cable (4 x 0.5 mm <sup>2</sup> ), on DMTa
LFTK 1 FE-5m-shd → 1-94	0.01...20 mS/cm	1 ±5 %	80	16	Epoxy	Pt 1000	PG 13.5, flow (length: 120 mm) or immersion	5 m fixed cable (4 x 0.25 mm <sup>2</sup> ), screened, on Compact; DMTa
LFTK 1 FE-3m-shd → 1-95	0.01...20 mS/cm	1 ±5 %	80	16	Epoxy	Pt 1000	PG 13.5, flow (length: 120 mm) or immersion	3 m fixed cable (4 x 0.25 mm <sup>2</sup> ), screened, on Compact; DMTa
LF 1 DE → 1-96	0.01...20 mS/cm	1 ±5 %	80	16	Epoxy	None, only for applications with constant temperature	PG 13.5, flow (length: 120 mm) or immersion	DIN 4-pin angle plug, on Compact; DMTa
LFT 1 DE → 1-97	0.01...20 mS/cm	1 ±5 %	80	16	Epoxy	Pt 100	PG 13.5, flow (length: 120 mm) or immersion	DIN 4-pin angle plug, on Compact; DMTa
LFTK 1 DE → 1-98	0.01...20 mS/cm	1 ±5 %	80	16	Epoxy	Pt 1000	PG 13.5, flow (length: 120 mm) or immersion	DIN 4-pin angle plug, on Compact; DMTa
LFT 1 1/2" → 1-99	0.01...20 mS/cm	1 ±5 %	80	16	Epoxy	Pt 100	1/2 inch male thread, flow (length: 120 mm) or immersion	DIN 4-pin angle plug, on Compact; DMTa
LFTK 1 1/2" → 1-100	0.01...20 mS/cm	1 ±5 %	80	16	Epoxy	Pt 1000	1/2 inch male thread, flow (length: 120 mm) or immersion	DIN 4-pin angle plug, on Compact; DMTa
CK 1 → 1-101	0.01...20 mS/cm	1 ±5 %	150	16	PES	None, only for applications with constant temperature	Flow, 1" outer thread	DIN 4-pin angle plug, on Compact; DMTa
CKPt 1 → 1-102	0.01...20 mS/cm	1 ±5 %	150	16	PES	Pt 100	Flow, 1" outer thread	DIN 4-pin angle plug, on Compact; DMTa
LM 1 → 1-103	0.1...20 mS/cm	1 ±5 %	70	16	PP	–	Flow, 3/4" outer thread	DIN 4-pin angle plug, on Compact; DMTa
LM 1-TA → 1-104	0.1...20 mS/cm	1 ±5 %	70	16	PP	–	Immersion, including immersion fitting 1 m	5 m fixed cable, screened, on Compact; DMTa



## 1.4 Conductivity Sensors

Type	Measuring range	Cell constant k cm <sup>-1</sup>	Medium temperature max. °C	Max. pressure bar	Shaft material	Temperature compensation	Process integration	Electrical connection on the measuring device
LMP 1 → 1-105	0.1...20 mS/cm	1 ±5 %	70	16	PP	Pt 100	Flow, 3/4" outer thread	DIN 4-pin angle plug, on Compact; DMTa
LMP 1-HT → 1-107	0.1...20 mS/cm	1 ±5 %	120	16	PVDF	Pt 100	Flow, 3/4" outer thread	DIN 4-pin angle plug, on Compact; DMTa
LMP 1-TA → 1-106	0.1...20 mS/cm	1 ±5 %	70	16	PP	Pt 100	Immersion, including immersion fitting 1 m	5 m fixed cable, screened, on Compact; DMTa
LF 204 → 1-108	1 µS/cm... 500 mS/cm	0.48 ±1.5 %	–	2	–	–	Manual immersion	On Portamess 911 Cond
ICT 1 → 1-108	0.2...1,000 mS/cm	8.5 ±5 %	70	16	PP	Pt 100	Flow DN 50	7 m fixed cable, On Compact *
ICT 1-IMA → 1-109	0.2...1,000 mS/cm	8.5 ±5 %	70	8	PP	Pt 100	Immersion including in-line probe fitting 1 m	7 m fixed cable, On Compact *
ICT 2 → 1-110	0.02...2,000 mS/cm	1.98	125	16	PFA	Pt 100, class A, completely extrusion-coated	Installation with SS flange, immersion with immersion pipe fixed cable (Accessories)	5 m fixed cable, On Compact *

### General information:

- 1 The DMTa transducer is available for conversion of the measurement signal into a temperature compensated 4-20 mA signal (see Chapter 8).
- 2 Connections for the DIN-4 pole angle plug:
  - Sensors: Earth and 2
  - Pt 100/1000: 1 and 3
- 3 With DIN 4 pole angle plugs, the cable must be screened if the sensor is connected to the compact controller or DMTa.
- 4 An adapter set PG 13.5 / 1" (order no. 1002190) is necessary for installation in the in-line probe housing type DLG III (1"-hole).

Measuring line for conductive conductivity sensors See page → 1-114



# 1.4 Conductivity Sensors

## 1.4.2

## 2-Electrode Conductivity Sensors

Conductive conductivity sensors measure the electrolytic conductivity indirectly via the charge transfer between two electrodes immersed in the medium to be measured. The sensor types with cell constants  $k = 0.01$  and  $k = 0.1 \text{ cm}^{-1}$  are especially suitable for the measurement of the lowest electrolytic conductivities of  $< 1 \text{ } \mu\text{S/cm}$  in pure and ultra-pure kinds of water.

The sensor types with cell constants  $k = 1 \text{ cm}^{-1}$  are used in numerous kinds of water without film-forming ingredients up to  $20 \text{ mS/cm}$ . The cost-effective sensor range LF(T) is used in clear, chemically uncontaminated water.

The sensor ranges LM(P), CK and CKPt can also be used in chemically contaminated kinds of water and at high temperatures.

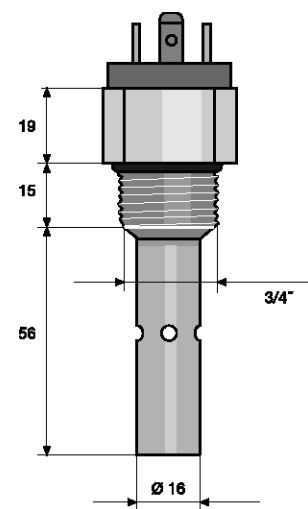
### Conductivity Sensor LMP 001



Sensor for the measurement of the lowest electrolytic conductivities for clear and also chemically contaminated water. With integrated temperature measurement and DIN 4-pin plug. For operation with the controllers Compact DCCa, DMTa, D1Ca

#### Your benefits

- Measured variable: electrolytic conductivity above  $0.01 \text{ } \mu\text{S/cm}$
- Cost-effective sensor for clear, chemically contaminated water
- Integrated Pt 100 for temperature compensation replaces separate temperature sensor and the corresponding sensor fitting



pk\_6\_048

<b>Measuring range</b>	0.01...50 $\mu\text{S/cm}$
<b>Cell constant k</b>	$0.01 \text{ cm}^{-1} \pm 5 \%$
<b>Temperature measurement</b>	Pt 100
<b>Medium temperature</b>	$70 \text{ } ^\circ\text{C}$
<b>Max. pressure</b>	16.0 bar up to $50 \text{ } ^\circ\text{C}$ ,
<b>Sensors</b>	Stainless steel 1.4571
<b>Shaft material</b>	PP
<b>Thread</b>	$3/4''$
<b>Length when fitted</b>	71 mm
<b>Installation</b>	Inline: direct installation into the pipework, bypass: with or without return of the sample water into the process line
<b>Electrical connection</b>	DIN 4-pin angle plug
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	Clean water applications, monitoring ion exchangers and reverse osmosis systems
<b>Resistance to</b>	Ingredients in the water of the target application, taking into account the compatibility of the material
<b>Measuring and control equipment</b>	Compact DCCa, DMTa, D1Ca
<b>Measuring principle, technology</b>	Conductive, 2 coils. Integrated temperature measurement

	Order no.
LMP 001	1020508

Please observe the general notes on p. → 1-86 (Overview Table for Conductivity Sensors)



## 1.4 Conductivity Sensors

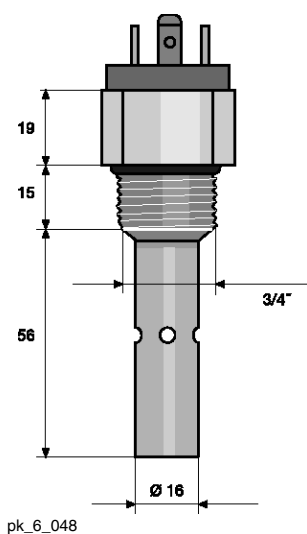
### Conductivity Sensor LMP 001-HT



Sensor for the measurement of the lowest electrolytic conductivity for clear and also chemically contaminated water. For high temperatures, with integrated temperature measurement and DIN 4-pin plug. For operation with the controllers Compact DCCa, DMTa, D1Ca

#### Your benefits

- Measured variable: electrolytic conductivity above 0.01  $\mu\text{S}/\text{cm}$
- Cost-effective sensor for clear, chemically contaminated water
- Integrated Pt 100 for temperature compensation replaces separate temperature sensor and the corresponding sensor fitting
- Temperature resistance up to 100 °C



<b>Measuring range</b>	0.01...50 $\mu\text{S}/\text{cm}$
<b>Cell constant k</b>	0.01 $\text{cm}^{-1} \pm 5\%$
<b>Temperature measurement</b>	Pt 100
<b>Medium temperature</b>	120 °C
<b>Max. pressure</b>	16.0 bar up to 100 °C,
<b>Sensors</b>	Stainless steel 1.4571
<b>Shaft material</b>	PVDF
<b>Thread</b>	3/4"
<b>Length when fitted</b>	71 mm
<b>Installation</b>	Inline: direct installation into the pipework, bypass: with or without return of the sample water into the process line
<b>Electrical connection</b>	DIN 4-pin angle plug
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	General applications at higher temperatures, clean water applications, condensate.
<b>Resistance to</b>	Ingredients in the water of the target application, taking into account the compatibility of the material
<b>Measuring and control equipment</b>	Compact DCCa, DMTa, D1Ca
<b>Measuring principle, technology</b>	Conductive, 2 coils. Integrated temperature measurement

#### Order no.

LMP 001-HT

1020509

Please observe the general notes on p. → 1-86 (Overview Table for Conductivity Sensors)

## 1.4 Conductivity Sensors

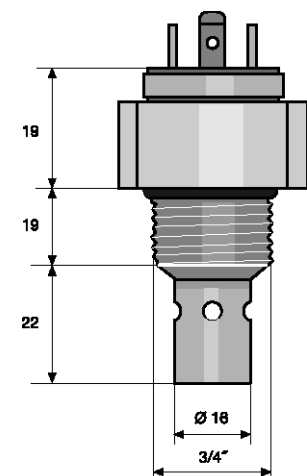


### Conductivity Sensor LMP 01

Sensor for the measurement of low electrolytic conductivities for clear and also chemically contaminated water. With integrated temperature measurement and DIN 4-pin plug. For operation with the controllers Compact DCCa, DMTa, D1Ca

#### Your benefits

- Measured variable: electrolytic conductivity above 0.1  $\mu\text{S}/\text{cm}$
- Cost-effective sensor for clear, chemically contaminated water
- Integrated Pt 100 for temperature compensation replaces separate temperature sensor and the corresponding sensor fitting



pk\_6\_049

<b>Measuring range</b>	0.1...500 $\mu\text{S}/\text{cm}$
<b>Cell constant k</b>	0.10 $\text{cm}^{-1} \pm 5\%$
<b>Temperature measurement</b>	Pt 100
<b>Medium temperature</b>	70 °C
<b>Max. pressure</b>	16.0 bar up to 50 °C,
<b>Sensors</b>	Stainless steel 1.4571
<b>Shaft material</b>	PP
<b>Thread</b>	3/4"
<b>Length when fitted</b>	46 mm
<b>Installation</b>	Inline: direct installation into the pipework, bypass: with or without return of the sample water into the process line
<b>Electrical connection</b>	DIN 4-pin angle plug
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	Monitoring ion exchangers, reverse osmosis systems and desalination systems.
<b>Resistance to</b>	Ingredients in the water of the target application, taking into account the compatibility of the material
<b>Measuring and control equipment</b>	Compact DCCa, DMTa, D1Ca
<b>Measuring principle, technology</b>	Conductive, 2 coils. Integrated temperature measurement

	<b>Order no.</b>
<b>LMP 01</b>	1020510

Please observe the general notes on p. → 1-86 (Overview Table for Conductivity Sensors)





## 1.4 Conductivity Sensors

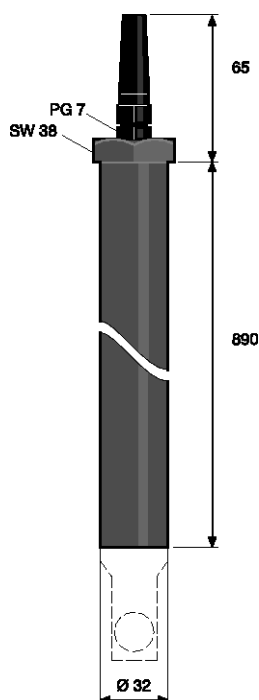
### Conductivity Sensor LMP 01-TA



Sensor for the measurement of low electrolytic conductivities for clear and also chemically contaminated water. With integrated temperature measurement and DIN 4-pin plug. For operation with the controllers Compact DCCa, DMTa, D1Ca

#### Your benefits

- Measured variable: electrolytic conductivity above 0.1  $\mu\text{S}/\text{cm}$
- Cost-effective sensor for clear, chemically contaminated water
- Simple installation in tanks and containers by sensor ready mounted in the immersion tube
- Integrated Pt 100 for temperature compensation replaces separate temperature sensor and the corresponding sensor fitting



pk\_6\_053

<b>Measuring range</b>	0.1...500 $\mu\text{S}/\text{cm}$
<b>Cell constant k</b>	0.10 $\text{cm}^{-1} \pm 5\%$
<b>Temperature measurement</b>	Pt 100
<b>Medium temperature</b>	70 °C
<b>Max. pressure</b>	16.0 bar up to 50 °C,
<b>Sensors</b>	Stainless steel 1.4571
<b>Shaft material</b>	PP
<b>Thread</b>	M 28 x 1.5 for immersion assembly TA-LM
<b>Fitting length</b>	Max. 1 m
<b>Installation</b>	Immersion through an immersion tube
<b>Electrical connection</b>	5 m fixed cable
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	Monitoring ion exchangers, reverse osmosis systems and desalination systems.
<b>Resistance to</b>	Ingredients in the water of the target application, taking into account the compatibility of the material
<b>Measuring and control equipment</b>	Compact DCCa, DMTa, D1Ca
<b>Measuring principle, technology</b>	Conductive, 2 coils. Integrated temperature measurement

		<b>Order no.</b>
<b>LMP 01-TA</b>	Sensor integrated in immersion fitting	1020512
<b>LMP 01-FE</b>	Replacement sensor for LMP 01-TA with 5 m fixed cable	1020626

Please observe the general notes on p. → 1-86 (Overview Table for Conductivity Sensors)

## 1.4 Conductivity Sensors

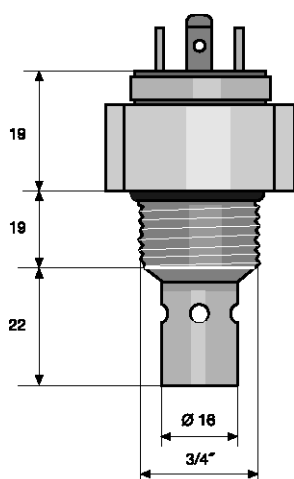


### Conductivity Sensor LMP 01-HT

Sensor for the measurement of low electrolytic conductivities for clear and also chemically contaminated water. For high temperatures, with integrated temperature measurement and DIN 4-pin plug. For operation with the controllers DCCa, DMTa, D1Ca

#### Your benefits

- Measured variable: electrolytic conductivity above 0.1  $\mu\text{S}/\text{cm}$
- Cost-effective sensor for clear, chemically contaminated water
- Temperature resistance up to 100 °C
- Integrated Pt 100 for temperature compensation replaces separate temperature sensor and the corresponding sensor fitting



pk\_6\_049

<b>Measuring range</b>	0.1...500 $\mu\text{S}/\text{cm}$
<b>Cell constant k</b>	0.10 $\text{cm}^{-1} \pm 5 \%$
<b>Temperature measurement</b>	Pt 100
<b>Medium temperature</b>	120 °C
<b>Max. pressure</b>	16.0 bar up to 100 °C,
<b>Sensors</b>	Stainless steel 1.4571
<b>Shaft material</b>	PVDF
<b>Thread</b>	3/4"
<b>Length when fitted</b>	46 mm
<b>Installation</b>	Inline: direct installation into the pipework, bypass: with or without return of the sample water into the process line
<b>Electrical connection</b>	DIN 4-pin angle plug
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	General applications at higher temperatures: industrial, process water, condensate
<b>Resistance to</b>	Ingredients in the water of the target application, taking into account the compatibility of the material
<b>Measuring and control equipment</b>	Compact DCCa, DMTa, D1Ca
<b>Measuring principle, technology</b>	Conductive, 2 coils. Integrated temperature measurement

#### Order no.

LMP 01-HT

1020511

Please observe the general notes on p. → 1-86 (Overview Table for Conductivity Sensors)



## 1.4 Conductivity Sensors

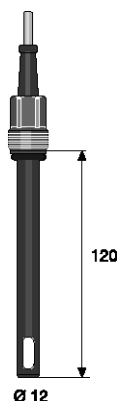
### Conductivity Sensor LF 1 FE



Cost-effective sensor for the measurement of electrolytic conductivity in clear, uncontaminated water. With integrated temperature measurement and fixed cable connector. For operation with controllers Compact D1Ca and DMTa

#### Your benefits

- Measured variable: electrolytic conductivity above 10  $\mu\text{S}/\text{cm}$
- Cost-effective sensor for all clear uncontaminated water
- Flexible process connection by the use of sensor fittings for standard pH sensors
- Special graphite electrodes, optimised for a highly dynamic measuring range: 0.01-20  $\text{mS}/\text{cm}$
- Integrated Pt 100 for temperature compensation replaces separate temperature sensor and the corresponding sensor fitting
- Fixed cable on the sensor head for difficult ambient conditions



pk\_6\_085

<b>Measuring range</b>	0.01 ... 20 $\text{mS}/\text{cm}$
<b>Cell constant k</b>	1.00 $\text{cm}^{-1} \pm 5\%$
<b>Temperature measurement</b>	Pt 100
<b>Medium temperature</b>	0 ... 80 °C (at 1 bar)
<b>Max. pressure</b>	16.0 bar, (at 25 °C)
<b>Sensors</b>	Special graphite
<b>Shaft material</b>	Epoxy
<b>Thread</b>	PG 13.5
<b>Fitting length</b>	120 mm $\pm$ 3 mm
<b>Installation</b>	Bypass: open outlet or return of the sample water into the process line, inline: direct installation into the pipework; fixed or replaceable (replaceable fitting), Tank, channel: Immersion in the immersion tube
<b>Electrical connection</b>	5 m fixed cable (4 x 0.5 $\text{mm}^2$ )
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	Potable, cooling, industrial water. Sensors of the LF series have only limited applicability for taking measurements in cleaning solutions containing surfactants and media containing solvents.
<b>Resistance to</b>	Unsuitable for chemically contaminated water and water containing film-forming ingredients
<b>Measuring and control equipment</b>	D1Ca, DMTa
<b>Measuring principle, technology</b>	Conductive, 2 coils. Integrated temperature measurement

#### Order no.

LFT 1 FE

1001374

Please observe the general notes on p. → 1-86 (Overview Table for Conductivity Sensors)

## 1.4 Conductivity Sensors

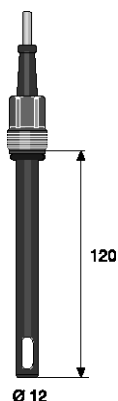


### Conductivity Sensor LFTK 1 FE-5m-shd

Cost-effective sensor for the measurement of electrolytic conductivity in clear, uncontaminated water. With integrated temperature measurement and fixed cable connector (5 m). For operation with controllers Compact DCCa, DMTa

#### Your benefits

- Measured variable: electrolytic conductivity above 10  $\mu\text{S}/\text{cm}$
- Cost-effective sensor for all clear uncontaminated water
- Flexible process connection by the use of sensor fittings for standard pH sensors
- Special graphite electrodes, optimised for a highly dynamic measuring range: 0.01-20 mS/cm
- Integrated Pt 1000 for precise temperature compensation in limited temperature ranges replaces separate temperature sensor and the corresponding sensor fitting
- Fixed cable on the sensor head for difficult ambient conditions



pk\_6\_085

<b>Measuring range</b>	0.01...20 mS/cm
<b>Cell constant k</b>	1.00 $\text{cm}^{-1} \pm 5\%$
<b>Temperature measurement</b>	Pt 1000
<b>Medium temperature</b>	0 ... 80 °C (at 1 bar)
<b>Max. pressure</b>	16.0 bar, (at 25 °C)
<b>Sensors</b>	Special graphite
<b>Shaft material</b>	Epoxy
<b>Thread</b>	PG 13.5
<b>Fitting length</b>	120 mm $\pm$ 3 mm
<b>Installation</b>	Bypass: with or without return of the sample water into the process line, Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting), Tank, channel: Immersion in the immersion tube
<b>Electrical connection</b>	5 m fixed cable (4 x 0.25 mm <sup>2</sup> ), screened
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	Potable, cooling, industrial water.
<b>Resistance to</b>	Unsuitable for chemically contaminated water and water containing film-forming ingredients
<b>Measuring and control equipment</b>	Compact DCCa, DMTa
<b>Measuring principle, technology</b>	Conductive, 2 coils. Integrated temperature measurement

#### Order no.

LFTK 1 FE-5m-shd

1046132

Please observe the general notes on p. → 1-86 (Overview Table for Conductivity Sensors)



## 1.4 Conductivity Sensors

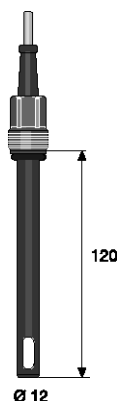
### Conductivity Sensor LFTK 1 FE-3m-shd



Cost-effective sensor for the measurement of electrolytic conductivity in clear, uncontaminated water. With integrated temperature measurement and fixed cable connector (3 m). For operation with controllers Compact DCCa, DMTa

#### Your benefits

- Measured variable: electrolytic conductivity above 10  $\mu\text{S}/\text{cm}$
- Cost-effective sensor for all clear uncontaminated water
- Flexible process connection by the use of sensor fittings for standard pH sensors
- Special graphite electrodes, optimised for a highly dynamic measuring range: 0.01-20 mS/cm
- Integrated Pt 1000 for precise temperature compensation in limited temperature ranges replaces separate temperature sensor and the corresponding sensor fitting
- Fixed cable on the sensor head for difficult ambient conditions



pk\_6\_085

<b>Measuring range</b>	0.01 ... 20 mS/cm
<b>Cell constant k</b>	1.00 $\text{cm}^{-1} \pm 5\%$
<b>Temperature measurement</b>	Pt 1000
<b>Medium temperature</b>	0 ... 80 °C (at 1 bar)
<b>Max. pressure</b>	16.0 bar, (at 25 °C)
<b>Sensors</b>	Special graphite
<b>Shaft material</b>	Epoxy
<b>Thread</b>	PG 13.5
<b>Fitting length</b>	120 mm $\pm$ 3 mm
<b>Installation</b>	Bypass: with or without return of the sample water into the process line, inline: direct installation into the pipework; fixed or replaceable (replaceable fitting), tank, channel: Immersion through an immersion tube
<b>Electrical connection</b>	3 m fixed cable (4 x 0.25 mm <sup>2</sup> ), screened
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	Potable, cooling, industrial water. Sensors of the LF series have only limited applicability for taking measurements in cleaning solutions containing surfactants and media containing solvents.
<b>Resistance to</b>	Unsuitable for chemically contaminated water and water containing film-forming ingredients
<b>Measuring and control equipment</b>	Compact DCCa, DMTa
<b>Measuring principle, technology</b>	Conductive, 2 coils. Integrated temperature measurement

#### Order no.

LFTK 1 FE-3m-shd

1046010

Please observe the general notes on p. → 1-86 (Overview Table for Conductivity Sensors)

## 1.4 Conductivity Sensors

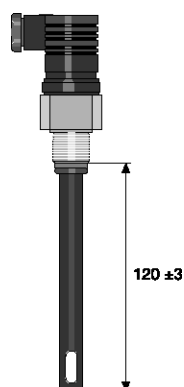


### Conductivity Sensor LF 1 DE

Cost-effective sensor for the measurement of electrolytic conductivity in clear, uncontaminated water. For applications with a constant temperature, with DIN 4-pin plug. For operation with controllers Compact DCCa, DMTa, D1Ca

#### Your benefits

- Measured variable: electrolytic conductivity above 10  $\mu\text{S}/\text{cm}$
- Cost-effective sensor for all clear uncontaminated water
- Flexible process connection by the use of sensor fittings for standard pH sensors
- Special graphite electrodes, optimised for a highly dynamic measuring range: 0.01-20 mS/cm
- Cost-effective version without integral temperature measurement with constant temperature of the medium to be measured
- DIN 4-pin plug for simple installation



pk\_6\_086

<b>Measuring range</b>	0.01...20 mS/cm
<b>Cell constant k</b>	1.00 $\text{cm}^{-1} \pm 5\%$
<b>Temperature measurement</b>	None, only for applications with constant temperature
<b>Medium temperature</b>	0 ... 80 °C (at 1 bar)
<b>Max. pressure</b>	16.0 bar, (at 25 °C)
<b>Sensors</b>	Special graphite
<b>Shaft material</b>	Epoxy
<b>Thread</b>	PG 13.5
<b>Fitting length</b>	120 mm $\pm$ 3 mm
<b>Installation</b>	Bypass: with or without return of the sample water into the process line, Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting), tank, channel: Immersion through an immersion tube
<b>Electrical connection</b>	DIN 4-pin angle plug
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	Potable, cooling, industrial water. Sensors of the LF series have only limited applicability for taking measurements in cleaning solutions containing surfactants and media containing solvents.
<b>Resistance to</b>	Unsuitable for chemically contaminated water and water containing film-forming ingredients
<b>Measuring and control equipment</b>	Compact DCCa, DMTa, D1Ca
<b>Measuring principle, technology</b>	Conductive, 2 electrodes

#### Order no.

LF 1 DE

1001375

Please observe the general notes on p. → 1-86 (Overview Table for Conductivity Sensors)



## 1.4 Conductivity Sensors

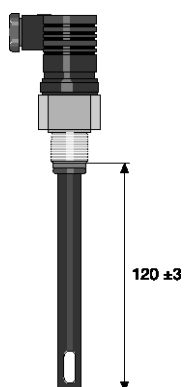
### Conductivity Sensor LFT 1 DE



Cost-effective sensor for the measurement of electrolytic conductivity in clear, uncontaminated water. With integrated temperature measurement and DIN 4-pin plug. For operation with controllers Compact DCCa, DMTa, D1Ca

#### Your benefits

- Measured variable: electrolytic conductivity above 10  $\mu\text{S/cm}$
- Cost-effective sensor for all clear, uncontaminated types of water
- Flexible process connection by the use of sensor fittings for standard pH sensors
- Special graphite electrodes, optimised for a highly dynamic measuring range: 0.01-20 mS/cm
- Integrated Pt 100 for temperature compensation replaces separate temperature sensor and the corresponding sensor fitting
- DIN 4-pin plug for simple installation



pk\_6\_086

<b>Measuring range</b>	0.01 ... 20 mS/cm
<b>Cell constant k</b>	1.00 $\text{cm}^{-1} \pm 5\%$
<b>Temperature measurement</b>	Pt 100
<b>Medium temperature</b>	0 ... 80 °C (at 1 bar)
<b>Max. pressure</b>	16.0 bar, (at 25 °C)
<b>Sensors</b>	Special graphite
<b>Shaft material</b>	Epoxy
<b>Thread</b>	PG 13.5
<b>Fitting length</b>	120 mm $\pm$ 3 mm
<b>Installation</b>	Bypass: with or without return of the sample water into the process line, Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting), tank, channel: Immersion through an immersion tube
<b>Electrical connection</b>	DIN 4-pin angle plug
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	Potable, cooling, industrial water. Sensors of the LF series have only limited applicability for taking measurements in cleaning solutions containing surfactants and media containing solvents.
<b>Resistance to</b>	Unsuitable for chemically contaminated water and water containing film-forming ingredients
<b>Measuring and control equipment</b>	Compact DCCa, DMTa, D1Ca
<b>Measuring principle, technology</b>	Conductive, 2 coils. Integrated temperature measurement

	<b>Order no.</b>
<b>LFT 1 DE</b>	1001376

Please observe the general notes on p. → 1-86 (Overview Table for Conductivity Sensors)

## 1.4 Conductivity Sensors

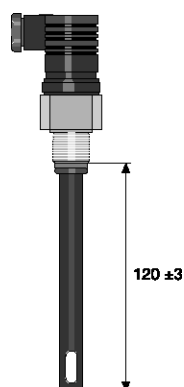


### Conductivity Sensor LFTK 1 DE

Cost-effective sensor for the measurement of the electrolytic conductivity in clear, uncontaminated water with integral temperature measurement and DIN 4-pin plug. For operation with controllers Compact DCCa, DMTa

#### Your benefits

- Measured variable: electrolytic conductivity above 10  $\mu\text{S}/\text{cm}$
- Cost-effective sensor for all clear uncontaminated water
- Flexible process connection by the use of sensor fittings for standard pH sensors
- Special graphite electrodes, optimised for a highly dynamic measuring range: 0.01-20 mS/cm
- Integrated Pt 100 for temperature compensation replaces separate temperature sensor and the corresponding sensor fitting
- DIN 4-pin plug for simple installation



pk\_6\_086

<b>Measuring range</b>	0.01...20 mS/cm
<b>Cell constant k</b>	1.00 $\text{cm}^{-1} \pm 5\%$
<b>Temperature measurement</b>	Pt 1000
<b>Medium temperature</b>	0 ... 80 °C (at 1 bar)
<b>Max. pressure</b>	16.0 bar, (at 25 °C)
<b>Sensors</b>	Special graphite
<b>Shaft material</b>	Epoxy
<b>Thread</b>	PG 13.5
<b>Fitting length</b>	120 mm $\pm$ 3 mm
<b>Installation</b>	Bypass: with or without return of the sample water into the process line, Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting), tank, channel: Immersion through an immersion tube
<b>Electrical connection</b>	DIN 4-pin angle plug
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	Potable, cooling, industrial water. Sensors of the LF series have only limited applicability for taking measurements in cleaning solutions containing surfactants and media containing solvents.
<b>Resistance to</b>	Unsuitable for chemically contaminated water and water containing film-forming ingredients
<b>Measuring and control equipment</b>	Compact DCCa, DMTa
<b>Measuring principle, technology</b>	Conductive, 2 coils. Integrated temperature measurement

#### Order no.

LFTK 1 DE

1002822

Please observe the general notes on p. → 1-86 (Overview Table for Conductivity Sensors)







## 1.4 Conductivity Sensors

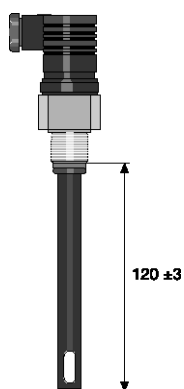
### Conductivity Sensor LFT 1 1/2"



Cost-effective sensor for the measurement of electrolytic conductivity in clear, uncontaminated water. With integrated temperature measurement and DIN 4-pin plug and 1/2-inch screw thread. For operation with controllers Compact DCCa, DMTa, D1Ca

#### Your benefits

- Measured variable: electrolytic conductivity above 10  $\mu\text{C}/\text{cm}$
- Cost-effective sensor for all clear, uncontaminated types of water
- Hydraulic connector with 1/2" thread as an alternative to the corresponding standard design with PG 13.5 thread
- Special graphite electrodes, optimised for a highly dynamic measuring range: 0.01-20 mS/cm
- Integrated Pt 100 for temperature compensation replaces separate temperature sensor and the corresponding sensor fitting
- DIN 4-pin plug for simple installation



pk\_6\_086

<b>Measuring range</b>	0.01 ... 20 mS/cm
<b>Cell constant k</b>	1.00 $\text{cm}^{-1} \pm 5\%$
<b>Temperature measurement</b>	Pt 100
<b>Medium temperature</b>	0 ... 80 °C (at 1 bar)
<b>Max. pressure</b>	16.0 bar, (at 25 °C)
<b>Sensors</b>	Special graphite
<b>Shaft material</b>	Epoxy
<b>Thread</b>	1/2"
<b>Fitting length</b>	120 mm $\pm$ 3 mm
<b>Installation</b>	Bypass: with or without return of the sample water into the process line, Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting), tank, channel: Immersion through an immersion tube
<b>Electrical connection</b>	DIN 4-pin angle plug
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	Potable, cooling, industrial water. Sensors of the LF series have only limited applicability for taking measurements in cleaning solutions containing surfactants and media containing solvents.
<b>Resistance to</b>	Unsuitable for chemically contaminated water and water containing film-forming ingredients
<b>Measuring and control equipment</b>	Compact DCCa, DMTa, D1Ca
<b>Measuring principle, technology</b>	Conductive, 2 coils. Integrated temperature measurement

#### Order no.

LFT 1 1/2"

1001378

Please observe the general notes on p. → 1-86 (Overview Table for Conductivity Sensors)

## 1.4 Conductivity Sensors

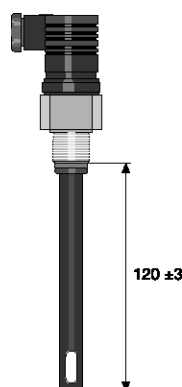


### Conductivity Sensor LFTK 1 1/2"

Cost-effective sensor for the measurement of electrolytic conductivity in clear, uncontaminated water. With integrated temperature measurement and DIN 4-pin plug and 1/2-inch screw thread. For operation with controllers Compact DCCa, DMTa

#### Your benefits

- Measured variable: electrolytic conductivity above 10  $\mu\text{C}/\text{cm}$
- Cost-effective sensor for all clear, uncontaminated types of water
- Hydraulic connector with 1/2" thread as an alternative to the corresponding standard design with PG 13.5 thread
- Special graphite electrodes, optimised for a highly dynamic measuring range: 0.01-20 mS/cm
- Integrated Pt 1000 for precise compensation in limited temperature ranges and with longer cables. Replaces separate temperature sensor and the corresponding sensor fitting
- DIN 4-pin plug for simple installation



pk\_6\_086

<b>Measuring range</b>	0.01...20 mS/cm
<b>Cell constant k</b>	1.00 $\text{cm}^{-1} \pm 5\%$
<b>Temperature measurement</b>	Pt 1000
<b>Medium temperature</b>	0 ... 80 °C (at 1 bar)
<b>Max. pressure</b>	16.0 bar, (at 25 °C)
<b>Sensors</b>	Special graphite
<b>Shaft material</b>	Epoxy
<b>Thread</b>	1/2"
<b>Fitting length</b>	120 mm $\pm$ 3 mm
<b>Installation</b>	Bypass: with or without return of the sample water into the process line, Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting), tank, channel: Immersion through an immersion tube
<b>Electrical connection</b>	DIN 4-pin angle plug
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	Potable, cooling, industrial water. Sensors of the LF series have only limited applicability for taking measurements in cleaning solutions containing surfactants and media containing solvents.
<b>Resistance to</b>	Unsuitable for chemically contaminated water and water containing film-forming ingredients
<b>Measuring and control equipment</b>	Compact DCCa, DMTa
<b>Measuring principle, technology</b>	Conductive, 2 coils. Integrated temperature measurement

#### Order no.

LFTK 1 1/2"

1002823

Please observe the general notes on p. → 1-86 (Overview Table for Conductivity Sensors)





## 1.4 Conductivity Sensors

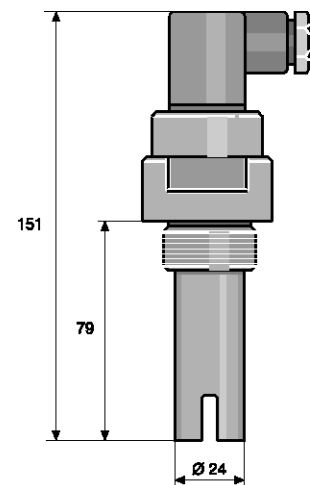
### Conductivity Sensor CK 1



Sensor for the measurement of the electrolytic conductivity in clear, chemically contaminated water with high but constant temperature with DIN 4-pin plug. For operation with the controllers Compact DCCa, DMTa, D1Ca

#### Your benefits

- Measured variable: electrolytic conductivity above 10  $\mu\text{S}/\text{cm}$
- Resistant to water ingredients in target applications thanks to injection-moulded design without adhesive or seals
- High temperature resistance up to 150 °C



pk\_6\_046

<b>Measuring range</b>	0.01 ... 20 mS/cm
<b>Cell constant k</b>	1.00 $\text{cm}^{-1} \pm 5 \%$
<b>Temperature measurement</b>	None, only for applications with constant temperature
<b>Medium temperature</b>	0 ... 150 °C (at 1 bar)
<b>Max. pressure</b>	16.0 bar, (at 20 °C)
<b>Sensors</b>	Special graphite
<b>Shaft material</b>	PES
<b>Thread</b>	R 1"
<b>Length when fitted</b>	79 mm
<b>Installation</b>	Bypass: with or without return of the sample water into the process line, Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting), tank, channel: Immersion through an immersion tube
<b>Electrical connection</b>	DIN 4-pin angle plug
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	Cooling, industrial, process water, tank and pipe, cleaning systems in breweries, dairies, media separation.
<b>Resistance to</b>	Ingredients in the water of the target application, taking into account the compatibility of the material
<b>Measuring and control equipment</b>	Compact DCCa, DMTa, D1Ca
<b>Measuring principle, technology</b>	Conductive, 2 electrodes

#### Order no.

CK 1

305605

## 1.4 Conductivity Sensors

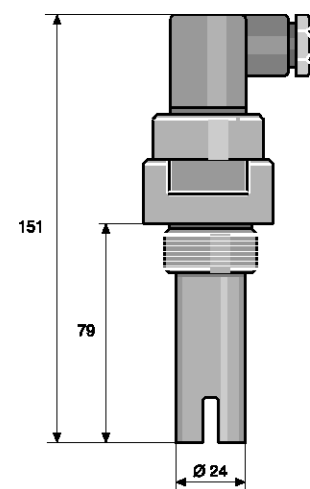


### Conductivity Sensor CKPt 1

Sensor for the measurement of the electrolytic conductivity for clear, chemically contaminated water and higher temperatures. With integrated temperature measurement and DIN 4-pin plug. For operation with the controllers Compact DCCa, DMTa, D1Ca

#### Your benefits

- Measured variable: electrolytic conductivity above 10  $\mu\text{S}/\text{cm}$
- Resistant to water ingredients in target applications thanks to injection-moulded design without adhesive or seals
- High temperature resistance up to 150 °C
- Integrated Pt 100 for temperature compensation replaces separate temperature sensor and the corresponding sensor fitting



pk\_6\_046

<b>Measuring range</b>	0.01...20 mS/cm
<b>Cell constant k</b>	1.00 cm <sup>-1</sup> ±5 %
<b>Temperature measurement</b>	Pt 100
<b>Medium temperature</b>	0 ... 150 °C (at 1 bar)
<b>Max. pressure</b>	16.0 bar, (at 20 °C)
<b>Sensors</b>	Special graphite
<b>Shaft material</b>	PES
<b>Thread</b>	R 1"
<b>Length when fitted</b>	79 mm
<b>Installation</b>	Bypass: with or without return of the sample water into the process line, Inline: direct installation into the pipework; fixed or replaceable (replaceable fitting), Tank, channel: Immersion through an immersion tube
<b>Electrical connection</b>	DIN 4-pin angle plug
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	Cooling, industrial, process water, tank and pipe cleaning systems in breweries and dairies, separation of media.
<b>Resistance to</b>	Ingredients in the water of the target application, taking into account the compatibility of the material
<b>Measuring and control equipment</b>	Compact DCCa, DMTa, D1Ca
<b>Measuring principle, technology</b>	Conductive, 2 coils. Integrated temperature measurement

CKPt 1

**Order no.**

305606





## 1.4 Conductivity Sensors

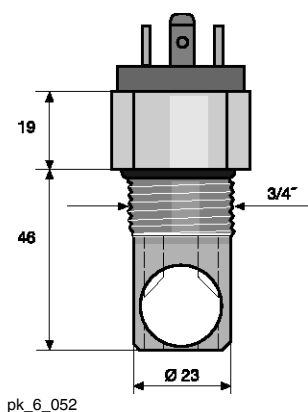
### Conductivity Sensor LM 1



Sensor for the measurement of the electrolytic conductivity for clear and also chemically contaminated water. With DIN 4-pin plug. For operation with the controllers Compact DCCa, DMTa, D1Ca

#### Your benefits

- Measured variable: electrolytic conductivity above 0.1 mS/cm
- Cost-effective sensor for clear, chemically contaminated water
- Resistant to the constituents in the water of the target application



#### Measuring range

0.1...20 mS/cm

#### Cell constant k

1.00 cm<sup>-1</sup> ±5 %

#### Temperature measurement

None, only for applications with constant temperature

#### Medium temperature

0 ... 70 °C (at 1 bar)

#### Max. pressure

16.0 bar, (at 50°C)

#### Sensors

Graphite

#### Shaft material

PP

#### Thread

3/4"

#### Length when fitted

46 mm

#### Installation

Inline: direct installation into the pipework, bypass: with or without return of the sample water into the process line

#### Electrical connection

DIN 4-pin angle plug

#### Enclosure rating

IP 65

#### Typical applications

Potable, cooling, industrial, process water, media separation

#### Resistance to

Ingredients in the water of the target application, taking into account the compatibility of the material

#### Measuring and control equipment

Compact DCCa, DMTa, D1Ca

#### Measuring principle, technology

Conductive, 2 electrodes

#### Order no.

LM 1

740433

## 1.4 Conductivity Sensors

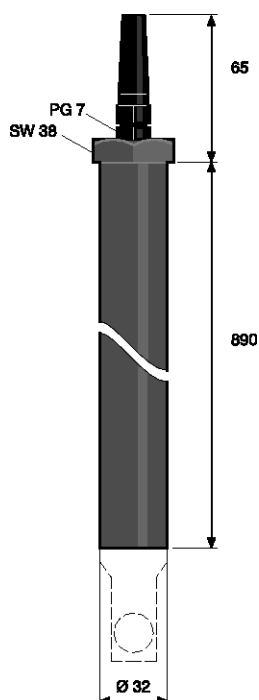


### Conductivity Sensor LM 1-TA

Sensor for the measurement of the electrolytic conductivity for clear and also chemically contaminated water. Completely mounted in an immersion fitting. For operation with the controllers Compact DCCa, DMTa, D1Ca

#### Your benefits

- Measured variable: electrolytic conductivity above 0.1 mS/cm
- Cost-effective sensor for clear, chemically contaminated water
- Resistant to the ingredients in the water of the target applications
- Simple installation in tanks, containers etc. by sensor ready mounted in the immersion tube



pk\_6\_053

<b>Measuring range</b>	0.1...20 mS/cm
<b>Cell constant k</b>	1.00 cm <sup>-1</sup> ±5 %
<b>Temperature measurement</b>	None, only for applications with constant temperature
<b>Medium temperature</b>	0 ... 70 °C (at 1 bar)
<b>Max. pressure</b>	16.0 bar, (at 50°C)
<b>Sensors</b>	Graphite
<b>Shaft material</b>	PP
<b>Thread</b>	M 28 x 1.5 for TA-LM in-line probe fitting
<b>Fitting length</b>	Max. 1 m
<b>Installation</b>	Tank, channel: Immersion through an immersion tube
<b>Electrical connection</b>	5 m fixed cable, screened
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	Potable, cooling, industrial, process water, media separation
<b>Resistance to</b>	Ingredients in the water of the target application, taking into account the compatibility of the material
<b>Measuring and control equipment</b>	Compact DCCa, DMTa, D1Ca
<b>Measuring principle, technology</b>	Conductive, 2 electrodes

		Order no.
LM 1-TA	Sensor integrated in immersion fitting	1020528
LM 1-FE	Replacement sensor for LM 1-TA	1020627





## 1.4 Conductivity Sensors

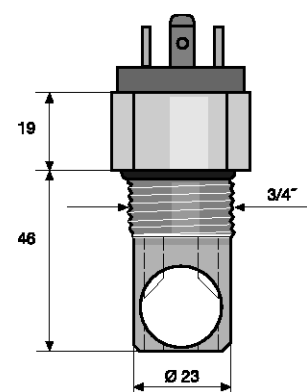
### Conductivity Sensor LMP 1



Sensor for the measurement of the electrolytic conductivity for clear and also chemically contaminated water. With integrated temperature measurement with DIN 4-pin plug. For operation with the controllers Compact DCCa, DMTa, D1Ca

#### Your benefits

- Measured variable: electrolytic conductivity above 0.1 mS/cm
- Cost-effective sensor for clear, chemically contaminated water
- Resistant to the ingredients in the water of the target applications
- Integrated Pt 100 for temperature compensation replaces separate temperature sensor and the corresponding sensor fitting



pk\_6\_052

<b>Measuring range</b>	0.1...20 mS/cm
<b>Cell constant k</b>	1.00 cm <sup>-1</sup> ±5 %
<b>Temperature measurement</b>	Pt 100
<b>Medium temperature</b>	0 ... 70 °C (at 1 bar)
<b>Max. pressure</b>	16.0 bar, (at 50°C)
<b>Sensors</b>	Graphite
<b>Shaft material</b>	PP
<b>Thread</b>	3/4"
<b>Length when fitted</b>	46 mm
<b>Installation</b>	Inline: direct installation into the pipework, bypass: with or without return of the sample water into the process line
<b>Electrical connection</b>	DIN 4-pin angle plug
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	Potable, cooling, industrial, process water, media separation
<b>Resistance to</b>	Ingredients in the water of the target application, taking into account the compatibility of the material
<b>Measuring and control equipment</b>	Compact DCCa, DMTa, D1Ca
<b>Measuring principle, technology</b>	Conductive, 2 coils. Integrated temperature measurement

	<b>Order no.</b>
<b>LMP 1</b>	1020513

Please observe the general notes on p. → 1-86 (Overview Table for Conductivity Sensors)

## 1.4 Conductivity Sensors



### Conductivity Sensor LMP 1-TA

Sensor for the measurement of the electrolytic conductivity for clear and also chemically contaminated water. With integrated temperature measurement, ready mounted in an immersion fitting. For operation with the controllers Compact DCCa, DMTa, D1Ca

#### Your benefits

- Measured variable: electrolytic conductivity above 0.1 mS/cm
- Cost-effective sensor for clear, chemically contaminated water
- Resistant to the ingredients in the water of the target applications
- Integrated Pt 100 for temperature compensation replaces separate temperature sensor and the corresponding sensor fitting
- Simple installation in tanks, containers etc. by sensor ready mounted in the immersion tube

<b>Measuring range</b>	0.1...20 mS/cm
<b>Cell constant k</b>	1.00 cm <sup>-1</sup> ±5 %
<b>Temperature measurement</b>	Pt 100
<b>Medium temperature</b>	0 ... 70 °C (at 1 bar)
<b>Max. pressure</b>	16.0 bar, (at 50 °C)
<b>Sensors</b>	Graphite
<b>Shaft material</b>	PP
<b>Thread</b>	M 28 x 1.5 for TA-LM in-line probe fitting
<b>Length when fitted</b>	1 m
<b>Installation</b>	Tank, channel: Immersion through an immersion tube
<b>Electrical connection</b>	5 m fixed cable, screened
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	Potable, cooling, industrial, process water, media separation
<b>Resistance to</b>	Ingredients in the water of the target application, taking into account the compatibility of the material
<b>Measuring and control equipment</b>	Compact DCCa, DMTa, D1Ca
<b>Measuring principle, technology</b>	Conductive, 2 electrodes

		<b>Order no.</b>
<b>LMP 1-TA</b>	Sensor integrated in immersion fitting	1020525
<b>LMP 1-FE</b>	Replacement sensor for LMP 1-TA	1020727

Please observe the general notes on p. → 1-86 (Overview Table for Conductivity Sensors)







## 1.4 Conductivity Sensors

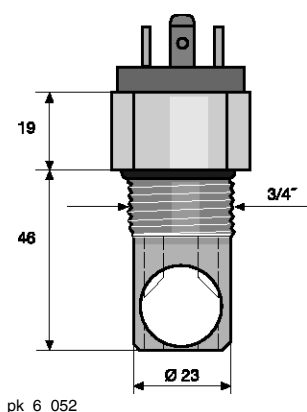
### Conductivity Sensor LMP 1-HT



Sensor for the measurement of the electrolytic conductivity for clear and also chemically contaminated water. For high temperatures, with integrated temperature measurement and DIN 4-pin plug. For operation with the controllers Compact DCCa, DMTa, D1Ca

#### Your benefits

- Measured variable: electrolytic conductivity above 0.1 mS/cm
- Cost-effective sensor for clear, chemically contaminated water
- Resistant to the ingredients in the water of the target applications
- Integrated Pt 100 for temperature compensation replaces separate temperature sensor and the corresponding sensor fitting
- Temperature resistance up to 100 °C



pk\_6\_052

<b>Measuring range</b>	0.1...20 mS/cm
<b>Cell constant k</b>	1.00 cm <sup>-1</sup> ±5 %
<b>Temperature measurement</b>	Pt 100
<b>Medium temperature</b>	0 ... 120 °C (at 1 bar)
<b>Max. pressure</b>	16.0 bar, (at 100 °C)
<b>Sensors</b>	Graphite
<b>Shaft material</b>	PVDF
<b>Thread</b>	3/4"
<b>Length when fitted</b>	46 mm
<b>Installation</b>	Inline: direct installation into the pipework, bypass: with or without return of the sample water into the process line
<b>Electrical connection</b>	DIN 4-pin angle plug
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	General applications at higher temperaturesprocess water, process water from electroplating, media separation, with CIP (cleaning in place)
<b>Resistance to</b>	Ingredients in the water of the target application, taking into account the compatibility of the material
<b>Measuring and control equipment</b>	Compact DCCa, DMTa, D1Ca
<b>Measuring principle, technology</b>	Conductive, 2 coils. Integrated temperature measurement

#### Order no.

**LMP 1-HT**

**1020524**

Please observe the general notes on p. → 1-86 (Overview Table for Conductivity Sensors)

## 1.4 Conductivity Sensors

### 1.4.3 Inductive Conductivity Sensors

Inductive conductivity sensors consist of a transducer, encapsulated in an inert material. The electrolytic conductivity is measured inductively without direct contact with the medium.

The sensors are used to measure electrolytic conductivity over a wide measuring range, even in heavily contaminated and/or aggressive media and, as such, offer particularly low maintenance operation. The sensors are particularly suitable for measuring high conductivities, as no electrode polarisation occurs. The inductive conductivity sensors are operated using the Compact controller DCCa xx L6 ... The controller includes the testing and calibration kit (Order no. 1026958).

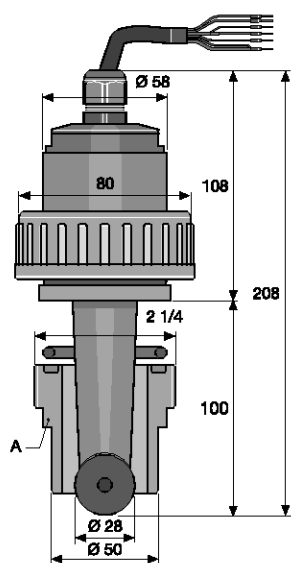
#### Conductivity Sensor ICT 1



Cost-effective inductive conductivity sensor, suitable for high electrolytic conductivities above 200  $\mu\text{S}/\text{cm}$ . Also suitable for chemically contaminated water and film-forming media. For installation in pipework

##### Your benefits

- Measured variable: electrolytic conductivity. The inductive (non-contact) measuring principle permits applications in chemically contaminated types of water and in film-forming media
- There is no need for adhesive or seals as the sensor is fully embedded in PP
- Measurements at high conductivity values of up to 1,000 mS/cm are possible without interfering polarisation by means of the high measuring range dynamics of the inductive measuring principle
- Simple installation in a PVC pipe by bonding the DN 40 adhesive connector supplied into a standard T-piece and screwing in the sensor using the union nut supplied. A DN 40 welded connector is optionally available for use in PP pipework



P\_MSRZ\_0013\_SW1

A=Adhesive joints PVC, Fusion joints PP, DN 40

<b>Measuring range</b>	0.2...1,000 mS/cm
<b>Cell constant k</b>	8.5 cm <sup>-1</sup> ±5 %
<b>Measuring accuracy</b>	< 1 % relative to final value of measuring range
<b>Temperature compensation</b>	Pt 100
<b>Process chemical temperature</b>	0...70 °C
<b>Max. pressure</b>	16.0 bar up to 40 °C, 1.0 bar up to 70 °C
<b>Material</b>	Sensor: PP Seals: FKM
<b>Electrical connection</b>	7 m fixed cable
<b>Enclosure rating</b>	IP 65
<b>Typical applications</b>	All types of soiled water, desalination control in cooling towers, control of electroplating baths, Cleaning in Place (CIP), product monitoring Seawater
<b>Resistance to Installation</b>	PP-compatible chemicals, deposit-forming media With union nut, 2 1/4 inch internal thread, DN 40, PVC incl. DN 40 bonded nozzle with 2 1/4 external thread for fitting in DN 40 PVC standard tube (within scope of supply). The corresponding set-in nozzle for fitting in PP standard tube is available as an accessory.
<b>Measuring and control equipment</b>	D1C for inductive conductivity
<b>Measuring principle, technology</b>	Inductive, 2 coils. Integrated temperature measurement

ICT 1

Order no.

1023244

## 1.4 Conductivity Sensors

### Conductivity Sensor ICT 1-IMA

Cost-effective inductive conductivity sensor, suitable for high electrolytic conductivities above 200  $\mu\text{S}/\text{cm}$ . Also suitable for chemically contaminated water and film-forming media. Completely integrated in an immersion pipe

#### Your benefits

- Measured variable: electrolytic conductivity. The inductive (non-contact) measuring principle permits applications in chemically contaminated types of water and in film-forming media
- There is no need for adhesive or seals as the sensor is fully embedded in PP
- Measurements at high conductivity values of up to 1,000 mS/cm are possible without interfering polarisation by means of the high measuring range dynamics of the inductive measuring principle
- Simple installation in tanks, containers etc. thanks to sensor ready mounted in the immersion tube

#### Measuring range

0.2...1,000 mS/cm

#### Cell constant k

8.5  $\text{cm}^{-1} \pm 5\%$

#### Measuring accuracy

< 1 % relative to final value of measuring range

#### Temperature compensation

Pt 100

#### Process chemical temperature

0...70 °C

#### Max. pressure

8.0 bar up to 40 °C, 1.0 bar up to 70 °C

#### Material

Sensor and immersion tube: PP  
Seals: FKM

#### Long immersion pipe

1 m / 2 m

#### Electrical connection

7 m fixed cable

#### Enclosure rating

IP 65

#### Typical applications

All types of soiled water, desalination control in cooling towers, control of electroplating baths, Cleaning in Place (CIP), product monitoring

#### Resistance to

PP-compatible chemicals, deposit-forming media

#### Long immersion pipe

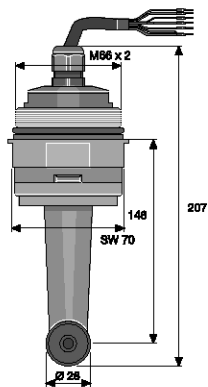
Immersion sensor complete with 1 m immersion pipe or 2 m immersion pipe. The fitting accessories for the immersion valve IPHa 3-PP can also be used for the immersion sensor.

#### Measuring and control equipment

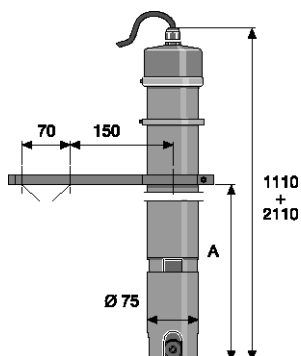
Compact controller DCCa

#### Measuring principle, technology

Inductive, 2 coils. Integrated temperature measurement

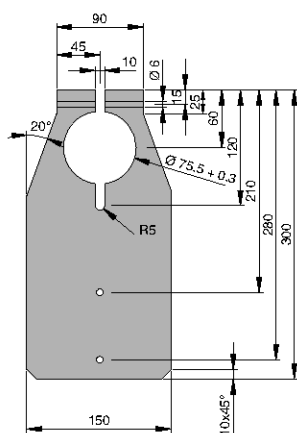


pk\_6\_089



pk\_6\_088

A = min. 155 mm / max. 1 m or 2 m



P\_AC\_0262\_SW1

#### ICT 1-IMA 1 m

#### Order no.

1023349

#### ICT 1-IMA 2 m

1023351



## 1.4 Conductivity Sensors

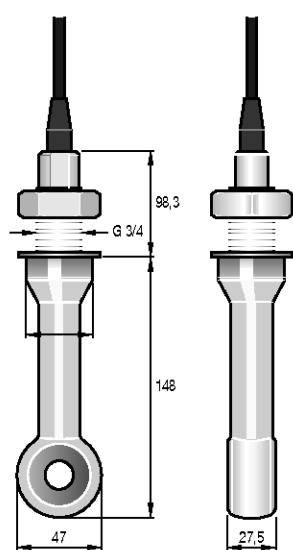


### Conductivity Sensor ICT 2

High-performance inductive conductivity sensor with high dynamic measuring range. Also suitable for types of water with aggressive chemicals and film-forming components. Permitted temperatures up to 125 °C. For installation in pipework, tanks and for immersion in storage tanks

#### Your benefits

- Measured variable: electrolytic conductivity. The inductive (non-contact) measuring principle permits applications in chemically contaminated types of water and in film-forming media
- There is no need for adhesive or seals as the sensor is fully embedded in PFA
- Measurements at high conductivity values of up to 2,000 mS/cm are possible without interfering polarisation by means of the high measuring range dynamics of the inductive measuring principle
- Flexible connection to the processes is possible via a flange or immersion pipe with optional accessories



pk\_6\_082

<b>Measuring range</b>	0.02...2,000 mS/cm
<b>Cell constant k</b>	1.98 cm <sup>-1</sup>
<b>Measuring accuracy</b>	± (5 µS/cm + 0.5 % of the measured value) at T < 100 °C ± (10 µS/cm + 0.5 % of the measured value) at T > 100 °C
<b>Temperature compensation</b>	Pt 100, class A, completely extrusion-coated
<b>Process chemical temperature</b>	0...125 °C for use together with D1C, temperature compensation is limited to 100 °C
<b>Max. pressure</b>	16.0 bar
<b>Material</b>	PFA, completely extrusion-coated
<b>Electrical connection</b>	5 m fixed cable
<b>Enclosure rating</b>	IP 67
<b>Typical applications</b>	Production processes in the chemical industry, phase separation of product mixtures, determination of concentrations of aggressive chemicals.
<b>Resistance to</b>	Electrolytic conductivity > 20 mS/cm, PFA-compatible aggressive chemicals, deposit-forming media
<b>Installation</b>	Fitting in pipes, tanks (sideways): G 3/4 stainless steel thread (1.4571) or flange fitting: With the accessories: Stainless steel flange ANSI 2 inch 300 lbs, SS 316L (adaptable to DIN counter flange DN 50 PN 16).
<b>Measuring and control equipment</b>	D1C
<b>Measuring principle, technology</b>	Inductive, 2 coils. Integrated temperature measurement

Installation kit for type ICT 2 sensors → 1-127

ICT 2

Order no.

1023352



## 1.5 Turbidity Measuring Points DULCOTEST®

### 1.5.1

### Measuring Points for Turbidity

**Reliable on-line measurement of turbidity with DULCOTEST® DULCO® turb C measuring points**  
**Measuring range 0 - 1,000 NTU**



DULCOTEST® DULCO® turb C is a compact measuring instrument for measuring turbidity with a large measuring range and different designs to comply with ISO and EPA standards and with and without automatic cleaning.

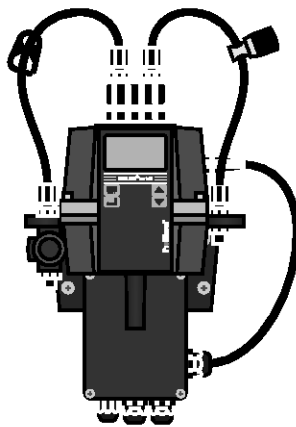
#### Your benefits

- Compact turbidity measuring station with integrated sensor, flow cuvette and measuring instrument saves space and is simple to install and operate.
- High dynamic measuring range between 0.02 and 1,000 NTU permits broad-based use in all stages of potable water treatment. Also ideal for monitoring waste water from clarification plants and for monitoring ruptures with filters.
- Short response times thanks to small-volume measuring cuvette.
- Long-term stable measurements, even in contaminated water, by the optional ultrasonic cleaning of the measuring cuvette.
- Fast and simple calibration on site by optionally available, pre-assembled and time-stable calibration standards.

The DULCOTEST® measuring points for turbidity in the DULCO® turb C range with versions TUC 1, TUC 2, TUC 3 and TUC 4, are compact online turbidity measuring points, consisting of a sensor, inline flow fitting and measuring device. The measuring device permits the measured value to be displayed, calibration, transmission of the measured value via a 4-20 mA signal and the indication of limit value transgressions and device faults. The measuring cuvette integrated in the measuring device enable the device to operate in the bypass of the process line. The visual measuring unit does not come into contact with the sample medium.

The intended application is the treatment of potable water, with the DULCO® turb C able to be used in all treatment stages of raw water, from filter monitoring to measurement of fine turbidity in dispensed potable water. It is also possible to monitor the turbidity of slightly contaminated process water and waste water, as well as treated water from the food and beverage industry up to a turbidity value of 1,000 NTU. Compared with the TUC 1/TUC 2, the TUC 3 / TUC 4 measuring stations include an ultrasound-based self-cleaning function. This helps in particular to extend the service intervals particularly when used with the types of water that form films.

The measuring principle is identical to light scatter measurements. The light beam that is beamed into the measuring cuvette filled with sample water is dispersed on turbidity particles and the scattered light is measured at right angles (90°) to the beamed in light (Nephelometric measurement). The measuring unit for the turbidity measurement can be given as NTU (Nephelometric Turbidity Unit) or as FNU (Formazin Nephelometric Unit). The measuring process of types TUC 1/TUC 3 (infrared light) corresponds to the globally applicable standard ISO 7027 and the European Standard DIN EN 27027. The measuring process of types TUC 2/TUC 4 (white light) corresponds to the US American standard USEPA 180.1.



P\_DMZ\_0002\_SW



# 1.5 Turbidity Measuring Points DULCOTEST®

## Technical Data

<b>Measurement range</b>	0 ... 1,000.0 NTU
<b>Accuracy</b>	± 2 % of the displayed value or ± 0.02 NTU below 40 NTU, depending on which value is the greater ± 5 % of the displayed value above 40 NTU
<b>Resolution</b>	0.0001 NTU below 10 NTU
<b>Response time</b>	Configurable
<b>Display</b>	Multiple row LCD display with background lighting
<b>Alarm relay</b>	Two programmable alarms, 120-240 VAC, 2 A form C relay
<b>Output signal</b>	4 ... 20 mA, 600 Ω, not electrically isolated: dual-isolated, degree of interference, overvoltage category II
<b>Communication interface</b>	Bi-directional RS-485, Modbus
<b>Max. pressure</b>	Integrated pressure regulating valve regulates 1,380 kPa (200 psi), based on the flow rate
<b>Flow</b>	6 – 60 l/h
<b>Temperature</b>	1 ... 50 °C
<b>Material that comes into contact with the media</b>	Polyamide (PA), silicone, polypropylene (PP), stainless steel, borosilicate glass
<b>Voltage supply</b>	100 – 240 VAC, 47 – 63 Hz, 80 VA
<b>Hydraulic connector</b>	Black tube, inside 4.75 mm, outside 8 mm
<b>Ambient conditions</b>	Not suitable for operation outdoors. Maximum operating altitude 2,000 m above sea level. Maximum 95 % relative air humidity (non-condensing).
<b>Enclosure rating</b>	IP 66, NEMA 4x
<b>Standard</b>	ISO 7027 or DIN EN 27027 with the "Infrared" version, USEPA 180.1 with the "Achromatic light" version
<b>Dimensions H x W x D</b>	35 x 30 x 30 cm
<b>Shipping weight</b>	2.5 kg

	Standard	Ultrasonic cleaning	Order no.
<b>TUC 1</b>	Infrared light: ISO 7027, DIN EN 27027	No	1037696
<b>TUC 2</b>	White light: US EPA 180.1	No	1037695
<b>TUC 3</b>	Infrared light: ISO 7027, DIN EN 27027	Yes	1037698
<b>TUC 4</b>	White light: US EPA 180.1	Yes	1037697

## Spare Parts

	Order no.
<b>Drying agent</b>	1037701
<b>Cuvette TUC 1 / TUC 2</b>	1037877
<b>Cuvette TUC 3 / TUC 4</b>	1037878
<b>Infrared lamp TUC 1 / TUC 3</b>	1037702
<b>Achromatic light lamp TUC 2 / TUC 4</b>	1037703
<b>Hose kit</b>	1037879
<b>Pressure regulating valve</b>	1037885

## Accessories

	Order no.
<b>Calibration set</b>	1037699
<b>Flow control</b>	1037880
<b>Air bubble trap</b>	1037700



## 1.6 Accessories Sensor Technology

### 1.6.1

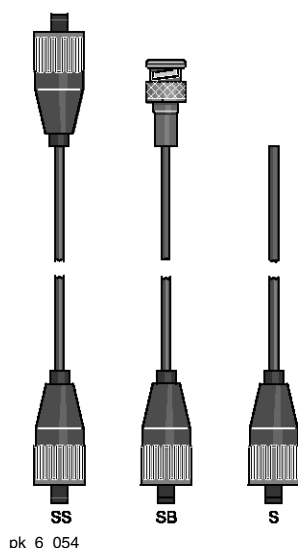
### Sensor Accessories

#### General guidelines:

- Ensure that signal leads are as short as possible.
- Ensure signal leads are separated from power cables running parallel to them.
- Use pre-assembled combined signal leads wherever possible.

#### Signal leads for pH/ORP measurement

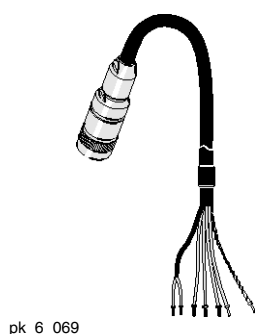
- Pre-assembled to facilitate installation
- Factory tested to ensure function reliability
- IP 65



Type	Description	Order no.
2 x SN6	Coaxial cable, Ø 5 mm, 0.8 m – SS	305077
2 x SN6	Coaxial cable, Ø 5 mm, 2 m – SS	304955
2 x SN6	Coaxial cable, Ø 5 mm, 5 m – SS	304956
2 x SN6	Coaxial cable Ø 5 mm, 10.0 m – SS	304957
SN6 - open end	Cable combination coaxial 0.8 m - SN6 - pre-assembled	1024105
SN6 - open end	Cable combination coaxial 2 m - SN6 - pre-assembled	1024106
SN6 - open end	Cable combination coaxial 5 m - SN6 - pre-assembled	1024107
SN6 - open end	Coaxial cable Ø 5 mm, 10.0 m - S	305040
SN6 - BNC	Coaxial cable Ø 3 mm, 10.0 m - SB	305099
SN6 - BNC	Coaxial cable, Ø 5 mm, 0.8 m – SB	1033988
SN6 - BNC	Coaxial cable, Ø 5 mm, 2.0 m – SB	1033011
SN6 - DIN	Coaxial cable Ø 5 mm, 0.8 m - SD	305098
SN6 - DIN	Coaxial cable Ø 5 mm, 2.0 m - SD	304810
SN6 - open end d5 (DSR)	Cable combination coax 2.0 m - S	1005672

#### Measuring line for sensors with Vario Pin plug-in heads

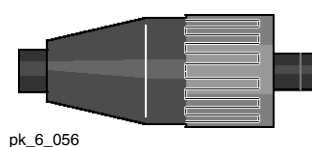
Ready-made 6-conductor measuring line with Vario Pin plug for connection to sensor type PHEPT 112 VE.



	Length m	Order no.
Vario Pin signal lead VP 6-ST/ 2 m	2	1004694
Vario Pin signal lead VP 6-ST/ 5 m	5	1004695
Vario Pin signal lead VP 6-ST/10 m	10	1004696

#### SN6 coax connector

K 74 crimping pliers and a soldering iron are required for connecting coax connectors to cables.



	Order no.
SN6 coaxial plug for 5 mm Ø coaxial signal lead	304974
SN6 coaxial plug for 3 mm Ø coaxial signal lead	304975

#### LK coax signal cable

For pH and ORP measurements.

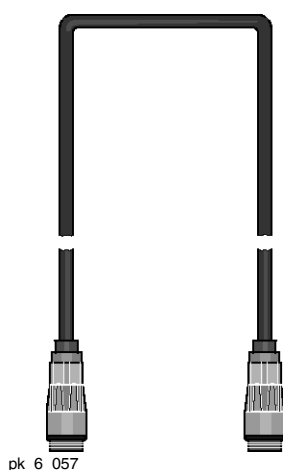


	Order no.
Coax low noise Ø 5 mm, black	723717
Coax low noise Ø 3 mm, black	723718

Please specify length with order.



## 1.6 Accessories Sensor Technology



### Measuring lines for 4P type chlorine sensors

The measuring line is necessary for the connection of -4P sensors to the measuring/control device D\_4a.

- Simple installation, as no self-assembly is required
- High operational safety due to factory functional testing
- IP 65

	Length m	Order no.
Measuring line for 4P type chlorine sensors	2	818455
Measuring line for 4P type chlorine sensors	5	818456
Measuring line for 4P type chlorine sensors	10	818470



### Measuring lines for DMT type chlorine sensors

The measuring line is needed for connection of DMT type sensors to the DMT transducer.

	Length m	Order no.
5-core universal cable, 5-pin round plug	2	1001300
5-core universal cable, 5-pin round plug	5	1001301
5-core universal cable, 5-pin round plug	10	1001302

### Cabling accessories for CAN type chlorine sensors

	Order no.
T-distributor M12 5 pole CAN	1022155
Termination resistor M12 coupling	1022154
Termination resistor M12 plug	1022592
Connecting cable - CAN M12 5-pole 0.5 m	1022137
Connecting cable - CAN M12 5-pole 1 m	1022139
Connecting cable - CAN M12 5-pole 2 m	1022140
Connecting cable - CAN M12 5-pole 5 m	1022141
Connecting cable - CAN, sold by the metre	1022160
Plug-CAN M12 5-pole screw terminal	1022156
Coupling-CAN M12 5-pole screw terminal	1022157

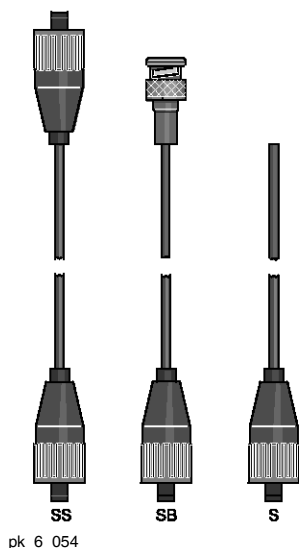
### Signal leads for Pt 100/Pt 1000 (2 x 0.5 mm<sup>2</sup>)

	Length m	Order no.
SN6 - open-ended	5	1003208
SN6 - open-ended	10	1003209
SN6 - open-ended	20	1003210

### Measuring line for conductive conductivity sensors

4-core, conductor: 0.25 mm<sup>2</sup>, cable diameter: 5.7 mm, screened

Type	Length m	Order no.
Measuring line for conductive conductivity sensors	1	1046024
	3	1046025
	5	1046026
	10	1046027





## 1.6 Accessories Sensor Technology

### 2-wire measuring line

2-core, conductor: 0.25 mm<sup>2</sup>, cable diameter: 4 mm

For mA type chlorine / bromine / chlorine dioxide / ozone sensors and pH, ORP, Pt 100, conductivity, hydrogen peroxide (PEROX) transducers.

	Order no.
Signal cable, sold by the metre 2 x 0.25 mm <sup>2</sup> Ø 4 mm	725122

### Connector cable

For fluid voltage comparison in-line probe housing DLG III and DGMA with connector, 5 m.

	Length m	Order no.
Connector cable	5	818438

### Test and calibration kit for inductive conductivity

	Order no.
Test and calibration kit	1026958



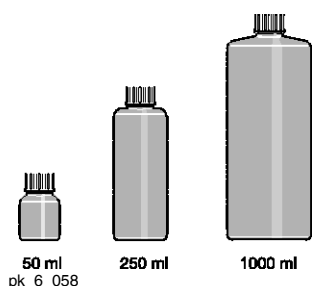
## 1.6 Accessories Sensor Technology

### 1.6.2 Consumable Items for Sensors

#### pH quality buffer solutions

Accuracy  $\pm$ pH 0.02 ( $\pm$ 0.05 at pH 10). The shelf life depends upon frequency of use and the amount of chemical drag-in.

Alkaline buffer solutions can react with CO<sub>2</sub> if left open. This will affect their values, therefore close after use. Buffer solutions should be replaced a maximum of three months after opening. The solution contains a biocide to prevent bacteria forming.



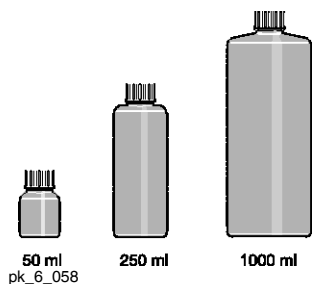
	Capacity ml	Order no.
Buffer pH 4.0 – red	50	506251
Buffer pH 4.0 – red	250	791436
Buffer pH 4.0 – red	1,000	506256
Buffer pH 5.0 – red	50	506252
Buffer pH 7.0 – green	50	506253
Buffer pH 7.0 – green	250	791437
Buffer pH 7.0 – green	1,000	506258
Buffer pH 9.0 –	50	506254
Buffer pH 9.0 –	1,000	506259
Buffer pH 10.0 – blue	50	506255
Buffer pH 10.0 – blue	250	791438
Buffer pH 10.0 – blue	1,000	506260

#### ORP quality buffer solutions

Accuracy to  $\pm$ 5 mV. Shelf life depends upon frequency of use and the strength of the chemicals in sample solutions.

Buffer solutions should be replaced a maximum of three months after opening.

Warning: The 465 mV ORP buffer solution is an irritant!

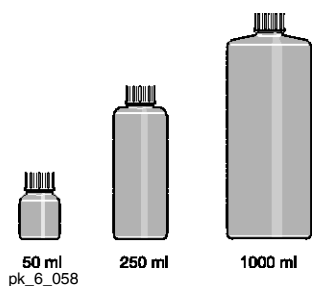


	Capacity ml	Order no.
ORP buffer 465 mV	50	506240
ORP buffer 465 mV	250	791439
ORP buffer 465 mV	1,000	506241
ORP buffer 220 mV	50	506244
ORP buffer 220 mV	1,000	506245

DPD-reagents for calibration of amperometric sensors s. p. → 2-101

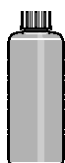
#### 3 molar KCl solutions

3-molar KCl solution is most suited for the storage of pH and ORP sensors (e.g. in sensor quills) and as an electrolyte for refillable sensors (e.g. PHEN, RHEN). We only recommend using the KCl solution saturated with AgCl for the old design of refillable sensors with reference electrodes without a large AgCl reservoir.



	Capacity ml	Order no.
KCl solution, 3 molar	50	505533
KCl solution, 3 molar	250	791440
KCl solution, 3 molar	1,000	791441
KCl solution, 3 molar, AgCl saturated	250	791442
KCl solution, 3 molar, AgCl saturated	1,000	505534

## 1.6 Accessories Sensor Technology



250 ml

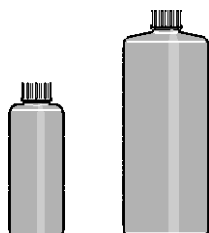
pk\_6\_058\_2

### Cleaning solutions

Cleaning solution pepsin/hydrochloric acid:

for cleaning pH sensors, the membranes of which have been contaminated with protein.

Capacity	Order no.
250 ml	791443



250 ml

1000 ml

pk\_6\_058\_3

### Conductivity calibration solution

For the precise calibration of conductivity sensors.

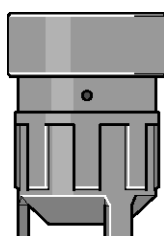
	Capacity ml	Order no.
Conductivity calibration 1413 $\mu\text{S}/\text{cm}$	250	1027655
Conductivity calibration 1413 $\mu\text{S}/\text{cm}$	1,000	1027656
Conductivity calibration 12.88 $\text{mS}/\text{cm}$	250	1027657
Conductivity calibration 12.88 $\text{mS}/\text{cm}$	1,000	1027658



pk\_6\_061

### Electrolyte for amperometric sensors

	Capacity ml	Order no.
Electrolyte for all chlorine sensors type CLE, CLR 1	100	506270
Electrolyte for CDM 1 and CDE 3 type chlorine dioxide sensors	100	506271
Electrolyte for CDE 2 and CDR 1 type chlorine dioxide sensors	100	506272
Electrolyte for OZE type ozone sensors	100	506273
Electrolyte for CGE/CTE/BRE type sensors	50	792892
Electrolyte for CDP type chlorine dioxide sensors	100	1002712
Electrolyte for peracetic acid sensors type PAA 1, OZR 1	100	1023896
Electrolyte for CLT 1 type chlorite sensors	50	1022015
Electrolyte for PER 1 type hydrogen peroxide sensors	50	1025774
Electrolyte for CLO 1 type chlorine sensor	100	1035191
Electrolyte for CLO 2 type chlorine sensor	100	1035480
Electrolyte for CBR 1 type chlorine/bromine sensor	100	1038017
Electrolyte for BCR 1 type bromine sensor	50	1044843



pk\_6\_075

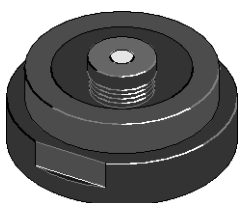
### Spare membrane caps, accessory sets for amperometric sensors

	Capacity ml	Order no.
Membrane cap for types CLE II T, CDM 1 and OZE 1	–	790486
Membrane cap for types: CLE 2.2, CLE 3, CDE 1.2, CDE 2, OZE 2 and OZE 3	–	790488
Sensor cap for CLO 1	–	1035197
Sensor cap for CLO 2	–	1035198
Membrane cap for CGE/CTE 1 (2/5/10 ppm) and BRE 1 (10 ppm), BRE 2	–	792862
Membrane cap for CTE 1 (0.5 ppm), CBR 1, BCR 1	–	741274
Membrane cap for CDP 1, BRE 1 (0.5 / 2 ppm), CLT	–	1002710
Membrane cap for CDE 3	–	1026578
Diaphragm cap for PAA 1, CDR 1, CLR 1, OZR 1	–	1023895
Membrane cap for PER 1	–	1025776
Membrane cap for H2.10 P	–	792978
Accessory set for CGE 2/CTE 1 (2/5/10 ppm) and BRE 1 (10 ppm), BRE 2 (2 membrane caps + electrolyte)	50	740048



## 1.6 Accessories Sensor Technology

	Capacity ml	Order no.
Accessory set for CTE 1 (0.5 ppm) (2 membrane caps + electrolyte)	50	741277
Accessory set for CLE (2 membrane caps + electrolyte)	100	1024611
Accessory set for CDP 1 (2 membrane caps + electrolyte), BRE 1 (0.5 / 2 ppm), CLT	100	1002744
Accessory kit for PAA 1 (2 membrane caps + electrolyte)	100	1024022
Accessory kit for PER 1 (2 membrane cap + electrolyte)	50	1025881
Accessory set for CDE 3 (2 membrane caps + electrolyte)	100	1026361
Accessory set for CLO 1 (electrolyte, grinding disc, plug)	100	1035482
Accessory set for CLO 2 (electrolyte, grinding disc, plug)	100	1035483
Accessory set for CBR 1 (2 membrane caps + electrolyte)	100	1038984
Accessory set BCR 1 (2 membrane caps + electrolyte)	50	1044844



pk\_6\_062

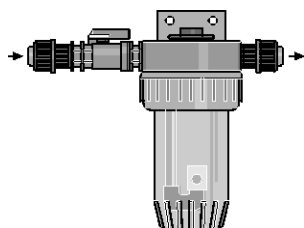
### Spare parts for dissolved oxygen sensors

	Measuring range	Order no.
Sensor insert for DO 1-mA-20 ppm: Membrane thickness 125 µm	2.00...20.0 mg/l	1020534
Sensor insert for DO 2-mA-10 ppm: Membrane thickness 50 µm	0.10...10.0 mg/l	1020535
Bracket for the sensor insert for DO 1-mA-20 ppm (with membrane protection for fish farming)		1020540
Bracket for the sensor insert for DO 2-mA-10 ppm		1020541

# 1.6 Accessories Sensor Technology

## 1.6.3

## Sensor Fittings



pk\_6\_063

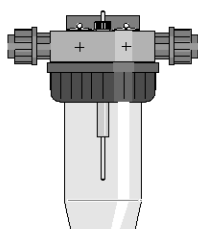
### DLG III type in-line probe housing

To hold 2 sensors (conductivity, Pt 100, pH or ORP sensors) with PG 13.5 screw-in thread plus one sensor with R 1" screw-in thread (amperometric sensors) with integrated stainless steel pin as liquid reference potential.

On the inlet side the DLG III is equipped with a plastic ball valve for blocking and adjusting the sample water flow.

<b>Material</b>	Material: Rigid PVC Transparent housing cup: Polyamide Ball valve material: Rigid PVC
<b>Max. pressure</b>	1.0 bar
<b>Max. temperature</b>	55 °C

	Type	Max. temperature °C	Order no.
<b>DLG III A with PVC hose connectors</b>	for PE line Ø 8/5 mm	55	914955
<b>DLG III A with flushing connector and PVC hose connection</b>	for PE line Ø 8/5 mm	55	1029096
<b>DLG III B with PVC adhesive connectors</b>	for pipe connection Ø 16 DN 10	55	914956
<b>Assembly kit for fitting amperometric sensors</b>	–	55	815079



pk\_6\_070

### DLG IV type in-line probe housing

To hold 4 sensors (pH, ORP, Pt 100, conductivity) with PG 13.5 screw-in thread. With integrated stainless steel rod as liquid reference potential. Angle for wall mounting.

<b>Material</b>	Material: Hard PVC or PP Transparent housing cup: Polyamide
<b>Max. pressure</b>	1.0 bar
<b>Connection for sample water line</b>	Union with d 16/DN 10 insert

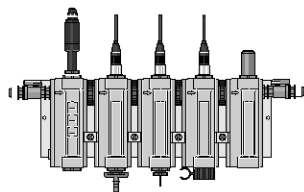
	Type	Max. temperature °C	Order no.
<b>DLG IV PP</b>	for Ø 16/DN 10 pipe work connector	80	1005331
<b>DLG IV PVC</b>	for Ø 16/DN 10 pipe work connector	55	1005332

### DLG sampling water cup

	Order no.
<b>DLG III sampling water cup with back flush device</b>	1029095



## 1.6 Accessories Sensor Technology



pk\_6\_066

### DGM modular in-line probe housing

To hold conductivity, Pt 100, pH or ORP sensors with PG 13.5 screw-in thread or amperometric sensors with R 1" screw-in thread.

#### Advantages:

- Simple installation (completely ready-mounted on a panel); max. 7 modules on a panel
- Simple retrofit extension option (see extension modules)
- Module for sample water flow control
- Quick measurement recording due to low volume of sample water
- Each completely assembled DGM is equipped with a simple sampling tap

Ball valves on both sides for shutting off the flow and for flow adjustment

#### Material

All modules: Transparent PVC  
Seals: FKM  
Calibration cup: PP  
Mounting panel: PVC white

#### Max. temperature

60 °C

#### Max. pressure

6.0 bar up to 30 °C, 1.0 bar up to 60 °C

#### Max. flow rate

80 l/h

#### Recommended Flow volume

40 l/h

#### Flow sensor

Reed contact  
Max. switch power 3 W  
Max. switch voltage 175 V  
Max. switch current 0.25 A  
Max. operating current 1.2 A  
Max. contact resistance 150 mΩ

#### Switching hysteresis

20 %

#### Enclosure rating

IP 65

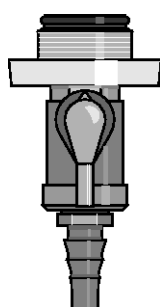
#### Typical applications

Potable water, swimming pool water or water of similar quality with no suspended solids

#### Assembly

Max. 5 modules pre-assembled onto baseboard: more than 5 modules, pre-assembled onto baseboard as custom version, priced accordingly.

FKM = fluoro rubber



pk\_6\_071

### Sampling tap for DGM

For PG 13.5 and 25 mm modules designed as a convenient ball valve.

	Order no.
PG 13.5 sampling tap	1004737
25 mm sampling tap	1004739

### Expansion modules for DGM

For simple retrofit to an existing DGM.

	Order no.
Flow expansion module with scale in l/h	1023923
Flow expansion module with scale in gph	1023973
Flow sensor for flow expansion module (optional)	791635
Expansion module for PG 13.5 sensors	1023975
Expansion module for 25 mm sensors	1023976

### Connecting lead

For fluid voltage comparison in-line probe housing DLG III and DGMA with connector, 5 m.

	Order no.
Connector cable	818438

## 1.6 Accessories Sensor Technology

### Isolation ball valve for DGM

To isolate the bypass from the process flow

	Order no.
Stopcock	1010380

### Mounting kit for sensor/DGM

For mounting amperometric sensors with R 10 connection

	Order no.
Mounting kit for sensor/DGM	791818

### Identity Code Ordering System for In-Line Probe Housing Modules

DGM	Series	Series Version
	A	
		<b>Flow monitor module</b>
		1 with l/h scale
		2 with gph scale (US)
		3 With flow monitor, l/h scale
		4 with flow monitor, gph scale (US)
		<b>Number of PG 13.5 modules</b>
		0 without PG 13.5 modules
		1 one PG 13.5 module
		2 two PG 13.5 modules
		3 three PG 13.5 modules
		4 four PG 13.5 modules
		<b>Number of 25 mm modules</b>
		0 No 25 mm modules
		1 One 25 mm module
		2 Two 25 mm modules
		<b>Main material</b>
		T Transparent PVC
		<b>Sealing material</b>
		0 FKM A
		<b>Hydraulic connectors</b>
		0 8 x 5 hose
		1 PVC DN 10 threaded connector
		4 Hose 12 x 6
		<b>Version</b>
		0 With ProMinent® logo
		1 Without ProMinent® logo
		2 With ProMinent® logo, without mounting plate
		3 Without ProMinent® logo, without mounting plate

#### Accessories supplied:

- Wall fastenings for PG 13.5 modules: Calibration plate, mounting kits for PG 13.5 probes

The identity code DGM A 3 2 1 T 0 0 0 describes, for example, a fully assembled configuration of a flow module with sensor, two PG 13.5 modules (e.g. for pH and ORP probes) and a 25 mm module (e.g. for CLE 3 chlorine sensor) 8 x 5 tube connectors are ready mounted.

#### Recommended accessories

	Order no.
for potential equalizer plug	– 791663
Flow sensor for flow expansion module (optional)	– 791635
additional calibration cup	– 791229
PG 13.5 sampling tap	for 13.5 module 1004737
25 mm sampling tap	for 25 mm module 1004739

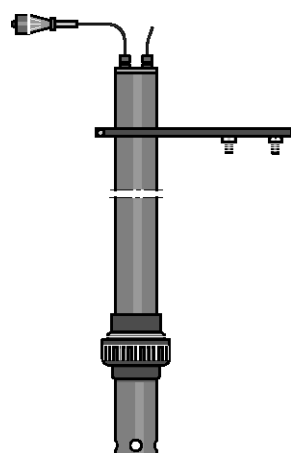
- Max. 7 modules possible on a mounting plate
- More on request

FKM = fluoro rubber



## 1.6 Accessories Sensor Technology

### 1.6.4 Immersion Sensor Fittings



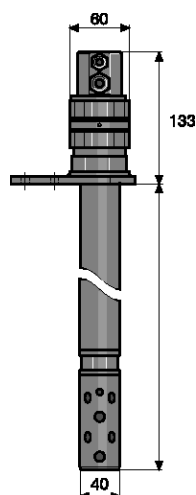
pk\_6\_064

#### PVC immersion assembly, type ETS 1 P

To hold **one** conductivity, Pt 100, pH or ORP sensor with SN6 plug-in head and PG 13.5 screw-in thread (with integrated stainless steel pin as liquid reference potential).

<b>Sensor connector (inner)</b>	SN6 connector
<b>Signal lead connector (outer)</b>	Coax SN6 male connector
<b>Material</b>	Rigid PVC
<b>Type of fitting</b>	Clamping flange with mounting plate
<b>Immersion depth</b>	Variable
<b>Max. temperature</b>	55 °C

	Order no.
ETS 1 P	914950



pk\_6\_080

#### PP immersion assembly type IPHa 1-PP

To hold **one** sensor (e.g. pH, ORP) with PG 13.5 screw-in thread and standard 120 mm length. The inside diameter is sized so that either pH or ORP transducers can be installed. In addition, a stainless steel rod is incorporated as a liquid reference potential. The outside diameter is 40 mm. Immersion depths of 1 and 2 m are offered, however customers can independently lengthen or shorten the immersion pipe. The fitting head contains two cable connectors; measuring lines of 3-7 mm diameter can be led out. Measuring lines are not contained in the scope of supply.

<b>Material</b>	Probe housing material: PP Seal material: FKM
<b>Max. temperature</b>	80 °C
<b>Pressure</b>	Installation at atmospheric pressure
<b>Immersion depth</b>	Max. 1, or 2 m; variable
<b>Immersion lance diameter</b>	40 mm

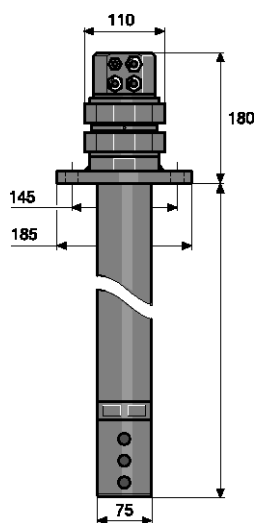
	Length when fitted m	Order no.
IPHa 1-PP	1	1008600
IPHa 1-PP	2	1008601

Other materials available on request.

FKM = fluoro rubber



## 1.6 Accessories Sensor Technology



pk\_6\_081

Fixed flange	DN 40	DN65
Pitch circle	110 mm	145 mm
Screws	4 x M16	4 x M16
Thickness d <sub>2</sub>	18 mm	18 mm
Diameter	150 mm	185 mm

### PP immersion assembly type IPHa 3 -PP

To hold up to **three** sensors (e.g. pH, ORP, temperature) with PG 13.5 screw-in thread and standard 120 mm length. The inside diameter is dimensioned so that up to three pH, ORP or temperature transducers can be installed. In addition a stainless steel rod is incorporated as a liquid reference potential. The outside diameter is 75 mm. Immersion depths of 1 and 2 m are offered, however, customers can independently lengthen or shorten the immersion pipe. The fitting head contains four cable connectors, measuring lines of 3-7 mm diameter can be led out. Measuring lines are not contained in the scope of supply. Technical data is as for fitting IPHa 1, except the immersion tube diameter is 75 mm.

	Length when fitted m	Order no.
IPHa 3-PP	1	1008602
IPHa 3-PP	2	1008603

Other materials available on request.

### Accessories for fitting type IPHa

	Order no.
Immersion pipe mounting for IPHa 1-PP	1008624
Immersion pipe mounting for IPHa 3-PP	1008625
Clamped threaded connector with fixed flange DN 40 according to DIN 2642 for IPHa 1-PP	1008626
Clamped threaded connector with fixed flange DN 65 according to DIN 2642 for IPHa 3-PP	1008627
Clamped threaded connector for welding connection for IPHa 1-PP	1008628
Clamped threaded connector for welding connection for IPHa 3-PP	1008629
Protective (weatherproofed) cover for assembly head for IPHa 1-PP	1008630
Protective (weatherproofed) cover for assembly head for IPHa 3-PP	1008631
Water-retaining basin for IPHa 1-PP	1008632
Water-retaining basin for IPHa 3-PP	1008633
Weatherproof cover PP	1023368

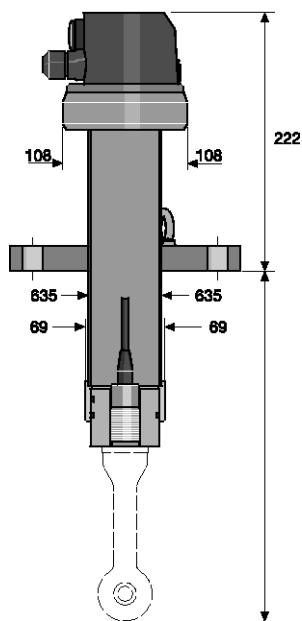
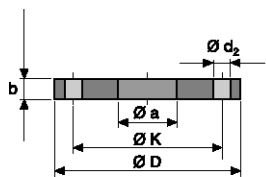
### Weatherproof cover for in-line probe fitting type IMA-ICT 1

For use in immersion assembly, type IMA-ICT 1.

	Order no.
Weatherproof cover PP	1023368



## 1.6 Accessories Sensor Technology



pk\_6\_094

Flange:	DN 80/PN 16
Ø D	200
Ø K	160
Ø d <sub>2</sub>	8 x 18
b	20
Ø a	63.5
Screws	M 16

### Immersion assembly type IMA-ICT 2

To hold one inductive conductivity sensor of type ICT 2.

<b>Material</b>	Fittings: Stainless steel 1.4404 Seal: FKM
<b>Max. temperature</b>	125 °C
<b>Max. pressure</b>	10 bar
<b>Length when fitted</b>	1 m
<b>Immersion lance diameter</b>	70 mm
<b>Flange</b>	Stainless steel flange DN 80 PN 16

#### Order no.

IMA-ICT 2

1023353

Adaptation to processes through flange installation in tank from top.

## 1.6 Accessories Sensor Technology

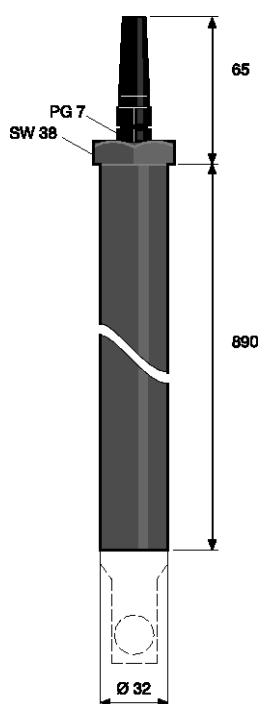
### Immersion assembly type TA-LM

To hold **one** conductivity sensor of type LM and LMP with M 28 thread for side fastening with pipe clips (2 contained in the scope of supply) or with union nut/collar bush/screw-in part for fastening in a tank cover.

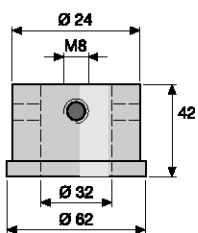
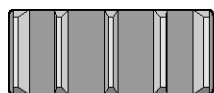
Union nut and screw-in part are to supplied by the customer (standard parts).

<b>Material</b>	PP
<b>Max. temperature</b>	70 °C
<b>Enclosure rating</b>	IP 68
<b>Max. pressure</b>	5.0
<b>Immersion lance diameter</b>	32 mm
<b>Pipe length</b>	890

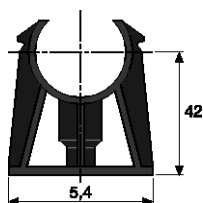
	Length mm	Order no.
<b>TA-LM</b>	890	1020632
<b>Headed bush d50</b>	–	1020634
<b>Extension tube 1000</b>	910	1020633



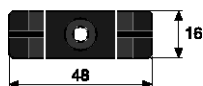
pk\_6\_053



pk\_6\_078



pk\_6\_079



# 1.6 Accessories Sensor Technology

## 1.6.5

## Immersion Sensor Fittings/Adaptors

### Adapter set (T-piece and adapter)

For direct fitting of conductivity, Pt 100, pH or ORP sensors with PG 13.5 screw-in pipework:

	Material	Order no.
90° T-piece DN 20	PVC	1001493
90° T-piece DN 25	PVC	1001494
45° T-piece DN 20	PVC	1001491
45° T-piece DN 25	PVC	1001492

### PVC adapter set for type LM sensors

For direct fitting of type LM conductivity sensors with 3/4" screw-in thread for measuring in the flow.

### For LM(P) 001 conductivity sensors

The sensors are fitted in the straight section of the T-piece.

	Material	Order no.
90° T-joint DN 25	PVC	356410
Adapter DN 25 with 3/4" thread	PVC	356923
90° T-joint DN 25	PP	358674
Adapter with 3/4" thread	PP	356953

### For LM(P) 01 conductivity sensors

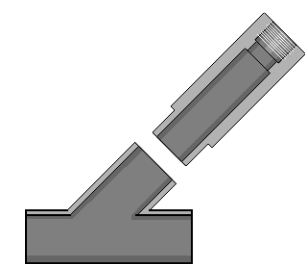
The sensors are fitted in the outlet of the T-piece.

	Material	Order no.
90° T-piece DN 20 - 3/4"	PVC	356455
90° T-piece DN 20 - 3/4"	PP	356471

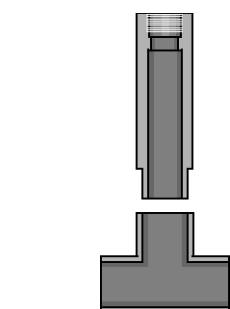
### For LM(P) 1 conductivity sensors

The sensors are fitted in the outlet of the T-piece.

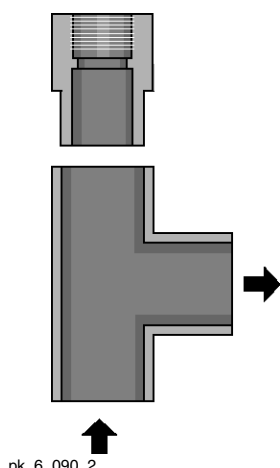
	Material	Order no.
90° T-joint DN 25	PVC	356410
Inline fitting DN 25 - 3/4"	PVC	1020616



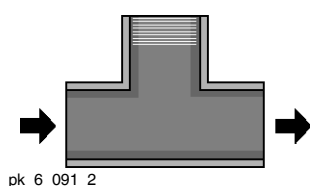
pk\_6\_059



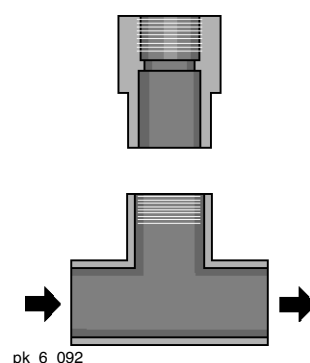
pk\_6\_060



pk\_6\_090\_2

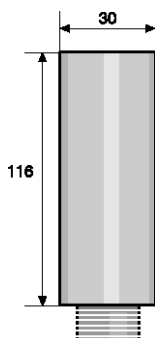


pk\_6\_091\_2



pk\_6\_092

## 1.6 Accessories Sensor Technology



pk\_6\_065

### Adapter PP, PG 13.5

For direct fitting of conductivity, Pt 100, pH or ORP sensors with PG 13.5 screw-in thread in, for example, pipework, tanks:

Max. temp: 80 °C (at atmospheric pressure)

EPDM sealing ring

	Material	Outer thread	Order no.
<b>Adapter DN 20</b>	PP	R 1/2"	1001834
<b>Adapter DN 25</b>	PP	R 3/4"	1001835

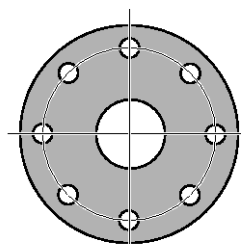
### Adapter, stainless steel, PG 13.5

For direct fitting of conductivity, Pt 100, pH or ORP sensors with PG 13.5 screw-in thread in, for example, pipework, tanks:

Max. temp: 180 °C (at atmospheric pressure)

Sealing ring, FKM (fluorine rubber)

	Material	Outer thread	Order no.
<b>Adapter DN 20</b>	SS	R 1/2"	1020737
<b>Adapter DN 25</b>	SS	R 3/4"	1020738



pk\_6\_093

### Installation kit for type ICT 2 sensors

For direct fitting of the inductive conductivity sensor ICT 2 in pipework and tanks.

	Order no.
<b>Installation kit for type ICT 2 sensors</b>	1023364

#### Kit consisting of

- Stainless steel flange ANSI 2 inch 300 lbs, SS 316L (adaptable to DIN counter flange DN 50 PN 16)
- Nut 3/4" stainless steel

Parts that come into contact with the medium:

- Sealing disk, "2", / PTFE
- Spacer ring, PTFE
- Seal

Fixed flange	ANSI 2"	DN 50
SS 316L	300 lbs	PN 16
Pitch circle	127	125
Screws	M 16	M 16
Thickness	22.2	18
Diameter	165.1	165

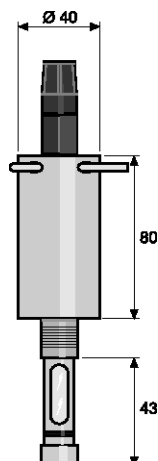
### Welding socket for T-piece (PP) type ICT 1

For connection of the inductive conductivity sensor ICT 1 in PP T-piece.

	Order no.
<b>Welding socket G 2 1/4 inch DN40 PP incl. O-ring FKM</b>	1023371



## 1.6 Accessories Sensor Technology



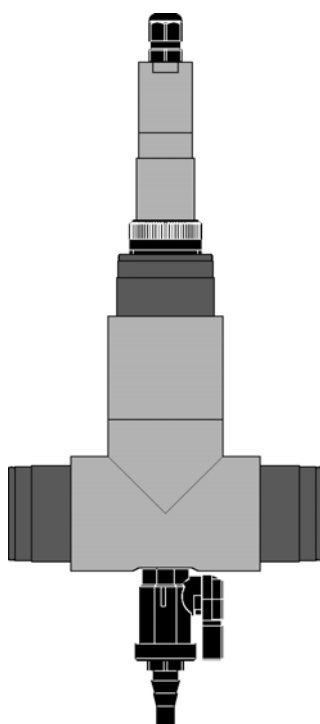
pk\_6\_013

### Retractable sensor housing for pH, ORP sensors WA-PH 1

To hold **one** pH sensor with PG 13.5 screw-in thread and length of between 110-125 mm for fitting in the storage tank or in the flow. The sensor can be removed and fitted for calibration and cleaning without draining the liquid from the storage tank or without interrupting the process in the flow.

<b>Material</b>	PP
<b>Max. temperature</b>	70 °C
<b>Max. pressure</b>	5.0 bar
<b>Thread</b>	3/4"

	Order no.
<b>WA-PH 1</b>	1020631



pk\_6\_110

### Installation fitting INLI for chlorine sensor CLO

The installation valve permits the installation of the sensor for free chlorine types CLO (part no. 1033870, 1033871, 1033878) for operation in the process line (G 1") or in the bypass to the process line. Use either with a free outlet or return of the sample water to the process line. Sample water temperature up to 70 °C/ 2 bar and 40 °C/7 bar. Keep the flow constant.

<b>Max. temperature</b>	70 °C (at 2 bar)
<b>Max. pressure</b>	7 bar (at 40 °C)
<b>Flow for operation of the sensor CLO</b>	400 - 800 l/h

<b>Material</b>	
<b>T-piece and fittings</b>	PP
<b>O-ring</b>	EPDM
<b>Sampling tap</b>	PVDF/FPM
<b>Stopcock</b>	PVDF/FPM
<b>Reducer</b>	Stainless steel 1.4571

<b>Connectors</b>	
<b>Sensor</b>	G 1"
<b>Sampling tap</b>	G 1/4"
<b>Hose on sampling tap</b>	6 x 4 mm
<b>Sample water line</b>	G 1"

	Order no.
<b>Installation fitting for chlorine sensor CLO</b>	1047238

### Accessories

	Order no.
<b>Stopcock</b>	1048213

### Spare Parts

	Order no.
<b>Sampling tap</b>	1047266

## 1.6 Accessories Sensor Technology



pk\_6\_072

### Immersion pipe adapter for dissolved oxygen sensor DO 1-mA-20 ppm

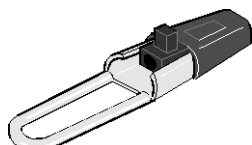
PVC adapter for connection of the DO 1-mA-20 ppm dissolved oxygen sensor to an immersion pipe with 1-1/4 inch internal thread.

Sensors for Dissolved Oxygen See page → 1-79

**Order no.**

**Immersion pipe adapter for DO 1-mA-20 ppm**

1020537



pk\_6\_073

### Mounting bracket for cable of dissolved oxygen sensor DO 1-mA-20 ppm

The stainless steel and polyamide cable bracket is used to guide and fix the sensor cable inside the DO 1-mA-20 ppm dissolved oxygen sensor.

Sensors for Dissolved Oxygen See page → 1-79

**Order no.**

**Cable bracket for DO 1-mA-20 ppm**

1020539

### Pipe adapter for dissolved oxygen sensor DO 2-mA-10 ppm

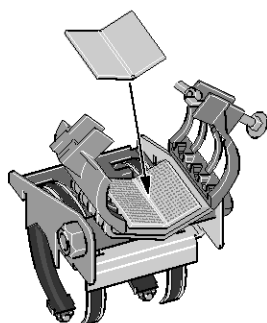
The PVC adapter is a spare part for the DO 2-mA-10 ppm dissolved oxygen sensor. The DO 2-mA-10 dissolved oxygen sensor can be adapted to fit metric or imperial tubing by fitting half of the adapter with 1-1/2 inch outside diameter, the other half with 50 mm outside diameter and at both ends with 1-1/4 inch internally threaded tube attached by means of a corresponding 45° standard angle piece (provided by the customer).

Sensors for Dissolved Oxygen See page → 1-79

**Order no.**

**Pipe adapter for DO 2-mA-10 ppm**

1020538



pk\_6\_010

### Railing bracket for plastic pipes

Stainless steel and plastic bracket for fixing of plastic tubes with 50 mm outside diameter to rails (e.g. on pools in sewage plants). Spare part for "dissolved oxygen" sensor: DO 2-mA-10 ppm.

Sensors for Dissolved Oxygen See page → 1-79

**Order no.**

**Railing bracket for DO 2-mA-10 ppm**

1020536



## 1.7 Application Examples

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**Application and Ordering Examples for the DULCOMETER® Compact See page → 2-34**

**D1Cb and D1Cc Application and Ordering Examples See page → 2-24**

**DACa Application and Ordering Examples See page → 2-8**

**Application Examples: Treatment of Swimming Pool Water in Public Baths See page → 2-83**

**Application Example: Measurement of Key Chemical Water Parameters at Various Points in the Treatment of Drinking Water See page → 2-87**







## 2.0 Measuring and Control Units DULCOMETER®

### 2.0.1

#### Measuring and Control Units DULCOMETER®

DULCOMETER® measuring and control units combine maximum process safety with a broad application spectrum. Different measured variables can be accurately determined. Depending on the application, the control behaviour of DULCOMETER® measuring and control units is adapted to meet the relevant application. Different designs permit flexible use.

##### Advantages at a glance:

- high measuring reliability, e.g. thanks to symmetrical input for pH/ORP
- high measuring accuracy, e.g. thanks high-impedance input for pH/ORP
- minimum disturbance, e.g. thanks to alternating current disturbance suppression
- two-wire technology for disturbance-resistant measurement
- highly versatile thanks to many options and different designs

DULCOMETER® measuring and control units, DULCOTEST® sensors with ProMinent® metering pumps - the complete control cycle, measuring-controlling-metering and recording, everything from one single source.

##### Controller selection table

Function	DACa	Compact	D1Cb	D1Cc
<b>Measured variablen</b>				
pH	✓	✓	✓	✓
ORP	✓	✓	✓	✓
Chlorine	✓	✓	✓	✓
Chlorine dioxide	✓		✓	✓
Chlorite	✓		✓	✓
Bromine	✓		✓	✓
Conductivity, conductive		✓		
Conductivity, inductive		✓		
Conductivity via mA	✓		✓	✓
Peracetic acid	✓		✓	✓
Hydrogen peroxide	✓		✓	✓
Ozone	✓		✓	✓
Dissolved oxygen	✓		✓	✓
Fluoride	✓		✓	✓
0/4...20 mA standard signal general measured variables	✓		✓	✓
<b>Power supply</b>				
90–253 V	✓	✓	✓	✓
<b>Method of installation, degree of protection</b>				
Wall mounted IP 65			✓	
Control panel mounting IP 54, 1/4 DIN				✓
Combination housing (wall-mounting, control panel mounting, pillar assembly) IP 67, IP 54	✓	✓		
<b>Measurement</b>				
Number of measuring channels	1/2 optionally selectable	1	1	1
Sensor monitoring of pH	✓	✓	✓	✓
Temperature compensation for pH	✓	✓	✓	✓
Temperature compensation for conductivity		✓		
pH compensation for chlorine	✓			
<b>Control</b>				
PID controller	✓	✓	✓	✓
1 way controller (e.g. with pH acid or alkali)	✓	✓		
2 way controller (e.g. with pH acid and alkali)	✓		✓	✓
<b>Control inputs</b>				
Digital control inputs	✓, 2/5	✓, 1	✓, 1	✓, 1

## 2.0 Measuring and Control Units DULCOMETER®

Function	DACa	Compact	D1Cb	D1Cc
<b>Control outputs</b>				
Control of metering pump by pulse frequency	✓, 2/4	✓	✓, 2	✓, 2
Control of solenoid valve/motor-driven metering pump	✓	✓	✓	✓
Disturbance variable of flow via mA	✓			
Disturbance variable of flow via frequency (e.g. of contact water meter)	✓			
Metering time monitoring with deactivation of the control variable	✓	✓	✓	✓
Output relay configurable as limit value relay	✓, 2	✓, 1	✓, 2	✓, 2
Cycle timer	✓, 2		✓, 2	✓, 2
Real time timer	✓, 2			
<b>Outputs</b>				
Analogue output 0/4...20 mA	✓, 2/3	✓, 1	✓, 1	✓, 1
<b>Special functions</b>				
Data logger with SD card	✓			
Web server via LAN/WAN	✓			
Parameter set switch-over via timer	✓			
Parameter set switch-over via contact	✓			
PROFIBUS®-DP	✓			
Modbus RTU	✓			
Modbus TCP	✓			
Subsequent extension of functions via enabling code	✓		✓	✓
Operating hour counter	✓		✓	✓



## 2.1 Controller DULCOMETER® diaLog DACa

### 2.1.1

### Controller DULCOMETER® diaLog DACa

#### Transparency of water analysis in the Dialog controller for one or two measuring points



Transparent water analysis with the DULCOMETER® diaLog DACa - all combinations of relevant water treatment sensors can be freely evaluated and all actuators controlled.

The diaLog DACa controller uses intelligent controller functions to close the control circuit between ProMinent DULCOTEST® sensors and ProMinent® metering pumps. It offers special functions for water treatment, like the processing of disturbance variables and switch-over of control parameters.

The controller was developed for continuous measurement and control of the parameters necessary for this and can be configured for one of two measuring channels depending on the application. Sensors from 14 freely selectable measured variables can be connected per channel. The controller can communicate with analogue or digital sensors and actuators.

Popular field buses are available for communication with the control level. The data, calibration and event logger records all measured values, control variables, digital inputs, calibration values, warning and error messages with a time stamp on the SD card.

#### Your benefits

- Lower investment costs: through two independent PID controllers in one unit
- Flexible selection and permits simple subsequent adjustments: 14 different measured variables per channel
- Ready for the world - offers 24 operating languages
- Transparency in troubleshooting: Event, calibration and measured data logger with easy-to-access SD memory card
- Read for integration into your system: with various field bus systems, like PROFIBUS®-DP, PROFINET®, Modbus RTU and Modbus TCP



P\_DM\_0031\_SW1

#### Technical details

##### Measuring range connector type mV:

- pH: 0.00 ... 14.00
- ORP voltage: -1500 ... +1500 mV

##### Connector type mA (amperometric measured variables, measuring ranges according to the sensors):

- Chlorine
- Chlorine dioxide
- Chlorite
- Bromine
- Ozone
- Hydrogen peroxide (PER sensor)
- Hydrogen peroxide (PEROX sensor with transducer)
- Peracetic acid
- Dissolved oxygen

##### Connector type mA (potentiometric measured variables, measuring ranges according to the transmitters):

- pH
- ORP voltage
- Fluoride

**Conductivity (measuring ranges according to the transmitters):** via transmitter 0/4 ... 20 mA

**Temperature:** via Pt 100/Pt 1000, measuring range 0 ... 150 °C

##### Dissolution:

- pH: 0.01
- ORP voltage: 1 mV
- Temperature: 0.1 °C
- Amperometric (chlorine etc.): 0.001/0.01 ppm, 0.01 Vol. %, 0.1 Vol. %

**Accuracy:** 0.3 % based on the full-scale reading

##### Inputs:

**Measuring input:** pH/ORP (input resistance > 0.5 x 10<sup>12</sup> Ω)

**Temperature compensation:** Pt 100/Pt 1000 for pH, chlorine dioxide (CDP) sensor and fluoride

**Temperature correction range:** 0 ... 100 °C

**pH correction range for chlorine:** Sensor CLE 3 and CLE 3.1 6.5 ... 8.5, CBR: 6.5 ... 9.5

## 2.1 Controller DULCOMETER® diaLog DACa

**Disturbance variable** Flow: via 0/4 ... 20 mA or contact water meter, 1 Hz – 500 Hz

**Control characteristic:** PID control

**Control:** 2 bidirectional controllers

**Analogue outputs:** 2 (3) x 0/4 ... 20 mA electrically isolated, max. load 450 Ω, range and assignment (measured, correction, control variable) can be adjusted

**Control outputs:**

- 2 (4) pulse frequency outputs for the control of metering pumps
- 2 relays (limit value, 3-point step or pulse length control)

**Alarm relay:** 250 V ~3 A, 700 VA type of contact: changeover contact

**Digital control inputs:**

2 (5) as a remote control input for the functions pause control/sample water fault, parameter set switch-over, level monitoring of chemical tanks

**Electrical connection:** 100-240 V, ±10 %, 50/60 Hz, 25 VA

**Field bus connection:** PROFIBUS®-DP, PROFINET, Modbus RTU and Modbus TCP

**Permissible operating temperature range:** -5 ... 60 °C (for use indoors or with a protective enclosure)

**Degree of protection:**

- Wall-mounted: IP 67, based on NEMA4X
- Installation in the control cabinet: IP 54

**Tests and certifications:** CE

**Housing material:** PC with flame-proof equipment

**Dimensions:** 250 x 220 x 122 mm (WxHxD)

**Weight:** 1.3 kg

Important note: The values above in brackets provide the data for the 2-channel version.

**Area of application**

- Measurement and control of water parameters in industrial and process water treatment plants
- Measurement of the pH value and disinfection parameters in the food and beverage industry.
- Monitoring of the chlorine dioxide concentration in systems for legionella control and prevention, for example in schools, hotels or hospitals
- Market gardening: Measurement of the disinfection parameters in irrigation and sprinkler irrigation water
- Monitoring of the water parameters in potable water circuits
- Measurement and control of the hygiene parameters in swimming pools

**Standard equipment of the 1-channel design**

- Measuring channel 1 with 14 freely selectable measured variables (via mV or mA). The measured variables conductive or inductive conductivity are provided by the Compact controllers COND\_C (conductive) and COND\_I (inductive).
- PID controller with pulse frequency-based metering pump control for 2 metering pumps.
- 2 analogue outputs for measured value, correction value or control variable (dependent on the optional equipment).
- 2 digital inputs for sample water fault detection, pause and parameter switch-over.
- 2 output relays selectable as limit value, cycle timer, real-time timer or intermittent programmable control output (depending on the optional equipment).
- Measured variables and language selection during commissioning.
- Temperature compensation of the pH, chlorine dioxide (CDP) and fluoride measurement via Pt100/Pt1000.
- 22 operating languages: all European languages as well as Chinese, Russian, Thai, Korean. The operating language is selected during commissioning and can be changed at any time by a keyboard shortcut. The documentation language is selected via the identity code. A data carrier is also supplied that contains all other languages.
- Saving and transfer of device parameterisation by means of the SD card.
- Calibration and event data logger (without SD card, data is saved in the controller).
- Disturbance variable processing (flow) via frequency (contact water meter).
- Subsequent upgrade of the software functions by means of an activation key or firmware update.





## 2.1 Controller DULCOMETER® diaLog DACa

### Optional equipment of the 2-channel version

#### Package 2

- Disturbance variable processing (flow) via mA, or
- pH compensation for chlorine with pH control, or
- External remote setpoint via an analogue signal for channel 1.

#### Package 3

- Second, complete measuring and control channel with PID controller (replaces the D2Ca controller).
- Third analogue output for measured value, correction value or control variable (depending on the optional equipment).
- 3 additional digital inputs, e.g. for level monitoring, pause and sample water alarm for channel 2.
- Temperature compensation of the pH, chlorine dioxide (CDP) and fluoride measurement.

#### Package 4

- Combination of packages 2 and 3

### Communication options

- Measurement data logger with SD card
- Visualisation of the measured data using a web server via LAN or WLAN and a PC/tablet PC plus web browser (available from 3rd quarter 2015)
- PROFIBUS®-DP, Modbus RTU, Modbus TCP (available from 3rd quarter 2015)

### Hardware extension

- Protective RC circuit for output relay: Protects the output relay if inductive loads are to be switched (e.g. solenoid valves or motors).

### A complete measuring station comprises the following:

- Measuring transducer / Controller DACa (see identity code)
- Fitting: DGMa..., DLG III ..., immersible inline probe housing
- pH sensor (identity code-dependent)
- ORP sensor (identity code-dependent)
- Chlorine, chlorine dioxide, chlorite, bromine, dissolved oxygen sensor
- Transducer for pH or ORP dependent on the cable length (> 10 m)
- Sensor cable

(For further information: Immersion Sensor Fittings see p. → 1-122; pH Sensors With SN6 or Vario Pin Plug-in Head see p. → 1-10; ORP Sensors with Fixed Cable see p. → 1-43; Sensors for Chlorine see p. → 1-49; Measuring Transducer 4...20 mA (Two Wire) see p. → 2-102; Sensor Accessories see p. → 1-113)

### Accessories

	Order no.
Cable combination coaxial 0.8 m - SN6 - pre-assembled	1024105
Cable combination coaxial 2 m - SN6 - pre-assembled	1024106
Cable combination coaxial 5 m - SN6 - pre-assembled	1024107
SN6 coaxial connector, retrofit, D1Cb, DACa	1036885
Fitting kit for DAC control panel installation	1041095

## 2.1 Controller DULCOMETER® diaLog DACa

### 2.1.2 Identity Code Ordering System for diaLog DACa, Wall Mounting IP 67

DACa	Version	
00	Wall mounted with ProMinent® logo	
S0	With fitting kit for control cabinet mounting	
<b>Operating voltage</b>		
6	90 ... 253 V, 48/63 Hz	
<b>Channel 1 (the measured variable is selected during initial commissioning)</b>		
1	Measurement + control, 2 pumps, 2 digital inputs, 2 mA outputs	
<b>Channel 2 (the measured variable is selected during initial commissioning or software presetting.)</b>		
0	No 2nd channel	
2	Package 2: Disturbance variable (mA) or external remote setpoint via mA or pH compensation for chlorine (all acting on channel 1)	
3	Package 3: 2nd measurement + control, additionally 2 pumps, additionally 3 control inputs	
4	Package 4: 2nd measurement + control, additionally 2 pumps, additionally 3 control inputs, disturbance variable (mA or frequency), pH compensation for chlorine	
<b>Software presets</b>		
0	No default settings	
1	Batch neutralisation 2 x pH measurement with 1-2 sided controller and final checking	
2	Batch neutralisation 2 x pH measurement with 1-2 sided controller, disturbance variable and final checking	
3	pH-/ORP measurement/control (pH 2 way, ORP 1 way)	
4	pH-/Cl <sub>2</sub> measurement/control (pH 2 way, chlorine 1 way)	
5	pH-/ClO <sub>2</sub> measurement/control (pH 2 way, chlorine dioxide 1 way)	
6	pH-/Cl <sub>2</sub> measurement/control with disturbance variable (pH 2 way, chlorine 1 way)	
7	ClO <sub>2</sub> -/ORP measurement/control (chlorine dioxide 1 way, ORP for monitoring)	
<b>Channel connections</b>		
0	Channel 1 / 2 via terminals (mA and mV)	
1	Channel 1 via SN 6 coaxial connection (only for pH and ORP via mV)	
2	Channel 2 via SN 6 coaxial connection (only for pH and ORP via mV)	
3	Channel 1 and 2 via SN 6 coaxial connection (only for pH and ORP via mV)	
<b>Connection of digital sensors / actuators</b>		
0	None	
<b>Communication interfaces *</b>		
0	None	
2	Modbus RTU	
4	PROFIBUS®-DP	
5	Visualisation via web server/LAN RJ45 (internal)	
6	Visualisation via web server/LAN M12 (external)	
8	Visualisation via web server/WAN	
<b>Data logger</b>		
0	No data logger	
1	Data logger with measured value display and SD card	
<b>Hardware upgrade</b>		
0	None	
1	Protective RC circuit for power relay	
<b>Approvals</b>		
01	None (CE is standard)	
<b>Certificates</b>		
0	None	
<b>Documentation language</b>		
DE	German	
EN	English	
ES	Spanish	
IT	Italian	
FR	French	
FI	Finish	
BG	Bulgarian	
CN	Chinese	
CZ	Czech	
DK	Danish	
EE	Estonian	
GR	Greek	
HU	Hungarian	
JP	Japanese	
KR	Korean	
LT	Lithuanian	
LV	Latvian	
NL	Dutch	
PL	Polish	
PT	Portuguese	
RO	Romanian	
RU	Russian	
SE	Swedish	
SK	Slovakian	
SI	Slovenian	
SV	Swedish	
TH	Thai	

\* Available from 3rd quarter 2015

## 2.1 Controller DULCOMETER® diaLog DACa

### 2.1.3 Retrospective Function Extension for the Controller diaLog DACa

**Requirements:**

**Channel 2 must be available in the controller. Retrofitting of missing hardware must be performed in the factory.**

Channel 2 can be enabled from either package 2 or package 3. The packages correspond to those that are also described in the identity code. The data logger function can always be enabled.

**The activation code can only be used for the relevant controller with the specified serial number.**

The activation code can be transmitted via email and is then read into the controller from the SD card or entered over the controller keypad. The enabled function is then available immediately and need only be activated and parameterised.

The following information must be available to determine the activation key:

- the serial number of the controller in question (see operating menu under <Diagnostics>, <Device information> and
- the desired upgrade packet.

		Order no.
Based on package 2	Upgrade: Package 2 to package 3	1047874
	Upgrade: Package 2 to package 4	1047875
Based on package 3	Upgrade: Package 3 to package 4	1047876

		Order no.
Based on 0=no data logger	Upgrade: Data logger	1047877



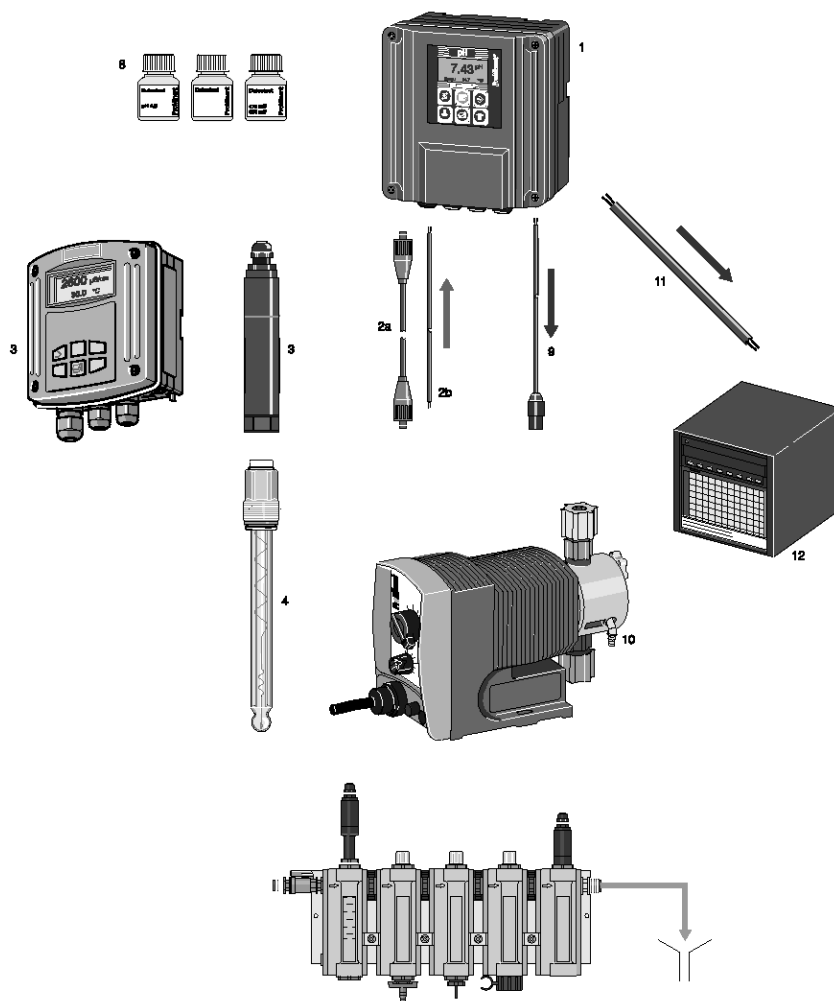
## 2.1 Controller DULCOMETER® diaLog DACa

### 2.1.4 DACa Application and Ordering Examples

The application examples contain typical combinations of components for measuring stations in applications in the areas of swimming pool, drinking water, waste water and the food industry.

#### Components of a complete measuring and control system

- 1 Measuring and control device e.g. DACa
- 2 Measuring line e.g. coaxial cable for pH and ORP sensors, Pt 100x
- 2a Measuring line 2-core for amperometric sensors with mA signal and transducer
- 2b Transducer 4 ... 20 mA (for two wire system), DMTa or pH V1
- 3 Sensor, e.g. pH single-rod sensor
- 4 Fitting e.g. in-line probe housing type DGMA
- 5 Stopcock sample water line
- 6 Sampling tap
- 7 Buffer solutions (pH/ORP)
- 8 Signal cable (metering pump control)
- 10 Actuator e.g. Beta® metering pump



AP\_MSR\_0006\_SW3

#### Examples for:

- 1 Treatment of swimming pool water and decorative wells/fountains
- 2 Potable water monitoring
- 3 Monitoring of waste water (pH neutralisation)
- 4 Applications in the food industry
- 5 Odour reduction during exhaust air scrubbing





## 2.1 Controller DULCOMETER® diaLog DACa

### 2.1.5 Application Examples, Treatment of Swimming Pool Water

#### Private swimming pool with measurement and metering of acid and chlorine based on the ORP value

##### Tasks and applications

The pool water of a private outdoor swimming pool, used for only a short time every year, is to be treated. Sulphuric acid is used to correct the pH and sodium-calcium hypochlorite is used as a disinfectant. The disinfectant is to be regulated on the basis of the ORP value (a comparative calibration with a DPD 1 measurement should be carried out at regular intervals, likewise calibration of the pH sensor).

Type DF2a peristaltic pumps are to be controlled. The sample water flow is to be monitored and upon failure, the controller should stop.

##### Components of the measuring/control station

Quantity		See page	Order no.
1	2-channel controller for pH and ORP diaLog DACa with data logger and protective RC circuit	→ 2-3	DACa006130 00011010EN
1	pH sensor PHES 112 SE	→ 1-11	150702
1	Cable combination coax 2 m - SN6, preconf.	→ 2-71	1024106
1	ORP sensor RHES-Pt-SE	→ 1-33	150703
1	Cable combination coax 2 m - SN6, preconf.	→ 2-71	1024106
1	In-line probe housing DGMa with sample water scale and limit switch	→ 1-120	DGMa 320T000
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

##### Benefits

- Simple operation, controller with plain text operator guidance in 22 languages
- Recording of measured data
- Automatically correct pH value and correct concentration of disinfectant
- All products are selected to operate correctly with each other

#### Private swimming pool with measurement and metering of acid and bromine

##### Tasks and applications

The pool water of a private outdoor swimming pool, used for only a short time every year, is to be treated. Sulphuric acid is used to correct the pH and bromine (BCDMH) is used as a disinfectant, that is dissolved and dosed via a bromine sluice. The disinfectant is to be regulated on the basis of a bromine measurement (a comparative calibration using a DPD 1 measuring unit should be carried out at regular intervals, likewise calibration of the pH sensor). The measured values are to be recorded. A DF2a peristaltic pump for pH correction and the solenoid valve of a bromine sluice are to be controlled. The sample water flow is to be monitored and upon failure, the controller should stop.

##### Components of the measuring/control station

Quantity		See page	Order no.
1	2-channel controller for pH and ORP diaLog DACa with data logger and protective RC circuit	→ 2-3	DACa006130000 11010EN
1	pH sensor PHES 112 SE	→ 1-11	150702
1	Sensor connection cable, coaxial 2 m, SN 6 pre-assembled	→ 1-113	1005672
1	Bromine sensor BCR 1-mA-10 ppm	→ 1-68	1041698
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	In-line probe housing DGMa with sample water scale and limit switch	→ 1-120	DGMa311T000
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

##### Benefits

- Simple operation, controller with plain text operator guidance in 22 languages
- Recording of measured data
- Automatically correct pH value and correct concentration of disinfectant
- All products are selected to operate correctly with each other

## 2.1 Controller DULCOMETER® diaLog DACa

### Private swimming pool with measurement of free chlorine and pH value

#### Tasks and applications

The pool water of a frequently-used private indoor swimming pool is to be treated. Sulphuric acid is used to correct the pH and sodium-calcium hypochlorite is used as a disinfectant. The disinfectant is to be regulated on the basis of the chlorine concentration (a comparative calibration with a DPD 1 measurement should be carried out at regular intervals, likewise calibration of the pH sensor). Beta® 4b metering pumps are to be controlled.

#### Components of the measuring/control station

Quantity		See page	Order no.
1	2-channel controller for pH and chlorine diaLog DACa with data logger	→ 2-3	DACa00613000 010010EN
1	Chlorine sensor CLE 3-mA 2 ppm	→ 1-51	792920
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	pH sensor PHES 112 SE	→ 1-11	150702
1	Cable combination coax 2 m - SN6, preconf.	→ 2-71	1024106
1	In-line probe housing DGMa with sample water scale and limit switch	→ 1-120	DGMa311T000
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

#### Benefits

- Simple operation, controller with plain text operator guidance
- Recording of measured data
- Automatically correct pH value and direct measurement and control of chlorine concentration
- All products are selected to operate correctly with each other

### Oxidation of well water with hydrogen peroxide

#### Tasks and applications

The water of a decorative well or fountain is to be disinfected/oxidised using hydrogen peroxide. The addition of hydrogen peroxide is to be measured. Metering is dependent on the measured value.

If with a control variable of 60 % the setpoint is reached after 1 hour, then metering should enter the basic load settings and an alarm should be set (a calibration of the hydrogen peroxide sensor using a comparative measurement is required at regular intervals).

#### Components of the measuring/control station

Quantity		See page	Order no.
1	1-channel controller for hydrogen peroxide diaLog DACa with data logger	→ 2-3	DACa0061000 0010010EN
1	Hydrogen peroxide sensor PER 1-mA-50 ppm	→ 1-83	1030511
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	DGMa in-line probe housing with sample water limit contact	→ 1-120	DGMa301T000
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

#### Benefits

- Simple operation, controller with plain text operator guidance
- Recording of measured data
- If the setpoint has not been reached within 1 hour, the dosing monitor signals via the alarm relay and sets control to an adjustable basic load
- All products are selected to operate correctly with each other





## 2.1 Controller DULCOMETER® diaLog DACa

### 2.1.6

#### Application Examples, Potable Water Monitoring

##### Measurement and control of ozone in water works for pre-oxidation of the raw water

###### Tasks and applications

In the treatment of potable water in a water works a measuring and control station is needed at the pre-oxidation stage at the inlet to the water works for the ozone oxidising and disinfectant agent used. With a constant flow, the fluctuating attrition of the ozone, caused by the changing quality of the raw water, is to be compensated on the basis of the measured variables. The following conditions must be met:

- Oxidising agent / disinfectant: Ozone with a concentration to be set to 0.2 ppm
- Raw water: Surface water with a pH of 7.3-7.6 and a temperature of 5 °C-17 °C
- Installation of the measuring station in the bypass of the process flow
- Alarm to signal transgression of upper and lower limit values
- Display of measured results and calibration via a measuring instrument in the proximity of the bypass installation and transmission of the measured value to the control desk via an electrically isolated 4-20 mA signal
- Alarm to signal lowering of sample water flow

###### Components of the measuring/control station

Quantity		See page	Order no.
1	1-channel controller for ozone diaLog DACa with data logger	→ 2-3	DACa00610000 010010EN
1	Ozone sensor OZE 3-mA-2 ppm	→ 1-77	792957
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	DGMa in-line probe housing with sample water limit contact	→ 1-120	DGMa301T000
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

###### Benefits

- Precise, self-regulating process management with changing raw water quality by the completely automated measuring and control station with variable-dependent control of ozone concentration
- Reliable, safe operation thanks to alarm signalling in the event of limit value transgression and lowering of sample water flow
- The control is monitored by transmission of the measured value as an electrically isolated 4-20 mA output signal by the controller to the control panel

##### Waterworks with control measurement of chlorine

###### Tasks and applications

The chlorine concentration in the outlet of a water works is to be monitored. Metering is performed with the volume proportional to the water flow. A MID with a 4-20 mA output signal directly controls a metering pump.

If the setpoint is not reached for at least 5 minutes, then a limit value relay should switch and signal via a signal generator that the stroke length of the metering pump must be increased. Conversely, monitoring should also be performed to determine if too much chlorine has been dosed (calibration of the chlorine sensor should be performed at regular intervals by means of a DPD 1 comparative measurement).

###### Components of the measuring/control station

Quantity		See page	Order no.
1	1-channel controller for chlorine diaLog DACa with data logger	→ 2-3	DACa00610000 010010EN
1	Chlorine sensor CLE 3-mA-0.5 ppm	→ 1-51	792927
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	DGMa in-line probe housing with sample water limit contact	→ 1-120	DGMa301T000
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

###### Benefits

- Simple operation, controller with plain text operator guidance
- Recording of measured data
- Signalling via a limit value relay if the setpoint has been reached after 5 minutes.
- All products are selected to operate correctly with each other

## 2.1 Controller DULCOMETER® diaLog DACa

### Measurement and control of free chlorine with feedforward control in a waterworks

#### Tasks and applications

A measuring and control station is needed for the "free chlorine" disinfectant in the treatment of drinking water in a water works. Metering is largely proportional to the flow (4...20 mA). However control can also be proportionately variable-dependent to compensate for peaks of chlorine loss, for instance in the event of rainfall. The following conditions must be met:

- Disinfectant: free chlorine with an adjustable concentration of 0.2 mg/l
- Raw water: source water with a pH of 7.0-7.5 and a temperature of 1-13 °C
- Installation of the measuring station in the bypass of the process flow
- Display of measured results and calibration via a measuring instrument in the proximity of the bypass installation and transmission of the measured value and control variable to the control panel via PROFIBUS®-DP
- Alarm to signal lowering of sample water flow (via PROFIBUS®-DP)
- Alarm signalling the transgression of the preset upper and lower limit values (via PROFIBUS®-DP)
- The measured data are to be recorded in the controller.

#### Components of the measuring/control station

Quantity		See page	Order no.
1	1-channel controller for chlorine with feedforward control diaLog DACa with data logger	→ 2-3	DACa0061200 0410010EN
1	Chlorine sensor CLE 3-mA-0.5 ppm	→ 1-51	792927
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	DGMa in-line probe housing with sample water limit contact	→ 1-120	DGMa301T000
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

#### Benefits

- Precise, self-regulating disinfection by a fully automated measuring and control station
- Flow-proportional control can be safeguarded by proportionate variable-dependent control to combat peaks of attrition
- Reliable, safe operation thanks to alarm signalling in the event of limit value transgression and lowering of sample water flow
- The control is monitored by transmission of the measured value and control variable via the PROFIBUS®-DP to the control panel

### Waterworks with measurement of chlorine dioxide

#### Tasks and applications

The chlorine dioxide concentration in the outlet of a water works is to be monitored. Metering is in the first place performed with the volume proportional to the water flow. A flow meter with a 4-20 mA output signal is used.

If the proportionality is not sufficient, then up to 20 % of the control variable is made available by the controller in an additive manner (a calibration of the chlorine dioxide sensor by means of a DPD 1 comparative measurement is required at regular intervals). The DACa controller pulse frequency is used to control the ProMinent Bello Zon® chlorine dioxide generation system.

#### Components of the measuring/control station

Quantity		See page	Order no.
1	2-channel controller for chlorine dioxide diaLog DACa with data logger	→ 2-3	DACa0061000 0010010EN
1	Chlorine dioxide sensor CDE 2-mA-0.5 ppm	→ 1-71	792930
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	DGMa in-line probe housing with sample water limit contact	→ 1-120	DGMa301T000
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

#### Benefits

- Simple operation, controller with plain text operator guidance
- Recording of measured data
- Primarily, chlorine dioxide metering proportional to flow; where this is not possible additive measured-value dependent control
- All products are selected to operate correctly with each other





## 2.1 Controller DULCOMETER® diaLog DACa

### Legionella prevention in public buildings

#### Tasks and applications

The chlorine dioxide and the chlorite concentration are to be monitored and recorded in the fresh water distribution system of a public building for the prevention of Legionella. Chlorite is a disinfection by-product of chlorine dioxide that arises if germs have been killed. The chlorite concentration is limited using a limit value of 0.2 mg/l.

#### Components of the measuring/control station

Quantity		See page	Order no.
1	2-channel controller for pH and chlorine diaLog DACa with data logger	→ 2-3	DACa00613000 010010EN
1	Chlorine dioxide sensor CDE 2-mA-0.5 ppm	→ 1-71	792930
5 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	Chlorite sensor CLT 1-mA-0.5 ppm	→ 1-75	1021596
5 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	DGMa in-line probe housing with sample water limit contact	→ 1-120	DGMa302T000
5 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

#### Benefits

- Simple operation, controller with plain text operator guidance
- Recording of all measured data
- Upon exceeding of the chlorite limit value, a limit value relay switches the chlorine dioxide metering off or to a basic load.
- All products are selected to operate correctly with each other

### Oxidation of well water with hydrogen peroxide

#### Tasks and applications

The water drawn from a deep well is to be oxidised using hydrogen peroxide. The addition of hydrogen peroxide is to be measured. Metering is dependent on the measured value.

If with a control variable of 60 % the setpoint is reached after 1 hour, then metering should enter the basic load settings and an alarm should be set (a calibration of the hydrogen peroxide sensor using a comparative measurement is required at regular intervals).

#### Components of the measuring/control station

Quantity		See page	Order no.
1	1-channel controller for hydrogen peroxide diaLog DACa with data logger	→ 2-3	DACa00610000 010010EN
1	Hydrogen peroxide sensor PER 1-mA-50 ppm	→ 1-83	1030511
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	DGMa in-line probe housing with sample water limit contact	→ 1-120	DGMa301T000
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

#### Benefits

- Hygienic trouble-free well water
- Simple operation, controller with plain text operator guidance
- Recording of measured data
- If the setpoint has not been reached within 1 hour, the dosing monitor signals via the alarm relay and sets control to an adjustable basic load
- All products are selected to operate correctly with each other

## 2.1 Controller DULCOMETER® diaLog DACa

### 2.1.7

#### Application Examples, Waste Water Monitoring

##### Neutralisation of the waste water of an industrial plant (non-steady receipt of water)

###### Tasks and applications

Turbid waste water with a significantly fluctuating pH value and intermittent occurrence is to be neutralised in batch mode. The waste water is pumped into an intermediate tank and in the process is neutralised using acid and alkali. The pH value should be measured and regulated in a stirred batch tank. The pH sensor should be fitted at a typical position on the tank using an immersion fitting. Once it has been neutralised the water is pumped onwards and the pH value should be controlled again in this pipe.

The DACa controller data logger automatically records the pH values and temperatures of both pH measuring points. In parallel, a digital input is used to record the proximity switch of the storage tank outlet. In this way it can be precisely determined how high the pH value was at the time of draining. Any limit value transgressions that may have occurred are also recorded in the data logger. If a limit value transgression occurs, the shut-off valve closes automatically. Additionally, a neutral zone is defined in the controller. If the pH value comes within this neutral zone, no control takes place. There may be solids in the waste water.

###### Components of the pH measuring/control station in the collection tank

Quantity		See page	Order no.
1	2-channel controller for pH and ORP diaLog DACa with data logger and protective RC circuit	→ 2-3	DACa006130 00011010EN
1	Cable combination coaxial 5 m - SN6 - pre-assembled	→ 1-113	1024107
1	DULCOTEST® pH sensor PHER 112 SE	→ 1-15	1001586
1	Temperature sensor Pt 100 SE	→ 1-46	305063
1	Cable combination controller cable 5 m - S SN6, open-ended (Pt 100, Pt 1000)	→ 1-114	1003208
1	Immersion fitting with 3 sensor slots IPHa 3-PP	→ 1-123	1008602
1	Cable combination coaxial 5 m - SN6 - pre-assembled	→ 1-123	1008633

###### Components of the measuring/control station in the outlet

Quantity		See page	Order no.
1	DULCOTEST® pH sensor PHER 112 SE	→ 1-15	1001586
1	Cable combination coaxial 5 m - SN6 - pre-assembled	→ 1-113	1024107
1	Retractable process assembly WA-PH 1	→ 1-128	1020631

**Note:** the use of other sensors is also possible depending on the quality of the waste water (see DULCOTEST® pH Sensor Selection Guide → 1-1)

With seriously contaminated waste water with solid matter content

Quantity	Name	See page	Order no.
1	pH sensor PHEX 112 SE	→ 1-16	305096

With clear waste water

Quantity	Name	See page	Order no.
1	pH sensor PHEP 112 SE	→ 1-13	150041

###### Benefits

- Simple operation, controller with plain text operator guidance in 22 languages
- Recording of all measured data and the opened or closed status of the shut-off valve
- pH limit value monitoring for the waste water
- pH control and final checking in a controller
- All products are selected to operate correctly with each other





## 2.1 Controller DULCOMETER® diaLog DACa

### Neutralisation of the waste water of an industrial plant (continuous receipt of water)

#### Tasks and applications

In an industrial plant, waste water arises in a continuous manner (continuous production), and can be acidic or alkaline. The water runs through a manifold. The flow volume is measured using a MID flow meter because the flow varies within wide limits. There is a pH sensor with a pH gate value and changeover valve in the pipe with which the pH value is adjusted. Further along the piping the pH value is used once again as a final check.

The flow signal of the MID is evaluated as a multiplicative disturbance variable in the DACa controller, i.e. this flow signal = disturbance variable is used to evaluate the controller control variable (control of the metering pumps) in a flow dependent manner. If a control deviation exists (deviation of the current value from the setpoint), for example, with a reduced flow less acid or alkali is necessary that with an increased flow. Provision of this information makes it easier for the controller to adhere to the setpoint. In the absence of such flow information, a PID controller alone could not perform such a task or could only perform it with great difficulty. Additionally, a neutral zone is defined in the controller. If the pH value comes within this neutral zone, no control takes place.

There may be solids in the waste water.

The DACa controller data logger automatically records the pH values and temperatures of both pH measuring points. Any limit value transgressions that may have occurred are also recorded in the data logger.

#### Components of the pH measuring/control station in the collection tank

Quantity		See page	Order no.
1	2-channel controller for 2 x pH and temperature diaLog DACa with data logger	→ 2-3	DACa0061400 0011010EN
1	DULCOTEST® pH sensor PHER 112 SE	→ 1-15	1001586
1	Cable combination coaxial 5 m - SN6 - pre-assembled	→ 1-113	1024107
1	Retractable process assembly WA-PH 1	→ 1-128	1020631

#### Components of the measuring/control station in the outlet

Quantity		See page	Order no.
1	DULCOTEST® pH sensor PHER 112 SE	→ 1-15	1001586
1	Cable combination coaxial 5 m - SN6 - pre-assembled	→ 1-113	1024107
1	Retractable process assembly WA-PH 1	→ 1-128	1020631

**Note:** the use of other sensors is also possible depending on the quality of the waste water (see DULCOTEST® pH Sensor Selection Guide → 1-1)

With seriously contaminated waste water with solid matter content

Quantity	Name	See page	Order no.
1	pH sensor PHEX 112 SE	→ 1-16	305096

With clear waste water

Quantity	Name	See page	Order no.
1	pH sensor PHEP 112 SE	→ 1-13	150041

#### Benefits

- Simple operation, controller with plain text operator guidance in 22 languages
- Processing of the flow signal as a disturbance variable
- Recording of all measured data and the opened or closed status of the shut-off valve
- pH limit value monitoring for the waste water
- pH control and final checking in a controller
- All products are selected to operate correctly with each other



## 2.1 Controller DULCOMETER® diaLog DACa

### 2.1.8

### Application Examples in the Food Industry

#### Bottler disinfection in the beverage industry

##### Tasks and applications

Continuous disinfection of the filler with disinfection solution means this sensitive part of the bottling process is reliably sterilised. Continuous spraying with disinfectant solution means high hygiene requirements are fulfilled,

The disinfectant solution comprises water with additional chlorine dioxide. The concentration of the chlorine dioxide is measured and set to the desired value using the DACa controller. From time to time the chlorine dioxide concentration must be increased.

An alternative parameter set can be activated in the DACa via a switch input. In this way a regularly required switchover can be smoothly implemented without the necessity for continual adaptation of the setpoint in the controller menu.

The measured data are to be recorded.

##### Components of the measuring/control station

Quantity		See page	Order no.
1	2-channel controller for chlorine dioxide diaLog DACa with data logger	→ 2-3	DACa0061000 0010010EN
1	Chlorine dioxide sensor CDR 1-mA-2 ppm	→ 1-73	1033393
1	DGMa in-line probe housing with sample water limit contact	→ 1-120	DGMa301T000
5 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

##### Benefits

- Simple operation, controller with plain text operator guidance in 22 languages
- Recording of all measured data
- Switchover of control parameters via an external potential-free contact
- All products are selected to operate correctly with each other

#### Irrigation water disinfection for useful plants

##### Tasks and applications

The irrigation water from e.g. salad seedlings is drawn from a well. The water could be contaminated with germs which could harm the salad seedlings. To prevent this, the irrigation water is disinfected using chlorine dioxide. The irrigation water requirement varies. Consequently, the irrigation water volume flow is measured. The irrigation water volume flow is used as an additive disturbance variable to control the adding of chlorine dioxide dependent on the required chlorine dioxide concentration and the irrigation water flow.

All measured data are to be recorded. The irrigation water may contain suspended matter.

##### Components of the measuring/control station

Quantity		See page	Order no.
1	2-channel controller for chlorine dioxide with additive feedforward control diaLog DACa with data logger	→ 2-3	DACa0061200 0010010EN
1	Chlorine dioxide sensor CDR 1-mA-2 ppm	→ 1-73	1033393
5 m	Coaxial cable, Ø 5 mm, 10.0 m – S	→ 1-113	305040
1	DGMa in-line probe housing with sample water limit contact	→ 1-120	DGMa301T000
5 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

##### Benefits

- Simple operation, controller with plain text operator guidance in 22 languages
- Processing of the irrigation water flow signal as a disturbance variable
- Recording of all measured data
- Switchover of control parameters via an external potential-free contact
- All products are selected to operate correctly with each other







## 2.1 Controller DULCOMETER® diaLog DACa

### 2.1.9

### Odour Reduction Application Examples (Clarification Plants)

#### Exhaust air scrubbers, clarification plants or fragrance production

##### Tasks and applications

The odorous components of the exhaust air from a clarification plant are to be scrubbed out using an exhaust air scrubber and oxidised using hydrogen peroxide. Here the hydrogen peroxide concentration is to be regulated to maintain 100 mg/l. As the exhaust air is acidic, the pH value is to be regulated to maintain 7.2. The measured values are to be recorded. The scrubbing water temperature can vary widely in the range 5 - 35 °C. Beta® 4b metering pumps are to be pulse frequency controlled.

##### Components of the measuring/control station

Quantity		See page	Order no.
1	2-channel controller for pH and chlorine diaLog DACa with data logger	→ 2-3	DACa006130 00010010EN
1	pH sensor PHES 112 SE	→ 1-11	150702
1	Sensor connection cable, coaxial 2 m, SN 6 pre-assembled	→ 1-113	1005672
1	H <sub>2</sub> O <sub>2</sub> sensor PEROX-H2.10 P	→ 1-84	792976
1	PEROX transducer V2, measuring range switchable up to 20/200/2,000 mg/l	→ 1-84	1034100
5 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	Temperature sensor Pt 100 SE	→ 1-46	305063
1	Cable combination controller cable 5 m - S SN6, open-ended (Pt 100, Pt 1000)	→ 1-114	1003208
1	Reference electrode REFP-SE	→ 1-46	1018458
1	DLG III A/B with PVC hose connection	→ 1-119	914955
1	Polishing paste (90 g tube)	→ 1-46	559810
1	Magnetic stirrer 100-240 V	–	790915
1	Magnetic stirring bar PTFE (magnetic stir bar)	–	790917
1	Photometer DT3B	→ 2-100	1039317

##### Benefits

- Simple operation, controller with plain text operator guidance in 22 languages
- Recording of all measured data
- Simultaneous measurement and control of the pH value and the hydrogen peroxide concentration
- All products are selected to operate correctly with each other

## 2.2 Measuring and Control Unit for all Measured Variables DULCOMETER® D1Cb/D1Cc

### 2.2.1

### Measuring and Control Unit for all Measured Variables DULCOMETER® D1Cb/D1Cc

#### The water analysis workhorse



The controller DULCOMETER® D1Cb/D1Cc can be used for control tasks in potable water treatment, waste water treatment and many other areas. Safe, convenient and clear, thanks to the large illuminated graphic display, plain text operating menu and pH sensor monitoring.

The D1Cb/D1Cc controller is a 1-channel P/PID controller for the measured variable pH, ORP, chlorine, chlorine dioxide, chlorite, ozone, bromine, peracetic acid, hydrogen peroxide, fluoride, dissolved oxygen and conductivity via mA. The sensors for pH and ORP can be directly connected via coaxial cable or using the 4-20 mA sensor input. The controller can bidirectionally control the measured variables, monitor limit values and transmit the measured value via an mA output, e.g. to a PLC. The mA output can optionally also be configured as a controlled variable output. The controller has two pulse frequency outputs to control two metering pumps (raise and lower). Two output relays can optionally be used as limit value relays or to control motor-driven pumps or solenoid valves. An alarm relay signals the occurrence of a fault. A digital input is used to switch off the control or to process a sample water limit contact by remote control. The impact of temperature on the measurements can be provided by temperature measurement or by manual input. Menu-driven operation is possible in 22 languages.

#### Your benefits

- Flexibility through free selection of variables from all measured variables
- Safety through sensor monitoring of pH for glass breakage and line breakage
- Flexibly upgradable, thanks to subsequent activation option of functions by means of an activation code
- Various installation options: wall-mounted or installation in a control cabinet

#### Technical details

##### Measuring ranges:

##### Connection type mV:

- pH: 0.00 ... 14.00
- ORP: - 1,000 ... + 1,000 mV

##### Connector type mV:

- Chlorine: 0.00...0.500/ 2.00/5.00/10.0/20.0/50.0/100.0 ppm
- Chlorine dioxide: 0.00...0.500/2.00/10.0/20.0 ppm
- Chlorite: 0.02...0.50/0.1...2 ppm
- Bromine: 0.02...2.0/0.1...10.0 ppm
- Ozone: 0.00...2.00 ppm
- Hydrogen peroxide, only with sensor PER1: 2.0...200.0/20...2,000 ppm
- Peracetic acid: 1...20/10...200/100...2,000 mg/l
- Dissolved oxygen: 0.1...10/0.1...20 ppm
- pH: 0.00...14.00
- ORP: 0...+1,000 mV
- Conductivity: 0...20/200/1,000 mS/cm only via mA transducer
- Temperature: 0...100 °C via mA transducer

##### Dissolution:

- pH: 0.01 pH
- ORP: 1 mV
- Amperometric (chlorine etc.): 0.001/ 0.01 ppm, 0.01 Vol. %

**Accuracy:** 0.5 % of the full-scale reading

**Measuring inputs:** pH/ORP (input resistance > 0.5 x 10<sup>12</sup> Ω)

**Correction variable:** Temperature via Pt 100/Pt 1000

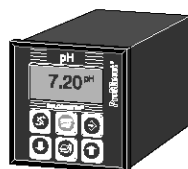
**Temperature correction range:** 0 ... 100 °C

**Control characteristic:** P/PID control

**Control:** Bidirectional control

#### Signal current output:

- 1 x 0/4-20 mA electrically isolated
- Max. load 450 Ω
- Range and assignment (measured, correction or control variable) can be adjusted



pk\_5\_002  
D1Cb (top), D1Cc (bottom)



## 2.2 Measuring and Control Unit for all Measured Variables DULCOMETER® D1Cb/D1Cc

### Control output:

- 2 pulse frequency outputs for control of the metering pump
- 2 relays (limit value or pulse length)

### Alarm relay:

- 250 V ~3 A, 700 VA
- Changeover contact type

**Electrical connection:** 100 - 240 V  $\pm 10\%$ , 50/60 Hz, 15 VA

**Permissible operating temperature range:** -5 ... +50 °C

### Degree of protection:

- Wall-mounted: IP 65
- Control panel installation: IP 54

### Dimensions:

- Wall-mounted: 198 x 200 x 76 mm (WxHxD) (D1Cb)
- Control panel installation: 96 x 96 x 145 mm (WxHxD) (D1Cc)

**Weight:** 0.8 kg

### Area of application

- Measurement and control of water parameters in industrial and process water treatment plants
- Waste water neutralisation
- Measurement of the pH value and the disinfection parameters in potable water treatment and in the food and beverage industry.
- Measurement and control of the hygiene parameters in swimming pools
- Flexibly upgradable thanks to subsequent activation option for functions by means of activation key (see D1Ub/D1Uc upgrade identity code)
- Equipped for the most important basic requirements in water treatment
- Illuminated graphic display
- Operator guidance through clear text menu available in 22 languages in the controller
- Automatic buffer detection for pH calibration

D1Ub Identity Code Ordering System, Subsequent Function Upgrade for D1Cb see page → 2-23

### A complete measurement station comes with:

- Measuring transducer/controller D1Cb/D1Cc (see Identity code)
- Fitting: DGMa..., DLG III ..., immersed fitting
- pH sensor (corresponding to Identity code)
- ORP sensor (corresponding to Identity code)
- Chlorine, chlorine dioxide, chlorite, bromine, dissolved oxygen sensor
- Transducer for pH or ORP (corresponding to Identity code)
- Sensor cable

### Accessories

	Order no.
Cable combination coaxial 0.8 m - SN6 - pre-assembled *	1024105
Cable combination coaxial 2 m - SN6 - pre-assembled *	1024106
Cable combination coaxial 5 m - SN6 - pre-assembled *	1024107
SN6 coaxial connector, retrofit, D1Cb, DACa	1036885
Protective RC circuit, retrofit kit for D1Cb	1034238
Spare parts kits D1Cc (frame, support brackets)	790130

\* For measured variable connection = 5

## 2.2 Measuring and Control Unit for all Measured Variables DULCOMETER® D1Cb/D1Cc

### 2.2.2 Identity Code Ordering System DULCOMETER® D1Cb, Wall Mounting

D1Cb	Installation									
	W	Wall mounting (IP 65)								
		<b>Version</b>								
		00	With ProMinent logo							
			<b>Power supply</b>							
		6	90...253 V, 48/63 Hz (wide-range power supply)							
			<b>Approvals</b>							
		01	CE approval							
			<b>Hardware add-on I</b>							
		0	None							
			<b>Hardware add-on II</b>							
		0	None							
		1	RC protection for power relays							
			<b>External connection</b>							
		0	None							
			<b>Software defaults</b>							
		U	Software default setting (all of the following selection options are automatically set to the default setting)							
		V	Software pre-set (the following selection options must be evaluated)							
			<b>Measured variable presetting</b>							
		0	Universal (choice upon commissioning)							
		A	Peracetic acid							
		B	Bromine							
		C	Chlorine							
		D	Chlorine dioxide							
		F	Fluoride							
		H	Hydrogen peroxide (PER1)							
		I	Chlorite							
		P	pH							
		R	ORP							
		S	0/4...20 mA Standard signal, general							
		T	Temperature via mA transducer							
		X	Dissolved oxygen							
		Z	Ozone							
		L	Conductivity via mA transducer							
			<b>Connection of the measured variable (presetting)</b>							
		1	mA terminal can be switched to mV, all measured variables selectable							
		2	SN6 plug for P or R or standard signal 0/4-20mA, all measured variables selectable							
		5	mV terminal can be switched to mA, all measured variables can be selected							
			<b>Correction variable</b>							
		0	None							
		2	Temperature Pt 100/1000 via terminal (for pH and conductivity)							
		4	Manual temperature entry (for pH and conductivity)							
			<b>Control input</b>							
		0	None							
		1	Pause control							
			<b>Signal output</b>							
		0	None							
		1	1 Analogue signal output 0/4...20 mA							
			<b>Relay control</b>							
		G	Alarm and 2 limit value relays or 2 timer relays							
		M	Alarm and 2 solenoid valve relays or 2 timer relays							
			<b>Pump control</b>							
		0	None							
		2	2 pumps via pulse frequency							
			<b>Control characteristic</b>							
		0	None							
		1	P-control							
		2	PID control							
			<b>Language</b>							
		00	no default							
		DE	German							
		EN	English							
		ES	Spanish							
		SV	Swedish							
		PT	Portuguese							
		CN	Chinese							
		FR	French							
		CZ	Czech							
		JP	Japanese							
		KR	Korean							
		NO	Norwegian							
		NL	Dutch							
		PL	Polish							
		RU	Russian							
		TH	Thai							
		HU	Hungarian							
		IT	Italian							
		DK	Danish							
		FI	Finish							
		GR	Greek							



## 2.2 Measuring and Control Unit for all Measured Variables DULCOMETER® D1Cb/D1Cc

### 2.2.3 Identity Code Ordering System DULCOMETER® D1Cc, Control Panel Mounting

D1Cc	Type of mounting
D	Control panel installation (IP 54)
<b>Design</b>	
00	With ProMinent logo
<b>Operating voltage</b>	
6	90...253 V, 48/63 Hz (wide voltage power supply)
<b>Certification</b>	
01	CE mark
<b>Hardware extension I</b>	
0	None
<b>Hardware extension II</b>	
0	None
<b>External connection</b>	
0	None
<b>Software default settings</b>	
U	Software basic setting (all of the following selection options are automatically set to the basic setting)
V	Software pre-set (the following selection options must be evaluated)
<b>Measured variable default setting</b>	
0	Universal (choice upon commissioning)
A	Peracetic acid
B	Bromine
C	Chlorine
D	Chlorine dioxide
F	Fluoride
H	Hydrogen peroxide (PER1)
I	Chlorite
P	pH
R	ORP
S	0/4...20 mA standard signal, general
T	Temperature via mA transducer
X	Dissolved oxygen
Z	Ozone
L	Conductivity via mA transducer
<b>Measured variable connection (default setting)</b>	
1	mA terminal can be switched to mV, all measured variables can be selected
5	mV terminal can be switched to mA, all measured variables can be selected
<b>Correction variable</b>	
0	None
2	Temperature Pt 100/1000 via terminal (for pH and conductivity)
4	Manual temperature input (for pH and conductivity)
<b>Control input</b>	
0	None
1	Pause control
<b>Signal output</b>	
0	None
1	1 analog signal output 0/4...20 mA
<b>Power activation</b>	
G	Alarm and 2 limit value relays or 2 timer relays
M	Alarm and 2 solenoid valve relays or 2 timer relays
<b>Pump activation</b>	
0	None
2	2 pumps via pulse frequency
<b>Control characteristic</b>	
0	None
1	Proportional control
2	PID control
<b>Language</b>	
00	no default setting
DE	German
EN	English
ES	Spanish
SV	Swedish
PT	Portuguese
CN	Chinese
FR	French
CZ	Czech
JP	Japanese
KR	Korean
NO	Norwegian
NL	Dutch
PL	Polish
RU	Russian
TH	Thai
HU	Hungarian
IT	Italian
DK	Danish
FI	Finish
GR	Greek

If software default setting **U** = software default setting is selected, the measured variables pH or ORP can be selected during commissioning. The menu language is automatically requested.

The connection of the measured variable is 5 = mV input for pH/ORP via shield clamp.

With all other options, the default settings (first option) are selected.

The controller with software with default settings can also be ordered with an order number.

<b>Controller in basic setting D1CbW00601000U01000G0000</b>	<b>Order no.</b> 1036423
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## 2.2 Measuring and Control Unit for all Measured Variables DULCOMETER® D1Cb/D1Cc

Subsequent activation of functions is possible at any time using an activation code.

This activation key can only be used with the controller with the specified serial number. The activation code can be provided by phone, fax or e-mail and can be simply entered into the control keyboard. The new function is then available and need only be enabled and parametrised.

The following information is essential to obtain the activation code:

- Serial number of the controller (refer to nameplate or operator menu under "General Settings and Information")
- Current identity code of the controller (refer to operator menu under "General Settings and Information")
- Required identity code





## 2.2 Measuring and Control Unit for all Measured Variables DULCOMETER® D1Cb/D1Cc

### 2.2.4 D1Ub Identity Code Ordering System, Subsequent Function Upgrade for D1Cb

D1Ub	Software defaults
	Software pre-set
	<b>Default - measured variable</b>
0	Universal (choice of measured variable upon commissioning)
	<b>Connection of measured variable</b>
1	Standard signal 0/4-20 mA, all measured variables and mV input for pH/ORP (standard)
	<b>Correction variable</b>
0	None
2	Temperature Pt100/Pt1000 via terminal (for pH and conductivity)
4	Manual temperature entry (for pH and conductivity)
	<b>Control input</b>
0	None
1	Pause control
	<b>Signal output</b>
0	None
1	1 analogue signal output 0/4-20 mA
	<b>Power control</b>
G	Alarm and 2 limit value relays or 2 timer relays
M	Alarm and 2 solenoid valve relays or 2 timer relays
	<b>Pump control</b>
0	None
2	2 pumps via pulse frequency
	<b>Control modes</b>
0	None
1	P control
2	PID control
	<b>Language</b>
00	No default

### 2.2.5 D1Ub Identity Code Ordering System, Subsequent Function Upgrade for D1Cc

D1Uc	Software defaults
	Software preset
	<b>Default - measured variable</b>
0	Universal (choice of measured variable upon commissioning)
	<b>Connection of measured variable</b>
1	Standard signal 0/4-20 mA, all measured variables and mV input for pH/ORP (standard)
	<b>Correction variable</b>
0	None
2	Temperature Pt100/Pt1000 via terminal (for pH and conductivity)
4	Manual temperature input (for pH and conductivity)
	<b>Control input</b>
0	None
1	Pause control
	<b>Signal output</b>
0	None
1	1 Analogue signal output 0/4-20 mA
	<b>Power control</b>
G	Alarm and 2 limit value relays or 2 timer relays
M	Alarm and 2 solenoid valve relays or 2 timer relays
	<b>Pump control</b>
0	None
2	2 pumps via pulse frequency
	<b>Control modes</b>
0	None
1	Proportional control
2	PID control
	<b>Language</b>
00	No default setting

## 2.2 Measuring and Control Unit for all Measured Variables DULCOMETER® D1Cb/D1Cc

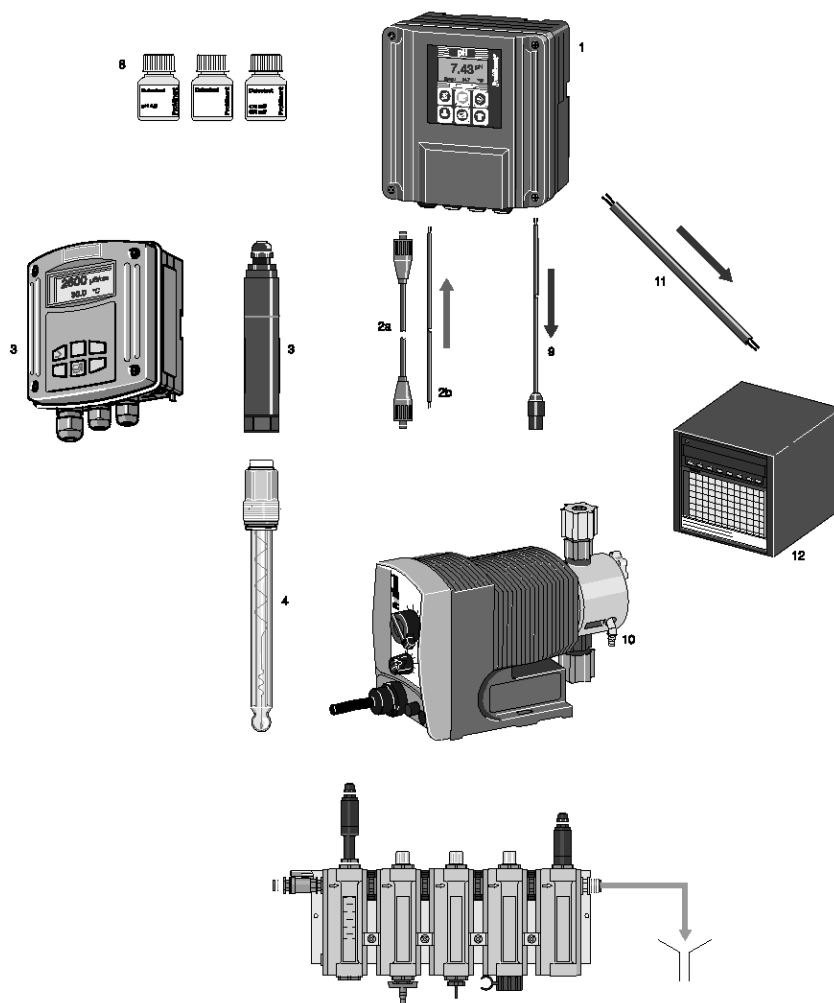
### 2.2.6

### D1Cb and D1Cc Application and Ordering Examples

The application examples contain typical combinations of components for measuring stations in applications in the areas of swimming pool, drinking water, waste water and the food industry.

#### Components of a complete measuring and control system

- 1 Measuring and control device e.g. DACa
- 2a Measuring line e.g. coaxial cable for pH and ORP sensors, Pt 100x
- 2b Measuring line 2-core for amperometric sensors with mA signal and transducer
- 3 Transducer 4 ... 20 mA (for two wire system), DMTa or pH V1
- 4 Sensor, e.g. pH single-rod sensor
- 5 Fitting e.g. in-line probe housing type DGMA
- 6 Stopcock sample water line
- 7 Sampling tap
- 8 Buffer solutions (pH/ORP)
- 9 Signal cable (metering pump control)
- 10 Actuator e.g. Beta® metering pump



AP\_MSR\_0006\_SW3

#### Examples for:

- 1 Treatment of swimming pool water and decorative wells/fountains
- 2 Potable water monitoring
- 3 Treatment and monitoring of waste water (pH neutralisation)
- 4 Applications in the food industry





## 2.2 Measuring and Control Unit for all Measured Variables DULCOMETER® D1Cb/D1Cc

### 2.2.7 Application Examples, Treatment of Swimming Pool Water

#### Private swimming pool with measurement and metering of acid and chlorine based on the ORP value

##### Tasks and applications

The pool water of a private outdoor swimming pool, used for only a short time every year, is to be treated. Sulphuric acid is used to correct the pH and sodium-calcium hypochlorite is used as a disinfectant. The disinfectant is to be regulated on the basis of the ORP value (a comparative calibration with a DPD 1 measurement should be carried out at regular intervals, likewise calibration of the pH sensor).

Type DF2a peristaltic pumps are to be controlled. The sample water flow is to be monitored and upon failure, the controller should stop.

##### Components of the measuring/control station

Quantity		See page	Order no.
1	1 channel controller D1Cb, pH	→ 2-18	D1CBW00601010 VP5010M21EN
1	pH sensor PHES 112 SE	→ 1-11	150702
1	Cable combination coax 2 m - SN6, preconf.	→ 2-71	1024106
1	1 channel controller D1Cb, ORP	→ 2-18	D1CBW00601010 VR5010M21EN
1	ORP sensor RHES-Pt-SE	→ 1-33	150703
1	Sensor connection cable, coaxial 2 m, SN 6 pre-assembled	→ 1-113	1005672
1	In-line probe housing DGMa with sample water scale and limit switch	→ 1-120	DGMa 320T000
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

##### Benefits

- Simple operation, controller with plain text operator guidance in 22 languages
- Automatically correct pH value and correct concentration of disinfectant
- All products are selected to operate correctly with each other

#### Private swimming pool with measurement and metering of acid and bromine

##### Tasks and applications

The pool water of a private outdoor swimming pool, used for only a short time every year, is to be treated. Sulphuric acid is used to correct the pH and bromine (BCDMH) is used as a disinfectant, that is dissolved and dosed via a bromine sluice. The disinfectant is to be regulated on the basis of a bromine measurement (a comparative calibration using a DPD 1 measuring unit should be carried out at regular intervals, likewise calibration of the pH sensor). The measured values are to be recorded. A DF2a peristaltic pump for pH correction and the solenoid valve of a bromine sluice are to be controlled. The sample water flow is to be monitored and upon failure, the controller should stop.

##### Components of the measuring/control station

Quantity		See page	Order no.
1	1 channel controller D1Cb, pH	→ 2-18	D1CBW00601010 VP5010M21EN
1	pH sensor PHES 112 SE	→ 1-11	150702
1	Sensor connection cable, coaxial 2 m, SN 6 pre-assembled	→ 1-113	1005672
1	1 channel controller D1Cb, bromine	→ 2-18	D1CBW00601010 VB1010M21EN
1	Bromine sensor BCR 1-mA-10 ppm	→ 1-68	1041698
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	In-line probe housing DGMa with sample water scale and limit switch	→ 1-120	DGMa311T000
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

## 2.2 Measuring and Control Unit for all Measured Variables DULCOMETER® D1Cb/D1Cc

### Benefits

- Simple operation, controller with plain text, operator guidance in 22 languages, display of measurement data
- Automatically correct pH value and correct concentration of disinfectant
- All products are selected to operate correctly with each other

### Private swimming pool with measurement of free chlorine and pH value

#### Tasks and applications

The pool water of a frequently-used private indoor swimming pool is to be treated. Sulphuric acid is used to correct the pH and sodium-calcium hypochlorite is used as a disinfectant. The disinfectant is to be regulated on the basis of the chlorine concentration (a comparative calibration with a DPD 1 measurement should be carried out at regular intervals, likewise calibration of the pH sensor). Beta® 4b metering pumps are to be controlled.

#### Components of the measuring/control station

Quantity		See page	Order no.
1	1 channel controller D1Cb, pH	→ 2-18	D1CBW0060101 0VP5010M21EN
1	pH sensor PHES 112 SE	→ 1-11	150702
1	Sensor connection cable, coaxial 2 m, SN 6 pre-assembled	→ 1-113	1005672
1	1 channel controller D1Cb, chlorine	→ 2-18	D1CBW0060101 0VC5010M21EN
1	Chlorine sensor CLE 3-mA 2 ppm	→ 1-51	792920
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	In-line probe housing DGMa with sample water scale and limit switch	→ 1-120	DGMa311T000
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

### Benefits

- Simple operation, controller with plain text operator guidance
- Automatically correct pH value and direct measurement and control of chlorine concentration
- All products are selected to operate correctly with each other

## 2.2 Measuring and Control Unit for all Measured Variables DULCOMETER® D1Cb/D1Cc

### Oxidation of well water with hydrogen peroxide

#### Tasks and applications

The water of a decorative well or fountain is to be disinfected/oxidised using hydrogen peroxide. The addition of hydrogen peroxide is to be measured. Metering is dependent on the measured value.

If with a control variable of 60 % the setpoint is reached after 1 hour, then metering should enter the basic load settings and an alarm should be set (a calibration of the hydrogen peroxide sensor using a comparative measurement is required at regular intervals).

#### Components of the measuring/control station

Quantity		See page	Order no.
1	1 channel controller D1Cb, bromine	→ 2-18	D1CBW0060101 0VH1010M21EN
1	Hydrogen peroxide sensor PER 1-mA-50 ppm	→ 1-83	1030511
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	In-line probe housing DGMa with sample water scale and limit switch	→ 1-120	DGMa311T000
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

#### Benefits

- Simple operation, controller with plain text operator guidance
- If the setpoint has not been reached within 1 hour, the dosing monitor signals via the alarm relay and sets control to an adjustable basic load
- All products are selected to operate correctly with each other



## 2.2 Measuring and Control Unit for all Measured Variables DULCOMETER® D1Cb/D1Cc

### 2.2.8

### Application Examples, Potable Water Monitoring

#### Waterworks with control measurement of chlorine

##### Tasks and applications

The chlorine concentration in the outlet of a water works is to be monitored. Metering is performed with the volume proportional to the water flow. A MID with a 4-20 mA output signal directly controls a metering pump.

If the setpoint is not reached for at least 5 minutes, then a limit value relay should switch and signal via a signal generator that the stroke length of the metering pump must be increased. Conversely, monitoring should also be performed to determine if too much chlorine has been dosed (calibration of the chlorine sensor should be performed at regular intervals by means of a DPD 1 comparative measurement).

##### Components of the measuring/control station

Quantity		See page	Order no.
1	1 channel controller D1Cb, chlorine	→ 2-18	D1CBW00601010 VD1010G21EN
1	Chlorine sensor CLE 3-mA-0.5 ppm	→ 1-51	792927
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	DGMa in-line probe housing with sample water limit contact	→ 1-120	DGMa301T000
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

##### Benefits

- Simple operation, controller with plain text operator guidance
- Signalling via a limit value relay if the setpoint has been reached after 5 minutes.
- All products are selected to operate correctly with each other

#### Legionella prevention in public buildings

##### Tasks and applications

The chlorine dioxide and the chlorite concentration are to be monitored and recorded in the fresh water distribution system of a public building for the prevention of Legionella. Chlorite is a disinfection by-product of chlorine dioxide that arises if germs have been killed. The chlorite concentration is limited using a limit value of 0.2 mg/l.

##### Components of the measuring/control station

Quantity		See page	Order no.
1	1 channel controller D1Cb, chlorine dioxide	→ 2-18	D1CBW0060101 OVD1010M21EN
1	Chlorine dioxide sensor CDE 2-mA-0.5 ppm	→ 1-71	792930
1 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	1 channel controller D1Cb, chlorite	→ 2-18	D1CBW0060101 OVI1010M21EN
1	Chlorite sensor CLT 1-mA-0.5 ppm	→ 1-75	1021596
1 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	DGMa in-line probe housing with sample water limit contact	→ 1-120	DGMa302T000
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

##### Benefits

- Simple operation, controller with plain text operator guidance
- Upon exceeding of the chlorite limit value, a limit value relay switches the chlorine dioxide off or to a basic load.
- All products are selected to operate correctly with each other

## 2.2 Measuring and Control Unit for all Measured Variables DULCOMETER® D1Cb/D1Cc

### Oxidation of well water with hydrogen peroxide

#### Tasks and applications

The water drawn from a deep well is to be oxidised using hydrogen peroxide. The addition of hydrogen peroxide is to be measured. Metering is dependent on the measured value.

If with a control variable of 60 % the setpoint is reached after 1 hour, then metering should enter the basic load settings and an alarm should be set (a calibration of the hydrogen peroxide sensor using a comparative measurement is required at regular intervals).

#### Components of the measuring/control station

Quantity		See page	Order no.
1	1 channel controller D1Cb, hydrogen peroxide	→ 2-18	D1CBW00601010V H1010G21EN
1	Hydrogen peroxide sensor PER 1-mA-50 ppm	→ 1-83	1030511
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	DGMa in-line probe housing with sample water limit contact	→ 1-120	DGMa301T000
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

#### Benefits

- Simple operation, controller with plain text operator guidance
- If the setpoint has not been reached within 1 hour, the dosing monitor signals via the alarm relay and sets control to an adjustable basic load
- All products are selected to operate correctly with each other



## 2.2 Measuring and Control Unit for all Measured Variables DULCOMETER® D1Cb/D1Cc

### 2.2.9

### Application Examples, Waste Water Monitoring

#### Neutralisation of the waste water of an industrial plant

##### Tasks and applications

In an industrial plant, waste water arises in an intermittent manner (batch production), and can be acidic or alkaline. The water is collected in a storage tank. There is a stirrer in the storage tank, a pH immersion fitting with wet holding cup, based on which the pH value is adjusted. The discharge connecting piece, which can be closed off using a shut-off valve with a limit switch, of a storage tank contains a pH sensor with a pH changeover device, which is used for the final check.

If a limit value transgression occurs, the shut-off valve closes automatically. Additionally, a neutral zone is defined in the controller. If the pH value comes within this neutral zone, no control takes place. There may be solids in the waste water.

##### Components of the pH measuring/control station in the collection tank

Quantity		See page	Order no.
1	1 channel controller D1Cb, pH	→ 2-18	D1CBW0060101 OVP5010M21EN
1	DULCOTEST® pH sensor PHER 112 SE	→ 1-15	1001586
1	Cable combination coaxial 5 m - SN6 - pre-assembled	→ 1-113	1024107
1	Temperature sensor Pt 100 SE	→ 1-46	305063
1	Cable combination controller cable 5 m - S SN6, open-ended (Pt 100, Pt 1000)	→ 1-114	1003208
1	Immersion fitting with 3 sensor slots IPHa 3-PP	→ 1-123	1008602
1	Cable combination coaxial 5 m - SN6 - pre-assembled	→ 1-123	1008633

##### Components of the measuring/control station in the outlet

Quantity		See page	Order no.
1	1 channel controller D1Cb, pH	→ 2-18	D1CBW0060101 OVP5010M21EN
1	DULCOTEST® pH sensor PHER 112 SE	→ 1-15	1001586
1	Cable combination coaxial 5 m - SN6 - pre-assembled	→ 1-113	1024107
1	Retractable process assembly WA-PH 1	→ 1-128	1020631

Note: The use of other sensors is also possible depending on the quality of the waste water (see DULCOTEST® pH Sensor Selection Guide → 1-1)

with seriously contaminated waste water with solid matter content

Quantity	Name	See page	Order no.
1	pH sensor PHEX 112 SE	→ 1-16	305096

with clear waste water

Quantity	Name	See page	Order no.
1	pH sensor PHEP 112 SE	→ 1-13	150041

##### Benefits

- The waste water pH value is within the specified limit values
- Simple operation, controller with plain text operator guidance in 22 languages
- pH limit value monitoring for the waste water
- All products are selected to operate correctly with each other





## 2.2 Measuring and Control Unit for all Measured Variables DULCOMETER® D1Cb/D1Cc

### 2.2.10 Application Examples in the Food Industry

#### Bottler disinfection in the beverage industry

##### Tasks and applications

Continuous disinfection of the filler with disinfection solution means this sensitive part of the bottling process is reliably sterilised. Continuous spraying with disinfectant solution means high hygiene requirements are fulfilled.

The disinfectant solution comprises water with additional chlorine dioxide. The concentration of the chlorine dioxide is measured and set to the desired value using the D1Cb controller.

##### Components of the measuring/control station

Quantity		See page	Order no.
1	1 channel controller D1Cb, chlorine	→ 2-18	D1CBW0060101 0VD1010G21EN
1	Chlorine dioxide sensor CDR 1-mA-2 ppm	→ 1-73	1033393
5 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	DGMa in-line probe housing with sample water limit contact	→ 1-120	DGMa301T000
5 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

##### Benefits

- Hygienic trouble-free bottling
- Simple operation, controller with plain text operator guidance in 22 languages
- All products are selected to operate correctly with each other

#### Irrigation water disinfection for useful plants

##### Tasks and applications

The irrigation water from e.g. salad seedlings is drawn from a well. The water could be contaminated with germs which could harm the salad seedlings. To prevent this, the irrigation water is disinfected using chlorine dioxide. The irrigation water requirement is always constant.

The irrigation water may contain suspended matter.

##### Components of the measuring/control station

Quantity		See page	Order no.
1	1 channel controller D1Cb, chlorine	→ 2-18	D1CBW0060101 0VD1010G21EN
1	Chlorine dioxide sensor CDR 1-mA-2 ppm	→ 1-73	1033393
5 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122
1	DGMa in-line probe housing with sample water limit contact	→ 1-120	DGMa301T000
5 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

##### Benefits

- Irrigation water does not harm the seedlings
- Simple operation, controller with plain text operator guidance in 22 languages
- Switchover of control parameters via an external potential-free contact
- All products are selected to operate correctly with each other

## 2.3 Measuring and Control Unit for pH/ORP, Chlorine and Conductivity DULCOMETER® Compact

### 2.3.1

### Measuring and Control Unit for pH/ORP, Chlorine and Conductivity DULCOMETER® Compact

#### Compact yet fully equipped - the basic water analysis unit

As a controller in water analysis, the DULCOMETER® Compact is the correct controller for control tasks that require only a 1 way control.

The DULCOMETER® Compact controller is a one-channel PID controller for the measured variables pH, ORP, chlorine and inductive conductivity. It can monodirectionally control the measured variable, monitor limit values and transmit the measured value via an mA output, e.g. to a PLC. The mA output can optionally also be configured as a controlled variable output. The controller has one pulse frequency output to control one metering pump. One output relay can optionally be used as an alarm or limit value or to control motor-driven metering pumps or solenoid valves. A digital input is used to switch off the control or to process a sample water limit contact by remote control. The impact of temperature on the measurements can be provided by temperature measurement or by manual input. Menu-driven operation is language-independent.

#### Your benefits

- Flexibility in the choice of measured variable with pH and ORP
- Always the optimum measured value resolution by auto-ranging with conductivity measurement
- Depending on the requirement, various display options for conductivity, such as: Conductivity, TDS (Total Dissolved Solids), salinity and specific resistance
- Safety through sensor monitoring of pH for glass breakage and line breakage
- Various installation options: wall-mounted, installation on an upright or in a control cabinet



P\_DM\_0025\_SW1

#### Technical details

##### Measuring ranges:

- pH: 0.00 ... 14.00
- ORP: - 1,000 ... + 1,000 mV
- Chlorine: 0.05 ... 5 ppm, shock dosing up to 12 ppm for max. 12 h
- Conductive conductivity: 1 µS/cm ... 200 mS/cm (auto-ranging, only 2 electrode sensors)
- Inductive conductivity: with ICT 1 sensor: 200 µS/cm ... 1,000 mS/cm (auto-ranging), with ICT 2 sensor: 20 µS/cm ... 2,000 mS/cm

##### Dissolution:

- pH: 0.01
- ORP: 1 mV
- Chlorine: 0.01 ppm
- Conductivity: depending on the measuring range 0.1/ 1 µS/cm, 1 mS/cm

**Accuracy:** 0.5 % based on the full-scale reading

**Temperature compensation range:** 0 ... 120 °C, chlorine 1 ... 45 °C

**Control:** Monodirectional PID control with selectable control direction

##### Inputs:

- Sensor input for the relevant measured variable
- Temperature sensor input: pH: Pt 1000, chlorine and conductivity: Pt 100/ Pt 1000
- 1 digital input as a remote control input for the functions pause control/sample water fault

##### Outputs:

- 1 pulse frequency output for the control of metering pumps
- 1 active 0/4...20 mA output configurable as a measured or control variable, max. load: 400 Ω
- 1 output relay used as a changeover contact, can be configured as an alarm, limit value or pulse width-modulated control output for motor-driven metering pumps

**Cell constant, conductive conductivity:** 0.05 cm<sup>-1</sup> ... 12.0 cm<sup>-1</sup>

**Power supply:** 100-240 V, ± 10 %, 50/60 Hz, 5 W

**Permissible operating temperature:** -10 ... +60 °C

**Degree of protection:** IP 67, based on NEMA4X

**Dimensions:** 135 x 125 x 75 mm (H x W x D)

**Weight:** 0.5 kg

#### Area of application

- Measurement and control of water parameters in industrial and process water treatment plants
- Permeate monitoring in reverse osmosis systems
- Measurement and control of the hygiene parameters in swimming pools





## 2.3 Measuring and Control Unit for pH/ORP, Chlorine and Conductivity DULCOMETER® Compact

### 2.3.2 Identity Code Ordering System DULCOMETER® Compact, Wall Mounting IP 67

DCCa	Type of mounting
W	Wall/pipe mounting IP 67
S	With fitting kit for control panel mounting IP 54
	<b>Design</b>
00	With ProMinent® logo
	<b>Operating voltage</b>
6	90 ... 253 V, 48/63 Hz
	<b>Measured variable</b>
C0	Free chlorine
PR	pH/ORP (switchable)
L3	Conductive conductivity (unit designation: COND_C)
L6	Inductive conductivity (unit designation: COND_I)
	<b>Hardware extension</b>
0	None
	<b>Certifications</b>
01	CE (Standard)
	<b>Certificates</b>
0	None
	<b>Documentation language</b>
DE	german
EN	english
ES	spanish
IT	italian
FR	french
FI	finnish
BG	bulgarian
CN	chinese
CZ	czech
GR	greek
HU	hungarian
JP	japanese
KR	korean
LT	lithuanian
LV	latvian
NL	dutch
PL	polish
PT	portuguese
RO	romanian
RU	russian
SE	swedish
SK	slovakian
SI	slovenian
SV	swedish
TH	thai

### 2.3.3 Accessories

Name of the item	Order no.
Cable combination coaxial 0.8 m - SN6 - pre-assembled *	1024105
Cable combination coaxial 2 m - SN6 - pre-assembled *	1024106
Cable combination coaxial 5 m - SN6 - pre-assembled *	1024107
Panel mounting kit DCCa	1037273
Chlorine sensor CLB 2-µA-5 ppm	1038902
Chlorine sensor CLB 3-µA-5 ppm	1041696

## 2.3 Measuring and Control Unit for pH/ORP, Chlorine and Conductivity DULCOMETER® Compact

### 2.3.4 Application and Ordering Examples for the DULCOMETER® Compact

The application examples contain typical combinations of components for measuring stations in applications in the areas of swimming pool, drinking water and waste water.

#### Components of a complete measuring and control system

- 1 Treatment of swimming pool water and decorative wells/fountains
- 2 Potable water monitoring
- 3 Treatment and monitoring of waste water (pH neutralisation)

### 2.3.5 Application Examples, Treatment of Swimming Pool Water

#### Private swimming pool with measurement and metering of acid and chlorine based on the ORP value

##### Tasks and applications

The pool water of a private outdoor swimming pool, used for only a short time every year, is to be treated. Sulphuric acid is used to correct the pH and sodium-calcium hypochlorite is used as a disinfectant. The disinfectant is to be regulated on the basis of the ORP value (a comparative check with a DPD 1 measurement should be carried out at regular intervals, likewise calibration of the pH sensor).

Type DF2a peristaltic pumps are to be controlled. The sample water flow is to be monitored and upon failure, the controller should stop.

##### Components of the measuring/control station

Quantity		See page	Order no.
1	Compact controller for pH	→ 2-32	DCCaW006P R0010EN
1	pH sensor PHES 112 SE	→ 1-11	150702
1	Cable combination coax 2 m - SN6, preconf.	→ 2-71	1024106
1	Compact controller for ORP	→ 2-32	DCCaW006P R0010EN
1	ORP sensor RHES-Pt-SE	→ 1-33	150703
1	Sensor connection cable, coaxial 2 m, SN 6 pre-assembled	→ 1-113	1005672
1	In-line probe housing DGMa with sample water scale and limit switch	→ 1-120	DGMa 320T000
4 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

##### Benefits

- Operation is simple and independent of the operating language
- Automatically correct pH value and correct concentration of disinfectant
- All products are selected to operate correctly with each other

#### Private swimming pool with measurement of free chlorine and pH value

##### Tasks and applications

The pool water of a frequently-used private indoor swimming pool is to be treated. Sulphuric acid is used to correct the pH and sodium-calcium hypochlorite is used as a disinfectant. The disinfectant is to be regulated on the basis of the chlorine concentration (a comparative calibration with a DPD 1 measurement should be carried out at regular intervals, likewise calibration of the pH sensor). Beta® 4b metering pumps are to be controlled.





## 2.3 Measuring and Control Unit for pH/ORP, Chlorine and Conductivity DULCOMETER® Compact

### Components of the measuring/control station

Quantity		See page	Order no.
1	Compact controller for pH	→ 2-32	DCCaW006PR0010EN
1	pH sensor PHES 112 SE	→ 1-11	150702
1	Sensor connection cable, coaxial 2 m, SN 6 pre-assembled	→ 1-113	1005672
1	Compact controller for chlorine	→ 2-32	DCCaW006C00010EN
1	CLB 2-µA-5 ppm	→ 1-58	1038902
1	In-line probe housing DGMA with sample water scale and limit switch	→ 1-120	DGMA320T000
4 m	Control line LiYY 2 x 0.25 mm² Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

### Benefits

- Operation is simple and independent of the operating language
- Automatically correct pH value and direct measurement and control of chlorine concentration
- All products are selected to operate correctly with each other

### 2.3.6 Application Examples, Potable Water Monitoring

#### Waterworks with control measurement of chlorine and pH

##### Tasks and applications

The chlorine concentration in the outlet of a water works is to be monitored. Metering is performed with the volume proportional to the water flow. A magnetically induced flow meter with a 4-20 mA output signal directly controls a metering pump.

If the setpoint is not reached for at least 5 minutes, then a limit value relay should switch and signal via a signal generator that the stroke length of the metering pump must be increased. Conversely, monitoring should also be performed to determine if too much chlorine has been dosed (calibration of the chlorine sensor should be performed at regular intervals by means of a DPD 1 comparative measurement).

### Components of the chlorine measuring/control station

Quantity		See page	Order no.
1	Compact controller for chlorine	→ 2-32	DCCaW006C00010EN
1	CLB 2-µA-5 ppm	→ 1-58	1038902
1	DGMA in-line probe housing with sample water limit contact	→ 1-120	DGMA310T000
2 m	Control line LiYY 2 x 0.25 mm² Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

### Components of the pH measuring/control station

Quantity		See page	Order no.
1	Compact controller for pH	→ 2-32	DCCaW006PR0010EN
1	DULCOTEST® pH-Sensor PHEP-112-SE	→ 1-13	150041
1	Sensor connection cable, coaxial 2 m, SN 6 pre-assembled	→ 1-113	1005672
1	DGMA in-line probe housing with sample water limit contact	→ 1-120	DGMA310T000
2 m	Control line LiYY 2 x 0.25 mm² Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

### Benefits

- Operation is simple and independent of the operating language
- Signalling via a limit value relay if the setpoint has been reached after 5 minutes.
- All products are selected to operate correctly with each other

## 2.3 Measuring and Control Unit for pH/ORP, Chlorine and Conductivity DULCOMETER® Compact

### Waterworks with control measurement of conductivity

#### Tasks and applications

The conductive conductivity in the outlet of a water works is to be monitored. The measured value is to be transmitted to a PLC via a 4-20 mA analogue signal.

#### Components of the measuring/control station

Quantity		See page	Order no.
1	Compact controller for conductive conductivity	→ 2-32	DCCaW006L 30010EN
1	Conductivity sensor measuring range 20 mS/cm, type LFTK 1	→ 1-98	1002822
1	Screened sensor cable LF, 5 m	→ 1-114	1046026
1	DGMa in-line probe housing with sample water limit contact	→ 1-120	DGMa 310T000
2 m	Control line LiYY 2 x 0.25 mm <sup>2</sup> Ø 4 mm 2 m (e.g.: flow sensor)	→ 1-115	725122

#### Benefits

- Operation is simple and independent of the operating language
- Signalling via a limit value relay if the setpoint has been reached after 5 minutes.
- All products are selected to operate correctly with each other

### 2.3.7

### Application Examples, Waste Water Monitoring

#### Neutralisation of the waste water of an industrial plant

##### Tasks and applications

In an industrial plant, waste water arises in an intermittent manner (batch production), the water is always acidic (or always alkaline). The water is collected in a storage tank. There is a stirrer in the storage tank, a pH immersion fitting with wet holding cup, based on which the pH value is adjusted. The storage tank discharge connecting piece contains a pH sensor with a pH changeover device, which is used for the final check.

The control is one-way, i.e. acidic or alkaline. There may be solids in the waste water. The measured values are transferred via the 4-20 mA analogue signal.

#### Components of the pH measuring/control station in the collection tank

Quantity		See page	Order no.
1	Compact controller for pH	→ 2-32	DCCaW006 PR0010EN
1	DULCOTEST® pH sensor PHER 112 SE	→ 1-15	1001586
1	Cable combination coaxial 5 m - SN6 - pre-assembled	→ 1-113	1024107
1	Pt 1000 Temperature sensor	→ 1-46	1002856
1	Cable combination controller cable 5 m - S SN6, open-ended (Pt 100, Pt 1000)	→ 1-114	1003208
1	Immersion fitting with 3 sensor slots IPHa 3-PP	→ 1-123	1008602

#### Components of the measuring/control station in the outlet

Quantity		See page	Order no.
1	Compact controller for pH	→ 2-32	DCCaW006 PR0010EN
1	DULCOTEST® pH sensor PHER 112 SE	→ 1-15	1001586
1	Cable combination coaxial 5 m - SN6 - pre-assembled	→ 1-113	1024107
1	Retractable process assembly WA-PH 1	→ 1-128	1020631

Note: The use of other sensors is also possible depending on the quality of the waste water (see DULCOTEST® pH Sensor Selection Guide → 1-1)

For seriously contaminated waste water with solid matter content

Quantity	Name	See page	Order no.
1	pH sensor PHEX 112 SE	→ 1-16	305096

## 2.3 Measuring and Control Unit for pH/ORP, Chlorine and Conductivity DULCOMETER® Compact

For clear waste water

Quantity	Name	See page	Order no.
1	pH sensor PHEP 112 SE	→ 1-13	150041

### Benefits

- Operation is simple and independent of the operating language
- pH limit value monitoring for the waste water
- All products are selected to operate correctly with each other



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.1

### Controller DULCOMARIN® II

#### Transparency of water analysis in the Dialog controller for one or two measuring points

Controller DULCOMARIN® II for water analysis: Green technology with energy and chemical saving function. Control of circulating pumps and filter backwash is possible.

The ProMinent DULCOMARIN® II control system manages your entire swimming pool and your hot tub: from water treatment to filter control, pool cover, attractions, water heating, solar control, pool and external lighting. System information and messages are clearly and graphically visualised on the coloured display. At the same time, the information can also be transmitted via the internet to a tablet PC or smartphone. Coupling to a building bus is simply possible via KNX, PROFIBUS®-DP, Modbus RTU or OPC. Based on the modern bus technology DULCO®-NET, the system is capable of growing to meet requirements and can be extended at any time. The application can be used in high-end private pools, school or hotel swimming pools or even in public leisure pools. Depending on requirements, a potable water treatment system or legionella prevention system can also be integrated. Almost all customer requirements can be met thanks to the integral SoftPLC. The DISINFECTION controller version can be used for general water treatment tasks.

#### Your benefits

- Visualisation made simple: with the embedded web server and a standard web browser
- Simple connection to your PC or PC network or the internet via a LAN interface
- Operation via Apple® iPod, iPad (WLAN access point necessary)
- Control of up to 16 sub-systems, each with 10 measuring parameters, in potable water systems or filter circuits in swimming pools or with general water treatment tasks
- Customer-specific adjustments are possible: A SoftPLC conforming to IEC 61131 also enables customer-specific process control to be integrated in addition to integral processing.
- View current and historical measured data directly on the controller: the integral data logger with screen plotter permits this
- Simply transmit measured data to a PC as standard: SD card and card reader for PC always included
- Simple wiring and subsequent expandability thanks to DULCO®NET bus system
- Intelligent sensors: save sensor data and always be in the optimum measuring range with auto-ranging
- Intelligent metering pumps: find information on operating parameters, such as: Chemical level status and pump capacity in the metering range of 0.74 l/h to 1,030 l/h
- Coupling to a PLC via a PROFIBUS®-DP and Modbus RTU

#### Technical details

##### Measuring ranges:

- pH 0...14
- ORP: -1,200...+1,200 mV
- Free chlorine 0.01...10 ppm/100 ppm
- Total chlorine 0.01...10 ppm
- Combined chlorine 0.01... 2 ppm
- Bromine: 0.01...10 ppm
- Chlorine dioxide: 0.01...10 ppm
- Chlorite anion: 0.10...2 ppm

**Temperature:** -20 ... 150 °C via Pt 100 or Pt 1,000

**Dissolution:** 0.01 pH / 1 mV / 0.01 ppm / 0.1 °C

**Accuracy:** 0.5 % of the full-scale reading

##### Measuring inputs:

- pH and ORP via mV terminal
- Chlorine via CANopen bus

**Control characteristic:** P/PI/PID control, intelligent control

**Control:** Acid and/or alkali and chlorine (2 control circuits), temperature, flocculant

**Digital inputs:** 5 potential-free inputs (sample water, pause, 3 pump errors, 2nd parameter set, Eco!mode)

**Signal current output:** 4 x 0/4-20 mA max. load 600 Ω, adjustable assignment.

**Important:** An isolating amplifier, e.g. part no. 1033536, is required for connecting to units, which are not electrically isolated!

##### Control outputs:

- 3 frequency outputs for acid, alkali or flocculants and chlorine for the control of metering pumps
- 3 relays (pulse length) changeover type of contact to control solenoid valves or peristaltic pumps

**Alarm relay:** 250 V ~3 A, 700 VA type of contact: changeover contact



pk\_5\_045





## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

**Interfaces:** LAN, SD expansion slot

**Electrical connection:** 85...265 V~, 50/60 Hz

**Permissible operating temperature range:** -5...45 °C

**Storage temperature:** -10...70 °C

**Degree of protection:** IP 65

**Climate:** Permissible relative humidity: 95 %, non-condensing DIN IEC 60068-2-30

**Dimensions H x W x D:** 227 x 342 x 78 mm

**Compliance of all units with CANopen specifications:** On the hardware side, all units comply with the harmonised CAN specification 2.0 (ISO99-1, ISO99-2). This includes the CAN protocol (ISO 11898-1) and details on the physical layer in compliance with ISO 11898-2 (high speed CAN up to 1 Mbit/sec) and ISO 11898-3 (low speed CAN up to 125 kBit/sec). The unit complies with the CAN-Open specification CIA-DS401 that forms the basis of the European standard EN50325-4 and also complies with the controller device profile CiA-404.

### Area of application

- Measurement and control of the hygiene parameters in swimming pools
- Monitoring of the water parameters in potable waterworks
- Monitoring of the chlorine dioxide concentration in systems for legionella control and prevention, for example in schools, hotels or hospitals

### The applications are defined in the identity code

Every potable water system or every filtration circuit has a proprietary on-site calibration option for all measured variables.

### What is the Eco!Mode operating mode?

Eco!Mode permits lowering of the circulation capacity when the DIN hygiene parameters pH, ORP, free chlorine and combined chlorine are within the permitted limits.

A circulating pump with frequency converter with analogue input is needed for this.

The reduction can be activated via a remote control, dependent on the DIN hygiene parameters being observed, the time and appropriate activation. A combination of criteria is also possible. If the DIN hygiene parameters are no longer adhered to, then the circulation capacity is again raised to the nominal power.

Lowering pump capacity saves energy and, in so doing, reduces CO<sub>2</sub> emissions.

In addition, upon reaching an adjustable redox potential, e.g. 780 mV, which signals effective disinfection of the water, chlorine metering is reduced either gradually or in one step. If the DIN hygiene parameters are no longer adhered to, then the chlorine metering is again raised to the normal setpoint.

### What is a web server?

A web server is a software application executed by the DULCOMARIN® II.

The web server delivers web pages with information about measurements, control, sensor calibration and control configuration to a PC with a web browser (e.g. Microsoft® Internet Explorer).

The web server enables simple and straightforward visualisation of the DULCOMARIN® II, without special visualisation software being required on the PC. The web server is independent of the PC's operating system.

The DULCOMARIN® II is connected to a PC via a LAN/Ethernet interface. This connection can be made directly, via a network or via the internet. The cables needed for direct connection to a PC or network connection are included in the option.

Standard commercially available network components can be used as accessories for cables, routers and WLAN access points etc.

The same information can be accessed via the web server as is available on the DULCOMARIN® II itself, for instance changing setpoints for all control variables, switching off the different controllers and entering names for the pools/systems. The exceptions are the control settings and bus configuration that can only be entered directly on the controller.

## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### What is OPC?

OPC stands for Openness, Productivity, Collaboration (formerly OLE for Process Control) and is used to describe a uniform software interface independent of specific manufacturers. OPC Data Access (OPC DA) is based on Windows COM (Component Object Model) and DCOM (Distributed Component Object Model) technology. OPC XML, in contrast, is based on the internet standards XML, SOAP and HTTP.

OPC is used wherever sensors, controllers and controls supplied by different manufacturers are used to create a common, flexible network. Without OPC, two devices would require precise knowledge about the communication options of the other device to be able to exchange data and extensions and exchanges would be correspondingly difficult. With OPC it is sufficient to write an OPC-compliant driver just once for each device. Ideally this is provided by the manufacturer. An OPC driver can be integrated without extensive adaptation into any large control and monitoring systems.

ProMinent supplies an OPC server/driver, such as this, for the multi-channel control system DULCOMARIN® II.

**The examples shown in the following are suitable for applications in potable water treatment and in swimming pool technology.**







## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.2

#### Controller DULCOMARIN® II

The DULCOMARIN® II multi-channel measuring and control system is suitable for 1 to 16 filtration circuits or potable water systems. The following bus modules are available for the control:

##### M module (measurement and control):

- Measurement and control of the pH value
- Measurement and display (optional control) of the ORP
- Measurement and display of the temperature of the sample water
- Sample water monitoring
- Measurement of free chlorine
- Measurement of combined chlorine (optional, calculated from total chlorine and free chlorine)

##### Chlorine sensors:

- Measurement of free chlorine and temperature
- Measurement of total available chlorine and temperature
- Measurement of combined chlorine as differential chlorine measurement

##### A module (control of metering pumps, analogue outputs):

- 3 frequency outputs to control metering pumps for pH correction, disinfection and flocculant metering
- 3 contact inputs to process pump alarm relays or tank fill level monitoring
- 4 freely programmable analogue outputs 0/4...20 mA for pH, ORP, free chlorine, combined chlorine or temperature

##### P module (controlling of peristaltic pumps, power supply of bus modules):

- Power relay pulse length control for pH value (e.g. control of the peristaltic pump)
- Power relay pulse length control of disinfectant (e.g. control of the chlorine electrolysis plant)
- Power relay limit value output to minimise combined chlorine
- Alarm relay
- Power supply of bus modules

##### N module (power supply of bus modules):

- Power supply of bus modules with no further function

##### R module (control of the chlorine gas metering units):

- Control of a chlorine gas metering unit and processing of a position feedback potentiometer (0...10 kΩ) (only possible as external module)

##### Metering pumps with CANopen interface of type Beta®, delta®, Sigma/ 1, Sigma/ 2, and Sigma/ 3

- Direct connection to the bus
- When using Beta/4aCANopen metering pumps, the A module is not required (provided no current outputs are required).

##### I module (current input module)

- 2 active/passive current inputs (e.g. for the connection of 2-wire transmitters)
- 1 passive current input (e.g. for the connection of a magnetic-inductive flow meter)
- 2 digital inputs for sample water alarm and pause control
- 1 channel with controller function

## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### F module (functional module)

The F module consolidates functions and also extends these functions

The following functions can be provided by the F module (you can find details on this in the individual application examples in the assembly and operating instructions):

- Control of circulation operation (depending on the weekday and the time of day)
- Automatic backwashing (depending on the weekday and the time of day)
- Discharge of first filtrate
- Lowering of the water level during idle operation
- Circulation flow control (Flowcontrol)
- IO module for SoftPLC
- Water level control
- Sample water valve
- Heating function
- Gutter cleaning function
- Attractions
- Flow control
- Control variables

### PROFIBUS®-DP V1 gateway

### Modbus RTU gateway

### KNX gateway

**SMS, email alarm signalling via mobile phone GPRS/EDGE – LAN router with web server visualisation**



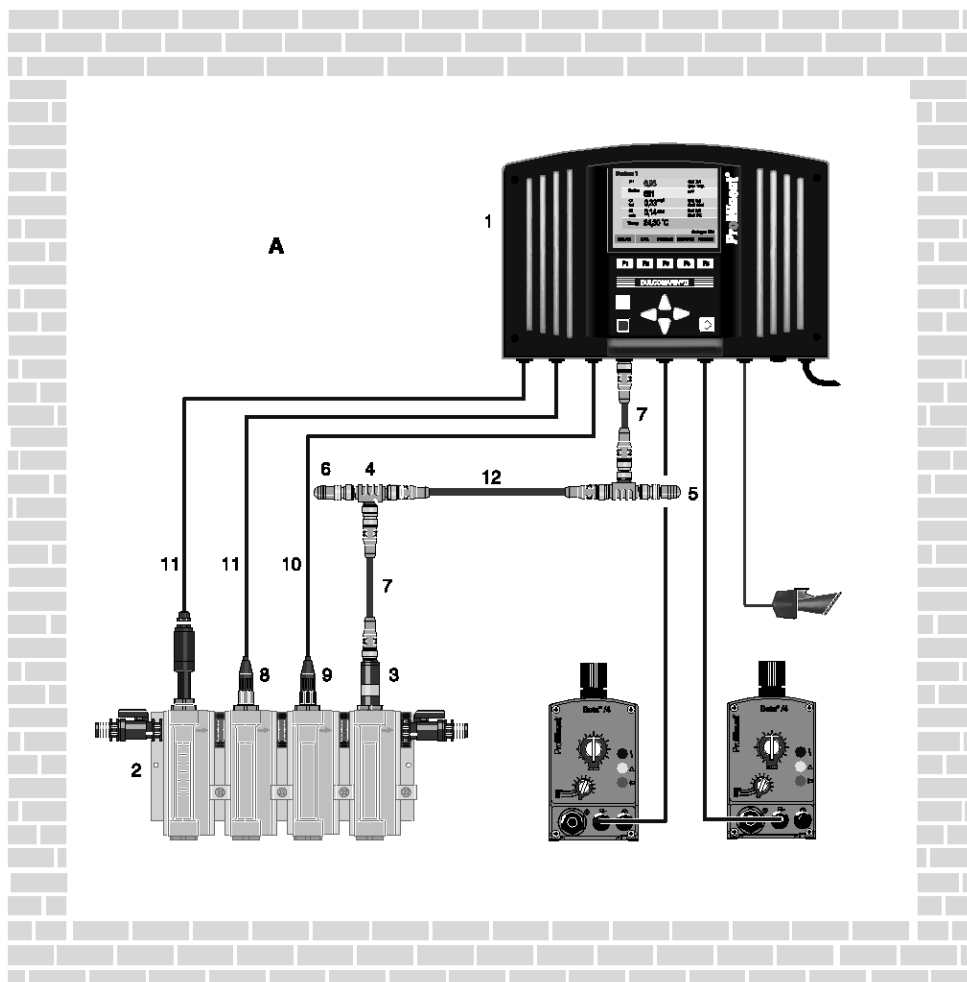


## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### Configuration example: 1-pool system

This example of a measuring and control system for pH, ORP, free chlorine and temperature shown for a filter circuit consists of the following components (without chemical fluid handling):

A Plant room



pk\_5\_020

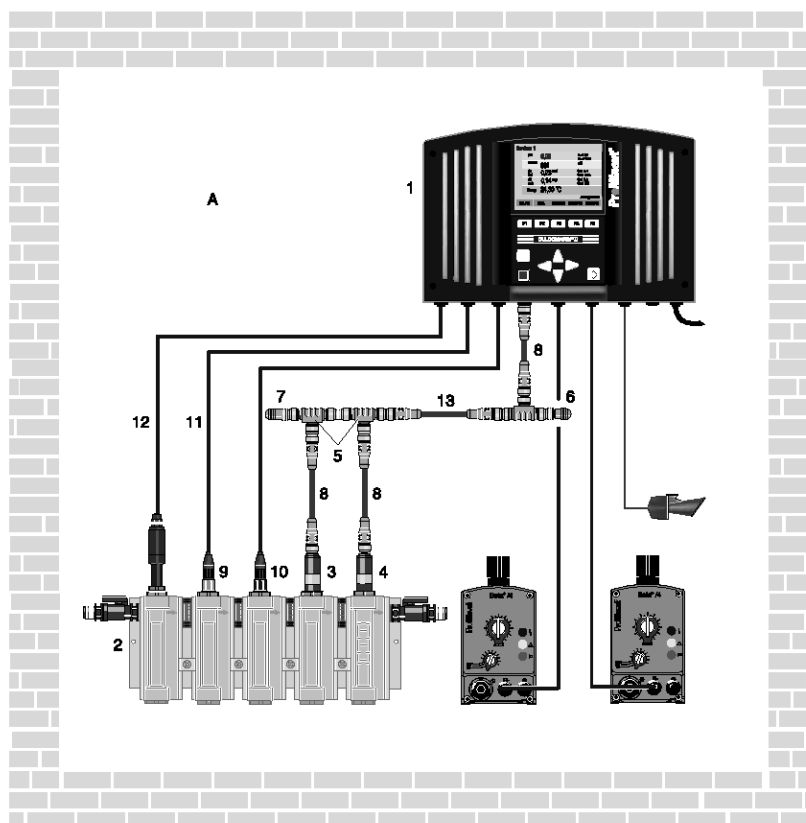
Item	Quantity	Name	Order no.
1	1	DULCOMARIN® II central unit with measuring and control modules DXCa W 0 0 1 M A P S DE 01	–
2	1	DULCOTEST® in-line probe housing DGMa 3 2 1 T 0 0 0	–
3	1	Chlorine sensor CLE 3-CAN-10 ppm	1023425
4	3	T-distributor M12 5 pol. CAN	included in delivery
5	1	Termination resistance M12 connector	included in delivery
6	1	Termination resistance M12 plug	included in delivery
7	3	Connection cable - CAN M12 5 way 0.5 m	included in delivery
8	1	pH sensor PHES 112 SE	150702
9	1	ORP sensor RHES-Pt-SE	150703
10	2	Cable combination coaxial 2 m - SN6 - pre-assembled	1024106
11	2 m	Signal cable, sold by the metre 2 x 0.25 mm² Ø 4 mm	725122
12	–	Connecting cable - CAN, sold by the metre	1022160

## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### Example 2

This example of a measuring and control system for pH, ORP, free and combined chlorine and temperature shown for a filter circuit consists of the following components (without chemical fluid handling):

A Plant room



pk\_5\_020\_1

Item	Quantity	Name	Order no.
1	1	DULCOMARIN® II central unit with measurement and actuation modules DXCa W 0 0 1 M A P S EN 01	–
2	1	DULCOTEST® in-line probe housing DGMa 3 2 2 T 0 0 0	–
3	1	Chlorine sensor CTE 1-CAN-10 ppm	1023427
4	1	Chlorine sensor CLE 3.1-CAN-10 ppm	1023426
5	3	T-distributors M12 5 pole CAN	included in delivery
6	1	Load resistor M12-coupler	included in delivery
7	1	Load resistor M12-plug	included in delivery
8	3	Connecting cable - CAN M12 5 pole 0.5 m	included in delivery
9	1	pH sensor PHES 112 SE	150702
10	1	ORP sensor RHES-Pt-SE	150703
11	2	Cable combination coaxial 2 m - SN6 - pre-assembled	1024106
12	2 m	Signal cable, sold by the metre 2 x 0.25 mm² Ø 4 mm	725122
13	1	CAN Connection cable	as required



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.3 Identity Code Ordering System DULCOMARIN® II

#### DULCOMARIN®II DXC range

DXCa	Installation
W	Wall mounting (IP 65)
S	Control cabinet (IP 54)
<b>Version</b>	
0	With controls
D	with operating elements for use in potable water/disinfection applications
<b>Communication interfaces</b>	
0	None
5	Embedded web server, LAN including 5 m LAN patch cable 1:1, LAN coupling, 5 m crossover cable <sup>1)</sup>
6	OPC server + embedded web server, LAN including 5 m LAN patch cable 1:1, LAN coupling, 5 m crossover cable <sup>1)</sup>
<b>Option (the corresponding communications modules are required, see accessories)</b>	
0	none
1	Videographic recorder with data logger including SD card and USB card reader for PC
2	SoftPLC function (communication option 5 or 6 needed)
3	KNX function (communication option 5 or 6 needed)
4	Alarm signalling via text, e-mail (communication option 5 or 6 needed)
5	SoftPLC function + KNX function + alarm signalling via text, e-mail (communication option 5 or 6 needed)
6	SoftPLC function + alarm signalling via text, e-mail (communication option 5 or 6 needed)
7	SoftPLC function + KNX function (communication option 5 or 6 needed)
8	KNX function + alarm signalling via text, e-mail (communication option 5 or 6 needed)
<b>Module 1</b>	
M	M module, measuring module for pH, ORP, temperature
A	A module, control module: 3 pump and 4 analogue outputs
I	I module, current input module, 3 mA, 2 digital inputs
<b>Module 2</b>	
0	Not used
A	A module, control module: 3 pump and 4 analogue outputs
M	M module, measuring module pH, ORP, temperature
I	I module, current input module, 3 mA, 2 digital inputs
F	F module, module for filter and attraction control
<b>Module 3</b>	
P	P module, mains power module, 1 alarm relay, 3 solenoid valve relays
N	N module, mains power module without relay
1	F module occupies module position 3
<b>Application</b>	
S	Swimming pool
D	Potable water/disinfection
<b>Language default</b>	
00	no operation
DE	German
EN	English
ES	Spanish
FR	French
IT	Italian
PL	Polish
NL	Dutch
CZ	Czech
<b>Approvals</b>	
01	CE mark

The identity code describes the **DULCOMARIN® II** controller.

- <sup>1</sup> The supplied cable is for connection to a hub, switch, router or an intranet.  
For direct connection of the DULCOMARIN® II to a PC/MAC, the supplied LAN coupling and category 5 cross-over cable are required.  
The maximum LAN cable length is approximately 100 m.  
To operate the web server on a PC we recommend Microsoft® Internet Explorer 5 or higher as the browser.  
The scope of supply of the DXCa includes:  
1 T-coupler, 1 CAN connection cable  
1 terminating resistance coupling and  
1 terminating resistance plug,  
1 SD card, 1 card reader suitable for PCs.

**Important note when ordering multi-channel measuring and control systems for potable water and pool water applications:**

**Potable water applications:** In the identity code, a "D" for "Potable water/disinfection" must be selected under "Version" and "Application". The description "System" will appear in the controller menu for the different potable water lines.

## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

**Swimming pool water applications:** In the identity code, a "0" for "with operating elements" must be selected under "Version" and then an "S" for "Swimming pool" under "Application". The description "Tank" will appear in the controller menu for the different filter circuits.

All adjustment options and the use of the different modules are identical with both applications.





## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.4

### Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

The multi-channel multi-parameter measuring and control system DULCOMARIN® II DULCO® Net can, in its top-of-the-range optional version, control 16 potable water systems/filtration circuits, i.e. the necessary external modules for 16 tanks can be connected to and operated by the central unit. The following options are available

#### Measurement and control of:

Up to 16 times:

- pH value
- ORP potential
- Free chlorine
- Combined chlorine (calculated)
- Temperature of the sample water

#### Also in potable water applications (using the I module):

- Flow (as disturbance variable for pH and chlorine control)
- UV intensity
- Conductivity
- Chlorine dioxide
- Chlorite
- Ammonia
- Fluoride
- Pt100/Pt1000 resistance thermometer via a transducer

#### Other inputs and outputs:

Up to 16 times:

- 3 frequency outputs for control of metering pumps for pH-correction, disinfectant and flocculent metering
- 3 contact inputs for processing of pump fault signal relays or container level monitoring
- 4 freely programmable analogue outputs 0/4 ... 20 mA (for pH, ORP, free chlorine, combined chlorine or temperature)
- 3 output relays pulse length control of the pH value, the disinfectant and minimisation of the combined chlorine (e.g. control of a peristaltic pump and chlorine electrolysis system and UV system)
- Control of a chlorine gas metering device
- 3 Beta®/4 CANopen metering pumps
- Up to 2 F modules per filter circuit are possible

The CAN bus with CANopen protocol is used as a data transfer medium between the various bus modules. This extremely interference-proof technology was developed by Bosch and is well known from its use in automotive applications. The maximum length of the bus backbone is 400 metres.

A T-coupler is used for connection of one of each bus module (M module, A module, P module, N module, Beta® 4 CANopen metering pumps and CAN chlorine sensors), which connects the devices to the bus backbone via a branching cable.

T-coupler and branching cable are part of the scope of supply of the modules.

All bus modules are supplied via the CAN bus with 24 V operating voltage (with the exception of Beta®/4 CANopen metering pumps, P modules, N modules. These require a separate mains voltage supply).

For this reason, depending on the size of the installation (number of filtration circuits to be controlled), additional P or N modules are required that feed the operating voltage for the bus modules into the bus. The central unit always contains a power supply (N or P module).

#### How many additional N or P modules do you require?

Number of filtration circuits	Additional N or P modules	Number of filtration circuits	Additional N or P modules
1	–	9	4
2	–	10	5
3	1	11	5
4	2	12	6
5	2	13	6
6	3	14	7
7	3	15	7
8	4	16	8

## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

The DULCOMARIN® II can be easily extended by the connection of bus modules.

### Which components can a DULCOMARIN® II system comprise?

A DULCOMARIN® II DULCO® Net system comprises:

- DXCa central unit with operating elements

and a customised combination of the following components:

- M module, DXMaM (measuring and control)
- A module, DXMaA (control of metering pumps, analogue outputs)
- P module (module in the DXCa housing for power supply to the modules and alarm relays, output relays for control of, for example, peristaltic pumps)
- N module, DXMaN (power supply to external modules with no other function)
- R module, DXMaR (control of chlorine gas metering devices with response signal processing)
- I module (processing of sensor signals via 0/4...20 mA)
- F module (filter and attraction control)

**The maximum bus backbone length is approximately 400 m!**



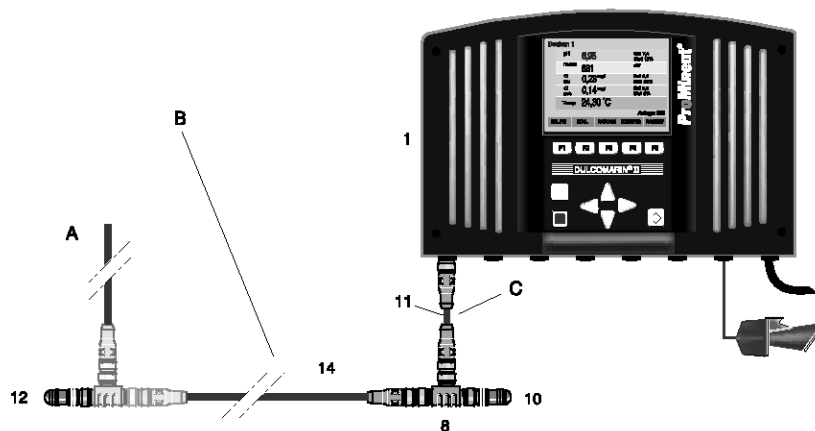




## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.5 Central Unit

- A Stub cable
- B Main BUS cable
- C Stub cable



pk\_5\_041\_2

The central unit can be installed anywhere, for example in the control room. It serves as an I/O unit (view measuring data, parameterise and configure individual modules). It includes the following functions: standard screen recorder/data logger function, interfaces\*, embedded Web server\* and power supply. As an option, the central unit can also include an M and an A module if the central unit is also located in the control room. The central unit is connected to other units via the main bus train.

For this connection, the T-distributor and the CAN connecting cable 0.5 m included in the scope of delivery are used.

The main bus train must be fitted with termination resistors at either end.

These components are included in the scope of delivery.

**The central unit in the above example consists of the following components:**

Item	Quantity	Name	Order no.
1	1	DULCOMARIN® II central unit DXCa W 0 0 1 0 0 P S EN 01	–
8	1	T-distributor M12 5 pol. CAN	included in delivery
11	1	Connection cable - CAN M12 5 way 0.5 m	included in delivery
14	1	CAN Connection cable	as required
10	1	Termination resistance M12 connector	included in delivery
12	1	Termination resistance M12 plug	included in delivery

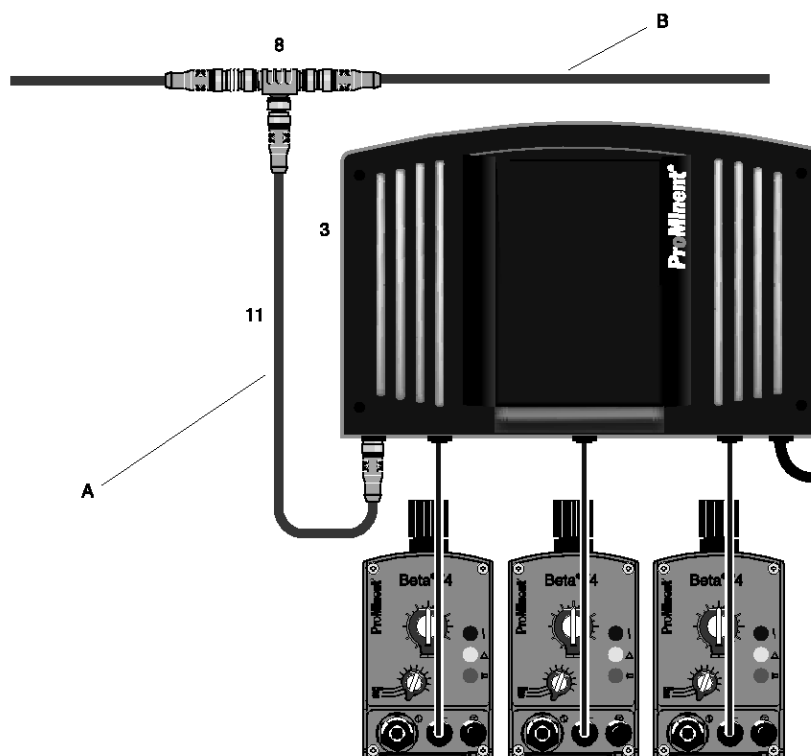
\* optional

## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.6

### Combination Module

- A Stub cable  
B Main BUS cable



pk\_5\_044

#### Combination of M, A, I-module and F, P, N module

Up to three different modules can be accommodated by the combination module (DXCa without control elements). The function of the combination module results from the function of the individual modules (see above description). The modules in the combination module are operated via the DXCa central unit.

The module is connected to other bus modules via the main bus line.

See the table below for the various equipment options.

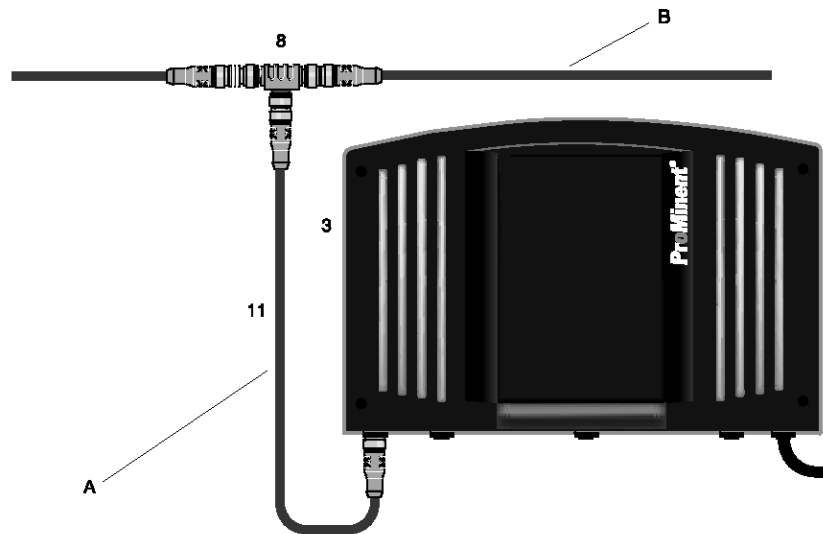
Module position 1	Module position 2	Module position 3
M, A, I module	M, A, I module	P, N module
M, A, I module	F module	Occupied by the F module

The combination in the above example consists of the following components (without chemical fluid handling):

Item	Quantity	Name	Order no.
3	1	Control module DXCa W 2 0 0 0 A P S 00 01	–
8	1	T-distributor M12 5 pol. CAN	included in delivery
11	1	Connection cable - CAN M12 5 way 0.5 m	included in delivery

## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.7 Functional Module (F Module)



P\_DC\_0009\_SW

The F module combines functions that were until now available in the A and P module combination and also extends these functions. It includes the supply voltage (90 – 253 VAC) for the controller. The F module is selected for the 2nd module position and also occupies the 3rd module position. The following functions can be provided by the F module (you can find details for this in the individual application examples in the assembly and operating instructions). The F module also acts as an input/output module for the SoftPLC.

#### Hydraulic functions:

- Control of circulation operation (depending on the weekday and the time of day)
- Automatic backwashing
- Route first filtrate through the internal circuit (electrical backflow shut-off valve)
- Lowering of the water level during idle operation
- Circulation flow control
- Water level control
- Sample water valve
- Heating function
  - Heating control heat exchanger
  - Solar heating
- Gutter cleaning function

#### Attractions:

- Open/Close cover
- Counterflow system/JetStream
- Flood/Neck shower
- Massage nozzle
- Underwater light

#### Monitoring:

- Flow control
  - Current circulation flow recording
  - Fresh water top-up recording
  - Cover
  - Massage pump active
  - 1, 2 or 4-stage level functions
- Control variables for:
  - Disinfection
  - pH (+/-)
  - Flocculation
  - UV system
  - Backwashing emergency-off, if water alarm emitted



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.8 Identity Code Ordering System Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II (Central Unit and Combination Module)

DXCa	Installation		
	W	Wall mounting (IP 65)	
	S	Control cabinet (IP 54)	
	Version		
	0	With controls	
	2	Without controls	
	D	With operating elements for use in potable water/disinfection applications	
	Communication interfaces		
	0	None	
	5	Embedded web server, LAN including 5 m LAN patch cable 1:1, LAN coupling, 5 m crossover cable	
	6	OPC server + embedded web server, LAN including 5 m LAN patch cable 1:1, LAN coupling, 5 m crossover cable	
	Option (the corresponding communications modules are required, see accessories)		
	0	None	
	1	Videographic recorder with data logger including SD card and USB card reader for PC	
	2	SoftPLC function (communication option 5 or 6 needed)	
	3	KNX function (communication option 5 or 6 needed)	
	4	Alarm signalling via text, e-mail (communication option 5 or 6 needed)	
	5	SoftPLC function + KNX function + alarm signalling via text, e-mail (communication option 5 or 6 needed)	
	6	SoftPLC function + alarm signalling via text, e-mail (communication option 5 or 6 needed)	
	7	SoftPLC function + KNX function (communication option 5 or 6 needed)	
	8	KNX function + alarm signalling via text, e-mail (communication option 5 or 6 needed)	
	Module 1		
	0	Not used	
	M	M module, measuring module: pH, ORP, temperature	
	A	A module, control module: 3 pump and 4 analogue outputs	
	I	I module, current input module, 3 mA inputs, 2 digital inputs	
	Module 2		
	0	Not used	
A	A module, control module: 3 pump and 4 analogue outputs		
M	M module, measuring module: pH, ORP, temperature		
I	I module, current input module, 3 mA inputs, 2 digital inputs		
F	F module, module for filter and attraction control		
Module 3			
P	P module, mains power module, 1 alarm relay, 3 solenoid valve relays		
N	N module, mains power module unit without relay		
1	F module occupies module position 3		
Application			
S	Swimming pool		
D	Potable water/disinfection		
Language default			
DE	German		
EN	English		
ES	Spanish		
FR	French		
IT	Italian		
PL	Polish		
NL	Dutch		
CZ	Czech		
Approvals			
01	CE mark		

#### Please note the following:

Upgrade modules for existing systems require a software update for the existing system. A Software Update Kit is needed to avoid any possible incompatibility between the different modules.

The update kit is free of charge and one is also needed when ordering more than one upgrade module. The kit includes an SD memory card with the current software for the DULCOMARIN® II and a description about how to perform the software update.

Update kit/DXC and modules	Order no.
	1031284

The Identity code describes the complete **DULCOMARIN®II DULCO®-Net** central unit.

The peripheral components mentioned in the above item list, however, are not included. If modules are assigned to the central unit, the following applies:

Module 1 preferably assigned as M module

Module 2 preferably assigned as A module

Module 3 must always be assigned as P module or N module.

## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

**Important note when ordering multi-channel measuring and control systems for potable water and pool water applications:**

**Potable water applications:** In the identity code, a "D" for "Potable water/disinfection" must be selected under "Version" and "Application". The description "System" will appear in the controller menu for the different potable water lines.

**Swimming pool water applications:** In the identity code, a "0" for "with operating elements" must be selected under "Version" and then an "S" for "Swimming pool" under "Application". The description "Tank" will appear in the controller menu for the different filter circuits.

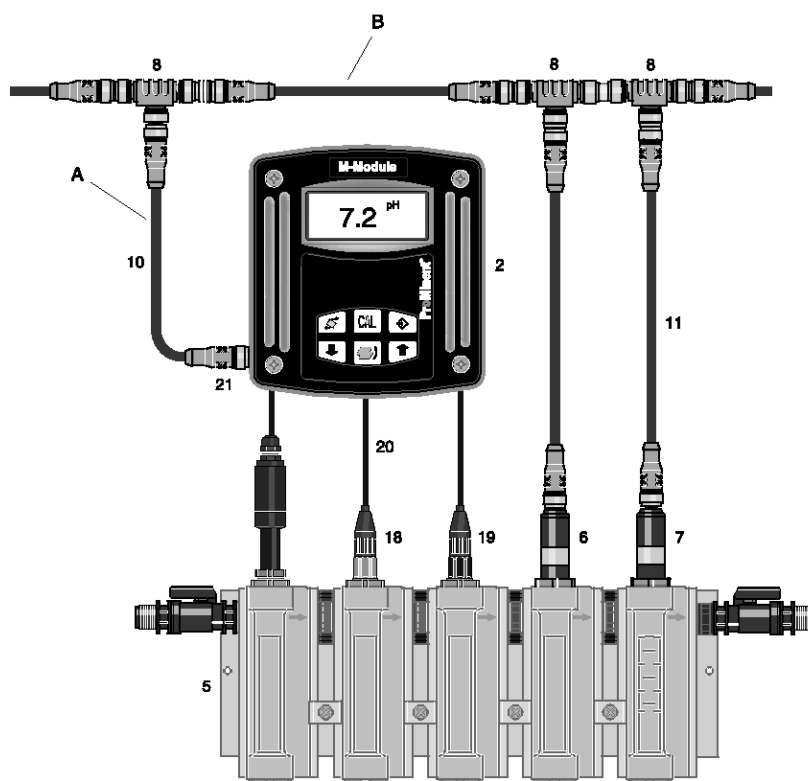
All adjustment options and the use of the different modules are identical with both applications.



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.9 Measuring Module (M module)

- A Stub cable  
B Main BUS cable



pk\_5\_042

The M module with its illuminated graphic display and keypad displays the measured values and allows all sensors for the corresponding filter circuit to be calibrated on site.

The following measurements can be taken:

- pH value
- ORP potential
- Free chlorine and
- Total available chlorine (optional or combined chlorine is calculated) and
- Sample water temperature using the temperature probe in the chlorine sensor or optionally using a separate Pt100/Pt1000 resistance thermometer

The M module has 3 digital inputs for:

- Sample water monitoring
- Controlling breaks in filter backwashing
- Parameter changeover for Eco!Mode

The M module is connected to the other bus modules via the main bus cable, using the T-distributor supplied and the 0.5 m CAN connection cable.

**The M module in the above example consists of the following components:**

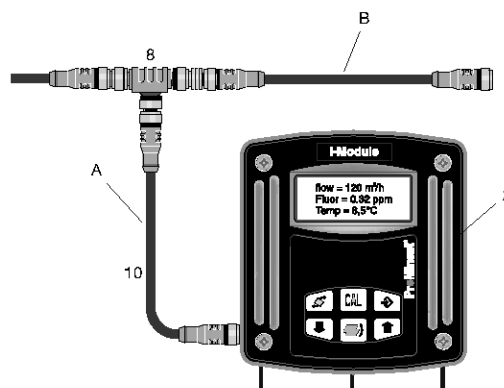
Item	Quantity	Name	Order no.
2	1	M module DXMa M W 0 S EN 01	DXMa M W 0 S EN 01
5	1	In-line probe housing DGMa 3 2 2 T 0 0 0	DGMa 3 2 2 T 0 0 0
6	1	Chlorine sensor CTE 1-CAN-10 ppm	1023427
7	1	Chlorine sensor CLE 3.1-CAN-10 ppm	1023426
8	3	T-distributor M12 5 pole CAN	included in delivery
10	1	Connection cable - CAN M12 5-pole 0.5 m	included in delivery
11	2	Connection cable - CAN M12 5-pole 0.5 m	included in delivery
18	1	pH sensor PHES 112 SE	150702
19	1	ORP sensor RHES-Pt-SE	150703
20	2	Cable combination coaxial 2 m - SN6 - pre-assembled	1024106
21	2 m	Signal cable, sold by the metre 2 x 0.25 mm <sup>2</sup> Ø 4 mm	725122



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.10 Current Input Module (I module)

- A Stub cable  
B Main BUS cable



AP\_DC\_0011\_SW

This I module with its illuminated graphic display and keypad is a current input module capable of processing 3 standard signals from sensors and two digital signals.

It can be used together with the multi-channel controller DULCOMARIN® II in potable water and swimming pool applications. All measured variables are available in the screen plotter and web and OPC® server.

Two analogue inputs are provided as 2-wire inputs and one as passive input. All channels have pre-selected measured variables. However the identifier and units can also be edited. Channel 1 acts as an interference variable channel for channel 2. Channel 3 acts as the temperature compensation channel for channel 2 when the measured variable is fluoride. Channel 2 has a control function.

The inputs can process the following values as 0/4... 20 mA standard signals:

- Turbidity
- Flow (can also be used as the disturbance variable)
- UV intensity
- Conductivity (via DMTa transmitter)
- Chlorine dioxide
- Chlorite
- Ammonia
- Fluoride
- Pt100 resistance thermometer via a transducer
- Dissolved oxygen
- Hydrogen peroxide
- Editable designation and unit for all 3 channels

The I module has 2 digital inputs for:

- Sample water monitoring and
- Pause control

The flow information can be used as an disturbance variable for the control of chlorine, pH correction and chlorine dioxide.

The I module is connected to other bus modules via the main bus cable using the T-distributor and 0.5 m CAN connection cable supplied as part of the delivery.

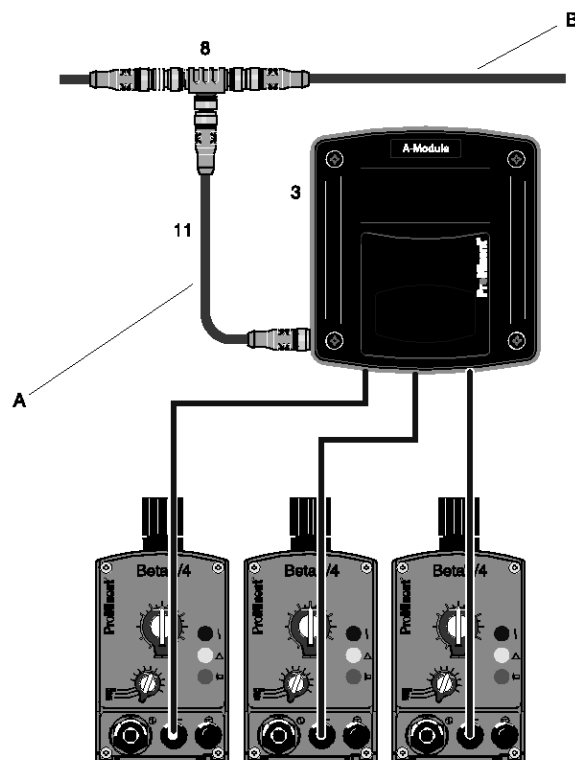
**The I module in the above example consists of the following components:**

Item	Quantity	Name	Order no.
2	1	I module DXMa I W 0 D EN 01	—
8	1	T-distributor M12 5P CAN	included in delivery
10	1	Connecting cable - CAN, M12, 5P, 0.5 m	Included in delivery

## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.11 Control Module (A module)

- A Stub cable  
B Main BUS cable



pk\_5\_043

The A module permits the control of up to three metering pumps via pulse frequency. Possible metering combinations are:

- pH lowering and disinfectant and flocculant or
- pH raising and disinfectant and flocculant or
- pH lowering and pH raising and disinfectant

It includes 3 digital inputs to evaluate the alarm relay of metering pumps, 4 freely programmable standard signal outputs 0/4...20 mA to document measured values, or as control outputs.

The T-distributor and 0.5 m CAN connecting cable included in the scope of delivery are used for this connection.

**Note:** No A modules are required if Beta®/4CANopen metering pumps are used!

The A module in the above example consists of the following components (without metering technology):

Item	Quantity	Name	Order no.
3	1	A module DXMa A W 2 0 00 01	–
8	1	T-distributor M12 5 pol. CAN	included in delivery
11	1	Connection cable - CAN M12 5 way 0.5 m	included in delivery

The A module is connected to other units via the main bus train.

**An isolating amplifier, e.g. order no. 1033536 is required for connection to units which are not electrically isolated (e.g. PLC)!**



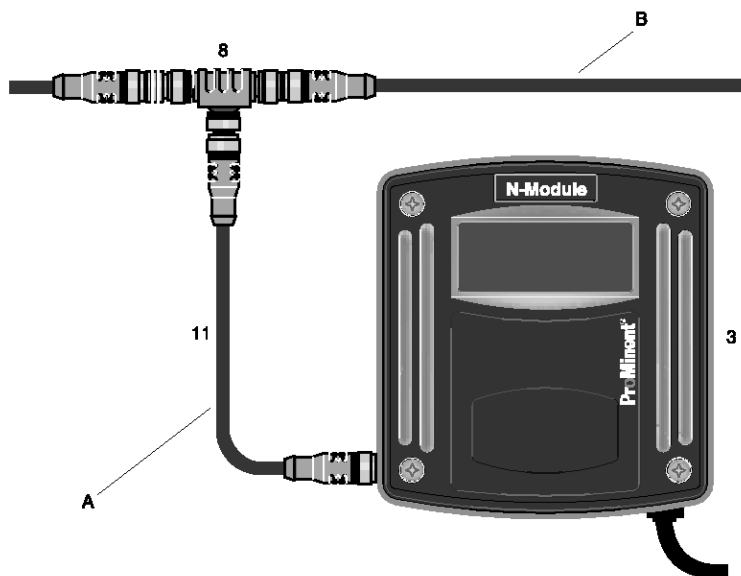


## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.12

#### Power Supply Module (N module)

- A Stub cable  
B Main BUS cable



pk\_5\_043\_C\_power

The N module (power supply) is used to supply the bus modules with power and has no further function.

The number of N modules required can be seen from the table below. If P modules are used in a system, the number of N modules is reduced accordingly. The central unit always includes a power supply unit (N or P module)

#### How many additional N or P modules do you require?

Number of filtration circuits	Additional N or P modules	Number of filtration circuits	Additional N or P modules
1	-	9	4
2	-	10	5
3	1	11	5
4	2	12	6
5	2	13	6
6	3	14	7
7	3	15	7
8	4	16	8

The N module requires a power supply for operation and is connected to the other bus modules via the main bus train. The T-distributor and 0.5 m CAN connecting cable included in the scope of delivery are used for this connection.

#### The N module in the above example consists of the following components:

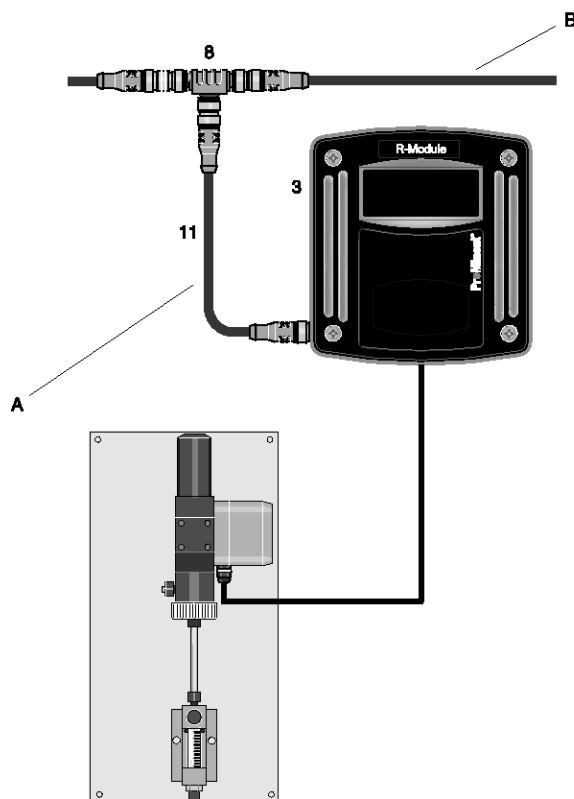
Item	Quantity	Name	Order no.
3	1	N module DXMa N W 2 0 00 01	–
8	1	T-distributor M12 5 pol. CAN	included in delivery
11	1	Connection cable - CAN M12 5 way 0.5 m	included in delivery

Our Sales department would be glad to assist with any questions you may have.

## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.13 Control Module for Chlorine Gas Metering Devices (R module)

- A Stub cable  
B Main BUS cable



pk\_5\_043\_C

The R module permits the control of chlorine gas metering units equipped with a position feedback potentiometer.

It includes 2 power relays for opening and closing and an input for a position feedback potentiometer 1 ... 10 kΩ

The R module is connected to other units via the main bus train.

The T-distributor and 0.5 m CAN connecting cable included in the scope of delivery are used for this connection.

**The R module in the above example consists of the following components (without the chlorine gas metering device):**

Item	Quantity	Name	Order no.
3	1	R module DXMa R W 2 0 00 01	–
8	1	T-distributor M12 5 pol. CAN	included in delivery
11	1	Connection cable - CAN M12 5 way 0.5 m	included in delivery

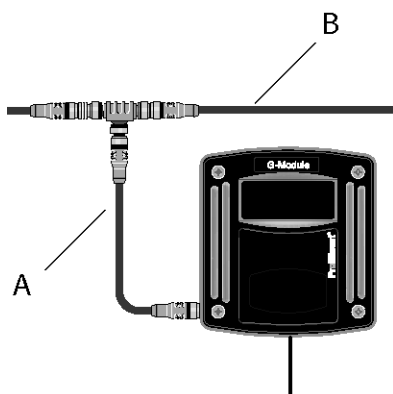
Our Sales department would be glad to assist with any questions you may have.



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.14 Limit Value and Alarm Module (G module)

- A Stub cable  
B Bus main cable



P\_DM\_0024\_SW3

The G-module is a limit value and alarm emitting module with 2 potential-free changeover relays to signal alarm states. Each of the two relays has ten different setting options to monitor measured values for minimum and maximum values and, should the values exceed or fall below these limits, this then triggers the relay. Both relays have the same setting options, thereby enabling signals for pre-warnings or shutdowns to be generated by the use of different delay periods.

The G module is connected to the other units via the main bus cable using the T-distributor and 0.5 m CAN connection cable supplied.

**The G module in the above example consists of the following components:**

Item	Quantity	Name	Order no.
3	1	G module DXMa G W 2 0 00 01	–
8	1	T-distributor M12 5 pol. CAN	included in delivery
11	1	Connection cable - CAN M12 5 way 0.5 m	included in delivery

Our Sales department would be glad to assist with any questions you may have.

## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.15

### Identity Code Ordering System for CANopen Modules

#### Modules for the DULCOMARIN® II, DXM product range

DXMa	Module
M	M module, measuring module: pH, ORP, temperature
A	A module, control module: 3 pump and 4 analogue outputs
R	R module, control module: chlorine gas metering unit with feedback <sup>1), 2)</sup>
N	N module, mains power module without relay <sup>1), 2)</sup>
P	P module, mains power module with relay, only mounting type "0" <sup>1), 2)</sup>
I	I module, current input module, 3 mA inputs, 2 digital inputs
<b>Installation</b>	
0	No housing, only P module (IP 00)
W	Wall mounting (IP 65)
E	Retrofit module (installation module for DXCa, IP 20)
<b>Version</b>	
0	With controls (only M module, mounting type W) <sup>1)</sup>
2	Without controls
3	Without controls (only mounting type "E" and "H")
<b>Application</b>	
0	Standard
S	Swimming pool (only M-module)
D	Potable water/disinfection (only I module)
<b>Language default</b>	
00	No controls <sup>2)</sup>
DE	German
EN	English
ES	Spanish
FR	French
<b>Approvals</b>	
00	No approval, only P-module without housing
01	CE mark

#### Please note the following:

Upgrade modules for existing systems require a software update for the existing system. A Software Update Kit is needed to avoid any possible incompatibility between the different modules.

The update kit is free of charge and one is also needed when ordering more than one upgrade module. The kit includes an SD memory card with the current software for the DULCOMARIN® II and a description about how to perform the software update.

	Order no.
Update kit/DXC and modules	1031284



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.16 Spare Parts and Upgrade Sets

Internal spare parts and upgrade sets for the DULCOMARIN® II cannot be ordered using the part number printed on the modules!

Modules have to be fully replaced (the exception to this is the N module).

The electrical unit for the central unit can only be replaced by a complete processor spare part.

Please use only the following identity codes when ordering:

#### Replacement central units

- Replacement central unit: DXCAC001000#DE01 (without communication interface, # = please state "S" for applications in swimming pools and "D" for applications relating to potable water).
- Replacement central unit: DXCAC051000#DE01 (with web server, # = please state "S" for applications in swimming pools and "D" for applications relating to potable water).
- Replacement central unit: DXCAC061000#DE01 (with OPC and web server, # = please state "S" for applications in swimming pools and "D" for applications relating to potable water).

#### External modules (replacement or upgrade modules):

- M module: DXMa M W 0 S EN 01 (with display)
- A module: DXMa AW2 0 00 01 (without display)
- N module: DXMa N W 2 0 00 01 (without display)
- R module: DXMa R W2 0 00 01 (without display)
- G module: DXMa G W2 0 00 01 (without display)
- P module: DXCa W 2 00 00 PS 00 01 (without display in large DXC housing)
- I module: DXMa I W 0 D D E 01 (with display)
- I module: DXMa I W 2 D 0 0 0 1 (without display)

#### Internal modules (replacement or upgrade modules):

- M module: DXMa M E3S 00 01
- A module: DXMa A E30 00 01
- P module: DXMa P03 00 00
- I module: DXMa I E 3 D 00 01
- N module: Order no. 732485, electrical set DXMaN 24 V/1A

### 2.4.17 Software Upgrades

The DULCOMARIN® II can be upgraded in-situ with the web server and OPC server functions. The upgrade is implemented by entry of an activation key. The activation key can be entered either manually via the keyboard into the DULCOMARIN® II or via an SD card. The SD card is supplied.

The following information is required to determine the device-specific activation key.

- 1 Serial number of the DULCOMARIN® II. This can be found under F1 HELP.
- 2 The actual identity code. This can be found under F1 HELP.
- 3 Desired upgrade.

	Order no.
<b>DXC retrofit kit on web server, including LAN cable and instructions</b>	1029466
<b>DXC retrofit kit on web server + OPC server, including LAN cable and instructions</b>	1029465
<b>DXC retrofit kit on web server + OPC server, including instructions and OPC CD-ROM</b>	1029467
<b>DXC retrofit kit SoftPLC</b>	1049734
<b>DXC retrofit kit KNX*</b>	1049735
<b>DXC retrofit kit SMS_EMAIL*</b>	1049736
<b>DXC retrofit kit SoftPLC, KNX, SMS_EMAIL*</b>	1049737
<b>DXC retrofit kit SoftPLC, SMS_EMAIL*</b>	1049738
<b>DXC retrofit kit SoftPLC, KNX*</b>	1049739
<b>DXC retrofit kit KNX, SMS_EMAIL*</b>	1049740

\* Order the gateways/routers separately. Communication option 5 or 6 is always needed.

## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.18

### Diaphragm Metering Pumps with CANopen Bus Interface



P\_BE\_0002\_SW  
Beta®

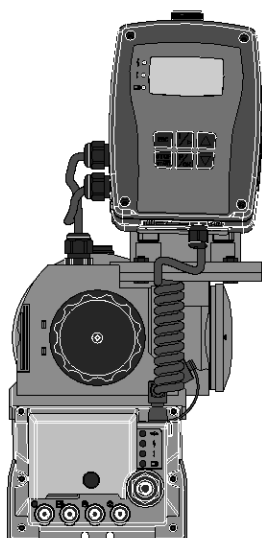
- CANopen bus interface for DULCOMARIN® II
- Pump capacity 0.2-1,030 l/h
- Stroke length continuously adjustable between 0 - 100% (recommended 30 - 100%)
- Transmission of the stroke length setting from the DULCOMARIN® II
- Material designs PP, clear acrylic/PVC
- Patented coarse/fine bleed valve for PP and clear acrylic/PVC
- Self-bleeding dosing head design in PP and clear acrylic/PVC
- Connector for 2-stage level switch
- design for low voltage 12-24 V DC, 24 V AC
- 4 LED display for operation, warning and error messages
- Alarm in the event of stroke length changes of  $> \pm 10\%$
- Transmission of level alarm without alarm relay via the bus

Diaphragm metering pumps are contained in Volume 1 on the following pages: Solenoid Driven Metering Pump Beta® → 1-7, Solenoid Driven Metering Pump delta® → 1-21.

Process metering pumps are contained in Volume 3 on the following pages: Motor Driven Metering Pump Sigma/ 1 (Basic type) → 1-7, Sigma/ 2 Basic Type (S2Ba) → 1-22, Sigma/ 3 Basic Type (S3Ba) → 1-34



P\_DE\_0002\_SW  
delta®



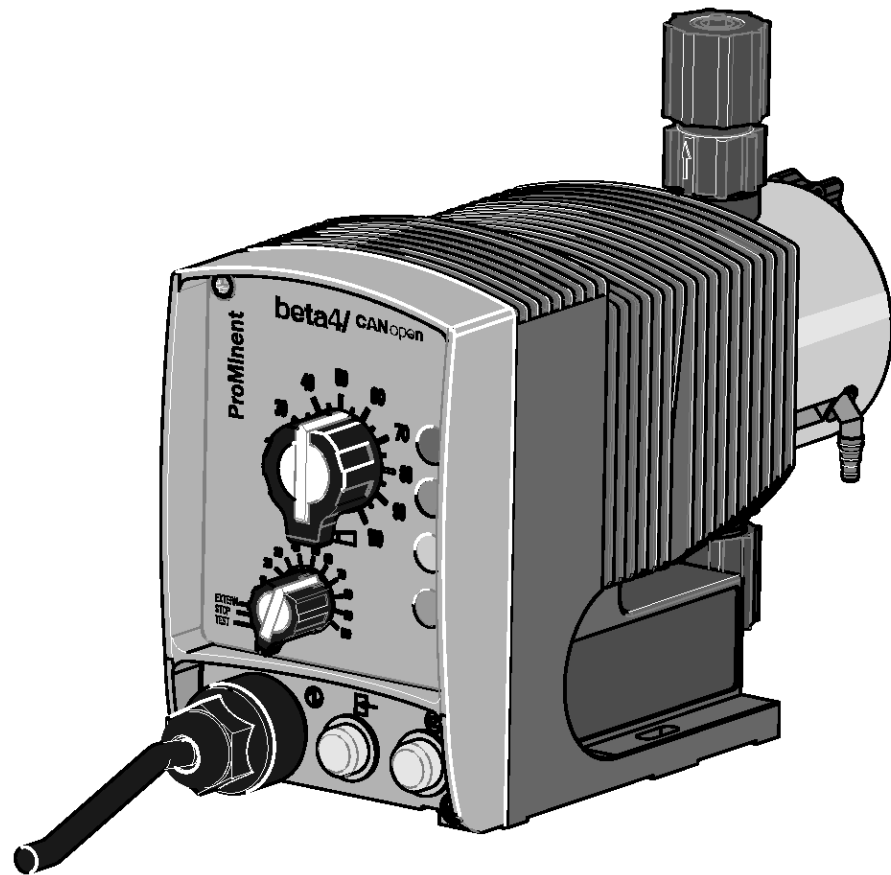
P\_SI\_0129\_SW  
Sigma/ 1 control type

## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.19

#### Solenoid Driven Metering Pumps Beta®

- CANopen bus interface for DULCOMARIN® II
- Feed rate range of 0.74 - 32 l/h, 16 - 2 bar
- Stroke length continuously adjustable between 0 - 100 % (recommended 30 - 100 %)
- Transmission of the stroke length setting from the DULCOMARIN® II
- Material versions PP, clear acrylic/PVC
- Patented coarse / fine bleed valve for PP and clear acrylic/PVC
- Self-bleeding dosing head version in PP and clear acrylic/PVC
- Connection for 2-stage level switch
- Version for low voltage 12/-24 V DC, 24 V AC
- 4 LED display for operation, warning and error messages



pk\_1\_004\_2



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### Technical Data

Pump type	Delivery rate at max. back pressure			Delivery rate at medium back pressure			Number of strokes	Connection size o Ø x i Ø	Suction lift	Shipping weight PP, NP, PV, TT kg
	bar	l/h	ml/ stroke	bar	l/h	ml/ stroke				
Beta®										
BT4a 1000***	10	0.74	0.07	5.0	0.82	0.08	180	6 x 4	6.0**	2.9
BT4a 1601***	16	1.10	0.10	8.0	1.40	0.13	180	6 x 4	6.0**	2.9
BT4a 1602***	16	2.10	0.19	8.0	2.50	0.24	180	6 x 4	6.0**	2.9
BT4a 1005***	10	4.40	0.41	5.0	5.00	0.46	180	8 x 5****	6.0**	3.1
BT4a 0708***	7	7.10	0.66	3.5	8.40	0.78	180	8 x 5	6.0**	3.1
BT4a 0413	4	12.30	1.14	2.0	14.20	1.31	180	8 x 5	3.0**	3.1
BT4a 0220	2	19.00	1.76	1.0	20.90	1.94	180	12 x 9	2.0**	3.3
Beta® metering pumps with self-bleeding dosing head*										
BT4a 1601	16	0.59	0.06	8.0	0.78	0.07	180	6 x 4	1.8**	2.9
BT4a 1602	16	1.40	0.13	8.0	1.70	0.16	180	6 x 4	2.1**	2.9
BT4a 1005	10	3.60	0.33	5.0	4.00	0.37	180	8 x 5	2.7**	3.1
BT4a 0708	7	6.60	0.61	3.5	7.50	0.69	180	8 x 5	2.0**	3.1
BT4a 0413	4	10.80	1.00	2.0	12.60	1.17	180	8 x 5	2.0**	3.1
BT4a 0220	2	16.20	1.50	1.0	18.00	1.67	180	12 x 9	2.0**	3.3

\* The given performance data constitutes assured minimum values, calculated using medium water at room temperature. The bypass connection with a self-bleeding dosing head is 6x4 mm.

\*\* Suction lift with a filled dosing head and filled suction line, for a self-bleeding dosing head with air in the suction line.

\*\*\* For special applications, e.g. in the swimming pool sector, pressure-reduced pump types are available in the pressure ratings 4, 7 and 10 bar. More detailed information is available upon request.

\*\*\*\* For stainless steel version 6 mm connector width.

### Materials in contact with the medium

	Dosing head	Suction/discharge connector	Seals	Valve balls
PPE	Polypropylene	Polypropylene	EPDM	ceramic
PPB	Polypropylene	Polypropylene	FKM	ceramic
NPE	Clear acrylic	PVC	EPDM	ceramic
NPB	Clear acrylic	PVC	FKM	ceramic

Only the self-bleeding version in PP and NPE material versions with a valve spring made of Hastelloy C and a valve insert in PVDF. Metering diaphragm with a PTFE coating.

FKM = fluoro rubber

Repeatability of metering  $\pm 2\%$  when used according to the operating instructions.

Permissible ambient temperature -10 °C to +45 °C

Mean power consumption                      Type 1000-0220 17 W

Degree of protection:                          IP 65, insulation class F

**Scope of supply:** Metering pump with mains cable (2 m) and plug, connector kit for hose/pipe connection as per table, connecting cable CAN M12 5 pole. 1 m, T-coupler M12 5-pole CAN.





## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### Beta® product range, Version a

BT5a	Type	Capacity
		bar l/h
	1605	16 4.10
	1008	10 6.80
	0713	7 11.00
	0420	4 17.10
	0232	2 32.00
BT4a		
	1000	10 0.74
	1601	16 1.10
	1602	16 2.10
	1005	10 4.40
	0708	7 7.10
	0413	4 12.30
	0220	2 19.00
<b>Liquid end/valve material</b>		
	PP	Polypropylene/polypropylene
	NP	Clear acrylic/PVC
	PV	PVDF/PVDF
	TT	PTFE/PTFE
	SS	Stainless steel 1.4404/1.4404
<b>Seal/diaphragm material</b>		
	E	EPDM/PTFE coated, only for PP and NP
	B	FKM-B/PTFE coated, only for PP and NP
	T	PTFE/PTFE coated, only for PV, TT and SS
	S	Diaphragm with additional FKM coating for media containing silicate, FKM-B seals for PP and NP, PTFE for TT, PV and SS
<b>Liquid end version</b>		
	0	Without bleed, without valve spring only for TT, SS and type 0232 NP, PP and PC
	1	Without bleed, with valve spring only for TT, SS and type 0232 NP, PP and PC
	2	With bleed, without valve spring only for PP, PV, NP not for type 0232
	3	With bleed, with valve spring only for PP, PV, NP not for type 0232
	4	Version for higher-viscosity media only for PVT, type 1005, 1605, 0708, 1008, 0413, 0713, 0220, 0420
	9	Self-bleeding only for PP/NP, not for types 1000 and 0232
<b>Hydraulic connections</b>		
	0	Standard connection according to technical data
	5	Connector for 12/6 tube, discharge side only
	9	Connector for 10/4 tube, discharge side only
<b>Version</b>		
	0	With ProMinent® logo
<b>Power supply</b>		
	A	200 – 230 V ± 10 %, 50/60 Hz
	B	100 – 115 V ± 10 %, 50/60 Hz
	U	100-230 V ± 10 %, 50/60 Hz
	M	12 – 24 V DC ± 10 %, only type 1000-0220 \only with 2 m connecting cable open end
	N	24 V DC ± 10 %, only type 1605-0232 \only with 2 m connecting cable open end
	P	24 V AC ± 10 % all types
<b>Cable and plug</b>		
	A	2 m Europe
	B	2 m Swiss
	C	2 m Australia
	D	2 m USA
	1	2 m open end
<b>Relay</b>		
	0	No relay
	1	Fault indicating relay NC, (change-over relay)
	3	Fault indicating relay NO, (change-over relay)
	4	as 1 + pacing relay, (each 1xON)
	5	as 3 + pacing relay, (each 1xON)
<b>Accessories</b>		
	0	No accessories
	1	with foot and injection valve, 2 m PVC suction line, 5 m PE metering line
<b>Control type</b>		
	0	no lock
	1	with lock: manual operation blocked when external cable plugged in
<b>Control Variants</b>		
	D	with CANopen interface for DULCOMARIN® II
<b>Options on request</b>		
	0 0	no option

## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.20

### Multi-Channel Measuring and Control System DULCOMARIN® II, Module Combinations

#### Number and type of modules required for a given number of pools

Number of filtration circuits	Central unit DXCa	P module	M module	A module*	Additional N or P module (power supply unit)	Free chlorine sensor	Total chlorine sensor (optional)
1	1	1	1	1	-	1	1
2	1	1	2	2	-	2	2
3	1	1	3	3	1	3	3
4	1	1	4	4	2	4	4
5	1	1	5	5	2	5	5
6	1	1	6	6	3	6	6
7	1	1	7	7	3	7	7
8	1	1	8	8	4	8	8
9	1	1	9	9	4	9	9
10	1	1	10	10	5	10	10
11	1	1	11	11	5	11	11
12	1	1	12	12	6	12	12
13	1	1	13	13	6	13	13
14	1	1	14	14	7	14	14
15	1	1	15	15	7	15	15
16	1	1	16	16	8	16	16

\* No A module if metering pumps with CANopen are used.  
 The above modules include all CAN bus connecting elements (T-distributor and spur line).  
 The T-distributors can also be directly coupled.  
 For distributed systems, the CAN cable must be ordered by the metre with the by-the-metre connecting kit.

	Order no.
<b>CAN bulk cable connection kit*</b>	1026589
<b>Connecting cable - CAN, sold by the metre*</b>	1022160

\* The CAN by-the-metre connecting kit consists of a CAN coupling M12 5P and a CAN connector M12 5P and a wiring diagram.  
 The by-the-metre connecting cable can be configured into a cable of individual length using the CAN by-the-metre connecting kit.  
 One CAN by-the-metre connecting kit is required for each cable to be configured.  
 The connecting cables CAN M12 5P 0.5 m (pump 1 m) supplied with the sensors and modules should be used for the spur lines.

If you have any questions, please contact our sales department.

#### Caution:

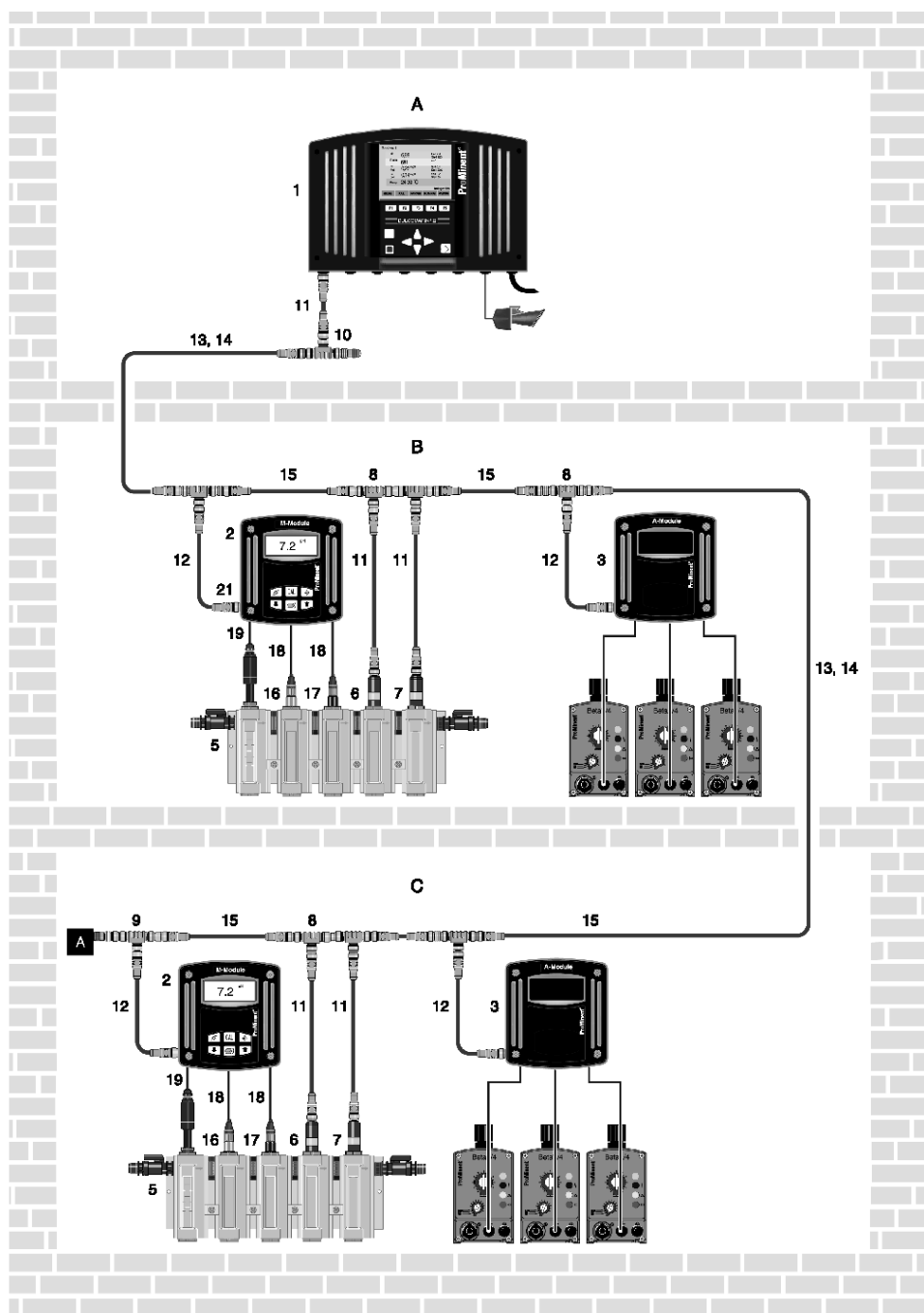
**The maximum main bus length (not including stubs) should be at most 400 m.**

## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.21

### Configuration Example 1

- A Pool attendant's room
- B Plant room pool 1
- C Plant room pool 2



pk\_5\_022\_1

#### Attention:

It is very important that you adhere precisely to the principle of the design shown above because otherwise correct function is not guaranteed!



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

Measuring and control system for two potable water systems/filtration circuits consisting of the following components:

Item	Quantity	Name	Order no.
1	1	DULCOMARIN® II central unit DXCa W 0 0 1 0 0 P S EN 01	–
2	2	M module DXMa M W 0 S EN 01	–
3	2	A module DXMa A W 2 0 00 01	–
5	2	DULCOTEST® in-line probe housing DGMa 3 2 2 T 0 0 0	–
6	2	Chlorine sensor CTE 1-CAN-10 ppm	1023427
7	2	Chlorine sensor CLE 3.1-CAN-10 ppm	1023426
8	9	T-distributor M12 5-pole CAN	supplied
9	1	Termination resistance M12 coupling	supplied
10	1	Termination resistance M12 plug	supplied
11	5	Connection cable - CAN M12 5-way 0.5 m	supplied
12	5	Connection cable - CAN M12 5-way 0.3 m	supplied
13	–	Connecting cable - CAN, sold by the metre	1022160
14	–	CAN bulk cable connection kit	1026589
15	–	CAN M12 5-pole connection cable - length as required	–
16	2	pH sensor PHES 112 SE	150702
17	2	ORP sensor RHES-Pt-SE	150703
18	4	Cable combination coaxial 2 m - SN6 - pre-assembled	1024106
19	4 m	Signal cable, sold by the metre 2 x 0.25 mm <sup>2</sup> Ø 4 mm	725122

\* The CAN by-the-metre connecting kit consists of a CAN coupling M12 5P and a CAN connector M12 5P and a wiring diagram.  
 The by-the-metre connecting cable can be configured into a cable of individual length using the CAN by-the-metre connecting kit.  
 One CAN by-the-metre connecting kit is required for each cable to be configured.  
 The connecting cables CAN M12 5P 0.5 m (pump 1 m) supplied with the sensors and modules should be used for the spur lines.

### Caution:

The maximum main bus length (not including spur lines) should be at most 400 m.

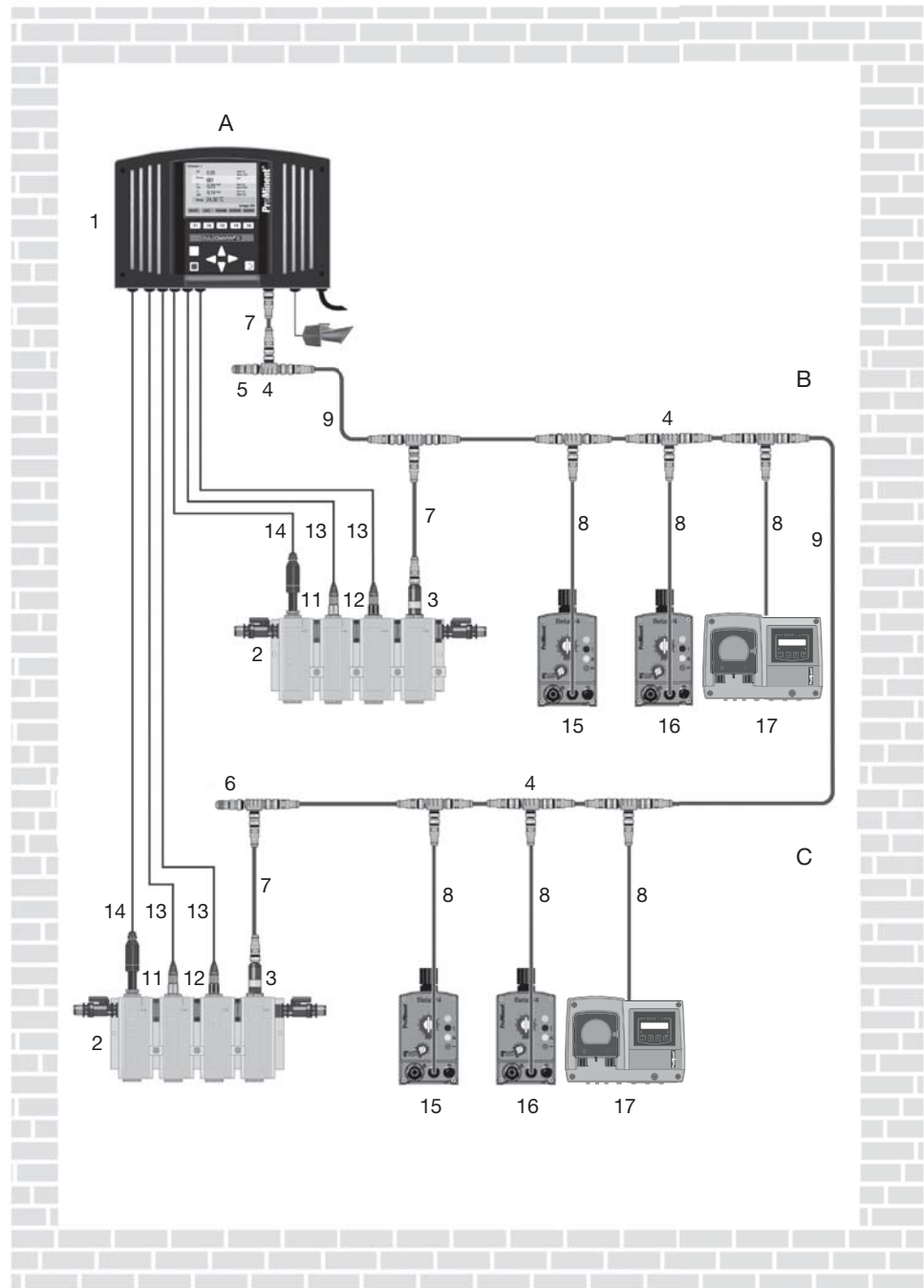
## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.22

#### Configuration Example: 2-Pool System

Two M modules in a central unit, use of metering pumps with CANopen bus.

- A Technikraum
- B Becken 1
- C Becken 2



pk\_5\_022\_neu

#### Attention:

It is very important that you adhere precisely to the principle of the design shown above because otherwise correct function is not guaranteed!



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

Measuring and control system for two filter circuits consisting of the following components:

Item	Quantity	Name	Order no.
1	1	DULCOMARIN®II central unit DXCa W 0 0 1 M M P S EN 01	–
2	2	DULCOTEST® in-line probe housing DGMa 3 2 2 T 0 0 0	–
3	2	Chlorine sensorCLE 3-CAN-10 ppm	1023425
4	9	T-distributor M12 5 pole CAN	included
5	1	Termination resistor M12 connector	included
6	1	Termination resistor M12 plug	included
7	5	Connection cable - CAN M12 5-pole 0.5 m	included
8	6	Connection cable - CAN M12 5-pole 0.3 m	included
9	–	Connecting cable - CAN M12 5-pin 10 m	1046383
11	2	pH sensor PHES 112 SE	150702
12	2	ORP sensor RHES-Pt-SE	150703
13	4	Cable combination coaxial 2 m - SN6 - pre-assembled	1024106
14	4 m	Signal cable, sold by the metre 2 x 0.25 mm² Ø 4 mm	725122
15	2	Beta®/ 4 CANopen for pH correction BT4A0402PVT290UA000D00**	–
16	2	Beta®/ 4 CANopen for disinfectant BT4A0402PVT290UA000D00**	–
17	2	DF4a CAN for flocculant DF4aFW004015P9UA00001D10	–

\* Up to 3 can be coupled from the connecting cable CAN M 12 5-pin 10 m.

\*\* Suggested configuration

### Caution:

Do not allow the maximum main bus length (without branch cables) to exceed 400 m.





## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.23 Accessories for the DULCOMARIN® II Measuring and Control System

	Order no.
CLE 3-CAN-10 ppm	1023425
CLE 3.1-CAN-10 ppm	1023426
CTE 1-CAN-10 ppm	1023427
BRE 3-CAN-10 ppm	1029660
T-distributor M12 5 pole CAN	1022155
Termination resistor M12 coupling	1022154
Termination resistor M12 plug	1022592
Connecting cable - CAN M12 5 pole 0.3 m	1024568
Connecting cable - CAN M12 5-pole 0.5 m	1022137
Connecting cable - CAN M12 5-pole 1 m	1022139
Connecting cable - CAN M12 5-pole 2 m	1022140
Connecting cable - CAN M12 5-pole 5 m	1022141
Connecting cable - CAN M12 5-pin 10 m	1046383
Connecting cable - CAN, sold by the metre	1022160
CAN bulk cable connection kit	1026589
PHES 112 SE	150702
RHES-Pt-SE	150703
Cable combination coaxial 0.8 m - SN6 - pre-assembled	1024105
Cable combination coaxial 2 m - SN6 - pre-assembled	1024106
Cable combination coaxial 5 m - SN6 - pre-assembled	1024107
Signal cable, sold by the metre 2 x 0.25 mm <sup>2</sup> Ø 4 mm	725122
Connecting cable LAN M12 - RJ45 5.0 m	1026715
Cross-over patch cable 2x RJ45 connector 5 m	1027859
LAN coupling 2x RJ45 socket 1:1	1027860
USB 2.0 SD card reader	732981
SD memory card/DXC measuring data archiving	1027470
Isolating amplifier 4-channel for mA outputs of the A module	1033536

\* Up to 3 cables, each 10 m, can be coupled

The CAN bulk cable connection kit comprises a 5-pin M12 CAN coupling and a 5-pin M12 CAN plug and a wiring diagram.

The CAN bulk cable connection kit can be used to configure the connecting cable to form a cable of any required length.

One CAN bulk cable connection kit is required for each cable to be assembled.

The 0.5 m (1 m pump) 5-pin M 12 CAN connecting cables supplied with the sensors and modules have to be used as branch cables.

#### Caution:

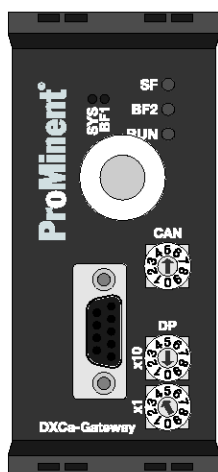
**Do not allow the maximum main bus length (excluding branch cables) to exceed 400 m!**

#### Sensor selection table (swimming pool)

Sensor	Measurement task	Free chlorine for a large percentage of combined chlorine.	Free chlorine for a small percentage of combined chlorine.	Combined chlorine and free chlorine (differential chlorine measurement)	Total available chlorine (e.g. trichlorinated isocyanuric acid)	Bromine BCDMH, DBDMH Calibration method DPD1 or DPD1+3
	Calibration method DPD 1	Calibration method DPD 1	Calibration method DPD 1	Calibration method DPD 1+3	Calibration method DPD 1	
CLE3-CAN-10 ppm (Order no.: 1023425)	X					
CLE3.1-CAN-10 ppm (Order no.: 1023426)		X		X		
CTE1-CAN-10 ppm * (Order no.: 1023427)				X		
CGE2-CAN-10 ppm (Order no.: 1024420)					X	
BRE3-CAN-10 ppm (Order no. 1029660)						X

\* the CTE1-CAN-10 ppm sensor only works together with the CLE3.1-CAN-10 ppm sensor

## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II



P\_MSRZ\_0014\_SW

### PROFIBUS®-DP V1 gateway

The CANopen - PROFIBUS®-DP V1 gateway is an interface based on CANopen, which connects the DULCOMARIN® II swimming pool controller or disinfection controller to a PROFIBUS® DP network. Here the DULCOMARIN® II is configured as the slave and the PLC is the master. Data traffic can be cyclic or acyclic. The measured values are transmitted cyclically. Setpoints can be changed, the system can be set to pause control and Eco!Mode operation can be activated in acyclic traffic. The corresponding GSD file can be loaded from the ProMinent homepage and is also contained on the enclosed data carrier.

The module is intended for installation in a control cabinet (top hat rail) and is connected to the CAN bus in the same way as other modules. The DULCOMARIN® II Controller must have software version 3022 or greater. No specific identity code is needed.

A separate 24 VDC power supply is required.

<b>Voltage supply</b>	24 V DC
<b>Typical power consumption approx.</b>	500 mA
<b>Max. number of measured values</b>	116
<b>Weight</b>	250 g
<b>Dimensions L x W x H (mm)</b>	117.2 x 45 x 113.5 mm
<b>RoHS (Restriction of Hazardous Substances)</b>	Yes
<b>CE conformity</b>	Yes
<b>Enclosure rating</b>	IP 20

#### Order no.

CANopen - PROFIBUS®-DP V1 gateway complete

1044462

### Modbus RTU gateway

The CANopen - Modbus RTU gateway is an interface based on CANopen, which connects the DULCOMARIN® II swimming pool controller or disinfection controller to a Modbus RTU network. Here the DULCOMARIN® II is configured as the slave and the PLC is the master. Data traffic can be cyclic or acyclic. The measured values are transmitted cyclically. Setpoints can be changed, the system can be set to pause control and Eco!Mode operation can be activated in acyclic traffic. The corresponding description table can be found in the operating instructions. It can be downloaded from the ProMinent homepage and is also contained on the enclosed data carrier.

The module is intended for installation in a control cabinet (top hat rail) and is connected to the CAN bus in the same way as other modules. No specific identity code is needed.

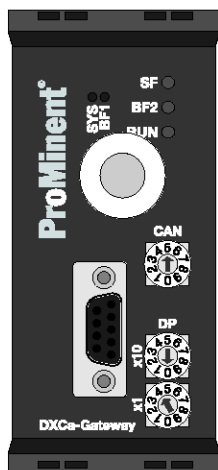
A separate 24 VDC power supply is required.

<b>Voltage supply</b>	24 V DC
<b>Typical power consumption approx.</b>	500 mA
<b>Max. number of measured values</b>	116
<b>Weight</b>	250 g
<b>Dimensions L x W x H (mm)</b>	117.2 x 45 x 113.5 mm
<b>RoHS (Restriction of Hazardous Substances)</b>	Yes
<b>CE conformity</b>	Yes
<b>Enclosure rating</b>	IP 20

#### Order no.

Gateway CANopen - Modbus RTU

1047247

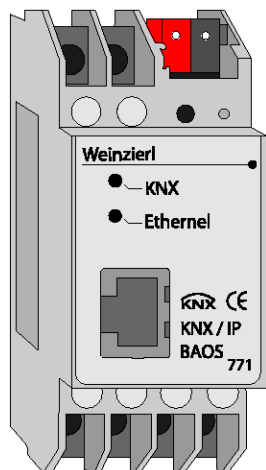


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## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### Ethernet KNX gateway



P\_MSRZ\_0017\_SW1

The Ethernet – KNX gateway is an Ethernet based interface that connects the DULCOMARIN® II swimming pool controller or disinfection controller to a KNX building control system. It can transmit the measured values and status messages from up to 2 systems/pools. No feedback effect from the KNX network is possible.

The module is intended for installation in a control cabinet (top hat rail) and is connected to the LAN/ Ethernet connector of the DXCa. The DXCa needs to have communication option 5 = web server or 8 = web server + OPC server for this.

A separate 24 VDC power supply is required.

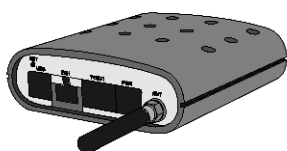
<b>Voltage supply</b>	12 – 24 V DC
<b>Typical power consumption approx.</b>	500 mA
<b>Max. number of measured values (max. 2-pool system)</b>	20
<b>Weight</b>	100 g
<b>Dimensions L x W x H (mm)</b>	117.2 x 60 x 113.5 mm
<b>RoHS (Restriction of Hazardous Substances)</b>	Yes
<b>CE conformity</b>	Yes
<b>Enclosure rating</b>	IP 20

	<b>Order no.</b>
<b>Gateway Ethernet-KNX</b>	1047326

### ER75i mobile phone router (GSM/GPRS/EDGE)

#### Important for operation of the mobile communications router:

- The products do not include a mobile communications data contract, which has to be concluded separately with a mobile communications provider.
- Please check in advance the network coverage of your mobile communications provider
- Make sure that the installation can be installed in a place whether the received signal has sufficient strength and there is also a power supply



P\_MSRZ\_0018\_SW1

You can connect to your DULCOMARIN® II Disinfection Controller using the mobile phone router ER75i irrespective of the separation.

Mobile Ethernet makes it possible to use the available infrastructure for location-independent Ethernet communication.

In addition to GSM and GPRS, EDGE technology can also be used for data transfer. Stable and permanent connections are monitored and maintained through continuous control. An integrated DHCP server makes possible simple installation and fast Internet access. The ideal device for alarm signalling, remote control and remote service.

The mobile phone router ER75i is specially configured for the DULCOMARIN® II / Disinfection Controller. The DULCOMARIN® II Disinfection Controller must have at least communications option 5 = web server. This DXCa option does not include the mobile phone router.

Scope of supply: Router, CD, patch cable, magnetic foot aerial, plug-in power pack.

GPRS/EDGE (class 10) mobile phone router for industrial applications (max. download 236 Kbit/s, max. upload 118.4 Kbit/s)

Single web-interface, DHCP, DynDNS, VRRP, NTP, dial-in router control via SMS

Data volume / roaming control via SMS

Status Information via SNMP and SMS

LED status display

<b>Frequency bands:</b>	850/900/1800/1900 MHz
<b>Interfaces:</b>	Ethernet 10/100
<b>External GSM aerial:</b>	FME - 50 Ω
<b>Power supply:</b>	10 ... 30 V DC
<b>Working temperature range:</b>	-30 °C ... +60 °C
<b>Dimensions:</b>	30 x 90 x 102 mm, plastic housing, also for wall mounting
<b>Weight:</b>	190 g (without aerial and plug-in power pack)
<b>Degree of protection:</b>	IP 44, for use in dry rooms or offices

	<b>Order no.</b>
<b>GSM/GPRS/EDGE mobile phone router ER75i</b>	1047329



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II



P\_MSRZ\_0019\_SW1

### UR5i mobile phone router (UMTS/HSPA+)

You can connect to your DULCOMARIN® II Disinfection Controller using the mobile phone router UR5i via UMTS/HSPA+ irrespective of the separation.

Mobile Ethernet makes it possible to use the available infrastructure for location-independent Ethernet communication.

UMTS/HSPA+ technology can be used for data transfer. Stable and permanent connections are monitored and maintained through continuous control. An integrated DHCP server makes possible simple installation and fast Internet access. The ideal device for alarm signalling, remote control and remote service.

With WLAN access. The WLAN access has no bridge function for connection of another WLAN network.

The mobile phone router is specially configured for the DULCOMARIN® II / Disinfection Controller.

The DULCOMARIN® II Disinfection Controller must have at least communications option 4 = alarm signalling via SMS / email, or greater. This DXCa option does not include the mobile phone router.

Scope of supply: Router, CD, patch cable, magnetic foot aerial, plug-in power pack. Degree of protection: IP 44, for use in dry rooms or offices.

UMTS/HSPA+ Tri-Band (max. download 14.4 Mbit/s, max. upload 5.7 Mbit/s)

WLAN supported NAT/PAT and X.509

Integrated firewall (SPI)

Single web-interface, DHCP, DynDNS, VRRP, dial-in router control via SMS

Data volume / roaming control via SMS

Status information via SNMP and SMS

Extensive mobile connection statistics options

LED status display

**Frequency bands:** GSM/GPRS/EDGE: 850/900/1800/1900 MHz

UMTS: 850/900/1900/2100 MHz

**External GSM aerial:** SMA - 50 Ω

**Power supply:** 10 ... 30 V DC

**Working temperature range:** -30 °C ... +60 °C

**Dimensions:** 50 x 84 x 117 mm, DIN top hat rail 35 mm

**Weight:** 207 g

**Degree of protection:** IP 44

#### Order no.

**UMTS/HSPA+ mobile phone router UR5i v2F**

1047330

#### Important for operation of the mobile communications router:

- The products do not include a mobile communications data contract, which has to be concluded separately with a mobile communications provider.
- Please check in advance the network coverage of your mobile communications provider
- Make sure that the installation can be installed in a place whether the received signal has sufficient strength and there is also a power supply



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### Sensor for Free Chlorine CLE 3-CAN



Standard sensor for measuring free chlorine in clear water. For use on controllers with CAN-bus connection

#### Your benefits

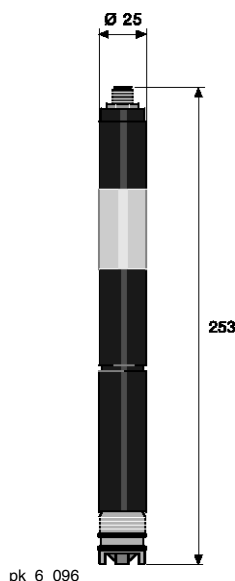
- Measured variable: free chlorine, no significant cross sensitivity to combined chlorine (chloramines)
- Diaphragm-covered sensor (encapsulated) minimises faults caused by changing flow or ingredients in the water
- Operation on the CAN-bus with all the associated benefits

<b>Measured variable</b>	Free chlorine (hypochlorous acid HOCl)
<b>Reference method</b>	DPD1
<b>pH range</b>	5.5 ... 8.0
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	30...60 l/h (in the DGM or DLG III)
<b>Supply voltage</b>	Via CAN interface (11 - 30 V)
<b>Output signal</b>	Uncalibrated, temperature compensated, electrically isolated
<b>Selectivity</b>	Free chlorine as against combined chlorine, even if there is not an excess of it
<b>Disinfection process</b>	Chlorine gas, hypochlorite, electrolysis with diaphragm. Disinfectants with organic chlorine, e.g. based on cyanuric acid, are unsuitable
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	DULCOMARIN® II
<b>Typical applications</b>	CLE 3-mA-0,5 ppm: potable water; CLE 3-mA-2.0/10 ppm: swimming pools (surfactant-free)
<b>Resistance to</b>	Salts, acids, alkalis. Not surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
<b>CLE 3-CAN-10 ppm</b>	0.01...10.0 mg/l	1023425

Chlorine sensors complete with 100 ml of electrolyte

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II



### Sensor for Free Chlorine CLE 3.1-CAN

Sensor for the measurement of free chlorine in clear water with higher selectivity towards combined chlorine. For use on controllers with CAN-bus connection

#### Your benefits

- Measured variable: free chlorine, no cross sensitivity to combined chlorine (chloramines) even if there is an excess of it
- Diaphragm-covered sensor (encapsulated) minimises faults caused by changing flow or ingredients in the water
- Operation on the CAN-bus with all the associated benefits

#### Measured variable

Free chlorine (hypochlorous acid HOCl) with large proportions of bound chlorine; to detect bound chlorine using DULCOMARIN® II and Sensor for Total Chlorine type CTE 1-CAN

#### Reference method

DPD1

#### pH range

5.5 ... 8.0

#### Temperature

5 ... 45 °C

#### Max. pressure

1.0 bar

#### Intake flow

30...60 l/h (in DGMa or DLG III)

#### Supply voltage

Via CAN interface (11 – 30 V)

#### Output signal

Uncalibrated, temperature compensated, electrically isolated

#### Selectivity

Free chlorine

#### Disinfection process

Chlorine gas, hypochlorite, electrolysis with diaphragm. Disinfectants with organic chlorine, e.g. based on cyanuric acid, are unsuitable

#### Installation

Bypass: open sample water outlet

#### Sensor fitting

DGM, DLG III

#### Measuring and control equipment

DULCOMARIN® II

#### Typical applications

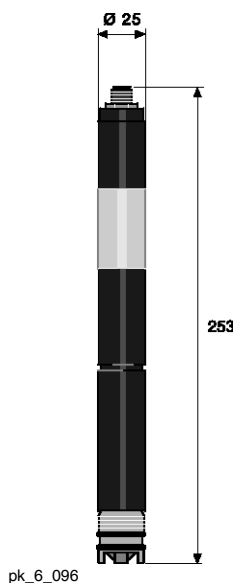
Potable water with higher volumes of combined chlorineSwimming pools, To determine the combined chlorine from the difference: Total chlorine minus free chlorine in the controller DULCOMARIN® II

#### Resistance to

Salts, acids, alkalis. Not surfactants

#### Measuring principle, technology

Amperometric, 2 electrodes, diaphragm-covered



#### Measuring range Order no.

CLE 3.1-CAN-10 ppm

0.01...10.0 mg/l

1023426

Chlorine sensors complete with 100 ml of electrolyte

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### Sensor for Total Chlorine CTE 1-CAN

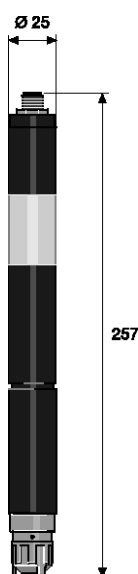


Sensor for total chlorine, including, for example, free chlorine, chloramines etc. even with high pH values in different kinds of water. For use on controllers with CAN-bus connection

#### Your benefits

- Measured variable: Total chlorine, chlorine compounds, in which chlorine acts as an oxidising agent, e.g. free chlorine (HOCl and OCl<sup>-</sup>), chloramines etc.
- Diaphragm-covered sensor (encapsulated) prevents faults caused by changing flow or ingredients in the water
- Hydrophilic diaphragm guarantees permeability for different water-soluble oxidising agents towards the measuring electrodes
- The special reaction system of the electrolyte allows components containing oxidising chlorine to be determined and used at a high pH of up to 9.5
- Operation on the CAN-bus with all the associated benefits

Sensor for connection to a CAN interface (e.g. DULCOMARIN® II swimming pool controller)



pk\_6\_084

<b>Measured variable</b>	Total chlorine
<b>Reference method</b>	DPD4
<b>pH range</b>	5.5 ... 9.5 (up to pH 8.5 with D1C pH correction)
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	3.0 bar
<b>Intake flow</b>	30...60 l/h (in DGMa or DLG III)
<b>Supply voltage</b>	Via CAN interface (11 - 30 V)
<b>Output signal</b>	Uncalibrated, temperature-compensated, electrically isolated
<b>Selectivity</b>	Not selective, cross-sensitive towards many oxidation agents
<b>Disinfection process</b>	Chlorine gas, hypochlorite, electrolysis with diaphragm, Monochloramine
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	DULCOMARIN® II
<b>Typical applications</b>	CTE 1-mA-0.5 ppm: Potable water; CTE 1-mA-2/5/10 ppm: Potable, industrial, process, waste water. In swimming pools combined with CLE 3.1 to detect combined chlorine
<b>Resistance to</b>	Surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	Measuring range	Order no.
<b>CTE 1-CAN-10 ppm</b>	0.01...10.0 mg/l	1023427

Chlorine sensors complete with 100 ml of electrolyte

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.

## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II



### Sensor for Total Available Chlorine CGE 2-CAN

Sensor for total available chlorine, such as derivatives of chloro(iso)cyanuric acid when used in swimming pools. For use on controllers with CAN-bus connection

#### Your benefits

- Measured variable: total available chlorine, for instance disinfectant with organic chlorine, such as derivatives of chloro(iso)cyanuric acid
- Diaphragm-covered sensor (encapsulated) minimises faults caused by changing flow or ingredients in the water
- Hydrophilic diaphragm guarantees the permeability of chloro(iso)cyanuric acid derivatives towards the measuring electrodes
- The special reaction system of the electrolyte allows the total available chlorine to be determined and use at a high pH of up to 9.5
- Operation on the CAN-bus with all the associated benefits

<b>Measured variable</b>	Total available chlorine: Total of organic combined chlorine (e.g. bound to cyanuric acid) and free chlorine
<b>Reference method</b>	DPD1
<b>pH range</b>	5.5 ... 9.5
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	3.0 bar
<b>Intake flow</b>	30...60 l/h (in the DGM or DLG III)
<b>Supply voltage</b>	Via CAN interface (11 – 30 V DC)
<b>Output signal</b>	Uncalibrated, temperature-compensated, electrically isolated
<b>Selectivity</b>	Only limited against combined chlorine (chloramines)
<b>Disinfection process</b>	Disinfectants with organic chlorine, e.g. based on cyanuric acid
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	DULCOMARIN® II
<b>Typical applications</b>	Swimming pool water, Disinfection processes with chloro(iso)cyanuric acid derivatives
<b>Resistance to</b>	Surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	<b>Measuring range</b>	<b>Order no.</b>
<b>CGE 2-CAN-10 ppm</b>	0.01...10.0 mg/l	1024420

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.





## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### Sensor for Total Available Bromine BRE 3-CAN



Sensor for free and combined bromine, also for use with slightly contaminated water. For use on controllers with CAN-bus connection

#### Your benefits

- Measured variable: total available bromine from BCDMH and other oxidative-acting bromine organic disinfectants
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water
- Use with high pH values by optimisation of the electrolyte diaphragm system
- Operation on the CAN-bus with all the associated benefits

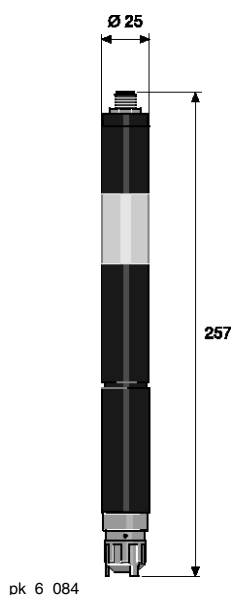
Sensor for connection to a CAN interface (e.g. DULCOMARIN® II swimming pool controller)

<b>Measured variable</b>	Total available bromine
<b>Reference method</b>	For DBDMH, free bromine: DPD1. For BCDMH: DPD4
<b>pH dependence</b>	If the pH changes from pH 7 to pH 8, the sensor sensitivity is reduced a) in the case of DBDMH and free bromine by approx. 10 % b) in the case of BCDMH by approx. 25 %
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	3.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM or DLG III)
<b>Supply voltage</b>	Via CAN interface (11 – 30 V)
<b>Output signal</b>	Uncalibrated, temperature-compensated, electrically isolated
<b>Selectivity</b>	Not selective, cross-sensitive towards many oxidation agents
<b>Disinfection process</b>	DBDMH (1,3-dibromo-5,5-dimethyl-hydantoin), BCDMH (1-bromo-3-chloro-5,5-dimethyl-hydantoin), Free bromine (HOBr, OBr)
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	DULCOMARIN® II
<b>Typical applications</b>	Swimming pools/whirlpools and cooling water; can also be used in sea water
<b>Resistance to</b>	Surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	Measuring range	Order no.
<b>BRE 3-CAN-10 ppm</b>	0.02...10.0 mg/l	1029660

**Note:** a mounting kit (order no. 815079) is required for initial fitting of the bromine sensors in the in-line probe housing DLG III.

Signal leads see Sensor Accessories, p. → 1-113



pk\_6\_084

## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II



### Chlorine Dioxide Sensor CDR 1-CAN

Sensor for the measurement of chlorine dioxide for all kinds of water, including hot and contaminated water. Without cross-sensitivity by free chlorine. For operation on controllers with 4-20 mA input

#### Your benefits

- Measured variable: Chlorine dioxide, without cross sensitivity to free chlorine
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water
- Resistance to films of dirt by pore-free diaphragm
- Operating temperature up to 60 °C (short term) by appropriate sensor materials
- Operation on the CAN-bus with all the associated benefits

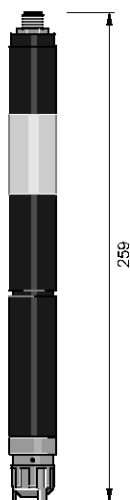
Sensors for connection to a CAN interface (e.g. Disinfection Controller)

<b>Measured variable</b>	Chlorine dioxide ( $\text{ClO}_2$ )
<b>Reference method</b>	DPD1
<b>pH range</b>	1.0 ... 10.0
<b>Cross sensibility</b>	Ozone
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM or DLG III)
<b>Supply voltage</b>	Via CAN interface (11-30 V)
<b>Output signal</b>	Uncalibrated, temperature-compensated, electrically isolated
<b>Response time sensor</b>	$t_{90} \sim 3$ min.
<b>Selectivity</b>	Chlorite, chlorate, free chlorine
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGMa/DLGIII

**Measuring and control equipment** DULCOMARIN® II

**Typical applications** Contaminated industrial, process water, containing surfactants, cooling water, irrigation water, slightly contaminated waste water, warm water

**Resistance to** Surfactants, water-soluble pollutants, solids/dirt, biofilms  
**Measuring principle, technology** Amperometric, 2 electrodes, membrane-covered



P\_DT\_0071\_SW1

	<b>Measuring range</b>	<b>Order no.</b>
<b>CDR 1-CAN-10 ppm</b>	0.01...10.0 mg/l	1041155

\* Complete with 100 ml of electrolyte, connecting cable - CAN M12 5-pin 0.5 m, T-distributor M12 5-pin CAN



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### Chlorite Sensor CLT 1-CAN

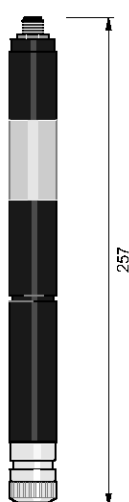


Sensor for monitoring the disinfection by-product chlorite in compliance with potable water regulations. Without cross-sensitivity towards chlorine dioxide, chlorate and chlorine. For use on controllers with CAN-bus connection

#### Your benefits

- Online monitoring of the disinfection by-product chlorite
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water
- No interference by chlorine dioxide/chlorine/chlorate
- Online monitoring improves process reliability
- Online monitoring replaces expensive laboratory analysis
- Operation on the CAN-bus with all the associated benefits

Sensors for connection to a CAN interface (e.g. Disinfection Controller)



P\_DT\_0070\_SW1

<b>Measured variable</b>	Chlorite anion ( $\text{ClO}_2^-$ )
<b>Reference method</b>	DPD method, chlorite together with chlorine dioxide
<b>pH range</b>	6.5 ... 9.5
<b>Cross sensibility</b>	Ozone
<b>Temperature</b>	1 ... 40 °C
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM or DLG III)
<b>Supply voltage</b>	Via CAN interface (11-30 V)
<b>Output signal</b>	Uncalibrated, temperature-compensated, electrically isolated
<b>Response time sensor</b>	3 min.
<b>Selectivity</b>	Chlorite selective towards chlorine dioxide, chlorate and free chlorine
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	DULCOMARIN® II
<b>Typical applications</b>	Monitoring of potable water or similar water treated with chlorine dioxide. Selective measurement of chlorite and chlorine dioxide, chlorine and chlorate is also possible.
<b>Resistance to</b>	Surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	Measuring range	Order no.
CLT 1-CAN-2 ppm	0.05...2.00 mg/l	1041156

\* Complete with 100 ml of electrolyte, connecting cable - CAN M12 5-pin 0.5 m, T-distributor M12 5-pin CAN



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.24

### Technical Data for the DULCOMARIN® II Multi-Channel Measuring and Control System

<b>Measuring range</b>	pH -1...15 ORP: -1,200 ... +1,200 mV Chlorine, free 0.01...10 ppm/100 ppm Chlorine, total 0.01...10 ppm Chlorine, combined 0.01... 2.00 ppm Bromine: 0.01...10 ppm Chlorine dioxide: 0.01...10 ppm Chlorite anion: 0.10...2 ppm
<b>Temperature</b>	-20 ... 150 °C Pt 100 or Pt 1000
<b>Resolution</b>	0.01 pH / 1 mV / 0.01 ppm / 0.1 °C
<b>Accuracy</b>	0.5% of the final value of the measuring range (at 25 °C)
<b>Measurement input</b>	ph and ORP via terminal mV Chlorine via CANopen bus
<b>Control characteristic</b>	P/PI/PID control, intelligent control
<b>Control</b>	Acid and/or alkali and chlorine (2 control circuits), temperature
<b>Digital inputs</b>	5 potential-free inputs (sample water, pause, 3 pump failures, 2nd parameter set)
<b>Signal current output</b>	4 x 0/4-20 mA max. load 600 Ω range adjustable. <b>An isolating amplifier, e.g. order no. 1033536, is required for connection to units which are not electrically isolated!</b>
<b>Control outputs</b>	3 reed contacts for acid, alkali or flocculants and chlorine (pulse frequency to control metering pumps) 3 relays (pulse length) contact type changeover to control solenoid valves or peristaltic pumps
<b>Alarm relay</b>	250 V ~3 A, 700 VA contact type, changeover
<b>Interfaces</b>	LAN, SD-expansion slot
<b>Electrical connection</b>	100...240 V~, 50/60 Hz
<b>Permissible ambient temperature</b>	-5...45 °C
<b>Storage temp.</b>	-10...70 °C
<b>Enclosure rating</b>	IP 65
<b>Climate</b>	Permissible relative humidity: 95% non-condensing DIN IEC 60068-2-30
<b>Dimensions H x W x D</b>	227 x 342 x 78 mm

Compliance of all devices with CANopen specifications:

On the hardware side, all devices comply with the harmonised CAN specification 2.0 (ISO99-1, ISO99-2). This includes the CAN protocol (ISO 11898-1) and details on the physical layer in compliance with ISO 11898-2 (high speed CAN up to 1 Mbit/sec) and ISO 11898-3 (low speed CAN up to 125 kBit/sec). The unit complies with the CAN-Open specification CiA-DS401 that forms the basis of the European standard EN50325-4 and also complies with the controller device profile CiA-404.



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.25

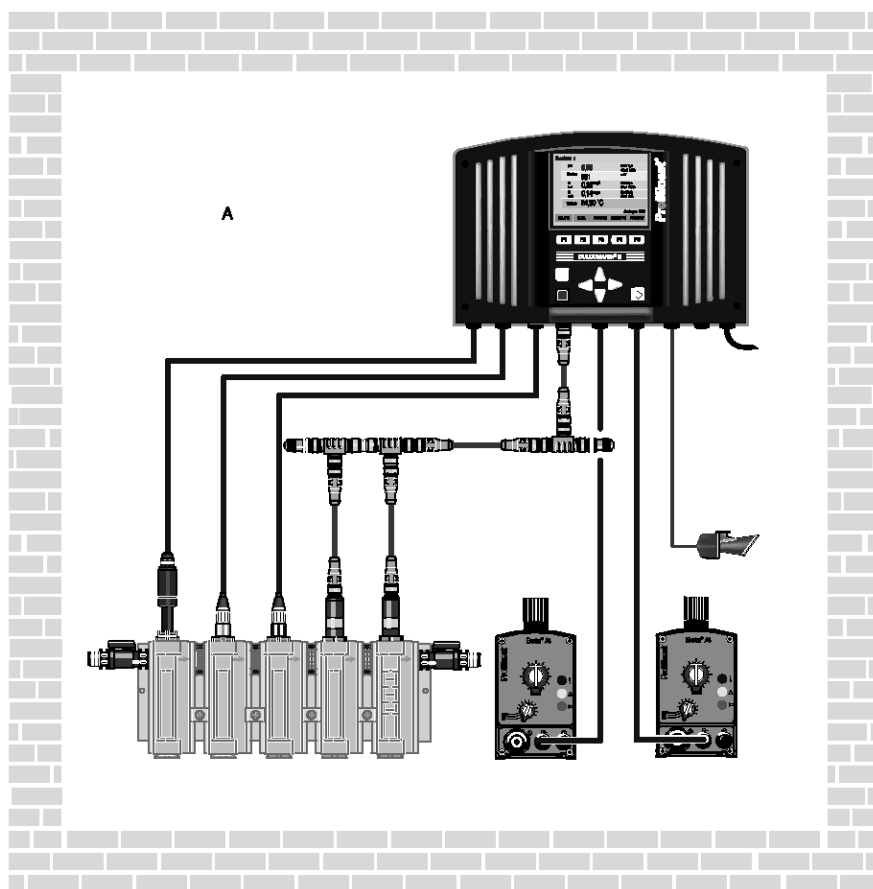
### Application Examples: Treatment of Swimming Pool Water in Public Baths

#### A public swimming pool with measurement of free and combined chlorine

##### Tasks and applications

The pool water of a frequently-used indoor swimming pool in a hotel is to be treated. Sulphuric acid is used to correct the pH and sodium-calcium hypochlorite is used as the disinfectant. The disinfectant is to be regulated on the basis of the concentration of chlorine. The filters and pool are older, which is why the percentage of combined chlorine has to be continuously measured for safety reasons (regular calibration with a DPD 1+3 measuring unit is necessary). Document all measured values with a recorder.

A Plant room



pk\_5\_020\_1\_SW3

#### Components of the measuring/control station

Quantity	Name	See page	Order no.
1	DULCOMARIN® II central unit with measuring and control modules and integral screen writer	→ 2-49	DXCaW001MA PSEN01
1	Chlorine sensor CLE 3.1-CAN-10 ppm	→ 1-55	1023426
1	Chlorine sensor CTE 1-CAN-10 ppm	→ 1-66	1023427
2	Cable combination coaxial 2 m - SN6 - pre-assembled	→ 2-71	1024106
1	pH sensor PHEP 112 SE	→ 1-13	150041
1	ORP sensor RHES-Pt-SE	→ 1-33	150703
2 m	Signal cable, sold by the metre 2 x 0.25 mm <sup>2</sup> Ø 4 mm	→ 1-115	725122
1	Bypass fitting DGMa with sample water limit contact	→ 1-120	DGMa322T000

All cables, T-pieces and termination resistors needed to connect the sensors are supplied.



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

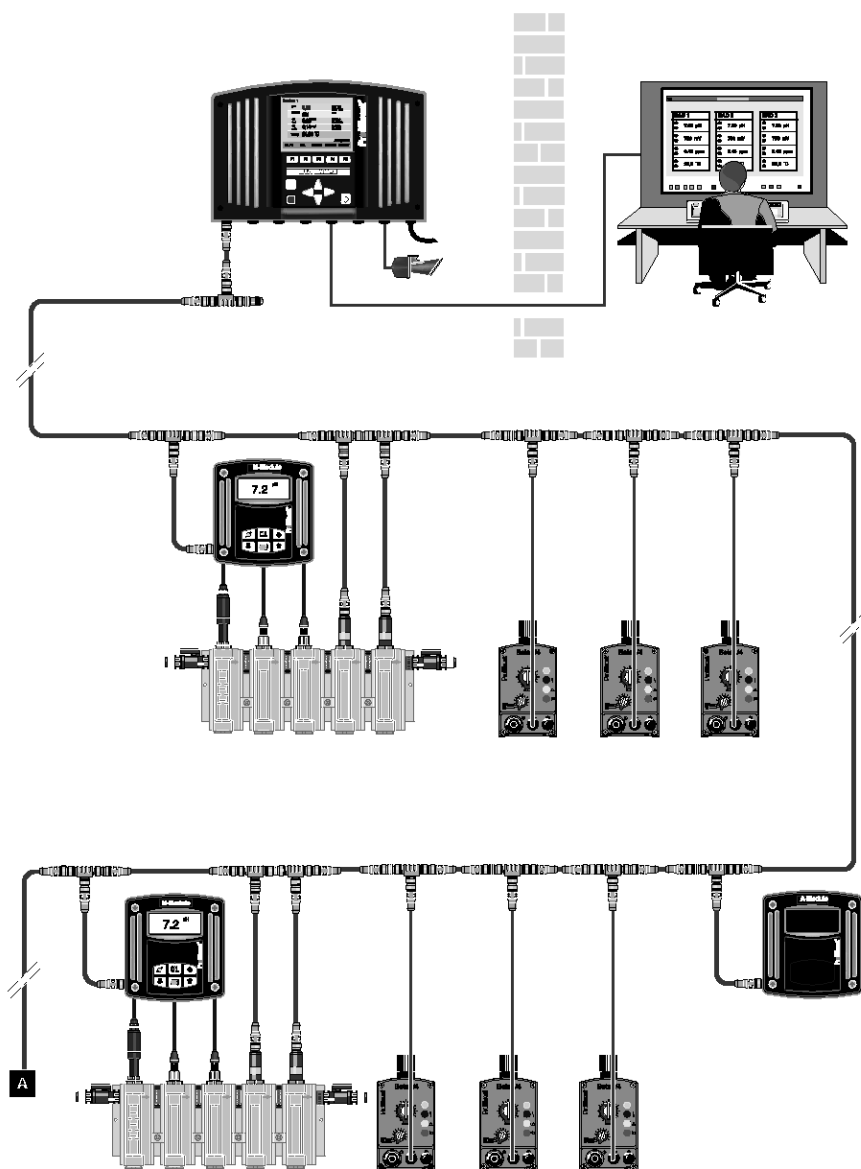
### Benefits

- The integral data logger and screen writer document the hygiene parameters required by law
- Continuous measurement of the bound chlorine provides information about the water quality
- The measuring and control system can be subsequently extended, for instance if a whirlpool is planned

### Public swimming pool with several pools

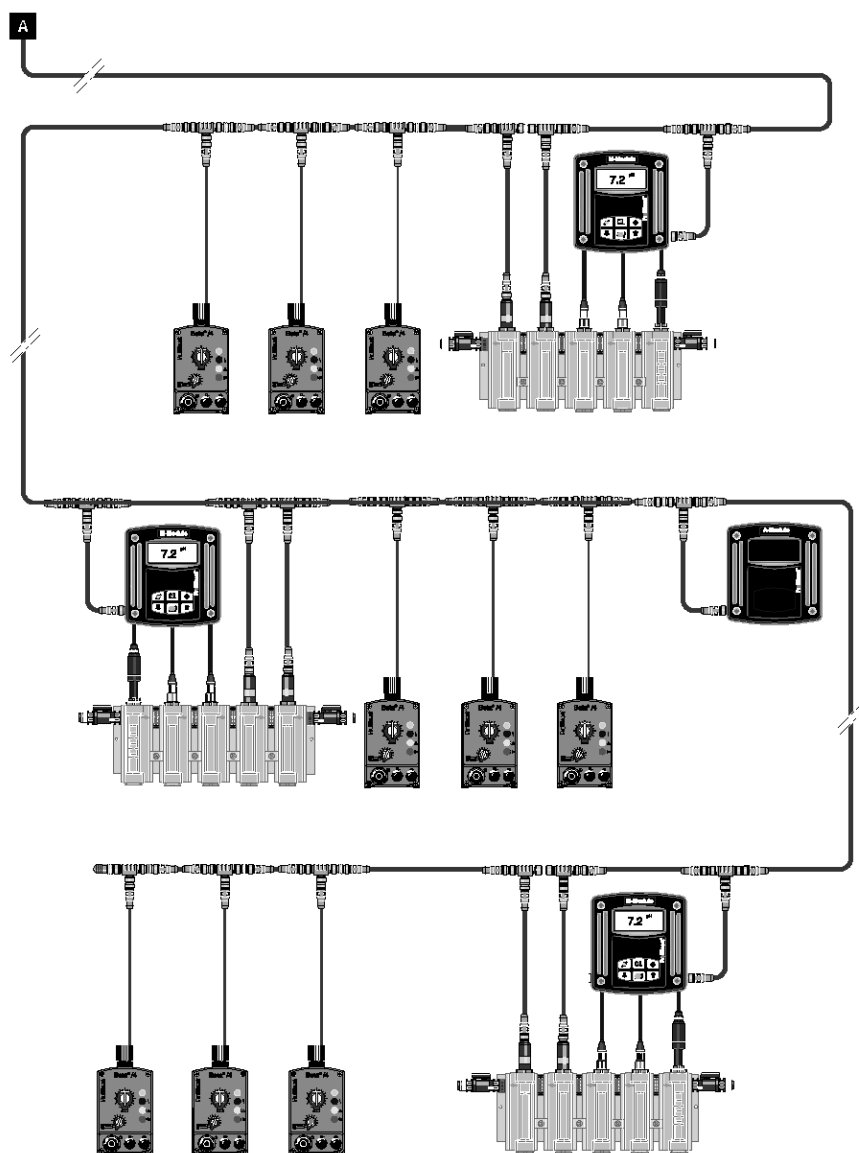
#### Tasks and applications

The pool water in 5 filtration circuits in a frequently-used leisure and adventure pool is to be treated. Sulphuric acid is used to correct the pH and sodium-calcium hypochlorite is used as the disinfectant. The disinfectant is to be regulated on the basis of the concentration of chlorine. Owing to the fact that the pool is heavily used, the percentage of combined chlorine is to be continuously measured for safety reasons (regular calibration with a DPD 1+3 measuring unit is necessary). Document all measured values with a recorder and transmit the measured values via OPC for process visualisation on the control panel. Metering pumps with a CAN bus connector are used. The filtration circuits each lie 50 m apart from each other.



pk\_5\_050

## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II



pk\_5\_051

### Components of the measuring/control station

Quantity	Name	See page	Order no.
1	DULCOMARIN® II central unit with screen writer, LAN connector and web+OPC server	→ 2-49	DXCaW06100 PSEN01
5	DXMa measuring module, measurement and control of pH, ORP, free and bound chlorine and temperature	→ 2-57	DXMAMW0SE N01
5	Chlorine sensor CLE 3.1-CAN-10 ppm	→ 1-55	1023426
5	Chlorine sensor CTE 1-CAN-10 ppm	→ 1-66	1023427
10	Cable combination coaxial 2 m - SN6 - pre-assembled	→ 2-71	1024106
5	pH sensor PHEP 112 SE	→ 1-13	150041
5	ORP sensor RHES-Pt-SE	→ 1-33	150703
10 m	Signal cable, sold by the metre 2 x 0.25 mm <sup>2</sup> Ø 4 mm	→ 1-115	725122
5	Bypass fitting DGMa with sample water limit contact	→ 1-120	DGMa322T000
2	Power supply modules DXMaN	→ 2-57	DXMANW3000 01
300 m	Connecting cable - CAN, sold by the metre	→ 2-71	1022160
5	CAN bulk cable connection kit	→ 2-71	1026589

All cables, T-pieces and termination resistors needed to connect the sensors are supplied.



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### Benefits

- All hygiene parameters in the five filtration circuits, together with all key parameters, such as air conditioning or heating parameters in the building management system, can be displayed by the PLC server
- Monitoring of all measured values and control parameters from one central location, such as the pool plant room
- The integral data logger and screen writer document the hygiene parameters required by law



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### 2.4.26

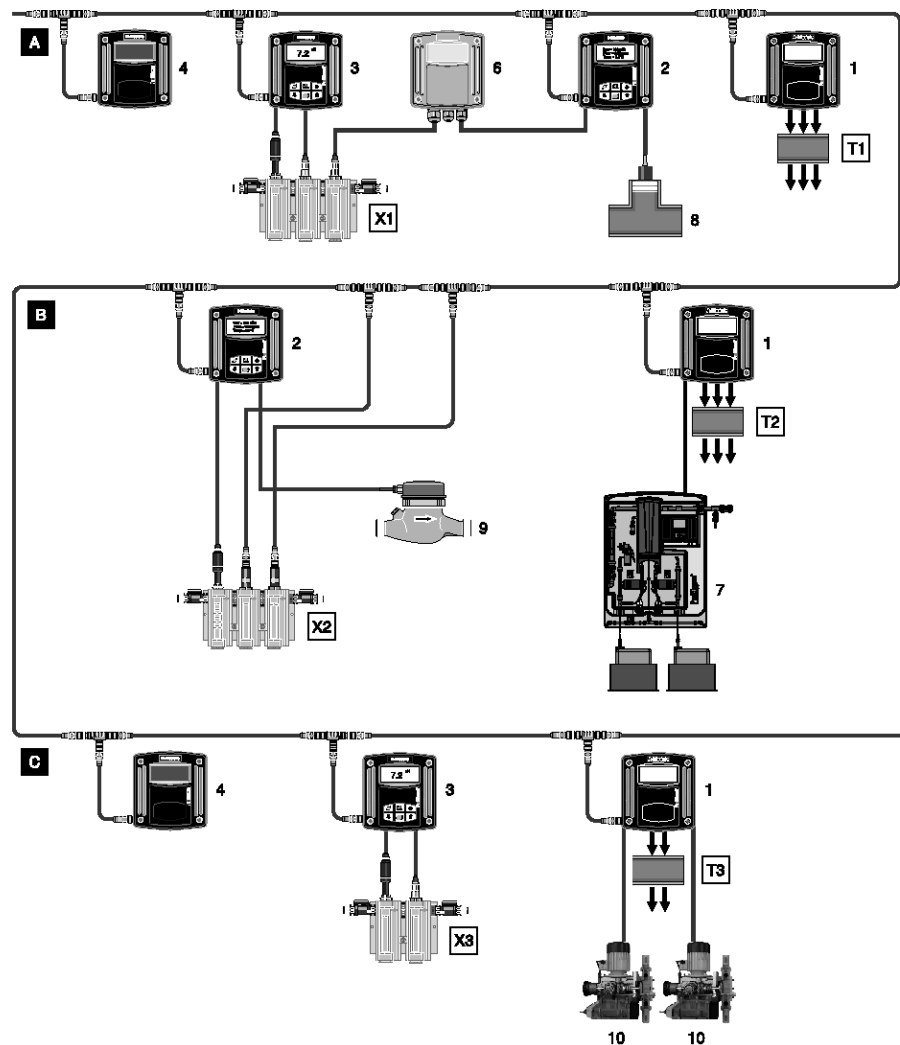
### Application Example: Measurement of Key Chemical Water Parameters at Various Points in the Treatment of Drinking Water

#### Tasks and applications

Measuring and control stations are needed at the following points in the treatment cycle and in the control room in the treatment of potable water in a water works:

- Assessment of the raw water at the inlet of the water works: pH, electrolytic conductivity, turbidity
- Intermediate oxidation/disinfection of the raw water with chlorine dioxide by combined flow- and variable-dependent control
- Control of the pH value on the basis of variable-dependent metering of lime milk
- Disinfection of the treated water to protect the distribution system network by the flow-proportional metering of chlorine dioxide
- Measuring stations for final inspection of the treated water: pH, electrolytic conductivity, turbidity, chlorine dioxide and chlorite and ORP

A	Raw water inlet control
B	Intermediate oxidation/disinfection with chlorine dioxide
C	pH adjustment
1	A module
2	I module
3	M module
4	N module
5	Disinfection Controller
6	DMT transmitter
7	Chlorine dioxide generator
8	Turbidity
9	Flow sensor
T1	Isolating amplifier with signal outputs for pH, conductivity and temperature
T2	Isolating amplifier with signal outputs for chlorine dioxide, chlorite and flow in the process line
T3	Isolating amplifier with signal outputs for pH measurement and pH control variable
X1	DGMA with flow control, pH sensor and conductivity sensor
X2	DGMA with flow control, chlorine dioxide sensor and chlorite sensor
X3	DGMA with flow control and pH sensor

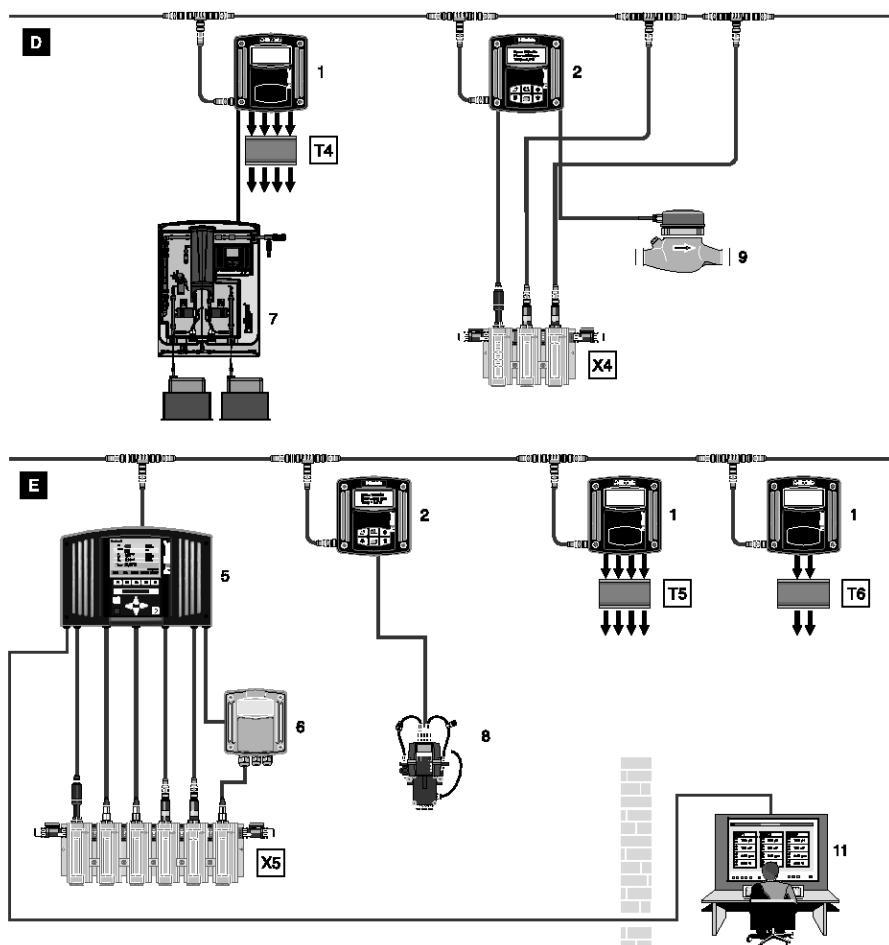


AP\_PTW\_0003\_1\_SW3



## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

D	ClO <sub>2</sub> disinfection
E	Final inspection
1	A module
2	I module
3	M module
4	N module
5	Disinfection Controller
6	DMT transmitter
7	Chlorine dioxide generator
8	Turbidity
9	Flow sensor
T4	Isolating amplifier with signal outputs for chlorine dioxide measurement, control variable, chlorite, flow
T5	Isolating amplifier with signal outputs for pH, ORP, chlorine dioxide and chlorite
T6	Isolating amplifier with signal outputs for turbidity and conductivity
X4	DGMA with flow control, chlorine dioxide sensor and chlorite sensor
X5	DGMA with flow control, pH, ORP, chlorine dioxide, chlorite and conductivity sensors
11	Control panel (OPC server)



AP\_PTW\_0003\_2\_SW3

The following conditions must be met:

- Disinfectant: free chlorine with an adjustable concentration of 0.2 ppm
- Raw water: surface water with a pH of 7.0-7.5 and a temperature of 5 °C-17 °C
- Installation of the measuring stations in the bypass of the process flow
- Distributed system at a distance of 300 m with bidirectional communication between
  - a The central unit located in the plant monitoring room at the outlet of the water works and used to display, register and transmit all measured values and actuating variables to the control panel via the OPC server. Optionally all measured values can be transmitted via 4-20 mA signals to the control panel.
  - b Modular measuring and control units located adjacent to the relevant bypass installation to connect the sensors, display the measured value, calibrate the measuring station and transmit the measured value to the central unit and via an electrically isolated 4-20 mA signal to the control panel.
- Alarm signalling the infringement of preset upper and lower limit values and ingress of the sample water flow





## 2.4 Multi-Channel Multi-Parameter Measuring and Control System DULCOMARIN® II

### Components of the measuring/control station

Quantity	Name	See page	Order no.
<b>Measuring and control units</b>			
1	DULCOMARIN® II multi-channel measuring and control system for the treatment of potable water	→ 2-38	DXCA WD61MINDEN01
2	M module	→ 2-54	DXMA MW0DEN01
6	A module	→ 2-56	DXMa AW0DEN01
3	I module	→ 2-55	DXMa IW0DEN01
3	N module	→ 2-57	DXMa NW200001
6	Isolating amplifier 4-channel for mA outputs of the A module	→ 2-71	1033536
<b>Sensors</b>			
3	pH sensor PHEP 112 SE	→ 1-13	150041
1	RHEP-Pt-SE	→ 1-35	150094
3	CDR 1-CAN-10 ppm	→ 1-74	1041155
2	Conductivity LFT 1 DE	→ 1-97	1001376
2	Turbidity	–	External unit with 4-20 mA signal
2	CLT 1-CAN-2 ppm	→ 1-76	1041156
<b>Connecting cable</b>			
300 m	Connecting cable - CAN, sold by the metre	→ 2-71	1022160
5	CAN bulk cable connection kit	→ 2-71	1026589
5	Signal cable, sold by the metre 2 x 0.25 mm² Ø 4 mm	→ 1-115	725122
4	Cable combination coaxial 2 m - SN6 - pre-assembled	→ 2-71	1024106
2	Measuring line type LKT for conductivity sensors Ø 6.2 mm	→ 1-114	1046024
<b>Fitting</b>			
1	Bypass fitting DGMA	→ 1-120	DGMA 320T000
2	Bypass fitting DGMA	→ 1-120	DGMA 302T000
1	Bypass fitting DGMA	→ 1-120	DGMA 332T000
1	Bypass fitting DGMA	→ 1-120	DGMA 301T000

### Benefits

- Cost-savings due to distributed system with only one central unit
- Cost-savings and enhanced cabling safety by means of a BUS system
- Improved process safety by the permanent and reliable availability of digital measured data and operating statuses, as well as automated process management and alarm signalling by bidirectional BUS intercommunication of all measuring and control units and communication to the higher-order control system via the OPC server
- Excellent data transparency at field level by the registration, display and traceability of all relevant measured and operating data in the central unit

## 2.5 Controller with Integral Metering Pump

### 2.5.1 Controller with Integral Metering Pump

You can find the Solenoid Driven Metering Pump delta® with controller module in Volume 1, see page → 1-21



pk\_1\_131\_2  
delta®

## 2.6 DULCOMETER® Transmitters

### 2.6.1

#### DULCOMETER® Transmitter DMTa

The compact 2-wire transmitter – the link to the PLC and DULCOMETER®.



The transmitter DULCOMETER® DMTa converts the sensor signals for pH, ORP value, chlorine concentration and conductivity into an interference-insensitive 4-20 mA analogue signal. Flexible, safe and always the optimum resolution of measured value.



The 2-wire transmitter DMTa converts the following sensor signals into an interference-insensitive 4-20 mA analogue signal: pH, ORP, temperature, chlorine and conductivity.

It is fed via the 2-wire analogue input of a PLC or via a 2-wire analogue input of a ProMinent controller. The 4-20 mA analogue current proportional to the measured value is transmitted via the same two lines.

The DMTa offers an on-site calibration option of the sensor and galvanic separation between the sensor input and measured value output.

#### Your benefits

- Flexibility in the choice of measured variable with pH, ORP and temperature
- Excellent operational safety, thanks to sensor monitoring (pH)
- Galvanic isolation between the sensor and supply
- Always the optimum measured value resolution by auto-ranging with conductivity measurement
- Safety through sensor monitoring of pH for glass breakage and line breakage
- Various installation options: wall-mounted, installation on an upright or in a control cabinet

#### Technical details

##### Measuring ranges:

- pH: - 1.00 / 15.00
- ORP: -1,200 ... +1,200 mV
- Chlorine: 0.01 ... 50.0 mg/l
- Temperature: -20 ... +150 °C
- Conductivity: 1 µS/cm ... 200 mS/cm (auto-ranging), depending on the cell constant

**Cell constant k:** 0.006...12.0 cm<sup>-1</sup>

##### Dissolution:

- pH: 0.01
- ORP: 1 mV
- Chlorine: 0.01 ppm/0.1 ppm, depending on the measuring range
- Temperature: 0.1 °C
- Conductivity: 0.001 µS/cm, 0.01 µS/cm, 1 µS/cm, 1 mS/cm, depending on the measuring range

**Measuring accuracy:** 0.5 % of the full-scale reading

##### Measuring inputs:

- mV terminal (pH, ORP); input resistance > 0.5 x 10<sup>12</sup> Ω
- Chlorine terminal (DMT chlorine probes)
- Pt 100/Pt 1000 terminal
- Conductivity terminal (2 or 4-line connection)

**Correction variable:** Temperature via Pt 100/Pt 1000 (pH, chlorine, conductivity)

**Correction range:** Chlorine: 5 ... 45 °C, pH: 0 ... 100 °C, conductivity: 0 ... 100 °C

**Current loop:** 4...20 mA

**Current in the event of an error:** 23 mA

**Feed voltage:** 2-wire transmitter, 16... 35 V DC, nominal 24 V, PROFIBUS®- DP design, 16... 30 V DC, 24 V nominal

**Communication interface:** PROFIBUS®-DP (wall-mounted only)

**Permissible ambient temperature:** 0...55 °C

**Climate:** Relative humidity up to 95% (non-condensing)

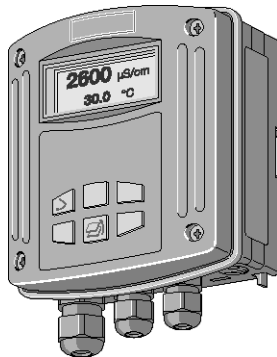
**Degree of protection:** IP 65 (wall-mounted, pipe installation), IP 54 (installation in a control cabinet)

**Display:** Graphic display

**Housing material:** PPE

**Dimensions:** W x H x D 135 x 125 x 75 mm

**Weight:** 0.45 kg



pk\_5\_001



## 2.6 DULCOMETER® Transmitters

### Area of application

Measuring technology in water treatment in the following sectors:

- Processes and process technology
- Food and beverage industry
- Chemical industry
- Pharmaceuticals
- Waste water treatment
- Power station technology

### A complete measuring station comprises the following:

- DMTa measuring transducer (see Identity code)
- In-line probe fitting: DGMa..., DLG III ..., immersible in-line probe fitting
- Chlorine sensor (dependent on Identity code)
- Assembly set for chlorine sensor
- pH sensor (dependent on Identity code)
- ORP sensor (dependent on Identity code)
- Temperature sensor Pt 100 /Pt 1000 (dependent on Identity code)
- Conductivity sensor
- Sensor cable
- PROFIBUS® DP connection accessories

(For further information: Immersion Sensor Fittings see p. → 1-122;

Sensors for Chlorine see p. → 1-49;

pH Sensors With SN6 or Vario Pin Plug-in Head see p. → 1-10;

ORP Sensors with Fixed Cable see p. → 1-43;

Temperature Sensors see p. → 1-46;

Conductivity Sensors see p. → 1-85;

Sensor Accessories see p. → 1-113;

Metering Monitor, Signal Cable see Volume 1 p. → 1-76)





## 2.6 DULCOMETER® Transmitters

### 2.6.2 Identity Code Ordering System for Transmitter DMTa

#### DULCOMETER® Transmitters

DMT	Series	Version
	A	Version
		<b>Installation</b>
		W Wall mounted (also pillar mounted)
		S Control panel installation <sup>1)</sup>
		<b>Version</b>
		0 With ProMinent® logo
		<b>Power supply</b>
		9 Current loop 4-20 mA (two wire technology), operating voltage 16...40 V DC, nominal 24 V DC (only if communication point = none)
		5 PROFIBUS® DP, operating voltage 16...30 V DC, nominal 24 V DC (only if communication interface = PROFIBUS® DP)
		<b>Communication interfaces</b>
		0 None
		4 PROFIBUS® DP (assembly type W only)
		<b>Measured variable 1</b>
		P pH
		R ORP
		T Temperature
		C Chlorine
		L Conductivity
		<b>Measured variable 2 (Correction variable)</b>
		1 Temperature Pt 1000/Pt 100
		0 None (in the case of measured variable T)
		<b>Enclosure rating</b>
		0 Standard
		<b>Language</b>
		D german
		E english
		F french
		S spanish
		I italian
		<b>Presetting A, probe</b>
		0 Standard ProMinent® buffer solution pH 4-7-10
		D Ref. buffer DIN 19266 pH 4-7-9
		V Variable buffer recognition
		<b>Presetting B, probe</b>
		0 Autom. temperature measurement (standard)
		1 Manual temperature measurement
		2 Autom./manual temperature measurement
		9 No temperature measurement
		<b>Presetting C, output</b>
		0 Prop. measured variable (standard)
		1 Manual adjustable current value
		2 Proportional or manual
		3 Proportional or manual hold
		4 4 mA constant current

The last four figures in the identity code represent the software defaults, e.g. cell constants for conductivity, temperature compensation, etc.

0 = standard parameters

The measuring transducer can be factory-set. The defaults can be easily changed in the operating menu.

#### Note:

<sup>1</sup> The rear housing part is omitted for control panel mounting.

## 2.6 DULCOMETER® Transmitters

### 2.6.3

### Application Example: Measurement of Free Chlorine with Connection to a PLC

#### Tasks and applications

In the treatment of drinking water in a water works with a PLC as the higher-order control system, simple measuring stations are needed to measure the disinfectant "free chlorine" at the outlet of the water works and thereafter to monitor protection of the network in the distribution system. Metering is proportional to the flow and is controlled by the PLC. The following conditions must be met:

- Disinfectant: free chlorine with an adjustable concentration of 0.1 ppm
- Raw water: groundwater with a pH of 7.5 and a temperature of 8-13 °C
- Installation of the measuring station in the bypass of the process flow
- Display of the measurement result and calibration by a measuring instrument in the proximity of the bypass installation and transmission of the measured value to the PLC via an electrically isolated 4-20 mA signal
- Power supply to the measuring instrument via the PLC (two wire instrument)

#### Components of the measuring/control station

Quantity	Name	See page	Order no.
1	Transmitter DMTa	→ 2-91	DMTa W090C00E0000
1	Sensor for free chlorine CLE 3-DMT-5 ppm	→ 1-53	1005511
1	5-core universal cable, 5-pin round plug	→ 1-114	1001300
1	Bypass fitting DGMA	→ 1-120	DGMA 101T000

#### Benefits

- Simple, compact and cost-effective measuring station close to the bypass installation
- Electrical installation cost-savings due to power supply over a two wire system
- No need for electrical isolation of the output signal by electrical isolation integral to the DMT



## 2.6 DULCOMETER® Transmitters

### 2.6.4

### DULCOMETER® Transmitter DULCOPAC

The compact transmitter for installation in control cabinets.



The transmitter DULCOMETER® DULCOPAC is a complete PID controller for the key measuring parameters in water treatment. It can be installed on a top hat rail inside a control cabinet.

The DULCOPAC transmitter in a DIN housing is intended for installation on a top hat rail (in a control cabinet). It measures and regulates the measured variables in aqueous solutions: pH, ORP, chlorine, bromine, peracetic acid, hydrogen peroxide and conductivity.

With the measured variables pH and ORP, it is possible to select between a DULCOPAC transmitter with a highly-ohmic coaxial input (direct connection of a pH/ORP sensor) or a 4-20 mA two-wire input. A transmitter is also needed when connecting pH or ORP via 4-20 mA (part no. 809126 for pH and part no. 809127 for ORP).

Two analogue outputs (0/4...20 mA) are available for recording purposes and two potential-free low voltage relays with a changeover contact for control of metering pumps. The analogue outputs are electrically isolated. The DULCOPAC is operated and configured using buttons and the integrated LC display via codes.

The power supply is provided via a special DULCOPAC power supply and can feed up to 10 DULCOPAC units. It provides the requisite galvanic isolation to the mains power supply.

#### Your benefits

- Space-saving: Direct installation in a control cabinet
- Safe measuring technology: galvanic isolation between the sensor and power supply

#### Technical details

##### Measuring ranges:

- pH: 2.00 ... 14.00
- ORP: -1,500 ... +1,500 mV
- Chlorine, bromine: 2 ppm to 100 ppm in 6 ranges
- Conductivity: 2 electrodes 100  $\mu$ S/cm to 10 mS/cm,  $k=0.1$  to 10  $\text{cm}^{-1}$
- Hydrogen peroxide: 0-200 to 50,000 ppm
- Peracetic acid: 0-50 to 5,000 ppm
- Temperature: 0 ... 100 °C

**Correction variable:** Temperature for pH and conductivity via Pt 100

**Correction range:** 0 ... 100 °C

**Control characteristic:** P/PID control

**Control:** Bidirectional control

**Signal current output:** 2 x 0/4-20 mA electrically isolated, range and assignment (measured or control variable) can be adjusted

**Control output:** 2 low voltage relays, 48 V at 1 A are used as a control output with pulse frequency or pulse width modulation or limit value output

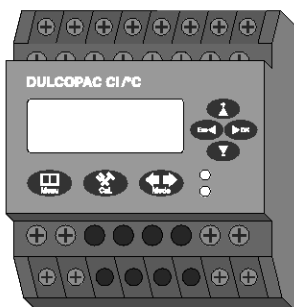
**Electrical connection:** 24 V DC, 3 W, via a DULCOPAC power supply

**Permissible operating temperature range:** -10...50 °C

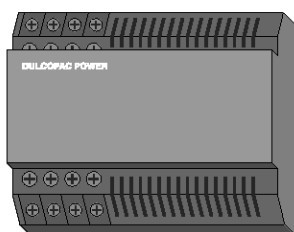
**Degree of protection:** IP 20

**Dimensions:** 60 x 90 x 55 mm (H x W x D)

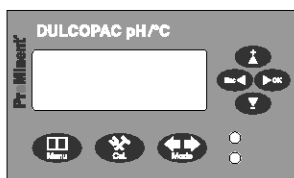
**Weight:** 0.3 kg



P\_DM\_0023\_SW



P\_DM\_0021\_SW



P\_DM\_0022\_SW



## 2.6 DULCOMETER® Transmitters

### Area of application

- Measurement and control of water parameters in industrial and process water treatment plants
- Processes and process technology
- Electroplating
- Waste water treatment

	Order no.
DULCOPAC pH (mV)	1036425
DULCOPAC pH (mA)	1036426
DULCOPAC ORP/redox (mV)	1036427
DULCOPAC ORP/redox (mA)	1036428
DULCOPAC Chlorine	1036429
DULCOPAC Conductivity (mA)	1036430
DULCOPAC Conductivity (direct)	1036431
DULCOPAC PAA (peracetic acid)	1036432
DULCOPAC PEROX	1036433
DULCOPAC Bromine	1036434
DULCOPAC power supply unit, 230 V AC - 24 V DC	1036436







## 2.6 DULCOMETER® Transmitters

### 2.6.5 Application Examples for DULCOPAC

This chapter describes typical combinations of components for measuring stations with DULCOPAC transducers.

#### Measurement of pH with connection to a PLC

##### Tasks and applications

The pH value is to be measured in the bypass of a process water pipe, temperature 35 °C, pressure 3 bar, no solid matter content. The transducer is located in a control cabinet and the converted measuring signal is transmitted to a PLC as an analogue signal.

##### Components of the measuring/control station

Quantity	Name	See page	Order no.
1	DULCOPAC pH (mV)	→ 2-95	1036425
1	DULCOPAC power supply unit, 230 V AC - 24 V DC	→ 2-95	1036436
2 m	Coaxial cable Ø 5 mm, 10.0 m - S	→ 1-113	305040
1	pH sensor PHEP 112 SE	→ 1-13	150041
1	Bypass fitting DGMA with sample water limit contact	→ 1-120	DGMa310T000

#### Measurement of free chlorine with connection to a PLC

##### Tasks and applications

The concentration of chlorine is to be measured in the bypass of a process water pipe. Chlorine concentration approx. 0.6 ppm, water temperature approx. 35 °C, total pressure approx. 1 bar, no solid matter. The transducer is located in a control cabinet and the converted measuring signal is transmitted to a PLC as an analogue signal.

##### Components of the measuring/control station

Quantity	Name	See page	Order no.
1	DULCOPAC Chlorine	→ 2-95	1036429
1	DULCOPAC power supply unit, 230 V AC - 24 V DC	→ 2-95	1036436
2 m	Signal cable, sold by the metre 2 x 0.25 mm <sup>2</sup> Ø 4 mm	→ 1-115	725122
1	Chlorine sensor CLE 3-mA-2 ppm	→ 1-51	792920
1	Bypass fitting DGMA	→ 1-120	DGMa 301T000

#### Measurement of conductive conductivity with connection to a PLC

##### Tasks and applications

The electrolytic conductivity is to be measured in the bypass of a process water pipe. Conductivity approx. 7500 µS/cm, water temperature approx. 35 °C, total pressure approx. 1 bar, no solid matter. The transducer is located in a control cabinet and the converted measuring signal is transmitted to a PLC as an analogue signal.

##### Components of the measuring/control station

Quantity	Name	See page	Order no.
1	DULCOPAC Conductivity (direct)	→ 2-95	1036431
1	DULCOPAC power supply unit, 230 V AC - 24 V DC	→ 2-95	1036436
1	Measuring line type LKT for conductivity sensors Ø 6.2 mm	→ 1-114	1046024
1	Conductivity LFT 1 DE	→ 1-97	1001376
1	Bypass fitting DGMA with sample water limit contact	→ 1-120	DGMa310 T000

## 2.7 Measuring and Test Systems

### 2.7.1

### Portable Meter Portamess® Measured Variable pH/ORP

Robust manual measuring instrument to withstand the most severe mechanical and chemical loading.

Measuring range pH -2.00 to + 16.00, ORP -1,300 ... +1,300 mV

pH and ORP measurement with Portamess® pH/ORP - battery-powered, hand-held meter with automatic or manual temperature compensation.

The Portamess® pH/ORP is used to measure the pH and ORP value in the industrial, environmental, food and waste water sectors. The unit complies with the requirements of the EMC Act and the NAMUR NE 21 recommendations. Calibration can be done with buffer solutions made of different, pre-selectable buffer sets.

#### Your benefits

- Robust and leak-tight
- Long lifespan: Over 2,000 h operating time with only 3 x AA batteries
- Always in sight: Large LC display

#### Technical details

- **Measuring ranges** pH: -2.00 ... +16.00, ORP: -1,300 ... +1,300 mV
- **Measuring errors** pH: < 0.01, ORP: < 0.1 % of the measured value ±0.3 mV
- **Sensor adaptation:** 8 buffer sets to choose from
- **Temperature compensation:** Manual
- **Degree of protection:** IP 66
- **Operating time:** 2,000 hours with 3 no. AA cells
- **Dimensions:** H x W x D 160 x 133 x 30
- **Weight:** 560 g with batteries
- **Scope of delivery:** Measuring instrument, field case, operating instructions in German, English and French.
- **Caution:** Order the pH sensor separately.

#### Area of application

- Industry
- Environmental protection
- Food production
- Water or waste water inspection
- Hard-wearing membrane keypad
- Large, easy-to-read LCD display
- Integrated sensor quiver to protect the sensor
- Sturdy housing (IP 66 degree of protection)
- Robust, watertight, gold-plated sockets

#### Accessories

	Capacity ml	Order no.
PHEKT-014F	–	1036537
Coaxial cable Ø 5 mm, 0.8 m - SD*	–	305098
Buffer pH 7.0	50	506253
Buffer pH 4.0	50	506251

\* fitting for all ProMinent® pH sensors with SN6 connection

Sensor quiver see p. → 2-104



pk\_5\_099



## 2.7 Measuring and Test Systems

### 2.7.2

#### Portamess Portable Meters Measured Variable, Conductivity

**Robust measuring instrument to withstand the most severe mechanical and chemical loading.**

**Measuring range 0.01  $\mu\text{S/cm}$  to 1,000 mS/cm**



The measuring instrument Portamess® conductivity is a robust, leak-tight and battery-operated hand-held measuring instrument with a large measuring range and automatic or manual temperature compensation, which can be used in the industrial, environmental, food and waste water sectors.



pk\_5\_098

The Portamess® conductivity is used to measure conductivity and temperature in the industrial, environmental, food and waste water sectors. The unit complies with the requirements of the EMC Act and the NAMUR NE 21 recommendations. Calibration can be done with buffer solutions made of different, pre-selectable buffer sets.

#### Your benefits

- Robust and leak-tight
- Long lifespan: Over 1,000 h operating time with only 3 x AA batteries
- Always in sight: Large LC display

#### Technical details

##### Measuring ranges:

- Conductivity instrument: 0.01  $\mu\text{S/cm}$  ... 1,000 mS/cm, with sensor LF204: 1  $\mu\text{S/cm}$  ... 500 mS/cm
- Temperature: -20 ... 120 °C
- Salinity: 0.0 ... 45.0 g/kg (0 ... 30 °C)
- TDS: 0 ... 1,999 mg/l (10 ... 40 °C)

##### Measuring error:

- Conductivity < 0.5% of the measured value (with conductivities of > 500 mS/cm < 1% of the measured value)  $\pm 1$  digit
- Temperature < 0.3 K  $\pm 1$  digit

**Sensor adaptation:** Direct input of the cell constants, automatic establishment of the cell constants with KCl solution 0.01 or 0.1 mol/l, cell adaptation with any known solutions

**Cell constant k:** 0.010 ... 199.9  $\text{cm}^{-1}$  (adjustable)

**Temperature compensation:** Configurable, manual or measured

**Degree of protection:** IP 66

**Operating time:** Approx. 1,000 hours with 3 no. AA cells

**Dimensions:** 160 x 133 x 30 mm (H x W x D)

**Weight:** 560 g with batteries

**Scope of delivery:** Measuring instrument, field case, conductivity sensor LF 204, operating instructions in German, English and French

#### Area of application

- Industry
- Environmental protection
- Food production
- Water or waste water inspection

#### Order no.

**Portamess® 911 Cond**

1008713

#### Note:

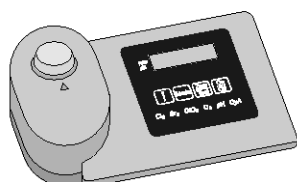
The scope of delivery does include the conductivity sensor LF 204.

Conductivity sensor LF 204 see p. → 2-104, Sensor quiver see p. → 2-104

## 2.7 Measuring and Test Systems

### 2.7.3

### Photometer



P\_DT\_0074\_SW  
Photometer

#### Precise measurement results through high-quality interference filters

Photometers measure nearly all disinfectants and the pH value based on the photometric principle. They are portable, compact and make safe, simple measurement possible.

The photometers DT1B, DT2C, DT3B and DT4B are used, among other things, as a reference method for calibrating the electrochemical sensors for chlorine, chlorine dioxide, fluoride, chlorite,  $H_2O_2$ , bromine and ozone. They have been adapted to today's requirements and can be used in almost all areas of water analysis. High-quality interference filters and long-term stable LEDs are used as the light source in the high-precision optics. The entire measuring unit is maintenance-free. Precise and reproducible analysis results are achieved with minimum time and effort. The units are winning customers over with their excellent operating convenience, ergonomic design, compact dimensions and ease of use.

#### Your benefits

- Portable and compact
- Simple to operate with text support
- Safe, simple measurement of chlorine, chlorine dioxide, fluoride, chlorite,  $H_2O_2$ , bromine, ozone, pH and trichloroisocyanuric acid
- Can be calibrated
- Memory function for the last measurements
- Backlit display
- Real-time clock
- Countdown
- Watertight, degree of protection IP 68

#### Technical details

##### Measuring ranges of the DT1B:

- 0.05... 6.0 mg/l free chlorine (DPD1) + total chlorine (DPD1+3)
- 5 ... 200 mg/l free chlorine (high range)
- 0.1 ... 13.0 mg/l bromine (DPD1)
- 0.05 ... 11 mg/l chlorine dioxide (DPD1)
- 0.03 ... 4.0 mg/l ozone (DPD4)
- 6.5 ... 8.4 pH (phenol red)
- 1 ... 80 mg/l cyanuric acid

##### Measuring ranges of the DT2C:

- 0.05 ... 2.0 mg/l fluoride
- 0.05... 6.0 mg/l free chlorine and total chlorine
- 0.05 ... 11.0 mg/l chlorine dioxide

##### Measuring ranges of the DT3B:

- 1 ... 50 / 40 ... 500 mg/l hydrogen peroxide ( $H_2O_2$ )

##### Measuring ranges of the DT4B:

- 0.03 ... 2.5 mg/l chlorite
- 0.05 ... 11 mg/l chlorine dioxide
- 0.05 ... 6 mg/l chlorine

**Measuring tolerance:** Depending on the measured value and measuring method

**Battery:** 4 no. AA/LR6 batteries

**Permissible ambient temperature range:** 5...40 °C

**Relative humidity:** 30 ... 90 % (non-condensing)

**Degree of protection:** IP 68

**Housing material:** ABS

**Keypad:** Polycarbonate film

**Dimensions:** 190 x 110 x 55 mm (L x W x H)

**Weight:** 0.4 kg

#### Area of application

- Swimming pools
- Potable water
- Process water

## 2.7 Measuring and Test Systems

	Order no.
Photometer DT1B	1039315
Photometer DT2C	1039316
Photometer DT3B	1039317
Photometer DT4B	1039318

Photometers supplied with accessories, container vessels and reagents.

### Consumable items

	Order no.
DPD 1 buffer, 15 ml	1002857
DPD 1 reagent, 15 ml	1002858
DPD 3 solution, 15 ml	1002859
Phenol red tablets R 175 (100 in each)	305532
Cyanuric acid tablets (100 in each)	1039744
SPADNS reagent, 250 ml for fluoride detection	1010381
Calibration standard fluoride 1 mg/l, for calibration of the photometer during fluoride determination	1010382
3 spare cells: round cells with covers for DPD phenol red and cyanuric acid detection (DT1 and DT2B)	1007566
3 spare cells for fluoride detection (DT2A and B)	1010396
DPD reagent set, 15 ml each: 3 x DPD 1 buffer, 1 x DPD 1 reagent, 2 x DPD 3 solution	1007567
Chlorine dioxide tablets no. 1	1039732
Chlorine dioxide tablets no. 2	1039733
Chlorine HR tablets (100 off)	Chlorine_tablets
ACiDiTYiNG tablets (100 off)	AC_tablets

### Spare parts

#### Chlorite Photometer

	Order no.
Stirrer for purging of chlorine dioxide (DT4)	1022754
3 spare cells: round cells with covers for DPD phenol red and cyanuric acid detection (DT1 and DT2B)	1007566

### H<sub>2</sub>O<sub>2</sub> measurement

	Order no.
Reagent for H <sub>2</sub> O <sub>2</sub> (DT3), 15 ml	1023636
Spare cell, 5x , for H <sub>2</sub> O <sub>2</sub> (DT3)	1024072



## 2.8 Accessories for Measuring and Control Devices

### 2.8.1 Measuring Transducer 4...20 mA (Two Wire)

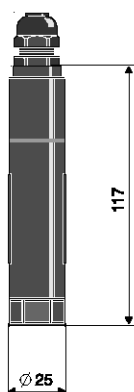
**Benefits:**

- Reliable signal transmission, even over large distances
- Interference-resistant 4 ... 20 mA signal
- Simple installation directly on the sensor

**Typical applications:**

Transmission of the measuring signal even over long distances and/or transmission of interference-resistant measured signals (e.g. pH, ORP) in conjunction with controllers type D1C, D2C and DULCOMARIN® or direct connection to PCs and/or a PLC. If using a PLC, it has to have an electrically isolated input.

#### pH measuring transducer 4 ... 20 mA type pH V1



pk\_5\_064

<b>Measuring range</b>	pH 0 ... 14
<b>Measuring error</b>	Better than 0.1 pH (typical $\pm 0.07$ pH)
<b>Socket</b>	SN6
<b>Input resistance</b>	$> 5 \times 10^{11} \Omega$
<b>Signal current output</b>	4 ... 20 mA $\approx$ -500 ... +500 mV $\approx$ pH 15.45 ... -1.45 not calibrated, not electrically isolated
<b>Power supply DC</b>	18...24 V DC
<b>Ambient temperature</b>	-5...50 °C, non-condensing
<b>Enclosure rating</b>	IP 65
<b>Dimensions</b>	141 mm (length), 25 mm ( $\varnothing$ )

**Order no.**

pH measuring transducer 4 ... 20 mA type pH V1

809126

#### ORP measuring transducer 4 ... 20 mA type RH V1

<b>Measuring range</b>	0 ... 1000 mV
<b>Measuring error</b>	Better than $\pm 5$ mV (typical $\pm 3$ mV)
<b>Socket</b>	SN6
<b>Input resistance</b>	$> 5 \times 10^{11} \Omega$
<b>Signal current output</b>	4 ... 20 mA $\approx$ 0 ... +1000 mV not electrically isolated
<b>Power supply DC</b>	18...24 V DC
<b>Ambient temperature</b>	-5...50 °C, non-condensing
<b>Enclosure rating</b>	IP 65
<b>Dimensions</b>	141 mm (length), 25 mm ( $\varnothing$ )

**Order no.**

ORP measuring transducer 4 ... 20 mA type RH V1

809127

#### Temperature measuring transducer 4 ... 20 mA type Pt100 V1

<b>Measuring range</b>	0 ... 100 °C
<b>Measuring error</b>	Better than $\pm 0.5$ °C (typical $\pm 0.3$ °C)
<b>Socket</b>	SN6
<b>Input resistance</b>	$\sim 0 \Omega$
<b>Signal current output</b>	4 ... 20 mA $\approx$ 0 ... +100 °C not electrically isolated
<b>Power supply DC</b>	18...24 V DC
<b>Ambient temperature</b>	-5...50 °C, non-condensing
<b>Enclosure rating</b>	IP 65
<b>Dimensions</b>	141 mm (length), 25 mm ( $\varnothing$ )

**Order no.**

Temperature measuring transducer 4 ... 20 mA type Pt 100 V1

809128



## 2.8 Accessories for Measuring and Control Devices

### PEROX transducer

The microprocessor-based PEROX transducer is used to control and activate the PEROX sensor and to evaluate the sensor signal. It is screwed directly on to the sensor head. The transducer can be directly connected to the D1C controller via a 3-core signal cable.

The PEROX transducer is approx. 205 mm long with a diameter of 32 mm.

### PEROX transducer for H<sub>2</sub>O<sub>2</sub> measurement

Includes an internal selector switch for the three ranges:

1 ... 20, 10 ... 200 and 100 ... 2000 mg/l H<sub>2</sub>O<sub>2</sub>

	Order no.
PEROX transducer V2 for DACa	1047979

PEROX transducer V1 for D1Ca on request.

### Accessory:

	Order no.
Signal cable, sold by the metre 2 x 0.25 mm <sup>2</sup> Ø 4 mm	725122



## 2.8 Accessories for Measuring and Control Devices

### 2.8.2

#### Accessories for Portable Meters Portamess®

##### Sensor quiver

Set of 5, for water tight storage of sensors. For Portamess® pH and Cond

Order no.

Sensor quiver

1008716

##### Conductivity sensor LF 204

Number of electrodes	4
Sensor shaft	Black epoxy
Sensors	Graphite
Shaft length	120 mm
Shaft diameter	15.3 mm
Cable length	1.5 m
Temperature sensor	NTC (30 kΩ) -5 ... 100 °C
Immersion depth min.	36 mm
Max. pressure	2 bar
Temperature	0 ... 90 °C
Cell constant	0.475 cm <sup>-1</sup> ±1.5 %
Measuring range	1 µS/cm...500 mS/cm

Order no.

Conductivity sensor LF 204

1008723



pk\_5\_093





## 3.0 Overview of Panel-Mounted Measuring/Control Stations

### 3.0.1

#### Selection Guide

##### Measuring, control and monitoring tasks in water treatment

###### DULCOTROL® DWCa\_P potable water/F&B

Treatment of potable water, water similar to potable water and treatment of rinsing water, industrial and process water in the food and beverage industry

- Disinfection
- Cleaning In Place (CIP)
- pH value adjustment
- Monitoring

###### DULCOTROL® DWCa\_W waste water

Treatment of industrial and municipal waste water

- pH neutralisation
- Disinfection
- Detoxification
- Desalination of process water
- Control of dissolved oxygen
- Monitoring

### 3.0.2

#### Identity Code Specifications in the DULCOTROL® Ordering System

We are offering DULCOTROL® measuring and control stations from the 1st quarter of 2015 in the new DWCa product range for applications in potable water/F&B and waste water. Until then the DULCOTROL® product line will be available as specified in the 2013 product catalogue with the product ranges PWCa, CWCa, WWCa and FCCa.

The measuring and control stations can be configured using the respective identity code ordering system. All the components, except the sensors, are mounted on a polypropylene panel on the "Panel-mounted" design. In the "Assembly kit" design, all components are supplied loose in a package. The DULCOTROL® ordering system works with user-based selection criteria so that you can select the most appropriate measuring and control station, largely without any great technical understanding. One or two measured variables can be configured in each product range. The identity code specifications are explained in more detail below. The content and scope of delivery contained in the specifications are described in Chapter 3.1.3 (Technical Description of the Scope of Delivery).

##### Specification: "Application"

The "Application" specification is used to define the application ("potable water", "waste water") in which the measuring and control station is deployed. This defines the types of sensors and fittings.

##### Specification: "Water to be measured"

This is used to further characterise the sample water (e.g. "clear water" or "turbid water") selected via the main application (e.g. potable water, waste water). The sensor type, measuring range (e.g. CLE 3-mA-2ppm) and fitting (e.g. DGMA) are defined in conjunction with the main application.

##### Specification: "Measured variable 1" and "Measured variable 2"

They are used to determine the measured variable to be measured or controlled (e.g. pH or chlorine). Up to two measured variables can be simultaneously selected within the scope of the specified options. This defines the sensor class (e.g. pH sensor or chlorine sensor) and the controller suitable for the measured variable and the appropriate measuring cable. We use the diaLog DACa controller for all measured variables except conductivity. We configure the Compact conductivity controller for the measured variable conductivity. The possible combinations of measured variables are listed in the tables in the "Technical Description of the Scope of Delivery" chapter.

##### Specification: "Communication interface"

This specification defines whether a PROFIBUS® DP interface is fitted on the controller. This interface is available from the 3rd quarter of 2015.

##### Specification: "Data logger"

This specification defines whether a data logger is available in the controller.

##### Specification: "Hardware expansion"

This specification defines whether a protective RC circuit is fitted to protect relays exposed to high loads.

##### Specification: "Sensor equipment"

This specification determines whether the measuring/control panel is supplied with or without sensors. If "with sensors" is selected, the sensors are also supplied in the original packaging. Select "without sensors" if the types of sensor supplied cannot be used (see chapter 3.1.3: Technical Description of the Scope of Delivery) (for example: Inapplicable measuring range) or if the measuring plates are to be stored.

## 3.0 Overview of Panel-Mounted Measuring/Control Stations

**Specification: "Design"**

This specification defines whether the measuring and control station is to be supplied as a completely assembled panel or an assembly kit and which label the panel is to have.

**Specification: "Sample water preparation"**

This specification defines whether a filter is fitted (for panel-mounted measuring and control stations) or is supplied ready for connection (for assembly kits).

**Specification: "Certification"**

This specification defines the approvals and certificates.

**Specification: "Documentation"**

This specification defines the operating language of the controller and the operating instructions.





## 3.1 Measuring and Control System DULCOTROL® Potable Water/F&B, DULCOTROL® Waste Water

### 3.1.1

#### DULCOTROL® Ordering System for Potable Water/F&B

Measuring and control stations DULCOTROL® for the potable water/F&B application are specially tailored to the potable water sector and food and beverage industry.

In addition, they also meet the particular requirements within these sectors: on the one hand, for potable water/product water treatment and, on the other hand, for the treatment of rinsing water, industrial water and process water.

Therefore, in the following identity code, if the Potable water/F&B application is selected under "Water to be measured", then the following types of water can be selected. Other types of water cannot be selected here.

- "Potable/product water treatment": this refers to the final treatment (e.g. disinfection) of water similar to potable water, as is the case in the production of potable water but also in the production of beverages or food.
- Rinsing/process/industrial water": this includes all rinsing process in the food and beverage industry, which aim to clean and disinfect pipework, vessels and machinery and/or more highly contaminated process or industrial process water.

# 3.1 Measuring and Control System DULCOTROL® Potable Water/F&B, DULCOTROL® Waste Water

## 3.1.2 Identity Code Ordering System for DULCOTROL® Measuring and Control Panels DWCA\_P: Potable Water/F&B

DWCa	Application
P	Potable water
<b>Water to be measured</b>	
1	Potable water/product water
2	Rinsing water/industrial water/process water
<b>Channel 1, measured variable 1</b>	
C0	Free chlorine < pH 8
C1	Free chlorine pH value > 8 and stable
G0	Total chlorine (free and combined chlorine)
P0	pH
R0	ORP
D0	Chlorine dioxide
I0	Chlorite
L0	Conductivity
Z0	Ozone
F0	Fluoride (pH min.= 5.5, pH max. = 9.5)
H0	Hydrogen peroxide
A0	Peracetic acid
X0	Dissolved oxygen
<b>Channel 2, measured variable 2 (optional)</b>	
00	None
C0	Free chlorine < pH 8
C1	Free chlorine pH value > 8 and stable
G0	Total chlorine (free and combined chlorine)
P0	pH
R0	ORP
D0	Chlorine dioxide
I0	Chlorite
L0	Conductivity
Z0	Ozone
F0	Fluoride (pH min.= 5.5, pH max. = 9.5)
H0	Hydrogen peroxide
A0	Peracetic acid
X0	Dissolved oxygen
<b>Measuring - Controlling</b>	
0	All measured variables measurable
9	All measured variables bidirectionally controllable
<b>Communication interface</b>	
0	without
4	PROFIBUS®-DP*
<b>Data logger</b>	
0	without
1	Data logger with measured value display on SD card
<b>Hardware expansion</b>	
0	without
1	Protective RC circuit for output relay
<b>Sensor equipment</b>	
0	With sensors
1	Without sensors
<b>Version</b>	
0	Panel-mounted with ProMinent Logo
B	Assembly kit without panel with ProMinent logo
(M)	Modified design
<b>Sample water treatments</b>	
0	without
1	With filter
<b>Certifications</b>	
01	CE (Standard)
<b>Documentation language</b>	
DE	German
EN	English
FR	French
IT	Italian
NL	Dutch
ES	Spanish
PL	Polish
SV	Swedish
HU	Hungarian
PT	Portuguese
CS	Czech

DWCa P 1 C0 P0 9 0 1 0 0 0 1 01 DE Identity code as a representative example

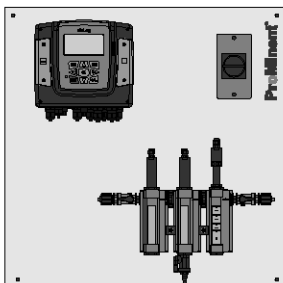
\* \* Available from 3rd quarter of 2015

Permissible measured variable combinations for DULCOTROL® DSWa\_P: Potable water/F&B see → 3-9

## 3.1 Measuring and Control System DULCOTROL® Potable Water/F&B, DULCOTROL® Waste Water

### 3.1.3

### DULCOTROL® potable water/F&B examples



P\_DVT\_0024\_SW1  
similar figure

#### Example 1: DWCa\_P\_D0\_I0\_1\_9\_0\_0\_0\_0\_0\_01\_DE

Application in potable water/F&B:

Measurement of chlorine dioxide and chlorite in potable water/product water with an integrated data logger.

#### Controller

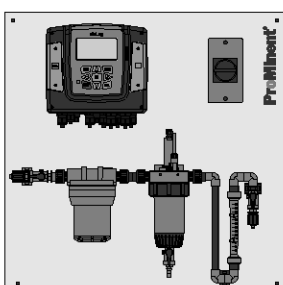
- DACa PA 6 1 4 0 0 0 0 1 0 0 1 0 DE

#### Fitting

- DGM\_A\_3\_2\_0\_T\_0\_0\_2:
- 1 measuring module: Chlorine dioxide sensor
- 1 measuring module: Chlorite sensor
- 1 continuous flow control module

#### Sensors

- CDE-2-mA 0.5 ppm
- CLT1-mA-0.5 ppm



P\_DVT\_0029\_SW1  
similar figure

#### Example 2: DWCa\_P\_P0\_C0\_2\_9\_0\_0\_1\_0\_0\_0\_01\_DE

Application in potable water/F&B:

Two-way control of pH and chlorine in rinsing water. The sample water is filtered through a 100 µm filter. The controller contains a relay protective RC circuit.

#### Controller

- DACa PA 6 1 4 0 0 0 0 0 1 0 1 0 DE

#### Fitting

- DLG III for pH and chlorine monitoring + flow control

#### Sensors

- CBR1-mA 2ppm
- PHER 112-SE

#### Panel-mounted water treatment

- Filter



## 3.1 Measuring and Control System DULCOTROL® Potable Water/F&B, DULCOTROL® Waste Water

### 3.1.4

#### DULCOTROL® Ordering System for Waste Water

The measuring and control stations DULCOTROL® for use with waste water are used in all branches of industry where waste water is treated.

The "Water to be measured" specification in the identity code ordering system is used to define which of the wetted components are suitable. Other types of water cannot be selected here.

- "Clear water": this means all types of waste water, containing hardly any or no visible solid fractions.
- "Water with solid fractions, turbid": this means all types of waste water, which have a low solids content, discernible as a milky turbidity.
- "Water with solid fractions, sludge-like": this means all types of waste water, which have a high solids content. In a sample taken, solid fractions either clearly settle out or the sample no longer lets through light.
- "Water with fluoride and pH < 5": this type of water generally has a higher content of free hydrofluoric acid (HF), which can damage certain materials (e.g. glass).





## 3.1 Measuring and Control System DULCOTROL® Potable Water/F&B, DULCOTROL® Waste Water

### 3.1.5 Identity Code Ordering System for DULCOTROL® Measuring and Control Panels DWCa\_W: Waste Water

DWCa	Application
W	Waste water
<b>Water to be measured</b>	
4	Clear waste water
5	Waste water with solid particle fraction, turbid
6	Waste water with solid particle fraction, containing sludge
7	Waste water, clear or turbid, with fluoride content and pH < 7
<b>Channel 1, measured variable 1</b>	
C0	Free chlorine < pH 8
C1	Free chlorine pH value > 8 and stable
G0	Total chlorine (free and combined chlorine)
P0	pH
R0	ORP
D0	Chlorine dioxide
I0	Chlorite
L0	Conductivity
Z0	Ozone
F0	Fluoride (pH min. = 5.5, pH max. = 9.5)
H0	Hydrogen peroxide
A0	Peracetic acid
X0	Dissolved oxygen
<b>Channel 2, measured variable 2 (optional)</b>	
00	None
C0	Free chlorine < pH 8
C1	Free chlorine pH value > 8 and stable
G0	Total chlorine (free and combined chlorine)
P0	pH
R0	ORP
D0	Chlorine dioxide
I0	Chlorite
L0	Conductivity
Z0	Ozone
F0	Fluoride (pH min. = 5.5, pH max. = 9.5)
H0	Hydrogen peroxide
A0	Peracetic acid
X0	Dissolved oxygen
<b>Measuring - Controlling</b>	
0	All measured variables measurable
9	All measured variables bidirectionally controllable
<b>Communication interface</b>	
0	without
4	PROFIBUS®-DP*
<b>Data logger</b>	
0	without
1	Data logger with measured value display on SD card
<b>Hardware expansion</b>	
0	without
1	Protective RC circuit for output relay
<b>Sensor equipment</b>	
0	With sensors
1	Without sensors
<b>Version</b>	
0	Panel-mounted with ProMinent Logo
B	Assembly kit without panel with ProMinent logo
(M)	Modified design
<b>Sample water treatments</b>	
0	without
1	With filter(not with waste water = 6)
<b>Certifications</b>	
01	CE (Standard)
<b>Documentation language</b>	
DE	German
EN	English
FR	French
IT	Italian
NL	Dutch
ES	Spanish
PL	Polish
SV	Swedish
HU	Hungarian
PT	Portuguese
CS	Czech
DWCa	W
1	C0
P0	9
0	1
0	0
0	0
1	01
DE	Identity code as a representative example

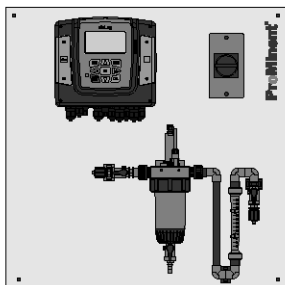
\* \* Available from 2nd quarter of 2015

Permissible measured variable combinations for DULCOTROL® DSWa\_W: Waste water see → 3-10

## 3.1 Measuring and Control System DULCOTROL® Potable Water/F&B, DULCOTROL® Waste Water

### 3.1.6

### DULCOTROL® waste water examples



P\_DVT\_0030\_SW1  
similar figure

#### Example 3: DWCa\_W\_H0\_00\_5\_9\_0\_0\_0\_0\_1\_1\_01\_DE

Waste water application:

Two-way control of the hydrogen peroxide in turbid waste water. The controller contains a relay protective RC circuit and a data logger.

#### Controller

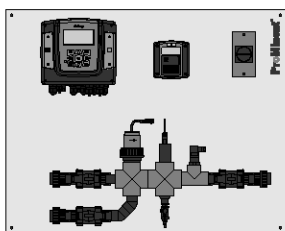
- DACa PA 6 1 0 0 0 0 0 1 1 0 1 0 DE

#### Fitting

- DLG III for hydrogen peroxide monitoring and flow control

#### Sensors

- PER-mA-50-ppm



P\_DVT\_0025\_SW1  
similar figure

#### Example 4: DWCa\_W\_P0\_L0\_6\_9\_0\_0\_0\_0\_1\_1\_01\_DE

Waste water application:

Two-way control of pH and measurement of conductivity in waste water containing sludge. The controller contains a relay protective RC circuit and a data logger.

#### Controller

- For pH: DACa PA 6 1 4 0 0 0 0 1 1 0 1 0 DE
- For conductivity: Compact Controller

#### Fitting

- Piping + flow control

#### Sensors

- ICT 1
- PHEX 112-SE





## 3.1 Measuring and Control System DULCOTROL® Potable Water/F&B, DULCOTROL® Waste Water

### 3.1.7 Permissible measured variable combinations for DULCOTROL® DSWa\_P: Potable water/F&B

Sample water 1: Potable water, product water															
Measured variable 1 (channel 1)		Measured variable 2 (channel 2)													
		00	C0	C1	G0	P0	R0	D0	I0	L0	Z0	F0	H0	A0	X0
Free chlorine < pH 8	C0	x			x	x	x	x							
Free chlorine < pH 8 and stable	C1	x			x	x	x	x							
Total chlorine (free and combined chlorine)	G0	x				x	x								
pH	P0	x				x									
ORP	R0	x				x									
Chlorine dioxide	D0	x				x	x		x						
Chlorite	I0	x													
Conductivity	L0	x				x	x								
Ozone	Z0	x				x	x								
Fluoride	F0	x				x									
Hydrogen peroxide	H0	x				x									
Peracetic acid	A0	x								x					
Dissolved oxygen	X0	x				x									

Sample water 2: Rinsing water, process water, industrial process water															
Measured variable (channel 1)		Measured variable (channel 2)													
		00	C0	C1	G0	P0	R0	D0	I0	L0	Z0	F0	H0	A0	X0
Free chlorine < pH 8	C0	x				x	x								
Free chlorine < pH 8 and stable	C1	x				x	x								
Total chlorine (free and combined chlorine)	G0	x				x	x								
pH	P0	x				x									
ORP	R0	x				x									
Chlorine dioxide	D0	x				x	x								
Chlorite	I0	x													
Conductivity	L0	x				x	x								
Ozone	Z0	x				x	x								
Fluoride	F0	x				x									
Hydrogen peroxide	H0	x				x									
Peracetic acid	A0	x								x					

## 3.1 Measuring and Control System DULCOTROL® Potable Water/F&B, DULCOTROL® Waste Water

### 3.1.8 Permissible measured variable combinations for DULCOTROL® DSWa\_W: Waste water

#### Sample water 4,5,7: clear and turbid waste water

Measured variable 1 (channel 1)		Measured variable 2 (channel 2)													
		00	C0	C1	G0	P0	R0	D0	I0	L0	Z0	F0	H0	A0	X0
Free chlorine < pH 8	C0	x				x	x								
Free chlorine < pH 8 and stable	C1	x				x	x								
Total chlorine (free and combined chlorine)	G0	x				x	x								
pH	P0	x				x									
ORP	R0	x				x									
Chlorine dioxide	D0	x				x	x								
Chlorite	I0	x													
Conductivity	L0	x				x	x								
Ozone	Z0	x				x	x								
Fluoride	F0	x				x									
Hydrogen peroxide	H0	x				x									
Peracetic acid	A0	x				x				x					

#### With sample water 6: waste water containing sludge

Measured variable 1 (channel 1)		Measured variable 2 (channel 2)													
		00	C0	C1	G0	P0	R0	D0	I0	L0	Z0	F0	H0	A0	X0
Free chlorine < pH 8	C0														
Free chlorine < pH 8 and stable	C1														
Total chlorine (free and combined chlorine)	G0														
pH	P0	x				x	x								
ORP	R0	x				x									
Chlorine dioxide	D0														
Chlorite	I0														
Conductivity	L0	x				x	x								
Conductivity	L0														x
Ozone	Z0														
Fluoride	F0														
Hydrogen peroxide	H0														
Peracetic acid	A0														
Dissolved oxygen	X0	x				x									



## 3.1 Measuring and Control System DULCOTROL® Potable Water/F&B, DULCOTROL® Waste Water

### 3.1.9 Technical Description of the Scope of Supply for DULCOTROL® DWCa

#### Controller

(For detailed information see chap. Measuring and Control Technology)

The DULCOMETER® dialog DACa controller is used for measuring all measured variables with the exception of conductivity. The Compact controller is configured for conductivity measurement.

The DULCOMETER® diaLog DACa Controller used with the DULCOTROL® DWCa is available as a single or two-channel measuring and control device. The following versions of the device can be separately selected using the DULCOTROL® identity code ordering system:

- Specification: **Communication interface**  
This specification defines whether a PROFIBUS® DP interface should be available on the measuring and control device. This interface is available from the 2nd quarter of 2014.
- Specification: **Data logger**  
This specification defines whether a data logger should be available on the measuring and control device.
- Specification: **Hardware expansion**  
This specification defines whether a protective RC circuit is to be available for the protection of relays subject to higher loading.

#### Hardware version and identity code of diaLog DACa controllers:

Hardware version	Identity code for diaLog DACa controller
1-channel device without RC, without data logger	DACa PA 6 1 0 0 0 0 0 0 0 1 0 DE
1-channel device with RC, without data logger	DACa PA 6 1 0 0 0 0 0 0 1 0 1 0 DE
2-channel device without RC, without data logger	DACa PA 6 1 4 0 0 0 0 0 0 1 0 DE
2-channel device with RC, without data logger	DACa PA 6 1 4 0 0 0 0 0 1 0 1 0 DE
1-channel device without RC, with data logger	DACa PA 6 1 0 0 0 0 0 1 0 0 1 0 DE
1-channel device with RC, with data logger	DACa PA 6 1 0 0 0 0 0 1 1 0 1 0 DE
2-channel device without RC, with data logger	DACa PA 6 1 4 0 0 0 0 1 0 0 1 0 DE
2-channel device with RC, with data logger	DACa PA 6 1 4 0 0 0 0 1 1 0 1 0 DE
1-channel device, PROFIBUS® DP	DACa PA 6 1 0 0 0 0 4 0 0 0 1 0 DE
2-channel device, PROFIBUS® DP	DACa PA 6 1 4 0 0 0 4 0 0 0 1 0 DE
1-channel device with RC, PROFIBUS® DP	DACa PA 6 1 0 0 0 0 4 0 1 0 1 0 DE
2-channel device with RC, PROFIBUS® DP	DACa PA 6 1 4 0 0 0 4 0 1 0 1 0 DE
1-channel device, PROFIBUS® DP, with data logger	DACa PA 6 1 0 0 0 0 4 1 0 0 1 0 DE
1-channel device with RC, PROFIBUS® DP, with data logger	DACa PA 6 1 0 0 0 0 4 1 1 0 1 0 DE
2-channel device, PROFIBUS® DP, with data logger	DACa PA 6 1 4 0 0 0 4 1 0 0 1 0 DE
2-channel device with RC, PROFIBUS® DP, with data logger	DACa PA 6 1 4 0 0 0 4 1 1 0 1 0 DE
<b>Order no.</b>	
Compact controller for conductive conductivity	DCCaW006L30010EN
Compact controller for inductive conductivity	DDCaW006L60010DE

## 3.1 Measuring and Control System DULCOTROL® Potable Water/F&B, DULCOTROL® Waste Water

### Sensors

(For detailed information see chap. Sensor Technology DULCOTEST®)

The identity code specifications "Application", "Measured variable" and "Water to be measured" define the sensor type to be used as specified below in the tables.

If another sensor type is necessary, the measuring/control panel can also be supplied without sensors (see identity code specification: "Sensor equipment"). The desired sensor should then be ordered separately.

### Sensor types for the defined specifications "measured variable" and "water to be measured" for the potable water ("P") application

Measured variable	Sample water	Sensor type	Order no.
Free chlorine with pH value < 8	1	CLE 3-mA-0.5 ppm	792927
Free chlorine with pH value > 8	1	CBR 1-mA-0,5 ppm	1038016
Free chlorine	2	CBR 1-mA-2 ppm	1038015
Total chlorine	1	CTE 1-mA-0.5 ppm	740686
Total chlorine	2	BCR 1-mA-2 ppm	1040115
pH	1	PHEP 112 SE	150041
pH	2	PHER 112 SE	1001586
ORP	1	RHEP-Pt-SE	150094
ORP	2	RHER-Pt-SE	1002534
ORP combined with ozone: R0 Z0	1/2	RHEP-Au-SE	1003875
Chlorine dioxide	1	CDE 2-mA-0.5 ppm	792930
Chlorine dioxide (temperature-corrected)	2	CDR 1-mA-2 ppm	1033393
Chlorite	1/2	CLT 1-mA-0.5 ppm	1021596
Conductivity, conductive	1	LFTK 1 DE	1002822
Conductivity, inductive	2	ICT 1	1023244
Ozone	1/2	OZE 3-mA-2 ppm	792957
Fluoride (temp.corr.)	1/2	FLEP 010-SE / FLEP 0100-SE	1028279
		Reference electrode, REFP-SE	1018458
		Pt 100 SE	305063
		Measuring transducer 4-20 mA FPV1	1028280
Hydrogen peroxide	1	PER 1-mA-200 ppm	1022509
Hydrogen peroxide	2	PER 1-mA-2000 ppm	1022510
Peracetic acid	1	PAA 1-mA-200 ppm	1022506
Peracetic acid	2	PAA 1-mA-2000 ppm	1022507
Dissolved oxygen	1/2	DO 1-mA-20 ppm	1020532
Temperature	1/2	Pt 100 SE	305063



### 3.1 Measuring and Control System DULCOTROL® Potable Water/F&B, DULCOTROL® Waste Water

Sensor types for the defined specifications "measured variable" and "water to be measured" for the waste water ("W") application

Measured variable	Sample water	Sensor type	Order no.
pH	4	PHEP 112 SE	150041
pH	5	PHER 112 SE	1001586
pH	6	PHEX 112 SE	305096
pH	7	PHEF 012 SE	1010511
ORP	4	RHEP-Pt-SE	150094
ORP	5	RHER-Pt-SE	1002534
ORP	6	RHEX-Pt-SE	305097
ORP combined with ozone: R0 Z0	1/2	RHEP-Au-SE	1003875
Fluoride (temp.corr.)	4/5/7	FLEP 010-SE / FLEP 0100-SE	1028279
		Measuring transducer 4-20 mA FP 100 V1	1031331
Temperature		Pt 100 SE	305063
		Reference electrode, REFP-SE	1018458
Conductivity, inductive	4/5/6/7	ICT 1	1023244
Total chlorine	4/5	BCR 1-mA-2 ppm	1040115
Free chlorine	4/5	CBR 1-mA-2 ppm	1038015
Hydrogen peroxide	4/5	PER 1-mA-50 ppm	1030511
Dissolved oxygen	4/5	DO 1-mA-20 ppm	1020532
Ozone	4/5	OZE 3-mA-2 ppm	792957
Chlorine dioxide (temperature-corrected)	4/5	CDR 1-mA-2 ppm	1033393
Peracetic acid	4/5	PAA 1-mA-200 ppm	1022506
Temperature	4/5/6	Pt 1000 SE	1002856



## 3.1 Measuring and Control System DULCOTROL® Potable Water/F&B, DULCOTROL® Waste Water

### Sensor fittings

(For detailed information see chap. Sensor Technology DULCOTEST®)

The bypass fitting used depends in particular on the water to be measured but sometimes also on the measured variable or the combination of measured variables.

### Fittings for the potable water/F&B ("P") application

In the Potable water/F&B ("P") application, the fitting type DGMA is used for all potable water type clear water. Fitting type DLG III is used for rinsing/industrial/process water with a turbid appearance in application "P".

Measured variable	Sample water	Sensor type
Free chlorine	1	DGMA
Total chlorine	1	DGMA
pH	1	DGMA
ORP	1	DGMA
Chlorine dioxide (CDE 2)	1	DGMA
Chlorite	1	DGMA
Conductivity	1	DGMA
Ozone	1	DGMA
Hydrogen peroxide	1	DGMA
Peracetic acid	1	DGMA
Temperature	1	DGMA
Free chlorine	2	DLGIII
Total chlorine	2	DLGIII
pH	2	DLGIII
ORP	2	DLGIII
Chlorine dioxide (CDR)	2	DLGIII
Chlorite	2	DLGIII
Ozone	2	DLGIII
Hydrogen peroxide	2	DLGIII
Peracetic acid	2	DLGIII
Temperature	2	DLGIII
Conductivity, inductive	2	ICT 3 in T-piece
Fluoride (temp.corr.)	1/2	DLGIV
Dissolved oxygen (DO1)	1	Adapter d75 pipe

### Fittings for the waste water/F&B ("W") application

In the "Waste water" ("W") application, the fitting type DLGIII is used for all clear water or water with only a low solid fraction. For sludge containing water in the "W" application the sensors are, wherever possible, fitted directly using adapters in the DN 40 PVC sample water line.

Measured variable	Sample water	Sensor type
Chlorine dioxide (CDR)	4/5	DLGIII
Fluoride	4/7	DLG IV (PVC) + magnetic stirrer
Dissolved oxygen (DO1)	4/5	Adapter for PVC pipe d75
Dissolved oxygen (DO2)	6	With pipe adapter for immersion pipe
Total chlorine	4/5	DLGIII
Conductivity, inductive (ICT 1)	4/5/6	Adapter for PVC pipe DN 40 (bypass on plate)
Ozone	4/5	DLGIII
ORP	6	T-piece / DN 40
ORP	4/5	DLGIII
Temperature	6	T-piece / DN 40
Temperature	4/5	DLGIII
Hydrogen peroxide	4/5	DLGIII
pH	6	T-piece / DN 40
pH	4/5/7	DLGIII



### 3.1 Measuring and Control System DULCOTROL® Potable Water/F&B, DULCOTROL® Waste Water

#### Hydraulic connector, piping

An 8 x 5 mm hose connector is used as the hydraulic connection for the sample water with "Water to be measured" 1, 2, 4, 5, 7 and a DN 25 connector for the "Water to be measured" 6 (containing sludge). Generally there is a shut-off ball valve fitted upstream and downstream of the bypass fitting. If ordered, a sample water filter is fitted upstream of the bypass fitting. The bypass fittings each contain a sampling tap. A metal pin is incorporated in the bypass fittings for potential equalisation.







# ProMinent® Chemical Resistance List

## Resistance of Materials Used in Liquid Ends to the Chemicals Most Frequently Used

The data apply to standard conditions (20 °C, 1,013 mbar).

s	=	saturated solution in water
+	=	resistant
+/o	=	largely resistant
o	=	conditionally resistant
-	=	not resistant
n	=	resistance not known
=>	=	see
*	=	for bonded connections, the resistance of the adhesive (e.g. Tangit) is to be considered. (Materials of the types 'o' and 'l' are not recommended !)
**	=	does not apply to glass fibre reinforced material

Concentration data are stated in weight percent, relative to aqueous solutions. If percentages are stated for the level of resistance, this level of resistance is only valid up to this concentration.

### NOTE:

The elastomers **CSM (Hypalon®)** and **IIR (butyl rubber)** used as diaphragm materials in pulsation dampers have properties similar to **EPDM**.

**PTFE** is resistant to all chemicals in this list.

**PTFE filled with carbon**, however, is attacked by strong oxidants such as bromine (anhydrous) or concentrated acids (phosphoric acid, sulphuric acid, chromic acid).

The resistance of PVC-U adhesive joints with Tangit deviates from the list below with regard to the following chemicals:

Medium	Concentration range
Sulfochromic acid	≥ 70 % H <sub>2</sub> SO <sub>4</sub> + 5 % K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> /Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>
Chromic acid	≥ 10 % CrO <sub>3</sub>
Hydrochloric acid	≥ 25 % HCl
Hydrogen peroxide	≥ 5 % H <sub>2</sub> O <sub>2</sub>
Hydrofluoric acid	≥ 0 % HF

### Explanation of abbreviations used as column headings:

<b>Acrylic:</b>	Acrylic resistance
<b>PVC:</b>	PVC, rigid, (PVC-U) resistance
<b>PP:</b>	Polypropylene resistance
<b>PVDF:</b>	PVDF resistance
<b>1.4404:</b>	Stainless steel 1.4404 & 1.4571 resistance
<b>FKM:</b>	Fluorine Rubber (e.g. Viton® A & B) resistance
<b>EPDM:</b>	Ethylene-Propylene-Dien-rubber resistance
<b>Tygon:</b>	Tygon® R-3603 resistance
<b>Pharmed:</b>	Pharmed® resistance
<b>PE:</b>	Polyethylene resistance
<b>2.4819:</b>	Hastelloy C-276 resistance
<b>WGK:</b>	water endangering class

Viton® is a registered trademark of DuPont Dow Elastomers

### Water endangering classes (WGK):

1	=	slightly hazardous to water
2	=	hazardous to water
3	=	severely hazardous to water
(X)	=	no classification. Classification according to conclusion by analogy. To be used under reserve.

### Safety data sheets

Safety data sheets on our products in a number of different languages are provided on our website.

[www.prominent.com/MSDS](http://www.prominent.com/MSDS)



# ProMinent® Chemical Resistance List

The data has been taken from relevant manufacturer's documentation and our own tests. Resistance of materials is also dependant on other factors, e.g. operating conditions, conditions of surfaces etc, and so this list must be treated as an initial guide only. It cannot claim to offer any guarantees. It should be taken into consideration in particular that usual dosing media are compounds, and their corrosiveness cannot be deducted simply by adding the corrosiveness of each single component. In such cases the chemical producers' data of the material compatibility are to be considered as a matter of prime importance for the material choice. A safety data sheet does not give this data and therefore cannot take the place of the technical documentation on the application.

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Acetaldehyde	CH <sub>3</sub> CHO	100%	-	-	o	-	+	-	+/-	-	-	+	+	2
Acetamide	CH <sub>3</sub> CONH <sub>2</sub>	s	+	+	+	+	+	o	+	-	+/-	+	+	1
Acetic Acid	CH <sub>3</sub> COOH	100%	-	50%	+	+	+	-	o	60%	60%	70%	+	1
Acetic Anhydride	(CH <sub>3</sub> CO) <sub>2</sub> O	100%	-	-	o	-	+	-	+/-	-	+	o	+	1
Acetic Ether => Ethyl Acetate														
Acetone	CH <sub>3</sub> COCH <sub>3</sub>	100%	-	-	+	-	+	-	+	-	-	+	+	1
Acetophenone	C <sub>6</sub> H <sub>5</sub> COCH <sub>3</sub>	100%	-	n	+	-	+	-	+	n	n	+	+	
Acetyl Chloride	CH <sub>3</sub> COCl	100%	-	+	n	-	o	+	-	-	o	n	+	1
Acetylacetone	CH <sub>3</sub> COCH <sub>2</sub> COCH <sub>3</sub>	100%	-	-	+	-	+	-	+	n	n	+	+	1
Acetylene Dichloride => Dichloro Ethylene														
Acetylene Tetrachloride => Tetrachloro Ethane														
Acrylonitril	CH <sub>2</sub> =CH-CN	100%	-	-	+	+	+	-	-	-	-	+	+	3
Adipic Acid	HOOC(CH <sub>2</sub> ) <sub>4</sub> COOH	s	+	+	+	+	+	+	+	-	+/-	+	+	1
Allyl Alcohol	CH <sub>2</sub> CHCH <sub>2</sub> OH	96%	-	o	+	+	+	-	+	-	o	+	+/-	2
Aluminium Acetate	Al(CH <sub>3</sub> COO) <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+/-	1
Aluminium Bromide	AlBr <sub>3</sub>	s	+	+	+	+	n	+	+	+	+	+	+	2
Aluminium Chloride	AlCl <sub>3</sub>	s	+	+	+	+	-	+	+	+	+	+	+	1
Aluminium Fluoride	AlF <sub>3</sub>	10%	+	+	+	+	-	+	+	+	+	+	+/-	1
Aluminium Hydroxide	Al(OH) <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Aluminium Nitrate	Al(NO <sub>3</sub> ) <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Aluminium Phosphate	AlPO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Aluminium Sulphate	Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Ammonium Acetate	CH <sub>3</sub> COONH <sub>4</sub>	s	+	+/-	+	+	+	+	+	+	+	+	+	1
Ammonium Bicarbonate	NH <sub>4</sub> HCO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Ammonium Carbonate	(NH <sub>4</sub> ) <sub>2</sub> CO <sub>3</sub>	40%	+	+	+	+	+	+	+	+	+	+	+	1
Ammonium Chloride	NH <sub>4</sub> Cl	s	+	+	+	+	-	+	+	+	+	+	+/-	1
Ammonium Fluoride	NH <sub>4</sub> F	s	+	o	+	+	o	+	+	+	+	+	+	1
Ammonium Hydroxide	"NH <sub>4</sub> OH"	30%	+	+	+	+	+	-	+	+	+	+	+	2
(25 °C)														
Ammonium Nitrate	NH <sub>4</sub> NO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Ammonium Oxalate	(COONH <sub>4</sub> ) <sub>2</sub> * H <sub>2</sub> O	s	+	+	+	+	+	+	+	+	+	+	+	1
Ammonium Perchlorate	NH <sub>4</sub> ClO <sub>4</sub>	10%	+	+	+	+	+	+	+	+	+	+	+	1
Ammonium Peroxodisulphate	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>8</sub>	s	+	+	+	+	5%	+	+	+	+	+	5%	2
Ammonium Phosphate	(NH <sub>4</sub> ) <sub>3</sub> PO <sub>4</sub>	s	+	+	+	+	10%	+	+	+	+	+	10%	1
Ammonium Sulphate	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	s	+	+	+	+	10%	+	+	+	+	+	10%	1
Ammonium Sulphide	(NH <sub>4</sub> ) <sub>2</sub> S	s	+	+	+	+	n	+	+	n	n	+	n	2
Ammoniumaluminium Sulphate	NH <sub>4</sub> Al(SO <sub>4</sub> ) <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Amyl Alcohol	C <sub>5</sub> H <sub>11</sub> OH	100%	+	+	+	+	+	-	+	-	-	+	+	1
Aniline	C <sub>6</sub> H <sub>5</sub> NH <sub>2</sub>	100%	-	-	+	+	+	-	+/-	-	o	+	+	2
Aniline Hydrochloride	C <sub>6</sub> H <sub>5</sub> NH <sub>2</sub> * HCl	s	n	+	+	+	-	+/-	+/-	-	o	+	+	2
Antimony Trichloride	SbCl <sub>3</sub>	s	+	+	+	+	-	+	+	+	+	+	n	2
Aqua Regia	3 HCl + HNO <sub>3</sub>	100%	-	+	-	+	-	-	o	-	-	-	-	2
Arsenic Acid	H <sub>3</sub> AsO <sub>4</sub>	s	+	+	+	+	+	+	+	20%	o	+	+	3
Barium Carbonate	BaCO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Barium Chloride	BaCl <sub>2</sub>	s	+	+	+	+	-	+	+	+	+	+	+	1
Barium Hydroxide	Ba(OH) <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Barium Nitrate	Ba(NO <sub>3</sub> ) <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Barium Sulphate	BaSO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Barium Sulphide	BaS	s	+	+	+	+	+	+	+	+	+	+	+	(1)
Benzaldehyde	C <sub>6</sub> H <sub>5</sub> CHO	100%	-	-	+	-	+	+	+	-	-	o	+	1
Benzene	C <sub>6</sub> H <sub>6</sub>	100%	-	-	o	+	+	o	-	-	-	o	+	3
Benzene Sulphonic Acid	C <sub>6</sub> H <sub>5</sub> SO <sub>3</sub> H	10%	n	n	+	+	+	+	-	-	-	n	+	2
Benzoic Acid	C <sub>6</sub> H <sub>5</sub> COOH	s	+	+	+	+	+	+	+	-	+/-	+	+	1
Benzoyl Chloride	C <sub>6</sub> H <sub>5</sub> COCl	100%	-	n	o	n	o	+	+	n	n	o	+	2



# ProMinent® Chemical Resistance List

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Benzyl Alcohol	$C_6H_5CH_2OH$	100%	-	-	+	+	+	+	-	-	+	+	+	1
Benzyl Benzoate	$C_6H_5COOC_7H_7$	100%	-	-	+	o	+	+	-	-	-	+	+	2
Benzyl Chloride	$C_6H_5CH_2Cl$	90%	-	n	o	+	+	+	-	-	-	o	+	2
Bitter Salt => Magnesium Sulphate														
Bleach => Sodium Hypochlorite														
Blue Vitriol => Copper Sulphate														
Borax => Sodium Tetraborate														
Boric Acid	$H_3BO_3$	s	+	+	+	+	+	+	+	+	+	+	+	1
Brine		s	+	+/o	+	+	+/o	+	+	+	+	+	+	1
Bromine (dry)	$Br_2$	100%	-	-	-	+	-	-	-	-	-	-	+	2
Bromine Water	$Br_2 + H_2O$	s	-	+	-	+	-	-	-	n	n	-	n	(2)
Bromo Benzene	$C_6H_5Br$	100%	n	n	o	+	+	o	-	-	-	o	+	2
Bromochloro Methane	$CH_2BrCl$	100%	-	-	-	+	+	n	+/o	-	-	o	+	2
Bromochlorotrifluoro Ethane	$HCClBrCF_3$	100%	-	-	o	+	+	+	-	+	+	o	+	(3)
Butanediol	$HOC_4H_8OH$	10%	n	+	+	+	+	o	+	+	+	+	+	1
Butanetriol	$C_4H_{10}O_3$	s	+	+	+	+	+	o	+	+	+	+	+	1
Butanol	$C_4H_9OH$	100%	-	+	+	+	+	o	+/o	-	-	+	+	1
Butyl Acetate	$C_7H_{13}O_2$	100%	-	-	+	+	+	-	-	-	+/o	+	+	1
Butyl Acetate	$CH_3COOC_4H_9$	100%	-	-	o	+	+	-	+/o	-	+/o	-	+	1
Butyl Alcohol => Butanol														
Butyl Amine	$C_4H_9NH_2$	100%	n	n	n	-	+	-	-	n	n	+	+	1
Butyl Benzoate	$C_6H_5COOC_4H_9$	100%	-	-	o	n	+	+	+	-	-	o	+	2
Butyl Mercaptane	$C_4H_9SH$	100%	n	n	n	+	n	+	-	n	n	n	n	3
Butyl Oleate	$C_{22}H_{42}O_2$	100%	n	n	n	+	+	+	+/o	n	n	n	+	1
Butyl Stearate	$C_{22}H_{44}O_2$	100%	o	n	n	+	+	+	-	n	n	n	+	1
Butyraldehyde	$C_3H_7CHO$	100%	-	n	+	n	+	-	+/o	-	-	+	+	1
Butyric Acid	$C_3H_7COOH$	100%	5%	20%	+	+	+	+	+	-	+/o	+	+	1
Calcium Acetate	$(CH_3COO)_2Ca$	s	+	+	+	+	+	+	+	+	+	+	+	1
Calcium Bisulphite	$Ca(HSO_3)_2$	s	+	+	+	+	+	+	+	+	+	+	+	(1)
Calcium Carbonate	$CaCO_3$	s	+	+	+	+	+	+	+	+	+	+	+	1
Calcium Chloride	$CaCl_2$	s	+	+	+	+	-	+	+	+	+	+	+	1
Calcium Cyanide	$Ca(CN)_2$	s	+	+	+	+	n	+	+	+	+	+	n	3
Calcium Hydroxide	$Ca(OH)_2$	s	+	+	+	+	+	+	+	+	+	+	+	1
Calcium Hypochlorite	$Ca(OCI)_2$	s	+	+	o	+	-	o	+	+	+	+	+	2
Calcium Nitrate	$Ca(NO_3)_2$	s	+	50%	50%	+	+	+	+	+	+	+	+	1
Calcium Phosphate	$Ca_3(PO_4)_2$	s	+	+	+	+	+	+	+	+	+	+	+	1
Calcium Sulphate	$CaSO_4$	s	+	+	+	+	+	+	+	+	+	+	+	1
Calcium Sulphide	$CaS$	s	+	+	+	+	n	+	+	+	+	+	+	(2)
Calcium Sulphite	$CaSO_3$	s	+	+	+	+	+	+	+	+	+	+	+	(1)
Calcium Thiosulphate	$CaS_2O_3$	s	+	+	+	+	-	+	+	+	+	+	+	1
Carbolic Acid => Phenole														
Carbon Disulphide	$CS_2$	100%	-	-	o	+	+	+	-	-	-	o	+	2
Carbon Tetrachloride	$CCl_4$	100%	-	-	-	+	+	+	-	-	-	o	+	3
Carbonic Acid	" $H_2CO_3$ "	s	+	+	+	+	+	+	+	+	+	+	+	1
Caustic Potash => Potassium Hydroxide														
Caustic Soda => Sodium Hydroxide														
Chloric Acid	$HClO_3$	20%	+	+	-	+	-	o	o	+	+	10%	+	2
Chlorinated Lime => Calcium Hypochlorite														
Chlorine Dioxide Solution	$ClO_2 + H_2O$	0.5%	o	+	o	+	-	o	-	o	-	o	+	
Chlorine Water	$Cl_2 + H_2O$	s	+	+	o	+	-	+	+	o	-	o	+	
Chloro Benzene	$C_6H_5Cl$	100%	-	-	+	+	+	+	-	-	-	o	+	2
Chloro Ethanol	$ClCH_2CH_2OH$	100%	-	-	+	o	+	-	o	-	+	+	+	3
Chloro Ethylbenzene	$C_6H_4ClC_2H_5$	100%	-	-	o	n	+	o	-	-	-	o	+	(2)
Chloro Phenole	$C_6H_4OHCl$	100%	-	n	+	+	+	n	-	-	-	+	+	2
Chloro Toluene	$C_7H_8Cl$	100%	-	-	n	+	+	+	-	-	-	n	+	2
Chloroacetone	$ClCH_2COCH_3$	100%	-	-	n	n	+	-	+	-	-	n	+	3
Chlorobutadiene	$C_4H_5Cl$	100%	-	-	n	n	+	+	-	-	-	n	+	1
Chloroform	$CHCl_3$	100%	-	-	o	+	+	+	-	-	o	-	+	2
Chlorohydrin	$C_3H_5OCl$	100%	-	n	+	-	+	+	o	-	+	+	+	3
Chloroprene => Chlorobutadiene														
Chlorosulphonic Acid	$SO_2(OH)Cl$	100%	-	o	-	+	-	-	-	-	-	-	o	1
Chrome-alum => Potassium Chrome Sulphate														
Chromic Acid	$H_2CrO_4$	50%	-	+	o	+	10%	+	-	o	o	+	10%	3



## ProMinent® Chemical Resistance List

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Chromic-Sulphuric Acid	$K_2CrO_4 + H_2SO_4$	s	-	+	-	+	n	n	n	-	-	-	n	3
Chromium Sulphate	$Cr_2(SO_4)_3$	s	+	+	+	+	+	+	+	+	+	+	+	1
Citric Acid	$C_6H_8O_7$	s	+	+	+	+	+	+	+	+	+	+	+	1
Cobalt Chloride	$CoCl_2$	s	+	+	+	+	-	+	+	+	+	+	+	2
Copper-II-Acetate	$Cu(CH_3COO)_2$	s	+	+	+	+	+	+	+	+	+	+	+	3
Copper-II-Arsenite	$Cu_3(AsO_3)_2$	s	+	+	+	+	+	+	+	+	+	+	+	3
Copper-II-Carbonate	$CuCO_3$	s	+	+	+	+	+	+	+	+	+	+	+	2
Copper-II-Chloride	$CuCl_2$	s	+	+	+	+	1%	+	+	+	+	+	+	2
Copper-II-Cyanide	$Cu(CN)_2$	s	+	+	+	+	+	+	+	+	+	+	+	(3)
Copper-II-Fluoride	$CuF_2$	s	+	+	+	+	+	+	+	+	+	+	+	(2)
Copper-II-Nitrate	$Cu(NO_3)_2$	s	+	+	+	+	+	+	+	+	+	+	+/o	2
Copper-II-Sulphate	$CuSO_4$	s	+	+	+	+	+	+	+	+	+	+	+	2
Cresols	$C_6H_4CH_3OH$	100%	o	o	+	+	+	+	-	-	-	+	+	2
Crotonaldehyde	$CH_3C_2H_2CHO$	100%	n	-	+	+	+	-	+	-	-	+	+	3
Cubic Nitre => Sodium Nitrate														
Cumene => Isopropyl Benzene														
Cyclo Hexane	$C_6H_{12}$	100%	+	-	+	+	+	+	-	-	-	+	o	1
Cyclohexanole	$C_6H_{11}OH$	100%	o	+/o	+	+	+	+	-	-	-	+	+	1
Cyclohexanone	$C_6H_{10}O$	100%	-	-	+	-	-	-	+/o	-	-	+	+	1
Cyclohexyl Alcohol => Cyclohexanol														
Cyclohexylamine	$C_6H_{11}NH_2$	100%	n	n	n	n	+	-	n	n	n	n	+	2
Decahydronaphthaline	$C_{10}H_{18}$	100%	-	+/o	o	+	n	o	-	-	-	o	+	2
Decaline => Decahydronaphthalene														
Dextrose => Glucose														
Diacetonolcohol	$C_6H_{12}O_2$	100%	-	-	+	o	+	-	+	-	-	+	+	1
Dibromoethane	$C_2H_4Br_2$	100%	-	-	n	+	+	+	-	-	-	-	+	3
Dibutyl Ether	$C_4H_9OC_4H_9$	100%	-	-	+	+	+	-	o	-	-	+	+	2
Dibutyl Phthalate	$C_{16}H_{22}O_4$	100%	-	-	+	+	+	+	+/o	o	+	o	+	2
Dibutylamine	$(C_4H_9)_2NH$	100%	n	n	+	+	+	-	-	n	n	+	+	1
Dichloro Acetic Acid	$Cl_2CHCOOH$	100%	-	+	+	+	+	-	+	-	o	+	+	1
Dichloro Benzene	$C_6H_4Cl_2$	100%	-	-	o	+	+	+	-	-	-	o	+	2
Dichloro Butan	$C_4H_8Cl_2$	100%	-	-	o	+	+	+	-	-	-	o	+	3
Dichloro Butene	$C_4H_6Cl_2$	100%	-	-	o	+	+	o	-	-	-	o	+	3
Dichloro Ethane	$C_2H_4Cl_2$	100%	-	-	o	+	+	+	-	-	o	-	+	3
Dichloro Ethylene	$C_2H_2Cl_2$	100%	-	-	o	+	+	o	-	-	o	-	+	2
Dichloro Methane	$CH_2Cl_2$	100%	-	-	o	o	o	+	-	-	o	-	+	2
Dichloroisopropyl Ether	$(C_3H_7Cl)_2O$	100%	-	-	o	n	+	o	o	-	-	o	+	(2)
Dicyclohexylamine	$(C_6H_{12})_2NH$	100%	-	-	o	n	+	-	-	-	-	o	+	2
Diethyleneglycol	$C_4H_{10}O_3$	s	+	+	+	+	+	+	+	+	+	+	+	1
Diethyleneglycolethyl Ether	$C_8H_{18}O_3$	100%	n	n	+	+	+	n	+/o	-	o	+	+	1
Diethylether	$C_2H_5OC_2H_5$	100%	-	-	o	+	+	-	-	-	o	o	+	1
Diglycolic Acid	$C_4H_6O_5$	30%	+	+	+	+	+	+	n	+	+/o	+	+	3
Dihexyl Phthalate	$C_{20}H_{26}O_4$	100%	-	-	+	+	+	-	n	o	+	+	+	(1)
Diisobutylketone	$C_9H_{18}O$	100%	-	-	+	+	+	-	+	-	-	+	+	1
Di-iso-nonyl Phthalate	$C_{26}H_{42}O_4$	100%	-	-	+	+	+	n	n	o	+	+	+	1
Diisopropylketone	$C_7H_{14}O$	100%	-	-	+	+	+	-	+	-	-	+	+	1
Dimethyl Carbonate	$(CH_3O)_2CO$	100%	n	n	+	+	+	+	-	n	n	+	+	1
Dimethyl Ketone => Acetone														
Dimethyl Phthalate	$C_{10}H_{10}O_4$	100%	-	-	+	+	+	-	+/o	o	+	+	+	1
Dimethylformamide	$HCON(CH_3)_2$	100%	-	-	+	-	+	-	+	-	+/o	+	+	1
Dimethylhydrazine	$H_2NN(CH_3)_2$	100%	n	n	+	n	+	-	+	n	n	+	+	3
Diocetyl Phthalate	$C_{44}H_{88}O_4$	100%	-	-	+	+	+	-	+/o	o	+	+	+	1
Dioxane	$C_4H_8O_2$	100%	-	-	o	-	+	-	+/o	-	-	+	+	1
Disodium Hydrogenphosphate	$Na_2HPO_4$	s	+	+	+	+	+	+	+	+	+	+	+	1
Disulfur Acid -- Oleum														
Disulphur Dichloride	$S_2Cl_2$	100%	n	n	n	+	n	+	-	-	-	n	n	
DMF => Dimethylformamide														
Engine Oils		100 %	n	+/o	+	+	+	+	-	-	-	+	+	2
Epsom salts => Magnesium Sulphate														
Ethanol	$C_2H_5OH$	100%	-	+	+	+	+	-	+	-	+	+	+	1
Ethanol Amine	$HOC_2H_4NH_2$	100%	o	n	+	-	+	-	+/o	-	o	+	+	1
Ethyl Acetate	$CH_3COOC_2H_5$	100%	-	-	35%	+	+	-	+/o	-	+/o	+	+	1
Ethyl Acrylate	$C_2H_3COOC_2H_5$	100%	-	-	+	o	+	-	+/o	-	-	+	+	2

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Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Ethyl Benzene	$C_6H_5-C_2H_5$	100%	-	-	o	+	+	o	-	-	-	o	+	1
Ethyl Benzoate	$C_6H_5COOC_2H_5$	100%	n	-	+	o	+	+	-	-	-	+	+	1
Ethyl Bromide	$C_2H_5Br$	100%	-	n	+	+	n	+	-	-	o	+	+	2
Ethyl Chloroacetate	$ClCH_2COOC_2H_5$	100%	-	o	+	+	+	+	-	-	-	+	+	2
Ethyl Chlorocarbonate	$ClCO_2C_2H_5$	100%	n	n	n	n	n	+	-	n	n	n	n	(2)
Ethyl Cyclopentane	$C_5H_4C_2H_5$	100%	+	+	+	+	+	+	-	-	-	+	+	(1)
Ethylacetoacetate	$C_6H_{10}O_3$	100%	n	-	+	+	+	-	+o	-	+o	+	+	1
Ethylacrylic Acid	$C_4H_7COOH$	100%	n	n	+	+	+	n	+o	n	n	+	+	(1)
Ethylene Diamine	$(CH_2NH_2)_2$	100%	o	o	+	-	o	-	+	n	n	+	o	2
Ethylene Dibromide => Dibromoethane														
Ethylene Dichloride => Dichloro Ethane														
Ethylene Glycol => Glycol														
Ethylenglycol Ethylether	$HOC_2H_4OC_2H_5$	100%	n	n	+	+	+	n	+o	-	o	+	+	1
Ethylhexanol	$C_8H_{16}O$	100%	n	+o	+	+	+	+	+	-	-	+	+	2
Fatty Acids	$R-COOH$	100%	+	+	+	+	+	+	o	-	o	+	+	1
Ferric Chloride	$FeCl_3$	s	+	+	+	+	-	+	+	+	+	+	+o	1
Ferric Nitrate	$Fe(NO_3)_3$	s	+	+	+	+	+	+	+	+	+	+	+	1
Ferric Phosphate	$FePO_4$	s	+	+	+	+	+	+	+	+	+	+	+	1
Ferric Sulphate	$Fe_2(SO_4)_3$	s	+	+	+	+	o	+	+	+	+	+	+	1
Ferrous Chloride	$FeCl_2$	s	+	+	+	+	-	+	+	+	+	+	+o	1
Ferrous Sulphate	$FeSO_4$	s	+	+	+	+	+	+	+	+	+	+	+	1
Fixing Salt => Sodium Thiosulphate														
Fluoro Benzene	$C_6H_5F$	100%	-	-	+	+	+	o	-	-	-	o	+	2
Fluoroboric Acid	$HBF_4$	35%	+	+	+	+	o	+	+	+	-	+	+	1
Fluorosilicic Acid	$H_2SiF_6$	100%	+	30%	30%	+	o	+	+	25%	o	40%	+o	2
Formaldehyde	$CH_2O$	40%	+	+	+	+	+	-	+o	-	-	+	+	2
Formalin => Formaldehyde														
Formamide	$HCONH_2$	100%	+	-	+	+	+	+	+	n	n	+	+	1
Formic Acid	$HCOOH$	s	-	+o	+	+	+	-	-	+o	+o	+	+	1
Furane	$C_4H_4O$	100%	-	-	+	-	+	-	n	-	-	+	+	3
Furane Aldehyde	$C_5H_4O_2$	100%	n	n	n	o	+	-	+o	-	-	n	n	2
Furfuryl Alcohol	$OC_4H_3CH_2OH$	100%	-	-	+	o	+	n	+o	-	-	+	+	1
Gallic Acid	$C_6H_2(OH)_3COOH$	5%	+	+	+	+	+	+	+o	+	+	+	+	1
Gasoline		100 %	-	-	+	+	+	+	-	-	-	+	+	2
Glauber's Salt => Sodium Sulphate														
Glucose	$C_6H_{12}O_6$	s	+	+	+	+	+	+	+	+	+	+	+	1
Glycerol	$C_3H_5(OH)_3$	100%	+	+	+	+	+	+	+	+	+	+	+	1
Glycerol Triacetate	$C_3H_5(CH_3COO)_3$	100%	n	n	+	+	+	-	+	n	n	+	+	1
Glycine	$NH_2CH_2COOH$	10%	+	+	+	+	+	+	+	+	+	+	+	1
Glycol	$C_2H_4(OH)_2$	100%	+	+	+	+	+	+	+	+	+	+	+	1
Glycolic Acid	$CH_2OHCOOH$	70%	+	37%	+	+	+	+	+	+	+o	+	+	1
Gypsum => Calcium Sulphate														
Heptane	$C_7H_{16}$	100%	+	+	+	+	+	+	-	-	-	+	+	1
Hexachloroplatinic Acid	$H_2PtCl_6$	s	n	+	+	+	-	n	+	n	n	+	-	
Hexanal	$C_5H_{11}CHO$	100%	n	n	+	+	+	-	+o	-	-	+	+	1
Hexane	$C_6H_{14}$	100%	+	+	+	+	+	+	-	-	-	+	+	1
Hexanol	$C_6H_{13}OH$	100%	-	-	+	+	+	n	+	-	o	+	+	1
Hexantriol	$C_6H_9(OH)_3$	100%	n	n	+	+	+	+	+	n	n	+	+	1
Hexene	$C_6H_{12}$	100%	n	+	+	+	+	+	-	-	-	+	+	1
Hydrazine Hydrate	$N_2H_4 \cdot H_2O$	s	+	+	+	+	+	n	+	-	o	+	+	3
Hydrobromic Acid	$HBr$	50%	+	+	+	+	-	-	+	+	-	+	o	1
Hydrochloric Acid	$HCl$	38%	32%	+	+	+	-	+	o	+	o	+	o	1
Hydrofluoric Acid	$HF$	80%	-	40% *	40% **	+	-	+	o	40%	-	40%	+o	1
Hydrogen Cyanide	$HCN$	s	+	+	+	+	+	+	+	+	+	+	+	3
Hydrogen Peroxide	$H_2O_2$	90%	40%	40%*	30%	+	+	30%	30%	30%	+	+	+	1
Hydroiodic Acid	$HI$	s	+	+	+	+	-	-	n	+	-	+	n	1
Hydroquinone	$C_6H_4(OH)_2$	s	o	+	+	+	+	+	-	+	+o	+	+	2
Hydroxylamine Sulphate	$(NH_2OH)_2 \cdot H_2SO_4$	10%	+	+	+	+	+	+	+	+	+	+	+	2
Hypochlorous Acid	$HOCl$	s	+	+	o	+	-	+	+o	+	+	o	+	(1)
Iodine	$I_2$	s	o	-	+	+	-	+	+o	+	+	o	+o	
Iron Vitriol => Ferrous Sulphate														
Isobutanol => Isobutyl Alcohol														
Isobutyl Alcohol	$C_2H_5CH(OH)CH_3$	100%	-	+	+	+	+	+	+	-	o	+	+	1



# ProMinent® Chemical Resistance List

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Isopropanol => Isopropyl Alcohol														
Isopropyl Acetate	$\text{CH}_3\text{COOCH}(\text{CH}_3)_2$	100%	-	-	+	+	+	-	+/-	-	+/-	+	+	1
Isopropyl Alcohol	$(\text{CH}_3)_2\text{CHOH}$	100%	-	+/-	+	+	+	+	+	-	o	+	+	1
Isopropyl Benzene	$\text{C}_6\text{H}_5\text{CH}(\text{CH}_3)_2$	100%	-	-	o	+	+	+	-	-	-	o	+	1
Isopropyl Chloride	$\text{CH}_3\text{CHClCH}_3$	80%	-	-	o	+	+	+	-	-	o	o	+/-	2
Isopropyl Ether	$\text{C}_6\text{H}_{14}\text{O}$	100%	-	-	o	+	+	-	-	-	o	o	+	1
Kitchen Salt => Sodium Chloride														
Lactic Acid	$\text{C}_3\text{H}_6\text{O}_3$	100%	-	+	+	+	+/-	+	10%	-	+/-	+	+	1
Lead Acetate	$\text{Pb}(\text{CH}_3\text{COO})_2$	s	+	+	+	+	+	+	+	+	+	+	+	2
Lead Nitrate	$\text{Pb}(\text{NO}_3)_2$	50%	+	+	+	+	+	+	+	+	+	+	+	2
Lead Sugar => Lead Acetate														
Lead Sulphate	$\text{PbSO}_4$	s	+	+	+	+	+	+	+	+	+	+	+	(2)
Lead Tetraethyl	$\text{Pb}(\text{C}_2\text{H}_5)_4$	100%	+	+	+	+	+	+	-	n	n	+	+	3
Lime Milk => Calcium Hydroxide														
Liquid Ammonia => Ammonium Hydroxide														
Lithium Bromide	LiBr	s	+	+	+	+	+	+	+	+	+	+	+	1
Lithium Chloride	LiCl	s	+	+	+	+	-	+	+	+	+	+	n	1
Lunar Caustic => Silver Nitrate														
Magnesium Carbonate	$\text{MgCO}_3$	s	+	+	+	+	+	+	+	+	+	+	+/-	1
Magnesium Chloride	$\text{MgCl}_2$	s	+	+	+	+	o	+	+	+	+	+	+	1
Magnesium Hydroxide	$\text{Mg}(\text{OH})_2$	s	+	+	+	+	+	+	+	+	+	+	+	1
Magnesium Nitrate	$\text{Mg}(\text{NO}_3)_2$	s	+	+	+	+	+	+	+	+	+	+	+	1
Magnesium Sulphate	$\text{MgSO}_4$	s	+	+	+	+	+	+	+	+	+	+	+/-	1
Maleic Acid	$\text{C}_4\text{H}_4\text{O}_4$	s	+	+	+	+	+	+	+	-	o	+	+	1
Malic Acid	$\text{C}_4\text{H}_6\text{O}_5$	s	+	+	+	+	+	+	+	+	+	+	+	1
Manganese-II-Chloride	$\text{MnCl}_2$	s	+	+	+	+	-	+	+	+	+	+	+	1
Manganese-II-Sulphate	$\text{MnSO}_4$	s	+	+	+	+	+	+	+	+	+	+	+	1
MEK => Methyl Ethyl Ketone														
Mercury	Hg	100%	+	+	+	+	+	+	+	+	+	+	+	3
Mercury-II-Chloride	$\text{HgCl}_2$	s	+	+	+	+	-	+	+	+	+	+	+	3
Mercury-II-Cyanide	$\text{Hg}(\text{CN})_2$	s	+	+	+	+	+	+	+	+	+	+	+	3
Mercury-II-Nitrate	$\text{Hg}(\text{NO}_3)_2$	s	+	+	+	+	+	+	+	+	+	+	+	3
Mesityl Oxide	$\text{C}_6\text{H}_{10}\text{O}$	100%	-	-	n	n	+	-	+/-	-	-	n	+	1
Methacrylic Acid	$\text{C}_3\text{H}_5\text{COOH}$	100%	n	n	+	+	+	o	+/-	-	+/-	+	+	1
Methanol	$\text{CH}_3\text{OH}$	100%	-	-	+	+	+	o	+	-	+/-	+	+	1
Methoxybutanol	$\text{CH}_3\text{O}(\text{CH}_2)_4\text{OH}$	100%	-	-	+	+	+	+	o	-	o	+	+	(1)
Methyl Acetate	$\text{CH}_3\text{COOCH}_3$	60%	-	-	+	+	+	-	+/-	-	+/-	+	+	2
Methyl Acrylate	$\text{C}_2\text{H}_3\text{COOCH}_3$	100%	-	-	+	+	+	-	+/-	-	o	+	+	2
Methyl Benzoate	$\text{C}_6\text{H}_5\text{COOCH}_3$	100%	-	-	+	o	+	+	-	-	-	+	+	2
Methyl Catechol	$\text{C}_6\text{H}_3(\text{OH})_2\text{CH}_3$	s	+	+	+	+	+	+	-	+	+o	+	+	(1)
Methyl Cellulose		s	+	+	+	+	+	+	+	+	+	+	+	1
Methyl Chloroacetate	$\text{ClCH}_2\text{COOCH}_3$	100%	-	o	+	+	+	o	-	-	-	+	+	2
Methyl Cyclopentane	$\text{C}_5\text{H}_9\text{CH}_3$	100%	+	+	+	+	+	+	-	-	-	+	+	(1)
Methyl Dichloroacetate	$\text{Cl}_2\text{CHCOOCH}_3$	100%	-	-	+	n	+	-	n	-	-	+	+	2
Methyl Ethyl Ketone	$\text{CH}_3\text{COC}_2\text{H}_5$	100%	-	-	+	-	+	-	+	-	-	+	+	1
Methyl Glycol	$\text{C}_3\text{H}_8\text{O}_2$	100%	+	+	+	+	+	-	+/-	+	+	+	+	1
Methyl Isobutyl Ketone	$\text{CH}_3\text{COC}_4\text{H}_9$	100%	-	-	+	-	+	-	o	-	-	+	+	1
Methyl Isopropyl Ketone	$\text{CH}_3\text{COC}_3\text{H}_7$	100%	-	-	+	-	+	-	+/-	-	-	+	+	1
Methyl Methacrylate	$\text{C}_3\text{H}_5\text{COOCH}_3$	100%	-	-	+	+	+	-	-	-	-	+	+	1
Methyl Oleate	$\text{C}_{17}\text{H}_{33}\text{COOCH}_3$	100%	n	n	+	+	+	+	+/-	n	n	+	+	1
Methyl Salicylate	$\text{HOC}_6\text{H}_4\text{COOCH}_3$	100%	-	-	+	+	+	n	+/-	-	-	+	+	1
Methylacetyl Acetate	$\text{C}_5\text{H}_8\text{O}_3$	100%	-	-	+	+	+	-	+/-	-	o	+	+	2
Methylamine	$\text{CH}_3\text{NH}_2$	32%	+	o	+	o	+	-	+	+	+	+	+	2
Methylene Chloride => Dichloro Methane														
Mirabilite => Sodium Sulphate														
Morpholine	$\text{C}_4\text{H}_9\text{ON}$	100%	-	-	+	-	+	n	n	-	-	+	+	2
Muriatic Acid => Hydrochloric Acid														
Natron => Sodium Bicarbonate														
Nickel-II-Acetate	$(\text{CH}_3\text{COO})_2\text{Ni}$	s	+	+	+	+	+	-	+	+	+	+	+	(2)
Nickel-II-Chloride	$\text{NiCl}_2$	s	+	+	+	+	-	+	+	+	+	+	+	2
Nickel-II-Nitrate	$\text{Ni}(\text{NO}_3)_2$	s	+	+	+	+	+	+	+	+	+	+	+/-	2
Nickel-II-Sulphate	$\text{NiSO}_4$	s	+	+	+	+	+	+	+	+	+	+	+/-	2
Nitrate of Lime => Calcium Nitrate														



# ProMinent® Chemical Resistance List

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Nitric Acid	HNO <sub>3</sub>	99%	10%	10%*	50%	65%	50%	65%	10%	35%	35%	50%	65%	1
Nitro Methane	CH <sub>3</sub> NO <sub>2</sub>	100%	-	-	+	o	+	-	+/-	-	-	+	+	2
Nitro Propane	(CH <sub>3</sub> ) <sub>2</sub> CHNO <sub>2</sub>	100%	-	-	+	n	+	-	+/-	-	-	+	+	2
Nitro Toluene	C <sub>6</sub> H <sub>4</sub> NO <sub>2</sub> CH <sub>3</sub>	100%	-	-	+	+	+	o	-	-	-	+	+	2
Octane	C <sub>8</sub> H <sub>18</sub>	100%	o	+	+	+	+	+	-	-	-	+	+	1
Octanol	C <sub>8</sub> H <sub>17</sub> OH	100%	-	-	+	+	+	+	+	-	-	+	+	1
Octyl Cresol	C <sub>15</sub> H <sub>24</sub> O	100%	-	-	+	+	+	o	n	-	-	+	+	(1)
Oil => Engine Oils														
Oleum	H <sub>2</sub> SO <sub>4</sub> + SO <sub>3</sub>	s	n	-	-	-	+	+	-	+	+	-	+	2
Orthophosphoric Acid => Phosphoric Acid														
Oxalic Acid	(COOH) <sub>2</sub>	s	+	+	+	+	10%	+	+	+/-	+/-	+	+/-	1
Pentane	C <sub>5</sub> H <sub>12</sub>	100%	+	+	+	+	+	+	-	-	-	+	+	1
Pentanol => Amyl Alcohol														
Perchloric Acid	HClO <sub>4</sub>	70%	n	10%	10%	+	-	+	+/-	o	+	+	n	1
Perchloroethylene => Tetrachloro Ethylene														
Perhydrol => Hydrogen Peroxide														
Petroleum Ether	C <sub>n</sub> H <sub>2n+2</sub>	100%	+	+/-	+	+	+	+	-	-	-	+	+	1
Phenole	C <sub>6</sub> H <sub>5</sub> OH	100%	-	-	+	+	+	+	-	10%	+	+	+	2
Phenyl Ethyl Ether	C <sub>6</sub> H <sub>5</sub> OC <sub>2</sub> H <sub>5</sub>	100%	-	-	+	n	+	-	-	-	-	+	+	2
Phenyl Hydrazine	C <sub>6</sub> H <sub>5</sub> NNH <sub>2</sub>	100%	-	-	o	+	+	o	-	-	-	o	+	2
Phosphoric Acid	H <sub>3</sub> PO <sub>4</sub>	85%	50%	+	+	+	+	+	+	+	+	+	+	1
Phosphorous Oxychloride	POCl <sub>3</sub>	100%	-	-	+	+	n	+	+	n	n	+	+	1
Phosphorous Trichloride	PCl <sub>3</sub>	100%	-	-	+	+	+	o	+	+	+/-	+	+	1
Phthalic Acid	C <sub>6</sub> H <sub>4</sub> (COOH) <sub>2</sub>	s	+	+	+	+	+	+	+	-	+	+	+	1
Picric Acid	C <sub>6</sub> H <sub>2</sub> (NO <sub>3</sub> ) <sub>3</sub> OH	s	+	+	+	+	+	+	+	+	-	+	+	2
Piperidine	C <sub>5</sub> H <sub>11</sub> N	100%	-	-	n	n	+	-	-	-	-	n	+	2
Potash Alum => Potassium Aluminium Sulphate														
Potassium Acetate	CH <sub>3</sub> COOK	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Aluminium Sulphate	KAl(SO <sub>4</sub> ) <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Bicarbonate	KHCO <sub>3</sub>	40%	+	+	+	+	+	+	+	+	+	+	+/-	1
Potassium Bifluoride	KHF <sub>2</sub>	s	n	+	+	+	+	+	+	+	+	+	+	1
Potassium Bisulphate	KHSO <sub>4</sub>	5%	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Bitartrate	KC <sub>4</sub> H <sub>5</sub> O <sub>6</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Borate	KBO <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	(1)
Potassium Bromate	KBrO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	2
Potassium Bromide	KBr	s	+	+	+	+	10%	+	+	+	+	+	0,1	1
Potassium Carbonate	K <sub>2</sub> CO <sub>3</sub>	s	+	+	+	+	+	+	+	55%	55%	+	+	1
Potassium Chlorate	KClO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	2
Potassium Chloride	KCl	s	+	+	+	+	-	+	+	+	+	+	+/-	1
Potassium Chromate	K <sub>2</sub> CrO <sub>4</sub>	10%	+	+	+	+	+	+	+	+	+	+	+	3
Potassium Chrome Sulphate	KCr(SO <sub>4</sub> ) <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Cyanate	KOCN	s	+	+	+	+	+	+	+	+	+	+	+	2
Potassium Cyanide	KCN	s	+	+	+	+	5%	+	+	+	+	+	5%	3
Potassium Cyanoferate II	K <sub>4</sub> Fe(CN) <sub>6</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Cyanoferate III	K <sub>3</sub> Fe(CN) <sub>6</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Dichromate	K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	s	+	+	+	+	25%	+	+	+	+	+	10%	3
Potassium Fluoride	KF	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Hydroxyde	KOH	50%	+	+	+	+	(25 °C)	-	+	10%	10%	+	+	1
Potassium Iodide	KI	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Nitrate	KNO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Perchlorate	KClO <sub>4</sub>	s	+	+	+	+	n	+	+	+	+	+	+	1
Potassium Permanganate	KMnO <sub>4</sub>	s	+	+	+	+	+	+	+	6%	6%	+	+	2
Potassium Persulphate	K <sub>2</sub> S <sub>2</sub> O <sub>8</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Phosphate	KH <sub>2</sub> PO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Pyrochromate => Potassium Dichromate														
Potassium Sulphate	K <sub>2</sub> SO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Sulphite	K <sub>2</sub> SO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Propionic Acid	C <sub>2</sub> H <sub>5</sub> COOH	100%	o	+	+	+	+	+	+	-	+/-	+	+	1
Propionitrile	CH <sub>3</sub> CH <sub>2</sub> CN	100%	n	n	+	+	+	+	-	-	-	+	+	2
Propyl Acetate	CH <sub>3</sub> COOC <sub>3</sub> H <sub>7</sub>	100%	-	-	+	+	+	-	+/-	-	-	+	+	1
Propylene Glycol	CH <sub>3</sub> CHOHCH <sub>2</sub> OH	100%	+	+	+	+	+	+	+	+	+	+	+	1
Prussic Acid => Hydrogen Cyanide														
Pyridine	C <sub>5</sub> H <sub>5</sub> N	100%	-	-	o	-	+	-	-	-	o	+	+	2



## ProMinent® Chemical Resistance List

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Pyrrrole	C <sub>4</sub> H <sub>4</sub> NH	100%	n	n	+	n	+	-	-	-	-	+	+	2
Roman Vitriol => Copper Sulphate														
Salicylic Acid	HOC <sub>6</sub> H <sub>4</sub> COOH	s	+	+	+	+	+	+	+	+	+	+	+/o	1
Salmiac => Ammonium Chloride														
Saltpeter => Potassium Nitrate														
Silic Acid	SiO <sub>2</sub> * x H <sub>2</sub> O	s	+	+	+	+	+	+	+	+	+	+	+	1
Silver Bromide	AgBr	s	+	+	+	+	+/o	+	+	+	+	+	+	1
Silver Chloride	AgCl	s	+	+	+	+	-	+	+	+	+	+	+/o	1
Silver Nitrate	AgNO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+/o	3
Slaked Lime => Calcium Hydroxide														
Soda => Sodium Carbonate														
Sodium Acetate	NaCH <sub>3</sub> COO	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Benzoate	C <sub>6</sub> H <sub>5</sub> COONa	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Bicarbonate	NaHCO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Bisulphate	NaHSO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Bisulphite	NaHSO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Borate	NaBO <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Bromate	NaBrO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	3
Sodium Bromide	NaBr	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Carbonate	Na <sub>2</sub> CO <sub>3</sub>	s	+	+	+	+	+/o	+	+	+	+	+	+	1
Sodium Chlorate	NaClO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	2
Sodium Chloride	NaCl	s	+	+	+	+	-	+	+	+	+	+	+	1
Sodium Chlorite	NaClO <sub>2</sub>	24%	+	+	+	+	10%	+	+	+	+	+	10%	2
Sodium Chromate	Na <sub>2</sub> CrO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	3
Sodium Cyanide	NaCN	s	+	+	+	+	+	+	+	+	+	+	+	3
Sodium Dichromate	Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	s	+	+	+	+	+	+	+	+	+	+	+	3
Sodium Dithionite	Na <sub>2</sub> S <sub>2</sub> O <sub>4</sub>	s	+	10%	10%	+	+	n	n	+	+	10%	+/o	1
Sodium Fluoride	NaF	s	+	+	+	+	10%	+	+	+	+	+	+	1
Sodium Hydrogen Sulphate => Sodium Bisulphate														
Sodium Hydroxide	NaOH	50%	+	+	+	+	+	-	+	10%	30%	+	+	1
						(60%/25 °C)								
Sodium Hypochlorite	NaOCl + NaCl	12%	+	+	o	+	-	+	+	+	+	o	> 10%	2
Sodium Iodide	NaI	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Metaphosphate	(NaPO <sub>3</sub> ) <sub>n</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Nitrate	NaNO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Nitrite	NaNO <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	2
Sodium Oxalate	Na <sub>2</sub> C <sub>2</sub> O <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Perborate	NaBO <sub>2</sub> *H <sub>2</sub> O <sub>2</sub>	s	+	+/o	+	+	+	+	+	+	+	+	+/o	1
Sodium Perchlorate	NaClO <sub>4</sub>	s	+	+	+	+	10%	+	+	+	+	+	10%	1
Sodium Peroxide	Na <sub>2</sub> O <sub>2</sub>	s	+	+	+	+	+	+	+	n	n	-	+	1
Sodium Persulphate	Na <sub>2</sub> S <sub>2</sub> O <sub>8</sub>	s	n	+	+	+	+	+	+	+	+	+	+	1
Sodium Pyrosulphite	Na <sub>2</sub> S <sub>2</sub> O <sub>5</sub>	s	+	+	+	+	+	n	n	+	+	+	+	1
Sodium Salicylate	C <sub>6</sub> H <sub>4</sub> (OH)COONa	s	+	+/o	+	+	+	+	+	+	+	+	+	1
Sodium Silicate	Na <sub>2</sub> SiO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Sulphate	Na <sub>2</sub> SO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Sulphide	Na <sub>2</sub> S	s	+	+	+	+	+	+	+	+	+	+	+	2
Sodium Sulphite	Na <sub>2</sub> SO <sub>3</sub>	s	+	+	+	+	50%	+	+	+	+	+	50%	1
Sodium Tetraborate	Na <sub>2</sub> B <sub>4</sub> O <sub>7</sub> * 10 H <sub>2</sub> O	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Thiosulphate	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub>	s	+	+	+	+	25%	+	+	+	+	+	25%	1
Sodium Tripolyphosphate	Na <sub>5</sub> P <sub>3</sub> O <sub>10</sub>	s	+	+	+	+	+	+/o	+	+	+	+	+	1
Starch	(C <sub>6</sub> H <sub>10</sub> O <sub>5</sub> ) <sub>n</sub>	s	+	+	+	+	+	+	n	+	+	+	+	1
Starch Gum		s	+	+	+	+	+	+	+	+	+	+	+	1
Styrene	C <sub>6</sub> H <sub>5</sub> CHCH <sub>2</sub>	100%	-	-	o	+	+	o	-	-	-	o	+	2
Sublimate => Mercury-II-Chloride														
Succinic Acid	C <sub>4</sub> H <sub>6</sub> O <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sugar Syrup		s	+	+	+	+	+	+	+	+	+	+	+	1
Sulphur Chloride => Disulphur Dichloride														
Sulphuric Acid	H <sub>2</sub> SO <sub>4</sub>	98%	30%	50%	85%	+	20%	+	+	30%	30%	80%	+	1
Sulphuric Acid, fuming --> Oleum														
Sulphurous Acid	H <sub>2</sub> SO <sub>3</sub>	s	+	+	+	+	10%	+	+	+	+	+	+	(1)
Sulphuryl Chloride	SO <sub>2</sub> Cl <sub>2</sub>	100%	-	-	-	o	n	+	o	-	-	-	n	1
Tannic Acid	C <sub>76</sub> H <sub>52</sub> O <sub>46</sub>	50%	+	+	+	+	+	+	+	+	+	+	+	1
Tartaric Acid	C <sub>4</sub> H <sub>6</sub> O <sub>6</sub>	s	50%	+	+	+	+	+	+/o	+	+	+	+	1





# ProMinent® Chemical Resistance List

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Tetrachloro Ethane	$C_2H_2Cl_4$	100%	-	-	o	+	+	o	-	-	o	o	+	3
Tetrachloro Ethylene	$C_2Cl_4$	100%	-	-	o	+	+	o	-	-	o	o	+	3
Tetrachloromethane => Carbon Tetrachloride														
Tetrahydro Furane	$C_4H_8O$	100%	-	-	o	-	+	-	-	-	-	o	+	1
Tetrahydro Naphthalene	$C_{10}H_{12}$	100%	-	-	-	+	+	+	-	-	-	o	+	3
Tetralin => Tetrahydro Naphthalene														
THF => Tetrahydrofuran														
Thionyl Chloride	$SOCl_2$	100%	-	-	-	+	n	+	+	+	+	-	n	1
Thiophene	$C_4H_4S$	100%	n	-	o	n	+	-	-	-	-	o	+	3
Tin-II-Chloride	$SnCl_2$	s	+	o	+	+	-	+	+	+	+	+	+/o	1
Tin-II-Sulphate	$SnSO_4$	s	n	+	+	+	+	+	+	+	+	+	+/o	(1)
Tin-IV-Chloride	$SnCl_4$	s	n	+	+	+	-	+	+	+	+	+	+	1
Titanium Tetrachloride	$TiCl_4$	100%	n	n	n	+	n	o	-	n	n	n	n	1
Toluene	$C_6H_5CH_3$	100%	-	-	o	+	+	o	-	-	-	o	+	2
Toluene Diisocyanate	$C_7H_3(NCO)_2$	100%	n	n	+	+	+	-	+/o	n	n	+	+	2
Tributyl Phosphate	$(C_4H_9)_3PO_4$	100%	n	-	+	+	+	-	+	o	+	+	+	1
Trichloro Ethane	$CCl_3CH_3$	100%	-	-	o	+	+	+	-	-	o	o	+	3
Trichloro Ethylene	$C_2HCl_3$	100%	-	-	o	+	+/o	o	-	-	o	o	+	3
Trichloro Methane => Chloroform														
Trichloroacetaldehyde Hydrate	$CCl_3CH(OH)_2$	s	-	-	o	-	+	o	o	n	n	+	+	2
Trichloroacetic Acid	$CCl_3COOH$	50%	-	+	+	+	-	-	o	+	+/o	+	+	1
Tricresyl Phosphate	$(C_7H_7)_3PO_4$	90%	-	-	+	n	+	o	+	o	+	+	+	2
Triethanol Amine	$N(C_2H_4OH)_3$	100%	+	o	+	n	+	-	+/o	-	o	+	+	1
Trilene => Trichloro Ethane														
Trioctyl Phosphate	$(C_8H_{17})_3PO_4$	100%	n	-	+	+	+	o	+	o	+	+	+	2
Trisodium Phosphate	$Na_3PO_4$	s	+	+	+	+	+	+	+	+	+	+	+	1
Urea	$CO(NH_2)_2$	s	+	+/o	+	+	+	+	+	20%	20%	+	+	1
Vinyl Acetate	$CH_2=CHOOCCH_3$	100%	-	-	+	+	+	n	n	-	+/o	+	+	2
Water Glass => Sodium Silicate														
Xylene	$C_6H_4(CH_3)_2$	100%	-	-	-	+	+	o	-	-	-	o	+	2
Zinc Acetate	$(CH_3COO)_2Zn$	s	+	+	+	+	+	-	+	+	+	+	+	1
Zinc Chloride	$ZnCl_2$	s	+	+	+	+	-	+	+	+	+	+	n	1
Zinc Sulphate	$ZnSO_4$	s	+	+	+	+	+	+	+	+	+	+	+/o	1



# ProMinent® Chemical Resistance List

## Overview of the Resistance of Soft PVC Hoses (Guttasyn®) to the Most Common Chemicals

This data applies to standard conditions (20 °C, 1013 mbar).

+	=	resistant
o	=	conditionally resistant
-	=	not resistant

The data has been taken from relevant manufacturers' literature and supplemented by our own tests and experience. As the resistance of a material also depends on other factors, especially pressure and operating conditions etc, this list should merely be regarded as an initial guide and does not claim to offer any guarantees. Take into consideration the fact that conventional dosing agents are largely compounds, the corrosiveness of which cannot simply be calculated by adding together the corrosiveness of each individual component. In cases such as these the material compatibility data produced by the chemical manufacturer must be read as a matter of priority when selecting a material. Safety data sheets do not provide this information and cannot therefore replace application-specific documentation.

Corrosive agent	Concentration in %	Evaluation
Acetic acid	50	o
Acetic acid (wine vinegar)		o
Acetic acid anhydride	100	-
Acetic acid, aqueous	10	+
Acetic ester	100	-
Acetone	all	-
Acetylene tetrabromide	100	-
Aluminium salts, aqueous	all	+
Alums of all kinds, aqueous	all	+
Ammonium salts	all	+
Ammonium, aqueous	15	-
Ammonium, aqueous	saturated	-
Aniline	100	-
Benzene	100	-
Bisulphite, aqueous	40	+
Borax solution	all	+
Boric acid, aqueous	10	+
Bromine, vaporous and liquid		-
Butanol	100	+
Butyl acetate	100	-
Butyric acid, aqueous	20	+
Butyric acid, aqueous	conc.	-
Calcium chloride, aqueous	all	+
Carbon disulphide	100	-
Carbonic acid	all	+
Caustic potash	15	+
Chlorinated hydrocarbons	all	-
Chrome-alum, aqueous	all	+
Chromic acid, aqueous	50	-
Copper sulphate, aqueous	all	+
Creosote		-
Dextrin, aqueous	saturated	+
Diesel oils, compressed oils	100	o
Diethyl ether	100	-
Difluorodichloromethane	100	-
Ethanol	96	-
Ethyl acetate	100	-
Ethylene glycol	30	+
Ferric chloride, aqueous	all	+
Fertilizing manure salt, aqueous	all	+
Formaldehyde, aqueous	30	o
Glacial acetic acid	100	-
Glucose, aqueous	saturated	+
Glycerol	100	-
Halogens	all	-



# ProMinent® Chemical Resistance List

Corrosive agent	Concentration in %	Evaluation
Hydrochloric acid	15	+
Hydrogen bromide	10	+
Hydrogen peroxide	to 10	+
Hydrogen sulphide, gaseous	100	-
Ink		+
Magnesium salts, aqueous	all	+
Methyl alcohol	100	+
Methylene chloride	100	-
Nitric acid, aqueous	25	+
Oils => fats, diesel oil, Lubricating oil and similar		
Perchloric acid	all	o
Phenol, aqueous	all	o
Phosphoric acid, aqueous	100	-
Potassium bichromate, aqueous	saturated	+
Potassium persulphate, aqueous	saturated	+
Silver nitrate	10	+
Sodium chloride, aqueous	all	+
Sodium hydroxide	aqueous	+
Sodium hypochlorite	15	+
Sodium salts => sodium chloride		
Sulphur dioxide, gaseous	all	+
Sulphuric acid	30	+
Tetrachloromethane	100	-
Toluene	100	-
Trichloroethylene	100	-
Urea, aqueous	all	+
Xylene	100	-
Zinc salts	all	+







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Motor-driven and process metering pumps  
for all capacity ranges



Issued by:

ProMinent Dosiertechnik GmbH  
Im Schuhmachergewann 5-11  
69123 Heidelberg  
Germany  
Phone +49 6221 842-0  
[info@prominent.com](mailto:info@prominent.com)  
[www.prominent.com](http://www.prominent.com)



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## Motor Driven and Process Metering Pumps



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### Pump Guide

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## Automatic Overload Shut-down as Pump Protection Function

The distinguishing feature of the new Sigma/ 2 product range is its automatic overload shut-down. With this control type, the motion and speed profiles are also recorded and evaluated in conjunction with the energy requirement. This data enables the energy supply to be limited to the amount of energy actually needed, thereby improving efficiency. In addition, an analysis of the energy requirement leads to automatic monitoring of the metering pump. This facilitates the internal overload shut-down of the pump, offering additional protection for the motor-driven metering pump.

For more information see page → 1-28



## Hydraulic Diaphragm Metering Pump Orlita® Evolution

The EF3a marks the launch of the Orlita® Evolution family, which will be showcased at AICHEMA 2015. The 4 product ranges EF1a to EF4a of the new family of process pumps to comply with API 675 provide a capacity ranging from 4 to 7,426 l/h at 400 to 10 bar.

For more information see page → 2-56





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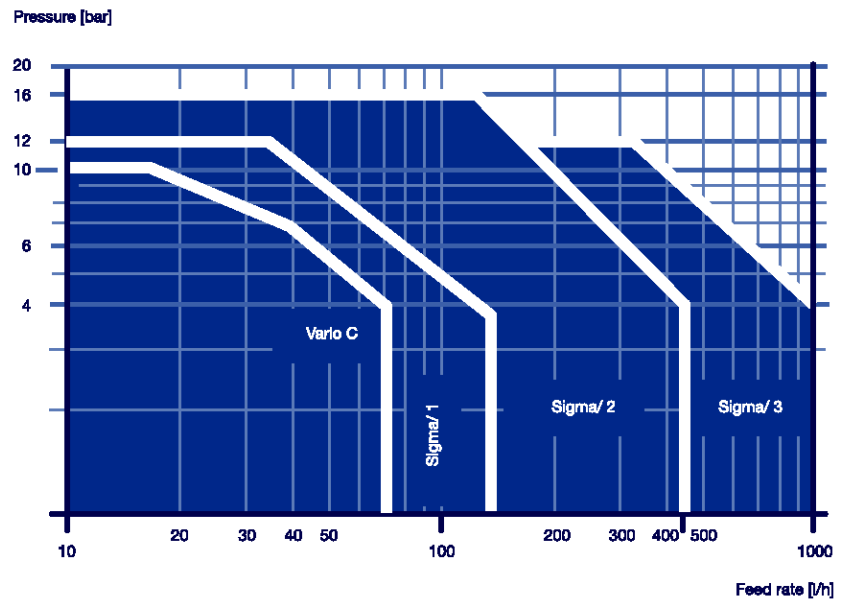




# 1.0 Overview of Motor Driven Metering Pumps

## 1.0.1

### Selection Guide

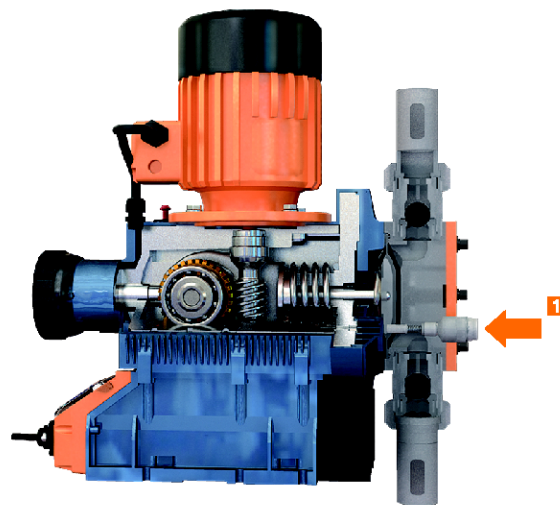


pk\_2\_diagramm

ProMinent offers an extensive range of metering pumps with a capacity rating of up to 1,000 l/h. All oscillating positive-displacement pumps feature a leak-free, hermetically sealed metering chamber and an identical operating structure.

### Applications

- General: Chemical metering up to 1,000 l/h
- Potable water treatment: Metering of disinfectants
- Cooling circuits: Metering of disinfectants
- Waste water treatment: Metering of flocculants
- Paper industry: Metering of additives
- Plastics production: Metering of additives
- Textile industry: Metering of dyeing additives



P\_SI\_0064\_C3

Sigma multi-layer safety diaphragm (1: Diaphragm rupture warning system)



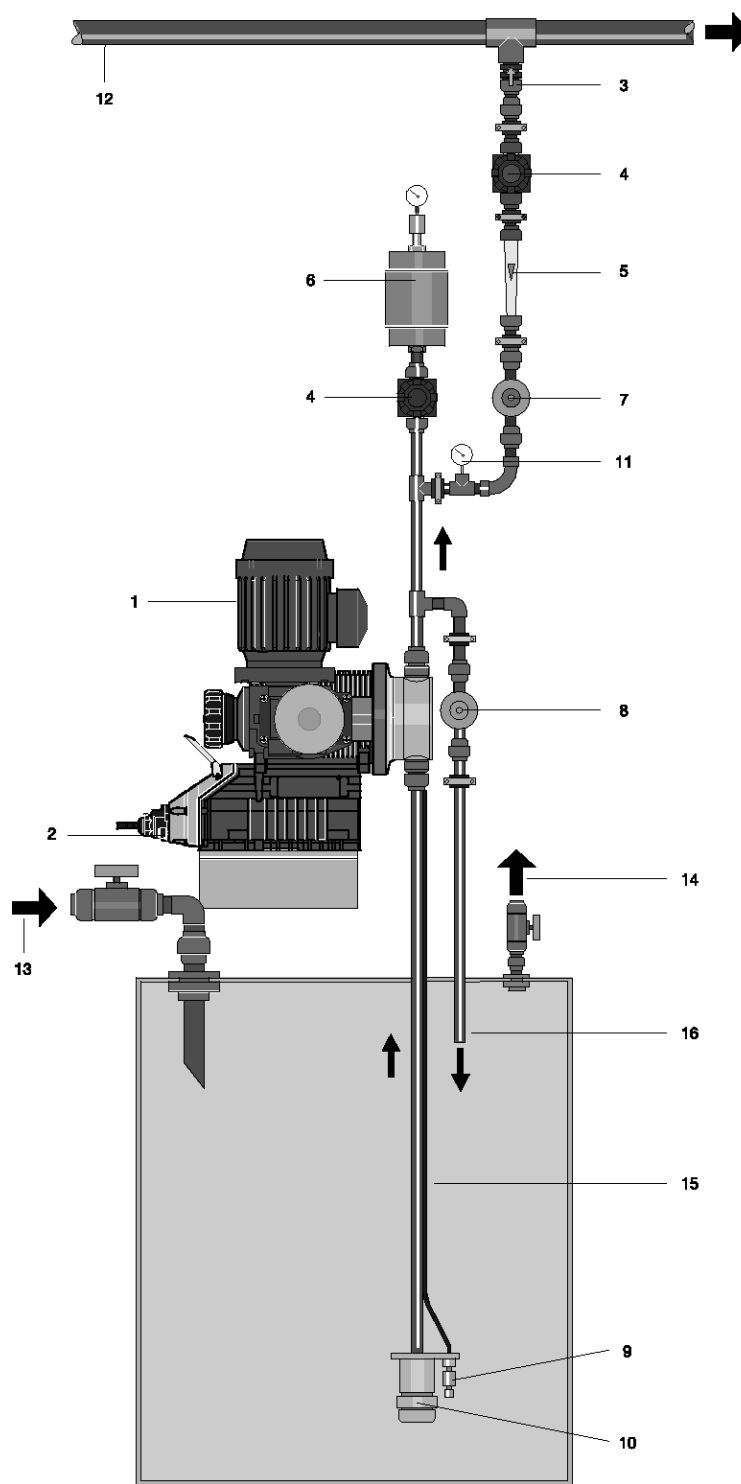
# 1.0 Overview of Motor Driven Metering Pumps

## 1.0.2

## Installation Options

The smooth operation of metering systems depends not only on choosing the correct model for your application, but also on the correct installation of application-specific accessories. The drawing below illustrates a variety of accessory components, not all of which will be required for every plant, but which give an overview of what can be achieved in practical terms.

We are always at your service, to help you choose the right accessories for your processing application, and to provide any additional technical advice (e.g. calculating pipework requirements).



- 1 Metering pump
- 2 Actuation and control options
- 3 Injector valve
- 4 Isolation assembly
- 5 Flow measurement/monitoring
- 6 Pulsation damper
- 7 Back pressure valve
- 8 Relief valve in bypass line
- 9 Float switch
- 10 Foot valve
- 11 Pressure gauge
- 12 System line
- 13 Filling
- 14 Vent
- 15 Metering line
- 16 Bypass

pk\_2\_000\_1

# 1.1 Motor Driven Metering Pump Vario C

## 1.1.1

## Motor Driven Metering Pump Vario C

**The basic pump for simple applications**

**Capacity range 8 – 76 l/h, 10 – 4 bar**



The motor-driven metering pump Vario C delivers a high level of process quality for continuous metering within simple metering tasks. It can be used, for example, in the metering of additives or flocculants in chemical metering.

### Your benefits

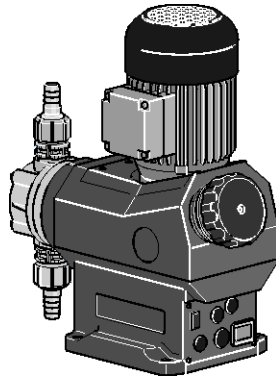
- Excellent suction capacity, gentle metering stroke and consistently precise metering
- Excellent process quality: Metering reproducibility is better than  $\pm 2\%$  within the stroke length adjustment range of 30 to 100%
- Flexible adjustment of the pump capacity by means of the stroke length in 1% increments
- Fibreglass-reinforced plastic housing
- Good adaptation to the specific application, thanks to 4 different gear reduction ratios and 2 sizes of liquid ends in 4 material designs
- Power end optionally available with three-phase or single-phase AC motor
- Customised designs are available on request

### Technical details

- Stroke length: 3 mm
- Stroke length adjustment range: 30 – 100%
- Stroke length adjustment: manually by means of self-locking rotary dial
- Metering reproducibility is better than  $\pm 2\%$  in the 30 – 100% stroke length adjustment range under defined conditions and with correct installation
- Wetted materials: PP, PVC, PVDF, stainless steel 1.4571/1.4404
- PTFE diaphragm
- Motor: Three-phase AC motor (0.07 kW, 230/400 V, 50/60 Hz) or single-phase AC motor (0.06 kW, 230 V 50 Hz or 115 V 60 Hz)
- Degree of protection: IP 55
- Fibreglass-reinforced plastic housing
- Provide suitable overload protection in all motor-driven metering pumps during installation for safety reasons.

### Field of application

- Chemical metering in potable water, cooling and waste water circuits
- Metering of additives, flocculants etc.



pk\_2\_126  
Vario C



# 1.1 Motor Driven Metering Pump Vario C

## Technical Data

Type VAMc	With 1500 rpm motor at 50 Hz				With 1800 rpm motor at 60 Hz			Suction lift	Perm. pre- pressure suction side	Connection, suction/ discharge side
	Delivery rate at max. back pressure			Max. stroke rate	Delivery rate at max. back pressure		Max. stroke rate			
	bar	l/h	ml/stroke	Strokes/min	psi	l/h/gph (US)	Strokes/min	mWC	bar	G-DN
	10008	10	8	4	38	145	9.6/2.5	45	7	2.8
10016	10	16	4	77	145	19.2/5.0	92	7	2.8	3/4-10
07026	7	26	4	120	100	31.2/8.2	144	7	2.8	3/4-10
07042	7	42	4	192	100	50.4/13.3	230	7	2.8	3/4-10
07012	7	12	5	38	100	14.4/3.8	45	6	1.7	3/4-10
07024	7	24	5	77	100	28.8/7.6	92	6	1.7	3/4-10
04039	4	40	5	120	58	48.0/12.6	144	6	1.7	3/4-10
04063	4	64	5	192	58	76.8/20.2	230	6	1.7	3/4-10

The shipping weight of all pump types is 6/7.2 kg (PVDF/SS)

## Materials in contact with the medium

Material	Dosing head	Suction/pressure connector	Seals	Valve balls	Valve seat
PPE	PP	PP	EPDM	Ceramic	PP
PCB	PVC	PVC	FKM	Ceramic	PVC
PVT	PVDF	PVDF	PTFE	Ceramic	PTFE
SST	Stainless steel mat. no. 1.4404	Stainless steel mat. no. 1.4581	PTFE	Stainless steel mat. no. 1.4404	PTFE

## Motor Data

Identity code characteristic	Voltage supply			Remarks
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz	0.07 kW
		250-280 V/440-480 V	60 Hz	0.07 kW
M	1 ph AC, IP 55	230 V ±5%	50/60 Hz	0.06 kW
N	1 ph AC, IP 55	115 V ±5 %	60 Hz	0.06 kW

Motor data sheets can be requested for more information.

Special motors or special motor flanges are available on request.

Motors less than 0.75 kW and motors designed for speed-controllable operation are not subject to the IEC2 standard in compliance with the Ecodesign Directive 2005/32/EC.



# 1.1 Motor Driven Metering Pump Vario C

## 1.1.2 Identity Code Ordering System for VAMc

### Vario Diaphragm Metering Pump

VAMc	Type*	bar	l/h
	10008	10	8
	10016	10	16
	07026	7	26
	07042	7	42
	07012	7	12
	07024	7	24
	04039	4	40
	04063	4	64
Material Liquid end			
	PPE	PP, seal EPDM	
	PCB	PVC, seal FKM	
	PVT	PVDF, PTFE seal	
	SST	stainless steel, PTFE seal	
Liquid end version			
	0	no valve spring (standard) PVC	
	1	with 2 valve springs. Hastelloy C4	
Hydraulic connection			
	0	standard connection	
	1	PVC union nut and insert	
	2	PP union nut and insert	
	3	PVDF union nut and insert	
	4	Stainless steel union nut and insert	
	5	PP union nut and hose nozzle	
	6	PVC union nut and hose nozzle	
	7	PVDF union nut and hose nozzle	
	8	Stainless steel union nut and hose nozzle	
Version			
	0	with ProMinent® logo (standard)	
	1	without ProMinent® logo	
	M	modified	
Electrical power supply			
	S	3 ph, 230 V / 400 V; 50/60 Hz	
	M	1 ph AC 230 V; AC 50/60 Hz	
	N	1 ph AC 115 V; AC 60 Hz	
Stroke sensor			
	0	no stroke sensor	
	3	with stroke sensor (Namur)	
Stroke length adjustment			
	0	manual (standard)	

\* Digits 1 and 2=back pressure [bar]; digits 3, 4, 5=flow rate [l/h]



# 1.1 Motor Driven Metering Pump Vario C

## 1.1.3

## Spare Parts

### Vario spare parts kit

The spare parts kit generally includes wear parts for the liquid ends.

#### Scope of supply for PPE, PCB, PVT material versions

- 1 Metering diaphragm
- 1 Suction valve assembly
- 1 Discharge valve assembly
- 2 Valve balls
- 1 Seal set (O-rings or cover rings for PVT version, ball seat housings)

#### Scope of supply for SST material version

- 1 Metering diaphragm
- 2 Valve balls
- 1 Seal set (cover rings, flat seals, ball seat)

Applicable to Identity code: Type VAMc 10008, 10016, 07026, 07042

Liquid end	Materials in contact with the medium	Order no.
FM 042 - DN 10	PPE	910753
FM 042 - DN 10	PCB	910754
FM 042 - DN 10	PVT	1003641
FM 042 - DN 10	SST	910751

Applicable to Identity code: Type VAMc 07012, 07024, 04039, 04063

Liquid end	Materials in contact with the medium	Order no.
FM 063 - DN 10	PPE	910758
FM 063 - DN 10	PCB	910759
FM 063 - DN 10	PVT	1003642
FM 063 - DN 10	SST	910756

### Pump diaphragms



pk\_2\_105\_1

	Order no.
Vario with FM 042 Type VAMc 10008, 10016, 07026, 07042	811458
Vario with FM 063 Type VAMc 07012, 07024, 04039, 04063	811459

### Accessories

- Foot Valves See page → 1-47
- Injection Valves See page → 1-49
- Connector Parts, Seals, Hoses See page → 1-66
- Suction Lances/Suction Assemblies See page → 1-55
- Speed Controllers See page → 1-72

### Spare Parts

- Custom Accessories See page → 1-77



## 1.2 Motor Driven Metering Pump Sigma/ 1 (Basic type)

### 1.2.1

### Motor Driven Metering Pump Sigma/ 1 (Basic type)

**The robust pump for safe and reliable use**

**Capacity range 17 – 144 l/h, 12 – 4 bar**

The Sigma/ 1 Basic is an extremely robust motor-driven metering pump with patented multi-layer safety diaphragm for excellent process safety. It offers a wide range of power end designs, such as three-phase or 1-phase AC motors, even for Exe and Exde areas with ATEX certification.

The Sigma/ 1 diaphragm metering pump together with pumps of type Sigma/ 2 and Sigma/ 3 represent an integrated product range. They cover the capacity range from 17 to 1,030 l/h, with a consistent operating concept, control concept and spare parts management. A wide range of drive versions is available, including some for use in Exe and Exde areas with ATEX certification.

#### Your benefits

Excellent process safety and reliability:

- In the event of an accident, the feed chemical does not escape to the outside nor into the pump's power end, thanks to the patented multi-layer safety diaphragm with optical (optionally electric) signalling
- Integrated relief valve protects the pump against overloading
- Reliable operation by bleed option during the suction process
- Metering reproducibility is better than  $\pm 2\%$  within the 30-100% stroke length adjustment range under certain defined conditions and after proper installation.

Flexible adaptation to the process:

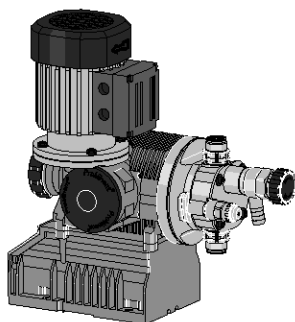
- The entire Sigma product range is available as standard in a "Physiologically safe in respect of wetted materials" design.
- Metering pumps with electro-polished stainless steel metering head and EHEDG certification enable them to be used in hygienically challenging applications
- Adaptation to specific installation situations, as the "Liquid end on left" is available as standard
- Wide range of power end versions, also for use in Exe and Exde areas and different flange designs for the use of customised motors
- Customised designs are available on request

#### Technical details

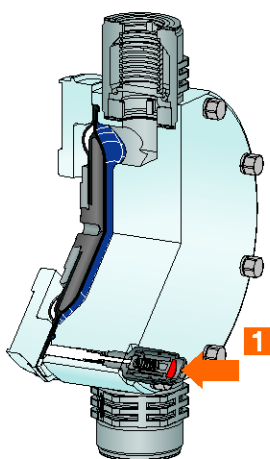
- Stroke length: 4 mm,
- Stroke length adjustment range: 0 – 100%
- Stroke length adjustment: manually by self-locking rotary dial in 1% increments (optionally with actuator or control drive)
- Metering reproducibility is better than  $\pm 2\%$  within the 30-100% stroke length adjustment range under certain defined conditions and after proper installation.
- Wetted materials: PVDF, stainless steel 1.4571/1.4404, special materials on request
- Patented multi-layer safety diaphragm with optical diaphragm rupture display (optionally with diaphragm rupture warning system via a contact)
- Integrated hydraulic relief and bleed valve
- A wide range of power end versions is available: Three-phase standard motor, 1-phase AC motor, motors for use in Exe and Exde areas and different flange designs for use in customer-specific motors
- Degree of protection IP 55 (optionally II2GExeIIIT3, II2GExdIICT4)
- Fibreglass-reinforced plastic housing
- Liquid end on left is available as standard
- For reasons of safety, provide suitable overload protection mechanisms in all mechanically deflected diaphragm metering pumps

#### Field of application

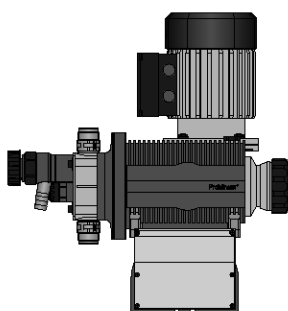
- Volume-proportional addition of chemicals in water treatment, e.g. sodium-calcium hypochlorite for the disinfection of potable water
- Addition of chemicals depending on the measured value, e.g. metering of acid and alkali for pH neutralisation in waste water treatment
- Time-controlled addition of chemicals in the cooling water circuit
- Pulse-controlled metering in the bottling of different volumes e.g. glycerin filling of manometers



P\_SI\_0128\_SW  
Sigma/ 1 Basic version



P\_SI\_0065\_C1  
1: Diaphragm rupture sensor



P\_SI\_0152\_SW  
Sigma / 1 liquid end on left







## 1.2 Motor Driven Metering Pump Sigma/ 1 (Basic type)

### Sigma Basic Type Control Functions (S1Ba)

#### Stroke length actuator/controller

**Actuator** for automatic stroke length adjustment, actuating period approx. 1 sec for 1 % stroke length, 1 k Ohm response signal potentiometer, enclosure rating IP 54.

**Controller** consists of actuator with servomotor and integrated servo control for stroke length adjustment via a standard signal. Standard signal input 0/4-20 mA corresponds to stroke length 0 - 100 %. Automatic/manual operation selection key for manual stroke adjustment. Mechanical status display of actual stroke length value output 0/4-20 mA for remote display.

#### Variable speed motors with integrated frequency converter (identity code specification V)

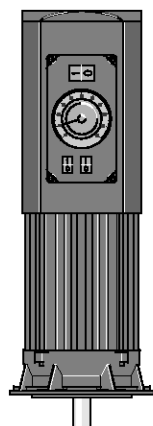
Power supply 1ph 230 V, 50/60 Hz, 0.18 kW

Externally controllable with 0/4-20 mA (see Fig. pk\_2\_103).

Upon request externally controllable via PROFIBUS® DP

#### Speed controllers with frequency converter (identity code specification Z)

The speed controller assembly consists of a frequency converter and a variable speed motor of 0.09 kW



pk\_2\_103

Variable speed motor with integrated frequency converter

### "Physiologically safe (FDA) in respect of wetted materials" version

All wetted materials in the "Physiologically safe (FDA) in respect of wetted materials" design comply with the FDA guidelines.

FDA guidelines:

- Material PTFE: FDA No. 21 CFR § 177.1550
- Material PVDF: FDA No. 21 CFR § 177.2510

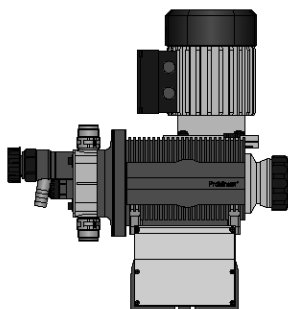
Available for material version PVT and SST.

Identity code example: S1BaH04084PVTS00 F S000

### Sigma / 1 Basic Type version "left liquid end "

This version offers additional adaptability to special installation situations, e.g. in combination with storage tanks, brackets, etc.

Identity code example: S1BaH07042PVTS00 5 S000



P\_SI\_0152\_SW

## 1.2 Motor Driven Metering Pump Sigma/ 1 (Basic type)

### Technical Data

Type S1Ba	With 1500 rpm motor at 50 Hz				With 1800 rpm motor at 60 Hz			Suction lift	Perm. pre-pressure suction side	Connection, suction/ discharge side	Shipping weight
	Delivery rate at max. back pressure			Max. stroke rate	Delivery rate at max. back pressure		Max. stroke rate				
	bar	l/h	ml/ stroke		Strokes/ min	psi					
								mWC	bar	G-DN	kg
12017 PVT	10	17	3.8	73	174	20.4/5.3	88	7	1	3/4-10	9
12017 SST	12	17	3.8	73	174	20.4/5.3	88	7	1	3/4-10	12
12035 PVT	10	35	4.0	143	174	42.0/11.0	172	7	1	3/4-10	9
12035 SST	12	35	4.0	143	174	42.0/11.0	172	7	1	3/4-10	12
10050 PVT	10	50	4.0	205	145	60.0/15.8	246	7	1	3/4-10	9
10050 SST	10	50	4.0	205	145	60.0/15.8	246	7	1	3/4-10	12
10022 PVT	10	22	5.0	73	145	26.4/6.9	88	6	1	3/4-10	9
10022 SST	10	22	5.0	73	145	26.4/6.9	88	6	1	3/4-10	12
10044 PVT	10	44	5.1	143	145	52.8/13.9	172	6	1	3/4-10	9
10044 SST	10	44	5.1	143	145	52.8/13.9	172	6	1	3/4-10	12
07065 PVT	7	65	5.2	205	102	78.0/20.6	246	6	1	3/4-10	9
07065 SST	7	65	5.2	205	102	78.0/20.6	246	6	1	3/4-10	12
07042 PVT	7	42	9.5	73	102	50.4/13.3	88	3	1	1-15	10
07042 SST	7	42	9.5	73	102	50.4/13.3	88	3	1	1-15	14
04084 PVT	4	84	9.7	143	58	100.8/26.6	172	3	1	1-15	10
04084 SST	4	84	9.7	143	58	100.8/26.6	172	3	1	1-15	14
04120 PVT	4	120	9.7	205	58	144.0/38.0	246	3	1	1-15	10
04120 SST	4	120	9.7	205	58	144.0/38.0	246	3	1	1-15	14

Performance data for TTT, see type PVT

### Materials in contact with the medium

Material	Dosing head	Suction/pressure onnector	Seals/ball seat	Balls	Integral relief valve
PVT	PVDF	PVDF	PTFE/PTFE	Ceramic	PVDF/FKM or EPDM
SST	Stainless steel 1.4404	Stainless steel 1.4581	PTFE/PTFE	Stainless steel 1.4404	Stainless steel/FKM or EPDM
TTT*	PTFE + 25 % carbon	PVDF	PTFE/PTFE	Ceramic	–

\* specifically for areas at risk from explosion

The ball seat is made of PVDF on the design "F"

### Motor Data

Identity code specification	Power supply	Δ / Y			Remarks
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz	0.09 kW	
		265-280 V/440-480 V	60 Hz	0.09 kW	
T	3 ph, IP 55	220-240 V/380-420 V	50 Hz	0.09 kW	With PTC, speed adjustment range 1:5
		265-280 V/440-480 V	60 Hz	0.09 kW	
R	3 ph, IP 55	220-240 V/380-420 V	50 Hz	0.09 kW	With PTC, speed adjustment range 1:20 with external fan 1ph 230 V; 50/60Hz
V0	1 ph, IP 55	230 V ±10 %	50/60 Hz	0.18 kW	Variable speed motor with integrated frequency converter control range 1:20
M	1 ph AC, IP 55	230 V ±5%	50/60 Hz	0.12 kW	
N	1 ph AC, IP 55	115 V ±5 %	60 Hz	0.12 kW	
L1	3 ph, II2GEEexIICT3	220-240 V/380-420 V	50 Hz	0.12 kW	
L2	3 ph, II2GEEexIICT4	220-240 V/380-420 V	50 Hz	0.18 kW	With PTC, speed adjustment range 1:5
P1	3 ph, II2GEEexIICT3	250-280 V/440-480 V	60 Hz	0.12 kW	
P2	3 ph, II2GEEexIICT4	250-280 V/440-480 V	60 Hz	0.18 kW	With PTC, speed adjustment range 1:5

Motor data sheets can be requested for more information.

Special motors or special motor flanges are available on request.

Motors less than 0.75 kW and motors designed for speed-controllable operation are not subject to the IEC2 standard in compliance with the Ecodesign Directive 2005/32/EC.

### Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 94/9/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label corresponds to or is better than the conditions prevalent in the intended field of application.



## 1.2 Motor Driven Metering Pump Sigma/ 1 (Basic type)

### Sigma/ 1 Basic Type (S1Ba)

S1Ba	Drive type
H	Main drive, diaphragm
Pump type	
	bar bar l/h
12017	12* 17
12035	12* 35
10050	10 50
10022	10 22
10044	10 44
07065	7 65
07042	7 42
04084	4 84
04120	4 120
Material of liquid end	
PV	PVDF (max. 10 bar)
SS	Stainless steel
TT	PTFE + 25 % carbon (max. 10 bar)
Seal material	
T	PTFE seal
Diaphragm	
S	Multi-layer safety diaphragm with optical rupture indicator
A	Multi-layer safety diaphragm with rupture signalling (contact)
Liquid end version	
0	No spring
1	With 2 valve springs, Hastelloy C, 0.1 bar
4**	With pressure relief valve, FKM seal, no valve spring, only with PV and SS
5**	With pressure relief valve, FKM seal with valve springs, only with PV and SS
6**	With pressure relief valve, EPDM seal, without valve spring, only with PV and SS
7**	With pressure relief valve, EPDM seal, with valve spring, only with PV and SS
Hydraulic connection	
0	Standard
1	Union nut and PVC insert
2	Union nut and PP insert
3	Union nut and PVDF insert
4	Union nut and SS insert
7	Union nut and PVDF hose nozzle
8	Union nut and SS hose nozzle
9	Union nut and stainless steel hose nozzle
Version	
0	With ProMinent® logo (standard)
1	Without ProMinent® logo
M	Modified
F	with physiological safety (FDA) in respect of wetted materials
5	Left liquid end
Electrical power supply	
S	3 ph, 230 V/400 V 50/60 Hz, 0.09 kW
T	3 ph, 230 V/400 V 50/60 Hz, with PTC
R	Variable speed motor 3 ph, 230/400 V, with PTC, with external fan 1 ph 230 V 50/60 Hz
V (0)	Variable speed motor with integrated frequency converter 1 ph, 230 V, 50/60 Hz
Z	Speed control compl 1 ph 230 V, 50/60 Hz (variable speed motor + FC)
M	1 ph, AC, 230 V/50/60 Hz, 0.09 kW
N	1 ph, AC 115 V 60 Hz, 0.09 kW
L	3 ph, 230 V/400 V, 50 Hz, (Exe, Exd)
P	3 ph, 265 V/440 V, 60 Hz, (Exe, Exd)
2	No motor, C 42 flange (NEMA)
3	No motor, B 5, size 56 (DIN)
Enclosure rating	
0	IP 55 (standard)
1	Exe motor version ATEX-T3
2	Exd motor version ATEX-T4
Stroke sensor	
0	No stroke sensor (standard)
2	Pacing relay (reed relay)
3	Stroke sensor (Namur) for hazardous locations
Stroke length adjustment	
0	Manual (standard)
1	With stroke positioning motor, 230 V/50/60 Hz
2	With stroke positioning motor, 115 V/60 Hz
3	With stroke control motor, 0...20 mA 230 V/50/60 Hz
4	With stroke control motor 4...20 mA 230 V/50/60 Hz
5	With stroke control motor 0...20 mA 115 V/60 Hz
6	With stroke control motor 4...20 mA 115 V/60 Hz

\* 10 bar with the PVDF and TTT version.

\*\* Standard with tube nozzle in the bypass. Threaded connection on request.

EHEDG-certified (European Hygienic Eng. Design Group) electropolished stainless steel dosing heads (< Ra 0.8) type EL class I are available on request.



## 1.2 Motor Driven Metering Pump Sigma/ 1 (Basic type)

### 1.2.2 Spare Parts

The replacement part kit in general includes wear parts for the liquid ends.

#### Scope of delivery for material PVT

1 x metering diaphragm, 1 x suction valve compl., 1 x discharge valve compl., 2 x valve balls  
1 x elastomer seal kit (EPDM, FKM-B)  
2 x ball seat bushings, 2 x ball washers, 4 x formed composite seals

#### Scope of delivery for material SST

1 x metering diaphragm, 2 x valve balls  
2 x seal kits compl. (packing rings, ball seat washers)  
4 x formed composite seals

#### Spare Parts Kit for Sigma/ 1 for Design with Multi-layer Safety Diaphragm

(For identity code: Type 12017, 12035, 10050)

Liquid end	Materials in contact with the medium	Order no.
FM 50 - DN 10	PVT/TTT	1035964
FM 50 - DN 10	SST	1035966
FM 50 - DN 10	SST (with 2 valve assemblies)	1035965

(For identity code: Type 10022, 10044, 07065)

Liquid end	Materials in contact with the medium	Order no.
FM 65 - DN 10	PVT/TTT	1035967
FM 65 - DN 10	SST	1035969
FM 65 - DN 10	SST (with 2 valve assemblies)	1035968

(For identity code: Type 07042, 04084, 04120)

Liquid end	Materials in contact with the medium	Order no.
FM 120 - DN 15	PVT/TTT	1035961
FM 120 - DN 15	SST	1035963
FM 120 - DN 15	SST (with 2 valve assemblies)	1035962

#### Spare parts kits for Sigma/ 1 for design with old diaphragm

(For Identity code: Type 12017, 12035, 10050)

Liquid end	Materials in contact with the medium	Order no.
FM 50 - DN 10	PVT	1010541
FM 50 - DN 10	SST	1010554
FM 50 - DN 10	SST (with 2 valve assemblies)	1010555

(For Identity code: Type 10022, 10044, 07065)

Liquid end	Materials in contact with the medium	Order no.
FM 65 - DN 10	PVT	1010542
FM 65 - DN 10	SST	1010556
FM 65 - DN 10	SST (with 2 valve assemblies)	1010557

(For Identity code: Type 07042, 04084, 04120)

Liquid end	Materials in contact with the medium	Order no.
FM 120 - DN 15	PVT	1010543
FM 120 - DN 15	SST	1010558
FM 120 - DN 15	SST (with 2 valve assemblies)	1010559



## 1.2 Motor Driven Metering Pump Sigma/ 1 (Basic type)

### Sigma/ 1 spare parts kit for FDA design (physiologically safe)

(For Identity code: Type 12017, 12035, 10050)

Liquid end	Materials in contact with the medium	Order no.
<b>FM 50 - DN 10</b>	PVT	1046466
<b>FM 50 - DN 10</b>	SST (without valve)	1046468
<b>FM 50 - DN 10</b>	SST (with valve)	1046467

(For Identity code: Type 10022, 10044, 07065)

Liquid end	Materials in contact with the medium	Order no.
<b>FM 65 - DN 10</b>	PVT	1046469
<b>FM 65 - DN 10</b>	SST (without valve)	1046471
<b>FM 65 - DN 10</b>	SST (with valve)	1046470

(For Identity code: Type 07042, 04084, 04120)

Liquid end	Materials in contact with the medium	Order no.
<b>FM 120 - DN 15</b>	PVT	1046453
<b>FM 120 - DN 15</b>	SST (without valve)	1046465
<b>FM 120 - DN 15</b>	SST (with valve)	1046464

### Multi-layer Safety Diaphragm (Standard)

	Order no.
<b>FM 50 (type 12017; 12035; 10050)</b>	1030114
<b>FM 65 (type 10022; 10044; 07065)</b>	1030115
<b>FM 120 (type 07042; 04084; 04120)</b>	1035828

### Metering diaphragm (old version)

	Order no.
<b>Sigma/ 1 FM 50 (12017; 12035; 10050)</b>	1010279
<b>Sigma/ 1 FM 65 (10022; 10044; 07065)</b>	1010282
<b>Sigma/ 1 FM 120 (07042; 04084; 04120)</b>	1010285

### Spare parts kits for integrated relief valve

Consisting of two Hast. C compression springs and four FKM-A and EPDM O-rings each

	For material	Seals	Order no.
<b>ETS overflow valve 4 bar</b>	PVT/SST	FKM-A/EPDM	1031199
<b>ETS overflow valve 7 bar</b>	PVT/SST	FKM-A/EPDM	1031200
<b>ETS overflow valve 10 bar</b>	PVT/SST	FKM-A/EPDM	1031201
<b>ETS overflow valve 12 bar</b>	PVT/SST	FKM-A/EPDM	1031202

### Accessories

- Foot Valves See page → 1-47
- Injection Valves See page → 1-49
- Connector Parts, Seals, Hoses See page → 1-66
- Suction Lances/Suction Assemblies See page → 1-55
- Speed Controllers See page → 1-72

### Spare Parts

- Custom Accessories See page → 1-77



## 1.3 Sigma/ 1 Control Type (S1Cb)

### 1.3.1

### Sigma/ 1 Control Type (S1Cb)

The intelligent pump for safe and reliable use in many applications

Capacity range 17 – 117 l/h, 12 – 4 bar

The Sigma / 1 Control can be used flexibly in a number of applications as an extremely robust motor-driven diaphragm metering pump. Excellent process safety and reliability is guaranteed with the patented multi-layer safety diaphragm. Highlights include its intelligent features, such as removable control unit and adjustable metering profiles, as well as a variety of power end and control configurations.

The Sigma/ 1 Control diaphragm metering pump together with pumps of type Sigma/ 2 Control and Sigma/ 3 Control represent an integrated product range. They cover the capacity range from 17 to 1,040 l/h. The entire Sigma Control product range is equipped with intelligent features to provide a high level of operating convenience, safety and efficiency. The pump features a removable operating unit and adjustable metering profiles to ensure optimum metering results.

#### Your benefits

Excellent process safety and reliability:

- In the event of an accident, the feed chemical does not escape to the outside nor into the pump's power end, thanks to the patented multi-layer safety diaphragm with optical (optionally electric) signalling
- Integrated relief valve protects the pump against overloading
- Reliable operation by bleed option during the suction process
- Metering reproducibility is better than  $\pm 2\%$  with a 30-100% stroke length adjustment range under certain defined conditions and with proper installation.

Flexible adaptation to the process:

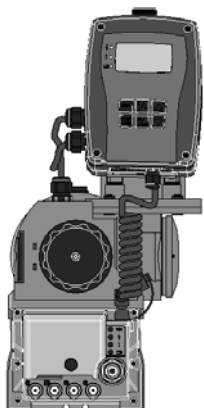
- Detachable operating unit with large illuminated LC display for outstanding user convenience
- Metering profiles for optimum metering results
- The entire Sigma product range is available as standard in a "Physiologically safe in respect of wetted materials" design.
- Metering pumps with electro-polished stainless steel metering head and EHEDG certification enable them to be used in hygienically challenging applications
- Adaptation to specific installation situations, as the "Liquid end on left" is available as standard
- Various control options are available, as well as trouble-free connection to bus-networked systems by PROFIBUS®
- Customised designs are available on request

#### Technical details

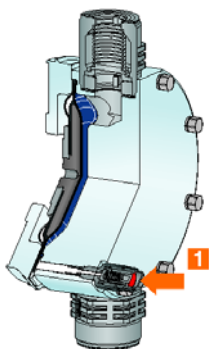
- Stroke length: 4 mm,
- Stroke length adjustment range: 0 – 100%
- Stroke length adjustment: manually using self-locking rotary dial in 1% increments
- Metering reproducibility is better than  $\pm 2\%$  in the 30 – 100% stroke length adjustment range under defined conditions and with correct installation
- Wetted materials: PVDF, stainless steel 1.4571/1.4404, special materials on request
- Patented multi-layer safety diaphragm with optical diaphragm rupture display (optionally with diaphragm rupture warning system via a contact)
- Integrated hydraulic relief and bleed valve
- Removable operating unit (HMI) with large illuminated LC display
- Metering profiles for optimum metering results
- Power supply: 1-phase, 100 – 230 V  $\pm 10\%$ , 240 V  $\pm 6\%$ , 50/60 Hz (110 W)
- Degree of protection IP 65
- Fibreglass-reinforced plastic housing
- Liquid end on left is available as standard
- For reasons of safety, provide suitable overload protection mechanisms in all mechanically deflected diaphragm metering pumps.

#### Field of application

- Volume-proportional addition of chemicals in water treatment, e.g. sodium-calcium hypochlorite for the disinfection of potable water
- Neutralisation in waste water treatment
- Time-controlled addition of chemicals in the cooling water circuit
- Pulse-controlled metering in the bottling of different volumes e.g. glycerin filling of manometers



P\_SI\_0129\_SW  
Sigma/ 1 control type



P\_SI\_0065\_C1  
1: Diaphragm rupture sensor



P\_SI\_0153\_SW  
Sigma/ 1 Control type design, liquid end on left

## 1.3 Sigma/ 1 Control Type (S1Cb)

### Detachable operating unit (HMI)



P\_SI\_0099\_SW3

The operating unit (HMI) can be attached directly to the metering pump or mounted on the wall alongside the pump. This provides the operator with a range of options for the integration of a metering system in the overall system that it is readily accessible and easy to use. Moreover the removable operating unit offers additional protection against unauthorised operation of the metering pump or against modification of the pump settings. The operating unit can, for example, be completely removed for project applications.

Individual functions of the metering pump can be easily selected and adjusted with five program keys. An illuminated LCD display provides information about the relevant operating status. LEDs on the operating unit and the control unit indicate the active pump functions or the pump status.

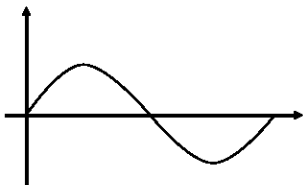
### Metering profiles

Metering profiles guarantee optimum metering results by adapting the metering behaviour of the metering pump to the application or chemical used.

The stroke motion of the displacement body is continually recorded and regulated so that the stroke is made in line with the desired metering profile. The pump can be operated in normal mode (Diagram 1), with optimised discharge stroke (Diagram 2) or with optimised suction stroke (Diagram 3). Three typical metering profiles are shown schematically with the behaviour over time.

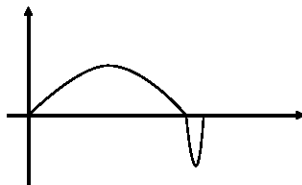
In normal operating mode, the time behaviour for the suction stroke and the discharge stroke is similar (Diagram 1). In the mode with optimised discharge stroke (Diagram 2), the discharge stroke is lengthened while the suction stroke is made as quickly as possible. This set-up is suited to applications which require optimum mixing and as continuous a mixing of chemicals as possible, for example.

In the mode with the optimised suction stroke (diagram 3), the suction stroke is carried out as slowly as possible, permitting precise and trouble-free metering of viscous and gaseous media. Select this setting to minimise the NPSH value as well.



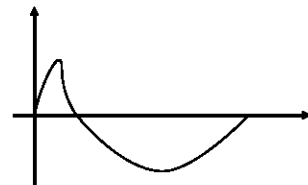
P\_SI\_0102\_SW

Diagram 1: Discharge stroke, suction stroke equal



P\_SI\_0103\_SW

Diagram 2: Long discharge stroke, short suction stroke



P\_SI\_0104\_SW

Diagram 3: Short discharge stroke, long suction stroke

### "Physiologically safe (FDA) in respect of wetted materials" version

All wetted materials in the "Physiologically safe (FDA) in respect of wetted materials" design comply with the FDA guidelines.

FDA guidelines:

- Material PTFE: FDA No. 21 CFR § 177.1550
- Material PVDF: FDA No. 21 CFR § 177.2510

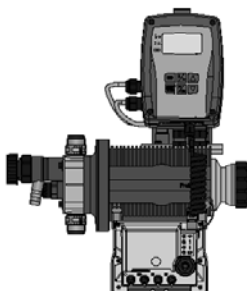
Available for material version PVT and SST.

Identity code example: S1CbH07042PVTS01 F UA10S0DE

### Sigma / 1 Control Type version "left liquid end"

This version offers additional adaptability to special installation situations, e.g. in combination with storage tanks, brackets, etc.

Identity code example: S1CbH07042PVTS01 5 UA10S0DE



P\_SI\_0153\_SW



## 1.3 Sigma/ 1 Control Type (S1Cb)

### Technical Data

Type S1Cb	Delivery rate at max. back pressure			Max. stroke rate	Delivery rate at max. back pressure		Suction lift	Perm. pre-pressure suction side	Connection, suction/discharge side	Shipping weight
	bar	l/h	ml/stroke		psi	gph (US)				
12017 PVT	10	21	3.8	90	145	5.5	7	1	3/4-10	9
12017 SST	12	21	3.8	90	174	5.5	7	1	3/4-10	12
12035 PVT	10	42	4.0	170	145	11.1	7	1	3/4-10	9
12035 SST	12	42	4.0	170	174	11.1	7	1	3/4-10	12
10050 PVT	10	49	4.0	200	145	12.9	7	1	3/4-10	9
10050 SST	10	49	4.0	200	145	12.9	7	1	3/4-10	12
10022 PVT	10	27	5.0	90	145	7.1	6	1	3/4-10	9
10022 SST	10	27	5.0	90	145	7.1	6	1	3/4-10	12
10044 PVT	10	53	5.1	170	145	14.0	6	1	3/4-10	9
10044 SST	10	53	5.1	170	145	14.0	6	1	3/4-10	12
07065 PVT	7	63	5.2	200	102	16.6	6	1	3/4-10	9
07065 SST	7	63	5.2	200	102	16.6	6	1	3/4-10	12
07042 PVT	7	52	9.5	90	102	13.7	3	1	1-15	10
07042 SST	7	52	9.5	90	102	13.7	3	1	1-15	14
04084 PVT	4	101	9.7	170	58	26.7	3	1	1-15	10
04084 SST	4	101	9.7	170	58	26.7	3	1	1-15	14
04120 PVT	4	117	9.7	200	58	30.9	3	1	1-15	10
04120 SST	4	117	9.7	200	58	30.9	3	1	1-15	14

### Materials in contact with the medium

Material	Dosing head	Suction/pressure connector	Seals/ball seat	Balls	Integral relief valve
PVT	PVDF	PVDF	PTFE/PTFE	Ceramic	PVDF/FKM or EPDM
SST	Stainless steel 1.4404	Stainless steel 1.4581	PTFE/PTFE	Stainless steel 1.4404	Stainless steel/FKM or EPDM

The ball seat is made of PVDF on the design "F"

### Motor Data

Identity code specification	Power supply		Remarks	
U	1-phase, IP 65	100 – 230 V ±10 % / 240 V ±6 %	50/60 Hz	110 W





## 1.3 Sigma/ 1 Control Type (S1Cb)

### Sigma/ 1 Control Type (S1Cb)

S1Cb	Drive type									
	H	Main power end, diaphragm								
		Pump type								
			bar	l/h		bar	l/h			
		12017	12 *	21	07065	7	63			
		12035	12 *	42	07042	7	52			
		10050	10	49	04084	4	101			
		10022	10	27	04120	4	117			
		10044	10	53						
		Dosing head material								
		PV	PVDF (max. 10 bar)							
		SS	Stainless steel							
		Seal material								
		T	PTFE seal							
		Displacement body								
		S	Multi-layer safety diaphragm with optical rupture indicator							
		A	Multi-layer safety diaphragm with electrical signal							
		Dosing head version								
		0	no valve spring (standard)							
		1	with 2 valve springs, Hastelloy C; 0.1 bar							
		2	with bleed valve, FKM seal, no valve spring							
		3	with bleed valve, FKM seal, with valve spring							
		4**	with relief valve, FPM seal, no valve springs							
		5**	with relief valve, FPM seal, with valve springs							
		6**	with relief valve, EPDM seal, no valve springs							
		7**	with relief valve, EPDM seal, with valve springs							
		8	with bleed valve, EPDM seal, no valve spring							
		9	with bleed valve, EPDM seal, with valve spring							
		Hydraulic connector								
		0	Standard connection				4	Union nut and stainless steel insert		
		1	Union nut and PVC insert				7	Union nut and PVDF tube nozzle		
		2	Union nut and PP insert				8	Union nut and stainless steel tube nozzle		
		3	Union nut and PVDF insert				9	Union nut and stainless steel welding sleeve		
		Version								
		0	With ProMinent® Logo							
		1	Without ProMinent® Logo							
		F	with physiological safety (FDA) in respect of wetted materials							
		5	Left liquid end							
		Electric power supply								
		U	1 ph, 100 – 230 V ±10 %, 240 V ±6 %, 50/60 Hz, 110 W							
		Cable and plug								
		A	2 m Europe			C	2 m Australia			
		B	2 m Swiss			D	2 m USA			
		Relay								
		0	No relay							
		1	Fault indicating relay (230 V, 8 A)							
		3	Fault indicating relay (24 V, 100 mA) + pacing relay (24 V, 100 mA)							
		8	0/4-20 mA analogue output + fault indicating / pacing relay (24 V - 100 mA)							
		Control versions								
		0	Manual + external contact with pulse control							
		1	as 0 + analogue + metering profiles							
		6	as 1 + PROFIBUS® DP interface, M 12							
		Overload switch-off								
		0	without overload switch-off							
		Operating unit (HMI)								
		S	HMI (0.5 m cable)							
		1	HMI + 2 m cable							
		2	HMI + 5 m cable							
		3	HMI + 10 m cable							
		X	without operating unit (HMI)							
		Access code								
		0	without access control; dynamic metering monitor							
		1	with access control; dynamic metering monitor							
Language										
DE	German									
EN	English									
ES	Spanish									
FR	French									
IT	Italian									
NL	Dutch									
PL	Polish									
PT	Portuguese									

\* 10 bar for PVDF version.

\*\* Standard with tube nozzle in the bypass. Threaded connection on request.

EHEDG-certified (European Hygienic Eng. Design Group) electropolished stainless steel dosing heads (< Ra 0.8) type EL class I are available on request.



## 1.3 Sigma/ 1 Control Type (S1Cb)

### 1.3.2 Spare Parts

The replacement part kit in general includes wear parts for the liquid ends.

#### Scope of delivery for material PVT

1 x metering diaphragm, 1 x suction valve compl., 1 x discharge valve compl., 2 x valve balls  
1 x elastomer seal kit (EPDM, FKM-B)  
2 x ball seat bushings, 2 x ball washers, 4 x formed composite seals

#### Scope of delivery for material SST

1 x metering diaphragm, 2 x valve balls  
2 x seal kits compl. (packing rings, ball seat washers)  
4 x formed composite seals

### Spare Parts Kit for Sigma/ 1 for Design with Multi-layer Safety Diaphragm

(For identity code: Type 12017, 12035, 10050)

Liquid end	Materials in contact with the medium	Order no.
FM 50 - DN 10	PVT/TTT	1035964
FM 50 - DN 10	SST	1035966
FM 50 - DN 10	SST (with 2 valve assemblies)	1035965

(For identity code: Type 10022, 10044, 07065)

Liquid end	Materials in contact with the medium	Order no.
FM 65 - DN 10	PVT/TTT	1035967
FM 65 - DN 10	SST	1035969
FM 65 - DN 10	SST (with 2 valve assemblies)	1035968

(For identity code: Type 07042, 04084, 04120)

Liquid end	Materials in contact with the medium	Order no.
FM 120 - DN 15	PVT/TTT	1035961
FM 120 - DN 15	SST	1035963
FM 120 - DN 15	SST (with 2 valve assemblies)	1035962

### Spare parts kits for Sigma/ 1 for design with old diaphragm

(For Identity code: Type 12017, 12035, 10050)

Liquid end	Materials in contact with the medium	Order no.
FM 50 - DN 10	PVT	1010541
FM 50 - DN 10	SST	1010554
FM 50 - DN 10	SST (with 2 valve assemblies)	1010555

(For Identity code: Type 10022, 10044, 07065)

Liquid end	Materials in contact with the medium	Order no.
FM 65 - DN 10	PVT	1010542
FM 65 - DN 10	SST	1010556
FM 65 - DN 10	SST (with 2 valve assemblies)	1010557

(For Identity code: Type 07042, 04084, 04120)

Liquid end	Materials in contact with the medium	Order no.
FM 120 - DN 15	PVT	1010543
FM 120 - DN 15	SST	1010558
FM 120 - DN 15	SST (with 2 valve assemblies)	1010559



## 1.3 Sigma/ 1 Control Type (S1Cb)

### Sigma/ 1 spare parts kit for FDA design (physiologically safe)

(For Identity code: Type 12017, 12035, 10050)

Liquid end	Materials in contact with the medium	Order no.
FM 50 - DN 10	PVT	1046466
FM 50 - DN 10	SST (without valve)	1046468
FM 50 - DN 10	SST (with valve)	1046467

(For Identity code: Type 10022, 10044, 07065)

Liquid end	Materials in contact with the medium	Order no.
FM 65 - DN 10	PVT	1046469
FM 65 - DN 10	SST (without valve)	1046471
FM 65 - DN 10	SST (with valve)	1046470

(For Identity code: Type 07042, 04084, 04120)

Liquid end	Materials in contact with the medium	Order no.
FM 120 - DN 15	PVT	1046453
FM 120 - DN 15	SST (without valve)	1046465
FM 120 - DN 15	SST (with valve)	1046464

### Multi-layer Safety Diaphragm (Standard)

	Order no.
FM 50 (type 12017; 12035; 10050)	1030114
FM 65 (type 10022; 10044; 07065)	1030115
FM 120 (type 07042; 04084; 04120)	1035828

### Metering diaphragm (old version)

	Order no.
Sigma/ 1 FM 50 (12017; 12035; 10050)	1010279
Sigma/ 1 FM 65 (10022; 10044; 07065)	1010282
Sigma/ 1 FM 120 (07042; 04084; 04120)	1010285

### Spare parts kits for integrated relief valve (S1Ca, S1Cb)

Consisting of two Hast. C compression springs and four FKM-A and EPDM O-rings each

	For material	Seals	Order no.
ETS overflow valve 4 bar	PVT/SST	FKM-A/EPDM	1031199
ETS overflow valve 7 bar	PVT/SST	FKM-A/EPDM	1031200
ETS overflow valve 10 bar	PVT/SST	FKM-A/EPDM	1031201
ETS overflow valve 12 bar	PVT/SST	FKM-A/EPDM	1031202

### Spare parts kits for integrated bleed valve (S1Cb)

Consisting of a compression spring made from Hastelloy C and four FKM-A and EPDM O-rings each.

For identity code feature "Dosing head version" with characteristic "2", "3", "8", "9".

	For material	Seals	Order no.
ETS	PVT/SST	FKM-A/EPDM	1043785



## 1.3 Sigma/ 1 Control Type (S1Cb)

### Protective cowling

Protection of the operating unit (HMI) of Sigma metering pumps against contamination; made from transparent silicone plastic. For Sigma control types S1Cb / S2Cb / S3Cb.

	Order no.
Protective cowling for operating unit (S1Cb, S2Cb, S3Cb)	1036724

### Wall bracket

Wall bracket with operating lever for wall mounting of the operating unit (HMI) without any fittings. For Sigma control types S1Cb / S2Cb / S3Cb.

	Order no.
Wall bracket for operating unit (S1Cb, S2Cb, S3Cb)	1036683

### Extension cable for operating unit (HMI)

	Order no.
Connecting cable - CAN M12 5-pole 1 m	1022139
Connecting cable - CAN M12 5-pole 2 m	1022140
Connecting cable - CAN M12 5-pole 5 m	1022141
Connecting cable - CAN M12 5-pin 10 m	1046383

### Accessories

- Foot Valves See page → 1-47
- Injection Valves See page → 1-49
- Connector Parts, Seals, Hoses See page → 1-66
- Suction Lances/Suction Assemblies See page → 1-55
- Speed Controllers See page → 1-72

### Spare Parts

- Custom Accessories See page → 1-77



## 1.3 Sigma/ 1 Control Type (S1Cb)

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## 1.4 Sigma/ 2 Basic Type (S2Ba)

### 1.4.1

### Sigma/ 2 Basic Type (S2Ba)

**The robust pump for safe and reliable use**

**Capacity range 50 – 420 l/h, 16 – 4 bar**

Robust motor-driven diaphragm metering pumps, like the Sigma/ 2 Basic guarantee excellent process reliability with their patented multi-layer safety diaphragm. The diaphragm metering pump offers a wide range of power end versions, such as three-phase or 1-phase AC motors, even for Exe and Exde areas with ATEX certification.

The Sigma/ 2 diaphragm metering pump together with pumps of type Sigma/ 1 and Sigma/ 3 represent an integrated product range. They cover the capacity range from 17 to 1,030 l/h, with a consistent operating concept, control concept and spare parts management. A wide range of drive versions is available, including some for use in Exe and Exde areas with ATEX certification.

#### Your benefits

Excellent process safety and reliability:

- In the event of an accident, the feed chemical does not escape to the outside nor into the pump's power end, thanks to the patented multi-layer safety diaphragm with optical (optionally electric) signalling
- Integrated relief valve protects the pump against overloading
- Reliable operation by bleed option during the suction process
- Metering reproducibility is better than  $\pm 2\%$  with a 30-100% stroke length adjustment range under certain defined conditions and with proper installation.

Flexible adaptation to the process:

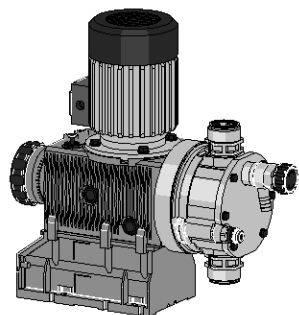
- The entire Sigma product range is available as standard in a "Physiologically safe in respect of wetted materials" design.
- Metering pumps with electro-polished stainless steel metering head and EHEDG certification enable them to be used in hygienically challenging applications
- Wide range of power end versions, also for use in Exe and Exde areas and different flange designs for the use of customised motors
- Customised designs are available on request

#### Technical details

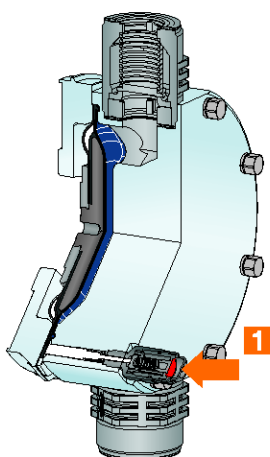
- Stroke length: 5 mm,
- Stroke length adjustment range: 0 – 100%
- Stroke length adjustment: manually by self-locking rotary dial in 1% increments (optionally with actuator or control drive)
- Metering reproducibility is better than  $\pm 2\%$  with a 30-100% stroke length adjustment range under certain defined conditions and with proper installation.
- Wetted materials: PVDF, stainless steel 1.4571/1.4404, special materials on request
- Patented multi-layer safety diaphragm with optical diaphragm rupture display (optionally with diaphragm rupture warning system via a contact)
- Integrated hydraulic relief and bleed valve
- A wide range of power end versions is available: Three-phase standard motor, 1-phase AC motor, motors for use in Exe and Exde areas and different flange designs for use in customer-specific motors
- Degree of protection IP 55 (optionally II2GExeIIIT3, II2GExdIICT4)
- Highly rigid fibreglass-reinforced plastic housing with excellent chemical resistance
- For reasons of safety, provide suitable overload protection mechanisms in all mechanically deflected diaphragm metering pumps.

#### Field of application

- Volume-proportional addition of chemicals in water treatment, e.g. sodium-calcium hypochlorite for the disinfection of potable water
- Addition of chemicals depending on the measured value, e.g. metering of acid and alkali for pH neutralisation in waste water treatment
- Time-controlled addition of chemicals in the cooling water circuit
- Pulse-controlled metering in the bottling of different volumes e.g. glycerin filling of manometers



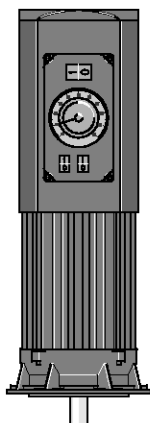
P\_SI\_0130\_SW  
Sigma/ 2 Basic Type



P\_SI\_0065\_C1  
1: Diaphragm rupture sensor



## 1.4 Sigma/ 2 Basic Type (S2Ba)



pk\_2\_103  
Variable speed motor with integrated frequency converter

### Sigma Basic Type Control Functions (S2Ba)

#### Stroke length actuator/controller

**Actuator** for automatic stroke length adjustment, actuating period approx. 1 sec for 1 % stroke length, 1 k Ohm response signal potentiometer, enclosure rating IP 54.

**Controller** consists of actuator with servomotor and integrated servo control for stroke length adjustment via a standard signal. Standard signal input 0/4-20 mA corresponds to stroke length 0 - 100 %. Automatic/manual operation selection key for manual stroke adjustment. Mechanical status display of actual stroke length value output 0/4-20 mA for remote display.

#### Variable speed motors with integrated frequency converter (identity code specification V)

Power supply 1ph 230 V, 50/60 Hz, 0.37 kW

Externally controllable with 0/4-20 mA (see Fig. pk\_2\_103)

On request externally controllable via PROFIBUS® DP

#### Speed controllers with frequency converter (identity code specification Z)

The speed controller assembly consists of a frequency converter and a variable speed motor of 0.37 kW.

### "Physiologically safe (FDA) in respect of wetted materials" version

All wetted materials in the "Physiologically safe (FDA) in respect of wetted materials" version comply with the FDA guideline.

FDA guidelines:

- Material PTFE: FDA No. 21 CFR § 177.1550
- Material PVDF: FDA No. 21 CFR § 177.2510

Available for material version PVT and SST.

Identity code example: S2BaHM07220PVTS00 F S000



## 1.4 Sigma/ 2 Basic Type (S2Ba)

### Technical Data

Type S2Ba	With 1500 rpm motor at 50 Hz				With 1800 rpm motor at 60 Hz			Suction lift	Perm. pre-pressure suction side	Connection suction/ discharge side	Shipping weight
	Delivery rate at max. back pressure		Max. stroke rate	Delivery rate at max. back pressure		Max. stroke rate					
	bar	l/h		ml/ stroke	Strokes/ min		psi				
								mWC	bar	G–DN	kg
16050 PVT	10	50	11.4	73	145	60.0/15.8	87	7	3	1–15	15
16050 SST	16	47	11.4	73	232	56.0/14.7	87	7	3	1–15	20
16090 PVT	10	88	11.4	132	145	106.0/28.0	158	7	3	1–15	15
16090 SST	16	82	11.4	132	232	98.4/25.9	158	7	3	1–15	20
16130 PVT	10	135	10.9	198	145	156.0/41.2	238	7	3	1–15	15
16130 SST	16	124	10.9	198	232	148.0/39.0	238	7	3	1–15	20
07120 PVT	7	126	27.4	73	102	150.0/39.6	87	5	1	1 1/2–25*	16
07120 SST	7	126	27.4	73	102	150.0/39.6	87	5	1	1 1/2–25*	24
07220 PVT	7	220	27.7	132	102	264.0/69.7	158	5	1	1 1/2–25*	16
07220 SST	7	220	27.7	132	102	264.0/69.7	158	5	1	1 1/2–25*	24
04350 PVT	4	350	29.4	198	58	420.0/110.9	238	5	1	1 1/2–25*	16
04350 SST	4	350	29.4	198	58	420.0/110.9	238	5	1	1 1/2–25*	24

Performance data for TTT, see type PVT

\* With Sigma types 07120, 07220 and 04350, the dosing head is fitted with DN 25 (G 1 1/2) valves. As DN 20 is generally sufficient for these types of pipes (see technical data, suction/discharge side connector), the connector parts that can be ordered under the identity code (e.g. inserts) are already reduced to DN 20, i.e. piping and accessories can be installed in DN 20.

### Materials in contact with the medium

Material	Dosing head	Suction/pressure connector	Seals/ball seat	Balls	Integral relief valve
PVT	PVDF	PVDF	PTFE/PTFE	Ceramic/glass*	PVDF/FKM or EPDM
SST	Stainless steel 1.4404	Stainless steel 1.4581	PTFE/PTFE	Stainless steel 1.4404	Stainless steel/FKM or EPDM
TTT**	PTFE + 25 % carbon	PVDF	PTFE/PTFE	Ceramic/glass*	–

\* With 07120, 07220, 04350

\*\* Specifically for areas at risk from explosion

The ball seat is made of PVDF on the design "F"

### Motor Data

Identity code specification	Power supply	Δ / Y	Remarks		
S	3 ph, IP 55	220-240 V/380-420 V 265-280 V/440-480 V	50 Hz 60 Hz	0.25 kW 0.25 kW	
T	3 ph, IP 55	220-240 V/380-420 V 265-280 V/440-480 V	50 Hz 60 Hz	0.25 kW	With PTC, speed adjustment range 1:5
R	3 ph, IP 55	220-240 V/380-420 V	50 Hz	0.37 kW	With PTC, speed adjustment range 1:20 with external fan 1ph 230 V; 50/60Hz
V0	1 ph, IP 55	230 V ±5 %	50/60 Hz	0.37 kW	Variable speed motor with integrated frequency converter control range 1:20
M	1 ph AC, IP 55	230 V ±5%	50/60 Hz	0.18 kW	
N	1 ph AC, IP 55	115 V ±5 %	60 Hz	0.18 kW	
L1	3 ph, II2GEEExIIIT3	220-240 V/380-420 V	50 Hz	0.18 kW	
L2	3 ph, II2GEEExIIICT4	220-240 V/380-420 V	50 Hz	0.18 kW	With PTC, speed adjustment range 1:5
P1	3 ph, II2GEEExIIIT3	250-280 V/440-480 V	60 Hz	0.18 kW	
P2	3 ph, II2GEEExIIICT4	250-280 V/440-480 V	60 Hz	0.21 kW	With PTC, speed adjustment range 1:5

Motor data sheets can be requested for more information.

Special motors or special motor flanges are available on request.

Motors less than 0.75 kW and motors designed for speed-controllable operation are not subject to the IEC2 standard in compliance with the Ecodesign Directive 2005/32/EC.

### Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 94/9/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label corresponds to or is better than the conditions prevalent in the intended field of application.





## 1.4 Sigma/ 2 Basic Type (S2Ba)

### Sigma/ 2 Basic Type (S2Ba)

S2Ba	Drive type		
	HM	Main drive, diaphragm	
		Pump type	
		bar	l/h
		16*	47
		16*	82
		16*	124
		7	126
		7	220
		4	350
		Liquid end material	
		PV	PVDF (max. 10 bar)
		SS	Stainless steel
		TT	PTFE + 25 % carbon (max. 10 bar)
		Seal material	
		T	PTFE seal
		Diaphragm	
		S	Multi-layer safety diaphragm with optical rupture indicator
		A	Multi-layer safety diaphragm with rupture signalling (contact)
		Liquid end version	
		0	No spring
		1	With 2 valve springs, Hastelloy C4, 0.1 bar
		4**	With pressure relief valve, FKM seal, no valve spring, only with PV and SS
		5**	With pressure relief valve, FKM seal with valve springs, only with PV and SS
		6**	With pressure relief valve, EPDM seal, without valve spring, only with PV and SS
		7**	With pressure relief valve, EPDM seal, with valve spring, only with PV and SS
		Hydraulic connection	
		0	Standard
		1	Union nut and PVC insert
		2	Union nut and PP insert
		3	Union nut and PVDF insert
		4	Union nut and SS insert
		7	Union nut and PVDF hose nozzle
		8	Union nut and SS hose nozzle
		9	Union nut and stainless steel hose nozzle
		Version	
		0	With ProMinent® logo (standard)
		1	Without ProMinent® logo
		M	Modified
		F	with physiological safety (FDA) in respect of wetted materials
		Electrical power supply	
		S	3 ph, 230 V/400 V 50/60 Hz
		T	3 ph, 230 V/400 V 50/60 Hz, with PTC
		R	Variable speed motor 3 ph, 230/400 V, with PTC, with external fan 1 ph 230 V 50/60 Hz
		V (0)	Variable speed motor with integrated frequency converter 1 pH, 230 V, 50/60 Hz
		Z	Speed control compl 1 ph 230 V, 50/60 Hz (variable speed motor + FC)
		M	1 ph, AC, 230 V/50/60 Hz
		N	1 ph, AC, 115 V, 60 Hz
		L	3 ph, 230 V/400 V, 50 Hz, (Exe, Exd)
		P	3 ph, 265 V/440 V, 60 Hz, (Exe, Exd)
		1	No motor, with B14 flange, Gr. 71 DIN
		2	No motor, with flange NEMA 56 C
		3	No motor, with B5 flange, Gr. 63 DIN
		Enclosure rating	
		0	IP 55 (standard)
		1	Exe motor version ATEX-T3
		2	Exd motor version ATEX-T4
		Stroke sensor	
		0	No stroke sensor (standard)
		2	Pacing relay (reed relay)
		3	Stroke sensor (Namur) for hazardous locations
		Stroke length adjustment	
		0	Manual (standard)
		1	With stroke positioning motor, 230 V/50/60 Hz
		2	With stroke positioning motor, 115 V/50/60 Hz
		3	With stroke control motor, 0...20 mA 230 V/50/60 Hz
		4	With stroke control motor, 4...20 mA 230 V/50/60 Hz
		5	With stroke control motor, 0...20 mA 115 V/50/60 Hz
		6	With stroke control motor, 4...20 mA 115 V/50/60 Hz

\* 10 bar with the PVDF and TTT version.

\*\* Standard with tube nozzle in the bypass. Threaded connection on request.

EHEDG-certified (European Hygienic Eng. Design Group) electropolished stainless steel dosing heads (< Ra 0.8) type EL class I are available on request.



## 1.4 Sigma/ 2 Basic Type (S2Ba)

### 1.4.2

### Spare Parts

The replacement part kit in general includes wear parts for the liquid ends.

#### Scope of delivery for material PVT

1 x metering diaphragm, 1 x suction valve compl., 1 x pressure valve compl., 2 x valve balls,  
1 x elastomer seal kit (EPDM, FKM-B),  
2 x ball seat bushings, 2 x ball washers, 4 x formed composite seals

#### Scope of delivery for material SST

1 x metering diaphragm, 2 x valve balls, 2 x ball seat washers,  
4 x formed composite seals

### Spare Parts Kit for Sigma/ 2 for Design with Multi-layer Safety Diaphragm

(Applies to identity code types 16050, 16090, 16130, 12050, 12090 and 12130)

Liquid end	Materials in contact with the medium	Order no.
FM 130 - DN 15	PVT/TTT	1035951
FM 130 - DN 15	SST	1035957
FM 130 - DN 15	SST (with 2 valve assemblies)	1035954

(Applies to identity code types 07120, 07220 and 04350)

Liquid end	Materials in contact with the medium	Order no.
FM 350 - DN 25	PVT/TTT	1035953
FM 350 - DN 25	SST	1035960
FM 350 - DN 25	SST (with 2 valve assemblies)	1035959

### Spare parts kits for Sigma/ 2 for design with old diaphragm

(Applies to identity code types 16050, 16090, 16130, 12050, 12090 and 12130)

Liquid end	Materials in contact with the medium	Order no.
FM 130 - DN 15	PVT	740324
FM 130 - DN 15	SST	740326
FM 130 - DN 15	SST (with 2 valve sets)	740328

(Applies to identity code types 07120, 07220 and 04350)

Liquid end	Materials in contact with the medium	Order no.
FM 350 - DN 25	PVT	740325
FM 350 - DN 25	SST	740327
FM 350 - DN 25	SST (with 2 valve sets)	740329

### Sigma/ 2 spare parts kit for FDA design (physiologically safe)

(Applies to identity code types 16050, 16090, 16130, 12050, 12090 and 12130)

Liquid end	Materials in contact with the medium	Order no.
FM 130 - DN 15	PVT	1046472
FM 130 - DN 15	SST (without valve)	1046473
FM 130 - DN 15	SST (with valve)	1046474

(Applies to identity code types 07120, 07220 and 04350)

Liquid end	Materials in contact with the medium	Order no.
FM 350 - DN 25	PVT	1046475
FM 350 - DN 25	SST (without valve)	1046476
FM 350 - DN 25	SST (with valve)	1046477



## 1.4 Sigma/ 2 Basic Type (S2Ba)

### Multi-layer Safety Diaphragm (Standard)

	Order no.
FM 130 (type: 16050, 16090, 16130)	1029771
FM 350 (type: 07120, 07220, 04350)	1033422

### Metering diaphragm (old version)

	Order no.
Sigma with FM 130 identity code: Type 16050, 16090, 16130	792495
Sigma with FM 350 identity code: Type 07120, 07220, 04350	792496

### Spare parts kits for integrated relief valve

Consisting of two Hast. C compression springs and four FKM-A and EPDM O-rings each

	For material	Seals	Order no.
ETS overflow valve 4 bar	PVT/SST	FKM-A/EPDM	1031199
ETS overflow valve 7 bar	PVT/SST	FKM-A/EPDM	1031200
ETS overflow valve 10 bar	PVT	FKM-A/EPDM	1031201
ETS overflow valve 16 bar	SST	FKM-A/EPDM	1031203

### Gear oil

	Volume l	Order no.
Mobilgear 634 VG 460 gear oil	1	1004542

### Accessories

- Foot Valves See page → 1-47
- Injection Valves See page → 1-49
- Connector Parts, Seals, Hoses See page → 1-66
- Suction Lances/Suction Assemblies See page → 1-55
- Speed Controllers See page → 1-72

### Spare Parts

- Custom Accessories See page → 1-77



## 1.5 Sigma/ 2 Control Type (S2Cb)

### 1.5.1

### Sigma/ 2 Control Type (S2Cb)

The intelligent pump for safe and reliable use in many applications

Capacity range 61 – 353 l/h, 16 – 4 bar

The Sigma/ 2 Control is a robust motor-driven diaphragm metering pump with a patented multi-layer safety diaphragm for outstanding process safety and reliability. The integrated automatic overload shut-down offers further protection for the pump. Its intelligent features, such as removable operating unit and adjustable metering profiles, as well as a variety of power end and control configurations, enable the versatile use of this pump in a number of applications.

The Sigma/ 2 Control diaphragm metering pump together with pumps of type Sigma/ 1 Control and Sigma/ 3 Control represent an integrated product range. They cover the capacity range from 17 to 1,040 l/h. The entire Sigma Control product range is equipped with intelligent features to provide a high level of operating convenience, safety and efficiency. The pump product range has a removable operating unit and adjustable metering profiles to ensure optimum metering results.

#### Your benefits

Excellent process safety and reliability:

- In the event of an accident, the feed chemical does not escape to the outside nor into the pump's power end, thanks to the patented multi-layer safety diaphragm with optical (optionally electric) signalling
- Automatic integrated overload switch-off as a pump protection function
- Reliable operation by bleed option during the suction process
- Metering reproducibility is better than  $\pm 2\%$  with a 30-100% stroke length adjustment range under certain defined conditions and with proper installation.

Flexible adaptation to the process:

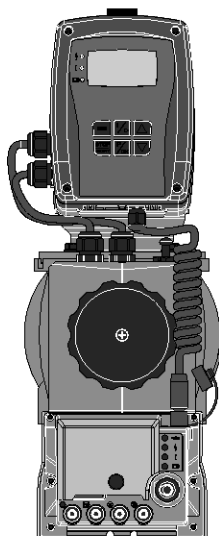
- Detachable operating unit with large illuminated LC display for outstanding user convenience
- Metering profiles for optimum metering results
- The entire Sigma product range is available as standard in a "Physiologically safe in respect of wetted materials" design.
- Metering pumps with electro-polished stainless steel metering head and EHEDG certification enable them to be used in hygienically challenging applications
- Various control options are available, as well as trouble-free connection to bus-networked systems by PROFIBUS®
- Customised designs are available on request

#### Technical details

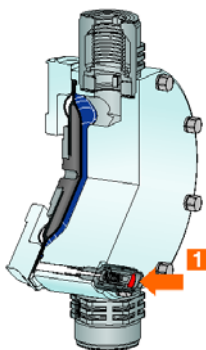
- Stroke length: 5 mm,
- Stroke length adjustment range: 0 – 100%
- Stroke length adjustment: manually by self-locking rotary dial in 1% increments (optionally with actuator or control drive)
- Metering reproducibility is better than  $\pm 2\%$  in the 30 – 100% stroke length adjustment range under defined conditions and with correct installation
- Wetted materials: PVDF, stainless steel 1.4571/1.4404, special materials on request
- Patented multi-layer safety diaphragm with optical diaphragm rupture display (optionally with diaphragm rupture warning system via a contact)
- Integrated automatic overload switch-off as a pump protection function
- Integrated hydraulic relief and bleed valve
- Removable operating unit with large illuminated LC display
- Metering profiles for optimum metering results
- Power supply: 1-phase, 100 – 230 V  $\pm 10\%$ , 240 V  $\pm 6\%$ , 50/60 Hz (220 W)
- Degree of protection IP 65
- Highly rigid fibreglass-reinforced plastic housing with excellent chemical resistance
- For reasons of safety, provide suitable overload protection mechanisms in all mechanically deflected diaphragm metering pumps.

#### Field of application

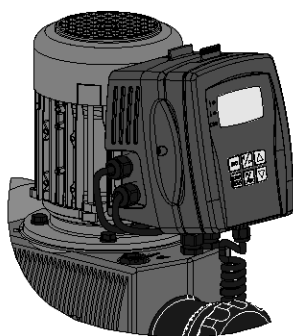
- Volume-proportional addition of chemicals in water treatment, e.g. sodium-calcium hypochlorite for the disinfection of potable water
- Neutralisation in waste water treatment
- Time-controlled addition of chemicals in the cooling water circuit
- Pulse-controlled metering in the bottling of different volumes e.g. glycerin filling of manometers



P\_SI\_0131\_SW  
Sigma/ 2 control type



P\_SI\_0065\_C1  
1: Diaphragm rupture sensor



P\_SI\_0099\_SW  
Abnehmbare Bedieneinheit

## 1.5 Sigma/ 2 Control Type (S2Cb)

### Detachable operating unit (HMI)



P\_SI\_0099\_SW3

The operating unit (HMI) can be attached directly to the metering pump or mounted on the wall alongside the pump. This provides the operator with a range of options for the integration of a metering system in the overall system that it is readily accessible and easy to use. Moreover the removable operating unit offers additional protection against unauthorised operation of the metering pump or against modification of the pump settings. The operating unit can, for example, be completely removed for project applications.

Individual functions of the metering pump can be easily selected and adjusted with five program keys. An illuminated LCD display provides information about the relevant operating status. LEDs on the operating unit and the control unit indicate the active pump functions or the pump status.

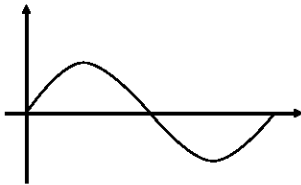
### Metering profiles

Metering profiles guarantee optimum metering results by adapting the metering behaviour of the metering pump to the application or chemical used.

The stroke motion of the displacement body is continually recorded and regulated so that the stroke is made in line with the desired metering profile. The pump can be operated in normal mode (Diagram 1), with optimised discharge stroke (Diagram 2) or with optimised suction stroke (Diagram 3). Three typical metering profiles are shown schematically with the behaviour over time.

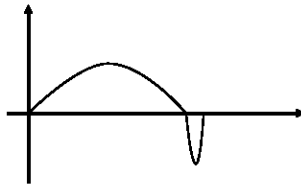
In normal operating mode, the time behaviour for the suction stroke and the discharge stroke is similar (Diagram 1). In the mode with optimised discharge stroke (Diagram 2), the discharge stroke is lengthened while the suction stroke is made as quickly as possible. This set-up is suited to applications which require optimum mixing and as continuous a mixing of chemicals as possible, for example.

In the mode with the optimised suction stroke (Diagram 3), the suction stroke is carried out as slowly as possible, permitting precise and trouble-free metering of viscous and gaseous media. Select this setting to minimise the NPSH value as well.



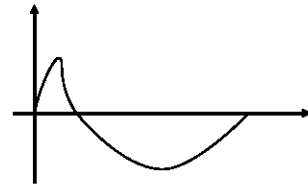
P\_SI\_0102\_SW

Diagram 1: Discharge stroke, suction stroke equal



P\_SI\_0103\_SW

Diagram 2: Long discharge stroke, short suction stroke



P\_SI\_0104\_SW

Diagram 3: Short discharge stroke, long suction stroke

### "Physiologically safe (FDA) in respect of wetted materials" version

All wetted materials in the "Physiologically safe (FDA) in respect of wetted materials" design comply with the FDA guidelines.

FDA guidelines:

- Material PTFE: FDA No. 21 CFR § 177.1550
- Material PVDF: FDA No. 21 CFR § 177.2510

Available for material version PVT and SST.

Identity code example: S1CbH07042PVTS01 F UA10S0DE



## 1.5 Sigma/ 2 Control Type (S2Cb)

### Technical Data

Type S2Cb	Delivery rate at max. back pressure			Max. stroke rate	Delivery rate at max. back pressure		Suction lift	Perm. pre-pressure suction side	Connection, suction/discharge side	Shipping weight
	bar	l/h	ml/stroke		psi	gph (US)				
16050 PVT	10	61	11.4	90	145	16.1	7	3	1-15	15
16050 SST	16	56	10.4	90	232	14.8	7	3	1-15	20
16090 PVT	10	109	11.4	160	145	28.8	7	3	1-15	15
16090 SST	16	99	10.3	160	232	26.2	7	3	1-15	20
16130 PVT	10	131	10.9	200	145	34.6	7	3	1-15	15
16130 SST	16	129	10.9	200	232	34.1	7	3	1-15	20
07120 PVT	7	150	27.4	90	102	39.6	5	1	1 1/2-25	16
07120 SST	7	150	27.4	90	102	39.6	5	1	1 1/2-25	24
07220 PVT	7	271	27.7	160	102	71.6	5	1	1 1/2-25	16
07220 SST	7	271	27.7	160	102	71.6	5	1	1 1/2-25	24
04350 PVT	4	353	29.4	200	58	93.3	5	1	1 1/2-25	16
04350 SST	4	353	29.4	200	58	93.3	5	1	1 1/2-25	24

\* With Sigma types 07120, 07220 and 04350, the dosing head is fitted with DN 25 (G 1 1/2) valves. As DN 20 is generally sufficient for these types of pipes (see technical data, suction/discharge side connector), the connector parts that can be ordered under the identity code (e.g. inserts) are already reduced to DN 20, i.e. piping and accessories can be installed in DN 20.

### Materials in contact with the medium

Material	Dosing head	Suction/pressure connector	Seals/ball seat	Balls	Integral relief valve
PVT	PVDF	PVDF	PTFE/PTFE	Ceramic/glass*	PVDF/FKM or EPDM
SST	Stainless steel 1.4404	Stainless steel 1.4581	PTFE/PTFE	Stainless steel 1.4404	Stainless steel/FKM or EPDM

\* With 07120, 07220, 04350

The ball seat is made of PVDF on the design "F"

### Motor Data

Identity code specification	Power supply			Remarks
U	1-phase, IP 65	100 – 230 V ±10 % / 240 V ±6 %	50/60 Hz	220 W



# 1.5 Sigma/ 2 Control Type (S2Cb)

## Sigma/ 2 Control Type (S2Cb)

S2Cb	Drive type
H	Main power end, diaphragm
Pump type	
bar	l/h
16050	16 * 56
16090	16 * 99
16130	16 * 129
07220	7 271
07120	7 150
04350	4 353
Dosing head material	
PV	PVDF (max. 10 bar)
SS	Stainless steel
Seal material	
T	PTFE seal
Displacement body	
S	Multi-layer safety diaphragm with optical rupture indicator
A	Multi-layer safety diaphragm with electrical signal
Dosing head version	
0	no valve spring (standard)
1	with 2 valve springs, Hastelloy C; 0.1 bar
2	with bleed valve, FKM seal, no valve spring
3	with bleed valve, FKM seal, with valve spring
4**	with relief valve, FPM seal, no valve springs
5**	with relief valve, FPM seal, with valve springs
6**	with relief valve, EPDM seal, no valve springs
7**	with relief valve, EPDM seal, with valve springs
8	with bleed valve, EPDM seal, no valve spring
9	with bleed valve, EPDM seal, with valve spring
Hydraulic connector	
0	Standard connection
1	Union nut and PVC insert
2	Union nut and PP insert
3	Union nut and PVDF insert
4	Union nut and stainless steel insert
7	Union nut and PVDF tube nozzle
8	Union nut and stainless steel tube nozzle
9	Union nut and stainless steel welding sleeve
Version	
0	With ProMinent® Logo
1	Without ProMinent® Logo
F	with physiological safety (FDA) in respect of wetted materials
Electric power supply	
U	1 ph, 100 – 230 V ±10 %, 240 V ±6 %, 50/60 Hz, 220 W
Cable and plug	
A	2 m Europe
B	2 m Swiss
C	2 m Australia
D	2 m USA
Relay	
0	No relay
1	Fault indicating relay (230 V, 8 A)
3	Fault indicating relay (24 V, 100 mA) + pacing relay (24 V, 100 mA)
8	0/4-20 mA analogue output + fault indicating / pacing relay (24 V - 100 mA)
Control versions	
0	Manual + external contact with pulse control
1	As 0 + analogue + metering profiles
6	As 1 + PROFIBUS® DP interface, M 12
Overload switch-off	
0	without overload switch-off
1	with overload switch-off
Operating unit (HMI)	
S	HMI (0.5 m cable)
1	HMI + 2 m cable
2	HMI + 5 m cable
3	HMI + 10 m cable
X	without operating unit (HMI)
Access code	
0	without access control; dynamic metering monitor
1	with access control; dynamic metering monitor
Language	
DE	German
EN	English
ES	Spanish
FR	French
IT	Italian
NL	Dutch
PL	Polish
PT	Portuguese

\* 10 bar for PVDF version.

\*\* Standard with tube nozzle in the bypass. Threaded connection on request.

EHEDG-certified (European Hygienic Eng. Design Group) electropolished stainless steel dosing heads (< Ra 0.8) type EL class I are available on request.



## 1.5 Sigma/ 2 Control Type (S2Cb)

### 1.5.2

### Spare Parts

The replacement part kit in general includes wear parts for the liquid ends.

#### Scope of delivery for material PVT

1 x metering diaphragm, 1 x suction valve compl., 1 x pressure valve compl., 2 x valve balls,  
1 x elastomer seal kit (EPDM, FKM-B),  
2 x ball seat bushings, 2 x ball washers, 4 x formed composite seals

#### Scope of delivery for material SST

1 x metering diaphragm, 2 x valve balls, 2 x ball seat washers,  
4 x formed composite seals

#### Spare Parts Kit for Sigma/ 2 for Design with Multi-layer Safety Diaphragm

(Applies to identity code types 16050, 16090, 16130, 12050, 12090 and 12130)

Liquid end	Materials in contact with the medium	Order no.
FM 130 - DN 15	PVT/TTT	1035951
FM 130 - DN 15	SST	1035957
FM 130 - DN 15	SST (with 2 valve assemblies)	1035954

(Applies to identity code types 07120, 07220 and 04350)

Liquid end	Materials in contact with the medium	Order no.
FM 350 - DN 25	PVT/TTT	1035953
FM 350 - DN 25	SST	1035960
FM 350 - DN 25	SST (with 2 valve assemblies)	1035959

#### Spare parts kits for Sigma/ 2 for design with old diaphragm

(Applies to identity code types 16050, 16090, 16130, 12050, 12090 and 12130)

Liquid end	Materials in contact with the medium	Order no.
FM 130 - DN 15	PVT	740324
FM 130 - DN 15	SST	740326
FM 130 - DN 15	SST (with 2 valve sets)	740328

(Applies to identity code types 07120, 07220 and 04350)

Liquid end	Materials in contact with the medium	Order no.
FM 350 - DN 25	PVT	740325
FM 350 - DN 25	SST	740327
FM 350 - DN 25	SST (with 2 valve sets)	740329

#### Sigma/ 2 spare parts kit for FDA design (physiologically safe)

(Applies to identity code types 16050, 16090, 16130, 12050, 12090 and 12130)

Liquid end	Materials in contact with the medium	Order no.
FM 130 - DN 15	PVT	1046472
FM 130 - DN 15	SST (without valve)	1046473
FM 130 - DN 15	SST (with valve)	1046474

(Applies to identity code types 07120, 07220 and 04350)

Liquid end	Materials in contact with the medium	Order no.
FM 350 - DN 25	PVT	1046475
FM 350 - DN 25	SST (without valve)	1046476
FM 350 - DN 25	SST (with valve)	1046477

#### Multi-layer Safety Diaphragm (Standard)

	Order no.
FM 130 (type: 16050, 16090, 16130)	1029771
FM 350 (type: 07120, 07220, 04350)	1033422





## 1.5 Sigma/ 2 Control Type (S2Cb)

### Metering diaphragm (old version)

	Order no.
<b>Sigma with FM 130 identity code: Type 16050, 16090, 16130</b>	792495
<b>Sigma with FM 350 identity code: Type 07120, 07220, 04350</b>	792496

### Spare parts kit for integrated relief valve (S2Ca, S2Cb)

Consisting of two Hast. C compression springs and four FKM-A and EPDM O-rings each

	For material	Seals	Order no.
<b>ETS overflow valve 4 bar</b>	PVT/SST	FKM-A/EPDM	1031199
<b>ETS overflow valve 7 bar</b>	PVT/SST	FKM-A/EPDM	1031200
<b>ETS overflow valve 10 bar</b>	PVT	FKM-A/EPDM	1031201
<b>ETS overflow valve 16 bar</b>	SST	FKM-A/EPDM	1031203

### Gear oil

	Volume l	Order no.
<b>Mobilgear 634 VG 460 gear oil</b>	1	1004542

### Spare parts kits for integrated bleed valve (S2Cb)

Consisting of a compression spring made from Hastelloy C and four FKM-A and EPDM O-rings each.  
For identity code feature "Dosing head version" with characteristic "2", "3", "8", "9".

	For material	Seals	Order no.
<b>ETS</b>	PVT/SST	FKM-A/EPDM	1043785

### Protective cowling

Protection of the operating unit (HMI) of Sigma metering pumps against contamination; made from transparent silicone plastic. For Sigma control types S1Cb / S2Cb / S3Cb.

	Order no.
<b>Protective cowling for operating unit (S1Cb, S2Cb, S3Cb)</b>	1036724

### Wall bracket

Wall bracket with operating lever for wall mounting of the operating unit (HMI) without any fittings. For Sigma control types S1Cb / S2Cb / S3Cb.

	Order no.
<b>Wall bracket for operating unit (S1Cb, S2Cb, S3Cb)</b>	1036683

### Extension cable for operating unit (HMI)

	Order no.
<b>Connecting cable - CAN M12 5-pole 1 m</b>	1022139
<b>Connecting cable - CAN M12 5-pole 2 m</b>	1022140
<b>Connecting cable - CAN M12 5-pole 5 m</b>	1022141
<b>Connecting cable - CAN M12 5-pin 10 m</b>	1046383

### Accessories

- Foot Valves See page → 1-47
- Injection Valves See page → 1-49
- Connector Parts, Seals, Hoses See page → 1-66
- Suction Lances/Suction Assemblies See page → 1-55
- Speed Controllers See page → 1-72

### Spare Parts

- Custom Accessories See page → 1-77



## 1.6 Sigma/ 3 Basic Type (S3Ba)

### 1.6.1

### Sigma/ 3 Basic Type (S3Ba)

**The robust pump for safe and reliable use**

**Capacity range 146 – 1,030 l/h, 12 – 4 bar**



The patented multi-layer safety diaphragm for excellent process safety and reliability is just one feature of the extremely robust motor-driven diaphragm metering pump Sigma/3 Basic. It also offers a wide range of power end versions, such as three-phase or 1-phase AC motors, even for Exe and Exde areas with ATEX certification.

The Sigma/ 3 diaphragm metering pump together with pumps of type Sigma/ 1 and Sigma/ 2 represent an integrated product range. They cover the capacity range from 17 to 1,030 l/h, with a consistent operating concept, control concept and spare parts management. A wide range of drive versions is available, including some for use in Exe and Exde areas with ATEX certification.

#### Your benefits

Excellent process safety and reliability:

- In the event of an accident, the feed chemical does not escape to the outside nor into the pump's power end, thanks to the patented multi-layer safety diaphragm with optical (optionally electric) signalling
- Integrated relief valve protects the pump against overloading
- Reliable operation by bleed option during the suction process
- Metering reproducibility is better than  $\pm 2\%$  with a 30-100% stroke length adjustment range under certain defined conditions and with proper installation.

Flexible adaptation to the process:

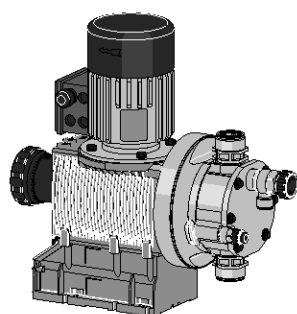
- The entire Sigma product range is available as standard in a "Physiologically safe in respect of wetted materials" design.
- Metering pumps with electro-polished stainless steel metering head and EHEDG certification enable them to be used in hygienically challenging applications
- Wide range of power end versions, also for use in Exe and Exde areas and different flange designs for the use of customised motors
- Customised designs are available on request

#### Technical details

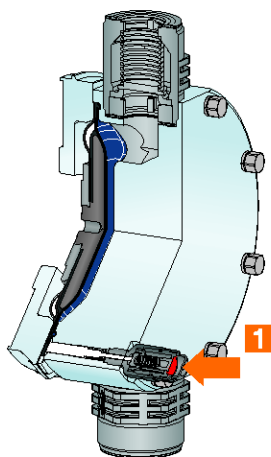
- Stroke length: 6 mm,
- Stroke length adjustment range: 0 – 100%
- Stroke length adjustment: manually by self-locking rotary dial in 1% increments (optionally with actuator or control drive)
- Metering reproducibility is better than  $\pm 2\%$  with a 30-100% stroke length adjustment range under certain defined conditions and with proper installation.
- Wetted materials: PVDF, stainless steel 1.4571/1.4404, special materials on request
- Patented multi-layer safety diaphragm with optical diaphragm rupture display (optionally with diaphragm rupture warning system via a contact)
- Integrated hydraulic relief and bleed valve
- A wide range of power end versions is available: Three-phase standard motor, 1-phase AC motor, motors for use in Exe and Exde areas and different flange designs for use in customer-specific motors
- Degree of protection IP 55 (optionally II2GExeIIIT3, II2GExdIICT4)
- Highly rigid fibreglass-reinforced plastic housing with excellent chemical resistance
- For reasons of safety, provide suitable overload protection mechanisms in all mechanically deflected diaphragm metering pumps.

#### Field of application

- Volume-proportional addition of chemicals in water treatment, e.g. sodium-calcium hypochlorite for the disinfection of potable water
- Addition of chemicals depending on the measured value, e.g. metering of acid and alkali for pH neutralisation in waste water treatment
- Time-controlled addition of chemicals in the cooling water circuit
- Pulse-controlled metering in the bottling of different volumes e.g. glycerin filling of manometers

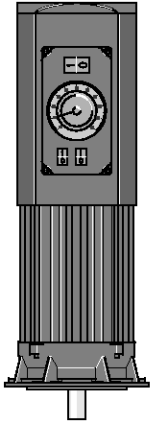


P\_SI\_0132\_SW  
Sigma/ 3



P\_SI\_0065\_C1  
1: Diaphragm rupture sensor

## 1.6 Sigma/ 3 Basic Type (S3Ba)



pk\_2\_103

### Sigma Basic Type Control Functions (S3Ba)

#### Stroke length actuator/controller

**Actuator** with stroke positioning motor for automatic stroke length adjustment. Setting time approx. 1 sec for 1 % stroke length. Resistance potentiometer 1 kΩ. Enclosure rating IP 54.

**Controller** consisting of actuator with stroke positioning motor and in-built follower for stroke length adjustment via a standard signal. Standard signal current input 0/4-20 mA corresponds to stroke length 0 - 100 %. Can be switched between manual and automatic operation, key switch for stroke adjustment for manual operation. Mechanical status display of actual stroke length value output 0/4-20 mA for remote display.

#### Variable speed motors with integrated frequency converter (identity code specification V)

Power supply 1ph 230 V, 50/60 Hz, 0.55 kW

Externally controllable with 0/4-20 mA (see Fig. pk\_2\_103).

On request externally controllable via PROFIBUS® DP

#### Speed controllers in metal housing (identity code characteristic Z)

The speed controller assembly consists of a speed controller and a 0.55 kW variable speed motor.

### "Physiologically safe (FDA) in respect of wetted materials" version

All wetted materials in the "Physiologically safe (FDA) in respect of wetted materials" design comply with the FDA guidelines.

FDA guidelines:

- Material PTFE: FDA No. 21 CFR § 177.1550
- Material PVDF: FDA No. 21 CFR § 177.2510

Available for material design PVT and SST and DN 25 ball valve.

Identity code example: S3BaH120330PVTS00 F S000



## 1.6 Sigma/ 3 Basic Type (S3Ba)

### Technical Data

Type S3Ba	With 1500 rpm motor at 50 Hz				With 1800 rpm motor at 60 Hz			Perm. pre-pressure suction side	Suction lift	Connection, suction/dis-charge side	Shipping weight
	Delivery rate at max. back pressure	Max. stroke rate			Delivery rate at max. back pressure	Max. stroke rate					
	bar	l/h	ml/stroke	Strokes/min	psi	l/h/gph (US)	Strokes/min	bar	mWC	G-DN	kg
120145 PVT	10	146	33.7	72	145	174/45.9	86	2	5	1 1/2–25	22
120145 SST	12	146	33.7	72	174	174/45.9	86	2	5	1 1/2–25	26
120190 PVT	10	208	33.7	103	145	251/66.3	124	2	5	1 1/2–25	22
120190 SST	12	208	33.7	103	174	251/66.3	124	2	5	1 1/2–25	26
120270 PVT	10	292	33.8	144	145	351/92.7	173	2	5	1 1/2–25	22
120270 SST	12	292	33.8	144	174	351/92.7	173	2	5	1 1/2–25	26
120330 PVT*	10	365	33.8	180	145	–	–	2	5	1 1/2–25	22
120330 SST*	12	365	33.8	180	174	–	–	2	5	1 1/2–25	26
070410 PVT	7	410	95.1	72	102	492/129.9	86	1	4	2–32	24
070410 SST	7	410	95.1	72	102	492/129.9	86	1	4	2–32	29
070580 PVT	7	580	95.1	103	102	696/183.8	124	1	4	2–32	24
070580 SST	7	580	95.1	103	102	696/183.8	124	1	4	2–32	29
040830 PVT	4	830	95.1	144	58	1,000/264.1	173	1	3	2–32	24
040830 SST	4	830	95.1	144	58	1,000/264.1	173	1	3	2–32	29
041030 PVT*	4	1,030	95.1	180	58	–	–	1	3	2–32	24
041030 SST*	4	1,030	95.1	180	58	–	–	1	3	2–32	29

Performance data for TTT, see type PVT

\* Only available for 50 Hz.

### Materials in contact with the medium

Material	Suction/pressure connector on dosing head	DN 25 ball valves			DN 32 plate valves			Integral relief valve
		Seals	Valve balls	Valve seats	Seals	Valve plates/ valve springs	Valve seats	
PVT	PVDF	PTFE	Glass	PTFE**	PTFE	Ceramic/ Hast C. + CTFE*	PTFE	PVDF/FKM or EPDM
SST	Stainless steel 1.4581	PTFE	Stainless steel 1.4404	PTFE**	PTFE	Stainless steel 1.4404/ Hast. C	PTFE	Stainless steel/FKM or EPDM
TTT***	PVDF	PTFE	Glass	PTFE**	PTFE	Ceramic/ Hast C. + CTFE*	PTFE	–

\* The valve spring is coated with CTFE (resistance similar to PTFE)

\*\*\* Specifically for areas at risk from explosion

\*\* On design "F", the ball seat is made of PVDF, only for DN 25 ball valves

### Motor Data

Identity code specification	Power supply	Δ / Y	Remarks		
S	3 ph, IP 55	220-240 V/380-420 V 250-280 V/440-480 V	50 Hz 60 Hz	0.37 kW 0.37 kW	
T	3 ph, IP 55	220-240 V/380-420 V 250-280 V/440-480 V	50 Hz 60 Hz	0.37 kW	With PTC, speed control range 1:5
R	3 ph, IP 55	220-240 V/380-420 V	50 Hz	0.55 kW	With PTC, speed adjustment range 1:20 with separate fan 1ph 230 V; 50/60Hz
V0	1 ph, IP 55	230 V ±5 %	50/60 Hz	0.55 kW	Variable speed motor with integrated frequency converter, control range 1:20 (1 ph, 230 V, 50/60 Hz)
M	1 ph AC, IP 55	230 V ±5%	50/60 Hz	0.55 kW	
N	1 ph AC, IP 55	115 V ±5 %	60 Hz	0.55 kW	
L1	3 ph, II2GEEExIICT3	220-240 V/380-420 V	50 Hz	0.37 kW	
L2	3 ph, II2GEEExIICT4	220-240 V/380-420 V	50 Hz	0.37 kW	With PTC, speed control range 1:5
P1	3 ph, II2GEEExIICT3	250-280 V/440-480 V	60 Hz	0.37 kW	
P2	3 ph, II2GEEExIICT4	250-280 V/440-480 V	60 Hz	0.37 kW	With PTC, speed control range 1:5
V2	3 ph, II2GEEExIICT4	400 V ±10 %	50/60 Hz	0.55 kW	Ex-variable speed motor with integrated frequency converter. Mains feed: 3 ph + neutral + earth, control range 1:10

Motor data sheets can be requested for more information.

Special motors or special motor flanges are available on request.

Motors less than 0.75 kW and motors designed for speed-controllable operation are not subject to the IEC2 standard in compliance with the Ecodesign Directive 2005/32/EC.

### Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 94/9/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label corresponds to or is better than the conditions prevalent in the intended field of application.



## 1.6 Sigma/ 3 Basic Type (S3Ba)

### Sigma/ 3 Basic Type (S3Ba)

S3Ba	Drive type																														
H	Main drive, diaphragm																														
	<b>Pump type</b>																														
	<table><tr><td></td><td>bar</td><td>l/h</td><td></td><td>bar</td><td>l/h</td></tr><tr><td>120145</td><td>12 *</td><td>146</td><td>070410</td><td>7</td><td>410</td></tr><tr><td>120190</td><td>12 *</td><td>208</td><td>070580</td><td>7</td><td>580</td></tr><tr><td>120270</td><td>12 *</td><td>292</td><td>040830</td><td>4</td><td>830</td></tr><tr><td>120330</td><td>12 *</td><td>365</td><td>041030</td><td>4</td><td>1,030</td></tr></table>		bar	l/h		bar	l/h	120145	12 *	146	070410	7	410	120190	12 *	208	070580	7	580	120270	12 *	292	040830	4	830	120330	12 *	365	041030	4	1,030
	bar	l/h		bar	l/h																										
120145	12 *	146	070410	7	410																										
120190	12 *	208	070580	7	580																										
120270	12 *	292	040830	4	830																										
120330	12 *	365	041030	4	1,030																										
	<b>Liquid end material</b>																														
	PV PVDF (max. 10 bar)																														
	SS Stainless steel																														
	TT PTFE + 25 % carbon (max. 10 bar)																														
	<b>Seals material</b>																														
	T PTFE seal																														
	<b>Diaphragm</b>																														
	S Multi-layer safety diaphragm with optical rupture indicator																														
	A Multi-layer safety diaphragm with rupture signalling (contact)																														
	<b>Liquid end version</b>																														
	0 No valve springs																														
	1 With 2 valve springs, Hastelloy C 4; 0.1 bar (standard for DN 32)																														
	4 With pressure relief valve, FKM seal, no valve springs, only with PV and SS																														
	5 With pressure relief valve, FKM seal with valve springs (standard at DN 32), only with PV and SS																														
	6 With pressure relief valve, EPDM seal, without valve spring, only with PV and SS																														
	7 With pressure relief valve, EPDM seal, with valve springs (standard at DN 32), only with PV and SS																														
	<b>Hydraulic connection</b>																														
	0 Standard threaded connector (as technical data)																														
	1 Union nut and PVC insert																														
	2 Union nut and PP insert																														
	3 Union nut and PVDF insert																														
	4 Union nut and SS insert																														
	7 Union nut and PVDF hose nozzle																														
	8 Union nut and SS hose nozzle																														
	9 Union nut and stainless steel hose nozzle																														
	<b>Version</b>																														
	0 With ProMinent® logo																														
	1 Without ProMinent® logo																														
	M Modified																														
	F with physiological safety (FDA) in respect of wetted materials (only for 12 bar version)																														
	<b>Electrical power supply</b>																														
	S 3 ph, 230 V/400 V																														
	T 3 ph, 230 V/400 V, with PTC																														
	R Variable speed motor 3 ph, 230/400 V, with PTC, with external fan 1 ph 230 V 50/60 Hz																														
	V (0) Variable speed motor with integrated frequency converter 1 ph, 230 V, 50/60 Hz																														
	Z Speed control compl 1 ph 230 V//400 V (variable speed motor + FC)																														
	M 1 ph, 230 V																														
	N 1 ph, 115 V																														
	L 3 ph, 230 V/400 V, 0.37 kW, 50 Hz, (Exe, Exd)																														
	P 3 ph, 265 V/440 V, 0.37 kW, 60 Hz, (Exe, Exd)																														
	V (2) Variable speed motor with integr. FC Exd (delivery with frame)																														
	1 No motor, with B5 flange, size 80 (DIN)																														
	2 No motor, with C56 NEMA flange																														
	3 No motor, with B5 flange, size 71 (DIN)																														
	<b>Enclosure rating</b>																														
	0 IP 55																														
	1 Exe motor version ATEX-T3																														
	2 Exd motor version ATEX-T4																														
	<b>Stroke sensor</b>																														
	0 No stroke sensor (standard)																														
	2 Pacing relay (read relay)																														
	3 Stroke sensor (Namur) for explosion-proof application																														
	<b>Stroke length adjustment</b>																														
	0 Manual (standard)																														
	1 With stroke positioning motor, 230 V/50/60 Hz																														
	2 With stroke positioning motor, 115 V/50/60 Hz																														
	3 With stroke control motor 0...20 mA 230 V/50/60 Hz																														
	4 With stroke control motor 4...20 mA 230 V/50/60 Hz																														
	5 With stroke control motor 0...20 mA 115 V/50/60 Hz																														
	6 With stroke control motor 4...20 mA 115 V/50/60 Hz																														

\* 10 bar for the PVDF and TTT version

EHEDG-certified (European Hygienic Eng. Design Group) electropolished stainless steel dosing heads (< Ra 0.8) type EL class I are available on request.

We are happy to supply alternative material versions to comply with export conditions for pump capacities > 600 l/h and PVDF.



## 1.6 Sigma/ 3 Basic Type (S3Ba)

### 1.6.2

### Spare Parts

The replacement part kit in general includes wear parts for the liquid ends.

#### Scope of delivery for material PVT

1 x metering diaphragm, 1 x suction valve compl., 1 x pressure valve compl., 2 x valve balls or valve plate with spring for DN 32, 1 x elastomer seal set (EPDM, FKM-B),

2 x ball seat bushings, 2 x ball seat washers

4 x formed composite seals

#### Scope of delivery for material SST

1 x metering diaphragm, 2 x valve balls or valve plate with spring for DN 32,

2 x ball seat washers,

4 x formed composite seals

### Spare Parts Kit for Sigma/ 3 for Design with Multi-layer Safety Diaphragm

(For Identity code: type 120145, 120190, 120270, 120330)

Liquid end	Materials in contact with the medium	Order no.
FM 330 - DN 25	PVT/TTT	1034678
FM 330 - DN 25	SST	1034679
FM 330 - DN 25	SST (with 2 valves compl.)	1034680

(For Identity code: type 070410, 070580, 040830, 041030)

Liquid end	Materials in contact with the medium	Order no.
FM 1000 - DN 32	PVT/PPT/PCT/TTT	1034681
FM 1000 - DN 32	SST	1034682
FM 1000 - DN 32	SST (with 2 valves compl.)	1034683

### Spare parts kits for Sigma/ 3 for design with old diaphragm

(Applies to identity code: Type 120145, 120190, 120270, 120330)

Liquid end	Materials in contact with the medium	Order no.
FM 330 - DN 25	PVT	1005308
FM 330 - DN 25	SST	1005310
FM 330 - DN 25	SST (with 2 valve set)	1005312

(Applies to identity code: Type 070410, 070580, 040830, 041030)

Liquid end	Materials in contact with the medium	Order no.
FM 1000 - DN 32	PVT/PPT/PCT	1020032
FM 1000 - DN 32	SST	1005311
FM 1000 - DN 32	SST (with 2 valve set)	1005313

### Sigma/ 3 spare parts kit for FDA design (physiologically safe)

Identity code type 120145, 120190, 120270, 120330

Liquid end	Materials in contact with the medium	Order no.
FM 330 - DN 25	PVT	1046478
FM 330 - DN 25	SST (without valve)	1046479
FM 330 - DN 25	SST (with valve)	1046480



## 1.6 Sigma/ 3 Basic Type (S3Ba)

### Multi-layer Safety Diaphragm (Standard)

	Order no.
FM 330 identity code: type 120145, 120190, 120270, 120330	1029604
FM 1000 identity code: type 070410, 070580, 040830, 041030	1029603

### Metering diaphragm (old version)

	Order no.
FM 330 Identity code: Type 120145, 120190, 120270, 120330	1004604
FM 1000 Identity code: Type 070410, 070580, 040830, 041030	1002835

### Spare parts kits for integrated relief valve

Consisting of two Hast. C compression springs and four FKM-A O-rings each

	for material	Seals	Order no.
ETS overflow valve 4 bar	PVT/SST	FKM-A/EPDM	1031204
ETS overflow valve 7 bar	PVT/SST	FKM-A/EPDM	1031205
ETS overflow valve 10 bar	PVT	FKM-A/EPDM	1031201
ETS overflow valve 12 bar	SST	FKM-A/EPDM	1031202

### Gear oil

	Volume l	Order no.
Mobilgear 634 VG 460 gear oil	1	1004542

### Accessories

- Foot Valves See page → 1-47
- Injection Valves See page → 1-49
- Connector Parts, Seals, Hoses See page → 1-66
- Suction Lances/Suction Assemblies See page → 1-55
- Speed Controllers See page → 1-72

### Spare Parts

- Custom Accessories See page → 1-77





## 1.7 Sigma/ 3 Control Type (S3Cb)

### 1.7.1

### Sigma/ 3 Control Type (S3Cb)

The intelligent pump for safe and reliable use in many applications

Capacity range 182 – 1,040 l/h, 12 – 4 bar

The motor-driven diaphragm metering pump Sigma/ 3 Control guarantees excellent process reliability, thanks to its patented multi-layer safety diaphragm. Intelligent features, such as removable operating unit and adjustable metering profiles, as well as a variety of power end and control configurations, enable the versatile use of this pump in a number of applications.

The Sigma/ 3 Control diaphragm metering pump together with pumps of type Sigma/ 1 Control and Sigma/ 2 Control represent an integrated product range. They cover the capacity range from 17 to 1,040 l/h. The entire Sigma Control product range is equipped with intelligent features to provide a high level of operating convenience, safety and efficiency. The pump product range has a removable operating unit and adjustable metering profiles to ensure optimum metering results.

#### Your benefits

Excellent process safety and reliability:

- In the event of an accident, the feed chemical does not escape to the outside nor into the pump's power end, thanks to the patented multi-layer safety diaphragm with optical (optionally electric) signalling
- Integrated relief valve protects the pump against overloading
- Reliable operation by bleed option during the suction process
- Metering reproducibility is better than  $\pm 2\%$  with a 30-100% stroke length adjustment range under certain defined conditions and with proper installation.

Flexible adaptation to the process:

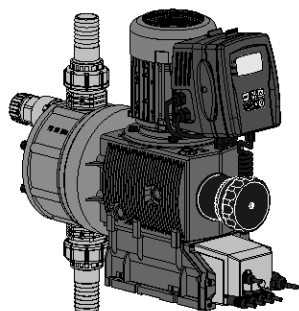
- Detachable operating unit with large illuminated LC display for outstanding user convenience
- Metering profiles for optimum metering results
- The entire Sigma product range is available as standard in a "Physiologically safe in respect of wetted materials" design.
- Metering pumps with electro-polished stainless steel metering head and EHEDG certification enable them to be used in hygienically challenging applications
- Various control options are available, as well as trouble-free connection to bus-networked systems by PROFIBUS®
- Customised designs are available on request

#### Technical details

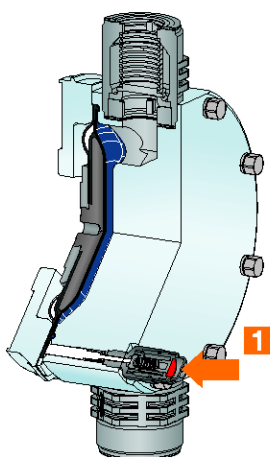
- Stroke length: 6 mm
- Stroke length adjustment range: 0 – 100%
- Stroke length adjustment: manually by self-locking rotary dial in 1% increments (optionally with actuator or control drive)
- Metering reproducibility is better than  $\pm 2\%$  in the 30 – 100% stroke length adjustment range under defined conditions and with correct installation
- Wetted materials: PVDF, stainless steel 1.4571/1.4404, special materials on request
- Patented multi-layer safety diaphragm with optical diaphragm rupture display (optionally with diaphragm rupture warning system via a contact)
- Integrated hydraulic relief and bleed valve
- Removable operating unit with large illuminated LC display
- Metering profiles for optimum metering results
- Degree of protection IP 65
- Highly rigid fibreglass-reinforced plastic housing with excellent chemical resistance
- For reasons of safety, provide suitable overload protection mechanisms in all mechanically deflected diaphragm metering pumps.

#### Field of application

- Volume-proportional addition of chemicals in water treatment, e.g. sodium-calcium hypochlorite for the disinfection of potable water
- Neutralisation in waste water treatment
- Time-controlled addition of chemicals in the cooling water circuit
- Pulse-controlled metering in the bottling of different volumes e.g. glycerin filling of manometers



P\_SI\_0101\_SW  
Sigma/ 3 control type



P\_SI\_0065\_C1  
1: Diaphragm rupture sensor





## 1.7 Sigma/ 3 Control Type (S3Cb)

### Detachable operating unit (HMI)



The operating unit (HMI) can be attached directly to the metering pump or mounted on the wall alongside the pump. This provides the operator with a range of options for the integration of a metering system in the overall system that it is readily accessible and easy to use. Moreover the removable operating unit offers additional protection against unauthorised operation of the metering pump or against modification of the pump settings. The operating unit can, for example, be completely removed for project applications.

Individual functions of the metering pump can be easily selected and adjusted with five program keys. An illuminated LCD display provides information about the relevant operating status. LEDs on the operating unit and the control unit indicate the active pump functions or the pump status.

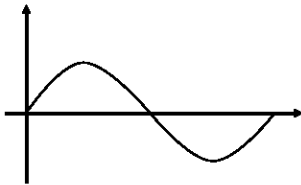
### Metering profiles

Metering profiles guarantee optimum metering results by adapting the metering behaviour of the metering pump to the application or chemical used.

The stroke motion of the displacement body is continually recorded and regulated so that the stroke is made in line with the desired metering profile. The pump can be operated in normal mode (Diagram 1), with optimised discharge stroke (Diagram 2) or with optimised suction stroke (Diagram 3). Three typical metering profiles are shown schematically with the behaviour over time.

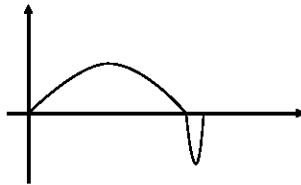
In normal operating mode, the time behaviour for the suction stroke and the discharge stroke is similar (Diagram 1). In the mode with optimised discharge stroke (Diagram 2), the discharge stroke is lengthened while the suction stroke is made as quickly as possible. This set-up is suited to applications which require optimum mixing and as continuous a mixing of chemicals as possible, for example.

In the mode with the optimised suction stroke (Diagram 3), the suction stroke is carried out as slowly as possible, permitting precise and trouble-free metering of viscous and gaseous media. Select this setting to minimise the NPSH value as well.



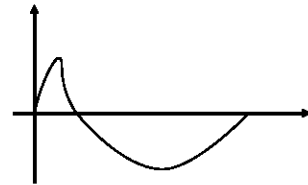
P\_SI\_0102\_SW

Diagram 1: Discharge stroke, suction stroke equal



P\_SI\_0103\_SW

Diagram 2: Long discharge stroke, short suction stroke



P\_SI\_0104\_SW

Diagram 3: Short discharge stroke, long suction stroke

### "Physiologically safe (FDA) in respect of wetted materials" version

All wetted materials in the "Physiologically safe (FDA) in respect of wetted materials" design comply with the FDA guidelines.

FDA guidelines:

- Material PTFE: FDA No. 21 CFR § 177.1550
- Material PVDF: FDA No. 21 CFR § 177.2510

Available for material version PVT and SST.

Identity code example: S1CbH07042PVTS01 F UA10S0DE



## 1.7 Sigma/ 3 Control Type (S3Cb)

### Technical Data

Type S3Cb	Delivery rate at max. back pressure			Max. stroke rate	Delivery rate at max. back pressure		Suction lift	Perm. pre-pressure suction side	Connection, suction/discharge side	Shipping weight
	bar	l/h	ml/stroke		psi	gph (US)				
120145 PVT	10	182	33.7	90	145	48.0	5	2	1 1/2-25	22
120145 SST	12	182	33.7	90	174	48.0	5	2	1 1/2-25	26
120190 PVT	10	243	33.7	120	145	64.1	5	2	1 1/2-25	22
120190 SST	12	243	33.7	120	174	64.1	5	2	1 1/2-25	26
120270 PVT	10	365	33.8	180	145	96.4	5	2	1 1/2-25	22
120270 SST	12	365	33.8	180	174	96.4	5	2	1 1/2-25	26
070410 PVT	7	500	95.1	90	102	132.0	4	1	2-32	24
070410 SST	7	500	95.1	90	102	132.0	4	1	2-32	29
070580 PVT	7	670	95.1	120	102	176.9	4	1	2-32	24
070580 SST	7	670	95.1	120	102	176.9	4	1	2-32	29
040830 PVT	4	1,040	95.1	180	58	274.7	3	1	2-32	24
040830 SST	4	1,040	95.1	180	58	274.7	3	1	2-32	29

### Materials in contact with the medium

Material	Suction/pressure connector on the dosing head	DN 25 ball valves			DN 32 plate valves			Integral relief valve
		Seals	Valve balls	Valve seats	Seals	Valve plates/ valve springs	Valve seats	
PVT	PVDF	PTFE	Glass	PTFE**	PTFE	Ceramic/ Hast C. + CTFE*	PTFE	PVDF/FKM or EPDM
SST	Stainless steel 1.4581	PTFE	Stainless steel 1.4404	PTFE**	PTFE	Stainless steel 1.4404/ Hast. C	PTFE	Stainless steel/FKM or EPDM

\* The valve spring is coated with CTFE (resistance similar to PTFE)

\*\* The ball seat is made of PVDF on design "F"

### Motor Data

Identity code specification	Power supply		Remarks	
U	1-phase, IP 65	100 – 230 V ±10 % / 240 V ±6 %	50/60 Hz	420 W



## 1.7 Sigma/ 3 Control Type (S3Cb)

### Sigma/ 3 Control Type (S3Cb)

S3Cb Drive type									
H		Main power end, diaphragm							
Pump type									
		bar	l/h		bar	l/h		bar	l/h
120145	12 *	182		120270	12 *	365		070580	7 670
120190	12 *	243		070410	7	500		040830	4 1,040
Dosing head material									
PV	PVDF (max. 10 bar)						SS	Stainless steel	
Seal material									
T	PTFE seal								
Displacement body									
S	Multi-layer safety diaphragm with optical rupture indicator								
A	Multi-layer safety diaphragm with electrical signal								
Dosing head version									
0	no valve spring (standard)								
1	with 2 valve springs, Hastelloy C; 0.1 bar (standard for DN 32)								
2	with bleed valve, FKM seal, no valve spring								
3	with bleed valve, FKM seal, with valve spring								
4**	with relief valve, FPM seal, no valve springs								
5**	with relief valve, FPM seal, with valve springs								
6**	with relief valve, EPDM seal, no valve springs								
7**	with relief valve, EPDM seal, with valve springs								
8	with bleed valve, EPDM seal, no valve spring								
9	with bleed valve, EPDM seal, with valve spring								
Hydraulic connector									
0	Standard connection						4	Union nut and stainless steel insert	
1	Union nut and PVC insert						7	Union nut and PVDF tube nozzle	
2	Union nut and PP insert						8	Union nut and stainless steel tube nozzle	
3	Union nut and PVDF insert						9	Union nut and stainless steel welding sleeve	
Version									
0	With ProMinent® Logo								
1	Without ProMinent® Logo								
F	with physiological safety (FDA) in respect of wetted materials (only for 12 bar version)								
Electric power supply									
U	1 ph, 100 – 230 V ±10 %, 240 V ±6 %, 50/60 Hz, 420 W								
Cable and plug									
A	2 m Europe						C	2 m Australia	
B	2 m Swiss						D	2 m USA	
Relay									
0	No relay								
1	Fault indicating relay (230 V, 8 A)								
3	Fault indicating relay (24 V, 100 mA) + pacing relay (24 V, 100 mA)								
8	0/4-20 mA analogue output + fault indicating / pacing relay (24 V - 100 mA)								
Control versions									
0	Manual + external contact with pulse control								
1	As 0 + analogue + metering profiles								
6	As 1 + PROFIBUS® DP interface, M 12								
Overload switch-off									
0	without overload switch-off								
Operating unit (HMI)									
S	HMI (0.5 m cable)								
1	HMI + 2 m cable								
2	HMI + 5 m cable								
3	HMI + 10 m cable								
X	without operating unit (HMI)								
Access code									
0	without access control; dynamic metering monitor								
1	with access control; dynamic metering monitor								
Language									
DE	German								
EN	English								
ES	Spanish								
FR	French								
IT	Italian								
NL	Dutch								
PL	Polish								
PT	Portuguese								

\* 10 bar for PVDF version.

\*\* Standard with tube nozzle in the bypass. Threaded connection on request.

EHEDG-certified (European Hygienic Eng. Design Group) electropolished stainless steel dosing heads (< Ra 0.8) type EL class I are available on request.

We are happy to supply alternative material versions to comply with export conditions for pump capacities > 600 l/h and PVDF.



## 1.7 Sigma/ 3 Control Type (S3Cb)

### 1.7.2

### Spare Parts

The replacement part kit in general includes wear parts for the liquid ends.

#### Scope of delivery for material PVT

1 x metering diaphragm, 1 x suction valve compl., 1 x pressure valve compl., 2 x valve balls or valve plate with spring for DN 32, 1 x elastomer seal set (EPDM, FKM-B),

2 x ball seat bushings, 2 x ball seat washers

4 x formed composite seals

#### Scope of delivery for material SST

1 x metering diaphragm, 2 x valve balls or valve plate with spring for DN 32,

2 x ball seat washers,

4 x formed composite seals

### Spare Parts Kit for Sigma/ 3 for Design with Multi-layer Safety Diaphragm

(For Identity code: type 120145, 120190, 120270, 120330)

Liquid end	Materials in contact with the medium	Order no.
FM 330 - DN 25	PVT/TTT	1034678
FM 330 - DN 25	SST	1034679
FM 330 - DN 25	SST (with 2 valves compl.)	1034680

(For Identity code: type 070410, 070580, 040830, 041030)

Liquid end	Materials in contact with the medium	Order no.
FM 1000 - DN 32	PVT/PPT/PCT/TTT	1034681
FM 1000 - DN 32	SST	1034682
FM 1000 - DN 32	SST (with 2 valves compl.)	1034683

### Spare parts kits for Sigma/ 3 for design with old diaphragm

(Applies to identity code: Type 120145, 120190, 120270, 120330)

Liquid end	Materials in contact with the medium	Order no.
FM 330 - DN 25	PVT	1005308
FM 330 - DN 25	SST	1005310
FM 330 - DN 25	SST (with 2 valve set)	1005312

(Applies to identity code: Type 070410, 070580, 040830, 041030)

Liquid end	Materials in contact with the medium	Order no.
FM 1000 - DN 32	PVT/PPT/PCT	1020032
FM 1000 - DN 32	SST	1005311
FM 1000 - DN 32	SST (with 2 valve set)	1005313

### Sigma/ 3 spare parts kit for FDA design (physiologically safe)

Identity code type 120145, 120190, 120270, 120330

Liquid end	Materials in contact with the medium	Order no.
FM 330 - DN 25	PVT	1046478
FM 330 - DN 25	SST (without valve)	1046479
FM 330 - DN 25	SST (with valve)	1046480



## 1.7 Sigma/ 3 Control Type (S3Cb)

### Multi-layer Safety Diaphragm (Standard)

	Order no.
FM 330 identity code: type 120145, 120190, 120270, 120330	1029604
FM 1000 identity code: type 070410, 070580, 040830, 041030	1029603

### Metering diaphragm (old version)

	Order no.
FM 330 Identity code: Type 120145, 120190, 120270, 120330	1004604
FM 1000 Identity code: Type 070410, 070580, 040830, 041030	1002835

### Spare parts kit for integrated relief valve (S3Ca, S3Cb)

Consisting of two Hast. C compression springs and four FKM-A O-rings each

	For material	Seals	Order no.
ETS overflow valve 4 bar	PVT/SST	FKM-A/EPDM	1031204
ETS overflow valve 7 bar	PVT/SST	FKM-A/EPDM	1031205
ETS overflow valve 10 bar	PVT	FKM-A/EPDM	1031201
ETS overflow valve 12 bar	SST	FKM-A/EPDM	1031202

### Gear oil

	Volume l	Order no.
Mobilgear 634 VG 460 gear oil	1	1004542

### Spare parts kits for integrated bleed valve (S3Cb)

Consisting of a compression spring made from Hastelloy C and four FKM-A and EPDM O-rings each.

For identity code feature "Dosing head version" with characteristic "2", "3", "8", "9".

	Pump type	For material	Seals	Order no.
ETS	120145, 120190, 120270	PVT/SST	FKM-A/EPDM	1043785
ETS	070410, 070580, 040830	PVT/SST	FKM-A/EPDM	1043786

### Protective cowling

Protection of the operating unit (HMI) of Sigma metering pumps against contamination; made from transparent silicone plastic. For Sigma control types S1Cb / S2Cb / S3Cb.

	Order no.
Protective cowling for operating unit (S1Cb, S2Cb, S3Cb)	1036724

### Wall bracket

Wall bracket with operating lever for wall mounting of the operating unit (HMI) without any fittings. For Sigma control types S1Cb / S2Cb / S3Cb.

	Order no.
Wall bracket for operating unit (S1Cb, S2Cb, S3Cb)	1036683



## 1.7 Sigma/ 3 Control Type (S3Cb)

### Extension cable for operating unit (HMI)

	Order no.
Connecting cable - CAN M12 5-pole 1 m	1022139
Connecting cable - CAN M12 5-pole 2 m	1022140
Connecting cable - CAN M12 5-pole 5 m	1022141
Connecting cable - CAN M12 5-pin 10 m	1046383

### Accessories

- Foot Valves See page → 1-47
- Injection Valves See page → 1-49
- Connector Parts, Seals, Hoses See page → 1-66
- Suction Lances/Suction Assemblies See page → 1-55
- Speed Controllers See page → 1-72

### Spare Parts

- Custom Accessories See page → 1-77



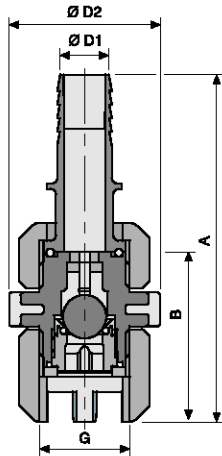
## 1.8 Hydraulic/Mechanical Accessories

### 1.8.1

### Foot Valves

For connection to the end of the suction line, used as a vacuum breaker and for protection of the pump against contamination. With filter meshes and ball check. Materials used as in the pump liquid ends. Union nuts and inserts/tube nozzles are included in the scope of supply with DN 10 and DN 15 foot valve sizes.

**Important:** Foot valves are not suitable as absolutely leak-tight shut-off devices.



P\_AC\_0206\_SW

#### PPE foot valve

Housing made of PP, seals made of EPDM, with filter meshes and ball check (glass).

DN 10, DN 15 with union nut and PP tube nozzle

DN 20 to DN 40 no connection parts

	G	B mm	Ø D2 mm	A mm	Ø D1 mm	Order no.
DN 10	3/4	59	40	101	16	809465
DN 15	1	66	47	142	20	924516
DN 20	1 1/4	77	55	–	–	803721
DN 25	1 1/2	84	60	–	–	803722
DN 32*	2	98	74	–	–	1006434
DN 40	2 1/4	113	90	–	–	1004204

\* PVDF/Teflon version

#### PCB foot valve

Housing made of PP, seals made of FKM, with filter meshes and ball check (glass).

DN 10, DN 15 with union nut and PP tube nozzle

DN 20 to DN 40 no connection parts

	G	B mm	Ø D2 mm	A mm	Ø D1 mm	Order no.
DN 10	3/4	59	40	101	16	809464
DN 15	1	66	47	142	20	924515
DN 20	1 1/4	77	55	–	–	803723
DN 25	1 1/2	84	60	–	–	803724
DN 32*	2	98	74	–	–	1006434
DN 40	2 1/4	113	90	–	–	1004193

\* PVDF/Teflon version

#### PVT foot valve

Housing made of PVDF, seals made of PTFE, with filter meshes and ball check (ceramic).

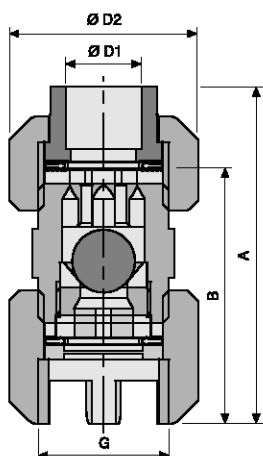
DN 10, DN 15 with union nut and PP tube nozzle

DN 20 to DN 40 no connection parts

	G	B mm	Ø D2 mm	A mm	Ø D1 mm	Order no.
DN 10	3/4	58	36	92	16	1029471
DN 15	1	64	48	131	20	1029472
DN 20	1 1/4	78	58	–	–	1029473
DN 25	1 1/2	81	65	–	–	1029474
DN 32	2	98	74	–	–	1006434
DN 40	2 1/4	108	83	–	–	1029475



# 1.8 Hydraulic/Mechanical Accessories



P\_AC\_0202\_SW

## TT foot valve

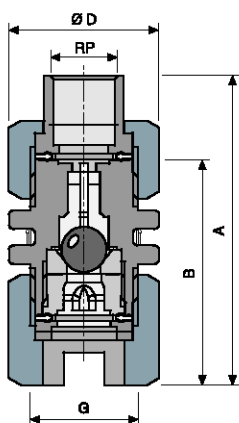
Housing made of PTFE, seals made of PTFE, with filter meshes and ball check (ceramic).

DN 10, DN 15 with union nut and insert

DN 20 to DN 40 no connection parts

	G	B mm	Ø D2 mm	A mm	Ø D1 mm	Order no.
DN 10	3/4	59	40	101	16	809466
DN 15	1	66	47	142	20	924517
DN 20	1 1/4	81	57	–	–	803725
DN 25	1 1/2	86	64	–	–	803726
DN 32*	2	98	74	–	–	1006434
DN 40	2 1/4	116	89	–	–	1004205

\* PVDF/Teflon version



P\_AC\_0204\_SW

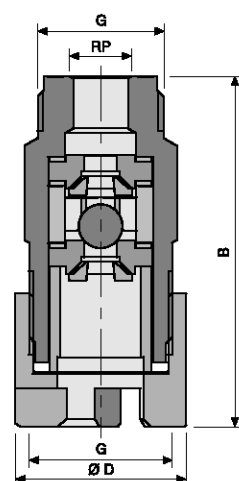
## SS foot valve

SS housing, PTFE seals spring-loaded with ball check (1.4571/1.4581).

DN 10, DN 15 with union nut and insert

DN 20 to DN 40 no connection parts

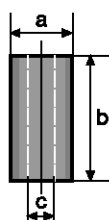
	G	A mm	B mm	Rp	Ø D mm	Order no.
DN 10	3/4	75	56	3/8	37	809467
DN 15	1	83	59	1/2	48	924518
DN 20	1 1/4	–	73	–	55	803727
DN 25	1 1/2	–	82	–	63	803728
DN 32	2	–	92	–	75	1006435
DN 40	2 1/4	–	109	–	90	1004206



P\_AC\_0205\_SW

## Foot valve SS for high-pressure pumps

	G	B mm	Rp	Ø D mm	Order no.
DN 10	3/4	70	1/4	41	803730
DN 10	3/4	70	3/8	41	803731



pk\_1\_082

## Ceramic weight for vertical alignment

	Ø A mm	B mm	Ø C mm	Weight g	Order no.
Size 3	40	50	24	70	1030189



## 1.8 Hydraulic/Mechanical Accessories

### 1.8.2 Injection Valves

For connecting the metering line to the metering station; metering valves consist of a non-return ball valve and a Hastelloy C spring (0.5 bar pre-pressure) and can be installed in any position. Used for generating pressure and preventing backflow. Materials match those in the pump liquid ends. Metering valve sizes DN 10 and 15 come with the required union nut and insert/hose socket.

**Important:** Metering valves are not suitable for use as tight-sealing shut-off elements.

#### PPE injection valve

PP housing, EPDM seals with spring-loaded ball check (glass), priming pressure approx. 0.5 bar.

DN 10, DN 15 with union nut and PP tube nozzle

DN 20 to DN 40 no connection parts

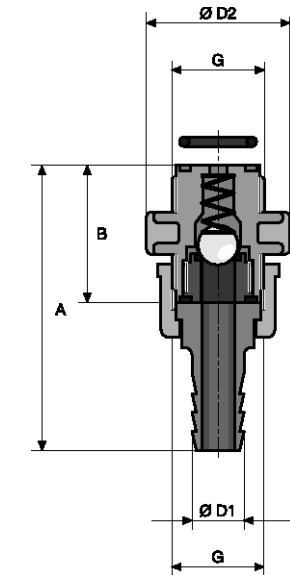
##### Operating range

25 °C - max. operating pressure 16 bar

50 °C - max. operating pressure 9 bar

	G	B mm	Ø D2 mm	A mm	Ø D1 mm	Order no.
DN 10	3/4	41	40	83	16	809461
DN 15	1	43	47	108	20	924521
DN 20	1 1/4	55	55	–	–	803710
DN 25	1 1/2	60	58	–	–	803711
DN 32*	2	68	70	–	–	1002783
DN 40	2 1/4	85	84	–	–	804761

\* PVDF/Teflon version



pk\_2\_029

#### PCB injection valve

PVC housing, FKM seals with spring-loaded ball check (glass), priming pressure approx. 0.5 bar.

DN 10, DN 15 with union nut and PP tube nozzle

DN 20 to DN 40 no connection parts

##### Operating range

25 °C - max. operating pressure 16 bar

45 °C - max. operating pressure 7 bar

	G	B mm	Ø D2 mm	A mm	Ø D1 mm	Order no.
DN 10	3/4	41	40	83	16	809460
DN 15	1	43	47	108	20	924520
DN 20	1 1/4	55	55	–	–	803712
DN 25	1 1/2	60	58	–	–	803713
DN 32*	2	68	70	–	–	1002783
DN 40	2 1/4	85	84	–	–	804760

\* PVDF/Teflon version



## 1.8 Hydraulic/Mechanical Accessories

### PVT injection valve

PVDF housing, PTFE seals with spring-loaded ball check (ceramic), priming pressure approx. 0.5 bar.

DN 10, DN 15 with union nut and PP tube nozzle

DN 20 to DN 40 no connection parts

#### Operating range

25 °C - max. operating pressure 16 bar

65 °C - max. operating pressure 10 bar

	G	B mm	Ø D2 mm	A mm	Ø D1 mm	Order no.
DN 10	3/4	40	36	84	16	1029476
DN 15	1	43	48	110	20	1029477
DN 20	1 1/4	55	52	–	–	1029478
DN 25	1 1/2	61	56	–	–	1029479
DN 32	2	68	70	–	–	1002783
DN 40	2 1/4	85	81	–	–	1029480

### TT injection valve

PTFE housing, PTFE seals with spring-loaded ball check (ceramic), priming pressure approx. 0.5 bar.

DN 10, DN 15 with union nut and insert

DN 20 to DN 40 no connection parts

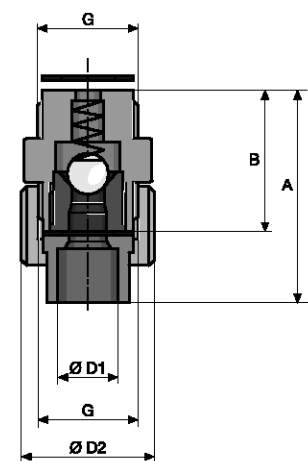
#### Operating range

25 °C - max. operating pressure 10 bar

90 °C - max. operating pressure 5 bar

	G	B mm	Ø D2 mm	A mm	Ø D1 mm	Order no.
DN 10	3/4	38	36	57	16	809462
DN 15	1	43	48	63	20	924522
DN 20	1 1/4	55	50	–	–	803714
DN 25	1 1/2	60	58	–	–	803715
DN 32*	2	68	70	–	–	1002783
DN 40	2 1/4	85	84	–	–	804762

\* PVDF/Teflon version



pk\_2\_030



## 1.8 Hydraulic/Mechanical Accessories

### SS injection valve

SS housing, PTFE seals with ball check (1.4571/1.4581), priming pressure approx. 0.5 bar.

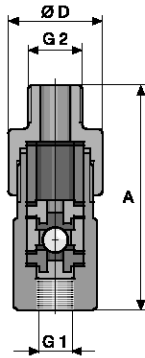
DN 10, DN 15 with union nut and insert

DN 20 to DN 40 no connection parts

#### Applications

90 °C - max. operating pressure, see table

	G	Max. pressure bar	B mm	Ø D2 mm	A mm	Ø D1	Order no.
DN 10	3/4	320	38	36	55	3/8	809463
DN 15	1	240	43	48	63	1/2	924523
DN 20	1 1/4	130	55	55	–		803716
DN 25	1 1/2	70	60	58	–		803717
DN 32	2	45	69	68	–		1002801
DN 40	2 1/4	25	85	84	–		804763



pk\_2\_028

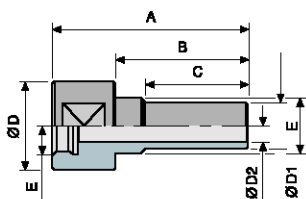
### SS Injection valve for Sigma/Meta/Makro TZ-HK

Housing and valve spring made of 1.4571, ball made of 1.4401, PTFE seals, priming pressure approx. 0.1 bar.

#### Applications

90 °C - max. operating pressure, see table

	Max. pressure bar	G1	G2	Ø D mm	A mm	Order no.
DN 8	320	Rp 1/4	Rp 1/2	42	85	803732
DN 10	190	Rp 3/8	Rp 1/2	42	90	803733



P\_AC\_0201\_SW

### PVDF metering valve adapter

E	A mm	B mm	C m	Ø D mm	Ø D1 mm	Ø D2 mm	Order no.
R 3/4	93	63	49	42	22	15	1022052
R 1	95	65	50	47	27	18	1022053
G 1 1/4*	150	119	104	56	27	18	1040722
G 1 1/2*	171	135	118	64	31	20	1040723

\* In set with 1 x FKM and 1 x EPDM O-ring.



## 1.8 Hydraulic/Mechanical Accessories

### 1.8.3

### Back Pressure Valves/Relief Valves

DHV-U series back pressure valves can be used universally and are back pressure-free piston diaphragm valves with an internal flow. They can be used to generate a constant back pressure, used as relief valves and be assembled anywhere in the pipework system.

Back pressure valves are used to generate a constant back pressure for precise chemical feed and/or to protect against over metering with a free outlet, fluctuating back pressure or to dose into a vacuum. They can also be used in conjunction with pulsation dampers for low-pulsation metering.

Relief valves are installed in the bypass to protect pumps, pipework and fittings from excess pressure as a result of operational errors or blockages. In the event of a malfunction, the pump conveys in a loop or back into the storage tank.

**Important:** Back pressure valves cannot be used as absolutely leak-tight shut-off devices. All relevant safety precautions should be taken when using with hazardous chemicals.

**Important:** Appropriate safety measures should be implemented when using as relief valves in conjunction with agglutinative media (e. g. milk of lime) (for instance flushing after activation).

#### Back Pressure Valve / Relief Valve Type DHV-U

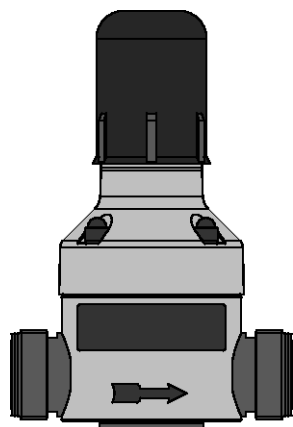
Adjustable pressure 0.5 – 10 bar

#### Applications of PPE / PPB / PCE / PCB

20 °C - max. operating pressure 10 bar

#### Applications of PVT / SST

30 °C - max. operating pressure 10 bar



P\_AC\_0256\_SW

Type	Nominal diameter	G	Order no.
PPE	DN 10	3/4	1037285
PPB	DN 10	3/4	1038133
PCE	DN 10	3/4	1038144
PCB	DN 10	3/4	1037765
PVT	DN 10	3/4	1037767
SST	DN 10	3/4	1043194
PPE	DN 15	1	1036816
PPB	DN 15	1	1038145
PCE	DN 15	1	1038146
PCB	DN 15	1	1037764
PVT	DN 15	1	1037766
SST	DN 15	1	1043193
PPE	DN 20	1 1/4	1037284
PPB	DN 20	1 1/4	1038147
PCE	DN 20	1 1/4	1038148
PCB	DN 20	1 1/4	1037775
PVT	DN 20	1 1/4	1037777
SST	DN 20	1 1/4	1043192
PPE	DN 25	1 1/2	1036633
PPB	DN 25	1 1/2	1038149
PCE	DN 25	1 1/2	1038150
PCB	DN 25	1 1/2	1037774
PVT	DN 25	1 1/2	1037776
SST	DN 25	1 1/2	1043191

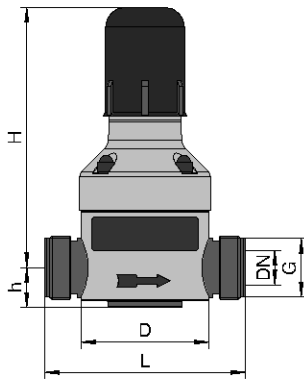
#### Materials

Type	Housing/Connectors	Plungers	Plunger Seal	Seal/Connectors
PPE	PP	PVDF	EPDM	EPDM
PPB	PP	PVDF	FKM	FKM
PCE	PVC	PVDF	EPDM	EPDM
PCB	PVC	PVDF	FKM	FKM
PVT	PVDF	PVDF	PTFE*	FKM
SST	1.4404	1.4404	PTFE*	PTFE

\* Cover ring made of PTFE/FKM

## 1.8 Hydraulic/Mechanical Accessories

### Dimensions of DHV-U (PP, PV, PVDF version)

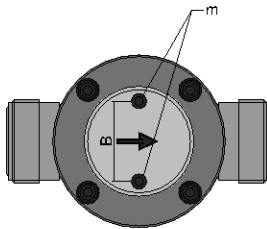


P\_AC\_0256\_m

DN	G	H mm	L mm	h mm	D mm	m	B mm
10	3/4	144*	118	24	79	M6	40
15	1	144*	118	24	79	M6	40
20	1 1/4	196*	150	37	99	M6	46
25	1 1/2	196*	150	37	99	M6	46

\* Approximate values

### Dimensions of DHV-U (SS version)



P\_MOZ\_0005\_SW

DN	G	H mm	L mm	h mm	D mm	m	B mm
10	3/4	144*	118	20	79	M6	40
15	1	144*	118	20	79	M6	40
20	1 1/4	196*	150	30	99	M6	46
25	1 1/2	196*	150	30	99	M6	46

\* Approximate values

### Back pressure valve/relief valve type DHV 712-R

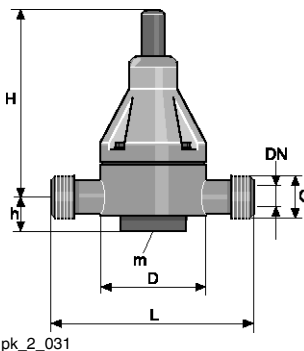
Adjustable pressure 0.5 – 10 bar

#### Applications of PPE / PCB

20 °C - max. operating pressure 10 bar

#### Applications of PVT / TT / SS

30 °C - max. operating pressure 10 bar

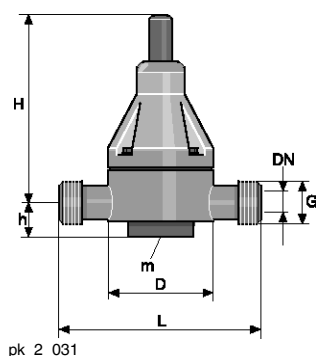


pk\_2\_031

Type	G	Nominal diameter	Order no.
PPE	2	DN 32	1000035
PPE	2 1/4	DN 40	1000036
PCB*	2	DN 32	1000051
PCB*	2 1/4	DN 40	1000052
PVT	2	DN 32	1000057
PVT	2 1/4	DN 40	1000058
TT	3/4	DN 10	1000059
TT	1	DN 15	1000060
TT1	1 1/4	DN 20	1000061
TT1	1 1/2	DN 25	1000062
TT1	2	DN 32	1000063
TT1	2 1/4	DN 40	1000064
SS1	2	DN 32	1000069
SS1	2 1/4	DN 40	1000070

\* **Caution:** The product contains adhesive joints with Tangit. Please note the resistance of Tangit adhesive.

## 1.8 Hydraulic/Mechanical Accessories



Dimensions of DHV 712-R

DN	G	H mm	L mm	h mm	D mm	m
32	2	260	205	59** / 37***	147	M8
40	2 1/4	260	205	59** / 37***	147	M8

\* = Approx. values;

\*\* = PP, PVC, PVDF;

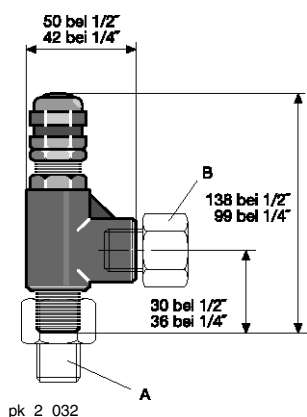
\*\*\* = TT, SS

### Materials

Type	Housing/Connectors	Plungers	Plunger Seal	Seal/Connectors
PPE	PP	PP	EPDM	EPDM
PCB	PVC	PVC	FKM	FKM
PVT	PVDF	PTFE <sup>2</sup>	PTFE <sup>3</sup>	FKM
TT1	PTFE with carbon	PTFE <sup>2</sup>	PTFE <sup>3</sup>	PTFE <sup>3</sup>

<sup>2</sup> PTFE (white)

<sup>3</sup> Packing ring PTFE/FKM



### Pressure relief valve/overflow valve for high-pressure applications

Use as a pressure relief valve (adjustable) and as a back pressure valve. Overflow valve and corresponding spring must be ordered separately.

Material: stainless steel 316/FKM

Temperature range: -18 °C to 120 °C

### Recommended use up to 200 l/h

	Connection	Order no.
Overflow valve	1/4" NPT inner and outer thread	202505
Spring for pressure range	Spring colour	Order no.
3.4 – 24 bar	blue	202519
24.0 – 52 bar	yellow	202520
52.0 – 103 bar	violet	202525
103.0 – 155 bar	orange	202524
155.0 – 207 bar	brown	202523
207.0 – 276 bar	white	202522
276.0 – 345 bar	red	202521

### Recommended use up to 300 l/h

	Connection	Order no.
Overflow valve	1/2" NPT inner and outer thread	1005499
Spring for pressure range	Spring colour	Order no.
3.4 – 24 bar	blue	1005500
24.0 – 50 bar	yellow	1005501
50.0 – 100 bar	violet	1005502

### Reducing pipe nipple

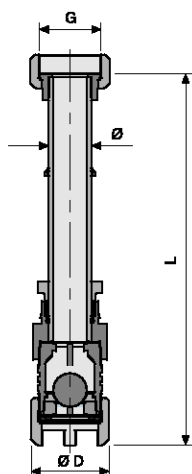
Connection	Order no.
1/4" NPT inner - 1/4 K outer (A)	359378
1/4" NPT outer - 1/4 inner (B)	359379
1/2" NPT inner - 1/2 K outer (A)	1005503
1/2" NPT outer - 1/2 inner (B)	1005504



## 1.8 Hydraulic/Mechanical Accessories

### 1.8.4

### Suction Lances/Suction Assemblies



P\_AC\_0203\_SW

#### PPE Suction assembly for 1,000 l tank

Connection	G	Ø mm	Ø D mm	L mm	Order no.
DN 10	3/4	20	47	1,340*	790389
DN 15	1	20	47	1,320*	790394
DN 20	1 1/4	25	55	1,345*	790395
DN 25	1 1/2	32	60	1,315*	790396
DN 32	2	40	74	1,170*	1005524

\* The length L can be adapted (shortened) on site by the customer.

An adapter can be used for tube applications: Intake fitting – hose connection kit → 1-57

#### PCB Suction assembly for 1,000 l tank\*

\* **Caution:** The product contains adhesive joints with Tangit. Please note the resistance of Tangit adhesive.

Connection	G	Ø mm	Ø D mm	L mm	Order no.
DN 10	3/4	20	47	1,340**	790387
DN 15	1	20	47	1,320**	790391
DN 20	1 1/4	25	55	1,345**	790392
DN 25	1 1/2	32	60	1,315**	790393
DN 32	2	40	74	1,170**	1005525

\*\* The length L can be adapted (cut) by the customer.

An adapter can be used for tube applications: Intake fitting – hose connection kit → 1-57

#### PVDF Level switch kit compl. two-phase

The level switch kit can be ordered together with the suction fittings DN 10 - DN 32.

For level monitoring in the storage tank, two-phase with pre-alarm signalling and deactivation of the metering pump after a further level decrease of 30 mm.

##### Technical data:

Max. switching voltage: 100 V

Switching current: 0.5 A

Switching capacity: 5 W/5 VA

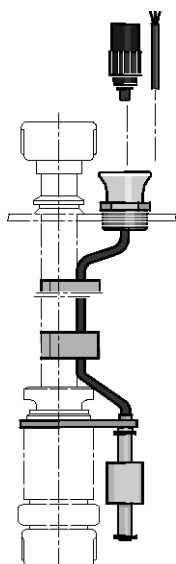
Temperature range: - 10 °C to 65 °C

IP rating: IP 67

**Switching mode:** for level shortage 2 x NC

##### Material:

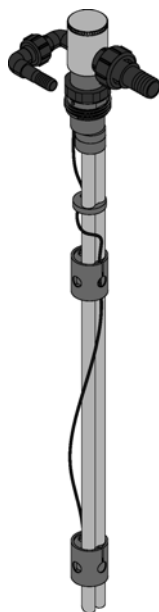
Body level switch PVDF, float PE, mounting strap PVDF, cable bracket PE, anti-kink device PE, cable PE.



pk\_2\_035

Connection	Type	Cable length m	Order no.
DN10/15	with 3-pin round plug	3	1034879
DN 20	with 3-pin round plug	3	1034880
DN 25	with 3-pin round plug	3	1034881
DN 32	with 3-pin round plug	3	1034882
DN 10/DN 15	with lead	5	1034883
DN 20	with lead	5	1034884
DN 25	with lead	5	1034885
DN 32	with lead	5	1034886

## 1.8 Hydraulic/Mechanical Accessories



P\_AC\_0252\_SW

- A Overall length
- B Immersion depth
- C Diameter of the immersion tube
- D Threaded connector adjustment range
- E Warning level adjustment range
- F Switch-off level adjustment range

### PPE universal suction lance for motor-driven metering pumps

Universal suction lance made of PP in 4 sizes for use in canisters, drums or tanks. The suction lance is configured as standard with return, ventilation function and 2-stage level monitoring. The height-adjustable level switch and tank threaded connectors ensure flexible adaptation to the process or tank height. In addition, the suction tube length can easily be shortened by the customer. A PTFE check valve is incorporated and prevents the suction line from running dry.

The suction lance is supplied with all additional parts in cardboard packaging.

**Material version:** PP with EPDM seals.

**Suction connector** is not supplied ready mounted. Fittings and pressure hose nozzles in DN 10, DN 15, DN 20, DN 25 (not for canisters) plus FKM seal do not form part of the scope of supply.

**Return connector** is not supplied ready mounted. Fittings and pressure hose nozzles in DN 10, DN 15, plus an FKM blanking plug and seal do not form part of the scope of supply.

**Level:** The level switches are protected by tube pieces in drum and tank lances. The lance level output is in the form of an M12 plug. Please order the level signal cable for connection to ProMinent® metering pumps or a PLC or terminal box separately.

General Electrical Accessories → 1-74

Special designs are available on request.

Universal suction lance	A	B	C	Total adjustment range			Order no.
				D	E	F	
	mm	mm	mm	mm	mm	mm	
For canister 20 l	542	405	41	100	250	200	1039206
For canister 20 -60 l	584	447	41	100	300	200	1038817
For drum 200 l	1,072	935	51	50	700	700	1039397
For container IBC	1,162	1,025	51	50	800	800	1039399

### PPE universal suction lance for motor-driven metering pumps, "physiologically safe" design

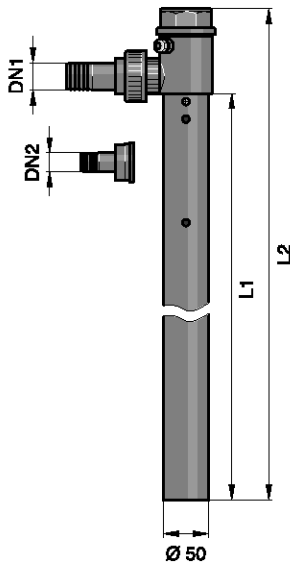
The universal suction lance is also available as a "Physiologically safe (FDA) in respect of wetted materials" design.

Universal suction lance	A	B	C	Total adjustment range			Order no.
				D	E	F	
	mm	mm	mm	mm	mm	mm	
For 20-litre canister	542	405	41	100	250	200	1046668
For 20 – 60-litre canister	584	447	41	100	300	200	1046670
For 200-litre drum	1,072	935	51	50	700	700	1046671
For IBC tank	1,162	1,025	51	50	800	800	1046672

**NEW**



## 1.8 Hydraulic/Mechanical Accessories



pk\_2\_100

### Suction lance for motor-driven metering pumps\*

Suction lance with 2-stage level switch in Ø 50 PVC protection tube with check valve for DN 10-DN 25, check valve in DN 32 (valve is not removable).

For sizes DN 10/15 and DN 20/25, the connection parts in both sizes and a blanking plate for the return form part of the scope of supply. For the DN 32 suction lance a return line is not possible. Drum suction lances are equipped with a drum lid.

2-stage level switch is wired to a terminal in the head.

The level sensor cable must be ordered separately.

Reed cable with 3-pin round plug, PE → 1-74

Special designs (materials, functions, Dytex adhesive etc.) are available on request.

**\* Caution:** The product contains adhesive joints with Tangit. Please note the resistance of Tangit adhesive.

### Suction lance for 200/600 l drum

Type	Suction connector DN 1	Return DN 2	Seal material	L1 mm	L2 mm	Order no.
PCB	10/15	10/15	FKM	1000	1100	1037748
PCE	10/15	10/15	EPDM	1000	1100	1037749
PCB	20/25	20/25	FKM	1000	1100	1037750
PCE	20/25	20/25	EPDM	1000	1100	1037751
PCB	32	–	FKM	1000	1100	1037752
PCE	32	–	EPDM	1000	1100	1037753

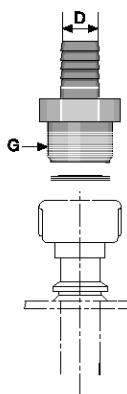
### Suction lance for 1000 l tank

Type	Suction connector DN 1	Return DN 2	Seal material	L1 mm	L2 mm	Order no.
PCB	10/15	10/15	FKM	1200	1300	1037722
PCE	10/15	10/15	EPDM	1200	1300	1037723
PCB	20/25	20/25	FKM	1200	1300	1037744
PCE	20/25	20/25	EPDM	1200	1300	1037745
PCB	32	–	FKM	1200	1300	1037746
PCE	32	–	EPDM	1200	1300	1037747

### Intake fitting – hose connection kit

Consisting of PVDF threaded socket and a PTFE-formed composite seal.

Suitable for PPE Suction assembly for 1,000 l tank → 1-55



pk\_2\_140

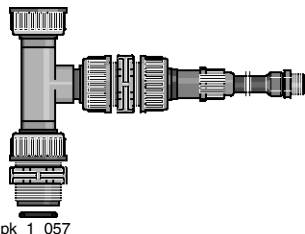
Connection	G	Material	Ø D mm	Order no.
DN 10	3/4	PVDF	16	1029486
DN 15	1	PVDF	20	1029487
DN 20	1 1/4	PVDF	25	1029488
DN 25	1 1/2	PVDF	32	1029489
DN 32	2	PVDF	40	1029490



## 1.8 Hydraulic/Mechanical Accessories

### 1.8.5

### Fittings



#### Flushing device

Flushing assemblies for flushing and cleaning liquid end, metering line and metering valve as well as for preventing deposits.

#### PPE flushing device

Connection	G	Order no.
DN 10	3/4	809917
DN 15	1	809919
DN 20	1 1/4	809921
DN 25	1 1/2	809923

Other sizes on request.

#### Flushing device PCB\*

Connection	G	Order no.
DN 10	3/4	809926
DN 15	1	803960
DN 20	1 1/4	803961
DN 25	1 1/2	803962
DN 40	2 1/4	803963

Other sizes and automatic flushing device for fully automatic flushing of the pump head on request.

\* **Caution:** The product contains adhesive joints with Tangit. Please note the resistance of Tangit adhesive.



## 1.8 Hydraulic/Mechanical Accessories

### 1.8.6

### Pulsation Damper

#### PVDF in-line pulsation damper

**Function:** Hydropneumatic accumulator with baffle

The PVDF accumulator with PTFE diaphragm offers outstanding resistance to chemicals and can therefore be used in connection with a large number of different liquids. The pulsation damper has two liquid connections and can therefore be installed directly in the piping system or be installed diagonally using a blanking plug kit. The baffle in the liquid valve directs the volume flow straight at the diaphragm. This ensures direct contact of the volume flow with the diaphragm. Fluctuations in volume flow are thus optimally balanced out by the enclosed gas volume.

**Important:** Pulsation dampers should be protected by an overflow valve.

Type	Volume l	Max. pressure bar	Connection	Order no.
PD In-line	0.2	10	G 1 – DN 15	1026252
PD In-line	0.5	10	G 1 – DN 15	1026736
PD-Inline	0.2	16	G 1 – DN 15	1033446
PD-Inline	0.5	16	G 1 – DN 15	1033447
PD-Inline	0.2	25	G 1 – DN 15	1036154
PD In-line	0.5	25	G 1 – DN 15	1036155

The priming pressure is approximately 0.6 x the operating pressure. Maximum medium temperature, 65 °C. Connection parts must be ordered separately.

Filling of the reservoir with nitrogen takes place via the VG8 gas filling connector or with compressed air using a standard filling valve (e.g. a car tyre valve).

**Attention:** If using combustible liquids, nitrogen must be used as a filling gas. Do not use oxygen under any circumstances!

**Configuration:** DGRL97/23/EC, other acceptances / countries upon request

**Fluid group:** 1 and 2

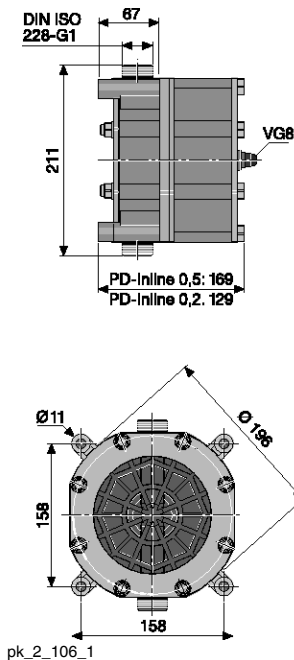
**Certificates:** Manufacturer's test certificate M DIN55350-18  
Wetted materials - FDA physiologically safe

**Manufacturer:** HYDAC Technology

#### Connection/adaptor kits

Consisting of PTFE-formed composite seal, insert/adaptor and union nut.

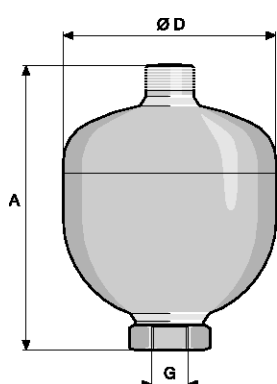
Connection PD In-line	Connection Piping	Material	Order no.
G 1 – DN 15	DN 10	PP	1029424
G 1 – DN 15	DN 10	PVC	1029425
G 1 – DN 15	DN 10	PVDF	1029426
G 1 – DN 15	DN 15	PP	1029443
G 1 – DN 15	DN 15	PVC	1029444
G 1 – DN 15	DN 15	PVDF	1029445
G 1 – DN 15	DN 20	PP	1029427
G 1 – DN 15	DN 20	PVC	1029428
G 1 – DN 15	DN 20	PVDF	1029429
G 1 – DN 15	DN 25	PP	1029430
G 1 – DN 15	DN 25	PVC	1029431
G 1 – DN 15	DN 25	PVDF	1029432



# 1.8 Hydraulic/Mechanical Accessories

## Accessories/Spare Parts

	Material	Order no.
Set of plugs	PVDF/PTFE	1029446
Valve tool for gas valve insert	Steel	1029661
Separating diaphragm	PTFE/NBR	1025235
Gas valve assembly	1.4571/FKM/PTFE/MS	1029513
Gas valve insert	FKM/PTFE /MS	1029514
Gas valve insert	FKM/PTFE /NIRO	1029515
Manometer with connection adapter	–	1031556
Charging hose with connector for compressed air system, 25 bar; 2.5 m	–	1036156
Charging hose with connector for nitrogen bottle or pressure reducer	–	1036157



pk\_2\_101

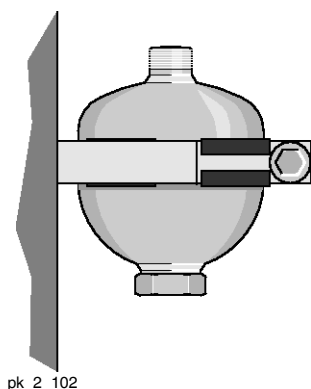
Admissible operating temperature: -10 to +80 °C. Response pressure: 2 bar (nitrogen). Other accumulator/diaphragm materials available on request.

## Stainless steel pulsation damper

Volume l	Max. pressure bar	Diaphragm material	Connector G	A mm	Ø D mm	Order no.
0.16	180	NBR	Rp 1/2	124	74	1008609
0.16	180	Butyl	Rp 1/2	124	74	1008610
0.16	180	FKM	Rp 1/2	124	74	1008611
0.32	160	NBR	Rp 1/2	137	93	1008612
0.32	160	Butyl	Rp 1/2	137	93	1008613
0.32	160	FKM	Rp 1/2	137	93	1008644
0.75	140	NBR	Rp 1/2	168	121	1008645
0.75	140	Butyl	Rp 1/2	168	121	1008646
0.75	140	FKM	Rp 1/2	168	121	1008647
2.00	100	NBR	Rp 3/4	224	167	1008648
2.00	100	Butyl	Rp 3/4	224	167	1008649
2.00	100	FKM	Rp 3/4	224	167	1008650
4.00	50	NBR	Rp 3/4	360	170	1008651
4.00	50	Butyl	Rp 3/4	360	170	1008652
4.00	50	FKM	Rp 3/4	360	170	1008653
0.75	140	NBR	Rp 1	168	121	1027617
0.75	140	Butyl	Rp 1	168	121	1027618
0.75	140	FKM	Rp 1	168	121	1027619
2.00	100	NBR	Rp 1 1/2	224	167	1027620
2.00	100	Butyl	Rp 1 1/2	224	167	1027621
2.00	100	FKM	Rp 1 1/2	224	167	1027622
4.00	50	NBR	Rp 1 1/2	360	170	1027623
4.00	50	Butyl	Rp 1 1/2	360	170	1027624
4.00	50	FKM	Rp 1 1/2	360	170	1027625

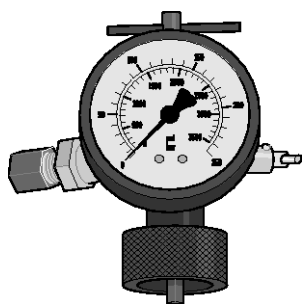
## Mounting clamp for stainless steel pulsation damper

Volume l	Number of Clamps	Ø D mm	Order no.
0.16	1	74	1008664
0.32	1	93	1008665
0.75	1	121	1008666
2.00	1	167	1008667
4.00	2	170	1008668



pk\_2\_102

## 1.8 Hydraulic/Mechanical Accessories



pk\_2\_116

### Inflation and testing unit for pulsation damper

The inflation and testing unit is used to recharge accumulators with nitrogen and check or alter the existing pre-filling pressure.

#### It contains:

- Checking and filling system with pressure gauge, non-return valve on the inlet, integrated bleed valve, valve stem to open gas inlet valve on accumulator.
- Charging hose, Length 2 m

Adjustment range	Order no.
Up to 25 bar	1008769
Up to 100 bar	1008669
Up to 250 bar	1008670

### Pulsation Damper (in-line)

The pulsation damper is used to produce minimal pulsation metering and to reduce flow resistance in long discharge lines.

The gas cushion between the housing and the line is compressed at a pressure stroke of the metering pump, a partial quantity of the medium being simultaneously metered into the metering line. The excess pressure generated in the gas cushion has the effect of allowing the compressed volume to continue to be transported with the following suction stroke and the original, relieved gas volume is restored.

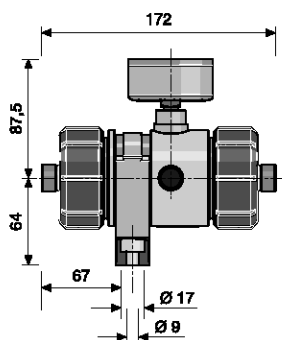
**Important notice:** The pulsation damper should be used in conjunction with a relief valve.

### PP in-line damper

Damper diaphragm is replaceable, seals made of EPDM.

Medium temperature max. 50 °C

Pre-pressure is approx. 0.6 x operating pressure.



P\_AC\_0180\_SW

	Volume l	Max. pressure bar	Damper di- aphragm	Connection	Order no.
PPE in-line damper	0.05	10	CSM*	G 3/4 - DN 10	1026769
PPB in-line damper	0.05	10	FKM	G 3/4 - DN 10	1026772
PDS 2.5	2.50	8	Hypalon	G 2 - DN 32	1001344
PDS 2.5	2.50	8	FKM	G 2 - DN 32	1001345

\* Chlorosulfonated polyethylene

For other sizes (0.2 l and 0.5 l) see in-line pulsation damper PVDF.

FKM = Fluorine Rubber

The priming pressure is approx. 0.6 x operating pressure.

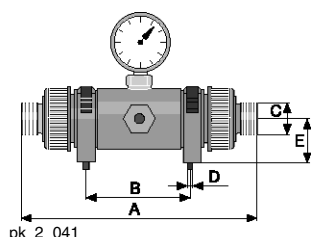
Max. liquid/chemical temperature 50 °C.

### PVC in-line damper

Removable hose, FKM seals.

Max. liquid/chemical temperature 50 °C.

The priming pressure is approx. 0.6 x operating pressure.



pk\_2\_041

Type	Dimensions				
	A	B	C	D	E
PDS 2.5	541	525	G2	11	99.5

	Volume l	Max. pressure bar	Damper di- aphragm	Connection	Order no.
PCE in-line damper	0.05	10	CSM*	G 3/4 - DN 10	1026775
PCB in-line damper	0.05	10	FKM	G 3/4 - DN 10	1026778
PDS 2.5	2.50	8	Hypalon	G 2 - DN 32	1001342
PDS 2.5	2.50	8	FKM	G 2 - DN 32	1001343

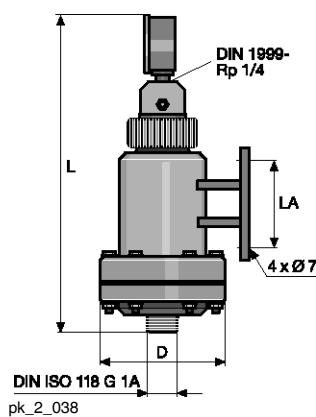
\* Chlorosulfonated polyethylene

For other sizes (0.2 l and 0.5 l) see in-line pulsation damper PVDF.



## 1.8 Hydraulic/Mechanical Accessories

### 1.8.7 Accumulators



Volume (l)	Max. operating pressure	Operating temperature
0.5/1	10 bar	25 °C
	6 bar	40 °C
2.5/5	6 bar	25 °C
	4 bar	40 °C

Pulsation dampers with separating bubble for providing separation between the gas cushion and metered chemical are used for low-pulsation metering as well as for reducing the flow resistance in long metering lines and in connection with viscous media. The response pressure of the gas cushion should be approx. 60-80 % of the operating pressure.

**Important:** When using a pulsation damper, the pressure relief valve should be fitted with an adjustable back pressure valve.

#### PVC accumulators

Accumulator removable, FKM seals.

Volume l	Diaphragm material	Connection	L mm	Ø D mm	LA mm	Order no.
0.5	Butyl	G 1 DN 15	361	145	100	791691
0.5	FKM	G 1 DN 15	361	145	100	791695
1.0	Butyl	G 1 1/4 DN 20	411	170	100	791692
1.0	FKM	G 1 1/4 DN 20	411	170	100	791696
2.5*	Butyl	G 1 1/2 DN 25	571	170	190	791693
2.5*	FKM	G 1 1/2 DN 25	571	170	190	791697
5.0*	Butyl	G 2 1/4 DN 40	936	170	230	791694
5.0*	FKM	G 2 1/4 DN 40	936	170	230	791698

\* **Caution:** The product contains adhesive joints with Tangit. Please note the resistance of Tangit adhesive.

#### PP accumulators

Accumulator removable, EPDM seals

Volume l	Diaphragm material	Connection	L mm	Ø D mm	LA mm	Order no.
0.5	Butyl	G 1 DN 15	361	145	100	792128
0.5	FKM	G 1 DN 15	361	145	100	792132
1.0	Butyl	G 1 1/4 DN 20	411	170	100	792129
1.0	FKM	G 1 1/4 DN 20	411	170	100	792133
2.5	Butyl	G 1 1/2 DN 25	571	170	190	792130
2.5	FKM	G 1 1/2 DN 25	571	170	190	792134
5.0	Butyl	G 2 1/4 DN 40	936	170	400	792131
5.0	FKM	G 2 1/4 DN 40	936	170	400	792135



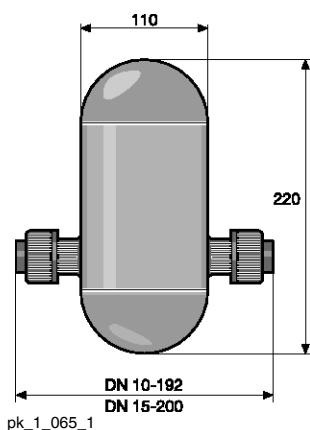
## 1.8 Hydraulic/Mechanical Accessories

### 1.8.8

### Accumulators Without Diaphragm

Pulsation dampers with no diaphragm separating the gas cushion and the chemical are used to produce minimal pulsation metering and to reduce flow resistance in long pipes and when metering viscous liquids.

**Important:** When using accumulators or pulsation dampers it is imperative that a relief valve with an adjustable back pressure valve is fitted.



#### PP in-line pressure accumulator

##### Operating range

20 °C - max. operating pressure 10 bar

40 °C - max. operating pressure 6 bar

	Volume l	Permissible displacement	Connection	Order no.
Size II	1	up to 5 ml	d 16-DN 10	243219
Size II	1	up to 5 ml	d 20-DN 15	243220

#### PVC in-line pressure accumulator\*

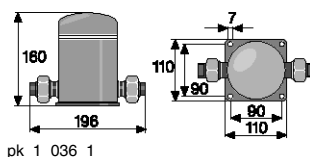
##### Operating range

20 °C - max. operating pressure 10 bar

40 °C - max. operating pressure 6 bar

	Volume l	Permissible displacement	Connection	Order no.
Size II	1	up to 5 ml	d 16-DN 10	243204
Size II	1	up to 5 ml	d 20-DN 15	243205

\* **Caution:** The product contains adhesive joints with Tangit. Please note the resistance of Tangit adhesive.

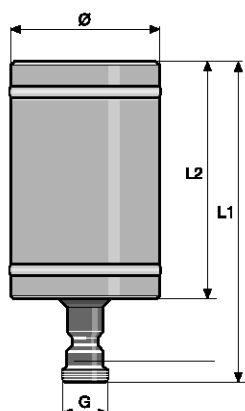


#### SS in-line pressure accumulator

Max. operating pressure 10 bar

	Volume l	Connection	Order no.
Size II	1	G 3/4 - DN 10	914756
Size II	1	R 1 1/2 - DN 15, with insert	914551

## 1.8 Hydraulic/Mechanical Accessories



pk\_2\_042

### PP pressure accumulator

Volume l	Connection	Ø mm	L1 mm	L2 mm	Order no.
2	G 1 1/4 – DN 20, without connector parts	140	290	220	243211
4	G 1 1/2 – DN 25, without connector parts	160	410	320	243212

### PVC pressure accumulator

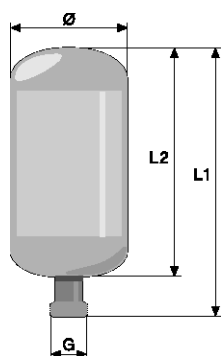
#### Operating range

20 °C - max. operating pressure 10 bar

40 °C - max. operating pressure 6 bar

Volume l	Connection	Ø mm	L1 mm	L2 mm	Order no.
2	G 1 1/4 – DN 20, without connector parts	140	290	220	243207
4	G 1 1/2 – DN 25, without connector parts	160	410	320	243208

\* **Caution:** The product contains adhesive joints with Tangit. Please note the resistance of Tangit adhesive.



pk\_2\_033

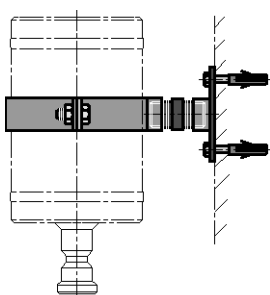
### SS pressure accumulator

Max. operating pressure 10 bar

Volume l	Connection	Ø mm	L1 mm	L2 mm	Order no.
2	G 1 1/4 – DN 20, without connector parts	140	272	222	243214
4	G 1 1/2 – DN 25, without connector parts	160	365	312	243215

### Wall mounting for accumulator (without diaphragm)

Consists of pipe clamp, mounting plate and connecting nipple.

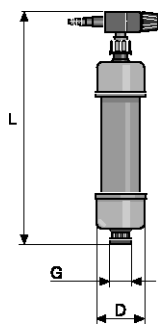


pk\_1\_061

	Ø mm	Order no.
For accumulator volume 2 l	110	818502
For accumulator volume 2 l	140	803645
For accumulator volume 4 l	160	803646



## 1.8 Hydraulic/Mechanical Accessories



pk\_2\_044

### Vacuum cylinder chamber PVC\*

With vacuum pump connector and central housing part made of transparent PVC.

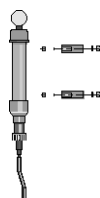
Seals: FKM or EPDM.

Max. operating pressure 2 bar at 40 °C operating temperature.

Volume l	Connection	Seal material	L mm	D mm	Order no.
0.5	G 1 – DN 15	FKM	380**	78	243591
0.5	G 1 – DN 15	EPDM	380**	78	1025699
1.0	G 1 1/4 – DN 20	FKM	440**	86	243592
1.0	G 1 1/4 – DN 20	EPDM	440**	86	1025701
2.5	G 1 1/2 – DN 25	FKM	520**	133	243593
2.5	G 1 1/2 – DN 25	EPDM	520**	133	1025702
5.0	G 2 1/4 – DN 40	FKM	630**	155	243594
5.0	G 2 1/4 – DN 40	EPDM	630**	155	1025703

\* **Caution:** The product contains adhesive joints with Tangit. Please note the resistance of Tangit adhesive.

\*\* Approx. values



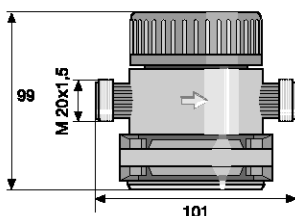
pk\_2\_045

### Vacuum pump kit/extraction aid\*

For pulsation dampers, suction side (vacuum cylinder accumulator).

Material	Seal material	Order no.
PVC	EPDM	790019

\* **Caution:** The product contains adhesive joints with Tangit. Please note the resistance of Tangit adhesive.



pk\_2\_079

### Suction pressure regulator\*

The suction pressure regulator is a spring-loaded diaphragm valve (max. 50 l/h) which opens as a result of the pump suction pressure. This ensures that chemicals cannot flow when the pump is not running, nor can a vacuum be created as a result of tube rupture.

A ball check valve should be fitted to prevent undesirable suction action at the pump outlet (e.g. siphon effect).

An adjustable spring is used to set the maximum required negative pressure for each operating situation up to 400 mbar. For pumps with positive inlet pressure a minimal vacuum of approx. 50 mbar is sufficient. The pump should produce this vacuum in any case, even for an atmospheric pressure inlet.

### Technical Data

Max. flow rate	50 l/h
Max. feed pressure	4 bar
Max. intake pressure	0.3 bar
Max. temperature	40 °C
Housing material	PVC
Diaphragm material	FKM
Seal material	FKM
Ball material	Glass
Spring material	Hastelloy C

Type		Connection	Order no.
SDR 50	For solenoid-driven pumps	M 20 x 1.5	1005505
SDR 50	For motor-driven pumps up to 50 l/h	G 3/4 - DN 10	1005506

Connection parts to be ordered separately.

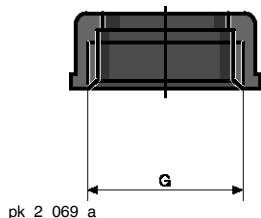
\* **Caution:** The product contains adhesive joints with Tangit. Please note the resistance of Tangit adhesive.



# 1.8 Hydraulic/Mechanical Accessories

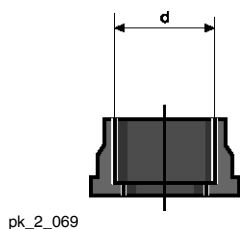
## 1.8.9 Connector Parts, Seals, Hoses

### Union nuts



	Material	Connection	Order no.
Union nut	PP	G 5/8 – DN 8	800665
	PP	G 3/4 – DN 10	358613
	PP	G 1 – DN 15	358614
	PP	G 1 1/4 – DN 20	358615
	PP	G 1 1/2 – DN 25	358616
	PP	G 2 – DN 32	358617
	PP	G 2 1/4 – DN 40	358618
	PP	G 2 3/4 – DN 50	358619
	PVC	G 5/8 – DN 8	800565
	PVC	G 3/4 – DN 10	356562
	PVC	G 1 – DN 15	356563
	PVC	G 1 1/4 – DN 20	356564
	PVC	G 1 1/2 – DN 25	356565
	PVC	G 2 – DN 32	740690
	PVC	G 2 1/4 – DN 40	356567
	PVC	G 2 3/4 – DN 50	356568
	PVDF	G 3/4 – DN 10	358813
	PVDF	G 1 – DN 15	358814
	PVDF	G 1 1/4 – DN 20	358815
	PVDF	G 1 1/2 – DN 25	358816
	PVDF	G 2 – DN 32	1003639
	PVDF	G 2 1/4 – DN 40	358818
	PVDF	G 2 3/4 – DN 50	358819
	1.4571	G 3/4 – DN 10	805270
	1.4571	G 1 – DN 15	805271
	1.4571	G 1 1/4 – DN 20	805272
	1.4571	G 1 1/2 – DN 25	805273
	1.4571	G 2 – DN 32	805274
	1.4571	G 2 1/4 – DN 40	805275
	1.4571	G 2 3/4 – DN 50	805276

### Inserts

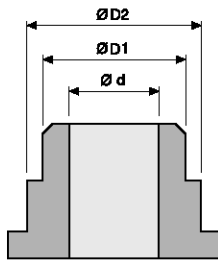


	Material	Connection	Order no.
Fusion socket	PP	d 12 – DN 8	800666
	PP	d 16 – DN 10	358603
	PP	d 20 – DN 15	358604
	PP	d 25 – DN 20	358605
	PP	d 32 – DN 25	358606
	PP	d 40 – DN 32	358607
	PP	d 50 – DN 40	358608
	PP	d 63 – DN 50	358609
	PVDF	d 16 – DN 10	358803
	PVDF	d 20 – DN 15	358804
	PVDF	d 25 – DN 20	358805
	PVDF	d 32 – DN 25	358806
	PVDF	d 40 – DN 32	1003640
	PVDF	d 50 – DN 40	358808
	PVDF	d 63 – DN 50	358809

## 1.8 Hydraulic/Mechanical Accessories

	Material	Connection	Order no.
Fusion coupler, grooved*	PP	d 16 – DN 10	1001785
	PP	d 20 – DN 15	1001395
	PP	d 25 – DN 20	1036258
	PP	d 32 – DN 25	1001787
	PP	d 40 – DN 32	1005105
	PP	d 50 – DN 40	1025960
	PP	d 63 – DN 50	1019207
	PVDF	d 16 – DN 10	358803
	PVDF	d 20 – DN 15	358804
	PVDF	d 25 – DN 20	1036259
	PVDF	d 32 – DN 25	1001788
	PVDF	d 40 – DN 32	1003640
	PVDF	d 50 – DN 40	1025959
	PVDF	d 63 – DN 50	1019208

\* To be used together with ProMinent® PTFE formed composite seals.



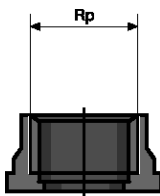
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	Material	Ø D1 mm	Ø D2 mm	Connection	Order no.
SS fusion coupler, grooved	1.4404	15.0	19.5	d 12 – DN 10	1006011
	1.4404	21.0	25.6	d 16 – DN 15	1006001
	1.4404	26.7	33.6	d 22 – DN 20	1031457
	1.4404	33.4	39.6	d 28 – DN 25	1031458
	1.4404	42.2	49.6	d 36 – DN 32	1031459
	1.4404	48.3	57.5	d 40 – DN 40	1023643
	1.4404	71.6	60.3	d 54 – DN 50	1031460

	Material	Connection	Order no.
Adhesive socket	PVC	d 16 – DN 10	356572
	PVC	d 20 – DN 15	356573
	PVC	d 25 – DN 20	356574
	PVC	d 32 – DN 25	356575
	PVC	d 40 – DN 32	356576
	PVC	d 50 – DN 40	356577
	PVC	d 63 – DN 50	356578

	Material	Connection	Order no.
Adhesive coupler, grooved*	PVC	d 16 – DN 10	1001784
	PVC	d 20 – DN 15	1001394
	PVC	d 25 – DN 20	1036257
	PVC	d 32 – DN 25	1001786
	PVC	d 40 – DN 32	1005104
	PVC	d 50 – DN 40	1025961
	PVC	d 63 – DN 50	1019206

\* To be used together with ProMinent® PTFE formed composite seals.



pk\_2\_069\_b

	Material	Connection	Order no.
Threaded pipe socket	1.4404	Rp 3/8 – DN 10	805285
	1.4404	Rp 1/2 – DN 15	805286
	1.4404	Rp 3/4 – DN 20	805287
	1.4404	Rp 1 – DN 25	805288
	1.4404	Rp 1 1/4 – DN 32	805289
	1.4404	Rp 1 1/2 – DN 40	805290
	1.4404	Rp 2 – DN 50	805291



## 1.8 Hydraulic/Mechanical Accessories

### Pressure hose nozzles

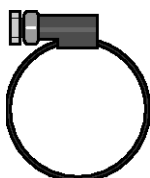


pk\_2\_046

	Material	Connection	Order no.
Pressure hose nozzle	PP	d 16 – DN 10	800657
	PP	d 20 – DN 15	800655
	PP	d 25 – DN 20	800656
	PP	d 32 – DN 25	811418
	PVC	d 16 – DN 10	800554
	PVC	d 20 – DN 15	811407
	PVC	d 25 – DN 20	811408
	PVC	d 32 – DN 25	811409
	PTFE	d 16 – DN 10	811572
	PTFE	d 20 – DN 15	811424
	PTFE	d 25 – DN 20	811425
	PTFE	d 32 – DN 25	811426
	PVDF	d 40 – DN 32	1005106
	1.4571	d 16 – DN 10	810536
	1.4571	d 20 – DN 15	810567
	1.4571	d 25 – DN 20	810568
	1.4571	d 32 – DN 25	810569
	1.4571	d 40 – DN 32	1005360

	Material	Connection	Order no.
Hose nozzle, grooved	PVDF	d 16 – DN 10	1002288
	PVDF	d 20 – DN 15	740632
	PVDF	d 25 – DN 20	1006014
	PVDF	d 32 – DN 25	1005560
	PVDF	d 40 – DN 32	1005106

To be used together with ProMinent® PTFE formed composite seals.

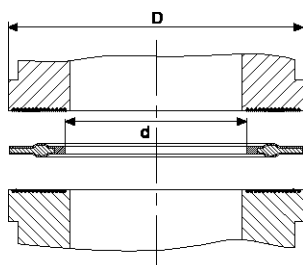


pk\_1\_068

### Stainless steel threaded clip

For connecting intake and metering line to pressure hose nozzle.

	Clamping range mm	Order no.
DN 10 clamping ring	16 – 25	359703
DN 15 clamping ring	20 – 32	359705
DN 20 clamping ring	25 – 40	359706
DN 25 clamping ring	32 – 50	359707
DN 32 clamping ring	40 – 60	1002777



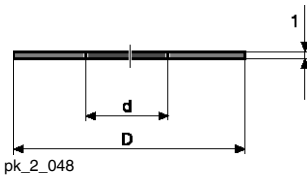
pk\_2\_130

### PTFE formed composite seals

Formed composite seals to be used on grooved sealing surfaces (e.g. pump valve and grooved inserts from ProMinent).

DN	Material	D mm	d mm	Order no.
DN 10	PTFE	23.8	14.0	1019364
DN 15	PTFE	29.5	18.0	1019365
DN 20	PTFE	38.0	22.6	1019366
DN 25	PTFE	44.0	27.6	1019367
DN 32	PTFE	56.0	34.6	1019353
DN 40	PTFE	62.0	40.6	1019368

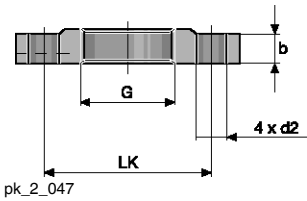
## 1.8 Hydraulic/Mechanical Accessories



### Set of elastomer flat packing seals

Comprising two EPDM and two FKM seals. An elastomer flat seal should be used with non-grooved sealing surfaces. Leaks may occur at the connection if a PTFE shaped composite seal is used.

	D mm	d mm	Order no.
DN 10	23.5	14.0	1024159
DN 15	29.5	18.0	1024160
DN 20	38.0	22.6	1036254
DN 25	44.0	28.0	1024161
DN 32	56.0	36.0	1024162
DN 40	62.0	41.0	1029508



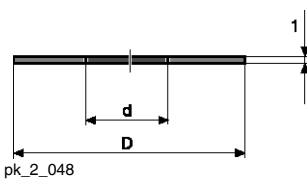
### Flange mountings

Flange connection in line with DIN 2566 for ProMinent® valve sizes.

Material	G/DN	Pressure rating PN	b mm	Ø LK mm	d2 mm	Order no.
PVDF	G 3/4 - DN 10	PN 16	12.4	60	14	1036274
PVDF with seal*	G 3/4 - DN 10	PN 16	12.4	60	14	1036279
PVDF	G 1 - DN 15	PN 16	13.0	65	14	1036275
PVDF with seal*	G 1 - DN 15	PN 16	13.0	65	14	1036280
PVDF	G 1 1/4 - DN 20	PN 16	15.0	75	14	1036276
PVDF	G 1 1/2 - DN 25	PN 16	16.0	85	14	1036277
PVDF with seal*	G 1 1/2 - DN 25	PN 16	16.0	85	14	1036281
PVDF	G 2 - DN 32	PN 16	18.0	100	18	1036278
PVDF with seal*	G 2 - DN 32	PN 16	18.0	100	18	1036282
PVDF	G 2 1/4 - DN 40	PN 16	20.0	100	18	1039037
1.4404	G 3/4 - DN 15	PN 40	12.0	65	14	803946
1.4404	G 1 - DN 15	PN 40	12.0	65	14	803940
1.4404	G 1 1/4 - DN 20	PN 40	15.0	75	14	803941
1.4404	G 1 1/2 - DN 25	PN 40	15.0	85	14	803942
1.4404	G 2 - DN 32	PN 40	18.0	100	18	1036283
1.4404	G 2 1/4 - DN 40	PN 40	20.0	110	18	803943
1.4404	G 2 3/4 - DN 50	PN 40	25.0	125	18	1020453
1.4404	G 2 1/2 - DN 65	PN 40	20.0	145	18	1010700

\* Flange mountings with a seal should be used for Sigma/ 1, Sigma/ 2 pumps with DN 15 connector and Sigma/ 3 pumps with DN 25 connector.

Other flange versions are available on request.



### Flat seals for previous flange mountings

Material	G/DN	D mm	d mm	Order no.
PTFE	G 3/4 - DN 15	52	12	483938
PTFE	G 1 - DN 15	52	17	483924
PTFE	G 1 1/4 - DN 20	62	22	483925
PTFE	G 1 1/2 - DN 25	72	27	483926
PTFE	G 2 - DN 32	83	33	1007541
PTFE	G 2 1/4 - DN 40	92	40	483928
PTFE	G 2 3/4 - DN 50	108	50	483929
PTFE	G 3 - DN 65	130	60	1020466
FKM	G 3/4 - DN 15	52	12	483939
FKM	G 1 - DN 15	52	17	483942
FKM	G 1 1/4 - DN 20	62	22	483943
FKM	G 1 1/2 - DN 25	72	27	483944
FKM	G 1 1/2 - DN 32	83	33	1007542
FKM	G 2 1/4 - DN 40	92	40	483946
FKM	G 2 3/4 - DN 50	108	50	483947
FKM	G 3 - DN 65	130	60	1020467

Flange mountings as DIN 2629. To order for Meta HK and Makro TZ HK plunger metering pumps.

FKM = Fluorine rubber



## 1.8 Hydraulic/Mechanical Accessories



pk\_1\_028

### Straight male adapter stainless steel

Swagelock system, stainless steel SS 316 (1.4401) for connection of pipework to liquid end and valves with internal thread and for SB version.

	Order no.
6 mm - ISO 7 R 1/4	359526
8 mm - ISO 7 R 1/4	359527
12 mm - ISO 7 R 1/4	359528
12 mm - ISO 7 R 3/8	359520
16 mm - ISO 7 R 3/8	359521



pk\_1\_013

### Suction line

For metering pumps and accessories. We recommend that only original tubing is used so that the mechanical connection of the compression fitting and the pressure rating and chemical resistance are ensured.

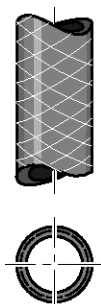
Supply with food-use certification is available upon request.

Material	oØ x iØ mm	Permissible pressure bar	Order no.
Soft PVC	19 x 15 for DN 10	0.5*	037020
Flexible PVC	22 x 18 for DN 15	0.5*	037022

#### Caution:

The resistance of soft PVC hoses is not identical to that of hard PVC. Please observe the resistance for soft PVC as well as the cleaning instructions when using the equipment for food applications (see homepage).

\* Permissible operating pressure at 20 °C, chemical resistance and proper connection assumed.



pk\_1\_060

### Suction and discharge line

Supply with food-use certification is available upon request.

Material	oØ x iØ mm	Permissible pressure bar	Order no.
Soft PVC with woven inner layer	24 x 16 for DN 10	16*	037040
Soft PVC with woven inner layer	27 x 19 for DN 15	16*	037041
Soft PVC with woven inner layer	34 x 25 for DN 20	12*	037043
Soft PVC with woven inner layer	40 x 30 for DN 25	10*	1000527
Soft PVC with woven inner layer	52 x 40 for DN 32	7*	1005508
Stainless steel pipe 1.4435	6 x 5 –	175*	015738
Stainless steel pipe 1.4435	6 x 4 –	185*	015739
Stainless steel pipe 1.4435	8 x 7 –	160*	015740
Stainless steel pipe 1.4435	12 x 10 Sold in metres	200*	015743

#### Caution:

The resistance of soft PVC hoses is not identical to that of hard PVC. Please observe the resistance for soft PVC as well as the cleaning instructions when using the equipment for food applications (see homepage).

For socket welded and PVC cemented rigid PP and PVDF pipe, pipes and fittings with a pressure rating of PN 16 or PN 10 bar are to be used.

\* Permissible operating pressure at 20 °C, chemical resistance and proper connection assumed.

### Hose Cutting Kit

Hose Cutting Set for Plastic Pipes up to a Diameter of 25 mm. Manufacturer: Gedore.

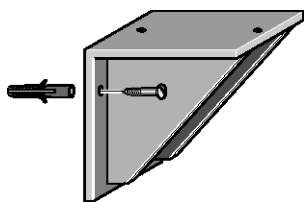
Order no.
Hose Cutting Kit
1038571



## 1.8 Hydraulic/Mechanical Accessories

### 1.8.10

#### Metering Pump Wall Mounting Bracket



pk\_2\_036

##### Metering pump wall mounting bracket for Vario, Sigma and Meta

PP wall mounting, holds pump parallel to the wall, includes fixings.

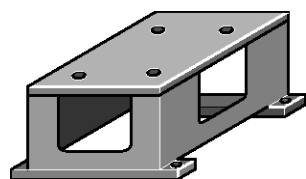
Measurements: L x W x H, 230 x 220 x 220 mm

**Wall mounting bracket**

for Vario, Sigma and Meta

**Order no.**

1001906



pk\_2\_037

##### Floor mounting for Sigma, Meta

For mounting metering pump, includes fixings. Material PP.

Measurements: L x W x H 250 x 160 x 150 mm

**Floor mounting****Order no.**

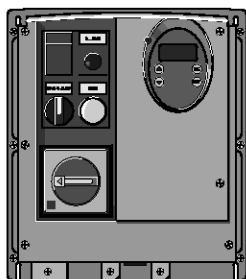
809910

## 1.9 Electrical Accessories

### 1.9.1

### Speed Controllers

#### Frequency converter for speed controller



Frequency converters are installed in the IP 55 protective enclosure and are suitable for the motor output ratings listed below.

Integrated control unit with various functions optimally matched to ProMinent metering pumps: Selectable external/internal control, internal/external reset, temperature monitoring and control via PTC sensor, separate motor fan control as well as evaluation of diaphragm rupture monitoring.

Internal control: via potentiometer

External control: 0/4-20 mA corresponding to 0-50 (60) Hz output frequency

Frequency converters can be used in the range of -10 °C to 40 °C.

P\_AC\_0185\_SW

Max. motor output kW	For pump type	Voltage supply	Voltage supply, external fan	Control range	Order no.
0.37	Sigma/ 1, Sigma/ 2, Meta, Hydro/ 2, MF1a, DR15	1 ph 200 – 240 V	230 V 50/60 Hz	1:10	1030684
0.75	Sigma/ 3, Hydro/ 3, MF2a	1 ph 200 – 240 V	230 V 50/60 Hz	1:10	1030685
1.50	Makro TZ, MF2a, MF3a, DR150	1 ph 200 – 240 V	230 V 50/60 Hz	1:10	1030686
2.20	Makro TZ, MF3a, DR150	1 ph 200 – 240 V	230 V 50/60 Hz	1:10	1030687
4.00	MF3a, MF4a	3 ph 380 – 500 V	3 ph 380 V	1:5	1030688

#### Dimensions and weight

Order no.	B mm	H mm	C mm	Weight kg
1030684	210	240	163	6.3
1030685	210	240	163	6.3
1030686	215	297	192	8.8
1030687	230	340	222	10.7
1030688	230	340	222	10.7

#### Variable speed motors with integrated speed controller

Externally controllable with 0/4-20 mA (factory setting 4-20 mA)

Voltage supply: 1 ph 230 V, 50/60 Hz (0.37-1.1 kW)

Voltage supply: 3 ph 400 V, 50/60 Hz (1.5-3 kW)

The following functions are integrated in the terminal box cover:

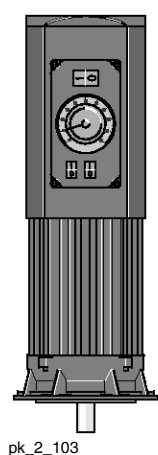
- Start/stop switch
- Switch for manual/external operation
- Potentiometer for speed control in manual mode.

Max. motor output kW	For pump	Control range	Flange Ø mm	Order no.
0.18	Sigma/ 1	1:20	120	1020229
0.37	Sigma/ 2	1:20	105	1008568
0.37	Hydro/ 2, Meta	1:20	160	1008569
0.55	Sigma/ 3	1:20	160	1008570
0.75	Hydro/ 3	1:20	160	1008571
1.10	Makro TZ (TZMB)	1:20	160	1008572
1.50	Makro TZ	1:20	160	1008573
2.20	Makro TZ	1:20	200	1008574
3.00	Makro/ 5	1:20	250	1027482

Motor data sheets can be requested for more information.

Special motors or special motor flanges are available on request.

Motors less than 0.75 kW and motors designed for speed-controllable operation are not subject to the IEC2 standard in compliance with the Ecodesign Directive 2005/32/EC.



pk\_2\_103





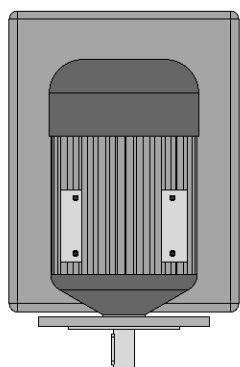
## 1.9 Electrical Accessories

### Operating unit for setting control parameters

	Order no.
With sub-D connector (old)	1020585
With Western connector (new)	1029493

**Note:**

Version suitable for use in ambient temperatures up to 55°C available on request.



P\_AC\_0211\_SW

### Explosion-protected compact drive with integrated frequency converter Protection class II 2G Eexde II C T4

Voltage supply:	400 V, 50/60 Hz
Mains feed:	3 ph + neutral + earth
Model:	IM B5
Inputs:	2 x analogue 0/4...20 mA 4 x digital (includes frequency input 0...100 kHz)
Outputs:	2 x analogue 4...20 mA 4 x digital 0/+20 V, 10 mA 1 x frequency output 0...10 kHz, 0/18...24 V, max. 5 mA
Terminal strip connectors:	ON/OFF Self-locking RESET

Winding and temperature monitoring by PTC resistor with integral evaluation.

External control circuit: 230 V with internal fuse.

**Note:**

Delivery on request

Max. motor output kW	For pump	Control range	Flange Ø mm
0.55	Hydro/ 2, Sigma/ 3, Orlita MF	1:10	80
0.75	Hydro/ 3, Orlita MF	1:10	80
1.50	Makro TZ, Orlita MF	1:10	200
2.20	Makro TZ, Orlita MF	1:10	200
4.00	Makro/ 5, Orlita MF	1:10	250

Pumps with compact drive are always delivered on a frame.

Motor data sheets can be requested for more information.

Special motors or special motor flanges and other control ranges are available on request.

Motors less than 0.75 kW and motors designed for speed-controllable operation are not subject to the IEC2 standard in compliance with the Ecodesign Directive 2005/32/EC.

# 1.9 Electrical Accessories

## 1.9.2 General Electrical Accessories



pk\_1\_085

### Universal signal cable

For control of the metering pump via potential-free contact, analogue standard signal and for potential-free ON/ OFF switching - switch-on function.

For Vario, S1Ca, S2Ca and S3Ca with 5-pin round plug made of plastic and 5-wire cable with open end.

	Cable length m	Order no.
Universal cable	2	1001300
Universal cable	5	1001301
Universal cable	10	1001302

### Reed cable with 3-pin round plug, PE



P\_AC\_0243\_SW

For Sigma metering pumps with 3-pin round plugs and a 3-core cable with an open end for level control. Suitable for use with the Suction lance for motor-driven metering pumps\* → 1-57

	Cable length m	Order no.
Reed cable with 3-pin round plug, PE	2	1030334
	3	1030335
	5	1030336

### Level sensor cable for connection of a universal suction lance and a motor-driven metering pump

For connection of the level switch of the universal suction lance for Sigma metering pumps or the higher-level control system (e.g. PLS).

Suitable for PPE universal suction lance for motor-driven metering pumps → 1-56



pk\_1\_126



P\_AC\_0243\_SW

	Cable length m	fig.	Order no.
Round plug coupling for M12 3-pin round plug	2	pk_1_126	1040962
Round plug coupling for M12 3-pin round plug	5	pk_1_126	1040963
Round plug coupling for M12 open end	1.1	P_AC_0243_SW	1009873
Round plug coupling for M12 open end	5	P_AC_0243_SW	1022537

### Extension cable, 3-core

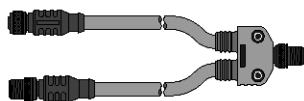
For 2-stage level switches, with round plug and round plug coupling.

	Cable length m	fig.	Order no.
Extension cable, 3-core	3	pk_1_126	1005559

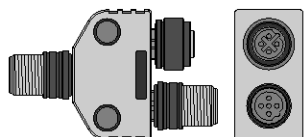
## 1.9 Electrical Accessories

### Profibus adaptor, IP 65 protection

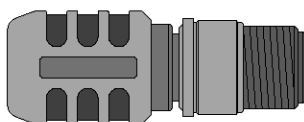
From eurofast 5-pin M12 x 1, length approx. 500 mm.



P\_AC\_0245\_SW



P\_AC\_0230\_SW\_1



P\_AC\_0239\_SW

		fig.	Order no.
Y-adaptor 2 x M12 x 1 male/female	M12 x 1 male	P_AC_0245_SW	1040956
PROFIBUS® termination assembly, comprising a Y-plug and terminating resistance	M12	–	1040955
PROFIBUS® Y-adaptor	M 12 x 1	P_AC_0230_SW	1036621
PROFIBUS® termination resistor, plug-in	M 12 x 1	P_AC_0239_SW	1036622

### USB adaptor

To connect a laptop to gamma and Sigma series metering pumps.

The USB adaptor can be used to transfer timer programmes created using ProTime software to the pump. You will find the ProTime software on our home page.

	Order no.
USB Adapter	1021544

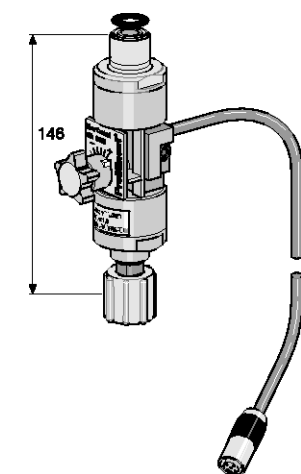
### Flow Control adjustable flow monitor

Fits PVT and SST Sigma/ 1 / 2 / 3 versions. Supplied complete with connection cable for assembly directly onto the liquid end.

Monitors individual strokes in accordance with the float and orifice principle. Using the adjustment screw, the partial dose flowing past the float can be matched to the set lift volume in such a way that any significant shortfall of the target dose will trigger an alarm signal. The Sigma Control (S1Ca/S2Ca/S3Ca) is used to select the permissible number of uncompleted full strokes in the range 1-127, enabling optimum matching to your process demands. Recommended operation for Sigma Control is "external switching operation".

#### Materials

Flow meter: PVDF  
Float: PTFE-coated  
Seals: FKM/EPDM

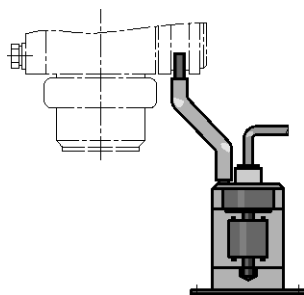


pk\_1\_086\_2

Flow Control	Seal material	For pump	Order no.
Flow Control DN 10	EPDM	Sigma/ 1	1021168
Flow Control DN 10	FKM	Sigma/ 1	1021169
Flow Control DN 15	EPDM	Sigma/ 1/ 2	1021170
Flow Control DN 15	FKM	Sigma/ 1/ 2	1021171
Flow Control DN 25	EPDM	Sigma/ 2/ 3	1021164
Flow Control DN 25	FKM	Sigma/ 2/ 3	1021165
Flow Control DN 32	EPDM	Sigma/ 3	1021166
Flow Control DN 32	FKM	Sigma/ 3	1021167



## 1.9 Electrical Accessories

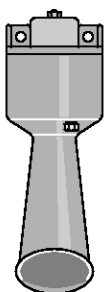


pk\_1\_087

### Diaphragm rupture indicator

Triggers alarm and switches off metering pump in the event of diaphragm rupture. Consists of float switch, PVC/PE, acrylic tank, connectors and connecting hose. Potential-free NO contact, max. contact voltage 60 V AC, 300 mA, 18 W.

	For pump	Order no.
Diaphragm rupture indicator	Meta, Makro TZ	803640
Diaphragm rupture indicator	Makro/ 5	1019528



pk\_1\_088

### Siren

HUW 55, 230 V, 50 - 60 Hz,

165 x 60 x 65, 85 phon, indoor.

(e.g. in association with fault indicating relay or relay controller)

	Order no.
HUW 55 Horn	705002

### Warning light

Wall mounted, red, 230 V, 50 - 60 Hz.

(e.g. in association with fault indicating relay, pulse generator or relay controller)

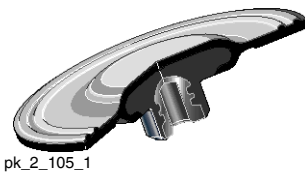
	Order no.
Indicator lamp, red	914780



## 1.10 Special Accessories

### 1.10.1

### Custom Accessories



pk\_2\_105\_1

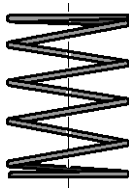
#### FKM metering diaphragm

As standard diaphragm but made of FKM, and without PTFE coating. Designed specifically for crystallising chemicals, e.g. silicate. Max. operating pressure 6 bar.

For pump type	Order no.
Vario 12017, 12026, 12042	811308
Vario 10025, 09039, 07063	811309
Vario 06047, 05075, 04120	811310
Sigma/ 1 (old diaphragm) 12017, 12035, 10050	1010281
Sigma/ 1 (old diaphragm) 10022, 10044, 07065	1010284
Sigma/ 1 (old diaphragm) 07042, 04084, 04120	1010287
Sigma/ 2 (old diaphragm) 16050, 16090, 16130	1018953
Sigma/ 2 (old diaphragm) 07120, 07220, 04350	1018984
Sigma/ 3 (old diaphragm) 120145, 120190, 120270, 120330	1006564
Sigma/ 3 (old diaphragm) 070410, 070580, 040830, 041030	1006566

Additional custom diaphragms for other pump types are available on request.

FKM = Fluorine Rubber

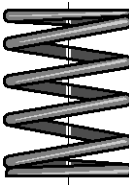


pk\_1\_103

#### Liquid end valve springs

With approx. 0.05-0.1 bar priming pressure for spring loading of the valve balls in the liquid end. Recommended to improve the valve function and to increase metering accuracy, in particular for viscous media above 50 m Pas.

	Order no.
1.4571 valve spring 0.05 bar for 1/4" connector on Meta/Makro TZ HK	469461
1.4571 valve spring 0.05 bar for 3/8" connector on Makro TZ HK	469462
Hastelloy C valve spring 0.1 bar DN 10	469114
Hastelloy C valve spring 0.1 bar DN 15	469107
Hastelloy C valve spring 0.1 bar DN 20	469451
Hastelloy C valve spring 0.1 bar DN 25	469452



pk\_1\_104

#### Injection valve springs

With approximately 0.5-1 bar priming pressure for increased metering reproducibility and prevention of suction and siphoning effect.

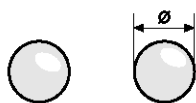
	Order no.
Hastelloy C valve spring 0.5 bar DN 10	469115
Hastelloy C valve spring 1 bar DN 10	469119
Hastelloy C valve spring 0.5 bar DN 15	469108
Hastelloy C valve spring 1 bar DN 15	469116
Hastelloy C valve spring 0.5 bar DN 20	469409
Hastelloy C valve spring 1 bar DN 20	469135
Hastelloy C valve spring 0.5 bar DN 25	469414
Hastelloy C valve spring 1 bar DN 25	469136
Hastelloy C valve spring 0.5 bar DN 40	469104
Hastelloy C valve spring 1 bar DN 40	469137

#### Injection valve spring with FEP coating

	Order no.
Hastelloy C/FEP valve spring 0.5 bar for DN 10	818515
Hastelloy C/FEP valve spring 0.5 bar for DN 15	818516
Hastelloy C/PVDF valve spring 0.5 bar for DN 10	818517
Hastelloy C/PVDF valve spring 0.5 bar for DN 25	818518
Hastelloy C/PVDF valve spring 0.5 bar for DN 40	818519



# 1.10 Special Accessories



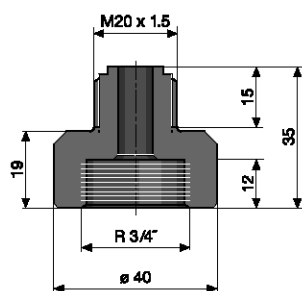
pk\_1\_102

## Custom valve balls

Ball valves and accessories for on site retrofitting of metering pumps when the standard material is unsuitable. Supplied loose only.

	Order no.
PTFE diameter 11.0 for DN 10 valve	404260
PTFE diameter 16.0 for DN 15 valve*	404259
PTFE diameter 20.0 for DN 20 valve	404256
PTFE diameter 25.0 for DN 25 valve	404257
PTFE diameter 38.1 for DN 40 valve	404261
Ceramic diameter 11.1 for DN 10 valve	404277
Ceramic diameter 16.0 for DN 15 valve*	404275
Ceramic diameter 20.0 for DN 20 valve	404273
Ceramic diameter 25.0 for DN 25 valve	404274
Ceramic diameter 38.1 for DN 40 valve	404278

\* Not suitable for PVT valve material.



pk\_2\_058

## Adapter for DN 10, 3/4" (Vario, Sigma) to M20 x 1.5

Fits 12 x 9 hose connector set

	Material	Order no.
Adapter from DN 10, 3/4" inner thread to M20 x 1.5 outer thread	PP	800815
Adapter from DN 10, 3/4" inner thread to M20 x 1.5 outer thread	PVC	800816
Adapter from DN 10, 3/4" inner thread to M20 x 1.5 outer thread	PVDF	1017406

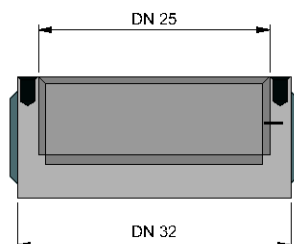
## DN15 adapter, 1" (Sigma) to M20 x 1.5

Fits 12 x 9 tube connector kit.

	Material	Order no.
Adapter from DN 15, 1" inner thread to M20 x 1.5 outer thread	PVDF	1028530

## Valve adapter DN 32 - DN 25

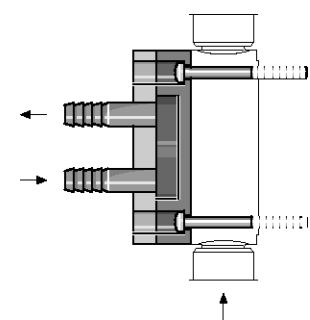
Suitable for the liquid end of the Sigma/ 3 metering pump FM 1000 up to 600 l/h.



P\_AC\_0244\_SW

	Material	Order no.
Adapter DN 32 - DN 25	SST	1035729
	PVT	1035732

## 1.10 Special Accessories



pk\_2\_059

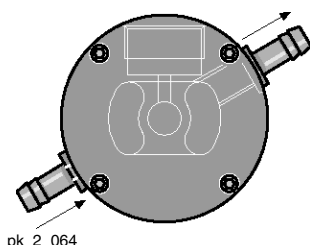
### Cooling/heating equipment, diaphragm metering pumps

For stainless steel liquid end. For assembly, including retrofitting, onto the liquid end. 10 mm diameter connectors for hot/cold chemicals with locking screws. Dimensions in mm. Outer diameter A, pitch circle diameter LK.

Temperature -10 ... 80 °C

For pump	Ø A mm	Ø LK mm	Order no.
Sigma/ 1 (old version) FM 50/65	–	–	1025500
Sigma/ 1 (old version) FM 120	–	–	1025501
Sigma/ 2 (old version) FM 130	–	–	1002178
Sigma/ 2 (old version) FM 350	–	–	1002179
Sigma/ 3 (old version) FM 330	–	–	1006455
Sigma/ 3 (old version) FM 1000	–	–	1006456
Hydro/ 2/3 FMH 025/060	–	–	1024743
Hydro/ 3 FMH 150	–	–	1040112
Hydro/ 4 FMH 400	–	–	1047700
Meta, Makro TZ FM 130, FM 260	145	127	803751
Meta, Makro TZ FM 530	180	164	803752
Makro TZ FM 1500/2100	248	219	806005
Makro/ 5 FM 4000	–	–	1020683
Makro TZ FMH 70/20	–	–	1041263
Makro/ 5 FMH 85/50	–	–	1041261
Makro/ 5 FMH 60/50	–	–	1041260
Makro/ 5 FMH 130/50	–	–	1041262

\* Adapted to the design with the new multi-layer safety diaphragm.



pk\_2\_064

### Cooling/heating equipment, plunger metering pumps

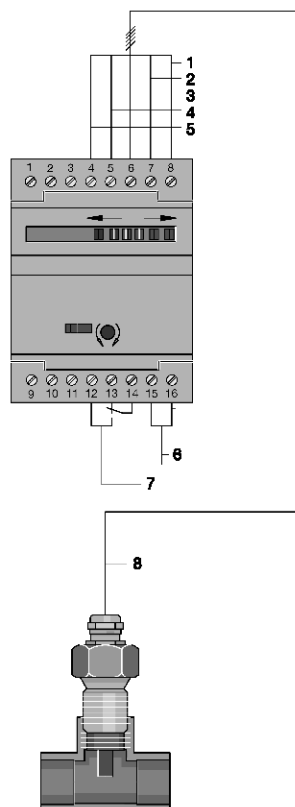
The cooling/heating equipment is installed in the liquid end. 10 mm diameter connectors. Cannot be retrofitted.

For pump	Order no.
Sigma HK - 08 S	1040459
Meta/Sigma HK - 12,5 S	803551
Meta/Sigma HK - 25 S	803552
Meta/Sigma HK - 50 S	803553
Makro TZ FK 30	1036645
Makro TZ FK 50	1036655
Makro TZ FK 85	1024665

Cooling/heating equipment for Makro TZ HK on request.



## 1.10 Special Accessories



pk\_1\_119

- 1 grey
- 2 black
- 3 brown
- 4 blue
- 5 white
- 6 Mains voltage
- 7 Relay flow control
- 8 Connecting for sensor

### Thermal metering monitor

The flow monitor consists of a sensor and monitor electronics. It operates on the principle of heat transference from the water flow and can be used with all solenoid and motor-driven metering pumps at or above a continuous metering quantity of 0.5 l/h.

#### Monitor electronics

The fault indicating relay is triggered when normally flowing liquid ceases to flow (switching power 250 V/ 4 A). At this point the relay opens for 3-20 sec (adjustable). The switch status is indicated by LED. Continuous flow volume adjustment.

#### Enclosure rating

Enclosure IP 40  
Terminal box IP 00

#### Permissible ambient temperature

0...60 °C

	Electrical connection	Order no.
Evaluation electronics	230 V, 50/60 Hz	792886

### Probe C

Single-section ceramic sensor

Outer thread	G 1/2
Operating temperature	5 °C to 60 °C medium temperature, not suitable for alkaline solutions
Lead length	Fixed input lead. Cable length 2 m.
Max. lead length	100 m
Enclosure rating	IP 67
Pressure resistance	7 bar
Adjustment range	0 – 60 cm/s

	Order no.
Probe C	1022339

### Probe S

Single-cell, metal-clad sensor, stainless steel material no. 1.4571

Outer thread	G 1/2
Operating temperature	-25 °C to 80 °C medium temperature
Lead length	Fixed input lead. Cable length 2 m.
Max. lead length	100 m
Enclosure rating	IP 67
Pressure resistance	30 bar
Adjustment range	1 cm/s to 5 m/s

	Order no.
Probe S	792888

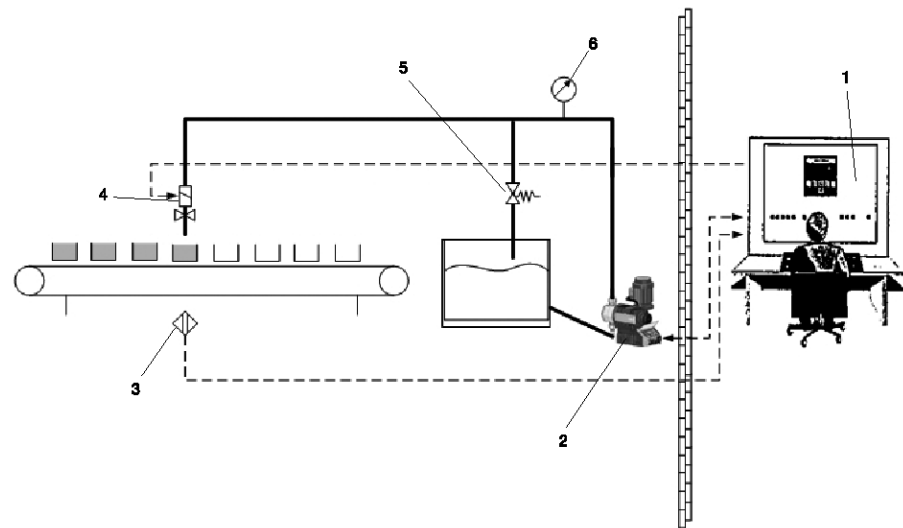
Required connector parts (T-piece, bypass) should be ordered separately.



# 1.11 Application Examples

## 1.11.1 Metering of Highly Viscous Substances

Product: **Motor-driven pumps**  
 Metered medium: **Viscous filler**  
 Sector: **Electronics**  
 Application: **Part filling**



- 1 Process control system (master)
- 2 Metering pump, Sigma (field unit)
- 3 Proximity switch
- 4 Solenoid valve
- 5 Overflow valve
- 6 Pressure gauge

pk\_2\_113

### Tasks and requirements

- Metering of a viscous filler in templates
- Metering accuracy  $\pm 2\%$
- Varying filling volumes

### Operating conditions

- The templates pass the metering point on a conveyor in „stop and go“ operation.
- The pump is started by a proximity switch at the conveyor (external contact control).

### Notes on application

- The start always begins with a pressure stroke, i.e. controlled stop of the diaphragm at the end of the suction stroke.
- When varying the filling volume, a stroke length as large as possible should be chosen - this improves accuracy.
- Short and stable suction and metering lines, no pulsation damper - thus reduction of the flexible (moved) volume.
- If possible work with feed so that the suction lines are always filled with liquid even during longer idle times.
- A solenoid valve is required for filling to prevent dripping of the residual quantities.

### Solution

- Sigma Control metering pump with PROFIBUS® connection
- Overflow valve, solenoid valve

### Benefit

- Monitoring of the metering pump and setting of the metering amount (number of strokes) by PCS in the control centre
- Less electrical installation work required
- Integration into the complete process flow through PROFIBUS®
- Safe and precise metering thanks to overflow and solenoid valves

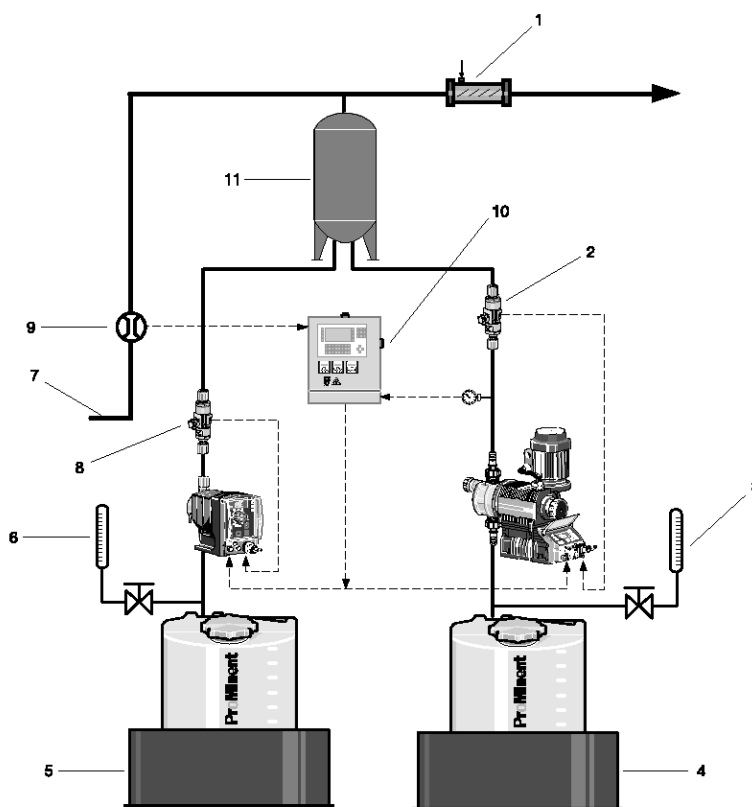


# 1.11 Application Examples

## 1.11.2

## Mixing Two Reagents

Product:	Motor-driven pumps, solenoid pumps
Metered medium:	Chlorine activator, oxidant (NaOCl)
Sector:	Process industry, power stations
Application:	Biocide handling in cooling water systems



- 1 Static mixer
- 2 Flow Control
- 3 Feed measuring unit
- 4 NaOCl solution
- 5 Chlorine activator
- 6 Feed measuring unit
- 7 Motive water
- 8 Flow Control
- 9 Flow rate measurement
- 10 Control cabinet
- 11 Reaction chamber

pk\_2\_114\_1

### Tasks and requirements

- Biocide treatment of cooling water systems used in combination with chlorination processes.
- Chlorine activator is mixed with NaOCl to produce hypobromous acid (HOBr) as an active biocide compound. HOBr is particularly effective at pH values from 7.5 to 9.0.
- A level of 0.5 g/m<sup>3</sup> of active HOBr over a period of 1 hour is to be secured twice a day for the purpose of disinfecting the cooling water.

### Operating conditions

- Biologically polluted water
- Automatic activation of metering pumps

### Application information

- The mixing ratio of chlorine activator and NaOCl (12.5 % solution) is 10 l to 26 – 52 l. The exact composition is to be determined by means of tests (on site).
- Metering pump with timer function activates the second pump and is therefore responsible for batch metering.
- Motor pump is protected against overload by a pressure gauge with pressure switch. The pressure gauge is connected to the control system.
- The control system monitors the installation and switches off the flow meter in response to corresponding signals (fault signalling).

## 1.11 Application Examples

### Solution

- gamma/ L metering pump with timer function (possibly with external timer)
- Sigma/ 1 metering pump, control version
- Feed monitoring, flow control
- Feed measuring facility
- Pressure gauge with pressure switch

### Benefits

- Efficient disinfection in water containing alkali and ammoniac
- Inexpensive raw material basis that is also stable and non-corrosive
- High degree of reliability ensured by flow monitoring
- Simple and effective facility for optimising the chemical composition in connection with feed measuring device

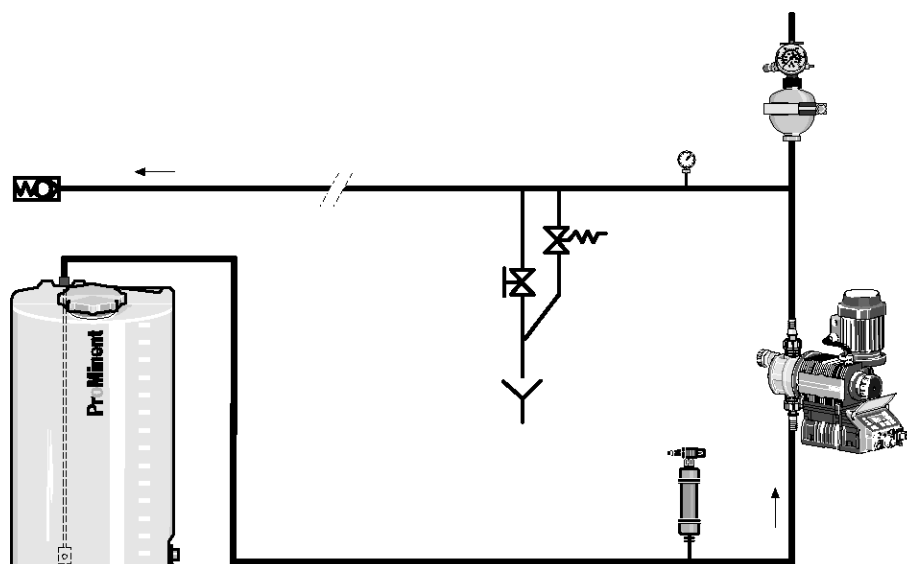


# 1.11 Application Examples

## 1.11.3

## Safe and Reliable Chemical Metering with Reduced Pulsation

Product: **Metering pump, accessories**  
 Metered medium: **High-viscosity chemicals**  
 Application: **Use of pulsation damper (PD)**



pk\_2\_117

### Tasks and requirements

- For process-technical reasons, a low-pulsation metering flow is desired.
- Mass accelerating forces during metering, caused by the oscillating movement of the displacement body in connection with the piping geometry need to be reduced.
- Cavitation-free process flow

### Operating conditions/environment

- Long suction/discharge lines
- Line cross-section with small dimensions
- Metering of high-viscosity, inert media

### Notes on application

- Pressure surges increase with increasing metering line length and smaller diameter; these may result in impermissible pressure peaks.
- For longer pipes, as well as for higher viscosity media, the need for a PD using a pipe calculation programme is to be evaluated.
- In an oscillating motor-driven metering pump, the maximum flow rate is approx. 3 times greater than the mean, in a solenoid pump approx. 5 times as great. This is to be considered when designing pipings without PD.
- PD should be preloaded with compressed air or nitrogen at approx. 60-80 % of the operating pressure to be expected.

### Solution

- ProMinent® metering pumps
- Pressure-relief/overflow valves
- Pulsation dampers

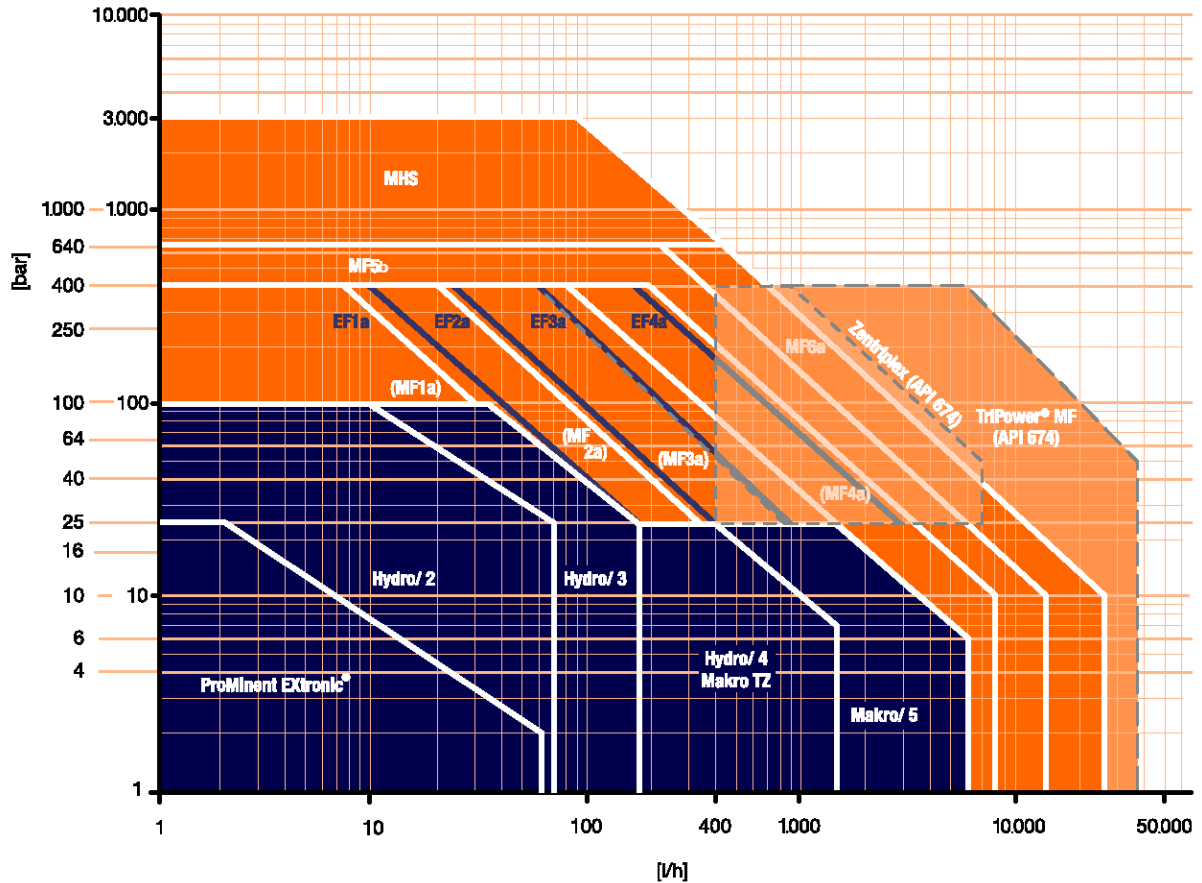
### Benefits

- Safe installation preventing damage to pumps and pipes
- Precise metering by avoiding of cavitation
- Compensation of delivery flow fluctuations



## 2.0 Overview of Process Metering Pumps

### 2.0.1 Selection Guide



SG\_0029\_C

### Overview of Process Metering Pumps

Type		EXBb	TZMb	M5Ma	HP2a	HP3a	HP4a	M5Ha	SBKa/ SCKa	MTKa	TZKa	M5Ka
Stroke length	mm	1.25	0 - 10	0 - 20	15	15	20	0 - 50	0 - 15	0 - 15	0 - 20	0 - 50
Connecting rod force	N	2,000	8,000	10,000	2,000	4,200	5,800	10,000	1,700	2,500	8,000	10,000
Type		EF1a	EF2a	EF3a	EF4a	S 18	S 35	S 80	S 180	S 600	S 1400	Rb 15
Stroke length	mm	0 - 15	0 - 15	0 - 25	0 - 40	0 - 15	0 - 20	0 - 20	0 - 40	0 - 40	0 - 60	0 - 15
Connecting rod force	N	2,300	5,400	8,000	15,700	1,750	3,500	14,000	18,000	40,000	60,000	1,800
Type		Rb 150	Zentriplex	Tripower								
Stroke length	mm	0 - 32	40	60								
Connecting rod force	N	15,000	18,000	80,000								



## 2.0 Overview of Process Metering Pumps

### 2.0.2 Installation Applications

#### A Oil Industry

##### A1 Well

##### A2 Platform

##### A3 Transportation (tanker, pipeline)

##### A4 Refinery

##### A5 Petrochemical

##### A6 Industry/power plants

##### A7 Filling stations

#### B Gas Industry

##### B1 Well

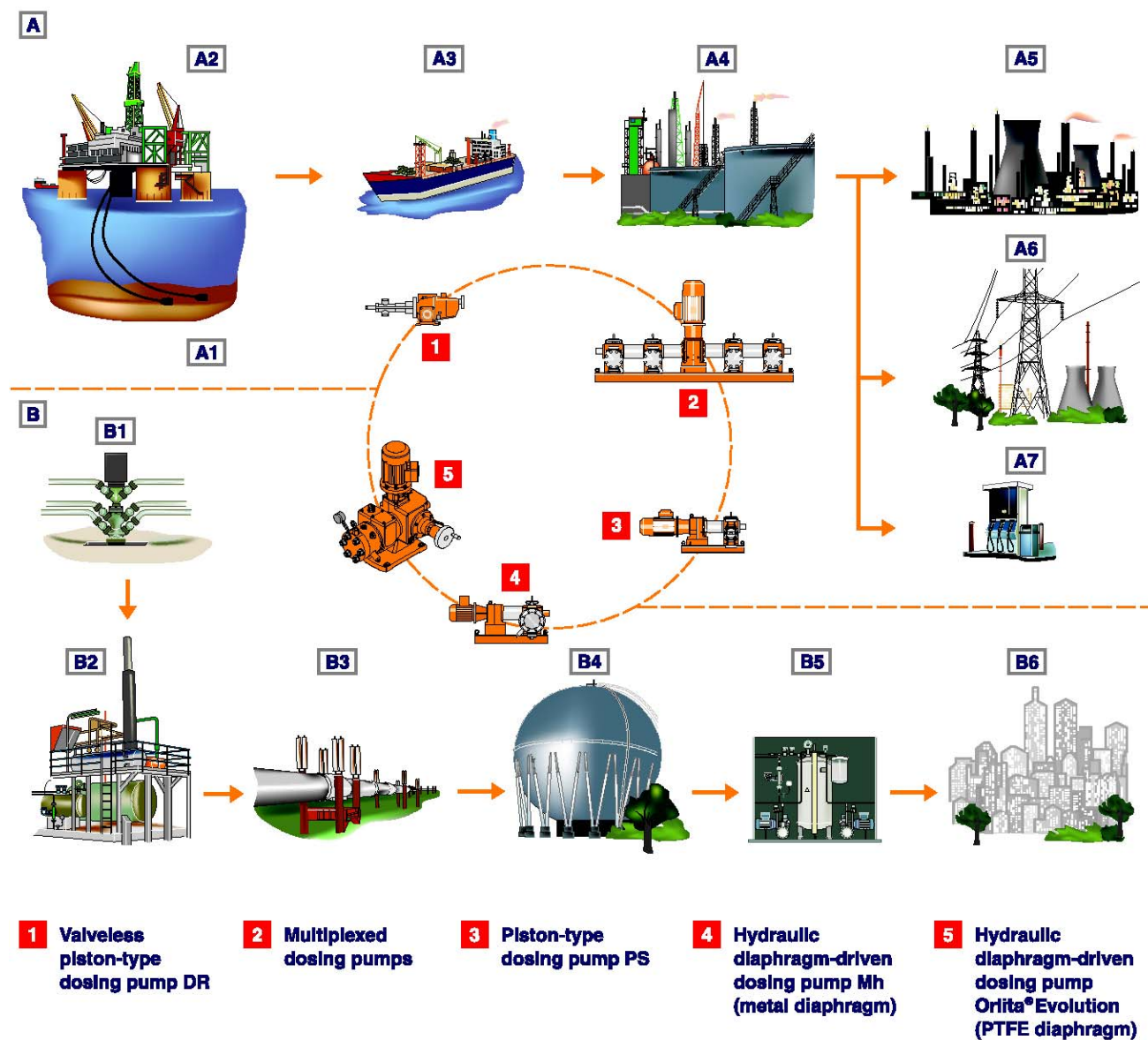
##### B2 Gas treatment/gas drying

##### B3 Transportation (tanker, pipeline)

##### B4 Gas storage tank

##### B5 Local distribution/odorization

##### B6 Industry/power plants



pk\_3\_07



## 2.1 Diaphragm Metering Pump EXtronic®

### 2.1.1

### Diaphragm Metering Pump EXtronic®

#### Precise metering with explosion protection

Capacity range of single pump: 0.19 – 60 l/h, 10 – 1.5 bar



The diaphragm metering pump EXtronic® is perfectly suited for the sensitive use of liquid media in facilities with an explosive gas atmosphere as well as for mines at risk of firedamp, as it is approved in compliance with the EC EX Regulation 94/9/EC (ATEX).

The ATEX-compliant diaphragm metering pump EXtronic® (EXBb) is tested and approved in line with the harmonised EC provisions of EN 50014/50018 for "compression-resistant enclosures" and thus offers the maximum level of protection. The short-stroke solenoid and the complete pump control are integrated in the pump housing so that, together with the explosion-proof power end, there is IP 65 protection against contact and humidity as per DIN 40050 even when the front cover is open.

#### Your benefits

Optimum adaptation for use in areas at risk from explosion

- ATEX-compliant in line with EExd IIC T6 and EExd I/IIC T6
- Excellent operating and functional reliability by a microprocessor controller, which compensates for fluctuations of mains voltage and automatically switches from 50 to 60 Hz operation
- Broad range of applications with an operating voltage of 500 V, 230 V and 115 V
- Ease of integration into processes thanks to the range of control types (internal, external contact, analogue)
- Also suitable for gaseous media, thanks to self-bleeding head

#### Technical details

- Stroke length: 1.25 mm, Rod force: 2,000 N
- Stroke length adjustment range: 0 – 100 % in operation and idle
- Stroke length adjustment: manually by scaled rotary dial
- Metering reproducibility is better than  $\pm 2$  % within the 30 – 100% stroke length range under defined conditions and with correct installation. Observe the information in the operating instructions
- DEVELOPAN® metering diaphragm with PTFE coating with diaphragm rupture control
- Wetted materials: Polypropylene, PVC, PTFE with carbon, clear acrylic, stainless steel, special designs available on request
- Degree of protection: IP 65 (also with open front cover)
- Short stroke solenoid drive and complete pump control integrated in the pump housing
- "Internal", "External contact" and "Analogue" control inputs available, the latter two also available as intrinsically safe and approved to EN 50020

- EXBb G for use in areas at risk from gases and vapours, degree of protection EEx [i,a] d IIC T6

This means:

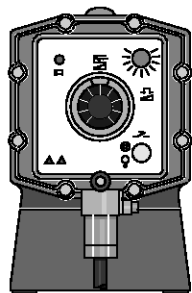
- EEx - Equipment complies with European standards
- [i,a] - Control input is intrinsically safe when 2 independent errors occur
- d - Type of ignition protection, compression-resistant enclosure
- IIC - Explosion group II for all areas at risk from explosion with the exception of mining, sub-group IIC (includes IIA and IIB)
- T6 - Temperature class permissible for gases and vapours with ignition temperature  $> 85$  °C
- EXBb M for use in mines at risk from firedamp, degree of protection EEx [i,a] d I/IIC T6

This means:

- EEx - Equipment complies with European standards
- [i,a] - Control input is intrinsically safe when 2 independent errors occur
- d - Type of ignition protection, compression-resistant enclosure
- IC - Explosion group I for mines at risk from firedamp
- IIC - Explosion group II for all areas at risk from explosion with the exception of mining, sub-group IIC (includes IIA and IIB)
- T6 - Temperature class permissible for gases and vapours with ignition temperature  $> 85$  °C

#### Field of application

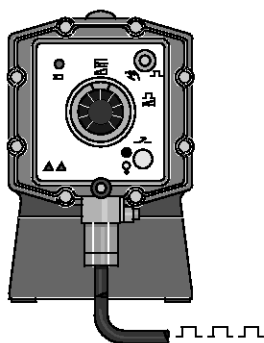
- Oil, gas and petrochemicals
- Mining
- For use in areas at risk of gases and vapours
- Use in mines at risk from firedamp



pk\_1\_020

Control type "Internal"

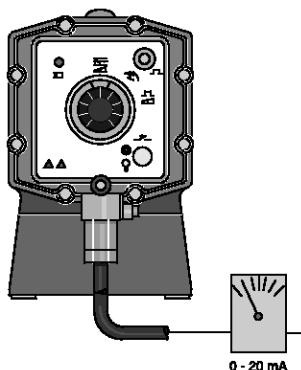
Stroke length adjustment 1:10, stroke rate adjustment 1:25, total adjustment range 1:250.



pk\_1\_019

Control type "External Contact"

Stroke length adjustment 1:10, Stroke frequency control 0 - 100% dependant upon external switch contacts. \*)



pk\_1\_018

Control type "Analogue"

Stroke length adjustment 1:10, Stroke frequency control 0-100 % proportional to analogue signal 0/4-20 mA. \*)

\*) The electrical cables for mains connection, contact or analogue control are already connected to the pump. Observe all instructions concerning connecting and activating electrical systems.

## 2.1 Diaphragm Metering Pump EXtronic®

### Technical Data

Type EXBb	Delivery rate at max. back pressure			Delivery rate at medium back pressure			Number of strokes	oØ x iØ	Suction lift	Shipping weight PP,NP,TT-SS
	bar	l/h	ml/stroke	bar	l/h	ml/stroke				
<b>EXBb</b>							<b>Strokes/min</b>	<b>mm</b>	<b>mWC</b>	<b>kg</b>
1000	10.0	0.19	0.03	5.0	0.27	0.04	120	6 x 4	1.5	12
2501	25.0	1.14	0.15	20.0	1.10	0.17	120	6 x 4	5.0	–
1601	16.0	1.00	0.15	8.0	1.30	0.18	120	6 x 4	5.0	12
1201	12.0	1.70	0.23	6.0	2.00	0.28	120	6 x 4	5.0	12
0803	8.0	3.70	0.51	4.0	3.90	0.54	120	6 x 4	3.0	12
1002	10.0	2.30	0.31	5.0	2.70	0.38	120	8 x 5	5.0	12
0308	3.0	8.60	1.20	1.5	10.30	1.43	120	8 x 5	5.0	12
2502	25.0	2.00	0.28	20.0	2.20	0.31	120	8 x 5	5.0	13
1006	10.0	6.00	0.83	5.0	7.20	1.00	120	8 x 5	5.0	13
0613	6.0	13.10	1.82	3.0	14.90	2.07	120	8 x 5	5.5	13
0417	3.5	17.40	2.42	2.0	17.90	2.49	120	12 x 9	4.5	13
2505	25.0	4.20	0.64	20.0	4.80	0.73	110	8 x 5	5.0	16
1310	13.0	10.50	1.59	6.0	11.90	1.80	110	8 x 5	5.0	16
0814	8.0	14.00	2.12	4.0	15.40	2.33	110	12 x 9	5.0	16
0430	3.5	27.00	4.09	2.0	29.50	4.47	110	DN 10	5.0	16
0260	1.5	60.00	9.09	–	–	–	110	DN 15	1.5	16
<b>EXtronic® metering pumps for high viscosity media</b>										
1002	10.0	2.30	0.31	5.0	2.70	0.38	120	DN 10	1.8	–
1006	10.0	6.00	0.83	5.0	7.20	1.00	120	DN 10	2.0	–
1310	10.0	10.50	1.59	5.0	11.90	1.80	110	DN 15	2.8	–
0814	8.0	14.00	2.12	4.0	15.40	2.33	110	DN 15	2.0	–
<b>EXtronic® metering pumps with self-bleeding liquid end</b>										
1601	16.0	0.66	0.09	–	–	–	120	6 x 4	1.8	–
1201	12.0	1.00	0.14	–	–	–	120	6 x 4	2.0	–
0803	8.0	2.40	0.33	–	–	–	120	6 x 4	2.8	–
1002	10.0	1.80	0.25	–	–	–	120	6 x 4	2.0	–

\* Shipping weight for EXBb M version... additional 14 kg

\*\* The data given here represents guaranteed minimum values, achieved with medium water at room temperature.

### Materials in contact with the medium

	Liquid end	Suction/discharge connector	Seals	Balls (connection 6-12 mm)	Balls (connection DN 10 and DN 15)
PP1	Polypropylene	Polypropylene	EPDM	Ceramic	Borosilicate glass
PP4*	Polypropylene	Polypropylene	EPDM	–	Ceramic
NP1	Plexiglass	PVC	FKM A	Ceramic	Borosilicate glass
NP3	Plexiglass	PVC	FKM B	Ceramic	–
NS3**	Plexiglass	PVC	FKM B	Ceramic	–
PS3**	PVC	PVC	FKM B	Ceramic	–
TT1	PTFE with carbon	PTFE with carbon	PTFE	Ceramic	Ceramic
SS ..	Stainless steel mat. no. 1.4404	Stainless steel mat. no. 1.4404	PTFE	Ceramic	Stainless steel mat. no. 1.4404

\* PP4 with valve springs made of Hastelloy C

\*\* NS3 and PS3 with valve springs made of Hastelloy C, valve insert made of PVDF  
FKM = fluorine rubber





## 2.1 Diaphragm Metering Pump EXtronic®

### 2.1.2 Identity Code Ordering System for EXBb

EXBb	Enclosure rating	
G	Gas-EX-proof	
M	Fire and explosion protection, permitted liquid end material: stainless steel and PTFE	
	<b>Capacity</b>	
	<b>bar</b>	<b>l/h</b>
	1000	10 0.19
	2501	25 1.14 (only available in SS and SB)
	1601	16 1.00
	1201	12 1.70
	0803	8 3.70
	1002	10 2.30
	0308	3 8.60
	2502	25 2.00 (available in SS and SB only)
	1006	10 6.00
	0613	6 13.10
	0417	4 17.40
	2505	25 4.20 (only available in SS and SB)
	1310	13 10.50 (only available in NP, PP4, SS and SB)
	0814	8 14.00
	0430	4 27.00
	0260	2 60.00
	<b>Liquid end material</b>	
	PP1	Polypropylene with EPDM O-ring
	PP4	HV Polypropylene for high viscosity liquids with EPDM O-ring and Hastelloy C valve springs (Types 1002, 1006, 1310 and 0814 only)
	NP1	Acrylic with FKM A O-ring*
	NP3	Acrylic with FKM B O-ring*
	NS3	Acrylic with FKM B O-ring*, self bleeding (Types 1601, 1201, 0803 and 1002 only)
	PS3	PVC with FKM B O-ring*, self bleeding (Types 1601, 1201, 0803 and 1002 only)
	TT1	PTFE with carbon, PTFE seal
	SS1	Stainless steel, no. 1.4404, with PTFE seal
	SS2	Stainless steel with 1/4" NPT internal thread, PTFE seal
	SB1	Stainless steel with ISO 7 Rp 1/4 internal thread, ISO 7 Rp 1/2 on type 0260, PTFE seal (recommended for flammable materials)
	SSM	as SS1, with diaphragm rupture indicator Type 2501 only
	SBM	as SB1, with diaphragm rupture indicator Type 2501 only
	<b>Valve springs</b>	
	0	No springs
	1	With 2 valve springs, 1.4571, 0.1 bar
	<b>Electrical connection</b>	
	A	230 V, 50/60 Hz
	B	115 V, 50/60 Hz
	E	500 V, 50/60 Hz
	Cable length 5 m, open end	
	<b>Control type</b>	
	0	Manual stroke rate adjustment via potentiometer
	1	External contact
	2	Analogue 0-20 mA
	3	Analogue 4-20 mA
	4	External contact, intrinsically safe [i,a]
	5	Analogue 0-20 mA, intrinsically safe [i,a]
	6	Analogue 4-20 mA, intrinsically safe [i,a]
	7	Manual with zero volts ON/OFF
	8	Manual with zero volts ON/OFF, intrinsically safe [i,a]
	<b>Control Versions</b>	
	0	With potentiometer(control type 0, 7 and 8 only)
	1	With manual auxiliary key for maximum stroke rate(control type 1-6 only)
	2	With manual auxiliary frequency changer key for maximum stroke rate(control type 1-6 only)
	<b>Approved/Language</b>	
	0	BVS - Europe, German, 100 V - 500 V
	1	BVS - Europe, English, 100 V - 500 V
	2	FM - USA, English, 115 V
	3	CSA - Canada, English, 115 V, 230 V

\* FKM = Fluorine rubber

## 2.1 Diaphragm Metering Pump EXtronic®

### Design of connectors

With PP, NP, NS, PS and TT	6, 8 and 12 mm	Hose nozzle with clamping ring
With stainless steel SS1/SSM	6, 8 and 12 mm	Swagelok system threaded connector
With stainless steel SS2	6, 8 and 12 mm	Internal thread 1/4" NPT
With stainless steel SS1/SBM	6, 8 and 12 mm	Internal thread ISO 7 Rp 1/4
With PP and NP	DN 10 and DN 15	Hose nozzle d 16 - DN 10 and d 20 - DN 15
With TT	DN 10 and DN 15	Welding sleeve d 16 - DN 10 and d 20 - DN 15 (PVDF)
With stainless steel SS1	DN 10 and DN 15	Insert with internal thread R 3/80 and R 1/2"
With stainless steel SB1	DN 10 and DN 15	Internal thread ISO 7 Rp 1/4 and 1/2

Repeatability of metering  $\pm 2$  % when performed in line with the information in the operating instructions.

For type 1601 with self-bleeding dosing head  $\pm 5$  %.

Permissible ambient temperature: -20 °C to +45 °C.

<b>Electrical connection:</b>	500 V $\pm 6$ %, 50/60 Hz
	230 V $\pm 10$ %, 50/60 Hz
	115 V $\pm 10$ %, 50/60 Hz

<b>Degree of protection:</b>	IP 65, insulation class F
------------------------------	---------------------------

Average power consumption at max. stroke rate (W)/peak current during metering stroke (A) at 230 V, 50/60 Hz

EXBb	Type 1000, 2501, 1601, 1201, 0803, 1002, 0308	13 W/0.8 A	at 120 strokes/min.
EXBb	Type 2502, 1006, 0613, 0417	35 W/1.8 A	at 120 strokes/min.
EXBb	Type 2505, 1310, 1014, 0430, 0260	45 W/2.2 A	at 110 strokes/min.

Scope of delivery: Metering pump with mains cable (5 m) and connector parts for hose/pipe connection as per the table.

### 2.1.3 Spare Parts

#### Spare parts kits ProMinent EXtronic®

##### Supplied for PP and NP versions:

- 1 metering diaphragm
- 1 suction valve compl.
- 1 discharge valve compl.
- 2 valve balls
- 1 seal set
- 1 connector set

##### Supplied for TT-PTFE versions:

- 1 metering diaphragm
- 1 suction valve compl.
- 1 discharge valve compl.
- 2 valve balls
- 2 ball seat discs
- 1 seal set
- 1 connector set

##### Supplied for NS3 and PS3 versions:

- 1 metering diaphragm
- 1 suction valve compl.
- 1 connector parts set
- 1 discharge valve compl.
- 1 bleed valve set
- 1 connector set

##### Supplied for SS stainless steel versions:

- 1 metering diaphragm
- 4 valve balls
- 4 ball seat discs
- 1 seal set
- 1 connector set



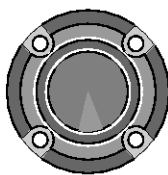


## 2.1 Diaphragm Metering Pump EXtronic®

Pump type	Materials in contact with the medium	Order no.
<b>EXBb 1000</b>	PP1	740357
	NP3	740354
	TT	910776
	SS/SK	910777
<b>EXBb 2501</b>	SBM	1020281
	SSM	1020282
<b>EXBb 1601</b>	PP1	740361
	NP3	740358
	NS3/PS3	792033
	TT	910778
	SS/SK	910779
<b>EXBb 1201</b>	PP1	740380
	NP3	740362
	NS3/PS3	792034
	TT	910780
	SS/SK	910781
<b>EXBb 0803</b>	PP1	740384
	NP3	740381
	NS3/PS3	792035
	TT	910782
	SS	910783
<b>EXBb 1002/2502</b>	PP1	740388
	NP3	740385
	NS3/PS3	792036
	TT	910784
	SS	910785
	HV/PP 4 (Type 1002)	910743
<b>EXBb 0308/1006/2505</b>	PP1	740497
	NP1	740498
	TT	910957
	SS	910959
	HV/PP4 (Type 1006)	910939
<b>EXBb 0613/1310</b>	PP1	740504
	NP1	740505
	TT	910969
	SS	910971
	HV/PP4 (Type 1310)	910941
<b>EXBb 0417/0814</b>	PP1	740501
	NP1	740502
	TT	910977
	SS	910979
	HV/PP4 (Type 0814)	910943
<b>EXBb 0430-DN 10</b>	PP1	740507
	NP1	740508
	TT	910993
	SS	910995

Replacement parts set as DN 10 with one-way ball valves.

## 2.1 Diaphragm Metering Pump EXtronic®



pk\_1\_008

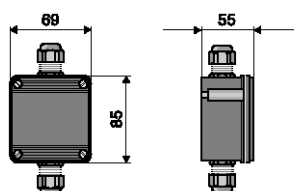
### PTFE metering diaphragms

ProMinent® DEVELOPAN® EPDM metering diaphragms with woven inner layer, integrally vulcanised steel core and PTFE Teflon coating on the side in contact with the feed chemical.

For pump type	Description	Order no.
1000	31.0 x 6.0	811452
2501	35.0 x 11.5	1000246
1601	48.0 x 9.5	811453
1201	48.0 x 12.5	811454
0803	48.0 x 18.5	811455
1002, 2502	60.0 x 17.0	811456
0308, 2505, 1006	60.0 x 28.0	811457
1310, 0613	76.0 x 37.0	811458
0814, 0417	76.0 x 45.0	811459
0430, 0230	127.5 x 63.0	811460
0260	127.5 x 91.0	811461

### 2.1.4

### Ex-Proof Ancillary Equipment

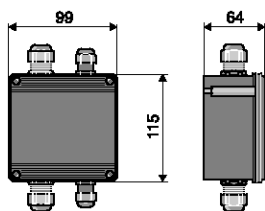


pk\_1\_023

#### Plastic terminal box: Type I

IP 66, EEx e II T 6, max. 380 V for mains connection, e.g. of ProMinent EXtronic® in areas at risk of explosion.

	Order no.
1 input, 1 output for power supply cable. 2 terminals + PE and 2 M 20-12 screw glands	1000071

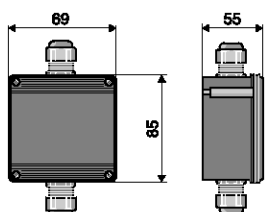


pk\_1\_021

#### Plastic terminal box: Type II

IP 66, EEx e II T 6, max. 380 V. As type I, but with additional connector for control cable (e.g. for contact water meter or DULCOMETER® controller).

	Order no.
2 inputs (mains and controller cable), 2 outputs 2 terminals + PE, 1 partition, 2 terminals and 2 M 20-12 screw glands and 2 M 16-0.8 screw glands	1000072



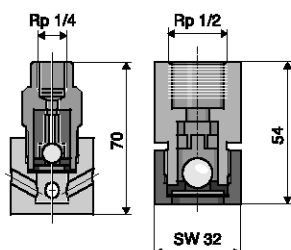
pk\_1\_022

#### Plastic terminal box: EExi Type I

IP 66, EEx ia II T 6 for intrinsically safe control cable

	Order no.
1 input, 1 output for control cable, 2 terminals and 2 M 16-0.8, blue screw glands	1000073

## 2.1 Diaphragm Metering Pump EXtronic®

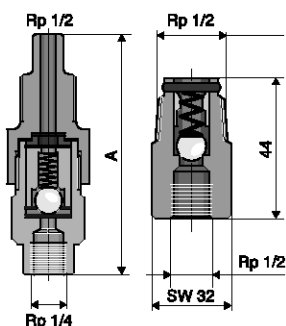


pk\_1\_30 / pk\_1\_031

### Stainless steel foot valve 1.4404 "SB"

With filter and ball check valve, designed for use with flammable materials. Materials: 1.4404/1.4401/PTFE/ceramic

	Order no.
Connector ISO 7 Rp 1/4 SB version for ProMinent EXtronic®	809301
Connector ISO 7 Rp 1/2 SB version for ProMinent EXtronic®	924561

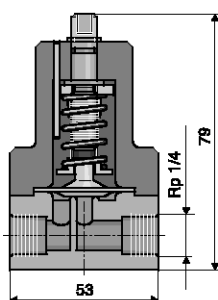


pk\_1\_032\_2 / pk\_1\_027

### Stainless steel 1.4404 "SB" metering valve

Spring-loaded ball check valve designed for use with flammable materials. Materials: 1.4404/1.4401/Hastelloy C/PTFE/ceramic

	Order no.
Connector ISO 7 Rp 1/4 - R 1/2, priming pressure approx. 0.5 bar	809302
Connector ISO 7 Rp 1/2 - R 1/2, priming pressure approx. 0.5 bar	924560



pk\_1\_029

### Adjustable "SB" back pressure valve

	Order no.
Operating range approx. 1-10 bar, closed version, designed for use with flammable materials.	924555

To generate a constant back pressure for accurate metering with a free outlet. Can also be used as an overflow valve.

### PTFE metering pipe

Carbon-filled, surface resistance  $< 10^7 \Omega$

Material	Length	Connection size o Ø x i Ø	Permissible pressure	Order no.
	m	mm	bar	
Carbon-filled PTFE	By the metre	6 x 4	12*	1024831
Carbon-filled PTFE	By the metre	8 x 5	16*	1024830
Carbon-filled PTFE	By the metre	12 x 9	9*	1024832

\* Permissible operating pressure at 20 °C in accordance with EN ISO 7751, 1/4 of the rupture pressure, assuming chemical resistance and correct connection.

**Additional ancillary equipment, i.e. foot valves, metering valves and back pressure valves in the usual material combinations, identical to gamma ancillary equipment and/or for connector DN 15 Vario ancillary equipment.**

(Hydraulic/Mechanical Accessories see p. → 1-47)



## 2.1 Diaphragm Metering Pump EXtronic®



pk\_1\_028

### Stainless steel straight threaded connectors

Swagelok system in stainless steel SS 316 (1.4401) for connection of pipework to liquid ends and valves with internal thread and for SB version.

Normal threaded seal compounds required.

	Order no.
6 mm - ISO 7 R 1/4	359526
8 mm - ISO 7 R 1/4	359527
12 mm - ISO 7 R 1/4	359528
16 mm - ISO 7 R 1/2	359529





## 2.2 Diaphragm Metering Pump Makro TZ

### 2.2.1

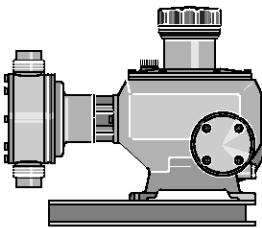
### Diaphragm Metering Pump Makro TZ

**Capacity range of single pump: 260 – 2,100 l/h, 12 – 4 bar**

**Greater safety in continuous operation through mechanically deflected multi-layer safety diaphragm**



The modular construction of the diaphragm metering pump Makro TZ with adjustable eccentric drive mechanism and mechanically deflected multi-layer safety diaphragm makes it wonderfully adaptable to the capacity requirements of the respective application.



The diaphragm metering pump Makro TZ (TZMb) has an adjustable eccentric drive mechanism and, together with the Makro TZ plunger metering pump, forms a range of drive mechanisms with stroke lengths of 10 and/or 20 mm. This covers the capacity range from 8 to 2,100 l/h at 320 – 4 bar. A wide range of drive versions is available, including some for use in Exe and Exde areas with ATEX certification.

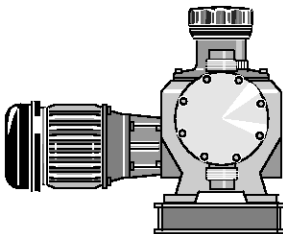
#### Your benefits

Excellent process safety and reliability:

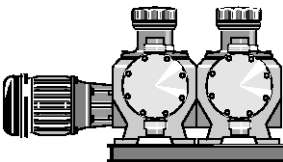
- Patented multi-layer safety diaphragm with integral diaphragm rupture warning system
- Metering reproducibility is better than  $\pm 2\%$  within the 30 – 100 % stroke length range under defined conditions and with correct installation

Excellent flexibility:

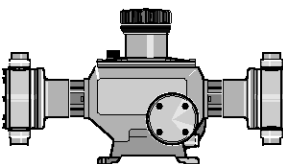
- The modular construction with single and double head versions permits a wide range of applications, with the double head designs being operated in push-pull mode
- It is possible to combine up to 4 metering units, even with different pump capacities, in multiple pump systems
- 5 different gear ratios are available
- Customised designs are available on request



pk\_2\_012  
Makro TZ TZMb



pk\_2\_013  
Makro TZ externally mounted pump



pk\_2\_014  
Makro TZ double head pump

#### Technical details

- Stroke length: 0-10 mm, Rod force: 8,000 N
- Stroke length adjustment range: 0 – 100 %
- Stroke length adjustment: manually by scaled rotary dial in 0.5% increments (optionally with electric actuator or control drive)
- Metering reproducibility is better than  $\pm 2\%$  within the 30 – 100% stroke length range under defined conditions and with correct installation. Observe the information in the operating instructions
- Patented multi-layer safety diaphragm with optical diaphragm rupture display (optionally with electrical diaphragm rupture warning system / warning via a contact)
- Wetted materials: Polypropylene, PVC, PTFE+25% carbon, stainless steel 1.4571. Special materials are available on request
- A wide range of power end versions is available: three-phase standard or 1-phase AC motor, motors for use in Exe and Exde areas, different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Salt water-resistant, acrylic resin-coated cast aluminium housing
- For reasons of safety, provide suitable overload protection mechanisms in all mechanically deflected diaphragm metering pumps

#### Field of application

- Volume-proportional metering of chemicals/additives in water treatment
- Metering of reactants and catalysts in the chemical industry
- Level-dependent metering of additives in industrial production engineering

## 2.2 Diaphragm Metering Pump Makro TZ

### Technical Data

Type TZMb	With 1500 rpm motor at 50 Hz				With 1800 rpm motor at 60 Hz				Suction lift	Connection, suction/ discharge side	Shipping weight PP,NP,TT-SS  kg
	Delivery rate at max. back pressure			Max. stroke rate	Delivery rate at max. back pressure			Max. stroke rate			
	bar	l/h	ml/stroke		Strokes/ min	psi	l/h				
120260	12	260	60	72	174	312	82	86	4.0	1 1/2–25	46/54
120340	12	340	60	96	174	408	108	115	4.0	1 1/2–25	46/54
120430	12	430	60	120	174	516	136	144	4.0	1 1/2–25	46/54
120510	12	510	60	144	174	622	164	173	4.0	1 1/2–25	46/54
120650	12	640	60	180	174	–	–	–	4.0	1 1/2–25	46/54
070430	7	430	99	72	100	516	136	86	3.5	2–32	50/64
070570	7	570	99	96	100	684	181	115	3.5	2–32	50/64
070720	7	720	99	120	100	864	228	144	3.5	2–32	50/64
070860	7	860	99	144	100	1,032	273	173	3.5	2–32	50/64
071070	7	1,070	99	180	100	–	–	–	3.5	2–32	50/64
040840	4	840	194	72	58	1,008	266	86	3.0	2 1/4–40	56/80
041100	4	1,100	194	96	58	1,320	349	115	3.0	2 1/4–40	56/80
041400	4	1,400	194	120	58	1,680	444	144	3.0	2 1/4–40	56/80
041670	4	1,670	194	144	58	2,004	529	173	3.0	2 1/4–40	56/80
042100	4	2,100	194	180	58	–	–	–	3.0	2 1/4–40	56/80

Stroke length 10 mm

Plastic material design: max. 10 bar back pressure

The permissible priming pressure on the suction side is approximately 50% of the max. permitted back pressure

### Materials in contact with the medium

Liquid end			DN 25 ball valves			DN 32/DN 40 plate valves **		
			Seals	Valve balls	Valve seats	Seals	Valve plates/valve spring	Valve seats
PPT	Polypropylene	PVDF	PTFE	Borosilicate glass	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
PCT	PVC	PVDF	PTFE	Borosilicate glass	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
TTT	PTFE with carbon	PVDF	PTFE	Ceramic	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
SST	Stainless steel mat. no. 1.4404	Stainless steel mat. no. 1.4581	PTFE	Stainless steel mat. no. 1.4401	PTFE	PTFE	Stainless steel 1.4404/Hast. C	PTFE

Multi-layer safety diaphragms with PTFE coating.

\*\* The valve spring is coated with CTFE (similar to PTFE)  
Special versions on request.



## 2.2 Diaphragm Metering Pump Makro TZ

### 2.2.2

## Identity Code Ordering System for TZMb

### Makro TZMb mechanically deflected diaphragm metering pump

TZMb	Drive type	
H	Main drive	
A	Add-on drive	
D	Double main drive	
B	Double add-on drive	
Type*		
120260	070430	040840
120340	070570	041100
120430	070720	041400
120510	070860	041670
120650	071070	042100
Liquid end material **		
PC	PVC	
PP	Polypropylene	
SS	Stainless steel	
TT	PTFE + 25% carbon	
Sealing material		
T	PTFE	
Displacement body		
1	Multi-layer safety diaphragm with rupture indicator	
Liquid end version		
0	No valve springs	
1	With valve springs	
Hydraulic connection		
0	Standard connection	
1	PVC union nut and insert	
2	PP union nut and insert	
3	PVDF union nut and insert	
4	SS union nut and insert	
Version		
0	with ProMinent® logo	
2	No ProMinent® logo	
A	With ProMinent® logo, with frame, simplex	
B	With ProMinent® logo, with frame, duplex	
C	With ProMinent® logo, with frame, triplex	
M	Modified	
Electrical power supply		
S	3 ph. 230/400 V 50/60 Hz (WBS)	
R	Variable speed motor, 4-pole, 230/400 V	
V (0)	Variable speed motor with integr. frequency converter	
Z	Speed control kit	
L	3 ph. 230/400 V 50 Hz (Exe, Exd)	
P	3 ph. 230/400 V 60 Hz (Exe, Exd)	
V (2)	Variable speed motor with integr. frequency converter (Exd)	
4	No motor, with 56 C flange	
7	No motor, with 120/80 flange	
8	No motor, with 160/90 flange	
0	No motor, externally mounted drive	
Enclosure rating		
0	IP 55 (Standard) ISO class F	
1	Exe version ATEX-T3	
2	Exd version ATEX-T4	
A	ATEX power end	
Stroke sensor		
0	No stroke sensor	
1	With stroke sensor (Namur)	
Stroke length adjustment		
0	Stroke length adjustment, manual	
1	230 V stroke actuator	
2	115 V stroke actuator	
3	230 V 0-20 mA stroke controller	
4	230 V 4-20 mA stroke controller	
5	115 V 0-20 mA stroke controller	
6	115 V 4-20 mA stroke controller (servo motors for Ex zones on request)	
Application		
0	Standard	

\* Digits 1 + 2=back pressure [bar]; digits 3 - 6=capacity [l/h]

\*\* Material version PCT/PPT/TTT max. 10 bar



## 2.2 Diaphragm Metering Pump Makro TZ

### Motor Data

Identity code specification		Power supply			Remarks
S	3 ph, IP 55	220-240 V/380-420 V 250-280 V/440-480 V	50 Hz 60 Hz	0.75 kW	
R	3 ph, IP 55	230 V/400 V	50/60 Hz	1.5 kW	With PTC, speed adjustment range 1:20 with external fan 1ph 230 V; 50/60Hz
V0	1 ph, IP 55	230 V $\pm$ 5 %	50/60 Hz	1.1 kW	Variable speed motor with integrated frequency converter
L1	3 ph, II2GEEexIIIT3	220-240 V/380-420 V	50 Hz	0.75 kW	
L2	3 ph, II2GEEExdIICT4	220-240 V/380-420 V	50 Hz	0.75 kW	With PTC, speed control range 1:5
P1	3 ph, II2GEEexIIIT3	250-280 V/440-480 V	60 Hz	0.75 kW	
P2	3 ph, II2GEEExdIICT4	250-280 V/440-480 V	60 Hz	0.75 kW	With PTC, speed control range 1:5
V2	3 ph, II2GEEExdIICT4	400 V $\pm$ 10 %	50/60 Hz	1.5 kW	Ex-variable speed motor with integrated frequency converter

Motor data sheets can be requested for more information.

Special motors or special motor flanges are available on request.

The motors are designed in compliance with the Ecodesign Directive 2005/32/EC (IE2 standard).

#### Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 94/9/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label corresponds to or is better than the conditions prevalent in the intended field of application.

### 2.2.3

### Spare Parts

The spare parts kit generally includes the wear parts for the liquid ends.

- 1 Metering diaphragm (multi-layer safety diaphragm)
- 1 Suction valve complete
- 1 Discharge valve complete
- 2 Valve balls (DN 32/DN 40 with plate and spring)
- 1 Complete sealing set (O-rings or flat seals, valve seats, valve seat bushings)

#### Makro TZ (TZMb) spare parts kits

**Identity code: 120260, 120340, 120430, 120510, 120650**

Liquid end	Materials in contact with the medium	Order no.
FM 650 - DN 25	PCT, PPT, TTT	1025164
	SST	1022896
	SST (without valve cpl.)	1022895

**Identity code: 070430, 070570, 070720, 070860, 071070**

Liquid end	Materials in contact with the medium	Order no.
FM 1100 - DN 32	PCT, PPT, TTT	1025167
	SST	1022917
	SST (without valve cpl.)	1022916



## 2.2 Diaphragm Metering Pump Makro TZ

**Identity code: 040840, 041100, 041400, 041670, 042100**

Liquid end	Materials in contact with the medium	Order no.
FM 2100 - DN 40	PCT, PPT, TTT	1025169
	SST	1022930
	SST (without valve cpl.)	1022929

### Multi-layer Metering Diaphragm for TZMb

ProMinent multi-layer safety diaphragm with diaphragm rupture warning system and PTFE Teflon coating on the wetted side.

Pump type	Order no.
Identity code: 120260, 120340, 120430, 120510, 120650; Makro TZ FM 650	1022887
Identity code: 070430, 070570, 070720, 070860, 071070; Makro TZ FM 1100	1022900
Identity code: 040840, 041100, 041400, 041670, 042100; Makro TZ FM 2100	1022921

### Makro TZ spare parts kits for TZMa

**Identity code: 120190, 120254, 120317, 120381**

Liquid end	Materials in contact with the medium	Order no.
Liquid end FM 530 - DN 25	PP	910452
	P	910455
	T	910458
	S (without valve cpl.)	910475
	S	910461

**Identity code: 060397, 060529, 060661, 060793**

Liquid end	Materials in contact with the medium	Order no.
Liquid end FM 530 - DN 25	PP	910453
	P	910456
	T	910459
	S (without valve cpl.)	910476
	S	910462

**Identity code: 030750, 031000, 031250, 031500, 031875, 031050 , 031395, 031740, 032100, 032500**

Liquid end	Materials in contact with the medium	Order no.
Liquid end FM 1500/2100	PP	1001573
	P	1001574
	T	1001575
	S (without valve cpl.)	1001577
	S	1001576

## 2.2 Diaphragm Metering Pump Makro TZ

### PTFE metering diaphragms for TZMa

ProMinent® DEVELOPAN® metering diaphragms with a generously-sized steel core vulcanised into fibre reinforced EPDM, with a PTFE Teflon coating on the process-wetted side.

Pump type	Order no.
Identity code: 100190, 120190, 100254, 100317, 120317, 100381, 120381; Makro TZ FM 260	811471
Identity code: 060397, 060529, 060661, 060793; Makro TZ FM 530	811472
Identity code: 030750, 031000, 031250, 031500, 031050, 031395, 031740, 032100, 032500; Makro TZ FM 1500/FM 2100	811473

### Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 94/9/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label corresponds to or is better than the conditions prevalent in the intended field of application.





## 2.3 Diaphragm Metering Pump Makro/ 5

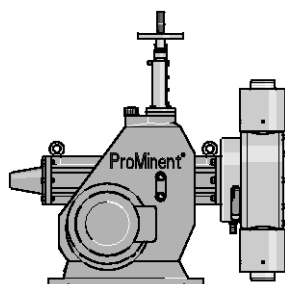
### 2.3.1

### Diaphragm Metering Pump Makro/ 5

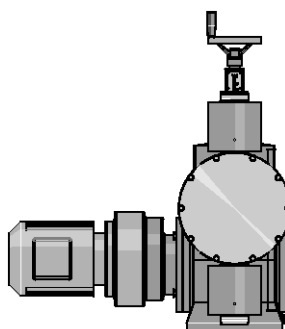
**It is not possible to do more with a mechanically deflected diaphragm**

**Capacity range of single pump: 1,540 – 4,000 l/h, 4 bar**

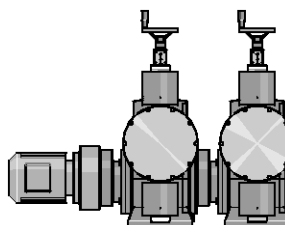
The diaphragm metering pump Makro/ 5 is used to meter reactants and catalysts in the chemical industry. Thanks to its modular construction, it can adapt outstandingly to the actual requirements of each application.



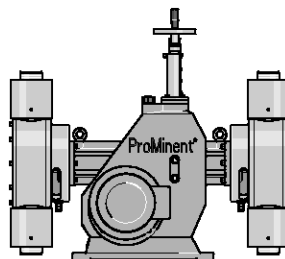
pk\_2\_099  
Makro/ 5 M5Ma



pk\_2\_093



pk\_2\_098  
Makro/ 5 externally mounted pump



pk\_2\_095  
Makro/ 5 double head pump

The diaphragm metering pump Makro/ 5 (M5Ma) together with the Makro/ 5 hydraulic diaphragm and plunger metering pumps form a range of drive mechanisms with stroke lengths of 20 and/or 50 mm. This covers the capacity range from 38 to 6,000 l/h at 320 – 4 bar. A wide range of drive versions is available, including some for use in Exe and Exde areas with ATEX certification.

#### Your benefits

Process reliability:

- Metering reproducibility is better than  $\pm 2\%$  within the 30-100 % stroke length range under defined conditions and with correct installation.

Excellent flexibility:

- The modular construction with single and double head versions permits a wide range of applications, with the double head designs being operated in push-pull mode
- It is possible to combine up to 4 metering units, even with different pump capacities, in multiple pump systems
- 5 different gear ratios are available
- Customised designs are available on request

#### Technical details

- Stroke length: 0-20 mm, Rod force: 10,000 N
- Stroke length adjustment range: 0 – 100 %
- Stroke length adjustment: manually by means of a manual adjustment wheel and scaled display in 0.5% increments (optionally with electric actuator or control drive)
- Metering reproducibility is better than  $\pm 2\%$  within the 30 – 100% stroke length range under defined conditions and with correct installation. Observe the information in the operating instructions
- Wetted materials: Polypropylene, PVC, PTFE+25% carbon, stainless steel 1.4571, special materials are available on request
- A wide range of power end versions is available: three-phase standard motors, motors for use in Exe and Exde areas and different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Salt water-resistant, acrylic resin-coated cast aluminium housing
- For reasons of safety, provide suitable overload protection mechanisms in all mechanically deflected diaphragm metering pumps

#### Field of application

- Volume-proportional metering of chemicals/additives in water treatment
- Metering of reactants and catalysts in the chemical industry
- Level-dependent metering of additives in industrial production engineering

## 2.3 Diaphragm Metering Pump Makro/ 5

### Technical Data

Type M5Ma	With 1500 rpm motor at 50 Hz				With 1800 rpm motor at 60 Hz				Suction lift  mWC	Connection, suction/ discharge side  G-DN	Shipping weight  kg
	bar	Delivery rate at max. back pressure l/h	ml/stroke	Max. stroke rate Strokes/min	psi	Delivery rate at max. back pressure l/h	gph (US)	Max. stroke rate Strokes/min			
041540	4	1,540	427	60	58	1,822	481	71	3.0	2 3/4-50	320
041900	4	1,900	427	75	58	2,254	595	89	3.0	2 3/4-50	320
042600	4	2,600	427	103	58	3,104	820	123	3.0	2 3/4-50	320
043400	4	3,400	427	133	58	4,064	1,074	159	3.0	2 3/4-50	320
044000	4	4,000	427	156	58	–	–	–	3.0	2 3/4-50	320

Stainless steel version: Shipping weight 340 kg

The permissible admission pressure on the intake side is approx. 50 % of the maximum permissible back pressure.

### Materials in contact with the medium

DN 50 plate valves					
	Liquid end	Suction/discharge valve	Seals	Valve plates/valve spring	Valve seats
PPT	Polypropylene	Polypropylene	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
PCT	PVC	PVC	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
TTT	PTFE with carbon	PTFE with carbon	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
SST	Stainless steel mat. no. 1.4571/1.4404	Stainless steel mat. no. 1.4571/1.4404	PTFE	Stainless steel mat. no. 1.4404/ Hast. C	PTFE

DEVELOPAN® metering diaphragm with PTFE coating.

\*\* The valve spring is coated with CTFE (similar to PTFE)

Special versions on request.

### Motor Data

Identity code specification	Power supply		Remarks	
S	3 ph, IP 55	220-240 V/380-420 V 250-280 V/440-480 V	50 Hz 60 Hz	3 kW
R	3 ph, IP 55	230 V/400 V	50/60 Hz	3 kW
L1	3 ph, II2GEEExIIIT3	220-240 V/380-420 V	50 Hz	3.6 kW
L2	3 ph, II2GEEExIICT4	220-240 V/380-420 V	50 Hz	4 kW
P1	3 ph, II2GEEExIIIT3	250-280 V/440-480 V	60 Hz	3.6 kW
P2	3 ph, II2GEEExIICT4	250-280 V/440-480 V	60 Hz	4 kW

Motor data sheets can be requested for more information.

Special motors or special motor flanges are available on request.

The motors are designed in compliance with the Ecodesign Directive 2005/32/EC (IE2 standard).

### Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 94/9/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label corresponds to or is better than the conditions prevalent in the intended field of application.



## 2.3 Diaphragm Metering Pump Makro/ 5

### 2.3.2 Identity Code Ordering System M5Ma

#### M5Ma motor-driven mechanically deflected diaphragm metering pump

M5Ma	Drive type
H	Main drive
D	Double main drive
A	Add-on drive
B	Double add-on drive
<b>Type</b>	
041540	
041900	
042600	
043400	
044000	
<b>Liquid end material</b>	
PC	PVC
PP	Polypropylene
SS	Stainless steel
TT	PTFE + 25 % carbon
<b>Sealing material</b>	
T	PTFE
<b>Displacement body</b>	
T	Pump diaphragm with PTFE coating
<b>Liquid end version</b>	
1	With valve springs, Hast. C; 0.1 bar
<b>Hydraulic connection</b>	
0	Standard connection
1	PVC union nut and insert
2	PP union nut and insert
3	PVDF union nut and insert
4	SS union nut and insert
<b>Version</b>	
0	With ProMinent® logo, no frame
1	Without ProMinent® logo, no frame
A	With ProMinent® logo, with frame, simplex
B	With ProMinent® logo, with frame, duplex
C	With ProMinent® logo, with frame, triplex
D	With ProMinent® logo, with frame, quadruplex
M	Modified
<b>Electrical power supply</b>	
S	3 ph. 230/400 V 50/60 Hz (WBS)
R	Variable speed motor 4-pole 230/400 V (R 1:5)
Z	Speed control complete 230/400 V, 50/60 Hz
L	3 ph. 230/400 V 50 Hz (Exe, Exd)
P	3 ph. 460 V 60 Hz (Exe, Exd)
5	No motor, with IEC 100 gearbox
6	No motor, with IEC 112 gearbox
0	No motor, no gearbox
<b>Enclosure rating</b>	
0	IP 55 (Standard) ISO class F
1	Exe version ATEX-T3
2	Exd version ATEX-T4
A	ATEX power end
<b>Stroke sensor</b>	
0	No stroke sensor
1	With stroke sensor (Namura)
<b>Stroke length adjustment</b>	
0	Stroke length adjustment, manual
3	230 V 0-20 mA stroke controller
4	230 V 4-20 mA stroke controller
5	115 V 0-20 mA stroke controller
6	Control drive 115 V 4-20 mA
	Other designs, such as explosion-proof, on request
<b>Application</b>	
0	Standard

## 2.3 Diaphragm Metering Pump Makro/ 5

### 2.3.3

### Spare Parts

#### Spare parts kit Makro/ 5 HM

The replacement part kit in general includes wear parts for the liquid ends.

- 1 Metering diaphragm
- 1 Suction valve compl.
- 1 Discharge valve compl.
- 2 Valve plate and Hast. C spring
- 1 Seal kit complete (envelope rings, valve seat/valve seat bushing)

Liquid end	Order no.
FM 4000 PCT	1008172
FM 4000 PPT	1008171
FM 4000 TTT	1008173
FM 4000 SST (without valves cpl.)	1008174

#### PTFE metering diaphragm

DEVELOPAN® diaphragm made of EPDM with woven fabric inlay, large-area, vulcanised aluminium core and PTFE-Teflon layer on the side in contact with the medium.

	Order no.
Metering diaphragm for Makro/ 5 FM 4000	1009023







## 2.4 Hydraulic Diaphragm Metering Pumps Hydro

### 2.4.1

### Hydraulic Diaphragm Metering Pumps Hydro

**Flexible metering with excellent process reliability in the medium pressure range? Not a problem for the hydraulic diaphragm metering pumps Hydro/ 2**

**Capacity range of single pump: 3 – 72 l/h, 100 – 25 bar**



As an extremely robust hydraulic diaphragm metering pump, the Hydro/ 2 meets the most exacting safety requirements. Its modular construction, with either one or two dosing heads, 4 gear ratios, 2 dosing head sizes and 3 dosing head materials, offers a very high degree of flexibility in terms of areas of application.

The Hydro/ 2 hydraulic diaphragm metering pump (HP2a) together with the Hydro/ 3 and Hydro/ 4 pumps represent an integrated product range with stroke lengths of 15 and/or 20 mm. This covers the capacity range from 3 to 1,450 l/h at 100 – 7 bar. A wide range of drive versions is available, including some for use in Exe and Exde areas with ATEX certification. The Hydro product range is designed to comply with API 675 among others.

#### Your benefits

Excellent process safety and reliability:

- PTFE multi-layer diaphragm with integral diaphragm rupture warning system
- Integral hydraulic relief valve
- Metering reproducibility is better than  $\pm 1\%$  within the 20-100% stroke volume range under defined conditions and with proper installation

Excellent flexibility:

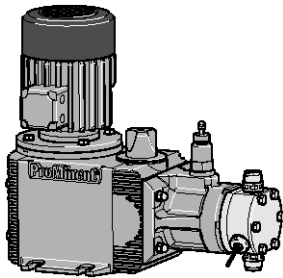
- The modular construction with single and double head versions permits a wide range of applications, with the double head designs being operated in push-pull mode
- It is possible to combine up to 5 metering units, even with different pump capacities, in multiple pump systems
- 5 different gear ratios are available

#### Technical details

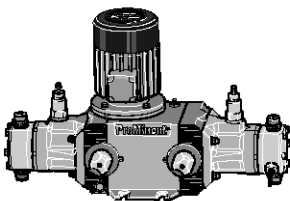
- Stroke length: 15 mm, Rod force: 2,000 N
- Stroke volume adjustment range: 0 – 100 %
- Stroke volume adjustment: manually by scaled rotary dial (optionally with electric actuator or control drive)
- Metering reproducibility is better than  $\pm 1\%$  in the 20 to 100% stroke volume range under defined conditions and with correct installation
- PTFE multi-layer diaphragm with electric diaphragm rupture warning system via a contact
- Integrated hydraulic relief and bleed valve
- Wetted materials: PVDF, PTFE+25 % carbon, stainless steel 1.4571, Hastelloy C.
- A wide range of power end versions is available: three-phase standard or 1-phase AC motor, motors for use in Exe and Exde areas, different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Design in compliance with API 675 among others

#### Field of application

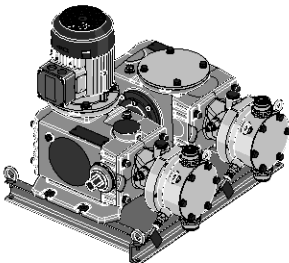
- Oil and gas industry
- Volume-proportional metering of chemicals/additives in the treatment of boiler feed water
- Metering of reactants and catalysts in the chemical industry
- Level-dependent metering of auxiliary agents in industrial production engineering, for instance hot wax metering in the production of adhesive strips



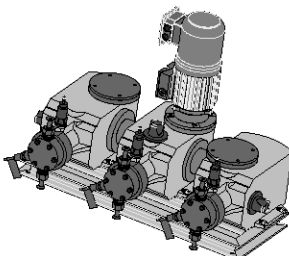
pk\_2\_074  
Hydro



pk\_2\_073  
Hydro double head pump



P\_HY\_0040\_SW1  
Hydro externally mounted pump



P\_PZ\_0001\_SW1  
Hydro triplex pump

## 2.4 Hydraulic Diaphragm Metering Pumps Hydro

### Technical Data

Type HP2a	With 1500 rpm motor at 50 Hz				With 1800 rpm motor at 60 Hz			Suction lift	Perm. pre-pressure suction side	Connection on suction/pressure side	Shipping weight	Plunger Ø
	Delivery rate at max. back pressure		Max. stroke rate	Delivery rate at max. back pressure		Max. stroke rate						
	bar	l/h		ml/stroke	Strokes/min		psi					
								mWC	bar	G-DN	kg	mm
100003*	100	3	0.8	60	1,450	3.6/1.0	72	3.0	5	Rp 1/4	31	16
100006*	100	6	0.8	125	1,450	7.0/1.8	150	3.0	5	Rp 1/4	31	16
100007*	100	7	0.8	150	1,450	8.0/2.1	180	3.0	5	Rp 1/4	31	16
100009*	100	9	0.8	187	1,450	11.0/2.9	224	3.0	5	Rp 1/4	31	16
100010*	100	10	0.8	212	–	–	–	3.0	5	Rp 1/4	31	16
064007	64	7	2.0	60	928	8.4/2.2	72	3.0	5	G 3/4-10	31	18
064015	64	15	2.0	125	928	18.0/4.8	150	3.0	5	G 3/4-10	31	18
064018	64	18	2.0	150	928	21.0/5.5	180	3.0	5	G 3/4-10	31	18
064022	64	22	2.0	187	928	26.0/6.9	224	3.0	5	G 3/4-10	31	18
064025	64	25	2.0	212	–	–	–	3.0	5	G 3/4-10	31	18
025019	25	19	5.3	60	362	23.0/6.1	72	3.0	5	G 3/4-10**	31	26
025040	25	40	5.3	125	362	48.0/12.7	150	3.0	5	G 3/4-10**	31	26
025048	25	48	5.3	150	362	58.0/15.3	180	3.0	5	G 3/4-10**	31	26
025060	25	60	5.3	187	362	72.0/19.0	224	3.0	5	G 3/4-10**	31	26
025068	25	68	5.3	212	–	–	–	3.0	5	G 3/4-10**	31	26

Material version PVDF max. 25 bar.

\* Material design SST/HCT with double ball valve, valve connector on the suction-pressure side as standard with internal thread Rp 1/4 and external thread G 3/4 - DN 10      \*\* HV design with G1 - DN 15 connector

### Materials in contact with the medium

Material	Dosing head	Suction/pressure connector	Seals/ball seat	Balls
SST	Stainless steel 1.4571/1.4404	Stainless steel 1.4581	PTFE/ZrO <sub>2</sub>	Ceramic
PVT	PVDF (polyvinylidene fluoride)	PVDF (polyvinylidene fluoride)	PTFE/PTFE	Ceramic
HCT	Hast. C	Hast. C	PTFE/Hast. C	Ceramic
TTT*	PTFE + 25 % carbon	PVDF (polyvinylidene fluoride)	PTFE/PTFE	Ceramic

\* Specifically for areas at risk from explosion

### Motor Data

Identity code specification	Power supply				Remarks
S	3 ph, IP 55	220-240 V/380-420 V 250-280 V/440-480 V	50 Hz 60 Hz	0.37 kW	
T	3 ph, IP 55	220-240 V/380-420 V 265-280 V/440-480 V	50 Hz 60 Hz	0.37 kW	With PTC, speed adjustment range 1:5
R	3 ph, IP 55	230 V/400 V	50/60 Hz	0.37 kW	With PTC, speed adjustment range 1:20 with external fan 1ph 230 V; 50/60Hz
V0	1 ph, IP 55	230 V ±10 %	50/60 Hz	0.37 kW	Variable speed motor with integrated frequency converter
L1	3 ph, II2GEEExIIIT3	220-240 V/380-420 V	50 Hz	0.37 kW	
L2	3 ph, II2GEEExdIICT4	220-240 V/380-420 V	50 Hz	0.37 kW	With PTC, speed adjustment range 1:5
P1	3 ph, II2GEEExIIIT3	254-277 V/440-480 V	60 Hz	0.37 kW	
P2	3 ph, II2GEEExdIICT4	254-277 V/440-480 V	60 Hz	0.37 kW	With PTC, speed adjustment range 1:5
V2	3 ph, II2GEEExdIICT4	400 V ±10 %	50/60 Hz	0.55 kW	Ex-variable speed motor with integrated frequency converter.

Motor data sheets can be requested for more information.

Special motors or special motor flanges are available on request.

The motors are designed in compliance with the Ecodesign Directive 2005/32/EC (IE2 standard).

### Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 94/9/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label corresponds to or is better than the conditions prevalent in the intended field of application.





## 2.4 Hydraulic Diaphragm Metering Pumps Hydro

### 2.4.2 Identity Code Ordering System HP2a

#### Hydro/ 2 (HP2a)

HP2a	Drive type	
H	Main drive	
D	Main drive, double-head version	
E	Main drive for add on drive	
F	Main drive, double-head version for add-on drive	
A	Add-on drive	
B	Double-head version add-on drive	
T	Triplex comprising 3 power ends and 3 identical heads	
Type*		
	bar	l/h
100003	100	3
100006	100	6
100007	100	7
100009	100	9
100010	100	10
	bar	l/h
064007	64	7
064015	64	15
064018	64	18
064022	64	22
064025	64	25
	bar	l/h
025019	25	19
025040	25	40
025048	25	48
025060	25	60
025068	25	68
Liquid end material		
SS	Stainless steel	
PV	PVDF (only for 025019 - 025068, 064007 - 064025)	
HC	Hastelloy C	
TT	PTFE + 25 % carbon	
Sealing material*		
T	PTFE	
Displacement body*		
0	Standard multi-layer diaphragm with rupture signalling facility	
Liquid end version		
0	No valve springs (standard)	
1	With valve springs	
D	Double ball valve (only for SST and HCT)	
H	HV version (only for 025019-025060)	
Hydraulic connection		
0	Standard threaded connector	
E	With DIN ISO flange	
F	With ANSI flange	
Version		
0	with ProMinent® logo	
1	without ProMinent® logo	
M	Modified	
Electrical power supply		
S	3 ph, 230/400 V, 50/60 Hz, 0,37 kW	
T	3 ph, 230/400 V, 50/60 Hz, with PTC	
R	3 ph, Variable speed motor, 230 V/400 V, 0.37 kW	
V (0)	Variable speed motor with integrated frequency converter	
Z	1 ph, Variable speed control set, 230 V, 50/60 Hz	
L	3 ph, 230/400 V, 50 Hz (Exe, Exd), 0.37 kW	
P	3 ph, 265/400 V, 60 Hz (Exe, Exd), 0.37 kW	
V (2)	Variable speed motor with integr. frequency converter (Exd)	
1	No motor, with flange 200/80	
3	No motor, with flange B 5, size 71	
4	No motor, with flange NEMA 56 C	
0	Add on drive	
Enclosure rating		
0	IP 55 (standard)	
1	Exe motor version ATEX-T3	
2	Exde motor version ATEX-T4	
A	ATEX power end	
Stroke sensor		
0	No stroke sensor (standard)	
1	Stroke sensor (for explosion-proof applications)	
Stroke length adjustment		
0	Manual (standard)	
1	With stroke positioning motor, 230 V/50/60 Hz	
2	With stroke positioning motor, 115 V/60 Hz	
A	With stroke control motor 0...20 mA 230 V/50/60 Hz	
B	With stroke control motor 4...20 mA 230 V/50/60 Hz	
C	With stroke control motor 0...20 mA 115 V/60 Hz	
D	With stroke control motor 4...20 mA 115 V/60 Hz	
Hydraulic oil		
0	Standard	
1	Food grade	
2	Low temperature to -25 °C	
3	Low temperature Zone 2	

\* PVT max. 25 bar

## 2.4 Hydraulic Diaphragm Metering Pumps Hydro

### 2.4.3 Spare Parts Kits

The spare parts kits generally include liquid end consumables.

#### Supplied as standard for SST/HCT stainless steel material version

- 1 metering diaphragm
- 2 valve balls
- 1 seal set

#### Supplied as standard for PVT material version

- 1 metering diaphragm
- 1 suction connector set
- 1 discharge connector set
- 2 valve balls
- 1 seal set

#### Spare parts kits for Hydro/ 2

Applies to identity code: Type 100010, 100009, 100007, 100006, 100003, 064025, 064022, 064018, 064015, 064007

Liquid end	Materials in contact with the medium	Order no.
FMH 25 - DN 10	PVT	1005548
	SST	1005549
	SST (for double ball valves)	1029260
	HCT	1009571
	SST (with valve set)	1005550

Applies to identity code: Type 025068, 025060, 025048, 025040, 025019

Liquid end	Materials in contact with the medium	Order no.
FMH 60 - DN 10	PVT	1005552
	SST	1005553
	SST (for double ball valves)	1005555
	HCT	1009573
	SST (with valve set)	1005554

#### Hydro/ 2 PTFE metering diaphragms / 1.4404

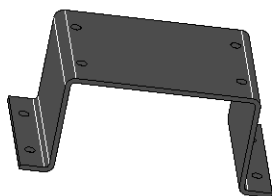
Liquid end		Order no.
FMH 25	Applies to identity code (SST): 100010, 100009, 100007, 100006, 100003, 064025, 064022, 064018, 064015, 064007	1005545
FMH 60	Applies to identity code (SST): 025068, 025060, 025048, 025040, 025019	1005546

#### Hydro/ 2 Pump diaphragms PTFE/Hastelloy C coated

Liquid end		Order no.
FMH 25	Applies to identity code (PVT/HCT): 064025, 064022, 064018, 064015, 064007	1006481
FMH 60	Applies to identity code: 025068, 025060, 025048, 025040, 025019	1006482

#### Base for Hydro hydraulic diaphragm metering pumps

	Order no.
Base for Hydro/ 2, dimensions: 300 x 160 x 128 mm (LxWxH)	1005660



P\_PZ\_0010\_SW1

## 2.5 Hydraulik-Membrandosierpumpe Hydro/ 3

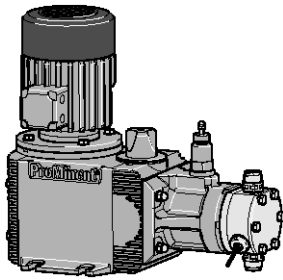
### 2.5.1

### Hydraulik-Membrandosierpumpe Hydro/ 3

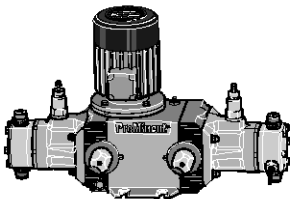
**Flexible metering with excellent process reliability in the medium pressure range? Not a problem for the hydraulic diaphragm metering pumps Hydro/ 3**

**Capacity range of single pump: 10 – 180 l/h, 100 – 25 bar**

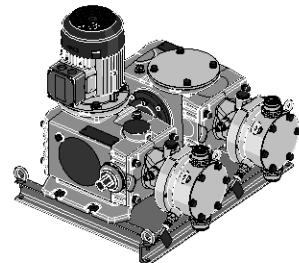
The Hydro/ 3 is an extremely robust hydraulic diaphragm metering pump. It meets the most exacting safety requirements. Its modular construction offers extremely good flexibility in terms of application, for example in the oil and gas industry.



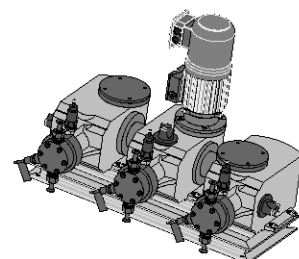
pk\_2\_074  
Hydro



pk\_2\_073  
Hydro double head pump



P\_HY\_0040\_SW1  
Hydro externally mounted pump



P\_PZ\_0001\_SW1  
Hydro triplex pump

The Hydro/ 3 hydraulic diaphragm metering pump (HP3a) together with the Hydro/ 2 and Hydro/ 4 pumps represent an integrated product range with stroke lengths of 15 and/or 20 mm. This covers the capacity range from 3 to 1,450 l/h at 100 – 7 bar. A wide range of drive versions is available, including some for use in Exe and Exde areas with ATEX certification. The Hydro product range is designed to comply with API 675 among others.

#### Your benefits

Excellent process safety and reliability:

- PTFE multi-layer diaphragm with integral diaphragm rupture warning system
- Integral hydraulic relief valve
- Metering reproducibility is better than  $\pm 1\%$  within the 20-100% stroke volume range under defined conditions and with proper installation

Excellent flexibility:

- The modular construction with single and double head versions permits a wide range of applications, with the double head designs being operated in push-pull mode
- It is possible to combine up to 5 metering units, even with different pump capacities, in multiple pump systems
- 5 different gear ratios are available
- Customised designs are available on request

#### Technical details

- Stroke length: 15 mm, Rod force: 4,200 N
- Stroke volume adjustment range: 0 – 100 %
- Stroke volume adjustment: manually by scaled rotary dial (optionally with electric actuator or control drive)
- Metering reproducibility is better than  $\pm 1\%$  in the 20 – 100% stroke volume range under defined conditions and with correct installation
- PTFE multi-layer diaphragm with electrical diaphragm rupture warning system via a contact
- Integrated hydraulic relief and bleed valve
- Wetted materials: PVDF, PTFE+25 % carbon, stainless steel 1.4571, Hastelloy C.
- A wide range of power end versions is available: three-phase standard or 1-phase AC motor, motors for use in Exe and Exde areas, different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Design in compliance with API 675 among others

#### Field of application

- Oil and gas industry.
- Volume-proportional metering of chemicals/additives in the treatment of boiler feed water
- Metering of reactants and catalysts in the chemical industry
- Level-dependent metering of auxiliary agents in industrial production engineering, for instance hot wax metering in the production of adhesive strips



## 2.5 Hydraulik-Membrandosierpumpe Hydro/ 3

### Technical Data

Type HP3a	With 1500 rpm motor at 50 Hz				With 1800 rpm motor at 60 Hz			Suction lift  mWC	Perm. pre- pressure suction side  bar	Connection suction/ discharge side  G-DN	Shipping weight  kg	Plunger Ø  mm
	Delivery rate at max. back pressure		Max. stroke rate	Delivery rate at max. back pressure		Max. stroke rate						
	bar	l/h		ml/ stroke	Strokes/ min		psi					
100010*	100	10	2.8	60	1,450	12/3.2	72	3.0	5	Rp 3/8-10	41	22
100021*	100	21	2.8	125	1,450	25/6.6	150	3.0	5	Rp 3/8-10	41	22
100025*	100	25	2.8	150	1,450	30/7.9	180	3.0	5	Rp 3/8-10	41	22
100031*	100	31	2.8	187	1,450	37/9.8	224	3.0	5	Rp 3/8-10	41	22
100035*	100	35	2.8	212	1,450		–	3.0	5	Rp 3/8-10	41	22
064019	64	19	5.3	60	928	23/6.1	72	3.0	5	G 3/4-10**	41	26
064040	64	40	5.3	125	928	48/12.7	150	3.0	5	G 3/4-10**	41	26
064048	64	48	5.3	150	928	58/15.3	180	3.0	5	G 3/4-10**	41	26
064060	64	60	5.3	187	928	72/19.0	224	3.0	5	G 3/4-10**	41	26
064068	64	68	5.3	212	928		–	3.0	5	G 3/4-10**	41	26
025048	25	48	13.4	60	362	58/15.3	72	3.0	5	G 1-15***	41	38
025100	25	100	13.4	125	362	120/31.7	150	3.0	5	G 1-15***	41	38
025120	25	120	13.4	150	362	144/38.0	180	3.0	5	G 1-15***	41	38
025150	25	150	13.4	187	362	180/47.6	224	3.0	5	G 1-15***	41	38
025170	25	170	13.4	212	362		–	3.0	5	G 1-15***	41	38

Material version PVDF max. 25 bar.

\* Material version SST/HCT with double ball valve, valve connection on suction/discharge side designed as standard with internal thread Rp 3/8 and external, thread G 3/4-DN 10

\*\*\*HV version with 1 1/4" DN 20 connection

\*\* HV version with G 1 - DN 15 connection

### Materials in contact with the medium

Material	Dosing head	Suction/pressure connector	Seals/ball seat	Balls
SST	Stainless steel 1.4571/1.4404	Stainless steel 1.4581	PTFE/ZrO <sub>2</sub>	Ceramic
PVT	PVDF (polyvinylidene fluoride)	PVDF (polyvinylidene fluoride)	PTFE/PTFE	Ceramic
HCT	Hast. C	Hast. C	PTFE/Hast. C	Ceramic
TTT*	PTFE + 25 % carbon	PVDF (polyvinylidene fluoride)	PTFE/PTFE	Ceramic

\* Specifically for areas at risk from explosion

### Motor Data

Identity code specification	Power supply				Remarks
S	3 ph, IP 55	220-240 V/380-420 V 250-280 V/440-480 V	50 Hz 60 Hz	0.75 kW	
T	3 ph, IP 55	220-240 V/380-420 V 265-280 V/440-480 V	50 Hz 60 Hz	0.75 kW	With PTC, speed adjustment range 1:5
R	3 ph, IP 55	230 V/400 V	50/60 Hz	0.75 kW	With PTC, speed control range 1:20 with external fan 1 ph 230 V; 50/60 Hz
V0	1 ph, IP 55	230 V ±10 %	50/60 Hz	0.75 kW	Variable speed motor with integrated frequency converter
L1	3 ph, II2GEEExIICT3	220-240 V/380-420 V	50 Hz	0.75 kW	
L2	3 ph, II2GEEExIICT4	220-240 V/380-420 V	50 Hz	0.75 kW	With PTC, speed adjustment range 1:5
P1	3 ph, II2GEEExIICT3	254-277 V/440-480 V	60 Hz	0.75 kW	
P2	3 ph, II2GEEExIICT4	254-277 V/440-480 V	60 Hz	0.75 kW	With PTC, speed adjustment range 1:5
V2	3 ph, II2GEEExIICT4	400 V ±10 %	50/60 Hz	0.75 kW	Ex-variable speed motor with integrated frequency converter.

Motor data sheets can be requested for more information.

Special motors or special motor flanges are available on request.

The motors are designed in compliance with the Ecodesign Directive 2005/32/EC (IE2 standard).

### Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 94/9/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label corresponds to or is better than the conditions prevalent in the intended field of application.





## 2.5 Hydraulik-Membrandosierpumpe Hydro/ 3

### 2.5.2 Identity Code Ordering System HP3a

#### Hydro/ 3 (HP3a)

HP3a	Drive type																																					
	H	Main drive																																				
	D	Main drive, double-head version																																				
	E	Main drive for add-on drive																																				
	F	Main drive, double-head version for add-on drive																																				
	A	Add-on drive																																				
	B	Double-head version add-on drive																																				
	T	Triplex comprising 3 power ends and 3 identical heads																																				
	Type*																																					
		<table><tr><td>bar</td><td>l/h</td><td>bar</td><td>l/h</td><td>bar</td><td>l/h</td></tr><tr><td>100010</td><td>100 10</td><td>064019</td><td>64 19</td><td>025048</td><td>25 48</td></tr><tr><td>100021</td><td>100 21</td><td>064040</td><td>64 40</td><td>025100</td><td>25 100</td></tr><tr><td>100025</td><td>100 25</td><td>064048</td><td>64 48</td><td>025120</td><td>25 120</td></tr><tr><td>100031</td><td>100 31</td><td>064060</td><td>64 60</td><td>025150</td><td>25 150</td></tr><tr><td>100035</td><td>100 35</td><td>064068</td><td>64 68</td><td>025170</td><td>25 170</td></tr></table>	bar	l/h	bar	l/h	bar	l/h	100010	100 10	064019	64 19	025048	25 48	100021	100 21	064040	64 40	025100	25 100	100025	100 25	064048	64 48	025120	25 120	100031	100 31	064060	64 60	025150	25 150	100035	100 35	064068	64 68	025170	25 170
	bar	l/h	bar	l/h	bar	l/h																																
	100010	100 10	064019	64 19	025048	25 48																																
	100021	100 21	064040	64 40	025100	25 100																																
	100025	100 25	064048	64 48	025120	25 120																																
	100031	100 31	064060	64 60	025150	25 150																																
	100035	100 35	064068	64 68	025170	25 170																																
	Liquid end material																																					
	SS	Stainless steel																																				
	PV	PVDF (max. 25 bar, only for 025048 - 025170, 064019 - 064068)																																				
	HC	Hastelloy C																																				
	TT	PTFE + 25 % carbon																																				
	Sealing material*																																					
	T	PTFE																																				
	Displacement body*																																					
	0	Standard multi-layer diaphragm with rupture signalling facility																																				
	Liquid end version																																					
	0	No valve springs (standard)																																				
	1	With valve springs																																				
	D	Double ball valve (for 100010-100035, 064019-064060, only for SST and HCT)																																				
	H	HV-Version																																				
	Hydraulic connection																																					
	0	Standard threaded connector																																				
	E	With DIN ISO flange																																				
	F	With ANSI flange																																				
	Version																																					
	0	with ProMinent® logo																																				
	1	without ProMinent® logo																																				
	M	Modified																																				
	Electrical power supply																																					
	S	3 ph, 230/400 V, 50/60 Hz, 0.75 kW																																				
	T	3 ph, 230/400 V, 50/60 Hz, with PTC																																				
	R	3 ph, variable speed motor, 230 V/400 V, 0.75 kW																																				
	V (0)	Variable speed motor with integrated frequency converter																																				
	Z	1 ph, variable speed control set, 230 V, 50/60 Hz																																				
	L	3 ph, 230/400 V 50 Hz (Exe, Exd), 0.75 kW																																				
P	3 ph, 265/440 V 60 Hz (Exe, Exd), 0.75 kW																																					
V (2)	Variable speed motor with integr. frequency converter (Exd)																																					
1	No motor, with flange 200/80																																					
3	No motor, with flange B 14, size 80, Ø 160																																					
4	No motor, with flange NEMA C 56																																					
0	Add on drive																																					
Enclosure rating																																						
0	IP 55 (standard)																																					
1	Exe motor version ATEX-T3																																					
2	Exd motor version ATEX-T4																																					
A	ATEX power end																																					
Stroke sensor																																						
0	No stroke sensor (standard)																																					
1	Stroke sensor (for explosion-proof applications)																																					
Stroke length adjustment																																						
0	Manual (Standard)																																					
1	With stroke positioning motor, 230 V/50/60 Hz																																					
2	With stroke positioning motor, 115 V/60 Hz																																					
A	With stroke control motor 0-20 mA 230 V/50/60 Hz																																					
B	With stroke control motor 4-20 mA 230 V/50/60 Hz																																					
C	With stroke control motor 0-20 mA 115 V/60 Hz																																					
D	With stroke control motor 4-20 mA 115 V/60 Hz																																					
Hydraulic oil																																						
0	Standard																																					
1	Food grade																																					
2	Low temperature to -25 °C																																					

\* PVT max. 25 bar



## 2.5 Hydraulik-Membrandosierpumpe Hydro/ 3

### 2.5.3

### Spare Parts Kits

The spare parts kits generally include liquid end consumables.

#### Supplied as standard for SST/HCT stainless steel material version

- 1 metering diaphragm
- 2 valve balls
- 1 seal set

#### Supplied as standard for PVT material version

- 1 metering diaphragm
- 1 suction connector set
- 1 discharge connector set
- 2 valve balls
- 1 seal set

### Spare parts kits for Hydro/ 3

Applies to identity code: Type 100035, 100031, 100025, 100021, 100010, 064068, 064060, 064048, 064040, 064019

Liquid end	Materials in contact with the medium	Order no.
FMH 60 - DN 10	PVT	1005552
	SST	1005553
	SST (for double ball valves)	1005555
	HCT	1009573
	SST (with valve set)	1005554

Applies to identity code: Type 025170, 025150, 025120, 025100, 025048

Liquid end	Materials in contact with the medium	Order no.
FMH 150 - DN 15	PVT	1005556
	SST	1005557
	HCT	1009575
	SST (with valve set)	1005558

### Hydro/ 3 pump diaphragm PTFE/1.4404

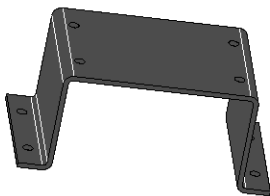
Liquid end		Order no.
FMH 60	Identity code (SST) 064025, 064022, 064018, 064015, 064007, 100010, 100009, 100007, 100006, 100003	1005546
FMH 150	Applies to Identity code (SST): 025170, 025150, 025120, 025100, 025048	1005547

### Hydro/ 3 pump diaphragm PTFE/Hastelloy C coated

Liquid end		Order no.
FMH 60	Applies to identity code (PVT/HCT): 100035, 100031, 100025, 100021, 100010, 064068, 064060, 064048, 064040, 064019	1006482
FMH 150	Applies to identity code (PVT/HCT): 025170, 025150, 025120, 025100, 025048	1006483

### Base for Hydro hydraulic diaphragm metering pumps

	Order no.
Base for Hydro/ 3, dimensions: 324 x 180 x 128 mm (LxWxH)	1005661



P\_PZ\_0010\_SW1



## 2.6 Hydraulik-Membrandosierpumpe Hydro/ 4

### 2.6.1

### Hydraulik-Membrandosierpumpe Hydro/ 4

**Flexible metering with excellent process reliability in the medium pressure range? Not a problem for the hydraulic diaphragm metering pumps Hydro/ 4**

**Capacity range of single pump: 130 – 1,450 l/h, 25 – 7 bar**



The Hydro/ 4 is an extremely robust hydraulic diaphragm metering pump, which meets the most exacting safety requirements – it is equipped as standard with a pressure relief valve and PTFE multi-layer diaphragm with diaphragm rupture warning system. Its modular construction offers extremely good flexibility in terms of applications.

The Hydro/ 4 hydraulic diaphragm metering pump (HP4a) together with the Hydro/ 2 and Hydro/ 3 pumps represent an integrated product range with stroke lengths of 15 and/or 20 mm. This covers the capacity range from 3 to 1,450 l/h at 100 – 7 bar. A wide range of drive versions is available, including some for use in Exe and Exde areas with ATEX certification. The Hydro product range is designed to comply with API 675 among others.

#### Your benefits

Excellent process safety and reliability:

- PTFE multi-layer diaphragm with integral diaphragm rupture warning system
- Integral hydraulic relief valve
- Metering reproducibility is better than  $\pm 1\%$  in the 20-100% stroke volume range under defined conditions and with proper installation.

Excellent flexibility:

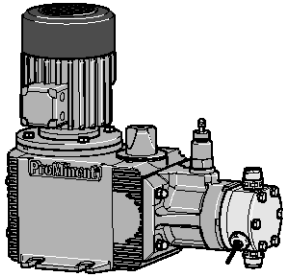
- The modular construction with single and double head versions permits a wide range of applications, with the double head designs being operated in push-pull mode
- It is possible to combine up to 5 metering units, even with different pump capacities, in multiple pump systems
- 5 different gear ratios are available
- Customised designs are available on request

#### Technical details

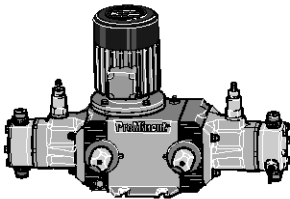
- Stroke length: 20 mm, Rod force: 5,800 N
- Stroke volume adjustment range: 0 – 100 %
- Stroke volume adjustment: manually by scaled rotary dial (optionally with electric actuator or control drive).
- Metering reproducibility is better than  $\pm 1\%$  in the 20 – 100% stroke volume range under defined conditions and with correct installation
- PTFE multi-layer diaphragm with electrical diaphragm rupture warning system via a contact
- Integrated hydraulic relief and bleed valve
- Wetted materials: PVDF, PTFE+25 % carbon, stainless steel 1.4571, Hastelloy C.
- A wide range of power end versions is available: three-phase standard or 1-phase AC motor, motors for use in Exe and Exde areas, different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Design in compliance with API 675 among others

#### Field of application

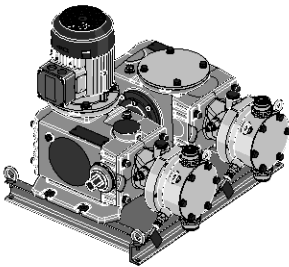
- Oil and gas industry.
- Volume-proportional metering of chemicals/additives in the treatment of boiler feed water
- Metering of reactants and catalysts in the chemical industry
- Level-dependent metering of auxiliary agents in industrial production engineering, for instance hot wax metering in the production of adhesive strips



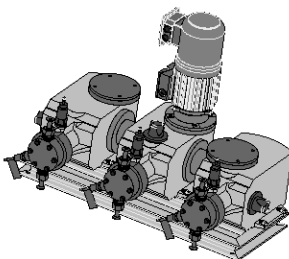
pk\_2\_074  
Hydro



pk\_2\_073  
Hydro double head pump



P\_HY\_0040\_SW1  
Hydro externally mounted pump



P\_PZ\_0001\_SW1  
Hydro triplex pump



## 2.6 Hydraulik-Membrandosierpumpe Hydro/ 4

### Technical Data

Type HP4a	With 1500 rpm motor at 50 Hz			With 1800 rpm motor at 60 Hz			Suction lift  mWC	Perm. pre- pressure suction side  bar	Connection suction/ discharge side  G-DN	Shipping weight  kg	Plunger Ø  mm
	Delivery rate at max. back pressure		Max. stroke rate  Strokes/ min	Delivery rate at max. back pressure		Max. stroke rate  Strokes/ min					
	bar	l/h		psi	l/h/gph (US)						
250130	25	130	71	363	155/41	86	3	1	G 1 1/2-25	69	52
250190	25	190	103	363	230/61	124	3	1	G 1 1/2-25	69	52
250250	25	250	136	363	300/79	164	3	1	G 1 1/2-25	69	52
250350	25	350	188	363	420/111	225	3	1	G 1 1/2-25	69	52
250400	25	400	214	—	—	—	3	1	G 1 1/2-25	69	52
160210	16	210	71	232	250/66	86	3	1	G 1 1/2-25	76	63
160300	16	300	103	232	360/95	124	3	1	G 1 1/2-25	76	63
160400	16	400	136	232	480/127	164	3	1	G 1 1/2-25	76	63
160550	16	550	188	232	660/174	225	3	1	G 1 1/2-25	76	63
160625	16	625	214	—	—	—	3	1	G 1 1/2-25	76	63
100330	10	330	71	145	400/106	86	3	1	G 2-32	87	80
100480	10	480	103	145	580/153	124	3	1	G 2-32	87	80
100635	10	635	136	145	760/201	164	3	1	G 2-32	87	80
100880	10	880	188	145	1,050/277	225	3	1	G 2-32	87	80
101000	10	1,000	214	—	—	—	3	1	G 2-32	87	80
070465	7	465	71	102	560/148	86	3	1	G 2 1/4-40	96	94
070670	7	670	103	102	805/213	124	3	1	G 2 1/4-40	96	94
070890	7	890	136	102	1,070/283	164	3	1	G 2 1/4-40	96	94
071230	7	1,230	188	102	1,450/383	225	3	1	G 2 1/4-40	96	94
071400	7	1,400	214	—	—	—	3	1	G 2 1/4-40	96	94

### Materials in contact with the medium

Material	Dosing head	Suction/pressure connector	DN 25 ball valves			DN 32/DN 40 plate valves		
			Seals	Valve balls	Valve seats	Seals	Valve plates/ valve springs	Valve seats
SST	Stainless steel 1.4404	Stainless steel 1.4404	PTFE	Stainless steel 1.4404	PTFE	PTFE	Stainless steel 1.4404/ Hast. C	PTFE
PVT	PVDF (polyvinylidene fluoride)	PVDF (polyvinylidene fluoride)	PTFE	Glass	PTFE	PTFE	Ceramic/E-CTFE	PTFE
HCT	Hast. C	Hast. C	PTFE	Hast. C	PTFE	PTFE	Hast. C / E-CTFE	PTFE
TTT*	PTFE + 25 % carbon	PVDF (polyvinylidene fluoride)	PTFE	Glass	PTFE	PTFE	Ceramic/E-CTFE	PTFE

\* Specifically for areas at risk from explosion

### Motor Data

Identity code specification	Power supply		Remarks		
S	3 ph, IP 55	220-240 V/380-420 V 250-280 V/440-480 V	50 Hz 60 Hz	1.1 kW	
T	3 ph, IP 55	220-240 V/380-420 V 265-280 V/440-480 V	50 Hz 60 Hz	1.1 kW	With PTC, speed control range 1:5
R	3 ph, IP 55	230 V/400 V	50/60 Hz	1.5 kW	With PTC, speed control range 1:20, with external fan 1 ph 230 V; 50/60 Hz
V0	3 ph, IP 55	400 V	50/60 Hz	1.5 kW	Variable speed motor with integrated frequency converter
L1	3 ph, II2GEEExellT3	220-240 V/380-420 V	50 Hz	1.1 kW	
L2	3 ph, II2GEEExdllCT4	220-240 V/380-420 V	50 Hz	1.1 kW	With PTC, speed control range 1:5
P1	3 ph, II2GEEExellT3	254-277 V/440-480 V	60 Hz	1.1 kW	
P2	3 ph, II2GEEExdllCT4	254-277 V/440-480 V	60 Hz	1.1 kW	With PTC, speed control range 1:5
V2	3 ph, II2GEEExdllCT4	400 V ±10 %	50/60 Hz	1.5 kW	Ex-variable speed motor with integrated frequency converter

Motor data sheets can be requested for more information.

Special motors or special motor flanges are available on request.

The motors are designed in compliance with the Ecodesign Directive 2005/32/EC (IE2 standard).

#### Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 94/9/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label corresponds to or is better than the conditions prevalent in the intended field of application.





## 2.6 Hydraulik-Membrandosierpumpe Hydro/ 4

### 2.6.2 Identity Code Ordering System HP4a

#### Hydro/ 4 (HP4a)

HP4a	Drive type										
H	Main drive										
D	Main drive, double-head version										
E	Main drive for add-on drive										
F	Main drive, double-head version for add-on drive										
A	Add-on drive										
B	Double-head version add-on drive										
T	Triplex comprising 3 power ends and 3 identical heads										
Type*											
	bar	l/h	bar	l/h	bar	l/h	bar	l/h	bar	l/h	
250130	25	130	160210	16	210	100330	10	330	070465	7	465
250190	25	190	160300	16	300	100480	10	480	070670	7	670
250250	25	250	160400	16	400	100635	10	635	070890	7	890
250350	25	350	160550	16	550	100880	10	880	071230	7	1,230
250400	25	400	160625	16	625	101000	10	1,000	071400	7	1,400
Liquid end material											
SS	Stainless steel										
PV	PVDF										
HC	Hastelloy C										
TT	PTFE + 25 % carbon										
Sealing material											
T	PTFE										
Displacement body											
0	Standard multilayer diaphragm with rupture signalling facility										
Liquid end version											
0	No valve springs (standard)										
1	With valve springs										
Hydraulic connection											
0	Standard threaded connection										
E	With DIN ISO flange										
F	With ANSI flange										
Version											
0	with ProMinent® logo										
1	without ProMinent® logo										
3	With ProMinent® logo, with electrical overpressure display										
M	Modified										
Electrical power supply											
S	3 ph, 230/400 V, 50/60 Hz, 1.1 kW										
T	3 ph, 230/400 V, 50/60 Hz, with PTC										
R	3 ph, variable speed motor, 230/400 V, 1.5 kW										
V (0)	Variable speed motor with integrated frequency converter										
Z	1 ph, variable speed control set, 230 V, 50/60 Hz										
L	3 ph, 230/400 V 50 Hz (Exe, Exd), 1.1 kW										
P	3 ph, 265/440 V 60 Hz (Exe, Exd), 1.1 kW										
V (2)	Variable speed motor with integr. frequency converter (Exd)										
1	No motor, with flange 250/100										
3	No motor, with flange B 5, size 90										
4	No motor, with flange NEMA TC 143/145										
0	Add on drive										
Enclosure rating											
0	IP 55 (standard)										
1	Exe motor version ATEX-T3										
2	Exd motor version ATEX-T4										
A	ATEX power end										
Stroke sensor											
0	No stroke sensor (standard)										
1	Stroke sensor (for explosion-proof applications)										
Stroke length adjustment											
0	Manual (Standard)										
K	Manual (outdoor, SS)										
1	With stroke positioning motor, 230 V/50/60 Hz										
2	With stroke positioning motor, 115 V/60 Hz										
A	With stroke control motor 0-20 mA 230 V/50/60 Hz										
B	With stroke control motor 4-20 mA 230 V/50/60 Hz										
C	With stroke control motor 0-20 mA 115 V/60 Hz										
D	With stroke control motor 4-20 mA 115 V/60 Hz										
Hydraulic oil											
0	Standard										
1	Food grade										
2	Low temperature to -25 °C										

\* PVT max. 25 bar

## 2.6 Hydraulik-Membrandosierpumpe Hydro/ 4

### 2.6.3 Spare Parts Kits

The spare parts kits generally include liquid end consumables.

#### Supplied as standard for SST/HCT stainless steel material version

- 1 metering diaphragm
- 2 valve balls
- 1 seal set

#### Supplied as standard for PVT material version

- 1 metering diaphragm
- 1 suction connector set
- 1 discharge connector set
- 2 valve balls
- 1 seal set

### Spare parts kits for Hydro/ 4

Identity code 250130, 250190, 250250, 250350, 250400

Liquid end	Materials in contact with the medium	Order no.
FMH 400 - DN 25	PVT	1043763
	PVT with valve	1023057
	SST	1040812
	SST with valve	1040813
	HCT	1040860

Identity code 160210, 160300, 160400, 160550, 160625

Liquid end	Materials in contact with the medium	Order no.
FMH 625 - DN 25	PVT	1043775
	PVT with valve	1040863
	SST	1040824
	SST with valve	1040825
	HCT	1040861

Identity code 100330, 100480, 100635, 100880, 101000

Liquid end	Materials in contact with the medium	Order no.
FMH 1000 - DN 32	PVT	1043776
	PVT with valve	1040866
	SST	1040826
	SST with valve	1040827
	HCT	1040864

Identity code 0704650, 070670, 070890, 071230, 071400

Liquid end	Materials in contact with the medium	Order no.
FMH 1400 - DN 40	PVT	1043777
	PVT with valve	1040869
	SST	1040828
	SST with valve	1040829
	HCT	1040867

### Hydro/ 4 metering diaphragm PTFE/1.4404

Liquid end	Order no.
FMH 400	Identity code (SST) 250130, 250190, 250250, 250350, 250400 1040808
FMH 625	Identity code (SST) 160210, 160300, 160400, 160550, 160625 1040809



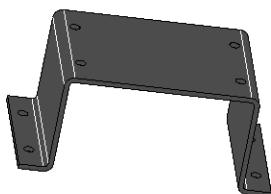
## 2.6 Hydraulik-Membrandosierpumpe Hydro/ 4

Liquid end		Order no.
<b>FMH 1000</b>	Identity code (SST) 100330, 100480, 100635, 100880, 101000	1040810
<b>FMH 1400</b>	Identity code (SST) 0704650, 070670, 070890, 071230, 071400	1040811

### Hydro/ 4 metering diaphragm PTFE/Hastelloy C coated

Liquid end		Order no.
<b>FMH 400</b>	Identity code (HCT) 250130, 250190, 250250, 250350, 250400	1040874
<b>FMH 625</b>	Identity code (HCT) 160210, 160300, 160400, 160550, 160625	1040875
<b>FMH 1000</b>	Identity code (HCT) 100330, 100480, 100635, 100880, 101000	1040876
<b>FMH 1400</b>	Identity code (HCT) 0704650, 070670, 070890, 071230, 071400	1040877

### Base for Hydro hydraulic diaphragm metering pumps



P\_PZ\_0010\_SW1

	Order no.
<b>Base for Hydro/ 4, dimensions: 344 x 250 x 120 mm (LxWxH)</b>	1051421



## 2.7 Hydraulic Diaphragm Metering Pump Makro/ 5

### 2.7.1

### Hydraulic Diaphragm Metering Pump Makro/ 5

**Excellent feed rates in the low pressure range**

**Capacity range of single pump: 450 – 6,108 l/h, 25 – 6 bar**

The robust hydraulic diaphragm metering pump Makro/ 5 guarantees outstanding process reliability. Its modular construction offers extremely good flexibility and a large range of power end versions are available.

The Makro/ 5 hydraulic diaphragm metering pump (M5Ha) together with the Makro/ 5 diaphragm and plunger metering pumps form an integrated product range with stroke lengths of 20 and/or 50 mm. This covers the capacity range from 38 to 6,108 l/h at 320 – 4 bar. A wide range of drive versions is available, including some for use in Exe and Exde areas with ATEX certification. The Makro/ 5 product range is designed to comply with API 675 among others.

#### Your benefits

Excellent process safety and reliability:

- PTFE multi-layer diaphragm with integral diaphragm rupture warning system
- Integral hydraulic relief valve
- Metering reproducibility is better than  $\pm 1\%$  within the 10-100 % stroke length range under defined conditions and with correct installation.

Excellent flexibility:

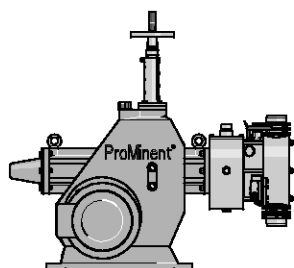
- The modular construction with single and double head versions permits a wide range of applications, with the double head designs being operated in push-pull mode
- It is possible to combine up to 4 metering units, even with different pump capacities, in multiple pump systems
- 5 different gear ratios are available
- Customised designs are available on request

#### Technical details

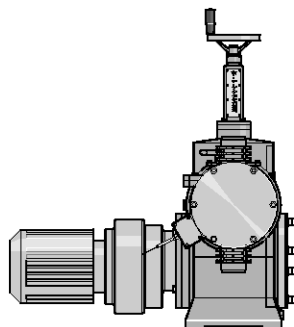
- Stroke length: 0 – 50 mm, Rod force: 10,000 N
- Stroke length adjustment range: 0 – 100 %
- Stroke length adjustment: manually by means of a manual adjustment wheel and scaled display (optionally with electric actuator or control drive)
- Metering reproducibility is better than  $\pm 1\%$  within the 10 – 100% stroke length range under defined conditions and with correct installation
- PTFE multi-layer diaphragm with electrical diaphragm rupture warning system via a contact
- Integrated hydraulic relief and bleed valve
- Wetted materials: PVDF, PTFE+25% carbon, stainless steel 1.4571, special materials are available on request
- A wide range of power end versions is available: three-phase standard motors, motors for use in Exe and Exde areas and different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Design in compliance with API 675 among others

#### Field of application

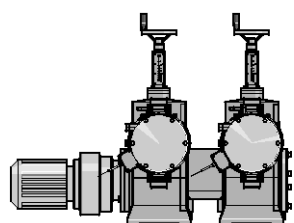
- Oil and gas industry.
- Volume-proportional metering of chemicals/additives in the treatment of boiler feed water
- Metering of reactants and catalysts in the chemical industry
- Level-dependent metering of auxiliary agents in industrial production engineering, for instance hot wax metering in the production of adhesive strips



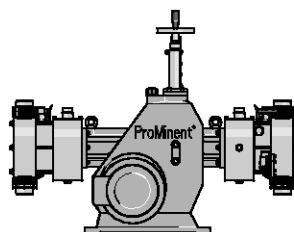
pk\_2\_096  
Makro/ 5 M5Ha



pk\_2\_097  
Makro/ 5 M5Ha



pk\_2\_094  
Makro/ 5 externally mounted pump



pk\_2\_092  
Makro/ 5 double head pump

## 2.7 Hydraulic Diaphragm Metering Pump Makro/ 5

### Control of Makro/5 hydraulic diaphragm metering pumps

#### Makro/ 5 stroke length controller

Control drive consisting of an actuator with servomotor and integral microprocessor controller for stroke length adjustment via a standard signal. Actuating period approx. 100 sec for 100 % stroke length, including 2 limit switches for min./max. position, IP 54 degree of protection. Electrical connection 230 V ( $\pm 10\%$ ), 50/60 Hz, 40 W mechanical stroke length display fitted on the Makro/ 5 power end.

Special voltage/higher degrees of protection/explosion protection on request.

Version with:

Standard signal current input 0/4-20 mA, corresponds to stroke length 0 - 100 %; internal switch for manual /automatic operation, key switch for stroke adjustment in manual mode. Actual value output 0/4-20 mA for remote display.

#### Speed controllers with frequency converter (identity code specification Z)

The speed controller (complete) comprises a frequency converter and a variable speed motor (see also identity code specification R). The frequency converter is accommodated in an IP 55 rated protective housing with integral control unit and main switch, suitable for max. motor power 0.37/0.75/1.1 kW.

Externally controllable with 0/4-20 mA or 0-10 V corresponding to 0-50 (60) Hz output frequency.

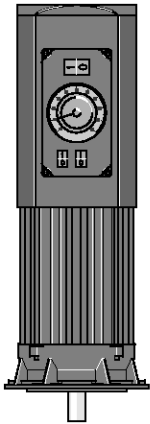
Frequency converter for speed controller See page → 1-72

#### Stroke sensor with Namur signal

Mounting on the crank drive mechanism of the Makro/ 5 gearbox. For precise measurement of each metering stroke, comprising electronic cams and inductive proximity switches, switching signal according to Namur. In combination with electronic pre-selection meters suitable for batch metering or proportional metering in conjunction with proportional control.

Retrospective fitting only possible in the factory.

**Approved for Ex safety operation with degree of protection EEx ia II C T6.**



pk\_2\_103  
Variable speed motor with integrated frequency converter



## 2.7 Hydraulic Diaphragm Metering Pump Makro/ 5

### Technical Data

Type M5Ha	With 1500 rpm motor at 50 Hz				With 1800 rpm motor at 60 Hz				Suction lift	Connection suction/ discharge side	Shipping weight	Plunger Ø
	Delivery rate at max. back pressure			Max. stroke rate	Delivery rate at max. back pressure			Max. stroke rate				
	bar	l/h	ml/ stroke		Strokes/ min	psi	l/h				gph (US)	Strokes/ min
250450	25	450	125.0	60	362	537	142	72	3.0	G 2-32	320	60
250562	25	562	125.0	75	362	671	177	89	3.0	G 2-32	320	60
250772	25	772	125.0	103	362	922	244	123	3.0	G 2-32	320	60
250997	25	997	125.0	133	362	1,191	315	159	3.0	G 2-32	320	60
251170	25	1,170	125.0	156	—	—	—	—	—	G 2-32	320	60
160616	16	616	171.2	60	232	736	194	72	3.0	G 2 1/4-40	320	70
160770	16	770	171.2	75	232	920	243	89	3.0	G 2 1/4-40	320	70
161058	16	1,058	171.2	103	232	1,264	334	123	3.0	G 2 1/4-40	320	70
161366	16	1,366	171.2	133	232	1,633	431	159	3.0	G 2 1/4-40	320	70
161602	16	1,602	171.2	156	—	—	—	—	3.0	G 2 1/4-40	320	70
120716	12	716	199.0	60	174	855	226	72	3.0	G 2 1/4-40	320	75
120895	12	895	199.0	75	174	1,069	282	89	3.0	G 2 1/4-40	320	75
121229	12	1,229	199.0	103	174	1,469	388	123	3.0	G 2 1/4-40	320	75
121588	12	1,588	199.0	133	174	1,898	501	159	3.0	G 2 1/4-40	320	75
121862	12	1,862	199.0	156	—	—	—	—	3.0	G 2 1/4-40	320	75
120919	12	919	255.3	60	174	1,098	290	72	3.0	G 2 1/4-40	320	85
121148	12	1,148	255.3	75	174	1,372	362	89	3.0	G 2 1/4-40	320	85
121577	12	1,577	255.3	103	174	1,885	498	123	3.0	G 2 1/4-40	320	85
122037	12	2,037	255.3	133	174	2,435	643	159	3.0	G 2 1/4-40	320	85
122389	12	2,389	255.3	156	—	2,856	754	—	3.0	G 2 1/4-40	320	85
101345	10	1,345	374.0	60	145	1,607	425	72	3.0	G 2 3/4-50	330	100
101680	10	1,680	374.0	75	145	2,008	530	89	3.0	G 2 3/4-50	330	100
102310	10	2,310	374.0	103	145	2,761	729	123	3.0	G 2 3/4-50	330	100
102980	10	2,980	374.0	133	145	3,562	941	159	3.0	G 2 3/4-50	330	100
103500	10	3,500	374.0	156	—	—	—	—	3.0	G 2 3/4-50	330	100
062305	6	2,305	641.0	60	87	2,755	728	72	3.0	Flange-65*	330	130
062880	6	2,880	641.0	75	87	3,443	910	89	3.0	Flange-65*	330	130
063960	6	3,960	641.0	103	87	4,734	1,251	123	3.0	Flange-65*	330	130
065110	6	5,110	641.0	133	87	6,108	1,614	159	3.0	Flange-65*	330	130
066000	6	6,000	641.0	156	—	—	—	—	3.0	Flange-65*	330	130

Material Version PPT/PCT/TTT max. 10 bar

\* SST version with G 2 1/2" thread

### Materials in contact with the medium

Dosing head		Suction/pressure valve	DN 32/DN50/DN65 plate valves			DN 40 plate valves		
			Seals	Valve plates/ valve springs	Valve seats	Seals	Valve plates	Valve seats
PPT	Polypropylene	Polypropylene	PTFE	Hast C.	PTFE	PPE	EPDM	Hast. C
PCT	PVC	PVC	PTFE	Hast C.	PTFE	PCA	Viton®	Hast. C
TTT	PTFE with carbon	PTFE with carbon	PTFE	Hast C.	PTFE	TTT	PTFE	Hast. C
SST	Stainless steel material no. 1.4571/1.4404	Stainless steel material no. 1.4571/1.4404	PTFE	Hast C.	PTFE	SST	PTFE	Hast. C

Patented multi-layer diaphragm, vacuum-packed

Special designs available on request

Viton® is a registered trademark of DuPont Dow Elastomers







## 2.7 Hydraulic Diaphragm Metering Pump Makro/ 5

### 2.7.2 Identity Code Ordering System for M5Ha

#### Motor-driven metering pump M5Ha

M5Ha	Drive type				
H	Main drive				
A	Add-on power end				
D	Double main drive				
B	Double add-on power end				
Type*					
250450	160616	120716	120919	101345	062305
250562	160770	120895	121148	101680	062880
250772	161058	121229	121577	102310	063960
250997	161366	121588	122037	102980	065110
251170	161602	121862	122389	103500	066000
Liquid end material					
PC	PVC				
PP	Polypropylene				
SS	Stainless steel				
TT	PTFE + 25 % carbon				
Sealing material					
T	PTFE				
Displacement body					
T	Composite diaphragm, PTFE coating, with rupture indicator				
Liquid end version					
1	With valve springs				
Hydraulic connection					
0	Standard connection				
1	PVC union nut and insert				
2	Union nut and insert PP				
3	PVDF union nut and insert				
4	SS union nut and insert				
Version					
0	with ProMinent® logo, no frame				
1	without ProMinent® logo, no frame				
A	with ProMinent® logo, with frame, simplex				
B	with ProMinent® logo, with frame, duplex				
C	with ProMinent® logo, with frame, triplex				
D	with ProMinent® logo, with frame, quadruplex				
M	Modified				
Electrical power supply					
S	3 ph. 230/400 V 50/60 Hz (WBS)				
R	Variable speed motor 4-pole, 230/400 V				
V (0)	Motor with integr. frequency converter				
L	3 ph. 230/400 V 50 Hz (Exe, Exd)				
P	3 ph. 230/400 V 60 Hz (Exe, Exd)				
V (2)	Motor with integr. frequency converter (Exd)				
5	No motor, with gearbox IEC 100				
6	No motor, with gearbox IEC 112				
0	No motor, no gearbox				
Enclosure rating					
0	IP 55 (Standard) ISO class F				
1	Exe version ATEX-T3				
2	Exd version ATEX-T4				
A	ATEX power end				
Stroke sensor					
0	No stroke sensor				
1	With stroke sensor (Namur)				
Stroke length adjustment					
0	Stroke length adjustment, manual				
3	230 V 0-20 mA stroke controller				
4	230 V 4-20 mA stroke controller				
5	115 V 0-20 mA stroke controller				
6	115 V 4-20 mA stroke controller				
Application					
0	Standard				
3	Low temperature to -25 °C				

\* Material version PC/PP/TT max. 10 bar

## 2.7 Hydraulic Diaphragm Metering Pump Makro/ 5

### Motor Data

Identity code specification		Power supply			Remarks
S	3 ph, IP 55	220-240 V/380-420 V 250-280 V/440-480 V	50 Hz 60 Hz	3 kW	
R	3 ph, IP 55	230 V/400 V	50/60 Hz	3 kW	With PTC, speed control range 1:5
V0	3 ph, IP 55	400 V $\pm$ 10 %	50/60 Hz	3 kW	Variable speed motor with integrated frequency converter
L1	3 ph, II2GEEExellT3	220-240 V/380-420 V	50 Hz	3.6 kW	
L2	3 ph, II2GEEExdllCT4	220-240 V/380-420 V	50 Hz	4 kW	With PTC, speed control range 1:5
P1	3 ph, II2GEEExellT3	250-280 V/440-480 V	60 Hz	3.6 kW	
P2	3 ph, II2GEEExdllCT4	250-280 V/440-480 V	60 Hz	4 kW	With PTC, speed control range 1:5
V2	3 ph, II2GEEExellCT4	400 V $\pm$ 10 %	50/60 Hz	4 kW	Ex-variable speed motor with integrated frequency converter

Motor data sheets can be requested for more information.

Special motors or special motor flanges are available on request.

The motors are designed in compliance with the Ecodesign Directive 2005/32/EC (IE2 standard).

#### Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 94/9/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label corresponds to or is better than the conditions prevalent in the intended field of application.





## 2.7 Hydraulic Diaphragm Metering Pump Makro/ 5

### 2.7.3

### Spare Parts

#### Spare parts kits for Makro/ 5 HMH

The spare parts kits generally contain the consumable components for the liquid ends.

- 1 metering diaphragm
- 1 suction valve set
- 1 discharge valve set
- 1 seal set (O-rings, packing rings, valve seat, valve seat housings)

Identity code: 250450, 250562, 250772, 250997, 251170

Liquid end	Materials in contact with the medium	Order no.
Liquid end FMH 60-50	S (with 2 additional valve assemblies)	1008170
	S (no valve set)	1008169

Identity code: 160616, 160770, 161058, 161366, 161602, 120716, 120895, 121229, 121588, 121862, 120919, 121148, 121577, 122037, 122389

Liquid end	Materials in contact with the medium	Order no.
Liquid end FMH 70/75/85-50	PPT	911904
	PCT	911902
	TTT	911906
	SST	911910
	SST (no valve set)	911909

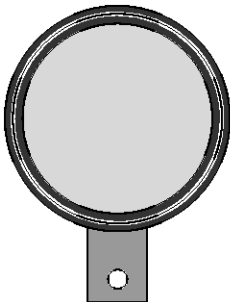
Identity code: 101345, 101680, 102310, 102980, 103500

Liquid end	Materials in contact with the medium	Order no.
Liquid end FMH 100-50	PP	1008246
	P	1008247
	T	1008248
	S (with valve set)	1008250
	S (no valve set)	1008249

Identity code: 062305, 062880, 063960, 065110, 066000

Liquid end	Materials in contact with the medium	Order no.
Liquid end FMH 130-50	PP	1008251
	P	1008252
	T	1008253
	S (with valve set)	1008265
	S (no valve set)	1008264

#### Makro/ 5 HMH metering diaphragms



pk\_2\_024

Liquid end	Order no.
FMH 60/70/75/85-50	1007298
FMH 100/130-50	1007852

## 2.8 Hydraulic Diaphragm Metering Pumps Orlita® MF

### 2.8.1

### Hydraulic Diaphragm Metering Pumps Orlita® MF

#### Reliable capacity even at high pressure

Capacity range of single pump: 0 – 13,000 l/h, 700 – 6 bar



The hydraulic diaphragm metering pump ORLITA® MF offers reliable capacities even under high pressure and has a modular construction, therefore has versatile uses. Thanks to its modular design, this pump is tailored to meet your requirements even at very high pump capacities.

ORLITA® MF hydraulic diaphragm metering pumps (MFS 18 to MFS 1400) with a stroke length of 15 to 60 mm provide a capacity ranging from 0 to 13,000 l/h at 700 – 6 bar. A wide range of drive versions is available, including some for use in Zone 1 or Zone 2 areas at risk from explosion with ATEX certification. The Orlita® MF product range is designed to comply with API 675. Its modular construction permits the free combination of drives, power ends and dosing heads, producing a pump for a range of different feed rates and media operating at different working pressures.

#### Your benefits

Excellent process safety and reliability:

- PTFE double diaphragm with integrated diaphragm rupture warning system ensures precise and low-wear operation despite high pressures
- The product chamber is hermetically separated from the hydraulic part
- Integrated hydraulic relief valve and automatic bleed valve for the hydraulic chamber
- Wear-free, valveless enforced anti-cavitation of the hydraulic leakage guarantees optimum dosing precision
- Metering reproducibility is better than  $\pm 0.5\%$  within the 10 – 100 % stroke length range under defined conditions and with correct installation
- Cone valves for use as suction and/or discharge valves with minimal wear, good self-cleaning and low pressure loss (NPSHR)

Excellent flexibility:

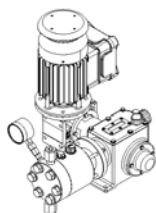
- The modular construction ensures a wide range of uses
- It is possible to combine up to 6 metering units, even with different pump capacities, in multiple pump systems
- 10 different gear ratios are available
- Power end configuration ideal for installation in any position (vertical or horizontal)
- Temperature range - 40 °C to + 150 °C
- Customised designs are available on request

#### Technical details

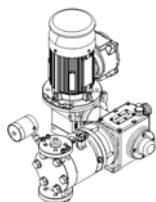
- MfS 18 (MF1a) – Stroke length: 0-15 mm, Rod force: 1,750 N
- MfS 35 (MF2a) – Stroke length: 0-20 mm, Rod force: 3,500 N
- MfS 80 (MF3a) – Stroke length: 0-20 mm, Rod force: 14,000 N
- MfS 180 (MF4a) – Stroke length: 0-40 mm, Rod force: 18,000 N
- MfS 600 (MF5a) – Stroke length: 0-40 mm, Rod force: 40,000 N
- MfS 1400 (MF6a) – Stroke length: 0-60 mm, Rod force: 60,000 N
- Stroke length adjustment range: 0 – 100 % in operation and idle
- Stroke length adjustment: manually by means of a manual adjustment wheel and scaled display (optionally with electric actuator or control drive)
- Metering reproducibility is better than  $\pm 0.5\%$  within the 10 – 100 % stroke length range under defined conditions and with correct installation
- PTFE multi-layer diaphragm with electrical diaphragm rupture warning system via a contact
- Integrated hydraulic relief and bleed valve
- Wetted materials: Stainless steel, special designs are available on request
- A wide range of power end versions is available: Three-phase standard motors, motors for use in Exe and Exde areas and different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Temperature range - 40 °C to + 150 °C
- Suction lift up to 8 m
- Design in compliance with API 675 among others

#### Field of application

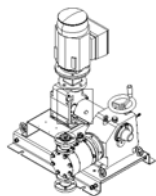
- Oil/ gas production (onshore/offshore)
- Refineries
- Chemical/Petrochemical industry
- Pharmaceuticals & cosmetics
- Food production
- Packaging industry (bottling pumps)



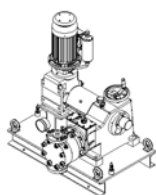
P\_ORL\_050\_SW1  
Orlita® MFS 18/12



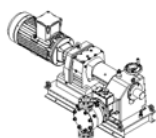
P\_ORL\_051\_SW1  
Orlita® MFS 35/30



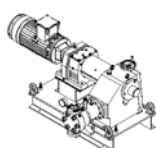
P\_ORL\_052\_SW1  
Orlita® MFS 80/40



P\_ORL\_053\_SW1  
Orlita® MFS 180/60

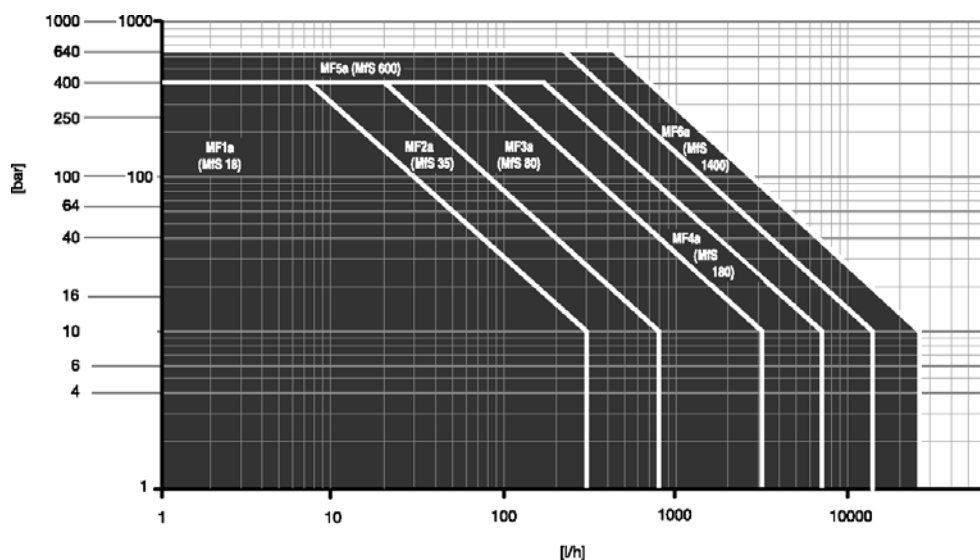


P\_ORL\_054\_SW1  
Orlita® MFS 600b/81



P\_ORL\_055\_SW1  
Orlita® MFS 1400/46

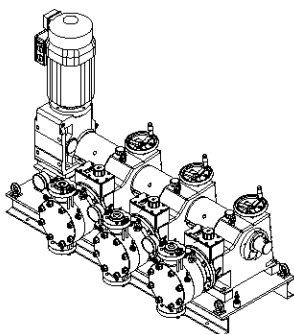
## 2.8 Hydraulic Diaphragm Metering Pumps Orlita® MF



Pressure [bar] depending on the metering volume [l/h] at 50 Hz

### Triplex metering pumps

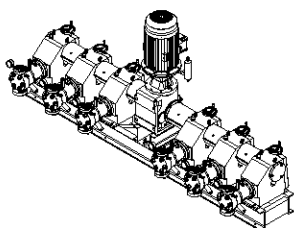
With triplex metering pumps, the pressure stroke of each liquid end occurs through 120° of crank travel. This results in a metering flow free of pulsation without the use of elaborate pulsation dampers. This design of process diaphragm pump is preferred in the chemical and petrochemical industries.



P\_ORL\_056\_SW1  
Orlita® MF3S 180/90-90-90 triplex pump

### Multiplexed metering pumps

The Orlita® MF range's modular construction permits a variable combination of drives, motors and liquid ends e.g. quadruple MF metering pumps with central drive.



P\_ORL\_057\_SW1  
Orlita® MF3S 1400/50 multiple pump



## 2.8 Hydraulic Diaphragm Metering Pumps Orlita® MF

### Actuation of ORLITA® MF, MH, PS, DR

**Control drive** consisting of an actuator with servo motor and integral servo controller for stroke length adjustment via a standard signal. Standard signal current input 0/4 – 20 mA, corresponds to stroke length 0 – 100 %, switch for manual/automatic operation; key switch for stroke adjustment in manual mode, mechanical status display of actual stroke length value output 0/4 – 20 mA for remote display. Control drives can also be designed with bus systems, like HART, PROFIBUS, Fieldbus Foundation ...

### Variable speed motors with integrated frequency converter (identity code specification V)

Power supply 1 ph 230 V, 50/60 Hz (up to 3 kW). Externally controllable with 0/4-20 mA (see Fig. pk\_2\_103).

The following functions are integrated in the terminal box cover: (see Chapter 2.17.2)

- Start/stop switch
- Switch for manual/external operation
- Potentiometer for speed control in manual mode

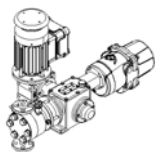
### Speed controllers with frequency inverter (identity code specification Z)

Frequency converter accommodated in IP 55 protective housing with integral control unit and main switch, suitable for max. 0.37/0.75 kW motor capacity (see Chap. 2.17.2).

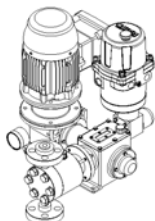
Externally controllable with 0/4-20 mA or 0-10 V corresponding to 0-50 (60) Hz output frequency.

Integrated controller with versatile functions, such as switching between external/internal control: frequency input using arrow keys with internal control, multilingual fault message display etc. and motor temperature monitoring (thermistor protection).

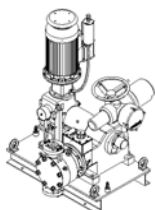
The speed controller assembly consists of a frequency converter and a variable speed motor.



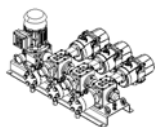
P\_ORL\_058\_SW1  
Orlita® MFS 18 with 1-phase control drive  
115/230 V



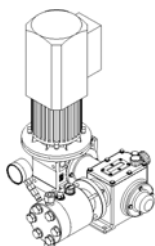
P\_ORL\_059\_SW1  
Orlita® MFS 35 with 1-phase control drive  
115/230 V vertical



P\_ORL\_060\_SW1  
Orlita® MFS 180 with 3-phase control drive



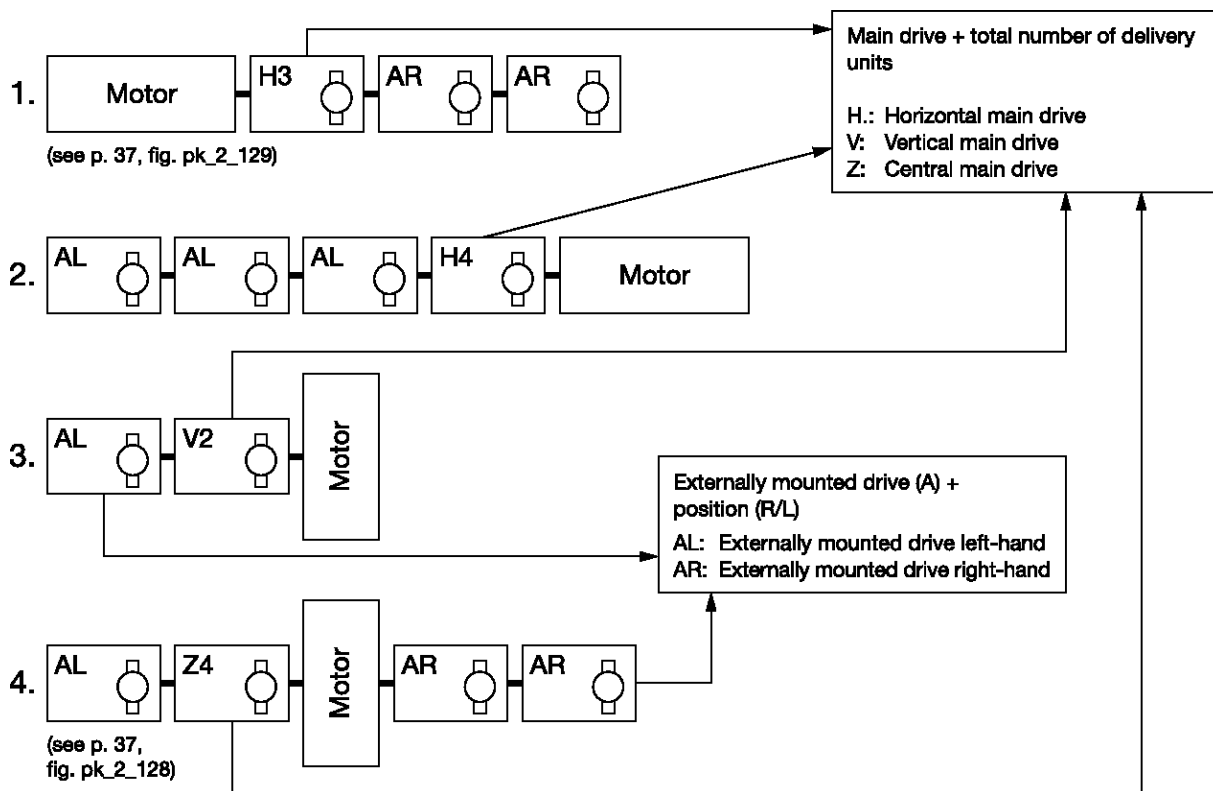
P\_ORL\_061\_SW1  
Orlita® MFS 35/12-12-12 with control drives



P\_ORL\_062\_SW1  
Orlita® MFS 18/7 with Varicon

## 2.8 Hydraulic Diaphragm Metering Pumps Orlita® MF

### Type of drive



When ordering a multiplexed pump, the main and/or all externally mounted pumps require a separate Identity code.

For example a triplex pompe (1.) :  
MF\_aH3.....  
MF\_aAR.....  
MF\_aAR.....

### Materials in contact with the medium

	Liquid end	Suction/discharge valve housing	Valve seals	Valve	Valve seat	Range
S1 (DIN)	1.4404	None	1.4571	Ceramic	1.4404	DN 3
S1 (ANSI)	A 316 L	N/A	A 316 Ti	Ceramic	A 316 L	
S1 (DIN)	1.4404	1.4404	1.4571	1.4462	1.4462	≥ DN6
S1 (ANSI)	A 316 L	A 316 L	A 316 Ti	Duplex SS	Duplex SS	
S2 (DIN)	1.4462	1.4462	1.4571	1.4462	1.4462	≥ DN6
S2 (ANSI)	Duplex SS	Duplex SS	A 316 Ti	Duplex SS	Duplex SS	
S3 (DIN)	1.4539	1.4539	2.4610	1.4539	1.4539	≥ DN6
S3 (ANSI)	A904L	A904L	Hastelloy C-4	A904L	A904L	

### Motor Data

A	50 Hz	3 ph. 230/400 V	3 ph. 500 V	3 ph. 380/660 V
		3 ph. 400/690 V	3 ph. 415 V	
B (adjustable 1:5)	50 Hz	3 ph. 230/400 V	3 ph. 500 V	3 ph. 380/660 V
		3 ph. 400/690 V	3 ph. 415 V	
H	60 Hz	3 ph. 220/380 V	3 ph. 400 V	
K (adjustable 1:5)	60 Hz	3 ph. 220/380 V	3 ph. 400 V	



## 2.8 Hydraulic Diaphragm Metering Pumps Orlita® MF

### 2.8.2 Orlita® MFS 18 (MF1a) Hydraulic Diaphragm Metering Pumps

#### Technical Data MfS 18 Single Pump 50 Hz

Plunger Ø	Stroke volume	Pump capacity Q <sub>th</sub> in l/h per pump head at H/min Identity code characteristic: [3 to 9]							Max. pressure	Efficiency at		Standard type of valve
		45 [3] l/h	58 [4] l/h	73 [5] l/h	91 [6] l/h	112 [7] l/h	145 [8] l/h	207 [9] l/h		100% pressure	50% pressure	
mm	ml/ stroke								bar			
7	0.58	1.5	2.0	2.5	3.1	3.8	5.0	7.1	400	0.50	0.70	DK DN 3
8	0.75	2.0	2.6	3.2	4.1	5.0	6.5	9.3	348	0.55	0.72	DK DN 3
10	1.18	3.2	4.1	5.1	6.4	7.8	10.2	14.6	222	0.67	0.79	Ke DN 6
11	1.43	3.8	4.9	6.2	7.7	9.5	12.4	17.7	184	0.67	0.79	Ke DN 6
12	1.70	4.6	5.9	7.3	9.2	11.3	14.7	21.0	154	0.84	0.88	Ke DN 6
14	2.31	6.2	8.0	10.0	12.5	15.4	20.0	28.7	113	0.85	0.88	Ke DN 6
16	3.02	8.2	10.5	13.1	16.4	20.1	26.2	37.4	87	0.86	0.88	Ke DN 6
18	3.82	10.3	13.2	16.6	20.7	25.5	33.2	47.4	68	0.87	0.88	Ke DN 6
20	4.71	12.8	16.4	20.5	25.6	31.5	41.0	58.5	55	0.88	0.89	Ke DN 6
22	5.70	15.5	19.8	24.8	31.0	38.1	49.6	70.8	46	0.88	0.89	Ke DN 10/6
25	7.36	20.0	25.6	32.0	40.0	49.2	64.0	91.5	35	0.89	0.89	Ke DN 10
27	8.59	23.3	29.8	37.3	46.7	57.4	74.7	106.7	30	0.89	0.89	Ke DN 10
29	9.91	26.9	34.4	43.1	53.8	66.3	86.2	123.1	26	0.89	0.89	Ke DN 10
30	10.60	28.8	36.9	46.1	57.6	70.9	92.2	131.7	24	0.89	0.89	Ke DN 10
36	15.27	41.5	53.1	66.4	83.0	102.1	132.8	189.7	17	0.89	0.89	Ke DN 16
40	18.85	51.2	65.6	82.0	102.4	126.1	163.9	234.2	13	0.89	0.89	Ke DN 16
44	22.81	62.0	79.3	99.2	124.0	152.6	198.4	283.4	11	0.89	0.90	Ke DN 16
50	29.45	80.0	102.4	128.1	160.1	197.1	256.2	366.0	8	0.89	0.90	Ke DN 16

#### Technical Data MfS 18 Single Pump 60 Hz

Plunger Ø	Stroke volume	Pump capacity Q <sub>th</sub> in l/h per pump head at H/min Identity code characteristic: [2 to 8]							Max. pressure	Efficiency at		Standard type of valve
		44 [2] l/h	55 [3] l/h	70 [4] l/h	88 [5] l/h	110 [6] l/h	135 [7] l/h	176 [8] l/h		100% pressure	50% pressure	
mm	ml/ stroke								bar			
7	0.58	1.5	1.9	2.4	3.0	3.8	4.6	6.1	400	0.50	0.70	DK DN 3
8	0.75	1.9	2.4	3.1	3.9	4.9	6.1	7.9	348	0.55	0.72	DK DN 3
10	1.18	3.1	3.8	4.9	6.2	7.7	9.5	12.4	222	0.67	0.79	Ke DN 6
11	1.43	3.7	4.7	6.0	7.5	9.4	11.5	15.0	184	0.67	0.79	Ke DN 6
12	1.70	4.4	5.6	7.1	8.9	11.2	13.7	17.9	154	0.84	0.88	Ke DN 6
14	2.31	6.1	7.6	9.7	12.1	15.2	18.7	24.3	113	0.85	0.88	Ke DN 6
16	3.02	7.9	9.9	12.7	15.9	19.9	24.5	31.8	87	0.86	0.88	Ke DN 6
18	3.82	10.0	12.6	16.1	20.1	25.1	31.0	40.3	68	0.87	0.88	Ke DN 6
20	4.71	12.4	15.5	19.9	24.8	31.1	38.2	49.7	55	0.88	0.89	Ke DN 6
22	5.70	15.0	18.8	24.0	30.1	37.6	46.3	60.2	46	0.88	0.89	Ke DN 10/6
25	7.36	19.4	24.3	31.1	38.8	48.6	59.8	77.7	35	0.89	0.89	Ke DN 10
27	8.59	22.6	28.3	36.2	45.3	56.6	69.7	90.6	30	0.89	0.89	Ke DN 10
29	9.91	26.1	32.7	41.8	52.3	65.3	80.4	104.6	26	0.89	0.89	Ke DN 10
30	10.60	27.9	34.9	44.7	55.9	69.9	86.1	111.9	24	0.89	0.89	Ke DN 10
36	15.27	40.3	50.3	64.4	80.6	100.7	124.0	161.2	17	0.89	0.89	Ke DN 16
40	18.85	49.7	62.2	79.6	99.5	124.4	153.1	199.0	13	0.89	0.89	Ke DN 16
44	22.81	60.2	75.2	96.3	120.1	150.5	185.2	240.8	11	0.89	0.90	Ke DN 16
50	29.45	77.7	97.1	124.4	155.5	194.3	239.2	311.0	8	0.89	0.90	Ke DN 16

DK Double ball valve, Ke Conical valve

#### Important note:

- Abridged presentation of our complete product range. Other types on request
- Allow for a minimum 10% power reserve when designing in accordance with API
- All hydraulic performance data is based on water at 20 °C





## 2.8 Hydraulic Diaphragm Metering Pumps Orlita® MF

### Identity Code Ordering System

#### Orlita® MFS18 (MF1a) hydraulic diaphragm metering pump

MF1a	Drive type											
	V1	Main drive vertical*										
	Z1	Main drive central*										
	AL	Drive module left-hand										
	AR	Drive module right-hand										
	M	Modified **										
	Plunger diameter											
	007	7 mm	011	11 mm	016	16 mm	022	22 mm	029	29 mm	040	40 mm
	008	8 mm	012	12 mm	018	18 mm	025	25 mm	030	30 mm	044	44 mm
	010	10 mm	014	14 mm	020	20 mm	027	27 mm	036	36 mm	050	50 mm
	Stroke rate 50 (60) Hz											
	2	-/44 strokes/min		4	58 (70) Strokes/min		6	91 (110) Strokes/min		8	145 (176) Strokes/min	
	3	45 (55) strokes/min		5	73 (88) Strokes/min		7	112 (135) Strokes/min		9	207 (-) Strokes/min	
	Liquid end material (including valve materials)											
	S1	Stainless steel (see table, sheet 2)										
	Temperature of pumped medium											
	0	-10 °C to 80 °C			2	-40 °C to 60 °C			4	10 °C to 150 °C		
	1	-25 °C to 60 °C			3	10 °C to 115 °C						
	Displacer format											
	0	PTFE multi-layer diaphragm										
	1	PTFE multi-layer diaphragm with pressure gauge										
	Liquid end version											
	0	Standard						2	Standard double valve			
	1	Standard with spring						3	Standard double valve with spring			
	Hydraulic connection suction side											
	G	Thread DIN/ISO						A	Flange ANSI			
	N	Thread NPT/ANSI						D	Flange DIN/ISO			
	Hydraulic connection discharge side											
	G	Thread DIN/ISO						A	Flange ANSI			
	N	Thread NPT/ANSI						D	Flange DIN/ISO			
	Version											
	0	No features										
	1	Liquid end heating										
	2	Liquid end polished										
	3	Special paint finish										
	Power connector											
	A	Standard voltage 50 Hz										
	B	Standard voltage 50 Hz adjustable										
	H	Standard voltage 60 Hz										
	K	Standard voltage 60 Hz adjustable										
	0	Externally mounted pump										
	1	Without motor with IEC flange										
	2	Without motor with NEMA flange										
	Electrical protection system / explosion protection											
	0	IP 55		C	IP 55 EExde							
	1	IP 56		D	IP 56 EExn							
	A	IP 55 EExn		E	IP 56 EExe							
	B	IP 55 EExe		F	IP 56 EExde							
	Electrical options											
	0	No options										
	1	Stroke sensor										
	Stroke length adjustment											
	0	Manual										
	1	0/4-20 mA without Ex										
	2	0/4-20 mA Ex Zone 2										
	3	0/4-20 mA Ex Zone 1										
	4	0/4-20 mA without EX offshore										
	5	0/4-20 mA Ex Zone 2 offshore										
	6	0/4-20 mA Ex Zone 1 offshore										
	Environmental conditions											
	0	-20 °C to 40 °C										
	1	-40 °C to 40 °C										
	2	0 °C to 55 °C										
	Approvals											
	0	CE										
	1	API 675										
	2	VDMA										
	3	ATEX										
	4	ATEX / API 675										
	5	VDMA / ATEX										

\*For other pump configurations see Type of drive page → 2-43

\*\* Modified version (M) is possible for each ID character of the identity code.

## 2.8 Hydraulic Diaphragm Metering Pumps Orlita® MF

### 2.8.3 Orlita® MFS 35 (MF2a) Hydraulic Diaphragm Metering Pumps

#### Technical Data MfS 35 Single Pump 50 Hz

Plunger Ø	Stroke volume	Pump capacity Q <sub>th</sub> in l/h per pump head at H/min Identity code characteristic: [3 to 9]							Max. pressure	Efficiency at		Standard type of valve
		45 [3] l/h	58 [4] l/h	73 [5] l/h	91 [6] l/h	112 [7] l/h	145 [8] l/h	207 [9] l/h		100% pressure	50% pressure	
mm	ml/ stroke								bar			
7	0.77	2.0	2.6	3.3	4.1	5.1	6.7	9.5	400	0.50	0.70	DK DN 3
8	1.01	2.7	3.5	4.3	5.4	6.7	8.7	12.4	400	0.50	0.70	DK DN 3
10	1.57	4.2	5.4	6.8	8.5	10.5	13.6	19.5	400	0.50	0.70	Ke DN 6
11	1.90	5.1	6.6	8.2	10.3	12.7	16.5	23.6	368	0.79	0.85	Ke DN 6
12	2.26	6.1	7.8	9.8	12.3	15.1	19.6	28.1	309	0.79	0.85	Ke DN 6
14	3.08	8.3	10.7	13.3	16.7	20.6	26.7	38.2	227	0.81	0.85	Ke DN 6
16	4.02	10.9	13.9	17.4	21.8	26.9	34.9	49.9	174	0.83	0.86	Ke DN 6
18	5.09	13.8	17.7	22.1	27.6	34.0	44.2	63.2	137	0.84	0.87	Ke DN 6
20	6.28	17.0	21.8	27.3	34.1	42.0	54.6	78.0	111	0.86	0.88	Ke DN 6
22	7.60	20.6	26.4	33.0	41.3	50.8	66.1	94.4	92	0.86	0.88	Ke DN 10/6
25	9.82	26.6	34.1	42.7	53.3	65.7	85.4	122.0	71	0.87	0.88	Ke DN 10
27	11.45	31.1	39.8	49.8	62.2	76.6	99.6	142.3	61	0.87	0.88	Ke DN 10
30	14.14	38.4	49.2	61.5	76.8	94.6	122.9	175.7	49	0.88	0.89	Ke DN 10
36	20.36	55.3	70.8	88.5	110.6	136.2	177.1	253.0	34	0.88	0.89	Ke DN 16
40	25.13	68.3	87.4	109.3	136.6	168.2	218.6	312.3	27	0.89	0.89	Ke DN 16
44	30.41	82.6	105.8	132.2	165.3	203.5	264.5	377.9	23	0.89	0.89	Ke DN 16
50	39.27	106.7	136.6	170.8	213.5	262.8	341.6	488.0	17	0.89	0.89	Ke DN 16
60	56.55	153.7	196.7	245.9	307.4	378.4	491.9	702.8	12	0.89	0.90	Ke DN 16/25
65	66.37	180.4	230.9	288.6	360.8	444.1	577.3	824.8	10	0.89	0.90	Ke DN 16/25
80	100.53	273.3	349.8	437.3	546.6	672.7	874.6	1,249.4	6	0.89	0.90	Ke DN 25

#### Technical Data MfS 35 Single Pump 60 Hz

Plunger Ø	Stroke volume	Pump capacity Q <sub>th</sub> in l/h per pump head at H/min Identity code characteristic [2 to 8]:							Max. pressure	Efficiency at		Standard type of valve
		44 [2] l/h	55 [3] l/h	70 [4] l/h	88 [5] l/h	110 [6] l/h	135 [7] l/h	176 [8] l/h		100% pressure	50% pressure	
mm	ml/ stroke								bar			
7	0.77	2.0	2.5	3.2	4.0	5.0	6.2	8.1	400	0.50	0.70	DK DN 3
8	1.01	2.6	3.3	4.2	5.3	6.6	8.1	10.6	400	0.50	0.70	DK DN 3
10	1.57	4.1	5.1	6.6	8.2	10.3	12.7	16.5	400	0.50	0.70	Ke DN 6
11	1.90	5.0	6.2	8.0	10.0	12.5	15.4	20.0	368	0.79	0.85	Ke DN 6
12	2.26	5.9	7.4	9.5	11.9	14.9	18.3	23.8	309	0.79	0.85	Ke DN 6
14	3.08	8.1	10.1	13.0	16.2	20.3	25.0	32.5	227	0.81	0.85	Ke DN 6
16	4.02	10.6	13.2	16.9	21.2	26.5	32.6	42.4	174	0.83	0.86	Ke DN 6
18	5.09	13.4	16.7	21.5	26.8	33.5	41.3	53.7	137	0.84	0.87	Ke DN 6
20	6.28	16.5	20.7	26.5	33.1	41.4	51.0	66.3	111	0.86	0.88	Ke DN 6
22	7.60	20.0	25.0	32.1	40.1	50.1	61.7	80.2	92	0.86	0.88	Ke DN 10/6
25	9.82	25.9	32.4	41.4	51.8	64.8	79.7	103.6	71	0.87	0.88	Ke DN 10
27	11.45	30.2	37.7	48.3	60.4	75.5	93.0	120.9	61	0.87	0.88	Ke DN 10
30	14.14	37.3	46.6	59.7	74.6	93.3	114.8	149.2	49	0.88	0.89	Ke DN 10
36	20.36	53.7	67.1	85.9	107.4	134.3	165.3	214.9	34	0.88	0.89	Ke DN 16
40	25.13	66.3	82.9	106.1	132.7	165.8	204.1	265.4	27	0.89	0.89	Ke DN 16
44	30.41	80.2	100.3	128.4	160.5	200.7	247.0	321.1	23	0.89	0.89	Ke DN 16
50	39.27	103.6	129.5	165.8	207.3	259.1	318.9	414.6	17	0.89	0.89	Ke DN 16
60	56.55	149.2	186.6	238.8	298.5	373.2	459.3	597.1	12	0.89	0.90	Ke DN 16/25
65	66.37	175.2	219.0	280.3	350.4	438.0	539.1	700.8	10	0.89	0.90	Ke DN 16/25
80	100.53	265.4	331.7	424.6	530.8	663.5	816.6	1,061.6	6	0.89	0.90	Ke DN 25

DK Double ball valve, Ke Conical valve

**Important note:**

- Abridged presentation of our complete product range. Other types on request
- Allow for a minimum 10% power reserve when designing in accordance with API
- All hydraulic performance data is based on water at 20 °C



## 2.8 Hydraulic Diaphragm Metering Pumps Orlita® MF

### Identity Code Ordering System

#### Orlita® MFS35 (MF2a) hydraulic diaphragm metering pump

MF2a Drive type											
V1	Main drive vertical *				AR	Drive module right-hand					
Z1	Main drive central *				M	Modified **					
AL	Drive module left-hand										
Plunger diameter											
007	7 mm	012	12 mm	020	20 mm	030	30 mm	050	50 mm		
008	8 mm	014	14 mm	022	22 mm	036	36 mm	060	60 mm		
010	10 mm	016	16 mm	025	25 mm	040	40 mm	065	65 mm		
011	11 mm	018	18 mm	027	27 mm	044	44 mm	080	80 mm		
Stroke rate 50 (60) Hz											
2	-/44 strokes/min		4	58 (70) Strokes/min		6	91 (110) Strokes/min		8	145 (176) Strokes/min	
3	45 (55) strokes/min		5	73 (88) Strokes/min		7	112 (135) Strokes/min		9	207 (-) Strokes/min	
Liquid end material (including valve materials)											
S1	Stainless steel (see table, sheet 2)										
Temperature of pumped medium											
0	-10 °C to 80 °C			2	-40 °C to 60 °C			4	10 °C to 150 °C		
1	-25 °C to 60 °C			3	10 °C to 115 °C						
Displacer format											
0	PTFE multi-layer diaphragm										
1	PTFE multi-layer diaphragm with pressure gauge										
Liquid end version											
0	Standard					2	Standard + double valve				
1	Standard with spring					3	Standard + double valve with spring				
Hydraulic connection suction side											
G	Thread DIN/ISO					A	Flange ANSI				
N	Thread NPT/ANSI					D	Flange DIN/ISO				
Hydraulic connection discharge side											
G	Thread DIN/ISO					A	Flange ANSI				
N	Thread NPT/ANSI					D	Flange DIN/ISO				
Version											
0	No features										
1	Liquid end heating										
2	Liquid end polished										
3	Special paint finish										
Power connector											
A	Standard voltage 50 Hz										
B	Standard voltage 50 Hz adjustable										
H	Standard voltage 60 Hz										
K	Standard voltage 60 Hz adjustable										
0	Externally mounted pump										
1	Without motor with IEC flange										
2	Without motor with NEMA flange										
Electrical protection system / explosion protection											
0	IP 55		D	IP 56 EExn							
1	IP 56		E	IP 56 EExe							
A	IP 55 EExn		F	IP 56 EExde							
B	IP 55 EExe		K	IP 65 EExde							
C	IP 55 EExde										
Electrical options											
0	No options										
1	Stroke sensor										
Stroke length adjustment											
0	Manual										
1	0/4-20 mA without Ex										
2	0/4-20 mA Ex Zone 2										
3	0/4-20 mA Ex Zone 1										
4	0/4-20 mA without EX offshore										
5	0/4-20 mA Ex Zone 2 offshore										
6	0/4-20 mA Ex Zone 1 offshore										
Environmental conditions											
0	-20 °C to 40 °C										
1	-40 °C to 40 °C										
2	0 °C to 55 °C										
Approvals											
0	CE										
1	API 675										
2	VDMA										
3	ATEX										
4	ATEX / API 675										
5	VDMA / ATEX										

\*For further pump configurations see Type of drive page → 2-43

\*\* Modified design (M) is available with every identity code feature

## 2.8 Hydraulic Diaphragm Metering Pumps Orlita® MF

### 2.8.4 Orlita® MFS 80 (MF3a) Hydraulic Diaphragm Metering Pumps

#### Technical Data MfS 80 Single Pump 50 Hz

Plunger Ø	Stroke volume	Pump capacity Q <sub>th</sub> in l/h per pump head at H/min Identity code characteristic [4 – 9; F]:							Max. pressure	Efficiency at		Standard type of valve
		104 [4] l/h	122 [5] l/h	134 [6] l/h	155 [7] l/h	160 [8] l/h	182 [9] l/h	193 [F] l/h		100% pressure	50% pressure	
mm	ml/ stroke								bar			
16	4.02	25	29	32	37	38	43	46	400	0.75	0.83	Ke DN 6
20	6.28	39	46	50	58	60	68	72	400	0.75	0.83	Ke DN 6
22	7.60	47	55	61	70	73	82	87	360	0.79	0.80	Ke DN 10/6
25	9.82	61	71	79	91	94	107	113	285	0.79	0.85	Ke DN 10
27	11.45	71	83	92	106	109	125	132	244	0.81	0.85	Ke DN 10
29	13.21	82	96	106	122	126	144	152	211	0.82	0.85	Ke DN 10
30	14.14	88	103	113	131	135	154	163	198	0.83	0.86	Ke DN 10
36	20.36	126	149	164	189	195	222	235	137	0.85	0.87	Ke DN 16
40	25.13	156	184	202	233	241	274	290	111	0.86	0.88	Ke DN 16
44	30.41	189	222	245	282	292	331	351	98	0.86	0.88	Ke DN 16
46	33.24	207	243	268	309	319	362	384	84	0.86	0.88	Ke DN 16
50	39.27	244	287	316	365	377	428	453	71	0.87	0.88	Ke DN 16
60	56.55	352	414	455	526	543	617	653	50	0.88	0.89	Ke DN 16/25
65	66.37	413	486	535	617	637	724	766	40	0.88	0.89	Ke DN 16/25
80	100.53	626	736	810	935	965	1,097	1,161	25	0.89	0.89	Ke DN 25
100	157.08	979	1,150	1,266	1,461	1,508	1,714	1,814	17	0.89	0.89	Ke DN 32

#### Technical Data MfS 80 Single Pump 60 Hz

Plunger Ø	Stroke volume	Pump capacity Q <sub>th</sub> in l/h per pump head at H/min Identity code characteristic [3 to 9]:							Max. pressure	Efficiency at		Standard type of valve
		119 [3] l/h	126 [4] l/h	148 [5] l/h	163 [6] l/h	188 [7] l/h	194 [8] l/h	221 [9] l/h		100% pressure	50% pressure	
mm	ml/ stroke								bar			
16	4.02	28	30	35	39	45	46	53	400	0.75	0.83	Ke DN 6
20	6.28	44	47	55	61	70	73	83	400	0.75	0.83	Ke DN 6
22	7.60	54	57	67	74	85	88	100	360	0.79	0.80	Ke DN 10/6
25	9.82	70	74	87	96	110	114	130	285	0.79	0.85	Ke DN 10
27	11.45	81	86	101	112	129	133	151	244	0.81	0.85	Ke DN 10
29	13.21	94	100	117	129	149	153	175	211	0.82	0.85	Ke DN 10
30	14.14	101	107	125	138	159	164	187	198	0.83	0.86	Ke DN 10
36	20.36	145	154	180	199	229	237	269	137	0.85	0.87	Ke DN 16
40	25.13	179	190	223	245	283	292	333	111	0.86	0.88	Ke DN 16
44	30.41	217	230	270	297	343	354	402	98	0.86	0.88	Ke DN 16
46	33.24	237	251	295	325	375	387	440	84	0.86	0.88	Ke DN 16
50	39.27	280	297	349	384	443	457	520	71	0.87	0.88	Ke DN 16
60	56.55	404	428	502	553	638	659	749	50	0.88	0.89	Ke DN 16/25
65	66.37	474	502	589	649	749	773	879	40	0.88	0.89	Ke DN 16/25
80	100.53	718	761	893	983	1,134	1,171	1,332	25	0.89	0.89	Ke DN 25
100	157.08	1,123	1,189	1,396	1,537	1,774	1,830	2,081	17	0.89	0.89	Ke DN 32

Ke Conical valve

- Important note:**
- Abridged presentation of our complete product range. Other types on request
  - Allow for a minimum 10% power reserve when designing in accordance with API
  - All hydraulic performance data is based on water at 20 °C



## 2.8 Hydraulic Diaphragm Metering Pumps Orlita® MF

### Identity Code Ordering System

#### Orlita® MFS 80 (MF3a) hydraulic diaphragm metering pump

MF3a	Drive type										
H1	Main drive horizontal*					AL	Drive module left-hand				
V1	Main drive vertical*					AR	Drive module right-hand				
Z1	Main drive central*					M	Modified **				
Plunger diameter											
016	16 mm	025	25 mm	030	30 mm	044	44 mm	060	60 mm	100 100 mm	
020	20 mm	027	27 mm	036	36 mm	046	46 mm	065	65 mm		
022	22 mm	029	29 mm	040	40 mm	050	50 mm	080	80 mm		
Stroke rate 50 (60) Hz											
3	- (119) Strokes/min			5	122 (148) Strokes/min		7	155 (188) Strokes/min		9 182 (221) strokes/min	
4	104 (126) strokes/min			6	134 (163) Strokes/min		8	160 (194) Strokes/min		F 193 (-) Strokes/min	
Liquid end material (including valve materials)											
S1	Stainless steel (see table, sheet 2)										
Temperature of pumped medium											
0	-10 °C to 80 °C			2	-40 °C to 60 °C		4	10 °C to 150 °C			
1	-25 °C to 60 °C			3	10 °C to 115 °C						
Displacer format											
0	PTFE multi-layer diaphragm										
1	PTFE multi-layer diaphragm with pressure gauge										
Liquid end version											
0	Standard										
1	Standard with spring										
2	Standard + double valve										
3	Standard + double valve with spring										
Hydraulic connection suction side											
G	Thread DIN/ISO							A	Flange ANSI		
N	Thread NPT/ANSI							D	Flange DIN/ISO		
Hydraulic connection discharge side											
G	Thread DIN/ISO							A	Flange ANSI		
N	Thread NPT/ANSI							D	Flange DIN/ISO		
Version											
0	No features										
1	Liquid end heating										
2	Liquid end polished										
3	Special paint finish										
Power connector											
A	Standard voltage 50 Hz										
B	Standard voltage 50 Hz adjustable										
H	Standard voltage 60 Hz										
K	Standard voltage 60 Hz adjustable										
0	Externally mounted pump										
1	without motor with IEC flange										
2	without motor with NEMA flange										
Electrical protection system / explosion protection											
0	IP 55		D		IP 56 EExn						
1	IP 56		E		IP 56 EExe						
A	IP 55 EExn		F		IP 56 EExde						
B	IP 55 EExe		K		IP 65 EExde						
C	IP 55 EExde										
Electrical options											
0	No options										
1	Stroke sensor										
Stroke length adjustment											
0	Manual										
1	0/4-20 mA without Ex										
2	0/4-20 mA Ex Zone 2										
3	0/4-20 mA Ex Zone 1										
4	0/4-20 mA Ex without EX offshore										
5	0/4-20 mA Ex Zone 2 offshore										
6	0/4-20 mA Ex Zone 1 offshore										
Environmental conditions											
0	-20 °C to 40 °C										
1	-40 °C to 40 °C										
2	0 °C to 55 °C										
Approvals											
0	CE										
1	API 675										
2	VDMA										
3	ATEX										
4	ATEX / API 675										
5	VDMA / ATEX										

\*For further pump configurations see Type of drive page → 2-43

\*\* Modified design (M) is available with every identity code feature

## 2.8 Hydraulic Diaphragm Metering Pumps Orlita® MF

### 2.8.5 Orlita® MFS 180 (MF4a) Hydraulic Diaphragm Metering Pumps

#### Technical Data MfS 180 Single Pump 50 Hz

Plunger Ø	Stroke volume	Pump capacity Q <sub>th</sub> in l/h per pump head at H/min [Identity code characteristic 4 – 9; F]:							Max. pressure	Efficiency at		Standard type of valve
		92 [4]	107 [5]	117 [6]	134 [7]	152 [8]	171 [9]	200 [F]		100%	50%	
mm	ml/ stroke	l/h	l/h	l/h	l/h	l/h	l/h	l/h	bar	pressure	pressure	
25	19.63	107	126	138	157	178	201	235	366	0.77	0.83	Ke DN 16
30	28.27	155	181	199	226	257	290	339	254	0.81	0.85	Ke DN 16
36	40.72	223	262	286	326	370	417	489	176	0.83	0.86	Ke DN 16
40	50.27	276	323	353	403	457	515	604	143	0.85	0.87	Ke DN 25
44	60.82	334	391	428	488	553	623	730	118	0.85	0.87	Ke DN 25
50	78.54	431	505	552	630	714	805	943	91	0.86	0.88	Ke DN 25
55	95.03	521	611	668	762	864	974	1,141	75	0.87	0.88	Ke DN 32
60	113.10	621	727	796	907	1,029	1,160	1,359	63	0.87	0.89	Ke DN 32
65	132.73	729	854	934	1,065	1,207	1,361	1,594	54	0.88	0.89	Ke DN 32
70	153.94	845	990	1,083	1,235	1,400	1,579	1,849	46	0.88	0.89	Ke DN 40
75	176.71	970	1,137	1,243	1,418	1,608	1,812	2,123	40	0.88	0.89	Ke DN 40
80	201.06	1,104	1,293	1,415	1,613	1,829	2,062	2,416	35	0.88	0.89	Ke DN 40
85	226.98	1,246	1,460	1,597	1,821	2,065	2,328	2,727	31	0.88	0.89	Ke DN 40
90	254.47	1,397	1,637	1,791	2,042	2,315	2,610	3,057	28	0.89	0.89	Ke DN 40
95	283.53	1,557	1,824	1,995	2,275	2,590	2,908	3,407	25	0.89	0.89	Pt DN 50
100	314.16	1,725	2,021	2,211	2,521	2,858	3,223	3,775	22	0.89	0.89	Pt DN 50
115	415.48	2,281	2,673	2,924	3,334	3,781	4,262	4,992	17	0.89	0.89	Pt DN 65
125	490.87	2,696	3,158	3,455	3,939	4,467	5,036	–	14	0.89	0.90	Pt DN 65
135	572.56	3,144	3,684	4,030	4,595	5,210	5,874	6,880	12	0.89	0.90	Pt DN 65
142	633.47	3,479	4,076	4,458	5,084	5,764	6,499	7,612	11	0.89	0.90	Pt DN 65

#### Technical Data MfS 180 Single Pump 60 Hz

Plunger Ø	Stroke volume	Pump capacity Q <sub>th</sub> in l/h per pump head at H/min [Identity code characteristic 3 to 9]:							Max. pressure	Efficiency at		Standard type of valve
		98 [3]	111 [4]	130 [5]	142 [6]	162 [7]	184 [8]	208 [8]		100%	50%	
mm	ml/ stroke	l/h	l/h	l/h	l/h	l/h	l/h	l/h	bar	pressure	pressure	
25	19.63	116	130	153	167	216	244	244	352	0.77	0.83	Ke DN 16
30	28.27	167	188	220	241	275	312	352	254	0.81	0.85	Ke DN 16
36	40.72	240	271	318	347	396	449	507	176	0.83	0.86	Ke DN 16
40	50.27	297	335	392	429	489	555	625	143	0.85	0.87	Ke DN 25
44	60.82	359	405	475	519	592	671	757	118	0.85	0.87	Ke DN 25
50	78.54	464	523	613	671	765	867	978	91	0.86	0.88	Ke DN 25
55	95.03	561	633	742	811	925	1,049	1,183	75	0.87	0.88	Ke DN 32
60	113.10	668	753	883	966	1,101	1,249	1,408	63	0.87	0.89	Ke DN 32
65	132.73	784	884	1,036	1,134	1,293	1,466	1,652	54	0.88	0.89	Ke DN 32
70	153.94	909	1,026	1,202	1,315	1,499	1,700	1,916	46	0.88	0.89	Ke DN 40
75	176.71	1,044	1,178	1,380	1,509	1,721	1,951	2,200	40	0.88	0.89	Ke DN 40
80	201.06	1,188	1,340	1,570	1,717	1,958	2,220	2,503	35	0.88	0.89	Ke DN 40
85	226.98	1,341	1,513	1,772	1,939	2,211	2,507	2,826	31	0.88	0.89	Ke DN 40
90	254.47	1,503	1,696	1,987	2,174	2,478	2,810	3,168	28	0.89	0.89	Ke DN 40
95	283.53	1,675	1,890	2,214	2,422	2,762	3,131	3,530	25	0.89	0.89	Pt DN 50
100	314.16	1,856	2,094	2,453	2,684	3,060	3,470	3,912	22	0.89	0.89	Pt DN 50
115	415.48	2,455	2,769	3,245	3,549	4,047	4,589	5,173	17	0.89	0.89	Pt DN 65
125	490.87	2,900	3,272	3,834	4,193	4,781	5,422	–	14	0.89	0.90	Pt DN 65
135	572.56	3,383	3,817	4,472	4,891	5,577	6,324	–	11	0.89	0.90	Pt DN 65
142	633.47	3,743	4,223	4,947	5,412	6,171	6,997	–	11	0.89	0.90	Pt DN 65

DK Double ball valve, Pt Plate valve

#### Important note:

- Abridged presentation of our complete product range. Other types on request
- Allow for a minimum 10% power reserve when designing in accordance with API
- All hydraulic performance data is based on water at 20 °C



## 2.8 Hydraulic Diaphragm Metering Pumps Orlita® MF

### Identity Code Ordering System

#### Orlita® MFS 180 (MF4a) hydraulic diaphragm metering pump

MF4a	Drive type									
H1	Main drive horizontal*			Z1	Main drive central *			AR	Drive module right-hand	
V1	Main drive vertical*			AL	Drive module left-hand			M	Modified **	
Plunger diameter										
025	25 mm	044	44 mm	065	65 mm	085	85 mm	115	115 mm	
030	30 mm	050	50 mm	070	70 mm	090	90 mm	125	125 mm	
036	36 mm	055	55 mm	075	75 mm	095	95 mm	135	135 mm	
040	40 mm	060	60 mm	080	80 mm	100	100 mm	142	142 mm	
Stroke rate 50 (60) Hz										
3	- (98) Strokes/min				7	134 (162) Strokes/min				
4	92 (111) strokes/min				8	152 (184) Strokes/min				
5	107 (130) Strokes/min				9	171 (208) strokes/min				
6	117 (142) Strokes/min				F	200 (-) Strokes/min				
Liquid end material (including valve materials)										
S1	Stainless steel (see table, sheet 2)									
Temperature of pumped medium										
0	-10 °C to 80 °C			2	-40 °C to 60 °C			4	10 °C to 150 °C	
1	-25 °C to 60 °C			3	10 °C to 115 °C					
Displacer format										
0	PTFE multi-layer diaphragm									
1	PTFE multi-layer diaphragm with pressure gauge									
Liquid end version										
0	Standard						2	Standard + double valve		
1	Standard with spring						3	Standard + double valve with spring		
Hydraulic connection suction side										
G	Thread DIN/ISO						A	Flange ANSI		
N	Thread NPT/ANSI						D	Flange DIN/ISO		
Hydraulic connection discharge side										
G	Thread DIN/ISO						A	Flange ANSI		
N	Thread NPT/ANSI						D	Flange DIN/ISO		
Version										
0	No features						2	Liquid end polished		
1	Liquid end heating						3	Special paint finish		
Power connector										
A	Standard voltage 50Hz									
B	Standard voltage 50Hz adjustable									
H	Standard voltage 60Hz									
K	Standard voltage 60Hz adjustable									
0	Externally mounted pump									
1	without motor with IEC flange									
2	without motor with NEMA flange									
Electrical protection system / explosion protection										
0	IP 55		D	IP 56 EExn						
1	IP 56		E	IP 56 EExe						
A	IP 55 EExn		F	IP 56 EExde						
B	IP 55 EExe		K	IP 65 EExde						
C	IP 55 EExde									
Electrical options										
0	No options									
1	Stroke sensor									
Stroke length adjustment										
0	Manual									
1	0/4-20 mA without Ex									
2	0/4-20 mA Ex Zone 2									
3	0/4-20 mA Ex Zone 1									
4	0/4-20 mA Ex without EX offshore									
5	0/4-20 mA Ex Zone 2 offshore									
6	0/4-20 mA Ex Zone 1 offshore									
Environmental conditions										
0	-20 °C to 40 °C									
1	-40 °C to 40 °C									
2	0 °C to 55 °C									
Approvals										
0	CE									
1	API 675									
2	VDMA									
3	ATEX									
4	ATEX / API 675									
5	VDMA / ATEX									

\*For further pump configurations see Type of drive page → 2-43

\*\* Modified design (M) is available with every identity code feature



## 2.8 Hydraulic Diaphragm Metering Pumps Orlita® MF

### 2.8.6 Hydraulic Diaphragm Metering Pumps Orlita® MFS 600 (MF5b)

#### Technical Data MfS 600 Single Pump 50 Hz

Plunger Ø	Stroke volume	Pump capacity Q <sub>th</sub> in l/h per pump head at H/min [Identity code characteristic 4 – 9; F]:							Max. pressure	Efficiency at		Standard type of valve
		90 [4] l/h	99 [5] l/h	117 [6] l/h	134 [7] l/h	156 [8] l/h	173 [9] l/h	204 [F] l/h		100% pressure	50% pressure	
mm	ml/ stroke								bar			
36	40.72	219	242	285	327	381	422	497	392	0.76	0.83	Ke DN 16
38	45.36	244	269	318	364	424	470	554	352	0.77	0.83	Ke DN 16
40	50.27	270	299	352	404	470	521	614	318	0.78	0.84	Ke DN 16
44	60.82	327	361	427	488	569	630	743	263	0.80	0.85	Ke DN 25
46	66.48	357	395	466	534	622	689	812	240	0.81	0.85	Ke DN 25
50	78.54	422	467	551	631	735	814	959	221	0.83	0.86	Ke DN 25
55	95.03	511	565	667	764	889	985	1,161	168	0.84	0.87	Ke DN 25
60	113.10	608	673	794	909	1,059	1,172	1,381	141	0.85	0.87	Ke DN 25
65	132.73	714	789	932	1,067	1,243	1,376	1,621	120	0.85	0.87	Ke DN 32
70	153.94	828	916	1,080	1,237	1,441	1,596	1,880	100	0.90	0.88	Ke DN 32
75	176.71	950	1,051	1,240	1,420	1,654	1,832	2,159	90	0.86	0.88	Ke DN 32
80	201.06	1,081	1,196	1,411	1,616	1,882	2,084	2,456	79	0.87	0.88	Ke DN 40
85	226.98	1,221	1,350	1,593	1,825	2,125	2,353	2,773	70	0.87	0.88	Ke DN 40
90	254.47	1,369	1,514	1,786	2,046	2,383	2,638	3,109	62	0.87	0.88	Ke DN 40
95	283.53	1,525	1,687	1,990	2,279	2,655	2,940	3,464	56	0.87	0.88	Ke DN 50
100	314.16	1,690	1,869	2,205	2,526	2,942	3,257	3,838	50	0.88	0.89	Ke DN 50
115	415.48	2,235	2,472	2,917	3,340	3,890	4,308	5,076	38	0.88	0.89	Ke DN 65
125	490.87	2,641	2,921	3,446	3,946	4,596	5,090	5,998	32	0.89	0.89	Ke DN 65
135	572.56	3,080	3,407	4,020	4,603	5,361	5,937	6,996	26	0.89	0.89	Ke DN 65
142	633.47	3,408	3,769	4,448	5,093	5,932	6,568	7,740	20	0.89	0.89	Ke DN 65

#### Technical Data MfS 600 Single Pump 60 Hz

Plunger Ø	Stroke volume	Pump capacity Q <sub>th</sub> in l/h per pump head at H/min [Identity code characteristic 3 – 9]:							Max. pressure	Efficiency at		Standard type of valve
		96 [3] l/h	109 [4] l/h	120 [5] l/h	142 [6] l/h	163 [7] l/h	189 [8] l/h	210 [9] l/h		100% pressure	50% pressure	
mm	ml/ stroke								bar			
36	40.72	235	265	294	347	397	462	512	392	0.76	0.83	Ke DN 16
38	45.36	262	296	327	386	442	515	570	352	0.77	0.83	Ke DN 16
40	50.27	291	328	363	428	490	571	632	318	0.78	0.84	Ke DN 16
44	60.82	352	397	439	518	593	691	765	263	0.80	0.85	Ke DN 25
46	66.48	384	434	480	566	648	755	836	240	0.81	0.85	Ke DN 25
50	78.54	454	512	567	669	765	892	988	200	0.83	0.86	Ke DN 25
55	95.03	550	620	686	809	926	1,080	1,196	168	0.84	0.87	Ke DN 25
60	113.10	654	738	816	963	1,102	1,285	1,423	141	0.85	0.87	Ke DN 25
65	132.73	768	866	958	1,131	1,294	1,508	1,670	120	0.85	0.87	Ke DN 40
70	153.94	891	1,005	1,111	1,312	1,501	1,749	1,937	100	0.90	0.88	Ke DN 32
75	176.71	1,023	1,154	1,276	1,506	1,723	2,008	2,224	90	0.86	0.88	Ke DN 32
80	201.06	1,164	1,313	1,452	1,713	1,960	2,285	2,530	79	0.87	0.88	Ke DN 40
85	226.98	1,314	1,482	1,639	1,934	2,213	2,580	2,856	70	0.87	0.88	Ke DN 40
90	254.47	1,473	1,661	1,838	2,168	2,481	2,892	3,202	62	0.87	0.88	Ke DN 40
95	283.53	1,641	1,851	2,047	2,416	2,767	3,222	3,568	56	0.87	0.88	Ke DN 50
100	314.16	1,818	2,051	2,269	2,677	3,063	3,571	3,954	50	0.88	0.89	Ke DN 50
115	415.48	2,405	2,713	3,000	3,541	4,051	4,722	5,229	38	0.88	0.89	Ke DN 65
125	490.87	2,841	3,205	3,545	4,183	4,786	5,579	–	32	0.89	0.89	Ke DN 65
135	572.56	3,314	3,739	4,135	4,879	5,587	6,508	7,206	26	0.89	0.89	Ke DN 65
142	633.47	3,667	4,136	4,575	5,399	6,182	7,200	7,973	20	0.89	0.89	Ke DN 65

DK Double ball valve, Ke Conical valve

#### Important note:

- Abridged presentation of our complete product range. Other types on request
- Allow for a minimum 10% power reserve when designing in accordance with API
- All hydraulic performance data is based on water at 20 °C





## 2.8 Hydraulic Diaphragm Metering Pumps Orlita® MF

### Identity Code Ordering System

#### Orlita® MFS 600 (MF5b) hydraulic diaphragm metering pump

MF5b	Drive type										
H1	Main drive horizontal *					AL	Drive module left-hand				
V1	Main drive vertical *					AR	Drive module right-hand				
Z1	Main drive central *					M	Modified **				
Plunger diameter											
036	36 mm	046	46 mm	065	65 mm	085	85 mm	115	115 mm		
038	38 mm	050	50 mm	070	70 mm	090	90 mm	125	125 mm		
040	40 mm	055	55 mm	075	75 mm	095	95 mm	135	135 mm		
044	44 mm	060	60 mm	080	80 mm	100	100 mm	142	142 mm		
Stroke rate 50 (60) Hz											
3	- (96) Strokes/min		5	99 (120) Strokes/min		7	134 (163) Strokes/min		9	173 (210) strokes/min	
4	90 (109) strokes/min		6	117 (142) Strokes/min		8	156 (189) Strokes/min		F	204 (-) Strokes/min	
Liquid end material (including valve materials)											
S1	Stainless steel (see table, sheet 2)										
Temperature of pumped medium											
0	-10 °C to 80 °C				2	-40 °C to 60 °C				4	10 °C to 150 °C
1	-25 °C to 60 °C				3	10 °C to 115 °C					
Displacer format											
0	PTFE multi-layer diaphragm										
1	PTFE multi-layer diaphragm with pressure gauge										
Liquid end version											
0	Standard							2	Standard + double valve		
1	Standard with spring							3	Standard + double valve with spring		
Hydraulic connection suction side											
G	Thread DIN/ISO							A	Flange ANSI		
N	Thread NPT/ANSI							D	Flange DIN/ISO		
Hydraulic connection discharge side											
G	Thread DIN/ISO							A	Flange ANSI		
N	Thread NPT/ANSI							D	Flange DIN/ISO		
Version											
0	No features										
1	Liquid end heating										
2	Liquid end polished										
3	Special paint finish										
Power connector											
A	Standard voltage 50Hz										
B	Standard voltage 50Hz adjustable										
H	Standard voltage 60Hz										
K	Standard voltage 60Hz adjustable										
0	Externally mounted pump										
1	without motor with IEC flange										
2	without motor with NEMA flange										
Electrical protection system / explosion protection											
0	IP 55		D	IP 56 EExn							
1	IP 56		E	IP 56 EExe							
A	IP 55 EExn		F	IP 56 EExde							
B	IP 55 EExe		K	IP 65 EExde							
C	IP 55 EExde										
Electrical options											
0	No options										
1	Stroke sensor										
Stroke length adjustment											
0	Manual										
1	0/4-20 mA without Ex										
2	0/4-20 mA Ex Zone 2										
3	0/4-20 mA Ex Zone 1										
4	0/4-20 mA Ex without EX offshore										
5	0/4-20 mA Ex Zone 2 offshore										
6	0/4-20 mA Ex Zone 1 offshore										
Environmental conditions											
0	-20 °C to 40 °C										
1	-40 °C to 40 °C										
2	0 °C to 55 °C										
Approvals											
0	CE										
1	API 675										
2	VDMA										
3	ATEX										
4	ATEX / API 675										
5	VDMA / ATEX										

\*For further pump configurations see Type of drive page → 2-43

\*\* Modified design (M) is available with every identity code feature

## 2.8 Hydraulic Diaphragm Metering Pumps Orlita® MF

### 2.8.7 Orlita® MFS 1400 (MF6a) Hydraulic Diaphragm Metering Pumps

#### Technical Data MfS 1400 Single Pump 50 Hz

Plunger Ø	Stroke volume	Pump capacity Q <sub>th</sub> in l/h per pump head at H/min [Identity code characteristic 4 – 9; F]:							Max. pressure	Efficiency at		Standard type of valve
		80 [4]	93 [5]	106 [6]	125 [7]	143 [8]	169 [9]	191 [F]		100%	50%	
mm	ml/ stroke	l/h	l/h	l/h	l/h	l/h	l/h	l/h	bar	pressure	pressure	
30	42.41	202	235	270	318	364	431	486	630	0.67	0.78	Ke DN 16
40	75.40	360	419	480	565	647	766	864	435	0.75	0.83	Ke DN 25
42	83.13	397	462	529	623	713	844	952	435	0.76	0.83	Ke DN 25
44	91.23	435	507	581	684	783	927	1,045	394	0.76	0.83	Ke DN 25
46	99.71	476	554	635	748	856	1,013	1,142	361	0.77	0.83	Ke DN 25
50	117.81	562	654	750	884	1,011	1,197	1,350	305	0.79	0.84	Ke DN 25
53	132.37	632	735	843	993	1,136	1,345	1,517	271	0.79	0.84	Ke DN 32
55	142.55	681	792	907	1,070	1,224	1,448	1,633	250	0.81	0.85	Ke DN 25
57	153.11	731	851	975	1,149	1,314	1,556	1,754	235	0.81	0.85	Ke DN 32
60	169.65	810	943	1,080	1,273	1,456	1,724	1,944	212	0.82	0.86	Ke DN 25
65	199.10	951	1,106	1,268	1,494	1,709	2,023	2,282	180	0.83	0.87	Ke DN 32
70	230.91	1,103	1,283	1,470	1,733	1,983	2,346	2,646	155	0.84	0.87	Ke DN 40
75	265.07	1,266	1,473	1,688	1,989	2,276	2,694	3,038	135	0.85	0.87	Ke DN 40
80	301.59	1,440	1,676	1,920	2,263	2,590	3,065	3,456	119	0.85	0.87	Ke DN 40
90	381.70	1,823	2,121	2,431	2,865	3,278	3,879	4,375	94	0.90	0.90	Ke DN 50
100	471.24	2,251	2,619	3,001	3,537	4,047	4,789	5,401	76	0.87	0.88	Ke DN 65
120	678.58	3,242	3,772	4,321	5,093	5,827	6,896	7,778	53	0.88	0.89	Ke DN 65
140	923.63	4,412	5,134	5,882	6,933	7,932	9,387	10,587	38	0.88	0.89	Ke DN 80
160	1,206.37	5,763	6,706	7,683	9,055	10,360	12,261	13,827	29	0.89	0.89	Ke DN 80

#### Technical Data MfS 1400 Single Pump 60 Hz

Plunger Ø	Stroke volume	Pump capacity Q <sub>th</sub> in l/h per pump head at H/min Identity code characteristic [3 to 9]:							Max. pressure	Efficiency at		Standard type of valve
		88 [3]	97 [4]	112 [5]	129 [6]	152 [7]	174 [8]	206 [9]		100%	50%	
mm	ml/ stroke	l/h	l/h	l/h	l/h	l/h	l/h	l/h	bar	pressure	pressure	
30	42.41	223	245	286	327	386	442	523	630	0.67	0.78	Ke DN 16
40	75.40	396	437	508	582	686	785	930	435	0.75	0.83	Ke DN 25
42	83.13	437	482	560	642	757	866	1,025	435	0.76	0.83	Ke DN 25
44	91.23	480	529	615	705	831	951	1,125	394	0.76	0.83	Ke DN 25
46	99.71	524	578	672	770	908	1,039	1,230	361	0.77	0.83	Ke DN 25
50	117.81	619	683	794	910	1,073	1,228	1,453	305	0.79	0.84	Ke DN 25
53	132.37	696	767	893	1,023	1,206	1,379	1,632	271	0.79	0.84	Ke DN 32
55	142.55	750	826	961	1,102	1,298	1,486	1,758	250	0.81	0.85	Ke DN 25
57	153.11	805	887	1,033	1,183	1,394	1,596	1,888	235	0.81	0.85	Ke DN 32
60	169.65	892	983	1,144	1,311	1,545	1,768	2,092	212	0.82	0.86	Ke DN 25
65	199.10	1,047	1,154	1,343	1,539	1,814	2,075	2,456	180	0.83	0.87	Ke DN 32
70	230.91	1,214	1,339	1,558	1,785	2,103	2,407	2,848	155	0.84	0.87	Ke DN 40
75	265.07	1,394	1,537	1,788	2,049	2,415	2,763	3,270	135	0.85	0.87	Ke DN 40
80	301.59	1,586	1,748	2,035	2,331	2,747	3,143	3,720	119	0.85	0.87	Ke DN 40
90	381.70	2,008	2,213	2,575	2,950	3,477	3,979	4,200	94	0.90	0.90	Ke DN 50
100	471.24	2,479	2,732	3,179	3,642	4,293	4,912	4,708	76	0.87	0.88	Ke DN 65
120	678.58	3,570	3,935	4,578	5,245	6,182	7,073	8,371	53	0.88	0.89	Ke DN 65
140	923.21	4,859	5,356	6,232	7,140	8,415	9,628	–	38	0.88	0.89	Ke DN 80
160	1,206.37	6,347	6,995	8,140	9,325	10,991	12,575	–	29	0.89	0.89	Ke DN 80

DK Double ball valve

Ke Conical valve

**Important note:**

- Abridged presentation of our complete product range. Other types on request
- Allow for a minimum 10% power reserve when designing in accordance with API
- All hydraulic performance data is based on water at 20 °C



## 2.8 Hydraulic Diaphragm Metering Pumps Orlita® MF

### Identity Code Ordering System

#### Orlita® MFS 1400 (MF6a) hydraulic diaphragm metering pump

MF6a	Drive type										
H1	Main drive bare horizontal *			Z1	Main drive bare central *			AR	Drive module right-hand		
V1	Main drive bare vertical *			AL	Drive module left-hand			M	Modified **		
Plunger diameter											
030	30 mm	046	46 mm	057	57 mm	075	75 mm	120	120 mm		
040	40 mm	050	50 mm	060	60 mm	080	80 mm	140	140 mm		
042	42 mm	053	53 mm	065	65 mm	090	90 mm	160	160 mm		
044	44 mm	055	55 mm	070	70 mm	100	100 mm				
Stroke rate 50 (60) Hz											
3	- (88) Strokes/min			5	93 (112) Strokes/min			7	125 (152) Strokes/min		
4	80 (97) strokes/min			6	106 (129) Strokes/min			8	143 (174) Strokes/min		
								F	169 (206) strokes/min		
									191 (-)		
Liquid end material (including valve materials)											
S1	Stainless steel (see table, sheet 2)										
Temperature of pumped medium											
0	-10 °C to 80 °C			2	-40 °C to 60 °C			4	10 °C to 150 °C		
1	-25 °C to 60 °C			3	10 °C to 115 °C						
Displacer format											
0	PTFE multi-layer diaphragm										
1	PTFE multi-layer diaphragm with pressure gauge										
Liquid end version											
0	Standard						2	Standard + double valve			
1	Standard with spring						3	Standard + double valve with spring			
Hydraulic connection suction side											
G	Thread DIN/ISO						A	Flange ANSI			
N	Thread NPT/ANSI						D	Flange DIN/ISO			
Hydraulic connection discharge side											
G	Thread DIN/ISO										
N	Thread NPT/ANSI										
A	Flange ANSI										
D	Flange DIN/ISO										
Version											
0	No features										
1	Liquid end heating										
2	Liquid end polished										
3	Special paint finish										
Power connector											
A	Standard voltage 50Hz										
B	Standard voltage 50Hz adjustable										
H	Standard voltage 60Hz										
K	Standard voltage 60Hz adjustable										
0	Externally mounted pump										
1	Without motor with IEC flange										
2	Without motor with NEMA flange										
Electrical protection system / explosion protection											
0	IP 55		D		IP 56 EExn						
1	IP 56		E		IP 56 EExe						
A	IP 55 EExn		F		IP 56 EExde						
B	IP 55 EExe		K		IP 65 EExde						
C	IP 55 EExde										
Electrical options											
0	No options										
1	Stroke sensor										
Stroke length adjustment											
0	Manual										
1	0/4-20 mA without Ex										
2	0/4-20 mA Ex Zone 2										
3	0/4-20 mA Ex Zone 1										
4	0/4-20 mA Ex without EX offshore										
5	0/4-20 mA Ex Zone 2 offshore										
6	0/4-20 mA Ex Zone 1 offshore										
Environmental conditions											
0	-20 °C to 40 °C										
1	-40 °C to 40 °C										
2	0 °C to 55 °C										
Approvals											
0	CE										
1	API 675										
2	VDMA										
3	ATEX										
4	ATEX / API 675										
5	VDMA / ATEX										

\*For further pump configurations see Type of drive page → 2-43

\*\* Modified design (M) is available with every identity code feature

## 2.9 Hydraulic Diaphragm Metering Pumps Orlita® Evolution 3

### 2.9.1

### Hydraulic Diaphragm Metering Pumps Orlita® Evolution 3

NEW



#### Maximum process reliability and flexibility

Capacity range of single pump: 25 – 1,335 l/h, 353 – 18 bar

The Orlita® Evolution 3 meets the most exacting safety requirements as an extremely robust hydraulic diaphragm metering pump. It stands out, among other things, thanks to its PTFE multi-layer diaphragm with integral diaphragm rupture warning system. Its modular construction offers extremely good flexibility in terms of applications.

The Orlita® Evolution (EF3a) hydraulic diaphragm metering pump together with the pumps EF1a, EF2a and EF4a form an integrated product range with stroke lengths of 15 to 40 mm. This covers the capacity range from 3 to 7,400 l/h at 400 – 10 bar. A wide range of drive versions is available, including some for use in Zone 1 or Zone 2 areas at risk from explosion with ATEX certification. The Orlita® Evolution product range is designed to comply with API 675.

#### Your benefits

Maximum process reliability:

- PTFE multi-layer diaphragm with integral diaphragm rupture warning system
- Integral hydraulic relief valve
- The new diaphragm layer control protects against impermissible operating statuses (e.g. no damage in the event of a blockage on the suction or discharge side)
- Metering reproducibility is better than  $\pm 1\%$  within the 10 – 100 % stroke length range under defined conditions and with correct installation
- Continuous bleeding of the oil chamber ensures reliable operation

Excellent flexibility:

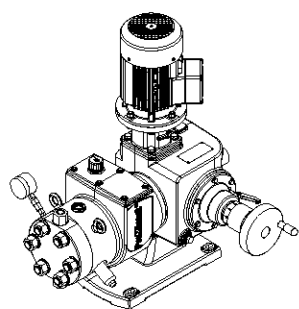
- The modular construction with single and multiple pump versions permits a wide range of applications, with up to 5 metering units, even with different pump capacities, which can be combined with multiple pump systems
- 7 different gear ratios are available
- Power end configuration ideal for installation in any position (vertical or horizontal)
- Customised designs are available on request

#### Technical details

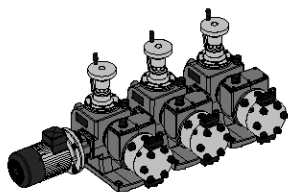
- Stroke length: 0 - 25 mm, Rod force: 8,000 N
- Stroke length adjustment: 0 – 100 %
- Stroke length adjustment: manually by means of a manual adjustment wheel and scaled display (optionally with electric actuator or control drive)
- Metering reproducibility is better than  $\pm 1\%$  within the 10 – 100 % stroke length range under defined conditions and with correct installation
- PTFE multi-layer diaphragm with electrical diaphragm rupture warning system via a contact
- Integrated hydraulic relief and bleed valve
- Wetted materials: Stainless steel 1.4404, special designs are available on request
- A wide range of power end versions is available: Three-phase standard motors also for use in Exe and Exde areas and different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Design in compliance with API 675 among others

#### Field of application

- Oil and gas industry
- Volume-proportional metering of chemicals/additives in the treatment of boiler feed water
- Metering of reactants and catalysts in the chemical industry
- Level-dependent metering of auxiliary agents in industrial production engineering, for instance hot wax metering in the production of adhesive strips



P\_ORL\_063\_SW1  
Orlita® Evolution EF3a



P\_PZ\_0008\_SW1  
Orlita® Evolution triplex pump



## 2.9 Hydraulic Diaphragm Metering Pumps Orlita® Evolution 3

Technical data for EF3a single pump 50 Hz

Plunger Ø	Stroke volume	Theoretical pump capacity in l/h at strokes/min (50 Hz)							Max. pressure	Efficiency at		Standard type of valve
		73 [2] l/h	97 [3] l/h	116 [4] l/h	145 [5] l/h	165 [6] l/h	181 [7] l/h	201 [8] l/h		100% pressure	50% pressure	
mm	ml/ stroke								bar			
17	5.67	24.68	32.91	39.49	49.37	56.10	61.71	68.57	352	0.75	0.86	DN 6
18	6.36	27.67	36.90	44.28	55.35	62.89	69.18	76.87	314	0.77	0.87	DN 6
22	9.50	41.34	55.12	66.14	82.68	93.95	103.35	114.83	210	0.86	0.92	DN 6
25	12.27	53.38	71.18	85.41	106.77	121.32	133.46	148.28	163	0.86	0.93	DN 10
30	17.67	76.87	102.49	122.99	153.74	174.71	192.18	213.53	113	0.90	0.93	DN 10
36	25.45	110.69	147.59	177.11	221.39	251.58	276.74	307.48	78	0.92	0.94	DN 16
42	34.64	150.67	200.89	241.07	301.33	342.42	376.67	418.52	57	0.93	0.94	DN 16
50	49.09	213.53	284.71	341.65	427.06	485.30	533.83	593.14	41	0.94	0.95	DN 25
60	70.69	307.48	409.98	491.97	614.97	698.83	768.71	854.12	27	0.95	0.96	DN 25
70	96.21	418.52	558.03	669.63	837.04	951.18	1,046.30	1,162.55	21	0.96	0.97	DN 25
75	110.45	480.44	640.59	768.71	960.89	1,091.92	1,201.11	1,334.56	17	0.97	0.98	DN 25

Technical data for EF3a single pump 60 Hz

Plunger Ø	Stroke volume	Theoretical pump capacity in l/h at strokes/min (60 Hz)					Max. pressure	Efficiency at		Standard type of valve
		88 [1] l/h	117 [2] l/h	140 [3] l/h	175 [4] l/h	199 [5] l/h		100% pressure	50% pressure	
mm	ml/ stroke						bar			
17	5.67	29.79	39.72	47.67	59.58	67.71	352	0.75	0.86	DN 6
18	6.36	33.40	44.53	53.44	66.80	75.91	314	0.77	0.87	DN 6
22	9.50	49.89	66.52	79.83	99.78	113.39	210	0.86	0.92	DN 10
25	12.27	64.43	85.90	103.08	128.85	146.43	163	0.86	0.93	DN 10
30	17.67	92.78	123.70	148.44	185.55	210.85	113	0.90	0.93	DN 10
36	25.45	133.60	178.13	213.75	267.19	303.63	78	0.92	0.94	DN 16
42	34.64	181.84	242.45	290.94	363.68	413.27	57	0.93	0.94	DN 16
50	49.09	257.71	343.61	412.33	515.42	585.70	41	0.94	0.95	DN25
60	70.69	371.10	494.80	593.76	742.20	843.41	27	0.95	0.96	DN 25
70	96.21	505.11	673.48	808.17	1,010.22	1,147.98	21	0.96	0.97	DN 25
75	110.45	579.84	773.13	927.75	1,159.69	1,317.83	17	0.97	0.98	DN 25

**Important note:**

Abridged presentation of our complete product range. Other types on request

### Materials in contact with the medium

#### Dosing head complete

Dosing head	Diaphragm retaining screw	Diaphragm
Stainless steel 1.4404	Stainless steel 1.4462	PTFE multi-layer diaphragm

#### Ball valve

	Suction/pressure connector	Valve/head seal	Valve ball	Valve seat	Valve housing	Clamp ring
DN 6 (double ball)	Stainless steel 1.4404	Stainless steel 1.4404	SIN	Stainless steel 1.4404	Stainless steel 1.4404	Stainless steel 1.4571, steel 2.4610
DN 10 (single ball)	Stainless steel 1.4404	Stainless steel 1.4404	Al <sub>2</sub> O <sub>3</sub> ceramic	Stainless steel 1.4404	Stainless steel 1.4404	Stainless steel 1.4571, steel 2.4610

#### Plate valve DN 15/DN 25

	Suction/pressure connector	Valve/head seal	Valve plate	Valve seat	Valve housing
DN 15 / DN 25	Stainless steel 1.4404	Stainless steel 1.4571	Stainless steel 1.4462	Stainless steel 1.4404	Stainless steel 1.4404

Further material versions and details available on request.

## 2.10 Hydraulic Diaphragm Metering Pumps Orlita® MH

### 2.10.1

### Hydraulic Diaphragm Metering Pumps Orlita® MH with Metal Diaphragm

**Reliable capacity even at very high pressure**

**Capacity range of single pump: up to 800 l/h, up to 700 bar**

The diaphragm metering pump ORLITA® MH has a robust metal diaphragm, which permits precise pump capacities even at very high pressure. The ORLITA® MH has a modular construction and therefore has a versatile range of uses. A range of power end versions are therefore available and drives, power ends and dosing heads can be freely combined.

ORLITA® MH hydraulic diaphragm metering pumps (MHS 18 to MHS 1400) with a stroke length of 15 to 60 mm provide a capacity range of up to 800 l/h at pressures of up to 7 bar. A wide range of drive versions is available, including some for use in Exe and Exde areas with ATEX certification. The Orlita® MF product range is designed to comply with API 675. Its modular construction permits the free combination of drives, power ends and dosing heads, producing a pump for a range of different feed rates and media operating at different working pressures.

#### Your benefits

Excellent process safety and reliability:

- Metal double diaphragm with integrated diaphragm rupture warning system ensures precise and low-wear operation even at very high pressure
- The product chamber is hermetically separated from the hydraulic part
- Integrated hydraulic relief valve and automatic bleed valve for the hydraulic chamber
- Wear-free, valveless enforced anti-cavitation of the hydraulic leakage guarantees optimum dosing precision
- Metering reproducibility is better than  $\pm 0.5\%$  within the 10 – 100 % stroke length range under defined conditions and with correct installation
- Cone valves for use as suction and/or discharge valves with minimal wear, good self-cleaning and low pressure loss (NPSHR)

Excellent flexibility:

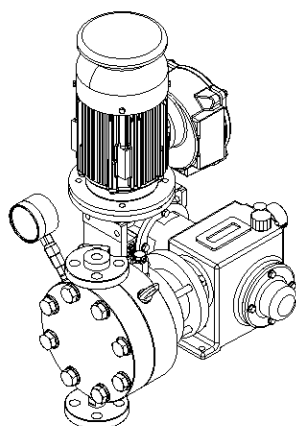
- The modular construction ensures a wide range of uses
- It is possible to combine up to 6 metering units, even with different pump capacities, in multiple pump systems
- 6 different gear ratios are available
- Power end configuration ideal for installation in any position (vertical or horizontal)
- Temperature range - 60 °C to + 200 °C
- Customised designs are available on request

#### Technical details

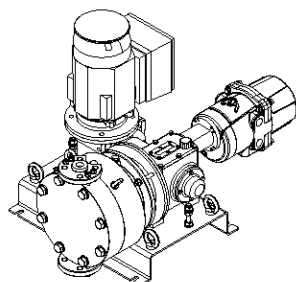
- MhS 18 – Stroke length: 0-15 mm, Rod force: 1,750 N
- MhS 35 – Stroke length: 0-20 mm, Rod force: 3,500 N
- MhS 80 – Stroke length: 0-20 mm, Rod force: 14,000 N
- MhS 180 – Stroke length: 0-40 mm, Rod force: 18,000 N
- MhS 600 – Stroke length: 0-40 mm, Rod force: 40,000 N
- MhS 1400 – Stroke length: 0-60 mm, Rod force: 60,000 N
- Stroke length adjustment range: 0 – 100% in operation and idle.
- Stroke length adjustment: manually by means of a manual adjustment wheel and scaled display (optionally with electric actuator or control drive).
- Metering reproducibility is better than  $\pm 0.5\%$  within the stroke length adjustment range of 10 – 100% under defined conditions and with proper installation.
- Metal diaphragm with diaphragm rupture monitoring system
- Integrated hydraulic relief and bleed valve
- Wetted materials: Stainless steel, special designs are available on request
- A wide range of power end versions is available: Three-phase standard motors, motors for use in Exe and Exde areas and different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Temperature range - 60 °C to + 200 °C
- Design in compliance with API 675 among others

#### Field of application

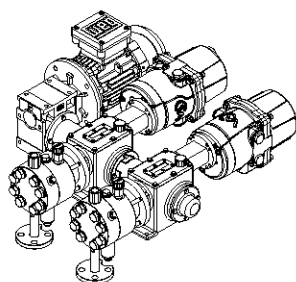
- Oil/ gas production (onshore/offshore)
- Chemical/Petrochemical industry
- Pharmaceuticals & cosmetics
- Food production
- Packaging industry (bottling pumps)



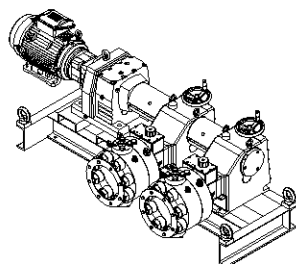
P\_ORL\_068\_SW1  
Orlita® MHS 18-20



P\_ORL\_067\_SW1  
Orlita® MHS 35/45



P\_ORL\_069\_SW1  
Orlita® MHS 35-8-8



P\_ORL\_070\_SW1  
Orlita® MHS 600-28-28





## 2.10 Hydraulic Diaphragm Metering Pumps Orlita® MH

Pump type	Plunger Ø		Stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)						Max. pressure
	mm	ml/stroke		58 l/h	73 l/h	91 l/h	112 l/h	145 l/h	207 l/h	
MHS 18/	3	0.11		0.37	0.46	0.58	0.71	0.92	1.32	100
	5	0.29		1	1.2	1.6	1.9	2.5	3.6	400
	6	0.42		1.4	1.8	2.3	2.8	3.6	5.2	400
	7	0.58		2	2.5	3.1	3.8	5	7.1	400
	8	0.75		2.6	3.2	4.1	5	6.5	9.3	348
	10	1.18		4.1	5.1	6.4	7.8	10.2	14.6	222
	12	1.70		5.9	7.3	9.2	11.3	14.7	21	154
	16	3.02		10.5	13.1	16.4	20.1	26.2	37.4	87
	20	4.71		16.4	20.5	25.5	31.5	41	58.5	55

Pump type	Plunger Ø		Stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)						Max. pressure
	mm	ml/stroke		58 l/h	73 l/h	91 l/h	112 l/h	145 l/h	207 l/h	
MHS 35/	7	0.77		2.6	3.3	4.1	5.1	6.7	9.5	900
	8	1.01		3.5	4.3	5.4	6.7	8.7	12.4	630
	10	1.57		5.4	6.8	8.5	10.5	13.6	19.5	445
	12	2.26		7.8	9.8	12.3	15.1	19.6	28.1	309
	14	3.08		10.7	13.3	16.7	20.6	26.7	38.2	227
	16	4.02		13.9	17.4	21.8	26.9	34.9	49.9	174
	18	5.09		17.7	22.1	27.6	34.0	44.2	63.2	137
	20	6.28		21.8	27.3	34.1	42.0	54.6	78.0	111
	22	7.60		26.4	33.0	41.3	50.8	66.1	94.4	92
	25	9.80		34.1	42.7	53.3	65.7	85.4	122.0	71
	36	20.36		70.8	88.5	110.6	136.2	177.1	253.0	34
	40	25.13		87.4	109.3	136.6	168.2	218.6	312.3	27
	45	31.81		110.6	138.3	172.9	212.8	276.7	395.3	22

Pump type	Plunger Ø		Stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)						Max. pressure
	mm	ml/stroke		98 l/h	104 l/h	122 l/h	134 l/h	160 l/h	182 l/h	
MHS 80/	16	4.02		23.6	25.0	29.4	32.4	38.6	43.9	696
	18	5.09		29.9	31.7	37.2	41.0	48.8	55.5	550
	20	6.28		37.0	39.1	46.0	50.6	60.3	68.5	445
	22	7.60		44.7	47.4	55.6	61.3	73.0	82.9	368
	25	9.82		57.8	61.2	71.9	79.1	94.2	107.1	285

Pump type	Plunger Ø		Stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)						Max. pressure
	mm	ml/stroke		99 l/h	117 l/h	134 l/h	156 l/h	173 l/h	204 l/h	
MHS 600/25,5	25.5	20.43		121	143	164	191	211	249	783
MHS 600/28	28	24.63		146	172	198	230	255	300	649
MHS 600/30	29.2	26.79		159	188	215	250	277	327	570
MHS 600/32	32	32.17		191	225	258	301	333	393	497

Pump type	Plunger Ø		Stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)						Max. pressure
	mm	ml/stroke		93 l/h	106 l/h	125 l/h	143 l/h	169 l/h	191 l/h	
MHS 1400/	30	42.41		235	270	318	364	431	486	848
	32	48.25		268	307	362	414	490	553	746
	36	91.07		339	388	458	524	620	700	589
	40	75.40		419	480	565	647	766	864	477

### Important note:

Abridged presentation of our complete product range. Other types on request

## 2.11 Hydraulic Metal Diaphragm Metering Pump High-pressure MHHP

### 2.11.1

### Hydraulic Metal Diaphragm Metering Pump High-pressure MHHP

**Reliable capacity even at maximum pressure**

**Capacity range of single pump: 3 – 11 l/h, 4,000 bar**

The metal diaphragm metering pumps ORLITA® MHR/MHS are special pumps, which provide precise pump capacities even at maximum pressures of up to 3,000 bar.

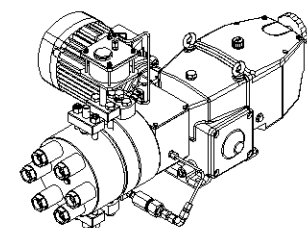
The hydraulic metal diaphragm metering pumps ORLITA® MHR 150 / MHS 600 have a metal diaphragm, which is designed to meter precisely at maximum pressures of up to 4,000 bar. Excellent process reliability is guaranteed as the Orilita® MHR/MHS are designed to comply with API 675.

#### Technical details

- MHS: Stroke length: 0 – 40 mm, Rod force: 40,000 N
- MHR: Stroke length: 0 – 32 mm, Rod force: 15,000 N
- Stroke length adjustment range: 0 – 100 % in operation and idle
- Stroke length adjustment: manually by means of a manual adjustment wheel and scaled display (optionally with electric actuator or control drive)
- Metering reproducibility is better than  $\pm 0.5$  % within the 10 – 100 % stroke length range under defined conditions and with correct installation
- Metal diaphragm with diaphragm rupture monitoring system
- Integrated hydraulic relief and bleed valve
- Wetted materials: Stainless steel, special designs are available on request
- A wide range of power end versions is available: Three-phase standard motors, motors for use in Exe and Exde areas and different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Temperature range -60 °C to +200 °C
- Design in compliance with API 675 among others

#### Field of application

- Chemical/petrochemical industry
- Maximum pressure applications of up to 3,000 bar



P\_ORL\_065\_SW1  
Orlita® MHR 150/7

Pump type	Plunger Ø		Stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)				Max. pressure
				58	87	116	145	
	mm	ml/stroke		l/h	l/h	l/h	l/h	bar
MHR 150/	6	0.90		3.1	4.7	6.3	7.8	3,000
	7	1.23		4.2	6.4	8.5	10.7	3,000

Pump type	Plunger Ø		Stroke volume	Max. capacity (theo.)					Max. pressure
				90	99	117	134	156	
	mm	ml/stroke		l/h	l/h	l/h	l/h	l/h	bar
MHS 600/	10.5	3.46		18.6	20.6	24.3	27.8	32.4	3,000





## 2.12 Plunger Metering Pump Sigma/ 2 (Basic Type)

### 2.12.1

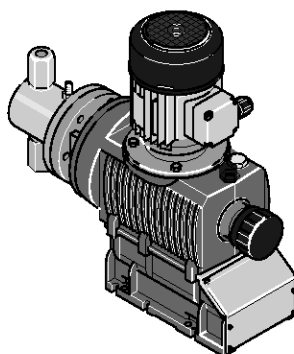
### Plunger Metering Pump Sigma/ 2 (Basic Type)

**Sigma plunger pump – durable and high-performance**

**Capacity range 2 – 76 l/h, 320 – 12 bar**



The plunger metering pump Sigma/ 2 (Basic Type) is an extremely robust plunger metering pump with high-performance plunger and the option to adjust the pump capacity in 0.2% increments. It offers a wide range of power end versions, such as three-phase or 1-phase AC motors, even for Exe and Exde areas with ATEX certification.



pk\_2\_006  
Sigma Basic Type SBKa

The plunger metering pump Sigma/ 2 (Basic Type) (SBKa) is a metering pump, the pump capacity of which can be precisely adjusted in 0.2% increments, either manually or optionally with an electric actuator or control drive. A wide range of drive versions is available, including some for use in Exe and Exde areas with ATEX certification.

#### Your benefits

Excellent process safety and reliability:

- Metering reproducibility is better than  $\pm 1\%$  within the 10 – 100 % stroke length range under defined conditions and with correct installation

Flexible adaptation to the process:

- Wide range of power end versions, also for use in Exe and Exde areas and different flange designs for the use of customised motors
- Customised designs are available on request

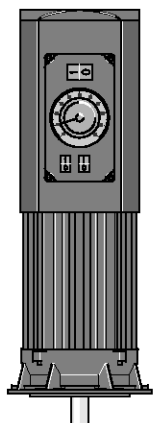
#### Technical details

- Stroke length: 15 mm
- Stroke length adjustment range: 0 – 100%
- Stroke length adjustment: manually by self-locking rotary dial in 0.2% increments (optionally with electric actuator or control drive)
- Metering reproducibility is better than  $\pm 1\%$  within the 10-100% stroke length adjustment range under certain defined conditions and with proper installation
- Wetted materials: Stainless steel 1.4571/1.4404, special materials are available on request
- High-performance oxide ceramic plunger
- A wide range of power end versions is available: Three-phase standard motor, 1-phase AC motor, motors for use in Exe and Exde areas and different flange designs for use in customer-specific motors
- Degree of protection IP 55
- Highly rigid fibreglass-reinforced plastic housing with excellent chemical resistance
- Provide suitable overload protection in all plunger metering pumps during installation for safety reasons

#### Field of application

- Volume-proportional metering of chemicals in the treatment of boiler feed water
- Metering of reactants and catalysts in the chemical industry
- Level-dependent metering of auxiliary agents in industrial production engineering, for instance hot wax metering in the production of adhesive strips

## 2.12 Plunger Metering Pump Sigma/ 2 (Basic Type)



pk\_2\_103  
Variable speed motor with integrated frequency converter

### Sigma Basic Type Control Functions

#### Stroke length actuator/controller

**Actuator** for automatic stroke length adjustment, actuating period approx. 1 sec for 1 % stroke length, 1 k $\Omega$  response signal potentiometer, enclosure rating IP 54.

**Controller** consists of actuator with servomotor and integrated servo control for stroke length adjustment via a standard signal. Standard signal input 0/4-20 mA corresponds to stroke length 0 - 100 %. Automatic/manual operation selection key for manual stroke adjustment. Mechanical status display of actual stroke length value output 0/4-20 mA for remote display.

#### Variable speed motors with integrated speed controller (identity code characteristic V)

Power supply 1 ph 230 V, 50/60 Hz, 0.37 kW.

External control with 0/4-20 mA (see pk\_2\_103)

(Speed Controllers see p. → 1-72)

#### Speed controllers in metal housing (identity code characteristic Z)

The speed controller assembly consists of a speed controller and a 0.37 kW variable speed motor.

(Speed Controllers see p. → 1-72)





## 2.12 Plunger Metering Pump Sigma/ 2 (Basic Type)

### Technical Data

Type SBKa	With 1500 rpm motor at 50 Hz				With 1800 rpm motor at 60 Hz				Suction lift  mWC	Perm. pre- pressure suction side  bar	Connector Suction/ Discharge Side  Rp-DN	Shipping weight  kg	Plunger Ø  mm
	Delivery rate at max. back pressure			Max. stroke rate  Strokes/ min	Delivery rate at max. back pressure			Max. stroke rate  Strokes/ min					
	bar	l/h	ml/ stroke		psi	l/h	gph (US)						
32002	320	1.9	0.46	71	4,641	2.3	0.61	84	5.0	160	1/4	24	8
23004	230	4.0	0.52	129	3,336	4.8	1.27	154	5.0	115	1/4	24	8
10006	100	6.4	0.55	195	1,450	7.6	2.01	233	5.0	50	1/4	24	8
14006	140	6.1	1.42	71	2,031	7.1	1.88	84	4.0	70	1/4	24	12
10011	100	11.0	1.43	129	1,450	13.1	3.46	153	4.0	50	1/4	24	12
05016	50	16.7	1.43	195	725	20.0	5.28	233	4.0	25	1/4	24	12
07012	70	12.4	2.90	71	1,015	14.8	3.91	85	4.0	35	1/4	24	17
04522	45	22.5	2.91	129	653	26.7	7.05	153	4.0	22.5	1/4	24	17
02534	25	34.1	2.92	195	363	40.8	10.78	233	4.0	12.5	1/4	24	17
04022	40	22.4	5.26	71	580	26.5	7.00	84	4.0	20	3/8	25	23
02541	25	41.5	5.37	129	363	49.2	13.00	153	4.0	12.5	3/8	25	23
01264	12	64.0	5.45	195	174	76.0	20.08	233	4.0	6	3/8	25	23

### Materials in contact with the medium

Material	Dosing head	Suction/pressure connector	Seals/ball seat	Balls	Ball seat
SST	Stainless steel 1.4404	Stainless steel 1.4404	PTFE or  PTFE +25% carbon	Ceramic	Stainless steel 1.4404

### Motor Data

Identity code specification		Power supply		Remarks	
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz 0.25 kW		
R	3 ph, IP 55	230 V/400 V	50/60 Hz 0.37 kW	With PTC, speed adjustment range 1:20 with external fan 1 ph 230 V; 50/60Hz	
V0	1 ph, IP 55	230 V ±5 %	50/60 Hz 0.37 kW	Variable speed motor with integrated frequency converter	
M	1 ph AC, IP 55	230 V ±5%	50/60 Hz 0.18 kW		
N	1 ph AC, IP 55	115 V ±5 %	60 Hz 0.18 kW		
L1	3 ph, II2GEEExIICT3	220-240 V/380-420 V	50 Hz 0.18 kW		
L2	3 ph, II2GEEExIICT4	220-240 V/380-420 V	50 Hz 0.18 kW	With PTC, speed control range 1:5	
P1	3 ph, II2GEEExIICT3	250-280 V/440-480 V	60 Hz 0.18 kW		
P2	3 ph, II2GEEExIICT4	250-280 V/440-480 V	60 Hz 0.21 kW	With PTC, speed control range 1:5	

Motor data sheets can be requested for more information.

Special motors or special motor flanges are possible on request.

The motors are designed in compliance with the Ecodesign Directive 2005/32/EC (IE2 standard).

### Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 94/9/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label corresponds to or is better than the conditions prevalent in the intended field of application.

## 2.12 Plunger Metering Pump Sigma/ 2 (Basic Type)

### 2.12.2

### Identity Code Ordering System for SBKa

#### Sigma Basic Type SBKa

SBKa	Drive type	
HK	Main drive, plunger	
Type		
	bar	l/h
32002	320	1.9
23004	230	4.0
10006	100	6.4
14006	140	6.1
10011	100	11.0
05016	50	16.7
07012	70	12.4
04522	45	22.5
02534	25	34.1
04022	40	22.4
02541	25	41.5
01264	12	64.0
Liquid end material		
SS	Stainless steel	
Sealing material*		
T	PTFE	
Displacement body*		
4	Plunger (oxide ceramic)	
Liquid end version		
0	No spring (standard)	
1	With 2 valve springs, Hastelloy C, 0.1 bar	
Hydraulic connection		
0	Standard threaded connector (according to technical data)	
Version		
0	With ProMinent® logo (standard)	
1	Without ProMinent® logo	
M	Modified	
Electrical power supply		
S	3 ph, 230 V/400 V 50/60 Hz, 0.18 kW	
R	3 ph, variable speed motor, 230/400 V, 0.37 kW	
V (0)	Variable speed motor with integrated SC 1 pH, 230 V, 50/60 Hz	
Z	1 ph, variable speed set 230 V, 50/60 Hz	
M	1 ph, AC, 230 V/ 50/60 Hz, 0.18 kW	
N	1 ph, AC 115 V 60 Hz, 0.18 kW	
L	3 ph, 230 V/400 V, 50 Hz, (EEExe, EEExd), 0.18 kW	
P	3 ph, 230 V/400 V, 60 Hz, (EEExe, EEExd), 0.18 kW	
1	No motor, with B 14 flange (size 71 (DIN))	
2	No motor, C 56 flange (NEMA)	
3	No motor, B 5 size 63 (DIN)	
Enclosure rating		
0	IP 55 (standard)	
1	Exe motor version ATEX-T3	
2	Exd motor version ATEX-T4	
A	ATEX power end	
Stroke sensor		
0	No stroke sensor (standard)	
2	Pacing relay (reed relay)	
3	Stroke sensor (Namur) for hazardous locations	
Stroke length adjustment		
0	Manual (standard)	
1	With stroke positioning motor, 230 V/50/60 Hz	
2	With stroke positioning motor, 115 V/50/60 Hz	
3	With stroke control motor 0...20 mA 230 V/50/60 Hz	
4	With stroke control motor 4...20 mA 230 V/50/60 Hz	
5	With stroke control motor 0...20 mA 115 V/50/60 Hz	
6	With stroke control motor 4...20 mA 115 V/50/60 Hz	

## 2.12 Plunger Metering Pump Sigma/ 2 (Basic Type)

### 2.12.3

#### Spare Parts Kits

Consisting of: 1 ceramic metering plunger, 4 valve balls, 4 ball seat discs, 2 PTFE/graphite ball seals, 2 plunger guides, 14 flat seals, 2 O-rings.

	Type	Order no.
Liquid end FK 08	Applies to identity code: 32002, 23004, 10006	1001572
Liquid end FK 12.5	Applies to identity code: 14006, 10011, 05016	910470
Liquid end FK 25	Applies to identity code: 07012, 04522, 02534	910471
Liquid end FK 50	Applies to identity code: 04022, 02541, 01264	910472



## 2.13 Plunger Metering Pump Sigma/ 2 (Control Type)

### 2.13.1

### Plunger Metering Pump Sigma/ 2 (Control Type)

**Sigma plunger pump – durable, high-performance and intelligent**

**Capacity range 2 – 76 l/h, 320 – 12 bar**



The plunger metering pump Sigma/2 (Control Type) is an extremely robust metering pump with integral control for analogue and/or contact operation. It has a high-performance plunger and offers the option of adjusting the pump capacity in 0.2% increments. It offers a wide range of power end versions, such as three-phase or 1-phase AC motors, and different flange designs.

The plunger metering pump Sigma/ 2 (Control Type) (SCKa) is a metering pump, the pump capacity of which can be precisely adjusted in 0.2% increments, either manually or optionally with an electric actuator or control drive. The integrated controller allows the pump to adapt quickly and reliably to changing metering tasks.

#### Your benefits

Process reliability:

- Metering reproducibility is better than  $\pm 1\%$  within the 10 – 100 % stroke length range under defined conditions and with correct installation

Flexible adaptation to the process:

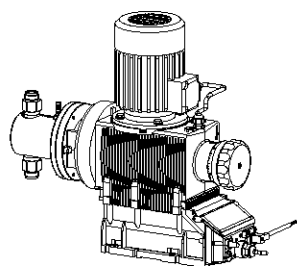
- The integrated controller allows the pump to adapt quickly and reliably to changing metering tasks
- Customised designs are available on request

#### Technical details

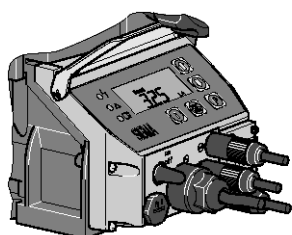
- Stroke length: 15 mm
- Stroke length adjustment range: 0 – 100%
- Stroke length adjustment: manually by self-locking rotary dial in 0.2% increments (optionally with electric actuator or control drive)
- Metering reproducibility is better than  $\pm 1\%$  within the 10-100% stroke length adjustment range under certain defined conditions and with proper installation
- Wetted materials: Stainless steel 1.4571/1.4404, special materials are available on request
- High-performance oxide ceramic plunger
- Integrated control for analogue and/or contact operation
- Power supply: 1-phase, 100 – 230 V  $\pm 10\%$ , 240 V  $\pm 6\%$ , 50/60 Hz (220 W)
- Degree of protection IP 55
- Highly rigid fibreglass-reinforced plastic housing with excellent chemical resistance
- Provide suitable overload protection in all plunger metering pumps during installation for safety reasons

#### Field of application

- Volume-proportional metering of chemicals in the treatment of boiler feed water
- Metering of reactants and catalysts in the chemical industry
- Level-dependent metering of auxiliary agents in industrial production engineering, for instance hot wax metering in the production of adhesive strips



P\_ORL\_066\_SW1  
Sigma control type SCKa



pk\_2\_104  
Sigma Controller



## 2.13 Plunger Metering Pump Sigma/ 2 (Control Type)

### Technical Data

Type	Delivery rate at max. back pressure		With 1800 rpm motor at 60 Hz				Suction lift	Perm. pre-pressure suction side	Connector Suction/ Discharge Side	Shipping weight	Plunger Ø
			Delivery rate at max. back pressure		Max. stroke rate						
	bar	ml/stroke	psi	l/h	gph (US)	Strokes/min				mWC	
32002	320	0.46	4,641	2.3	0.61	84	5.0	160	1/4	24	8
23004	230	0.52	3,336	4.8	1.27	154	5.0	115	1/4	24	8
10006	100	0.55	1,450	7.6	2.01	233	5.0	50	1/4	24	8
14006	140	1.42	2,031	7.1	1.88	84	4.0	70	1/4	24	12
10011	100	1.43	1,450	13.1	3.46	153	4.0	50	1/4	24	12
05016	50	1.43	725	20.0	5.28	233	4.0	25	1/4	24	12
07012	70	2.90	1,015	14.8	3.91	85	4.0	35	1/4	24	17
04522	45	2.91	653	26.7	7.05	153	4.0	22.5	1/4	24	17
02534	25	2.92	363	40.8	10.78	233	4.0	12.5	1/4	24	17
04022	40	5.26	580	26.5	7.00	84	4.0	20	3/8	25	23
02541	25	5.37	363	49.2	13.00	153	4.0	12.5	3/8	25	23
01264	12	5.45	174	65.4	17.28	200	4.0	6	3/8	25	23

### Materials in contact with the medium

Material	Dosing head	Suction/pressure connector	Seals/ball seat	Balls	Ball seat
SST	Stainless steel 1.4404	Stainless steel 1.4404	PTFE or PTFE +25% carbon	Ceramic	Stainless steel 1.4404

### Motor Data

Identity code specification	Power supply				Remarks
U	1-phase, IP 55	100 – 230 V ±10 %, 240 V ±6 %, 50/60 Hz	220 W		

The motors are designed in compliance with the Ecodesign Directive 2005/32/EC (IE2 standard).

### Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 94/9/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label corresponds to or is better than the conditions prevalent in the intended field of application.

## 2.13 Plunger Metering Pump Sigma/ 2 (Control Type)

### 2.13.2 Identity Code Ordering System for SCKa

#### Sigma Control Type SCKa

SCKa	Drive type
HK	Main drive, plunger
<b>Type</b>	
	bar l/h
32002	320 2.3
23004	230 4.8
10006	100 6.4
14006	140 7.1
10011	100 13.1
05016	50 16.7
07012	70 14.8
04522	45 26.7
02534	25 34.1
04022	40 26.5
02541	25 49.2
01264	12 64.0
<b>Liquid end material</b>	
SS	Stainless steel
<b>Sealing material*</b>	
T	PTFE
<b>Displacement body*</b>	
4	Plunger (oxide ceramic)
<b>Liquid end version</b>	
0	No spring (standard)
1	With 2 valve springs, Hastelloy C 4, 0.1 bar
<b>Hydraulic connection</b>	
0	Standard threaded connector (according to technical data)
<b>Version</b>	
0	With ProMinent® logo
1	Without ProMinent® logo
<b>Electrical power supply</b>	
U	1 ph 100-230 V ±10 %, 50/60 Hz
<b>Cable and plug</b>	
A	2 m European
B	2 m Swiss
C	2 m Australian
D	2 m USA
<b>Relay</b>	
0	No relay
1	With fault indicating relay 1x changeover 230 V – 2A
3	With fault indicating relay 1x changeover 230 V – 2A
4	As 1 + pacing relay 2x normally open 24 V - 100 mA
5	As 3 with pacing relay 2x normally open 24 V - 100 mA
A	Shut-off and warning relays normally closed 2x normally open 24 V - 100 mA
F	Power relay normally closed 1x changeover 230 V - 8 A
<b>Control variant</b>	
0	Manual + external with pulse control
1	Manual + external + pulse control + analogue
<b>Access code</b>	
0	No access code
1	With access code
<b>Metering monitor</b>	
0	Input with pulse evaluation
1	Input with cont. evaluation
<b>Stroke length adjustment</b>	
0	Manual

### 2.13.3 Spare Parts Kits

Consisting of: 1 ceramic metering plunger, 4 valve balls, 4 ball seat discs, 2 PTFE/graphite ball seals, 2 plunger guides, 14 flat seals, 2 O-rings.

	Type	Order no.
<b>Liquid end FK 08</b>	applies to identity code: 32002, 23004, 10006	1001572
<b>Liquid end FK 12.5</b>	applies to identity code: 14006, 10011, 05016	910470
<b>Liquid end FK 25</b>	applies to identity code: 07012, 04522, 02534	910471
<b>Liquid end FK 50</b>	applies to identity code: 04022, 02541, 01264	910472





## 2.14 Plunger Metering Pump Meta

### 2.14.1

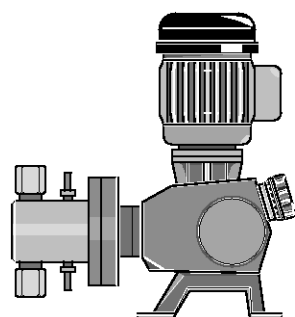
### Plunger Metering Pump Meta

**Meta plunger pump – durable and high-performance**

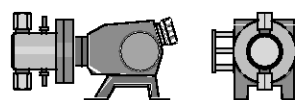
**Capacity range 6 – 59 l/h, 216 – 52 bar**



The extremely high-performance Meta is a plunger metering pump with the option of adjusting the pump capacity in 0.2% increments. It offers a wide range of power end versions, such as three-phase or 1-phase AC motors, even for Exe and Exde areas with ATEX certification.



pk\_2\_010  
Meta plunger metering pump MTKa



pk\_2\_011  
Meta plunger metering pump MTKa

The Meta (MTKa) is a plunger metering pump, the pump capacity of which can be precisely adjusted in 0.2% increments, either manually or optionally with an electric actuator or control drive. A wide range of drive versions is available, including some for use in Exe and Exde areas with ATEX certification.

#### Your benefits

Excellent process safety and reliability:

- Metering reproducibility is better than  $\pm 0.5\%$  within the 10 – 100 % stroke length range under defined conditions and with correct installation

Flexible adaptation to the process:

- Wide range of power end versions, also for use in Exe and Exde areas and different flange designs for the use of customised motors
- Customised designs are available on request

#### Technical details

- Stroke length: 15 mm,
- Stroke length adjustment range: 0 – 100%
- Stroke length adjustment: manually by self-locking rotary dial in 0.2% increments (optionally with electric actuator or control drive)
- Metering reproducibility is better than  $\pm 1\%$  within the 10-100% stroke length adjustment range under certain defined conditions and with proper installation
- Wetted materials: Stainless steel 1.4571/1.4404
- High-performance oxide ceramic plunger
- A wide range of power end versions is available: Three-phase standard motor, 1-phase AC motor, motors for use in Exe and Exde areas and different flange designs for use in customer-specific motors
- Degree of protection IP 55
- Fibreglass-reinforced plastic housing
- Provide suitable overload protection in all plunger metering pumps during installation for safety reasons.

#### Field of application

- Volume-proportional metering of chemicals in the treatment of boiler feed water
- Metering of reactants and catalysts in the chemical industry
- Level-dependent metering of auxiliary agents in industrial production engineering, for instance hot wax metering in the production of adhesive strips

### Control of Meta piston metering pumps

(Speed Controllers see p. → 1-72)

#### Speed controllers in metal housing (Identity code characteristic Z)

Frequency changer built into IP 54 protective housing and main switch designed for max. 0.37 kW motor output.

Externally controlled with 0/4-20 mA / 0-10 V to correspond to 0-50 (60) Hz output frequency.

Integrated controller with versatile functions e.g. switching between external/internal control. With internal control, frequency input is via arrow keys. Multi lingual fault message display and motor temperature monitoring (thermistor-protection).

The speed controller assembly consists of a speed controller and a variable speed motor (see also identity code characteristic R).

## 2.14 Plunger Metering Pump Meta

### Technical Data

Type MTKa	With 1500 rpm motor at 50 Hz				With 1800 rpm motor at 60 Hz			Suction lift  mWC	Perm. pre- pressure suction side  bar	Connector Suction/ Discharge Side  Rp-DN	Motor rating  W	Shipping weight  kg	Plung- er Ø  mm
	Delivery rate at max. back pres- sure		Max. stroke rate	Delivery rate at max. back pres- sure		Max. stroke rate							
	bar	l/h ml/ stroke		Strokes/ min	psi l/h/gph (US)		Strokes/ min						
21606	216	6.1	1.42	72	3,130	7.3/1.9	86	4.0	108	1/4	180	18	12
24006	240	6.1	1.42	72	3,477	7.3/1.9	86	4.0	120	1/4	370	20	12
16208	162	8.1	1.42	96	2,347	9.8/2.6	115	4.0	81	1/4	180	18	12
22508	225	8.1	1.42	96	3,260	9.8/2.6	115	4.0	112.5	1/4	370	20	12
12910	129	10.2	1.42	120	1,878	12.2/3.2	144	4.0	64.5	1/4	180	18	12
21610	216	10.2	1.42	120	3,130	12.2/3.2	144	4.0	108	1/4	370	20	12
10812	108	12.2	1.42	144	1,565	14.7/3.9	173	4.0	54	1/4	180	18	12
21012	210	12.2	1.42	144	3,043	14.7/3.9	173	4.0	105	1/4	370	20	12
10213	102	13.0	3.01	72	1,479	15.6/4.1	86	4.0	51	1/4	180	18	17
11313	113	13.0	3.01	72	1,644	15.6/4.1	86	4.0	56.5	1/4	370	20	17
07617	76	17.3	3.01	96	1,109	20.8/5.5	115	4.0	38	1/4	180	18	17
10617	106	17.3	3.01	96	1,541	20.8/5.5	115	4.0	53	1/4	370	20	17
06122	61	21.7	3.01	120	888	26.0/6.9	144	4.0	30.5	1/4	180	18	17
10222	102	21.7	3.01	120	1,479	26.0/6.9	144	4.0	51	1/4	370	20	17
05126	51	26.0	3.01	144	740	31.2/8.2	173	4.0	25.5	1/4	180	18	17
09926	99	26.0	3.01	144	1,438	31.2/8.2	173	4.0	49.5	1/4	370	20	17
05425	54	24.6	5.71	72	782	29.5/7.8	86	4.0	27	3/8	180	18	23
06025	60	24.6	5.71	72	869	29.5/7.8	86	4.0	30	3/8	370	20	23
04033	40	32.8	5.71	96	587	39.4/10.4	115	4.0	20	3/8	180	18	23
05633	56	32.8	5.71	96	815	39.4/10.4	115	4.0	28	3/8	370	20	23
03241	32	41.1	5.71	120	469	49.3/13.0	144	4.0	16	3/8	180	18	23
05441	54	41.1	5.71	120	782	49.3/13.0	144	4.0	27	3/8	370	20	23
02749	27	49.3	5.71	144	391	59.2/15.6	173	4.0	13.5	3/8	180	18	23
05249	52	49.3	5.71	144	761	59.2/15.6	173	4.0	26	3/8	370	20	23

### Materials in contact with the medium

Material	Dosing head	Suction/pressure connector	Seals	Valve balls	Valve seat	Plunger
SST	Stainless steel 1.4404	Stainless steel 1.4404	PTFE or PTFE + 25 % carbon	Ceramic	Stainless steel 1.4404	Ceramic

### Motor Data

Identity code specification	Power supply				Remarks
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz	0.18/0.37 kW	
		250-280 V/440-480 V	60 Hz	0.18/0.37 kW	
R	3 ph, IP 55	230 V/400 V	50/60 Hz	0.37 kW	with PTC, speed adjustment range 1:20 with external fan 1 ph 230 V; 50/60Hz
M	1 ph AC, IP 55	230 V ±5%	50/60 Hz	0.37 kW	
N	1 ph AC, IP 55	115 V ±5 %	60 Hz	0.37 kW	
L1	3 ph, II2GEEexIICT3	220-240 V/380-420 V	50 Hz	0.18/0.37 kW	
L2	3 ph, II2GEEexIICT4	220-240 V/380-420 V	50 Hz	0.18/0.37 kW	with PTC, speed control range 1:5
P1	3 ph, II2GEEexIICT3	250-280 V/440-480 V	60 Hz	0.18/0.37 kW	
P2	3 ph, II2GEEexIICT4	250-280 V/440-480 V	60 Hz	0.18/0.37 kW	with PTC, speed control range 1:5

The motor power is dependent on the pump type (see technical data).

Motor data sheets can be requested for more information.

Special motors or special motor flanges are possible on request.

The motors are designed in compliance with the Ecodesign Directive 2005/32/EC (IE2 standard).

### Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 94/9/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label corresponds to or is better than the conditions prevalent in the intended field of application.





## 2.14 Plunger Metering Pump Meta

### 2.14.2 Identity Code Ordering System for MTKa

#### Meta piston metering pump, version a

MTKa	Drive type	
	H	Main drive
	A	Add-on drive
	Type	
		bar l/h
	21606	216 6.1
	24006	240 6.1
	16208	162 8.1
	22508	225 8.1
	12910	129 10.2
	21610	216 10.2
	10812	108 12.2
	21012	210 12.2
	10213	102 13.0
	11313	113 13.0
	07617	76 17.3
	10617	106 17.3
	06122	61 21.7
	10222	102 21.7
	05126	51 26.0
	09926	99 26.0
	05425	54 24.6
	06025	60 24.6
	04033	40 32.8
	05633	56 32.8
	03241	32 41.1
	05441	54 41.1
	02749	27 49.3
	05249	52 49.3
	Liquid end material	
	SS	Stainless steel
	Sealing material*	
	T	PTFE
	Displacement body*	
	S	Standard plunger, oxide ceramic
	Liquid end version	
	0	No valve springs
	1	With 2 valve springs, Hastelloy C, 0.1 bar
	Hydraulic connection	
	0	Standard threaded connector (according to technical data)
	Version	
	0	With ProMinent® logo (standard)
	1	Without ProMinent® logo
	M	Modified
	Electrical power supply	
	S	3 ph, 230 V/400 V, 50/60 Hz (WBS)
	R	3 ph, variable speed motor, 230 V/400 V
	Z	1 ph, variable speed set 230 V, 50/60 Hz
	M	1 ph, AC, 230 V, 50/60 Hz
	N	1 ph, AC, 115 V, 60 Hz
	L	3 ph, 230 V/400 V, 50 Hz, (Exe, Exd)
	P	3 ph, 230 V/400 V, 60 Hz, (Exe, Exd)
	1	No motor, with flange 90/63
	2	No motor, with flange 140/71
	3	No motor, with flange 160/71
	4	No motor, with flange 56 C
	0	Add-on pump (no motor)
	Enclosure rating	
	0	IP 55 (standard)
	1	Exe motor version ATEX-T3
	2	Exd motor version ATEX-T4
	A	ATEX power end
	Stroke sensor	
	0	No stroke sensor (standard)
	1	With stroke sensor, Namur signal (Ex)
	Stroke length adjustment	
	0	Manual (standard)
	2	With stroke positioning, 115 V/50/60 Hz
	A	With stroke control motor 0...20 mA 230 V/50/60 Hz
	B	With stroke control motor 4...20 mA 230 V/50/60 Hz
	C	With stroke control motor 0...20 mA 115 V/50/60 Hz
	D	With stroke control motor 4...20 mA 115 V/50/60 Hz

## 2.14 Plunger Metering Pump Meta

### 2.14.3

### Spare Parts

#### Spare parts kit Meta (MTKa) piston metering pump

Consisting of:

- 1 ceramic plunger
- 4 valve balls
- 4 ball seat discs
- 2 PTFE /graphite plunger packing rings
- 2 plunger guide bands
- 14 flat seals
- 2 O-rings

	Order no.
<b>Liquid end FK 12.5 applies to identity code: 21606, 24006, 16208, 22508, 12910, 21610, 10812, 21012</b>	910470
<b>Liquid end FK 25 applies to identity code: 10213, 11313, 07617, 10617, 06122, 10222, 05126, 09926</b>	910471
<b>Liquid end FK 50 applies to identity code: 05425, 06025, 04033, 05633, 03241, 05441, 02749, 05249</b>	910472

#### Base Frames for Meta MTMa and MTKa

A base frame is available for main and add-on pump combinations.

	Order no.
<b>Base frame for main and one add-on pump</b>	803897
<b>Base frame for main and two add-on pumps</b>	803898
<b>Base frame for main and three add-on pumps</b>	803899

#### Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 94/9/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label corresponds to or is better than the conditions prevalent in the intended field of application.



## 2.15 Plunger Metering Pumps Makro TZ

### 2.15.1

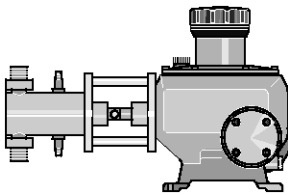
### Plunger Metering Pumps Makro TZ

**Powerful, built to last with a plunger**

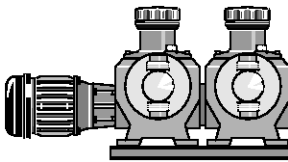
**Capacity range of single pump: 8 – 1,141 l/h, 320 – 11 bar**



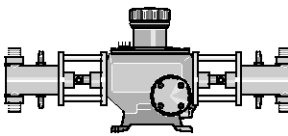
The plunger metering pump Makro TZ impresses with its excellent process reliability, outstanding flexibility and its modular construction enables it to be outstandingly adapted to the performance requirements of the respective application.



pk\_2\_019  
Makro TZ plunger metering pump



pk\_2\_018  
Makro TZ TZKa externally mounted pump



pk\_2\_020  
Makro TZ TZKa double head pump

The plunger metering pump Makro TZ (TZKa) has an adjustable eccentric drive mechanism and, together with the Makro TZ diaphragm metering pump, forms a range of drive mechanisms with stroke lengths of 10 and/or 20 mm. This covers the capacity range from 8 to 2,100 l/h at 320 – 4 bar. A wide range of drive versions is available, including some for use in Exe and Exde areas with ATEX certification.

#### Your benefits

Process reliability:

- Metering reproducibility is better than  $\pm 0.5\%$  within the 10 – 100 % stroke length range under defined conditions and with correct installation

Excellent flexibility:

- The modular construction with single and double head versions permits a wide range of applications, with the double head designs being operated in push-pull mode
- It is possible to combine up to 4 metering units, even with different pump capacities, in multiple pump systems
- 4 different gear ratios are available
- Customised designs are available on request

#### Technical details

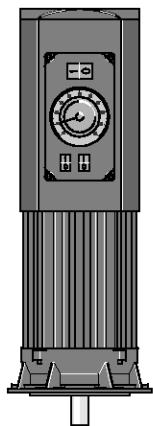
- Stroke length: 0-20 mm, Rod force: 8,000 N
- Stroke length adjustment range: 0 – 100 %
- Stroke length adjustment: manually by means of shift ring in 0.5 % increments (optionally with electric actuator or control drive)
- Metering reproducibility is better than  $\pm 0.5\%$  within the stroke length adjustment range of 10 – 100% under defined conditions and with proper installation. Observe the information in the operating instructions.
- High-performance ceramic-coated stainless steel plunger Wetted materials: Stainless steel 1.4571. Special materials are available on request
- A wide range of power end versions is available: three-phase standard motors, motors for use in Exe and Exde areas and different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Salt water-resistant, acrylic resin-coated cast aluminium housing
- Provide suitable overload protection in all plunger metering pumps during installation for safety reasons

#### Field of application

- Volume-proportional metering of chemicals/additives in water treatment
- Metering of reactants and catalysts in the chemical industry
- Level-dependent metering of additives in industrial production engineering



## 2.15 Plunger Metering Pumps Makro TZ



pk\_2\_103

Variable speed motor with integrated frequency converter

### Makro TZ Metering Pump Actuators

#### Makro TZ stroke length actuator/control drive

##### Makro TZ actuator

Servomotor for automatic stroke length adjustment, actuating period approx. 1 sec for 1 % stroke length, including 1 k $\Omega$  feedback potentiometer for stroke position response signal, IP 54 degree of protection. Electrical connection 230 V ( $\pm 10$  %), 50/60 Hz, 40 W mech. stroke length display fitted on the Makro TZ power end.

Special voltage/higher degrees of protection/explosion protection upon request.

##### Makro TZ control drive

Control drive consisting of an actuator with servomotor and integral microprocessor controller for stroke length adjustment via a standard signal. Technical data see actuator.

##### Design:

Standard signal current input 0/4-20 mA corresponds to stroke length 0 -100 %, manual /automatic operation switch, key switch for stroke adjustment in manual mode. Actual value output 0/4-20 mA for remote display.

#### Variable speed motors with integrated frequency converter (identity code specification V)

The following functions are integrated in the terminal box cover:

- Start/Stop switch
- Manual/external operation switch (0/4 - 20 mA)
- Potentiometer for speed control in manual mode
- Onn request externally controllable via PROFIBUS® DP

Variable speed motors with integrated speed controller See page → 1-72

#### Speed controllers with frequency converter (identity code specification Z)

The speed controller (complete) comprises a frequency converter and a variable speed motor (see also identity code specification R). The frequency converter is accommodated in an IP 55 rated protective housing with integral control unit and main switch.

Externally controllable with 0/4 - 20 mA or 0 - 10 V corresponding to 0 - 50 (60) Hz output frequency.

Frequency converter for speed controller See page → 1-72



## 2.15 Plunger Metering Pumps Makro TZ

### Technical Data

Typ TZKa	With 1500 rpm motor at 50 Hz				With 1800 rpm motor at 60 Hz			Suction lift	Connection, suction/ discharge side	Shipping weight	Plunger Ø
	Delivery rate at max. back pressure		Max. stroke rate	Delivery rate at max. back pressure		Max. stroke rate					
	bar	l/h		ml/ stroke	Strokes/ min		psi				
								mWC	G-DN	kg	mm
320009	320	8.7	2.0	72	4,627	10/2.6	86	4.0	Rp 1/4**–8	50	12
320012	320	11.6	2.0	96	4,627	14/3.7	115	4.0	Rp 1/4**–8	50	12
320014	320	14.5	2.0	120	4,627	17/4.5	144	4.0	Rp 1/4**–8	50	12
320017	320	17.4	2.0	144	4,627	21/5.5	173	4.0	Rp 1/4**–8	50	12
320018	320	17.7	4.1	72	4,627	21/5.5	86	4.0	Rp 1/4**–8	50	17
320024	320	23.6	4.1	96	4,627	28/7.4	115	4.0	Rp 1/4**–8	54	17
320030	320	29.5	4.1	120	4,627	35/9.2	144	4.0	Rp 1/4**–8	54	17
313035	313	35.4	4.1	144	4,526	42/11.1	173	4.0	Rp 1/4**–8	54	17
192033	192	32.9	7.6	72	2,776	39/10.3	86	4.0	Rp 3/8**–10	55	23
192044	192	43.9	7.6	96	2,776	59/15.6	115	4.0	Rp 3/8**–10	55	23
192055	192	54.8	7.6	120	2,776	66/17.4	144	4.0	Rp 3/8**–10	55	23
168066	168	65.8	7.6	144	2,437	79/20.9	173	4.0	Rp 3/8**–10	55	23
113057	113	57.5	13.3	72	1,634	69/18.2	86	4.0	Rp 3/8**–10	56	30
113077	113	76.6	13.3	96	1,634	92/24.3	115	4.0	Rp 3/8**–10	56	30
113096	113	95.8	13.3	120	1,634	115/30.4	144	4.0	Rp 3/8**–10	56	30
096115	96	114.9	13.3	144	1,392	138/36.5	173	4.0	Rp 3/8**–10	56	30
063104	63	104.3	24.2	72	911	125/33.0	86	4.0	G 1 1/4–20	58	40
063139	63	139.0	24.2	96	911	167/44.1	115	4.0	G 1 1/4–20	58	40
063174	63	173.8	24.2	120	914	209/55.2	144	4.0	G 1 1/4–20	58	40
052208	52	208.5	24.2	144	754	250/66.0	173	4.0	G 1 1/4–20	58	40
040163	40	162.9	37.7	72	578	195/51.5	86	4.0	G 1 1/4–20	58	50
040217	40	217.2	37.7	96	578	261/68.9	115	4.0	G 1 1/4–20	58	50
040271	40	271.5	37.7	120	580	326/86.1	144	4.0	G 1 1/4–20	58	50
033326	33	325.8	37.7	144	479	391/103.3	173	4.0	G 1 1/4–20	58	50
028237	28	237.0	54.9	72	405	284/75.0	86	4.0	G 1 1/2–25	62	60
028316	28	315.9	54.9	96	405	379/100.1	115	4.0	G 1 1/2–25	62	60
027395	27	394.9	54.9	120	392	474/125.2	144	4.0	G 1 1/2–25	62	60
022474	22	473.9	54.9	144	319	569/150.3	173	4.0	G 1 1/2–25	62	60
020322	20	322.5	74.7	72	289	387/102.2	86	4.0	G 1 1/2–25	62	70
020430	20	430.0	74.7	96	289	516/136.3	115	4.0	G 1 1/2–25	62	70
020538	20	537.6	74.7	120	290	645/170.4	144	4.0	G 1 1/2–25	62	70
016645	16	645.1	74.7	144	232	774/204.5	173	4.0	G 1 1/2–25	62	70
014475	14	475.1	110.0	72	202	571/150.8	86	4.0	G 2 1/4–40	68	85
014634	14	634.1	110.0	96	202	761/201.0	115	4.0	G 2 1/4–40	68	85
013793	13	792.6	110.0	120	189	951/251.2	144	4.0	G 2 1/4–40	68	85
011951	11	951.1	110.0	144	160	1,141/301.4	173	4.0	G 2 1/4–40	68	85

Other gear reduction ratios are available upon request.

**The permissible admission pressure on the suction side is approx. 50 % of the max. permissible back pressure.**

\*\* The suction and discharge connectors Rp 1/4 and Rp 3/8 are inner threaded and fitted with double ball valves.

### Materials in contact with the medium

Pump type	Hydraulic Ø mm	Dosing head connection	Suction/ discharge seals	Ball seat	Valve balls	Plunger
SST	... 12 S to 30 S	Stainless steel 1.4571/1.4404	1.4571/1.4404	SS/PTFE	Oxide ceramics	Stainless steel/ ceramic
SST	... 40 S to 70 S	Stainless steel 1.4571/1.4404	1.4581	PTFE/PTFE	Stainless steel 1.4401	Stainless steel/ ceramic
SST	... 85 S	Stainless steel 1.4571/1.4404	1.4581	PTFE/PTFE	1.4404 (plate) Hast. C (spring)	Stainless steel/ ceramic

## 2.15 Plunger Metering Pumps Makro TZ

### 2.15.2

### Identity Code Ordering System TZKa

#### Plunger metering pump TZKa

TZKa	Drive type					
H	Main drive					
A	Add-on					
D	Double main drive					
B	Double add-on					
Type*						
320009	320030	113057	063174	028237	020538	
320012	313035	113077	052208	028316	016645	
320014	192033	113096	040163	027395	014475	
320017	192044	096115	040217	022474	014634	
320018	192055	063104	040271	020322	013793	
320024	168066	063139	033326	020430	011951	
Liquid end material						
SS	Stainless steel					
Sealing material						
T	PTFE					
Displacement body						
S	Stainless steel plunger, chromium dioxide-coated					
Liquid end version						
0	No valve springs					
1	With valve springs					
Hydraulic connection						
0	Standard connection					
4	SS union nut and insert					
Version						
0	With ProMinent® logo, no frame					
2	Without ProMinent® logo, no frame					
A	With ProMinent® logo, with frame, simplex					
B	With ProMinent® logo, with frame, duplex					
C	With ProMinent® logo, with frame, triplex					
M	Modified					
Electrical power supply						
S	3 ph. 230/400 V 50/60 Hz (WBS)					
R	Variable speed motor 4-pole 230/400 V					
V (0)	Variable speed motor with integr. frequency converter					
Z	1 ph, variable speed control set 1 ph, 230 V, 50/60 Hz					
P	3 ph. 230/400 V 60 Hz (Exe, Exd)					
L	3 ph. 230/400 V 50 Hz (Exe, Exd)					
V (2)	With integrated frequency converter (Exd)					
4	No motor, with 56 C flange					
7	No motor, with 120/80 flange					
8	No motor, with 160/90 flange					
0	Without motor, externally mounted drive					
Enclosure rating						
0	IP 55 (Standard) ISO class F					
1	Exe version ATEX-T3					
2	Exd version ATEX-T4					
A	ATEX power end					
Stroke sensor						
0	No stroke sensor					
1	With stroke sensor (Namur)					
Stroke length adjustment						
0	Stroke length adjustment, man.					
1	230 V stroke adjustment motor					
2	115 V stroke adjustment motor					
3	230 V 0-20 mA stroke controller					
4	230 V 4-20 mA stroke controller					
5	115 V 0-20 mA stroke controller					
6	115 V 4-20 mA stroke controller					
Application						
0	Standard					

\* Digits 1 - 3=back pressure [bar]; digits 4 - 6=feed rate [l/h]





## 2.15 Plunger Metering Pumps Makro TZ

### Motor Data

Identity code specification		Power supply			Remarks
S	3 ph, IP 55	220-240 V/380-420 V 250-280 V/440-480 V	50 Hz 60 Hz	1.5 kW	
R	3 ph, IP 55	230 V/400 V	50/60 Hz	2.2 kW	With PTC, speed adjustment range 1:20 with external fan 1 ph 230 V; 50/60Hz
V0	3 ph, IP 55	400 V $\pm$ 10 %	50/60 Hz	2.2 kW	Variable speed motor with integrated frequency converter
L1	3 ph, II2GEEExelIT3	220-240 V/380-420 V	50 Hz	1.5 kW	
L2	3 ph, II2GEEExdIICT4	220-240 V/380-420 V	50 Hz	1.5 kW	With PTC, speed control range 1:5
P1	3 ph, II2GEEExelIT3	250-280 V/440-480 V	60 Hz	1.5 kW	
P2	3 ph, II2GEEExdIICT4	250-280 V/440-480 V	60 Hz	1.5 kW	With PTC, speed control range 1:5
V2	3 ph, II2GEEExdIICT4	400 V $\pm$ 10 %	50/60 Hz	2.2 kW	Ex-variable speed motor with integrated frequency converter

Motor data sheets can be requested for more information.

Special motors or special motor flanges are available on request.

The motors are designed in compliance with the Ecodesign Directive 2005/32/EC (IE2 standard).

#### Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 94/9/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label corresponds to or is better than the conditions prevalent in the intended field of application.

### 2.15.3 Spare Parts Kits

#### Spare parts kit for Makro TZ

Comprising:

Valve balls  
Valve plate with spring  
Ball seat discs  
PTFE/graphite plunger packing rings  
Plunger guides  
Flat seals/O rings

	Order no.
Spare parts kit for Makro TZ FK 12/20 S DN 8	1019106
Spare parts kit for Makro TZ FK 17/20 S DN 8	1019107
Spare parts kit for Makro TZ FK 23/20 S DN 10	1019108
Spare parts kit for Makro TZ FK 30/20 S DN 10	1019109
Spare parts kit for Makro TZ FK 40/20 S DN 20	1019110
Spare parts kit for Makro TZ FK 50/20 S DN 20	1019111
Spare parts kit for Makro TZ FK 60/20 S DN 25	1019112
Spare parts kit for Makro TZ FK 70/20 S DN 25	1019113
Spare parts kit for Makro TZ FK 85/20 S DN 40	1019124

## 2.16 Plunger Metering Pumps Makro/ 5

### 2.16.1

### Plunger Metering Pumps Makro/ 5

**Powerful, built to last with a plunger**

**Capacity range of single pump: 38 – 6,014 l/h, 320 – 6 bar**



The plunger metering pump Makro/ 5 can virtually be used throughout the low-pressure range and its modular construction enables it to be outstandingly adapted to the performance requirements of the respective application.

The plunger metering pump Makro/ 5 (M5ka) together with the Makro/ 5 hydraulic diaphragm and plunger metering pumps form a range of drive mechanisms with stroke lengths of 20 and/or 50 mm. This covers the capacity range from 38 to 6,108 l/h at 320 – 4 bar. A wide range of drive versions is available, including some for use in Exe and Exde areas with ATEX certification.

#### Your benefits

Process reliability:

- Metering reproducibility is better than  $\pm 0.5\%$  within the 10 – 100 % stroke length range under defined conditions and with correct installation

Excellent flexibility:

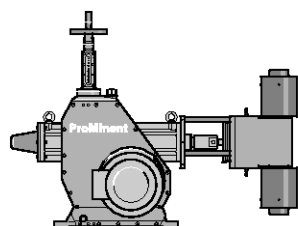
- The modular construction with single and double head versions permits a wide range of applications, with the double head designs being operated in push-pull mode
- It is possible to combine up to 4 metering units, even with different pump capacities, in multiple pump systems
- 5 different gear ratios are available
- Customised designs are available on request

#### Technical details

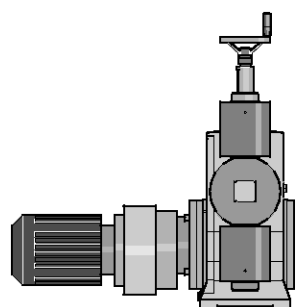
- Stroke length: 0-50 mm, Rod force: 10,000 N
- Stroke length adjustment range: 0 – 100 %
- Stroke length adjustment: manually by means of a manual adjustment wheel and scaled display in 0.5% increments (optionally with electric control drive)
- Metering reproducibility is better than  $\pm 0.5\%$  within the 10 – 100% stroke length range under defined conditions and with correct installation. Observe the information in the operating instructions
- High-performance ceramic-coated stainless steel plunger
- Wetted materials: Stainless steel 1.4571, special materials are available on request
- A wide range of power end versions is available: three-phase standard motors, motors for use in Exe and Exde areas and different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Salt water-resistant, acrylic resin-coated cast aluminium housing
- Provide suitable overload protection in all plunger metering pumps during installation for safety reasons

#### Field of application

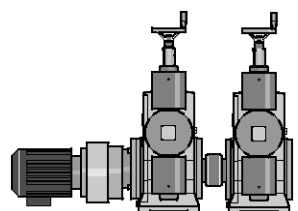
- Volume-proportional metering of chemicals/additives in water treatment
- Metering of reactants and catalysts in the chemical industry
- Level-dependent metering of additives in industrial production engineering



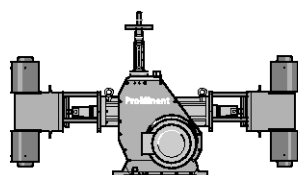
pk\_2\_075  
Makro/ 5 M5Ka



pk\_2\_076  
Makro/ 5 M5Ka



pk\_2\_077  
Makro/ 5 M5Ka externally mounted pump



pk\_2\_078  
Makro/ 5 double head pump

## 2.16 Plunger Metering Pumps Makro/ 5

### Makro/ 5 Pump Control

#### Stroke length variable speed drive Makro/ 5

Variable speed drive consisting of actuator with motor actuator and integrated microprocessor controller for stroke length adjustment via a standard signal. Actuating time approx. 100 sec. for 100% stroke length, equipped with 2 limit switches for min./max. position, IP rating: IP 52. Electrical connection 230 V ( $\pm 10\%$ ), 50/60 Hz, approx. 40 W, mech. stroke position indicator present at drive Makro/ 5.

Special voltage/higher IP ratings/Ex protection on request.

Includes:

Standard current input 0/4-20 mA (corresponds to stroke length 0-100%); internal switch for manual/automatic operation, key switch for stroke adjustment in manual operation mode. Actual value output 0/4-20 mA for remote display.

#### Frequency converter for speed control in metal housing, IP rating 54

Frequency converter installed in protective housing IP 54 with integrated control unit and main switch suitable for the motor output stated in the following.

Externally controllable with 0/4-20 mA or 0-10V corresponding to 0-50 (60) Hz output frequency.

Integrated control unit with numerous functions, such as toggling external/internal control. With internal control, frequency setting is via arrow keys, error message on multi lingual display etc.

Including evaluator for temperature monitoring of the motor (thermistor protection).

#### Stroke sensor with namur signal

Mounted on the crank drive of the Makro/5 gearbox. For precise detection of each metering stroke, consisting of actuating cams and inductive proximity switch, switching signal according to Namur. Combined with electronic preselection counters suitable for batch metering or proportional metering in connection with the proportional control.

Retrofitting is only possible on factory premises.

**Approved for ex-proof operation with IP rating EEx ia II C T6.**



## 2.16 Plunger Metering Pumps Makro/ 5

### Technical Data

Type M5Ka	With 1500 rpm motor at 50 Hz				With 1800 rpm motor at 60 Hz				Suction lift	Connection, suction/ discharge side	Shipping weight	Plunger Ø
	Delivery rate at max. back pressure			Max. stroke rate	Delivery rate at max. back pressure			Max. stroke rate				
	bar	l/h	ml/ stroke		Strokes/ min	psi	l/h				gph (US)	Strokes/ min
3200038	320	38	11	60	4,640	44	12	71	3.0	Rp 1/4-8	300	17
3200048	320	48	11	75	4,640	56	15	89	3.0	Rp 1/4-8	300	17
3200066	320	66	11	103	4,640	78	21	123	3.0	Rp 1/4-8	300	17
3200085	320	85	11	133	4,640	101	27	159	3.0	Rp 3/8-10	300	17
3200100	320	100	11	156	—	—	—	—	3.0	Rp 3/8-10	300	17
2400070	240	70	21	60	3,480	82	22	71	3.0	Rp 3/8-10	300	23
2400088	240	88	21	75	3,480	104	27	89	3.0	Rp 3/8-10	300	23
2400121	240	121	21	103	3,480	144	38	123	3.0	Rp 3/8-10	300	23
2160157	216	157	21	133	3,132	187	49	159	3.0	Rp 3/8-10	300	23
1700184	170	184	21	156	—	—	—	—	3.0	G 1-15	300	23
1400120	140	120	35	60	2,030	142	38	71	3.0	G 1-15	302	30
1400151	140	151	35	75	2,030	179	47	89	3.0	G 1-15	302	30
1400207	140	207	35	103	2,030	247	65	123	3.0	G 1-15	302	30
1270267	127	267	35	133	1,842	319	84	159	3.0	G 1 1/4-20	302	30
1000314	100	314	35	156	—	—	—	—	3.0	G 1 1/4-20	302	30
0800214	80	214	63	60	1,160	253	67	71	3.0	G 1 1/4-20	303	40
0800268	80	268	63	75	1,160	318	84	89	3.0	G 1 1/4-20	303	40
0800368	80	368	63	103	1,160	439	116	123	3.0	G 1 1/4-20	303	40
0700476	70	476	63	133	1,015	569	150	159	3.0	G 1 1/2-25	303	40
0560558	56	558	63	156	—	—	—	—	3.0	G 1 1/2-25	303	40
0500335	50	335	98	60	725	396	105	71	3.0	G 1 1/2-25	303	50
0500419	50	419	98	75	725	497	131	89	3.0	G 1 1/2-25	303	50
0500576	50	576	98	103	725	687	181	123	3.0	G 1 1/2-25	303	50
0450744	45	744	98	133	653	889	235	159	3.0	G 2-32	303	50
0350872	35	872	98	156	—	—	—	—	3.0	G 2-32	303	50
0350483	35	483	141	60	508	571	151	71	3.0	G 1 1/2-25	311	60
0350604	35	604	141	75	508	716	189	89	3.0	G 1 1/2-25	311	60
0350829	35	829	141	103	508	989	261	123	3.0	G 2-32	311	60
0301071	30	1,071	141	133	435	1,280	338	159	3.0	G 2-32	311	60
0251257	25	1,257	141	156	—	—	—	—	3.0	G 2-32	311	60
0250658	25	658	192	60	363	778	206	71	3.0	G 2-32	311	70
0250822	25	822	192	75	363	975	258	89	3.0	G 2-32	311	70
0251129	25	1,129	192	103	363	1,348	356	123	3.0	G 2-32	311	70
0231458	23	1,458	192	133	334	1,743	460	159	3.0	G 2 1/4-40	311	70
0181710	18	1,710	192	156	—	—	—	—	3.0	G 2 1/4-40	311	70
0160970	16	970	284	60	232	1,147	303	71	3.0	G 2 1/4-40	317	85
0161212	16	1,212	284	75	232	1,438	380	89	3.0	G 2 1/4-40	317	85
0161665	16	1,665	284	103	232	1,988	525	123	3.0	G 2 1/4-40	317	85
0162150	16	2,150	284	133	232	2,570	679	159	3.0	G 2 3/4-50	317	85
0162522	16	2,522	284	156	—	—	—	—	3.0	G 2 3/4-50	317	85
0121343	12	1,343	393	60	174	1,589	420	71	3.0	G 2 3/4-50	331	100
0121678	12	1,678	393	75	174	1,991	526	89	3.0	G 2 3/4-50	331	100
0122305	12	2,305	393	103	174	2,752	727	123	3.0	G 2 3/4-50	331	100
0122977	12	2,977	393	133	174	3,558	940	159	3.0	G 2 3/4-50	331	100
0103491	10	3,491	393	156	—	—	—	—	3.0	G 2 3/4-50	331	100
0062269	6	2,269	664	60	87	2,684	709	71	3.0	G 2 1/2-65	350	130
0062837	6	2,837	664	75	87	3,366	889	89	3.0	G 2 1/2-65	350	130
0063896	6	3,896	664	103	87	4,652	1,229	123	3.0	G 2 1/2-65	350	130
0065031	6	5,031	664	133	87	6,014	1,589	159	3.0	G 2 1/2-65	350	130
0066000	6	6,000	664	156	—	—	—	—	3.0	G 2 1/2-65	350	130





## 2.16 Plunger Metering Pumps Makro/ 5

### 2.16.2 Identity Code Ordering System for M5Ka

#### Makro/ 5 piston metering pump

M5Ka	Drive type				
H	Main drive				
A	Add-on power end				
D	Double main drive				
B	Double add-on power end				
Type*					
3200038	1400120	0500335	0250658	0121343	
3200048	1400151	0500419	0250822	0121678	
3200066	1400207	0500576	0251129	0122305	
3200085	1270267	0450744	0231458	0122977	
3200100	1000314	0350872	0181710	0103491	
2400070	0800214	0350483	0160970	0062269	
2400088	0800268	0350604	0161212	0062837	
2400121	0800368	0350829	0161665	0063896	
2160157	0700476	0301071	0162150	0065031	
1700184	0560558	0251257	0162522	0066000	
Liquid end material					
SS	Stainless steel				
Sealing material*					
T	PTFE				
Displacement body					
S	Stainless steel plunger, chromium dioxide-coated				
Liquid end version					
0	No valve springs				
1	With valve springs				
Hydraulic connection					
0	Standard connection				
4	SS union nut and insert				
Version					
0	With ProMinent® logo, no frame				
2	No ProMinent® logo, no frame				
A	With ProMinent® logo, with frame, simplex				
B	With ProMinent® logo, with frame, duplex				
C	With ProMinent® logo, with frame, triplex				
D	With ProMinent® logo, with frame, quadruplex				
M	Modified				
Electrical power supply					
S	3 ph. 230/400 V 50/60 Hz (WBS)				
R	Variable speed motor 4-pole 230/400 V				
V (0)	Motor with integrated frequency converter				
P	3 ph. 230/400 V 60 Hz (Exe, Exd)				
L	3 ph. 230/400 V 50 Hz (Exe, Exd)				
V (2)	Motor with integrated frequency converter (Exd)				
5	No motor, with IEC 100 gearbox				
6	No motor, with IEC 112 gearbox				
0	No motor, no gearbox				
Enclosure rating					
0	IP 55 (Standard) ISO class F				
1	Exe version ATEX-T3				
2	Exd version ATEX-T4				
A	ATEX power end				
Stroke sensor					
0	No stroke sensor				
1	With stroke sensor (Namur)				
Stroke length adjustment					
0	Stroke length adjustment, man.				
3	230 V 0-20 mA stroke controller				
4	230 V 4-20 mA stroke controller				
5	115 V 0-20 mA stroke controller				
6	115 V 4-20 mA stroke controller				
Application					
0	Standard				

\* Digits 1 - 3=back pressure [bar]; digits 4 - 7=feed rate [l/h]

## 2.16 Plunger Metering Pumps Makro/ 5

### Materials in contact with the medium

	Liquid end	Suction/pressure connector	Valve seat/ seals	Valve balls	Plunger
Makro 5/50 HK ...DN 8-DN 10	Stainless steel 1.4571/ 1.4404	1.4571/1.4404	SS/PTFE	Oxide ceramics	Stainless steel/ ceramic
Makro 5/50 HK ...DN 15-DN 25	Stainless steel 1.4571/ 1.4404	1.4581	PTFE/PTFE	Stainless steel 1.4401	Stainless steel/ ceramic
Makro 5/50 HK ...DN 32-DN 65	Stainless steel 1.4571/ 1.4404	1.4581/1.4404	PTFE/PTFE	Stainless steel 1.4404 (plate/spring)	Stainless steel/ ceramic

The permissible priming pressure on the suction side is approx. 50 % of the max. permissible back pressure.

### Motor Data

Identity code specification		Power supply			Remarks
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz	3 kW	
		250-280 V/440-480 V	60 Hz		
R	3 ph, IP 55	230 V/400 V	50/60 Hz	3 kW	With PTC, speed control range 1:5
V0	3 ph, IP 55	400 V ±10 %	50/60 Hz	3 kW	Variable speed motor with integrated frequency converter
L1	3 ph, II2GEEexII T3	220-240 V/380-420 V	50 Hz	3.6 kW	
L2	3 ph, II2GEEexdII CT4	220-240 V/380-420 V	50 Hz	4 kW	With PTC, speed control range 1:5
P1	3 ph, II2GEEexII T3	250-280 V/440-480 V	60 Hz	3.6 kW	
P2	3 ph, II2GEEexdII CT4	250-280 V/440-480 V	60 Hz	4 kW	With PTC, speed control range 1:5
V2	3 ph, II2GEEexII CT4	400 V ±10 %	50/60 Hz	4 kW	Ex-variable speed motor with integrated frequency converter

Motor data sheets can be requested for more information.

Special motors or special motor flanges are available on request.

The motors are designed in compliance with the Ecodesign Directive 2005/32/EC (IE2 standard).

### Information for use in areas at risk from explosion

Only use pumps with the appropriate labelling in line with the ATEX Directive 94/9/EC in premises at risk from explosion. Ensure that the explosion group, category and degree of protection specified on the label corresponds to or is better than the conditions prevalent in the intended field of application.





## 2.16 Plunger Metering Pumps Makro/ 5

### 2.16.3

#### Spare Parts Kits

##### Spare parts kits for Makro/ 5

Comprising:

Valve balls  
Valve plate with spring  
Ball seat discs  
PTFE/graphite plunger packing rings  
Plunger rings  
Flat seals/O-rings

	Order no.
Spare parts kit for Makro/ 5 FK 17/50 S DN 8	1005899
Spare parts kit for Makro/ 5 FK 17/50 S DN 10	1005536
Spare parts kit for Makro/ 5 FK 23/50 S DN 10	1005004
Spare parts kit for Makro/ 5 FK 23/50 S DN 15	1005900
Spare parts kit for Makro/ 5 FK 30/50 S DN 15	1005901
Spare parts kit for Makro/ 5 FK 30/50 S DN 20	1005537
Spare parts kit for Makro/ 5 FK 40/50 S DN 20	1005902
Spare parts kit for Makro/ 5 FK 40/50 S DN 25	1005538
Spare parts kit for Makro/ 5 FK 50/50 S DN 25	1005539
Spare parts kit for Makro/ 5 FK 60/50 S DN 25	1005903
Spare parts kit for Makro/ 5 FK 60/50 S DN 32	1005540
Spare parts kit for Makro/ 5 FK 70/50 S DN 32	1005541
Spare parts kit for Makro/ 5 FK 70/50 S DN 40	1005904
Spare parts kit for Makro/ 5 FK 85/50 S DN 40	1005542
Spare parts kit for Makro/ 5 FK 85/50 S DN 50	1005905
Spare parts kit for Makro/ 5 FK 100/50 S DN 50	1005543
Spare parts kit for Makro/ 5 FK 130/50 S DN 65	1005544

## 2.17 Plunger Metering Pumps Orlita® PS

### 2.17.1

### Plunger Metering Pumps Orlita® PS

**Orlita® PS - simple, robust and reliable.**

**Capacity range of single pump: 0 – 37,000 l/h, 400 – 4 bar**

The high-performance plunger metering pump ORLITA® PS enables precise pump capacities even at maximum pressure and temperatures of up to +400 °C. The ORLITA® PS pump has a modular construction and thus versatile uses.

ORLITA® PS plunger metering pumps (PS 18 to PS 1400) with a stroke length of 15 to 60 mm provide a capacity ranging from 0 to 37,000 l/h at 400 – 4 bar. A wide range of drive versions is available, including some for use in Exe and Exde areas with ATEX certification. The Orlita® PS product range is designed to comply with API 675. Its modular construction permits the free combination of drives, power ends and dosing heads, producing a pump for a range of different feed rates and media operating at different working pressures.

#### Your benefits

Flexible adaptation to the process:

- Precise capacity even at maximum pressure
- Metering reproducibility is better than  $\pm 0.5\%$  within the 10-100 % stroke length range under defined conditions and with correct installation.
- Cone valves for use as suction and/or discharge valves with minimal wear, good self-cleaning and low pressure loss (NPSHR)
- Excellent hydraulic efficiency

Excellent flexibility:

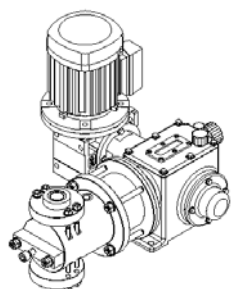
- The modular construction ensures a wide range of uses
- It is possible to combine up to 6 metering units, even with different pump capacities, in multiple pump systems
- 6 different gear ratios are available
- Power end configuration ideal for installation in any position (vertical or horizontal)
- Customised designs are available on request
- Temperature range - 40 °C to + 400 °C

#### Technical details

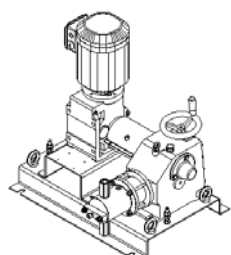
- PS 18 – Stroke length: 0-15 mm, Rod force: 1,750 N
- PS 35 – Stroke length: 0-20 mm, Rod force: 3,500 N
- PS 80 – Stroke length: 0-20 mm, Rod force: 14,000 N
- PS 180 – Stroke length: 0-40 mm, Rod force: 18,000 N
- PS 600 – Stroke length: 0-40 mm, Rod force: 40,000 N
- PS 1400 – Stroke length: 0-60 mm, Rod force: 60,000 N
- Stroke length adjustment range: 0 – 100% in operation and idle
- The plunger packing can be tightened by the tensioning screw on the front even during operation
- Metering reproducibility is better than  $\pm 0.5\%$  within the 10 – 100 % stroke length range under defined conditions and with correct installation
- Wetted materials: Stainless steel, special designs are available on request
- A wide range of power end versions is available: Three-phase standard motors, motors for use in Exe and Exde areas and different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Temperature range - 40 °C to + 400 °C
- Design in compliance with API 675 among others

#### Field of application

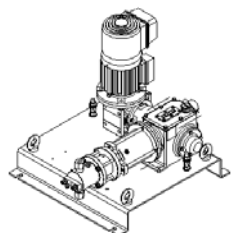
- Oil/ gas production (onshore/offshore)
- Refineries
- Chemical/Petrochemical industry
- Pharmaceuticals & cosmetics
- Packaging industry (bottling pumps)
- Maximum temperature applications of up to +400 °C



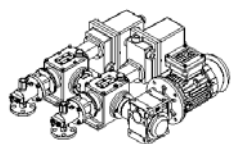
P\_ORL\_071\_SW1  
Orlita® PS 18-36



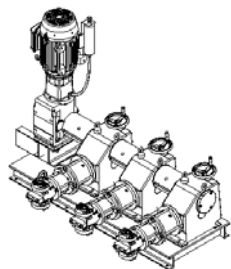
P\_ORL\_072\_SW1  
Orlita® PS 80-30



P\_ORL\_073\_SW1  
Orlita® PS 18-12 high-temperature



P\_ORL\_074\_SW1  
Orlita® PS 35-7-7



P\_ORL\_075\_SW1  
Orlita® PS 600-40-40-40







## 2.17 Plunger Metering Pumps Orlita® PS

Pump type	Plunger Ø	Stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)						Max. pressure
			58 l/h	73 l/h	91 l/h	112 l/h	145 l/h	207 l/h	
	mm	ml/stroke							bar
PS 18/	5	0.29	1.0	1.2	1.6	1.9	2.5	3.6	250
	6	0.42	1.4	1.8	2.3	2.8	3.6	5.2	250
	7	0.58	2.0	2.5	3.1	3.8	5.0	7.1	250
	8	0.75	2.6	3.2	4.1	5.0	6.5	9.3	250
	10	1.18	4.1	5.1	6.4	7.8	10.2	14.6	200
	12	1.70	5.9	7.3	9.2	11.3	14.7	21.0	139
	16	3.02	10.5	13.1	16.4	20.1	26.2	37.4	78
	20	4.71	16.4	20.5	25.6	31.5	41.0	58.5	50
	25	7.36	25.6	32.0	40.0	49.2	64.0	91.5	32
	30	10.60	36.9	46.1	57.6	70.9	92.2	131.7	16
	36	15.27	53.1	66.4	83.0	102.1	132.8	189.7	15
	40	18.85	65.6	82.0	102.4	126.1	163.9	234.2	10
	50	29.45	102.4	128.1	160.1	197.1	256.2	366.0	8

Pump type	Plunger Ø	Stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)						Max. pressure
			58 l/h	73 l/h	91 l/h	112 l/h	145 l/h	207 l/h	
	mm	ml/stroke							bar
PS 35/	7	0.77	2.6	3.3	4.1	5.1	6.7	9.5	630
	8	1.01	3.5	4.3	5.4	6.7	8.7	12.4	400
	10	1.57	5.4	6.8	8.5	10.5	13.6	19.5	400
	12	2.26	7.8	9.8	12.3	15.1	19.6	28.1	250
	16	4.02	13.9	17.4	21.8	26.9	34.9	49.9	156
	20	6.28	21.8	27.3	34.1	42.0	54.6	78.0	100
	25	9.82	34.1	42.7	53.3	65.7	85.4	122.0	64
	30	14.14	49.2	61.5	76.8	94.6	122.9	175.7	44
	36	20.36	70.8	88.5	110.6	136.2	177.1	253.0	30
	40	25.13	87.4	109.3	136.6	168.2	218.6	312.3	25
	50	39.27	136.6	170.8	213.5	262.8	341.6	488.0	16
	65	66.37	230.9	288.6	360.8	444.1	577.3	824.8	9
	80	100.53	349.8	437.3	546.6	672.7	874.6	1,249.4	6
	100	157.08	546.6	683.3	854.1	1,051.2	1,366.5	1,952.2	4

Pump type	Plunger Ø	Stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)						Max. pressure
			78 l/h	98 l/h	122 l/h	134 l/h	155 l/h	182 l/h	
	mm	ml/stroke							bar
PS 80/	20	6.28	29	37	46	50	58	68	400
	25	9.82	45	57	71	79	91	107	250
	30	14.14	66	83	103	113	131	154	178
	36	20.36	95	119	149	164	189	222	123
	40	25.13	117	148	184	202	233	274	100
	50	39.27	183	231	287	316	365	428	64
	60	56.55	264	333	414	455	526	617	44
	65	66.37	310	390	486	535	617	724	37
	80	100.53	470	592	736	810	935	1,097	25
	100	157.08	734	925	1,150	1,266	1,461	1,714	16
	125	245.44	1,148	1,445	1,797	1,978	2,283	2,679	10
	140	307.88	1,440	1,813	2,254	2,482	2,864	3,360	8
	160	402.12	1,880	2,368	2,944	3,242	3,741	4,389	6

### Important note:

All performance data is stated at 50 Hz motor frequency

Abridged presentation of our complete product range. Other types on request

## 2.17 Plunger Metering Pumps Orlita® PS

Pump type	Plunger Ø		Stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)						Max. pressure
	mm	ml/stroke		107 l/h	117 l/h	134 l/h	152 l/h	171 l/h	200 l/h	
PS 180/	30	28.27		181	199	226	257	290	339	229
	36	40.72		262	286	326	370	417	489	159
	40	50.27		323	353	403	457	515	604	125
	50	78.54		505	552	630	714	805	943	80
	54	91.61		589	644	735	833	939	1,100	70
	65	132.73		854	934	1,065	1,207	1,361	1,594	48
	70	153.94		990	1,083	1,235	1,400	1,579	1,849	40
	80	201.06		1,293	1,415	1,613	1,829	2,062	2,416	32
	94	277.59		1,786	1,953	2,227	2,526	2,847	3,335	23
	125	490.87		3,158	3,455	3,939	4,467	5,036	5,898	13
	140	615.75		3,962	4,334	4,941	5,603	6,317	7,399	10
	160	804.25		5,175	5,660	6,454	7,318	8,251	9,664	8
	200	1,256.64		8,086	8,845	10,085	11,435	12,892	15,100	5

Pump type	Plunger Ø		Stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)						Max. pressure
	mm	ml/stroke		99 l/h	117 l/h	134 l/h	156 l/h	173 l/h	204 l/h	
PS 600/	30	28.27		168	198	227	264	293	345	400
	36	40.27		242	285	327	381	422	497	353
	40	50.27		299	352	403	470	521	614	286
	50	78.54		467	551	630	735	814	959	183
	54	91.61		545	643	735	857	949	1,119	157
	65	132.73		789	932	1,067	1,243	1,376	1,621	100
	70	153.94		916	1,080	1,236	1,441	1,596	1,880	93
	80	201.06		1,196	1,411	1,616	1,882	2,084	2,456	71
	94	277.59		1,651	1,949	2,229	2,599	2,878	3,391	51
	125	490.87		2,921	3,446	3,946	4,596	5,090	5,998	29
	140	615.75		3,664	4,323	4,945	5,766	6,385	7,523	23
	160	804.25		4,785	5,647	6,466	7,531	8,339	9,827	16
	200	1,256.64		7,477	8,823	10,104	11,768	13,030	15,354	11

Pump type	Plunger Ø		Stroke volume	Max. capacity (theo.) in l/h at strokes/min (50 Hz)						Max. pressure
	mm	ml/stroke		93 l/h	106 l/h	125 l/h	143 l/h	169 l/h	191 l/h	
PS 1400/	40	75.40		419	480	565	647	766	864	400
	50	117.81		654	750	884	1,011	1,197	1,350	275
	60	169.65		943	1,080	1,273	1,456	1,724	1,944	190
	70	230.91		1,283	1,470	1,733	1,983	2,346	2,646	140
	80	301.59		1,676	1,920	2,263	2,590	3,065	3,456	107
	94	416.39		2,314	2,651	3,125	3,576	4,231	4,772	77
	125	736.31		4,093	4,689	5,527	6,323	7,483	8,439	44
	140	923.63		5,134	5,882	6,933	7,932	9,387	10,587	35
	160	1,206.37		6,706	7,683	9,055	10,360	12,261	13,827	25
	200	1,884.96		10,478	12,005	14,149	16,188	19,157	21,606	17
	280	3,694.51		20,538	23,530	27,732	31,729	37,549	42,348	8

### Important note:

All performance data is stated at 50 Hz motor frequency

Abridged presentation of our complete product range. Other types on request



## 2.18 Plunger Metering Pump Orlita® DR

### 2.18.1

### Plunger Metering Pump Orlita® DR

**For the precise metering of high-viscosity and extremely high-viscosity media even containing solid fractions**

**Capacity range of single pump: 0 – 4,000 l/h, 400 – 4 bar**



The plunger metering pump Orlita® DR does not need valves and can be operated within a broad stroke rate range. It is therefore suitable for use with high-viscosity and extremely high-viscosity media of up to 10<sup>6</sup> mPas within a wide temperature range from -40 °C to 400 °C, for example in the food industry.

Orlita® DR plunger metering pumps (DR 15 to DR 150) are special pumps for high-viscosity and extremely high-viscosity media, which can also contain solids. The pump can be operated within a broad stroke rate range due to its operation without valves.

#### Your benefits

Optimum adaptation to processes with high-viscosity and extremely high-viscosity media, even containing solid fractions:

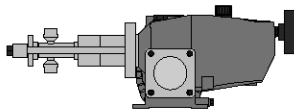
- Low-wear and precise operation even at high pressures, thanks to the rotary plunger with abrasion-resistant/wear-resistant surface coating
- Valve-free operation guarantees a broad stroke rate range
- Wide range of uses: Operating pressure of up to 400 bar, temperature range of - 40 °C to + 400 °C
- Pump direction can be selected depending on the fitting position of the plunger
- Metering reproducibility is better than ± 0.5 % within the 10 – 100 % stroke length range under defined conditions and with correct installation
- Excellent hydraulic efficiency
- A reverse suction effect is continuously adjustable by rotating the pump head around its longitudinal axis
- 4 different gear ratios are available
- Power end configuration ideal for installation in any position (vertical or horizontal)
- Customised designs are available on request

#### Technical details

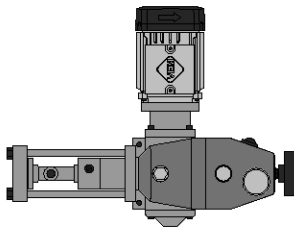
- DR 15 - Stroke length: 0-15 mm, Rod force: 1,800 N
- DR 150 - Stroke length: 0-32 mm, Rod force: 15,000 N
- Stroke length adjustment range: 0 – 100% in operation and idle
- Stroke length adjustment: manually by means of a manual adjustment wheel and scaled display (optionally with electric actuator or control drive)
- Metering reproducibility is better than ± 0.5 % within the stroke length adjustment range of 10 to 100% under defined conditions and with proper installation
- Wetted materials: Stainless steel, special designs are available on request
- A wide range of power end versions is available: Three-phase standard motors, motors for use in Exe and Exde areas and different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Temperature range - 40 °C to + 400 °C
- The interplay between the plunger and cylinder responsible for the sealing effect, is selected depending on the viscosity
- Turret on the rear head end as a circular collecting vessel
- The turret is sealed by elastomer lip sealing rings
- Design in compliance with API 675 among others

#### Field of application

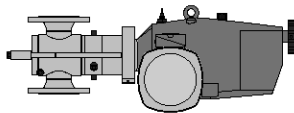
- Metering of high-viscosity and extremely high-viscosity media containing some solid fractions, for example in the food industry.



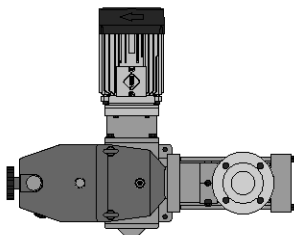
P\_ORL\_0020\_SW  
Orlita® DR



P\_ORL\_0021\_SW  
Orlita® DR 15/12



P\_ORL\_0022\_SW  
Orlita® 150/90



P\_ORL\_0023\_SW  
Orlita® DR 150/90

## 2.18 Plunger Metering Pump Orlita® DR

Pump type	Plunger Ø	Stroke volume	Capacity max. (theo.) in l/h at strokes/min (50 Hz)			Max. pressure
			58 l/h	77 l/h	116 l/h	
	mm	ml/stroke				bar
DR 15/	7	0.58	2.0	2.6	4.0	400
	12	1.70	5.9	7.8	11.8	159
	18	3.82	13.2	17.7	26.5	70
	25	7.36	25.6	34.1	51.2	36
	36	15.27	53.1	70.8	106.2	17
	50	29.45	102.4	136.6	204.9	9
	70	57.73	200.8	267.8	401.7	4

Pump type	Plunger Ø	Stroke volume	Capacity max. (theo.) in l/h at strokes/min (50 Hz)				Max. pressure
			58 l/h	77 l/h	116 l/h	145 l/h	
	mm	ml/stroke					bar
DR 150/	12	3.62	12.5	16.7	25.1	31.4	400
	18	8.14	28.3	37.7	56.6	70.8	400
	25	15.71	54.6	72.8	109.3	136.6	250
	36	32.57	113.3	151.1	226.7	283.3	147
	50	62.83	218.6	291.5	437.3	546.6	76
	70	123.15	428.5	571.4	857.1	1,071.4	38
	90	203.58	708.4	944.5	1,416.8	1,771.1	23
	120	361.91	1,259.4	1,679.2	2,518.9	3,148.6	13
	140	492.60	1,714.2	2,285.6	3,428.5	4,285.6	9

### Important note:

All performance data is stated at 50 Hz motor frequency

Abridged presentation of our complete product range. Other types on request





## 2.19 Diaphragm Process Pump Zentriplex

### 2.19.1

### Diaphragm Process Pump Zentriplex

**The innovative process metering pump with the ideal dimensions and excellent energy-saving efficiency**

**Capacity range 424 – 8,000 l/h, 367 – 36 bar**



The Zentriplex guarantees excellent performance and provides outstanding efficiency as an oscillating triplex process diaphragm pump, with an extremely small footprint thanks to the space-saving arrangement of the pump and drive unit. It also stands out on account of its efficiency, as minimal material and labour are required.

The Zentriplex is an oscillating process diaphragm metering pump, which has a very small footprint thanks to its unconventional design, as the pump and drive unit are mounted above each other to save space. Diaphragm dosing heads and hydraulic units are arranged in a star pattern around the drive unit, resulting in minimised loads and significantly lower material and drive requirements. The Zentriplex is designed in compliance with API 674.

#### Your benefits

Excellent conservation of resources:

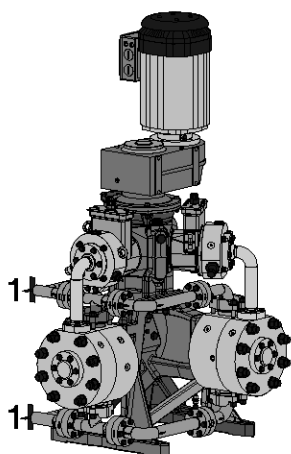
- Excellent energy efficiency.
- Diaphragm replacement without dismantling the suction and discharge lines ensures cost-effective maintenance of the pump
- Low noise emissions
- Very quiet thanks to complete balancing of masses
- Only one connection required by the customer. Collective discharge and suction lines are integrated in the pump
- Low flow rate pulsation
- Customised designs are available on request

#### Technical details

- Stroke length: 40 mm, Rod force: 18,000 N fixed stroke pump
- Metering reproducibility is better than  $\pm 1\%$  under defined conditions and with proper installation
- PTFE multi-layer diaphragm with electrical diaphragm rupture warning system via a contact
- Integrated hydraulic relief and bleed valve
- Wetted materials: Stainless steel, special designs are available on request
- A wide range of motor versions is available: Three-phase standard motors with varied adjustment ranges, motors for use in Exe and Exde areas, different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Design in compliance with API 674

#### Field of application

- Chemical industry
- Petrochemical industry
- Refineries
- Oil and gas industry



P\_PZ\_0009\_SW1

Process diaphragm pump Zentriplex (1= customer-side connection)

## 2.19 Diaphragm Process Pump Zentriplex

### Technical Data

Plunger Ø	Stroke volume	Theoretical pump capacity $Q_{th}$ at a stroke rate n in rpm					Max. operating pressure	Rated pressure	Efficiency at		Standard type of valve
		120 [3] l/h	145 [4] l/h	170 [5] l/h	200 [6] l/h	220 [7] l/h			100% pressure	50% pressure	
mm	ml/ stroke						bar	bar			
25	58.90	424	512	601	707	778	367	36	0.78	0.83	DN 10
26	63.71	459	554	650	765	841	339	32	0.78	0.83	DN 10
30	84.82	611	738	865	1,018	1,120	255	25	0.81	0.85	DN 15
36	122.15	879	1,063	1,246	1,466	1,612	177	16	0.84	0.87	DN 20
44	182.46	1,314	1,587	1,861	2,190	2,409	118	10	0.85	0.88	DN 20
60	339.29	2,443	2,952	3,461	4,072	4,479	64	6	0.90	0.92	DN 25
70	461.81	3,325	4,018	4,711	5,542	6,096	47	4	0.90	0.92	DN 32
80	603.19	4,343	5,248	6,152	7,238	7,962	36	2	0.90	0.92	DN 32

Abridged presentation of our complete product range. Other types on request

### Materials in contact with the medium

Dosing head complete	Diaphragm retaining screw		Diaphragm	Manifold Suction/pressure connector	Seal, manifold
Dosing head					
Stainless steel 1.4404	Stainless steel 1.4462		PTFE multi-layer diaphragm	Stainless steel 1.4571	Viton O-ring with seamless FEP jacket

### Ball valve DN 10

Suction/pressure connector	Seal valve/head	Valve ball	Valve seat	Valve housing
Stainless steel 1.4571	Stainless steel 1.4571	Al <sub>2</sub> O <sub>3</sub> ceramic	Stainless steel 1.4404	Stainless steel 1.4404

### Plate valve DN 15 / DN 20 / DN 25 / DN 32

Suction/pressure connector	Seal valve/head	Valve plate	Valve seat	Valve housing
Stainless steel 1.4571	Stainless steel 1.4571	Stainless steel 1.4462	Stainless steel 1.4571	Stainless steel 1.4571

Further material versions and details available on request.

### Motor and gearbox data

Motors and gearboxes from 7.5 to 15 kW are available for the Zentriplex product range. Further options and details available upon request.

Standard gear motor 7.5 kW, 9.2 kW, 11 kW, 15 kW	3 ph, IP 55	400/690V	50/60 Hz	Control range 1:5
Ex gear motor EExde IICT4 11 kW, 15 kW	3 ph, IP 65	400/690V	50/60 Hz	Control range 1:5
Standard external gearbox 11 kW...15 kW	IP 55			Version according to DIN/ISO standard flange
Standard external gearbox 11 kW...15 kW	IP 55			NEMA flange version
Ex gearbox 2 IIGD c,k T4/T120C external 11 kW...15 kW	IP 55			Version according to DIN/ISO standard flange
Ex gearbox 2 IIGD c,k T4/T120C external 11 kW...15 kW	IP 55			NEMW flange version

## 2.20 Diaphragm Process Pump TriPower®

### 2.20.1

### Diaphragm Process Pump TriPower®

The product range for high capacities with a minimal footprint

Capacity range 4 – 38 m³/h, 415 – 50 bar



The process diaphragm pump TriPower® is perfect for use in the oil/gas industry or in the chemical industry. It is compact yet high-performance and has a multi-layer safety diaphragm. Its compact design enables it to be installed in the smallest space.

With TriPower® process pumps, the discharge stroke of the individual dosing heads is displaced through a 120° crank angle. The result is a low-pulsation discharge flow even without the use of pulsation dampers. This design of process diaphragm pumps is favoured in the chemical and petrochemical industries.

#### Your benefits

Excellent process safety and reliability:

- PTFE multi-layer diaphragm with integral diaphragm rupture warning system
- Integral hydraulic relief valve protects against overloading
- Metering reproducibility is better than  $\pm 0.5\%$  under defined conditions and with proper installation
- Safe, leak-free metering, even of potentially hazardous media.
- Excellent process safety thanks to resistance to aggressive, corrosive and flammable media.

Excellent conservation of resources:

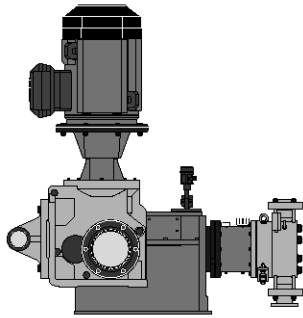
- Reduced footprint due to compact drive unit with integral gear
- Maintenance-friendly and low operating costs
- Minimal monitoring and maintenance expense due to integrated pressurised lubrication system
- Low pulsation metering without expensive pulsation damper
- Use in explosive atmospheres thanks to ATEX-compliant design
- Customised designs are available on request

#### Technical details

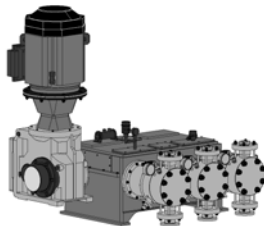
- Stroke length: 60 mm, Rod force: 80,000 N
- Fixed stroke pump
- Metering reproducibility is better than  $\pm 0.5\%$  under certain defined conditions and with proper installation. Observe the information in the operating instructions.
- PTFE multi-layer diaphragm with integral diaphragm rupture warning system
- Integrated hydraulic relief and bleed valve
- Wetted materials: Stainless steel, special designs are available on request
- A wide range of power end versions is available: Three-phase standard motors with varied adjustment ranges, motors for use in Exe and Exde areas, different flange designs for use in customer-specific motors
- Degree of protection: IP 55
- Design in compliance with API 674

#### Field of application

- Oil and gas industry
- Petrochemical industry
- Chemical industry



P\_TR\_0003\_SW1



P\_TR\_0003\_SW3



## 2.20 Diaphragm Process Pump TriPower®

### Technical data TriPower® size B/ 60 mm stroke / MF liquid ends

Plunger Ø	Stroke volume	Pump capacity $Q_{th}$ in l/h in total Triplex at a stroke rate n in 1/min					Max. pressure	Efficiency at		Standard type of valve
		100 [3] l/h	130 [4] l/h	170 [5] l/h	200 [6] l/h	230 [7] l/h		100% pressure	50% pressure	
mm	cm³/stroke						bar			
46	3 x 99.71	1,795	2,333	3,051	3,590	4,128	415	0.77	0.83	DN 32
55	3 x 142.55	2,566	3,336	4,362	5,132	5,902	320	0.81	0.85	DN 32
70	3 x 230.91	4,156	5,403	7,066	8,313	9,560	200	0.84	0.87	DN 40
90	3 x 381.70	6,871	8,932	11,680	13,741	15,802	125	0.90	0.90	DN 50
140	3 x 923.63	16,625	21,613	28,263	33,251	38,238	50	0.88	0.89	DN 80

Abridged presentation of our complete product range. Other types on request

### Materials in contact with the medium

#### Dosing head complete

Dosing head	Diaphragm retaining screw	Diaphragm
Stainless steel 1.4404	Stainless steel 1.4462	PTFE multi-layer diaphragm

#### Conical valve

Valve	Suction/discharge valve housing	Seals	Valve seat
1.4462	1.4404	1.4571	1.4462





## 2.21 Hydraulic/Mechanical Accessories

### Hydraulic/mechanical accessories

Hydraulic / mechanical accessories for metering pumps such as injection valves and foot valves, can be found in Chapter 1.5, sorted by nominal width DN 8 ... DN 40:

Please observe the permitted pressure ratings or material combinations when selecting. Further accessories are available on request.

### Electrical accessories

Accessories for metering pumps, such as frequency converters etc., can be found in Chapter 1.6, sorted by motor capacity DN 8 ... DN 40.

### 2.21.1 Return/Pressure Relief Valve, Spring-loaded

Spring-loaded valves, inline version, designed as pump valves, i.e. to cope with a very high number of load cycles. Also suitable for use without pulsation damper.

#### Features:

- Female thread on both sides or with sealing surface
- For bracing between 2 flanges
- PN 200 or PN 400
- Settings factory-set
- Standard design in stainless steel, hastelloy also available on request, as is Inconel

Also available heatable on request.

DN	Adjustable pressure	Construction	Order no.
6	2.0 bar	Ball	1020074
6	4.0 bar	Ball	1019224
6	8.0 – 9.0 bar	Ball	1019097
10	2.0 bar	Cone, fixed	1019649
10	3.0 – 6.0 bar	Cone, adjustable	1023053
10	8.0 – 14.0 bar	Cone, adjustable	1024065
16	2.0 bar	Cone, fixed	1017937
16	3.0 bar	Cone, fixed	1035266
16	4.5 – 5.4 bar	Cone, fixed	1017936
25	1.0 – 2.0 bar	Cone, fixed	1021843

## 2.21 Hydraulic/Mechanical Accessories

### 2.21.2

### Safety Valve

#### Regulations:

Safety valves are designed to comply with the following regulations:

- Pressurised Vessel and Steam Boiler Directive
- TRD 421, 721
- TRB 403
- AD 2000 Bulletins A2 and A4
- DIN EN ISO 4126
- Pressure Equipment Directive 97/23/EC
- ASME Code, Sections II and VIII
- API 526, 520, 527
- Others

The relevant product-specific certificates are available to prove compliance with these regulations and thus also the safety of the products.

Safety valves carry a parts label (specification label) stipulating the following data:

- Order date (serial no.)
- Technical data
- Set pressure
- VdTÜV Parts test number
- CE mark with number of nominated centre
- Further data, e.g. UV stamp with ASME-approved safety valves

#### Inspection / Labelling:

Following adjustment and inspection, every safety valve is sealed by the manufacturer.

Connectors: NPT threaded connectors, threaded sockets, flange mountings comply with DIN / ANSI.  
Other connections are available on request.

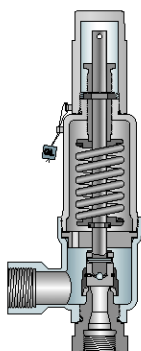
#### Inlet body material

Material description	X 14 CrNiMo 17-12-2
Material no.	1.4404
ASME	316L

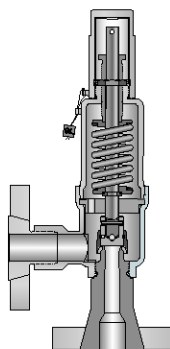
#### Dimensions, pressure ranges, weights

#### Standard 10 mm

Pressure rating at inlet	320 PN
Pressure rating at outlet	160 PN
Min. response pressure	0.1 bar
Max. response pressure (4373 / 4374)	68 bar
Narrowest flow cross-section	78.5 mm <sup>2</sup>
Narrowest flow diameter	10 mm
Leg length (outlet / inlet)	30 mm / 33 mm
Pin length (G 1/2 / G 3/4)	15 mm / 16 mm
Flange design	100 mm
Height (H2 / H4)	137/162 mm
Weight	1.2 kg



P\_AC\_0231\_SW



P\_AC\_0232\_SW



## 2.21 Hydraulic/Mechanical Accessories

### 2.21.3

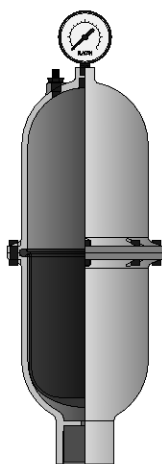
### Pulsation Damper

**NEW**

Pulsation dampers with separating membrane / bubble / bellows for providing separation between the gas cushion and metered chemical are used for low-pulsation metering as well as for reducing flow resistance in long metering lines and with viscous media. The response pressure of the gas cushion should be approx. 60-80 % of the operating pressure.

**Important:** A pressure relief valve should always be fitted with an adjustable back pressure valve when using a pulsation damper.

#### Bladder dampers, metal

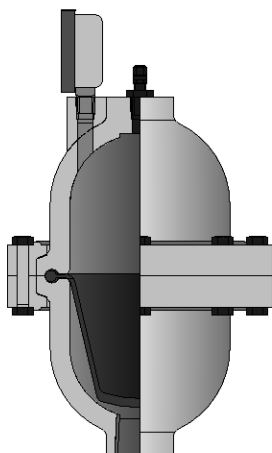


<b>Volume</b>	0.066 - 379 l
<b>Pressure</b>	20.7 bar
<b>Material of bladder/diaphragm</b>	EPDM or FKM
<b>Housing material</b>	316 L stainless steel, Hastelloy C, PTFE

Further material versions and details available on request.

P\_AC\_0258\_SW1

#### Bladder damper, plastic



<b>Volume</b>	0.066 - 19 l
<b>Pressure</b>	17.2 bar
<b>Material of bladder/diaphragm</b>	EPDM or FKM
<b>Housing material</b>	PVDF

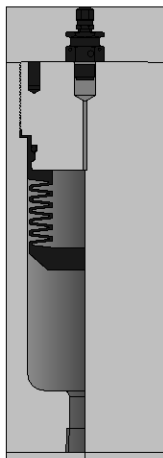
Further material versions and details available on request.

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## 2.21 Hydraulic/Mechanical Accessories

### Bladder damper, high pressure

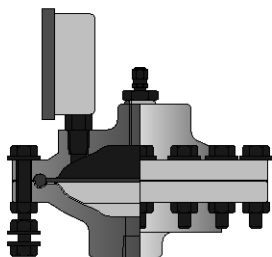


<b>Volume</b>	0.13 - 0.39 l
<b>Pressure</b>	793 bar
<b>Material of bladder/diaphragm</b>	EPDM or FKM
<b>Housing material</b>	316 L stainless steel, Hastelloy C, Alloy 20

Further material versions and details available on request.

P\_AC\_0260\_SW1

### Diaphragm damper with PTFE diaphragm



<b>Volume</b>	0.20
<b>Pressure</b>	137 bar
<b>Material of bladder/diaphragm</b>	PTFE
<b>Housing material</b>	316 L stainless steel, Hastelloy C, Alloy 20

Further material versions and details available on request.

P\_AC\_0261\_SW1



# Data Required for Specification of Metering Pump and Accessories

## Pump Specification Data

Min./max. required feed rate l/h \_\_\_\_\_  
 Available power supply \_\_\_\_\_ V, \_\_\_\_\_ Hz  
 Min./max. operating temperature °C \_\_\_\_\_  
 Properties of process chemical \_\_\_\_\_  
 Name, concentration % \_\_\_\_\_  
 Solids content % \_\_\_\_\_  
 Dynamic viscosity mPa (= cP) \_\_\_\_\_  
 Vapour pressure at operating temperature bar \_\_\_\_\_  
 Remarks, e.g. abrasive, \_\_\_\_\_  
 gaseous, flammable, \_\_\_\_\_  
 corrosive towards \_\_\_\_\_

### Suction conditions:

Min./max. suction lift m \_\_\_\_\_  
 Min./max. positive suction head m \_\_\_\_\_  
 Pressure in chemical tank bar \_\_\_\_\_  
 Suction line length m \_\_\_\_\_  
 Suction line diameter mm \_\_\_\_\_

### Discharge conditions:

Min./max. back pressure bar \_\_\_\_\_  
 Min./max. discharge head m \_\_\_\_\_  
 Min./max. negative discharge head m \_\_\_\_\_  
 Discharge line length m \_\_\_\_\_  
 Discharge line diameter mm \_\_\_\_\_  
 Number of valves and fittings in suction and discharge line \_\_\_\_\_

### Data required for proportional dosing:

Water flow Q min./max. m³/h \_\_\_\_\_  
 Required final concentration g/m³, ppm \_\_\_\_\_

### Example:

A required dose in mg/l = g/m³ = ppm

(Water flow Q max. 50 m³/h)

Pulse spacing (flow volume per pulse) of water meter 5 l.

Process fluid = sodium hypochlorite solution Na OCl with 12 % chlorine (by weight) = 120 g/kg = 150 g/l = 150 mg/ml

Selected dosing pump GALa 1005 NPB2 with 0.41 ml/per stroke volume, at max. 10800 strokes/h.

Variables: pump type, pulse spacing and concentration. The stroke rate (max. throughput l/h: pulse spacing l/pulse = 50,000 l/h : 5 l/pulse = 10000 pulses/h) must not exceed the max. stroke frequency (10800 strokes/h) of the dosing pump.

$$\text{Feed quantity} = \frac{\text{water throughput Q max. (l/h)} \times \text{stroke volume (l)}}{\text{pulse spacing (l)}} = \frac{50,000 \text{ l} \times 0.00041 \text{ l}}{\text{h} \times 5 \text{ l}} = 4.1 \text{ l/h}$$

$$\begin{aligned} \text{Final dose} &= \frac{\text{concentration (mg/ml)} \times \text{stroke volume (l)}}{\text{pulse spacing (l)}} = \frac{150 \text{ mg} \times 0.41 \text{ ml}}{\text{ml} \times 5 \text{ l}} = 12.3 \text{ mg/l} \\ &= 12.3 \text{ g/m}^3 \\ &= 12.3 \text{ ppm chlorine Cl}_2 \end{aligned}$$





# ProMinent® Chemical Resistance List

## Resistance of Materials Used in Liquid Ends to the Chemicals Most Frequently Used

The data apply to standard conditions (20 °C, 1,013 mbar).

s	=	saturated solution in water
+	=	resistant
+/o	=	largely resistant
o	=	conditionally resistant
-	=	not resistant
n	=	resistance not known
=>	=	see
*	=	For bonded connections, the resistance of the adhesive (e.g. Tangit) is to be considered. (Materials of the types 'o' and '-' are not recommended!)
**	=	does not apply to glass fibre reinforced material

Concentration data are stated in weight percent, referred to aqueous solutions. If percentages are stated for the level of resistance, this level of resistance is only valid up to this concentration.

### NOTE:

The elastomers **CSM (Hypalon®)** and **IIR (butyl rubber)** used as diaphragm materials in pulsation dampers have properties similar to **EPDM**.

**PTFE** is resistant to all chemicals in this list.

**PTFE filled with carbon**, however, is attacked by strong oxidants such as bromine (anhydrous) or concentrated acids (phosphoric acid, sulphuric acid, chromic acid).

The resistance of PVC-U adhesive joints with Tangit deviates from the list below with regard to the following chemicals:

Medium	Concentration range
Sulfochromic acid	≥ 70 % H <sub>2</sub> SO <sub>4</sub> + 5 % K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> /Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>
Chromic acid	≥ 10 % CrO <sub>3</sub>
Hydrochloric acid	≥ 25 % HCl
Hydrogen peroxide	≥ 5 % H <sub>2</sub> O <sub>2</sub>
Hydrofluoric acid	≥ 0 % HF

### Explanation of abbreviations used as column headings:

<b>Acrylic:</b>	Acrylic resistance
<b>PVC:</b>	PVC, rigid, (PVC-U) resistance
<b>PP:</b>	Polypropylene resistance
<b>PVDF:</b>	PVDF resistance
<b>1.4404:</b>	Stainless steel 1.4404 & 1.4571 resistance
<b>FKM:</b>	Fluorine Rubber (e.g. Viton® A & B) resistance
<b>EPDM:</b>	Ethylene-Propylene-Dien-rubber resistance
<b>Tygon:</b>	Tygon® R-3603 resistance
<b>Pharmed:</b>	Pharmed® resistance
<b>PE:</b>	Polyethylene resistance
<b>2.4819:</b>	Hastelloy C-276 resistance
<b>WGK:</b>	Water endangering class

Viton® is a registered trademark of DuPont Dow Elastomers

### Water endangering classes (WGK):

1	=	slightly hazardous to water
2	=	hazardous to water
3	=	severely hazardous to water
(X)	=	No classification. Classification according to conclusion by analogy. To be used under reserve.

### Safety data sheets

Safety data sheets on our products in a number of different languages are provided on our website.

[www.prominent.com/MSDS](http://www.prominent.com/MSDS)



# ProMinent® Chemical Resistance List

The data has been taken from relevant manufacturer's documentation and our own tests. Resistance of materials is also dependant on other factors, e.g. operating conditions, conditions of surfaces etc, and so this list must be treated as an initial guide only. It cannot claim to offer any guarantees. It should be taken into consideration in particular that usual dosing media are compounds, and their corrosiveness cannot be deducted simply by adding the corrosiveness of each single component. In such cases the chemical producers' data of the material compatibility are to be considered as a matter of prime importance for the material choice. A safety data sheet does not give this data and therefore cannot take the place of the technical documentation on the application.

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Acetaldehyde	CH <sub>3</sub> CHO	100%	-	-	o	-	+	-	+/-	-	-	+	+	2
Acetamide	CH <sub>3</sub> CONH <sub>2</sub>	s	+	+	+	+	+	o	+	-	+/-	+	+	1
Acetic Acid	CH <sub>3</sub> COOH	100%	-	50%	+	+	+	-	o	60%	60%	70%	+	1
Acetic Anhydride	(CH <sub>3</sub> CO) <sub>2</sub> O	100%	-	-	o	-	+	-	+/-	-	+	o	+	1
Acetic Ether => Ethyl Acetate														
Acetone	CH <sub>3</sub> COCH <sub>3</sub>	100%	-	-	+	-	+	-	+	-	-	+	+	1
Acetophenone	C <sub>6</sub> H <sub>5</sub> COCH <sub>3</sub>	100%	-	n	+	-	+	-	+	n	n	+	+	
Acetyl Chloride	CH <sub>3</sub> COCl	100%	-	+	n	-	o	+	-	-	o	n	+	1
Acetylacetone	CH <sub>3</sub> COCH <sub>2</sub> COCH <sub>3</sub>	100%	-	-	+	-	+	-	+	n	n	+	+	1
Acetylene Dichloride => Dichloro Ethylene														
Acetylene Tetrachloride => Tetrachloro Ethane														
Acrylonitril	CH <sub>2</sub> =CH-CN	100%	-	-	+	+	+	-	-	-	-	+	+	3
Adipic Acid	HOOC(CH <sub>2</sub> ) <sub>4</sub> COOH	s	+	+	+	+	+	+	+	-	+/-	+	+	1
Allyl Alcohol	CH <sub>2</sub> CHCH <sub>2</sub> OH	96%	-	o	+	+	+	-	+	-	o	+	+/-	2
Aluminium Acetate	Al(CH <sub>3</sub> COO) <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+/-	1
Aluminium Bromide	AlBr <sub>3</sub>	s	+	+	+	+	n	+	+	+	+	+	+	2
Aluminium Chloride	AlCl <sub>3</sub>	s	+	+	+	+	-	+	+	+	+	+	+	1
Aluminium Fluoride	AlF <sub>3</sub>	10%	+	+	+	+	-	+	+	+	+	+	+/-	1
Aluminium Hydroxide	Al(OH) <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Aluminium Nitrate	Al(NO <sub>3</sub> ) <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Aluminium Phosphate	AlPO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Aluminium Sulphate	Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Ammonium Acetate	CH <sub>3</sub> COONH <sub>4</sub>	s	+	+/-	+	+	+	+	+	+	+	+	+	1
Ammonium Bicarbonate	NH <sub>4</sub> HCO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Ammonium Carbonate	(NH <sub>4</sub> ) <sub>2</sub> CO <sub>3</sub>	40%	+	+	+	+	+	+	+	+	+	+	+	1
Ammonium Chloride	NH <sub>4</sub> Cl	s	+	+	+	+	-	+	+	+	+	+	+/-	1
Ammonium Fluoride	NH <sub>4</sub> F	s	+	o	+	+	o	+	+	+	+	+	+	1
Ammonium Hydroxide	"NH <sub>4</sub> OH"	30%	+	+	+	+	+	-	+	+	+	+	+	2
(25 °C)														
Ammonium Nitrate	NH <sub>4</sub> NO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Ammonium Oxalate	(COONH <sub>4</sub> ) <sub>2</sub> * H <sub>2</sub> O	s	+	+	+	+	+	+	+	+	+	+	+	1
Ammonium Perchlorate	NH <sub>4</sub> ClO <sub>4</sub>	10%	+	+	+	+	+	+	+	+	+	+	+	1
Ammonium Peroxodisulphate	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>8</sub>	s	+	+	+	+	5%	+	+	+	+	+	5%	2
Ammonium Phosphate	(NH <sub>4</sub> ) <sub>3</sub> PO <sub>4</sub>	s	+	+	+	+	10%	+	+	+	+	+	10%	1
Ammonium Sulphate	(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	s	+	+	+	+	10%	+	+	+	+	+	10%	1
Ammonium Sulphide	(NH <sub>4</sub> ) <sub>2</sub> S	s	+	+	+	+	n	+	+	n	n	+	n	2
Ammoniumaluminium Sulphate	NH <sub>4</sub> Al(SO <sub>4</sub> ) <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Amyl Alcohol	C <sub>5</sub> H <sub>11</sub> OH	100%	+	+	+	+	+	-	+	-	-	+	+	1
Aniline	C <sub>6</sub> H <sub>5</sub> NH <sub>2</sub>	100%	-	-	+	+	+	-	+/-	-	o	+	+	2
Aniline Hydrochloride	C <sub>6</sub> H <sub>5</sub> NH <sub>2</sub> * HCl	s	n	+	+	+	-	+/-	+/-	-	o	+	+	2
Antimony Trichloride	SbCl <sub>3</sub>	s	+	+	+	+	-	+	+	+	+	+	n	2
Aqua Regia	3 HCl + HNO <sub>3</sub>	100%	-	+	-	+	-	-	o	-	-	-	-	2
Arsenic Acid	H <sub>3</sub> AsO <sub>4</sub>	s	+	+	+	+	+	+	+	20%	o	+	+	3
Barium Carbonate	BaCO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Barium Chloride	BaCl <sub>2</sub>	s	+	+	+	+	-	+	+	+	+	+	+	1
Barium Hydroxide	Ba(OH) <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Barium Nitrate	Ba(NO <sub>3</sub> ) <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Barium Sulphate	BaSO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Barium Sulphide	BaS	s	+	+	+	+	+	+	+	+	+	+	+	(1)
Benzaldehyde	C <sub>6</sub> H <sub>5</sub> CHO	100%	-	-	+	-	+	+	+	-	-	o	+	1
Benzene	C <sub>6</sub> H <sub>6</sub>	100%	-	-	o	+	+	o	-	-	-	o	+	3
Benzene Sulphonic Acid	C <sub>6</sub> H <sub>5</sub> SO <sub>3</sub> H	10%	n	n	+	+	+	+	-	-	-	n	+	2
Benzoic Acid	C <sub>6</sub> H <sub>5</sub> COOH	s	+	+	+	+	+	+	+	-	+/-	+	+	1
Benzoyl Chloride	C <sub>6</sub> H <sub>5</sub> COCl	100%	-	n	o	n	o	+	+	n	n	o	+	2





# ProMinent® Chemical Resistance List

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Benzyl Alcohol	C <sub>6</sub> H <sub>5</sub> CH <sub>2</sub> OH	100%	-	-	+	+	+	+	-	-	+	+	+	1
Benzyl Benzoate	C <sub>6</sub> H <sub>5</sub> COOC <sub>7</sub> H <sub>7</sub>	100%	-	-	+	o	+	+	-	-	-	+	+	2
Benzyl Chloride	C <sub>6</sub> H <sub>5</sub> CH <sub>2</sub> Cl	90%	-	n	o	+	+	+	-	-	-	o	+	2
Bitter Salt => Magnesium Sulphate														
Bleach => Sodium Hypochlorite														
Blue Vitriol => Copper Sulphate														
Borax => Sodium Tetraborate														
Boric Acid	H <sub>3</sub> BO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Brine		s	+	+/o	+	+	+/o	+	+	+	+	+	+	1
Bromine (dry)	Br <sub>2</sub>	100%	-	-	-	+	-	-	-	-	-	-	+	2
Bromine Water	Br <sub>2</sub> + H <sub>2</sub> O	s	-	+	-	+	-	-	n	n	-	n		(2)
Bromo Benzene	C <sub>6</sub> H <sub>5</sub> Br	100%	n	n	o	+	+	o	-	-	-	o	+	2
Bromochloro Methane	CH <sub>2</sub> BrCl	100%	-	-	-	+	+	n	+/o	-	-	o	+	2
Bromochlorotrifluoro Ethane	HCClBrCF <sub>3</sub>	100%	-	-	o	+	+	+	-	+	+	o	+	(3)
Butanediol	HOC <sub>4</sub> H <sub>8</sub> OH	10%	n	+	+	+	+	o	+	+	+	+	+	1
Butanetriol	C <sub>4</sub> H <sub>10</sub> O <sub>3</sub>	s	+	+	+	+	+	o	+	+	+	+	+	1
Butanol	C <sub>4</sub> H <sub>9</sub> OH	100%	-	+	+	+	+	o	+/o	-	-	+	+	1
Butyl Acetate	C <sub>7</sub> H <sub>13</sub> O <sub>2</sub>	100%	-	-	+	+	+	-	-	-	+/o	+	+	1
Butyl Acetate	CH <sub>3</sub> COOC <sub>4</sub> H <sub>9</sub>	100%	-	-	o	+	+	-	+/o	-	+/o	-	+	1
Butyl Alcohol => Butanol														
Butyl Amine	C <sub>4</sub> H <sub>9</sub> NH <sub>2</sub>	100%	n	n	n	-	+	-	-	n	n	+	+	1
Butyl Benzoate	C <sub>6</sub> H <sub>5</sub> COOC <sub>4</sub> H <sub>9</sub>	100%	-	-	o	n	+	+	+	-	-	o	+	2
Butyl Mercaptane	C <sub>4</sub> H <sub>9</sub> SH	100%	n	n	n	+	n	+	-	n	n	n	n	3
Butyl Oleate	C <sub>22</sub> H <sub>42</sub> O <sub>2</sub>	100%	n	n	n	+	+	+	+/o	n	n	n	+	1
Butyl Stearate	C <sub>22</sub> H <sub>44</sub> O <sub>2</sub>	100%	o	n	n	+	+	+	-	n	n	n	+	1
Butyraldehyde	C <sub>3</sub> H <sub>7</sub> CHO	100%	-	n	+	n	+	-	+/o	-	-	+	+	1
Butyric Acid	C <sub>3</sub> H <sub>7</sub> COOH	100%	5%	20%	+	+	+	+	+	-	+/o	+	+	1
Calcium Acetate	(CH <sub>3</sub> COO) <sub>2</sub> Ca	s	+	+	+	+	+	+	+	+	+	+	+	1
Calcium Bisulphite	Ca(HSO <sub>3</sub> ) <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	(1)
Calcium Carbonate	CaCO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Calcium Chloride	CaCl <sub>2</sub>	s	+	+	+	+	-	+	+	+	+	+	+	1
Calcium Cyanide	Ca(CN) <sub>2</sub>	s	+	+	+	+	n	+	+	+	+	+	n	3
Calcium Hydroxide	Ca(OH) <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Calcium Hypochlorite	Ca(OCl) <sub>2</sub>	s	+	+	o	+	-	o	+	+	+	+	+	2
Calcium Nitrate	Ca(NO <sub>3</sub> ) <sub>2</sub>	s	+	50%	50%	+	+	+	+	+	+	+	+	1
Calcium Phosphate	Ca <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Calcium Sulphate	CaSO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Calcium Sulphide	CaS	s	+	+	+	+	n	+	+	+	+	+	+	(2)
Calcium Sulphite	CaSO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	(1)
Calcium Thiosulphate	CaS <sub>2</sub> O <sub>3</sub>	s	+	+	+	+	-	+	+	+	+	+	+	1
Carbolic Acid => Phenole														
Carbon Disulphide	CS <sub>2</sub>	100%	-	-	o	+	+	+	-	-	-	o	+	2
Carbon Tetrachloride	CCl <sub>4</sub>	100%	-	-	-	+	+	+	-	-	-	o	+	3
Carbonic Acid	"H <sub>2</sub> CO <sub>3</sub> "	s	+	+	+	+	+	+	+	+	+	+	+	1
Caustic Potash => Potassium Hydroxide														
Caustic Soda => Sodium Hydroxide														
Chloric Acid	HClO <sub>3</sub>	20%	+	+	-	+	-	o	o	+	+	10%	+	2
Chlorinated Lime => Calcium Hypochlorite														
Chlorine Dioxide Solution	ClO <sub>2</sub> + H <sub>2</sub> O	0.5%	o	+	o	+	-	o	-	o	-	o	+	
Chlorine Water	Cl <sub>2</sub> + H <sub>2</sub> O	s	+	+	o	+	-	+	+	o	-	o	+	
Chloro Benzene	C <sub>6</sub> H <sub>5</sub> Cl	100%	-	-	+	+	+	+	-	-	-	o	+	2
Chloro Ethanol	ClCH <sub>2</sub> CH <sub>2</sub> OH	100%	-	-	+	o	+	-	o	-	+	+	+	3
Chloro Ethylbenzene	C <sub>6</sub> H <sub>4</sub> ClC <sub>2</sub> H <sub>5</sub>	100%	-	-	o	n	+	o	-	-	-	o	+	(2)
Chloro Phenole	C <sub>6</sub> H <sub>4</sub> OHCl	100%	-	n	+	+	+	n	-	-	-	+	+	2
Chloro Toluene	C <sub>7</sub> H <sub>8</sub> Cl	100%	-	-	n	+	+	+	-	-	-	n	+	2
Chloroacetone	ClCH <sub>2</sub> COCH <sub>3</sub>	100%	-	-	n	n	+	-	+	-	-	n	+	3
Chlorobutadiene	C <sub>4</sub> H <sub>5</sub> Cl	100%	-	-	n	n	+	+	-	-	-	n	+	1
Chloroform	CHCl <sub>3</sub>	100%	-	-	o	+	+	+	-	-	o	-	+	2
Chlorohydrin	C <sub>3</sub> H <sub>5</sub> OCl	100%	-	n	+	-	+	+	o	-	+	+	+	3
Chloroprene => Chlorobutadiene														
Chlorosulphonic Acid	SO <sub>2</sub> (OH)Cl	100%	-	o	-	+	-	-	-	-	-	-	o	1
Chrome-alum => Potassium Chrome Sulphate														
Chromic Acid	H <sub>2</sub> CrO <sub>4</sub>	50%	-	+	o	+	10%	+	-	o	o	+	10%	3



## ProMinent® Chemical Resistance List

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Chromic-Sulphuric Acid	$K_2CrO_4 + H_2SO_4$	s	-	+	-	+	n	n	n	-	-	-	n	3
Chromium Sulphate	$Cr_2(SO_4)_3$	s	+	+	+	+	+	+	+	+	+	+	+	1
Citric Acid	$C_6H_8O_7$	s	+	+	+	+	+	+	+	+	+	+	+	1
Cobalt Chloride	$CoCl_2$	s	+	+	+	+	-	+	+	+	+	+	+	2
Copper-II-Acetate	$Cu(CH_3COO)_2$	s	+	+	+	+	+	+	+	+	+	+	+	3
Copper-II-Arsenite	$Cu_3(AsO_3)_2$	s	+	+	+	+	+	+	+	+	+	+	+	3
Copper-II-Carbonate	$CuCO_3$	s	+	+	+	+	+	+	+	+	+	+	+	2
Copper-II-Chloride	$CuCl_2$	s	+	+	+	+	1%	+	+	+	+	+	+	2
Copper-II-Cyanide	$Cu(CN)_2$	s	+	+	+	+	+	+	+	+	+	+	+	(3)
Copper-II-Fluoride	$CuF_2$	s	+	+	+	+	+	+	+	+	+	+	+	(2)
Copper-II-Nitrate	$Cu(NO_3)_2$	s	+	+	+	+	+	+	+	+	+	+	+/o	2
Copper-II-Sulphate	$CuSO_4$	s	+	+	+	+	+	+	+	+	+	+	+	2
Cresols	$C_6H_4CH_3OH$	100%	o	o	+	+	+	+	-	-	-	+	+	2
Crotonaldehyde	$CH_3C_2H_2CHO$	100%	n	-	+	+	+	-	+	-	-	+	+	3
Cubic Nitre => Sodium Nitrate														
Cumene => Isopropyl Benzene														
Cyclo Hexane	$C_6H_{12}$	100%	+	-	+	+	+	+	-	-	-	+	o	1
Cyclohexanole	$C_6H_{11}OH$	100%	o	+/o	+	+	+	+	-	-	-	+	+	1
Cyclohexanone	$C_6H_{10}O$	100%	-	-	+	-	+	-	+/o	-	-	+	+	1
Cyclohexyl Alcohol => Cyclohexanol														
Cyclohexylamine	$C_6H_{11}NH_2$	100%	n	n	n	n	+	-	n	n	n	n	+	2
Decahydronaphthaline	$C_{10}H_{18}$	100%	-	+/o	o	+	n	o	-	-	-	o	+	2
Decaline => Decahydronaphthalene														
Dextrose => Glucose														
Diacetonolcohol	$C_6H_{12}O_2$	100%	-	-	+	o	+	-	+	-	-	+	+	1
Dibromoethane	$C_2H_4Br_2$	100%	-	-	n	+	+	+	-	-	-	-	+	3
Dibutyl Ether	$C_4H_9OC_4H_9$	100%	-	-	+	+	+	-	o	-	-	+	+	2
Dibutyl Phthalate	$C_{16}H_{22}O_4$	100%	-	-	+	+	+	+	+/o	o	+	o	+	2
Dibutylamine	$(C_4H_9)_2NH$	100%	n	n	+	+	+	-	-	n	n	+	+	1
Dichloro Acetic Acid	$Cl_2CHCOOH$	100%	-	+	+	+	+	-	+	-	o	+	+	1
Dichloro Benzene	$C_6H_4Cl_2$	100%	-	-	o	+	+	+	-	-	-	o	+	2
Dichloro Butan	$C_4H_8Cl_2$	100%	-	-	o	+	+	+	-	-	-	o	+	3
Dichloro Butene	$C_4H_6Cl_2$	100%	-	-	o	+	+	o	-	-	-	o	+	3
Dichloro Ethane	$C_2H_4Cl_2$	100%	-	-	o	+	+	+	-	-	o	-	+	3
Dichloro Ethylene	$C_2H_2Cl_2$	100%	-	-	o	+	+	o	-	-	o	-	+	2
Dichloro Methane	$CH_2Cl_2$	100%	-	-	o	o	o	+	-	-	o	-	+	2
Dichloroisopropyl Ether	$(C_3H_6Cl)_2O$	100%	-	-	o	n	+	o	o	-	-	o	+	(2)
Dicyclohexylamine	$(C_6H_{12})_2NH$	100%	-	-	o	n	+	-	-	-	-	o	+	2
Diethyleneglycol	$C_4H_{10}O_3$	s	+	+	+	+	+	+	+	+	+	+	+	1
Diethyleneglycolethyl Ether	$C_8H_{18}O_3$	100%	n	n	+	+	+	n	+/o	-	o	+	+	1
Diethylether	$C_2H_5OC_2H_5$	100%	-	-	o	+	+	-	-	-	o	o	+	1
Diglycolic Acid	$C_4H_6O_5$	30%	+	+	+	+	+	+	n	+	+/o	+	+	3
Diethyl Phthalate	$C_{20}H_{26}O_4$	100%	-	-	+	+	+	-	n	o	+	+	+	(1)
Diisobutylketone	$C_9H_{18}O$	100%	-	-	+	+	+	-	+	-	-	+	+	1
Di-iso-nonyl Phthalate	$C_{26}H_{42}O_4$	100%	-	-	+	+	+	n	n	o	+	+	+	1
Diisopropylketone	$C_7H_{14}O$	100%	-	-	+	+	+	-	+	-	-	+	+	1
Dimethyl Carbonate	$(CH_3O)_2CO$	100%	n	n	+	+	+	+	-	n	n	+	+	1
Dimethyl Ketone => Acetone														
Dimethyl Phthalate	$C_{10}H_{10}O_4$	100%	-	-	+	+	+	-	+/o	o	+	+	+	1
Dimethylformamide	$HCON(CH_3)_2$	100%	-	-	+	-	+	-	+	-	+/o	+	+	1
Dimethylhydrazine	$H_2NN(CH_3)_2$	100%	n	n	+	n	+	-	+	n	n	+	+	3
Diocetyl Phthalate	$C_{44}H_{88}O_4$	100%	-	-	+	+	+	-	+/o	o	+	+	+	1
Dioxane	$C_4H_8O_2$	100%	-	-	o	-	+	-	+/o	-	-	+	+	1
Disodium Hydrogenphosphate	$Na_2HPO_4$	s	+	+	+	+	+	+	+	+	+	+	+	1
Disulfur Acid -- Oleum														
Disulphur Dichloride	$S_2Cl_2$	100%	n	n	n	+	n	+	-	-	-	n	n	
DMF => Dimethylformamide														
Engine Oils		100 %	n	+/o	+	+	+	+	-	-	-	+	+	2
Epsom salts => Magnesium Sulphate														
Ethanol	$C_2H_5OH$	100%	-	+	+	+	+	-	+	-	+	+	+	1
Ethanol Amine	$HOC_2H_4NH_2$	100%	o	n	+	-	+	-	+/o	-	o	+	+	1
Ethyl Acetate	$CH_3COOC_2H_5$	100%	-	-	35%	+	+	-	+/o	-	+/o	+	+	1
Ethyl Acrylate	$C_2H_3COOC_2H_5$	100%	-	-	+	o	+	-	+/o	-	-	+	+	2



# ProMinent® Chemical Resistance List

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Ethyl Benzene	C <sub>6</sub> H <sub>5</sub> -C <sub>2</sub> H <sub>5</sub>	100%	-	-	o	+	+	o	-	-	-	o	+	1
Ethyl Benzoate	C <sub>6</sub> H <sub>5</sub> COOC <sub>2</sub> H <sub>5</sub>	100%	n	-	+	o	+	+	-	-	-	+	+	1
Ethyl Bromide	C <sub>2</sub> H <sub>5</sub> Br	100%	-	n	+	+	n	+	-	-	o	+	+	2
Ethyl Chloroacetate	ClCH <sub>2</sub> COOC <sub>2</sub> H <sub>5</sub>	100%	-	o	+	+	+	+	-	-	-	+	+	2
Ethyl Chlorocarbonate	ClCO <sub>2</sub> C <sub>2</sub> H <sub>5</sub>	100%	n	n	n	n	n	+	-	n	n	n	n	(2)
Ethyl Cyclopentane	C <sub>5</sub> H <sub>4</sub> C <sub>2</sub> H <sub>5</sub>	100%	+	+	+	+	+	+	-	-	-	+	+	(1)
Ethylacetoacetate	C <sub>6</sub> H <sub>10</sub> O <sub>3</sub>	100%	n	-	+	+	+	-	+/-	-	+/-	+	+	1
Ethylacrylic Acid	C <sub>4</sub> H <sub>7</sub> COOH	100%	n	n	+	+	+	n	+/-	n	n	+	+	(1)
Ethylene Diamine	(CH <sub>2</sub> NH <sub>2</sub> ) <sub>2</sub>	100%	o	o	+	-	o	-	+	n	n	+	o	2
Ethylene Dibromide => Dibromoethane														
Ethylene Dichloride => Dichloro Ethane														
Ethylene Glycol => Glycol														
Ethylenglycol Ethylether	HOC <sub>2</sub> H <sub>4</sub> OC <sub>2</sub> H <sub>5</sub>	100%	n	n	+	+	+	n	+/-	-	o	+	+	1
Ethylhexanol	C <sub>8</sub> H <sub>16</sub> O	100%	n	+/-	+	+	+	+	+	-	-	+	+	2
Fatty Acids	R-COOH	100%	+	+	+	+	+	+	o	-	o	+	+	1
Ferric Chloride	FeCl <sub>3</sub>	s	+	+	+	+	-	+	+	+	+	+	+/-	1
Ferric Nitrate	Fe(NO <sub>3</sub> ) <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Ferric Phosphate	FePO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Ferric Sulphate	Fe <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub>	s	+	+	+	+	o	+	+	+	+	+	+	1
Ferrous Chloride	FeCl <sub>2</sub>	s	+	+	+	+	-	+	+	+	+	+	+/-	1
Ferrous Sulphate	FeSO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Fixing Salt => Sodium Thiosulphate														
Fluoro Benzene	C <sub>6</sub> H <sub>5</sub> F	100%	-	-	+	+	+	o	-	-	-	o	+	2
Fluoroboric Acid	HBFB <sub>4</sub>	35%	+	+	+	+	o	+	+	+	-	+	+	1
Fluorosilicic Acid	H <sub>2</sub> SiF <sub>6</sub>	100%	+	30%	30%	+	o	+	+	25%	o	40%	+/-	2
Formaldehyde	CH <sub>2</sub> O	40%	+	+	+	+	+	-	+/-	-	-	+	+	2
Formalin => Formaldehyde														
Formamide	HCONH <sub>2</sub>	100%	+	-	+	+	+	+	+	n	n	+	+	1
Formic Acid	HCOOH	s	-	+/-	+	+	+	-	-	+/-	+/-	+	+	1
Furane	C <sub>4</sub> H <sub>4</sub> O	100%	-	-	+	-	+	-	n	-	-	+	+	3
Furane Aldehyde	C <sub>5</sub> H <sub>4</sub> O <sub>2</sub>	100%	n	n	n	o	+	-	+/-	-	-	n	n	2
Furfuryl Alcohol	OC <sub>4</sub> H <sub>3</sub> CH <sub>2</sub> OH	100%	-	-	+	o	+	n	+/-	-	-	+	+	1
Gallic Acid	C <sub>6</sub> H <sub>2</sub> (OH) <sub>3</sub> COOH	5%	+	+	+	+	+	+	+/-	+	+	+	+	1
Gasoline		100 %	-	-	+	+	+	+	-	-	-	+	+	2
Glauber's Salt => Sodium Sulphate														
Glucose	C <sub>6</sub> H <sub>12</sub> O <sub>6</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Glycerol	C <sub>3</sub> H <sub>5</sub> (OH) <sub>3</sub>	100%	+	+	+	+	+	+	+	+	+	+	+	1
Glycerol Triacetate	C <sub>3</sub> H <sub>5</sub> (CH <sub>3</sub> COO) <sub>3</sub>	100%	n	n	+	+	+	-	+	n	n	+	+	1
Glycine	NH <sub>2</sub> CH <sub>2</sub> COOH	10%	+	+	+	+	+	+	+	+	+	+	+	1
Glycol	C <sub>2</sub> H <sub>4</sub> (OH) <sub>2</sub>	100%	+	+	+	+	+	+	+	+	+	+	+	1
Glycolic Acid	CH <sub>2</sub> OHCOOH	70%	+	37%	+	+	+	+	+	+	+/-	+	+	1
Gypsum => Calcium Sulphate														
Heptane	C <sub>7</sub> H <sub>16</sub>	100%	+	+	+	+	+	+	-	-	-	+	+	1
Hexachloroplatinic Acid	H <sub>2</sub> PtCl <sub>6</sub>	s	n	+	+	+	-	n	+	n	n	+	-	
Hexanal	C <sub>5</sub> H <sub>11</sub> CHO	100%	n	n	+	+	+	-	+/-	-	-	+	+	1
Hexane	C <sub>6</sub> H <sub>14</sub>	100%	+	+	+	+	+	+	-	-	-	+	+	1
Hexanol	C <sub>6</sub> H <sub>13</sub> OH	100%	-	-	+	+	+	n	+	-	o	+	+	1
Hexantriol	C <sub>6</sub> H <sub>9</sub> (OH) <sub>3</sub>	100%	n	n	+	+	+	+	+	n	n	+	+	1
Hexene	C <sub>6</sub> H <sub>12</sub>	100%	n	+	+	+	+	+	-	-	-	+	+	1
Hydrazine Hydrate	N <sub>2</sub> H <sub>4</sub> * H <sub>2</sub> O	s	+	+	+	+	+	n	+	-	o	+	+	3
Hydrobromic Acid	HBr	50%	+	+	+	+	-	-	+	+	-	+	o	1
Hydrochloric Acid	HCl	38%	32%	+	+	+	-	+	o	+	o	+	o	1
Hydrofluoric Acid	HF	80%	-	40%*	40%**	+	-	+	o	40%	-	40%	+/-	1
Hydrogen Cyanide	HCN	s	+	+	+	+	+	+	+	+	+	+	+	3
Hydrogen Peroxide	H <sub>2</sub> O <sub>2</sub>	90%	40%	40%*	30%	+	+	30%	30%	30%	+	+	+	1
Hydroiodic Acid	HI	s	+	+	+	+	-	-	n	+	-	+	n	1
Hydroquinone	C <sub>6</sub> H <sub>4</sub> (OH) <sub>2</sub>	s	o	+	+	+	+	+	-	+	+/-	+	+	2
Hydroxylamine Sulphate	(NH <sub>2</sub> OH) <sub>2</sub> * H <sub>2</sub> SO <sub>4</sub>	10%	+	+	+	+	+	+	+	+	+	+	+	2
Hypochlorous Acid	HOCl	s	+	+	o	+	-	+	+/-	+	+	o	+	(1)
Iodine	I <sub>2</sub>	s	o	-	+	+	-	+	+/-	+	+	o	+/-	
Iron Vitriol => Ferrous Sulphate														
Isobutanol => Isobutyl Alcohol														
Isobutyl Alcohol	C <sub>2</sub> H <sub>5</sub> CH(OH)CH <sub>3</sub>	100%	-	+	+	+	+	+	+	-	o	+	+	1



# ProMinent® Chemical Resistance List

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Isopropanol => Isopropyl Alcohol														
Isopropyl Acetate	$\text{CH}_3\text{COOCH}(\text{CH}_3)_2$	100%	-	-	+	+	+	-	+/-	-	+/-	+	+	1
Isopropyl Alcohol	$(\text{CH}_3)_2\text{CHOH}$	100%	-	+/-	+	+	+	+	+	-	o	+	+	1
Isopropyl Benzene	$\text{C}_6\text{H}_5\text{CH}(\text{CH}_3)_2$	100%	-	-	o	+	+	+	-	-	-	o	+	1
Isopropyl Chloride	$\text{CH}_3\text{CHClCH}_3$	80%	-	-	o	+	+	+	-	-	o	o	+/-	2
Isopropyl Ether	$\text{C}_6\text{H}_{14}\text{O}$	100%	-	-	o	+	+	-	-	-	o	o	+	1
Kitchen Salt => Sodium Chloride														
Lactic Acid	$\text{C}_3\text{H}_6\text{O}_3$	100%	-	+	+	+	+/-	+	10%	-	+/-	+	+	1
Lead Acetate	$\text{Pb}(\text{CH}_3\text{COO})_2$	s	+	+	+	+	+	+	+	+	+	+	+	2
Lead Nitrate	$\text{Pb}(\text{NO}_3)_2$	50%	+	+	+	+	+	+	+	+	+	+	+	2
Lead Sugar => Lead Acetate														
Lead Sulphate	$\text{PbSO}_4$	s	+	+	+	+	+	+	+	+	+	+	+	(2)
Lead Tetraethyl	$\text{Pb}(\text{C}_2\text{H}_5)_4$	100%	+	+	+	+	+	+	-	n	n	+	+	3
Lime Milk => Calcium Hydroxide														
Liquid Ammonia => Ammonium Hydroxide														
Lithium Bromide	LiBr	s	+	+	+	+	+	+	+	+	+	+	+	1
Lithium Chloride	LiCl	s	+	+	+	+	-	+	+	+	+	+	n	1
Lunar Caustic => Silver Nitrate														
Magnesium Carbonate	$\text{MgCO}_3$	s	+	+	+	+	+	+	+	+	+	+	+/-	1
Magnesium Chloride	$\text{MgCl}_2$	s	+	+	+	+	o	+	+	+	+	+	+	1
Magnesium Hydroxide	$\text{Mg}(\text{OH})_2$	s	+	+	+	+	+	+	+	+	+	+	+	1
Magnesium Nitrate	$\text{Mg}(\text{NO}_3)_2$	s	+	+	+	+	+	+	+	+	+	+	+	1
Magnesium Sulphate	$\text{MgSO}_4$	s	+	+	+	+	+	+	+	+	+	+	+/-	1
Maleic Acid	$\text{C}_4\text{H}_4\text{O}_4$	s	+	+	+	+	+	+	+	-	o	+	+	1
Malic Acid	$\text{C}_4\text{H}_6\text{O}_5$	s	+	+	+	+	+	+	+	+	+	+	+	1
Manganese-II-Chloride	$\text{MnCl}_2$	s	+	+	+	+	-	+	+	+	+	+	+	1
Manganese-II-Sulphate	$\text{MnSO}_4$	s	+	+	+	+	+	+	+	+	+	+	+	1
MEK => Methyl Ethyl Ketone														
Mercury	Hg	100%	+	+	+	+	+	+	+	+	+	+	+	3
Mercury-II-Chloride	$\text{HgCl}_2$	s	+	+	+	+	-	+	+	+	+	+	+	3
Mercury-II-Cyanide	$\text{Hg}(\text{CN})_2$	s	+	+	+	+	+	+	+	+	+	+	+	3
Mercury-II-Nitrate	$\text{Hg}(\text{NO}_3)_2$	s	+	+	+	+	+	+	+	+	+	+	+	3
Mesityl Oxide	$\text{C}_6\text{H}_{10}\text{O}$	100%	-	-	n	n	+	-	+/-	-	-	n	+	1
Methacrylic Acid	$\text{C}_3\text{H}_5\text{COOH}$	100%	n	n	+	+	+	o	+/-	-	+/-	+	+	1
Methanol	$\text{CH}_3\text{OH}$	100%	-	-	+	+	+	o	+	-	+/-	+	+	1
Methoxybutanol	$\text{CH}_3\text{O}(\text{CH}_2)_4\text{OH}$	100%	-	-	+	+	+	+	o	-	o	+	+	(1)
Methyl Acetate	$\text{CH}_3\text{COOCH}_3$	60%	-	-	+	+	+	-	+/-	-	+/-	+	+	2
Methyl Acrylate	$\text{C}_2\text{H}_3\text{COOCH}_3$	100%	-	-	+	+	+	-	+/-	-	o	+	+	2
Methyl Benzoate	$\text{C}_6\text{H}_5\text{COOCH}_3$	100%	-	-	+	o	+	+	-	-	-	+	+	2
Methyl Catechol	$\text{C}_6\text{H}_3(\text{OH})_2\text{CH}_3$	s	+	+	+	+	+	+	-	+	+o	+	+	(1)
Methyl Cellulose		s	+	+	+	+	+	+	+	+	+	+	+	1
Methyl Chloroacetate	$\text{ClCH}_2\text{COOCH}_3$	100%	-	o	+	+	+	o	-	-	-	+	+	2
Methyl Cyclopentane	$\text{C}_5\text{H}_9\text{CH}_3$	100%	+	+	+	+	+	+	-	-	-	+	+	(1)
Methyl Dichloroacetate	$\text{Cl}_2\text{CHCOOCH}_3$	100%	-	-	+	n	+	-	n	-	-	+	+	2
Methyl Ethyl Ketone	$\text{CH}_3\text{COC}_2\text{H}_5$	100%	-	-	+	-	+	-	+	-	-	+	+	1
Methyl Glycol	$\text{C}_3\text{H}_8\text{O}_2$	100%	+	+	+	+	+	-	+/-	+	+	+	+	1
Methyl Isobutyl Ketone	$\text{CH}_3\text{COC}_4\text{H}_9$	100%	-	-	+	-	+	-	o	-	-	+	+	1
Methyl Isopropyl Ketone	$\text{CH}_3\text{COC}_3\text{H}_7$	100%	-	-	+	-	+	-	+/-	-	-	+	+	1
Methyl Methacrylate	$\text{C}_3\text{H}_5\text{COOCH}_3$	100%	-	-	+	+	+	-	-	-	-	+	+	1
Methyl Oleate	$\text{C}_{17}\text{H}_{33}\text{COOCH}_3$	100%	n	n	+	+	+	+	+/-	n	n	+	+	1
Methyl Salicylate	$\text{HOC}_6\text{H}_4\text{COOCH}_3$	100%	-	-	+	+	+	n	+/-	-	-	+	+	1
Methylacetyl Acetate	$\text{C}_5\text{H}_8\text{O}_3$	100%	-	-	+	+	+	-	+/-	-	o	+	+	2
Methylamine	$\text{CH}_3\text{NH}_2$	32%	+	o	+	o	+	-	+	+	+	+	+	2
Methylene Chloride => Dichloro Methane														
Mirabilite => Sodium Sulphate														
Morpholine	$\text{C}_4\text{H}_9\text{ON}$	100%	-	-	+	-	+	n	n	-	-	+	+	2
Muriatic Acid => Hydrochloric Acid														
Natron => Sodium Bicarbonate														
Nickel-II-Acetate	$(\text{CH}_3\text{COO})_2\text{Ni}$	s	+	+	+	+	+	-	+	+	+	+	+	(2)
Nickel-II-Chloride	$\text{NiCl}_2$	s	+	+	+	+	-	+	+	+	+	+	+	2
Nickel-II-Nitrate	$\text{Ni}(\text{NO}_3)_2$	s	+	+	+	+	+	+	+	+	+	+	+/-	2
Nickel-II-Sulphate	$\text{NiSO}_4$	s	+	+	+	+	+	+	+	+	+	+	+/-	2
Nitrate of Lime => Calcium Nitrate														



# ProMinent® Chemical Resistance List

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Nitric Acid	HNO <sub>3</sub>	99%	10%	10%*	50%	65%	50%	65%	10%	35%	35%	50%	65%	1
Nitro Methane	CH <sub>3</sub> NO <sub>2</sub>	100%	-	-	+	o	+	-	+/-	-	-	+	+	2
Nitro Propane	(CH <sub>3</sub> ) <sub>2</sub> CHNO <sub>2</sub>	100%	-	-	+	n	+	-	+/-	-	-	+	+	2
Nitro Toluene	C <sub>6</sub> H <sub>4</sub> NO <sub>2</sub> CH <sub>3</sub>	100%	-	-	+	+	+	o	-	-	-	+	+	2
Octane	C <sub>8</sub> H <sub>18</sub>	100%	o	+	+	+	+	+	-	-	-	+	+	1
Octanol	C <sub>8</sub> H <sub>17</sub> OH	100%	-	-	+	+	+	+	+	-	-	+	+	1
Octyl Cresol	C <sub>15</sub> H <sub>24</sub> O	100%	-	-	+	+	+	o	n	-	-	+	+	(1)
Oil => Engine Oils														
Oleum	H <sub>2</sub> SO <sub>4</sub> + SO <sub>3</sub>	s	n	-	-	-	+	+	-	+	+	-	+	2
Orthophosphoric Acid => Phosphoric Acid														
Oxalic Acid	(COOH) <sub>2</sub>	s	+	+	+	+	10%	+	+	+/-	+/-	+	+/-	1
Pentane	C <sub>5</sub> H <sub>12</sub>	100%	+	+	+	+	+	+	-	-	-	+	+	1
Pentanol => Amyl Alcohol														
Perchloric Acid	HClO <sub>4</sub>	70%	n	10%	10%	+	-	+	+/-	o	+	+	n	1
Perchloroethylene => Tetrachloro Ethylene														
Perhydrol => Hydrogen Peroxide														
Petroleum Ether	C <sub>n</sub> H <sub>2n+2</sub>	100%	+	+/-	+	+	+	+	-	-	-	+	+	1
Phenole	C <sub>6</sub> H <sub>5</sub> OH	100%	-	-	+	+	+	+	-	10%	+	+	+	2
Phenyl Ethyl Ether	C <sub>6</sub> H <sub>5</sub> OC <sub>2</sub> H <sub>5</sub>	100%	-	-	+	n	+	-	-	-	-	+	+	2
Phenyl Hydrazine	C <sub>6</sub> H <sub>5</sub> NNH <sub>2</sub>	100%	-	-	o	+	+	o	-	-	-	o	+	2
Phosphoric Acid	H <sub>3</sub> PO <sub>4</sub>	85%	50%	+	+	+	+	+	+	+	+	+	+	1
Phosphorous Oxychloride	POCl <sub>3</sub>	100%	-	-	+	+	n	+	+	n	n	+	+	1
Phosphorous Trichloride	PCl <sub>3</sub>	100%	-	-	+	+	+	o	+	+	+/-	+	+	1
Phthalic Acid	C <sub>6</sub> H <sub>4</sub> (COOH) <sub>2</sub>	s	+	+	+	+	+	+	+	-	+	+	+	1
Picric Acid	C <sub>6</sub> H <sub>2</sub> (NO <sub>3</sub> ) <sub>3</sub> OH	s	+	+	+	+	+	+	+	+	-	+	+	2
Piperidine	C <sub>5</sub> H <sub>11</sub> N	100%	-	-	n	n	+	-	-	-	-	n	+	2
Potash Alum => Potassium Aluminium Sulphate														
Potassium Acetate	CH <sub>3</sub> COOK	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Aluminium Sulphate	KAl(SO <sub>4</sub> ) <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Bicarbonate	KHCO <sub>3</sub>	40%	+	+	+	+	+	+	+	+	+	+	+/-	1
Potassium Bifluoride	KHF <sub>2</sub>	s	n	+	+	+	+	+	+	+	+	+	+	1
Potassium Bisulphate	KHSO <sub>4</sub>	5%	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Bitartrate	KC <sub>4</sub> H <sub>5</sub> O <sub>6</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Borate	KBO <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	(1)
Potassium Bromate	KBrO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	2
Potassium Bromide	KBr	s	+	+	+	+	10%	+	+	+	+	+	0,1	1
Potassium Carbonate	K <sub>2</sub> CO <sub>3</sub>	s	+	+	+	+	+	+	+	55%	55%	+	+	1
Potassium Chlorate	KClO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	2
Potassium Chloride	KCl	s	+	+	+	+	-	+	+	+	+	+	+/-	1
Potassium Chromate	K <sub>2</sub> CrO <sub>4</sub>	10%	+	+	+	+	+	+	+	+	+	+	+	3
Potassium Chrome Sulphate	KCr(SO <sub>4</sub> ) <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Cyanate	KOCN	s	+	+	+	+	+	+	+	+	+	+	+	2
Potassium Cyanide	KCN	s	+	+	+	+	5%	+	+	+	+	+	5%	3
Potassium Cyanoferate II	K <sub>4</sub> Fe(CN) <sub>6</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Cyanoferate III	K <sub>3</sub> Fe(CN) <sub>6</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Dichromate	K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	s	+	+	+	+	25%	+	+	+	+	+	10%	3
Potassium Fluoride	KF	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Hydroxyde	KOH	50%	+	+	+	+	+	-	+	10%	10%	+	+	1
(25 °C)														
Potassium Iodide	KI	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Nitrate	KNO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Perchlorate	KClO <sub>4</sub>	s	+	+	+	+	n	+	+	+	+	+	+	1
Potassium Permanganate	KMnO <sub>4</sub>	s	+	+	+	+	+	+	+	6%	6%	+	+	2
Potassium Persulphate	K <sub>2</sub> S <sub>2</sub> O <sub>8</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Phosphate	KH <sub>2</sub> PO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Pyrochromate => Potassium Dichromate														
Potassium Sulphate	K <sub>2</sub> SO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Potassium Sulphite	K <sub>2</sub> SO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Propionic Acid	C <sub>2</sub> H <sub>5</sub> COOH	100%	o	+	+	+	+	+	+	-	+/-	+	+	1
Propionitrile	CH <sub>3</sub> CH <sub>2</sub> CN	100%	n	n	+	+	+	+	-	-	-	+	+	2
Propyl Acetate	CH <sub>3</sub> COOC <sub>3</sub> H <sub>7</sub>	100%	-	-	+	+	+	-	+/-	-	-	+	+	1
Propylene Glycol	CH <sub>3</sub> CHOHCH <sub>2</sub> OH	100%	+	+	+	+	+	+	+	+	+	+	+	1
Prussic Acid => Hydrogen Cyanide														
Pyridine	C <sub>5</sub> H <sub>5</sub> N	100%	-	-	o	-	+	-	-	-	o	+	+	2



# ProMinent® Chemical Resistance List

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Pyrrole	C <sub>4</sub> H <sub>4</sub> NH	100%	n	n	+	n	+	-	-	-	-	+	+	2
Roman Vitriol => Copper Sulphate														
Salicylic Acid	HOC <sub>6</sub> H <sub>4</sub> COOH	s	+	+	+	+	+	+	+	+	+	+	+/o	1
Salmiac => Ammonium Chloride														
Saltpeter => Potassium Nitrate														
Silic Acid	SiO <sub>2</sub> * x H <sub>2</sub> O	s	+	+	+	+	+	+	+	+	+	+	+	1
Silver Bromide	AgBr	s	+	+	+	+	+/o	+	+	+	+	+	+	1
Silver Chloride	AgCl	s	+	+	+	+	-	+	+	+	+	+	+/o	1
Silver Nitrate	AgNO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+/o	3
Slaked Lime => Calcium Hydroxide														
Soda => Sodium Carbonate														
Sodium Acetate	NaCH <sub>3</sub> COO	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Benzoate	C <sub>6</sub> H <sub>5</sub> COONa	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Bicarbonate	NaHCO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Bisulphate	NaHSO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Bisulphite	NaHSO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Borate	NaBO <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Bromate	NaBrO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	3
Sodium Bromide	NaBr	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Carbonate	Na <sub>2</sub> CO <sub>3</sub>	s	+	+	+	+	+/o	+	+	+	+	+	+	1
Sodium Chlorate	NaClO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	2
Sodium Chloride	NaCl	s	+	+	+	+	-	+	+	+	+	+	+	1
Sodium Chlorite	NaClO <sub>2</sub>	24%	+	+	+	+	10%	+	+	+	+	+	10%	2
Sodium Chromate	Na <sub>2</sub> CrO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	3
Sodium Cyanide	NaCN	s	+	+	+	+	+	+	+	+	+	+	+	3
Sodium Dichromate	Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	s	+	+	+	+	+	+	+	+	+	+	+	3
Sodium Dithionite	Na <sub>2</sub> S <sub>2</sub> O <sub>4</sub>	s	+	10%	10%	+	+	n	n	+	+	10%	+/o	1
Sodium Fluoride	NaF	s	+	+	+	+	10%	+	+	+	+	+	+	1
Sodium Hydrogen Sulphate => Sodium Bisulphate														
Sodium Hydroxide	NaOH	50%	+	+	+	+	+	-	+	10%	30%	+	+	1
						(60%/25 °C)								
Sodium Hypochlorite	NaOCl + NaCl	12%	+	+	o	+	-	+	+	+	+	o	> 10%	2
Sodium Iodide	NaI	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Metaphosphate	(NaPO <sub>3</sub> ) <sub>n</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Nitrate	NaNO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Nitrite	NaNO <sub>2</sub>	s	+	+	+	+	+	+	+	+	+	+	+	2
Sodium Oxalate	Na <sub>2</sub> C <sub>2</sub> O <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Perborate	NaBO <sub>2</sub> *H <sub>2</sub> O <sub>2</sub>	s	+	+/o	+	+	+	+	+	+	+	+	+/o	1
Sodium Perchlorate	NaClO <sub>4</sub>	s	+	+	+	+	10%	+	+	+	+	+	10%	1
Sodium Peroxide	Na <sub>2</sub> O <sub>2</sub>	s	+	+	+	+	+	+	+	n	n	-	+	1
Sodium Persulphate	Na <sub>2</sub> S <sub>2</sub> O <sub>8</sub>	s	n	+	+	+	+	+	+	+	+	+	+	1
Sodium Pyrosulphite	Na <sub>2</sub> S <sub>2</sub> O <sub>5</sub>	s	+	+	+	+	+	n	n	+	+	+	+	1
Sodium Salicylate	C <sub>6</sub> H <sub>4</sub> (OH)COONa	s	+	+/o	+	+	+	+	+	+	+	+	+	1
Sodium Silicate	Na <sub>2</sub> SiO <sub>3</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Sulphate	Na <sub>2</sub> SO <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Sulphide	Na <sub>2</sub> S	s	+	+	+	+	+	+	+	+	+	+	+	2
Sodium Sulphite	Na <sub>2</sub> SO <sub>3</sub>	s	+	+	+	+	50%	+	+	+	+	+	50%	1
Sodium Tetraborate	Na <sub>2</sub> B <sub>4</sub> O <sub>7</sub> * 10 H <sub>2</sub> O	s	+	+	+	+	+	+	+	+	+	+	+	1
Sodium Thiosulphate	Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub>	s	+	+	+	+	25%	+	+	+	+	+	25%	1
Sodium Tripolyphosphate	Na <sub>5</sub> P <sub>3</sub> O <sub>10</sub>	s	+	+	+	+	+	+/o	+	+	+	+	+	1
Starch	(C <sub>6</sub> H <sub>10</sub> O <sub>5</sub> ) <sub>n</sub>	s	+	+	+	+	+	+	n	+	+	+	+	1
Starch Gum		s	+	+	+	+	+	+	+	+	+	+	+	1
Styrene	C <sub>6</sub> H <sub>5</sub> CHCH <sub>2</sub>	100%	-	-	o	+	+	o	-	-	-	o	+	2
Sublimate => Mercury-II-Chloride														
Succinic Acid	C <sub>4</sub> H <sub>6</sub> O <sub>4</sub>	s	+	+	+	+	+	+	+	+	+	+	+	1
Sugar Syrup		s	+	+	+	+	+	+	+	+	+	+	+	1
Sulphur Chloride => Disulphur Dichloride														
Sulphuric Acid	H <sub>2</sub> SO <sub>4</sub>	98%	30%	50%	85%	+	20%	+	+	30%	30%	80%	+	1
Sulphuric Acid, fuming --> Oleum														
Sulphurous Acid	H <sub>2</sub> SO <sub>3</sub>	s	+	+	+	+	10%	+	+	+	+	+	+	(1)
Sulphuryl Chloride	SO <sub>2</sub> Cl <sub>2</sub>	100%	-	-	-	o	n	+	o	-	-	-	n	1
Tannic Acid	C <sub>76</sub> H <sub>52</sub> O <sub>46</sub>	50%	+	+	+	+	+	+	+	+	+	+	+	1
Tartaric Acid	C <sub>4</sub> H <sub>6</sub> O <sub>6</sub>	s	50%	+	+	+	+	+	+/o	+	+	+	+	1



# ProMinent® Chemical Resistance List

Chemical	Formula	Conc	Acryl	PVC	PP	PVDF	1.4404	FPM	EPDM	Tygon	PharMed	PE	HastelloyC	WPC
Tetrachloro Ethane	$C_2H_2Cl_4$	100%	-	-	o	+	+	o	-	-	o	o	+	3
Tetrachloro Ethylene	$C_2Cl_4$	100%	-	-	o	+	+	o	-	-	o	o	+	3
Tetrachloromethane => Carbon Tetrachloride														
Tetrahydro Furane	$C_4H_8O$	100%	-	-	o	-	+	-	-	-	-	o	+	1
Tetrahydro Naphthalene	$C_{10}H_{12}$	100%	-	-	-	+	+	+	-	-	-	o	+	3
Tetralin => Tetrahydro Naphthalene														
THF => Tetrahydrofuran														
Thionyl Chloride	$SOCl_2$	100%	-	-	-	+	n	+	+	+	+	-	n	1
Thiophene	$C_4H_4S$	100%	n	-	o	n	+	-	-	-	-	o	+	3
Tin-II-Chloride	$SnCl_2$	s	+	o	+	+	-	+	+	+	+	+	+/o	1
Tin-II-Sulphate	$SnSO_4$	s	n	+	+	+	+	+	+	+	+	+	+/o	(1)
Tin-IV-Chloride	$SnCl_4$	s	n	+	+	+	-	+	+	+	+	+	+	1
Titanium Tetrachloride	$TiCl_4$	100%	n	n	n	+	n	o	-	n	n	n	n	1
Toluene	$C_6H_5CH_3$	100%	-	-	o	+	+	o	-	-	-	o	+	2
Toluene Diisocyanate	$C_7H_3(NCO)_2$	100%	n	n	+	+	+	-	+/o	n	n	+	+	2
Tributyl Phosphate	$(C_4H_9)_3PO_4$	100%	n	-	+	+	+	-	+	o	+	+	+	1
Trichloro Ethane	$CCl_3CH_3$	100%	-	-	o	+	+	+	-	-	o	o	+	3
Trichloro Ethylene	$C_2HCl_3$	100%	-	-	o	+	+/o	o	-	-	o	o	+	3
Trichloro Methane => Chloroform														
Trichloroacetaldehyde Hydrate	$CCl_3CH(OH)_2$	s	-	-	o	-	+	o	o	n	n	+	+	2
Trichloroacetic Acid	$CCl_3COOH$	50%	-	+	+	+	-	-	o	+	+/o	+	+	1
Tricresyl Phosphate	$(C_7H_7)_3PO_4$	90%	-	-	+	n	+	o	+	o	+	+	+	2
Triethanol Amine	$N(C_2H_4OH)_3$	100%	+	o	+	n	+	-	+/o	-	o	+	+	1
Trilene => Trichloro Ethane														
Trioctyl Phosphate	$(C_8H_{17})_3PO_4$	100%	n	-	+	+	+	o	+	o	+	+	+	2
Trisodium Phosphate	$Na_3PO_4$	s	+	+	+	+	+	+	+	+	+	+	+	1
Urea	$CO(NH_2)_2$	s	+	+/o	+	+	+	+	+	20%	20%	+	+	1
Vinyl Acetate	$CH_2=CHOOCCH_3$	100%	-	-	+	+	+	n	n	-	+/o	+	+	2
Water Glass => Sodium Silicate														
Xylene	$C_6H_4(CH_3)_2$	100%	-	-	-	+	+	o	-	-	-	o	+	2
Zinc Acetate	$(CH_3COO)_2Zn$	s	+	+	+	+	+	-	+	+	+	+	+	1
Zinc Chloride	$ZnCl_2$	s	+	+	+	+	-	+	+	+	+	+	n	1
Zinc Sulphate	$ZnSO_4$	s	+	+	+	+	+	+	+	+	+	+	+/o	1



# ProMinent® Chemical Resistance List

## Overview of the Resistance of Soft PVC Hoses (Guttasyn®) to the Most Common Chemicals

This data applies to standard conditions (20 °C, 1013 mbar).

+	=	resistant
o	=	conditionally resistant
-	=	not resistant

The data has been taken from relevant manufacturers' literature and supplemented by our own tests and experience. As the resistance of a material also depends on other factors, especially pressure and operating conditions etc, this list should merely be regarded as an initial guide and does not claim to offer any guarantees. Take into consideration the fact that conventional dosing agents are largely compounds, the corrosiveness of which cannot simply be calculated by adding together the corrosiveness of each individual component. In cases such as these the material compatibility data produced by the chemical manufacturer must be read as a matter of priority when selecting a material. Safety data sheets do not provide this information and cannot therefore replace application-specific documentation.

Corrosive agent	Concentration in %	Evaluation
Acetic acid	50	o
Acetic acid (wine vinegar)		o
Acetic acid anhydride	100	-
Acetic acid, aqueous	10	+
Acetic ester	100	-
Acetone	all	-
Acetylene tetrabromide	100	-
Aluminium salts, aqueous	all	+
Alums of all kinds, aqueous	all	+
Ammonium salts	all	+
Ammonium, aqueous	15	-
Ammonium, aqueous	saturated	-
Aniline	100	-
Benzene	100	-
Bisulphite, aqueous	40	+
Borax solution	all	+
Boric acid, aqueous	10	+
Bromine, vaporous and liquid		-
Butanol	100	+
Butyl acetate	100	-
Butyric acid, aqueous	20	+
Butyric acid, aqueous	conc.	-
Calcium chloride, aqueous	all	+
Carbon disulphide	100	-
Carbonic acid	all	+
Caustic potash	15	+
Chlorinated hydrocarbons	all	-
Chrome-alum, aqueous	all	+
Chromic acid, aqueous	50	-
Copper sulphate, aqueous	all	+
Creosote		-
Dextrin, aqueous	saturated	+
Diesel oils, compressed oils	100	o
Diethyl ether	100	-
Difluorodichloromethane	100	-
Ethanol	96	-
Ethyl acetate	100	-
Ethylene glycol	30	+
Ferric chloride, aqueous	all	+
Fertilizing manure salt, aqueous	all	+
Formaldehyde, aqueous	30	o
Glacial acetic acid	100	-
Glucose, aqueous	saturated	+
Glycerol	100	-
Halogens	all	-





# ProMinent® Chemical Resistance List

Corrosive agent	Concentration in %	Evaluation
Hydrochloric acid	15	+
Hydrogen bromide	10	+
Hydrogen peroxide	to 10	+
Hydrogen sulphide, gaseous	100	-
Ink		+
Magnesium salts, aqueous	all	+
Methyl alcohol	100	+
Methylene chloride	100	-
Nitric acid, aqueous	25	+
Oils => fats, diesel oil, Lubricating oil and similar		
Perchloric acid	all	o
Phenol, aqueous	all	o
Phosphoric acid, aqueous	100	-
Potassium bichromate, aqueous	saturated	+
Potassium persulphate, aqueous	saturated	+
Silver nitrate	10	+
Sodium chloride, aqueous	all	+
Sodium hydroxide	aqueous	+
Sodium hypochlorite	15	+
Sodium salts => sodium chloride		
Sulphur dioxide, gaseous	all	+
Sulphuric acid	30	+
Tetrachloromethane	100	-
Toluene	100	-
Trichloroethylene	100	-
Urea, aqueous	all	+
Xylene	100	-
Zinc salts	all	+







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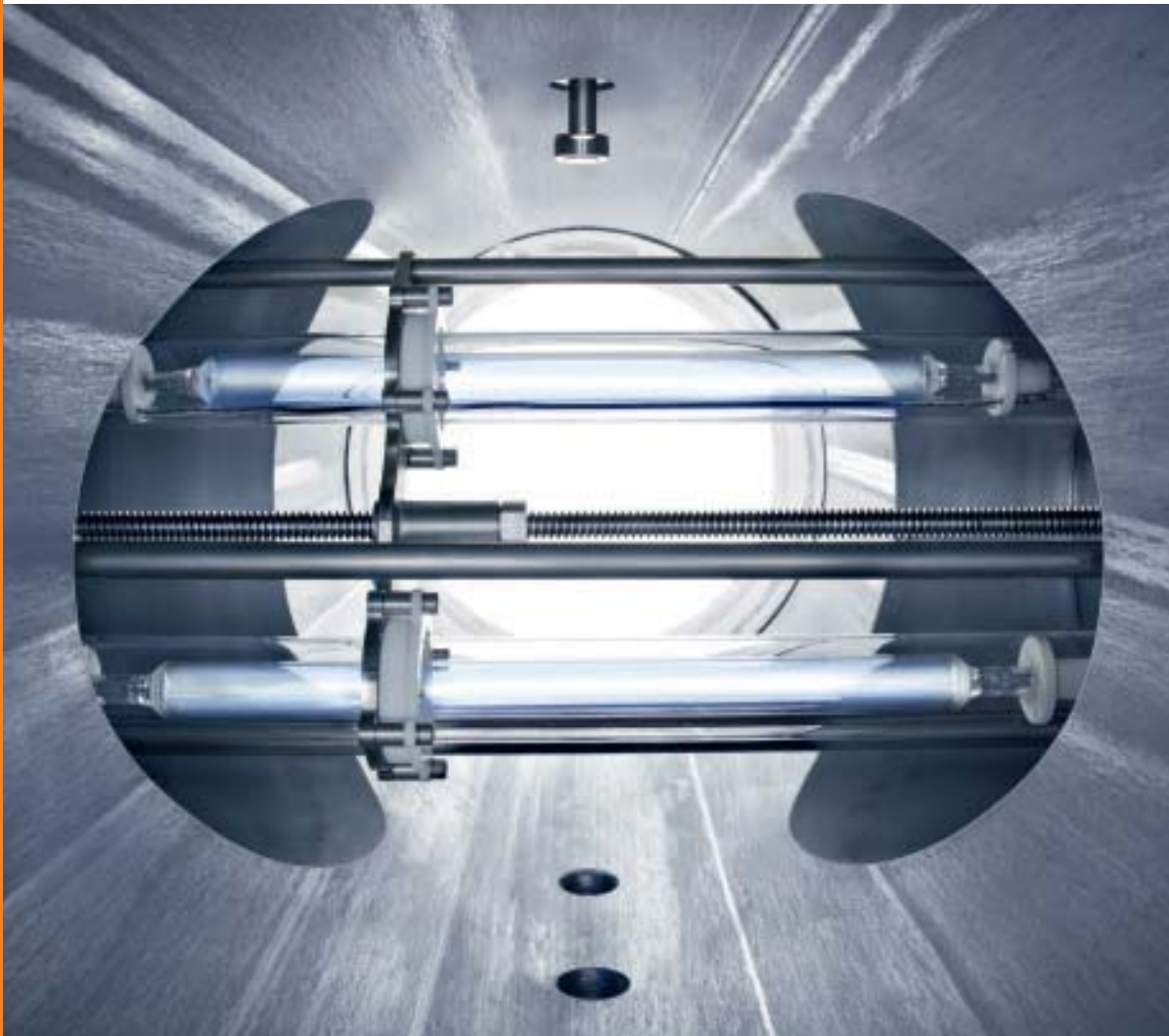


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## Water treatment and water disinfection

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Issued by:

ProMinent GmbH  
Im Schuhmachergewann 5-11  
69123 Heidelberg  
Germany  
Phone +49 6221 842-0  
[info@prominent.com](mailto:info@prominent.com)  
[www.prominent.com](http://www.prominent.com)



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Heidelberg, January 2015

## Water Treatment and Water Disinfection



### A clear case of disinfection

Hygienically pure water is one of the greatest challenges of our time. With ProMaqua® products and systems - combined with our many years of practical experience - we have developed application-based solutions for a range of different industries. They are characterised by their outstanding handling of natural resources, minimal operating costs and maximum efficiency.

Chapter 1 offers **UV systems** for the gentle and chemical-free disinfection of water. They are ideal for applications associated with the treatment of potable water or swimming pool water, as well as in the beverage industry.

Refer to Chapter 2 for the effective removal of undesirable organic and inorganic substances or for efficient disinfection in the treatment of cooling and process water. The chapter focuses on **ozone systems** with the most diverse capacity ranges. Choose from this diverse product range for a trouble-free outcome - advice included!

**Chlorine dioxide systems** – the economically and ecologically sensible alternative to chlorine-based disinfectants is described in chapter 3.

Chapter 4 describes **electrolysis systems**, precisely the right alternative for ultra-environmentally-friendly applications, for example instead of chlorine gas.

Chapter 5 is devoted to the treatment of swimming pool water. The product range DULCODOS® Pool is available for this. These complete **panel-mounted systems** are available in different models - for private pools to public swimming pools.

When it comes to the reliable removal of particles and salts, we recommend systems with **membrane filter technology** described in Chapter 6.

### We're happy to help!

The selection of a product depends on a number of different factors.

Our team will be happy to be of assistance should you have any questions about water treatment and water disinfection. Give us a call! We look forward to hearing from you.

Monday to Friday 8:00 – 16:30

#### ProMinent Germany Sales

0049 6221 842 – 0  
info-de@prominent.com

#### Technical Consulting

0049 6221 842 – 1850  
service@prominent.com

#### Important note:

We can also support you by phone in selecting the right products and, in many cases, optimising entire applications. For more complex requirements, our consultants will hand the task over to a field sales colleague, who will then clarify your requirements in person on site.

### After-sales Service

Our service technicians are on hand to help you. Whether for the initial installation or for maintenance and repair work. We're happy to help!

0049 6221 842 – 1850  
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## Chlorine Dioxide Systems Bello Zon® CDLb with Multiple Points of Injection

Flexible solutions for the production and metering of  $\text{ClO}_2$  adapted to our customers' tasks, requirements and anticipated pricing. Perfectly coordinated modular chlorine dioxide system, which can operate up to 6 points of injection.

**0-120 g/h preparation capacity with storage of up to 60 g of chlorine dioxide for peak metering.  
Max. flow at 0.2 ppm  $\text{ClO}_2$  metering is 600 m<sup>3</sup>/h**

For more information see page → 3-10



## Electrolysis System CHLORINSITU® V

### Scope of delivery:

Electrolysis systems of type Chlorinsitu® V are ready mounted, wired for use, on a powder coated stainless steel frame with a Programmable Logic Controller (PLC) in the control cabinet, Remote Control Engineer for remote diagnosis and troubleshooting, integral water softening unit, diaphragm electrolysis cells, ATEX-95-compliant bleed system and separate salt dissolving tank with level monitoring. The scope of delivery also includes a frequency-controlled central injector system matched to the system to meter active chlorine and sodium hydroxide for pH correction and a single booster pump. A chlorine gas warning unit and automatic monitoring of water hardness downstream of the softening system come as standard with systems producing more than 600 g/h.

For more information see page → 4-10



# New Products Water Treatment and Water Disinfection



## Swimming Pool Metering Systems DULCODOS® Pool

### ■ Soft

DULCODOS® Pool Soft is especially suited to private pools used by a small number of people. It works with active oxygen substances, which are less effective than chlorine. Water treatment with active oxygen is a good alternative for ecologically-minded pool owners or if users are allergic to chlorine. DULCODOS® Pool Soft uses no chlorine chemicals.

### ■ Basic

DULCODOS® Pool Basic regulates the pH and chlorine content using the redox potential. This is the direct measurement of effective oxidation in the water and is therefore an indication of the disinfectant effect and concentration of the metered chlorine. The concentration of chlorine cannot be determined with accuracy with this process. ORP measurements allow a particular range of chlorine to be set. DULCODOS® Pool Basic is robust and requires little maintenance.

### ■ Comfort

DULCODOS® Pool Comfort uses highly specific chlorine sensors to measure the chlorine content. The concentration of chlorine in the water can be determined and set with accuracy. The effectiveness of the pool filter is boosted by an integrated feeder assembly for flocculant, resulting in crystal-clear water! Numerous features to enhance operating convenience, such as measured values being mapped by a screen plotter or remote control from your PC, iPad or other tablet device using an integrated web server, make the metering system very popular with customers.

### ■ Professional

In addition to the features described above, DULCODOS® Pool Professional also measures the combined chlorine. This is an important parameter in public pools. It can be incorporated in the building management system via OPC and KNX and alarm messages can be sent by text or e-mail. Eco!Mode operating mode reduces the energy consumption of the filter pumps. The integrated soft PLC control can be used to operate several peripheral devices and functions. The swimming pool controller becomes the central control unit for all the swimming pool technology.

For more information see page → 5-1

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# 1 UV Systems Dulcodes

## 1.1 General Notes on UV Treatment

Disinfection is a key stage in modern water treatment. UV disinfection is used to an ever increasing extent, as a safe, chemical-free and reliable disinfection process. Extensive research projects and numerous trouble-free operational systems prove the safety and reliability of UV disinfection.

With UV disinfection, the water to be disinfected is irradiated with ultraviolet light, which involves a purely physical, chemical-free process for water disinfection.

UV-C radiation in particular, with a wavelength ranging from 240 to 280 nm, attacks the vital DNA of the bacteria directly. The radiation initiates a photochemical reaction and destroys the genetic information contained in the DNA. The germ loses its reproduction capability and is destroyed. Even parasites, like Cryptosporidia or Giardia, which are extremely resistant to chemical disinfectants, are efficiently reduced.

Photochemical reactions are triggered in other applications too. The undesirable use of combined chlorine in swimming pool water is reduced by UV radiation, as a result of which enormous fresh water savings are achieved. Oxidants, such as ozone, chlorine or chlorine dioxide, are reliably reduced in the production water used in the food and beverage industry, avoiding the need for costly activated charcoal filters.

UV disinfection has many advantages:

- Immediate and safe destruction of germs without the addition of chemicals
- Photochemical reduction of undesirable substances
- No THM or AOX formation, no formation of other undesirable substances
- No impairment of the odour or taste of the water
- No storage and handling of chemicals required
- Effect is independent of pH
- No reaction vessel or reaction tank required
- Minimal space requirement
- Low investment and operating costs with excellent reliability and efficiency

### 1.1.1 Applications of Dulcodes UV Systems

A large number of our UV disinfection systems have been supplied worldwide, for the most diverse of applications:

- **Private source water and municipal water works**  
For the disinfection of drinking water
- **Food and beverage industry**  
To destroy the germs and bacteria in the water needed for food and beverage production and for the disinfection of process water  
To reduce the chlorine dioxide in the production water
- **Pharmaceutical and cosmetics industry**  
To uphold the high microbiological requirements of the production water  
To destroy residual ozone in the production water without the use of activated charcoal
- **Reverse osmosis systems**  
For permeate disinfection
- **Municipal clarification plants**  
For the reduction of the micro-biological count in the clarification plant outflow  
For the reduction of the micro-biological count in the process water extracted from the clarification plant outflow
- **Horticulture**  
For the disinfection of the irrigation water
- **Spa pools and swimming pools**  
For the disinfection of the pool water  
For chloramine reduction in the pool water

# 1 UV Systems Dulcodes

## 1.1.2

### Description of Dulcodes UV Systems

#### Dulcodes UV disinfection systems essentially comprise:

- High-quality radiation chambers made of stainless steel (DIN 1.4404) or UV-resistant plastic
- Lamp protection tubes made of high-quality quartz, easily removable for cleaning purposes
- Lamps with an exceptionally high UV output in the 254 nm range, ensuring outstanding disinfection
- Highly selective long-term and temperature-stable UVC sensors
- UV system controllers and modern electronic ballasts fitted in a control cabinet

#### The special features of our Dulcodes UV disinfection systems are:

- Uniform radiation of the entire water flow through optimised system hydraulics, thereby ensuring outstanding disinfection results
- Flow-optimised inlet zone
- Highly turbulent flow along the UV lamps
- Use of UV lamps with a long lamp life time and high UV-C output
- Automatic cleaning system for the protection tube of medium-pressure lamps
- Protection tube manual cleaning system for Dulcodes R and S system types
- System controller with comprehensive monitoring and reporting functions
- Display of all important operating parameters and reporting of faults in plain text
- Trend display of the variation of the UV sensor signal over time
- Analogue output sensor signal and fault indicating relay
- Use of modern electronic ballasts with bus technology for gentle lamp ignition and operation
- Individual lamp monitoring
- Direct control of automatic shut-off and flushing valves

### Dulcodes UV Lamps

#### Standard low-pressure lamp

Robust, high performance low-pressure mercury lamp with a life expectancy of approx. 14,000 operating hours. The operating temperature of the lamp is 30-50 °C which is why its use is limited to water temperatures between 5 and 40 °C. The output is approx. 100 W per metre arc length.

#### High-Flux low-pressure lamp

Low-pressure amalgam lamp with a life expectancy of approximately 10,000 operating hours. The operating temperature of the lamp is 100-130 °C so that it can even be used in water temperatures of up to approximately 70 °C. The output is independent of the water temperature and is approximately 200 W per metre arc length.

#### Low-pressure Opti-Flux lamp

Doped, high-performance low-pressure amalgam lamp with a life expectancy of approximately 14,000 operating hours. The operating temperature of the lamp is 100-130 °C so that it can even be used in water temperatures of up to approximately 70 °C. The output is independent of the water temperature and is approximately 300 W per metre arc length.

#### Medium-pressure Powerline lamp

Medium-pressure mercury lamp with a life expectancy of approx. 8,000 to 10,000 operating hours, depending on lamp size. The high output of these lamps (up 10,000 W per metre arc length) permits the treatment of very large flows. Thanks to their broad range spectrum, these lamps are particularly suitable for photochemical processes. The operating temperature of the lamps is 650-850 °C. Powerline medium-pressure lamps are typically operated with a mechanical wiper system, which is why their use is limited to water temperatures of up to about 40 °C.

# 1 UV Systems Dulcodes

## Dulcodes UV Controllers

### Compact controller

Compact unit for control of all basic functions of the UV system. The large graphic display shows the current UV-C output, the operating hours and the number of lamp switch-ons. With fixed-setting warning and safety threshold levels, a warning signal is generated and a relay output (230 V / 0.2 A) for operation of an shut-off valve is actuated if the UV output is too low. Alternatively, this output can also be used as a common alarm relay (230 V / 2.5 A).

### Deluxe control

The Dulcodes deluxe control includes a large, graphic display for viewing the UVC sensor signal. Shown as a trend display, lamp ageing, deposit formation on the lamp protection tube or a change in water quality can be seen in a time window. The freely programmable safety and alarm thresholds are also shown, as well as the number and times of lamp activations. All operating and error messages are shown in plain text. Setting the operating parameters is facilitated by the clear menu layout. The control offers a selection of 9 different languages.

The control is connected to the ballasts via a bus system so that each individual lamp can be monitored. This also makes it possible to position the control at long distances from the radiation chamber, lamps and ballasts.

Various auxiliary functions, such as the automatic flushing of the system over a freely programmable flushing time, control of a shut-off valve and a circulating pump are integrated as standard. 2 voltage outputs 230 V / 0.2 A and a switching output 230 V / 2.5 A are provided for this purpose.

The UVC sensor signal can be monitored online via a standard signal output 0/4-20 mA. If the warning and safety thresholds are undershot, two relay outputs (230 V / 2.5 A) send a corresponding signal. All other faults are signalled via a combined alarm relay (230 V / 2.5 A).

3 potential-free control inputs make it possible to connect external information to the control: The error input can, for example, be used for external temperature monitoring, the pause input can be used to interrupt operation of the system at scheduled intervals, the flow control can be of help in connection with flushing procedures.

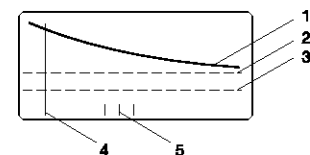
### Powerline deluxe control

This control additionally includes the option of external power control via a standard signal 0/4-20 mA (not for Dulcodes M 2 kW, 3 kW and Dulcodes S). The systems can thus, for example, be controlled according to the flow or the lamp output and can be automatically adjusted to a defined UVC sensor signal. This saves energy costs and extends the lamp service life.

The control is also equipped with a display and monitor for the radiation chamber temperature, together with a freely programmable control for the mechanical wiper system used in automatic cleaning of the lamp protection tube.

### Dulcodes A deluxe control

A Siemens S7-1200 control with a KP 300 Basic operating unit is used for operation and control of Dulcodes A systems. In addition to the functions of the Powerline deluxe control, it also has a digital input. The digital input can be used to set one of two freely programmable power levels (e.g. night reduction for pool water).



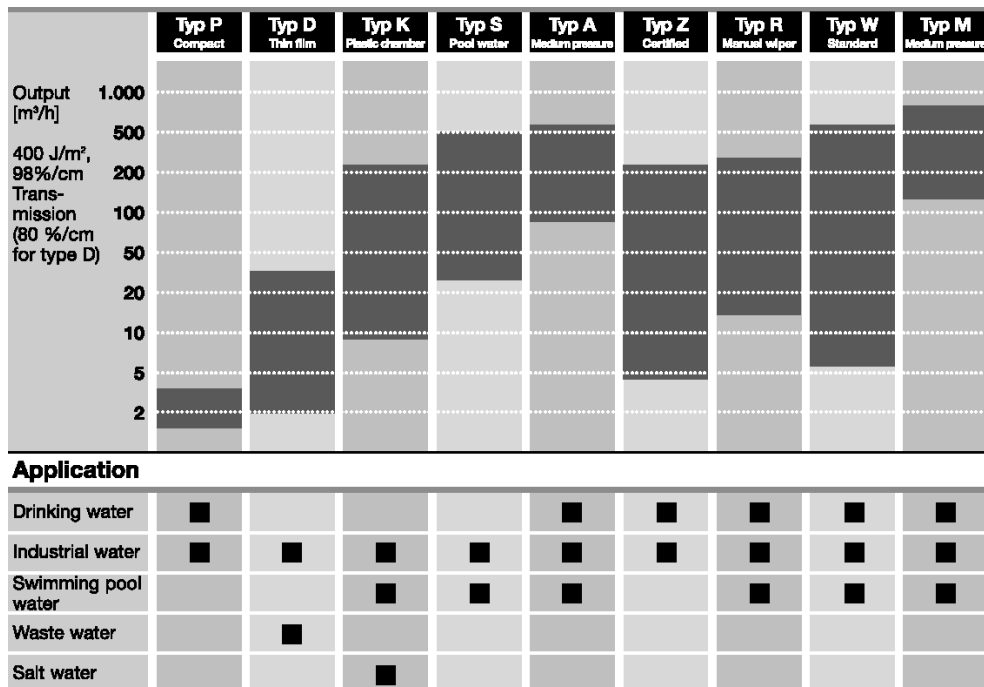
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- 1 UV sensor signal
- 2 Warning threshold
- 3 Safety threshold
- 4 Calibration
- 5 On/off contacts

# 1 UV Systems Dulcodes

## 1.2 Performance Overview of Dulcodes UV Systems

ProMinent offers a wide range of UV systems for the most diverse applications. The following overview shows the capacity and main applications of our standard systems:



P\_PMA\_DS\_0026\_SW

ProMinent provides all the advice needed for the safe operation of a Dulcodes UV system:

- Evaluation of the situation on site by trained, expert field sales staff.
- We can measure all the key water parameters required for optimum system design in our water laboratory.
- Project planning of the system.
- Commissioning and system maintenance by our trained service technicians.

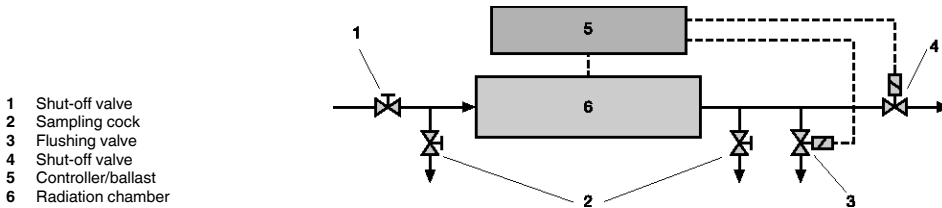


# 1 UV Systems Dulcodes

## 1.2.1

### Notes on Planning and Designing an UV System

- The system should always be designed for the maximum water flow.
- The system should always be designed for the worst anticipated UV transmission.
- Fireproof sampling cocks for microbiological tests should be provided upstream and downstream of UV disinfection systems.
- A manual shut-off valve should be provided before the UV system to isolate the system for maintenance work.
- With potable water disinfection and similar applications, an electrically-controlled shut-off valve should be provided downstream of the UV disinfection system, which also closes automatically on mains failure (solenoid valve, automatic closing flap valve or similar).
- With service water disinfection, it is normally sufficient to provide a manual valve to isolate the system for maintenance work, instead of the electrically-controlled valve.
- With potable water disinfection and similar applications, a flushing valve should be provided downstream of the UV disinfection.
- It should be ensured that there is sufficient space available for removing the lamp protection tube and lamp replacement.
- Modern electronic ballasts only allow a limited cable length between ballast and lamp, so that the control box with the ballasts should be positioned close to the lamp. On the other hand, the controller can be fitted in a control area, for example. **However, the maximum cable lengths we have specified should not be exceeded in this case.**



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Typical installation diagram of a UV disinfection system

The following details are required for design of a UV system:

- Application of the system
- Maximum water flow
- Minimum UV transmission of the water

The UV transmission should be determined by means of a laboratory measurement of the absorption at 254 nm.

A full water analysis gives important conclusions on the operating conditions of the system. The following questionnaire provides our project engineers with the information needed to design an appropriate system.

# 1 UV Systems Dulcodes

## 1.3 Questionnaire for Designing an UV System

### Application of the UV system:

- ☐ for disinfection of
- ☐ drinking water
  - ☐ production water in the food industry, cosmetics or pharmaceuticals
  - ☐ utility water
  - ☐ wastewater
  - ☐ salt water or brackish water
  - ☐ \_\_\_\_\_
- ☐ for photochemical reduction of
- ☐ \_\_\_\_ ppm ozone
  - ☐ \_\_\_\_ ppm chlorine dioxide
  - ☐ \_\_\_\_ ppm chlorine
  - ☐ \_\_\_\_ ppm chloramine

### Water data:

Maximum water flow \_\_\_\_\_ m<sup>3</sup>/h      Maximum water pressure \_\_\_\_\_ bar

Minimum UV transmission at 254 nm \_\_\_\_\_ %/1 cm      \_\_\_\_\_ %/10 cm      \_\_\_\_\_ SAC 254 nm

Turbidity \_\_\_\_\_ FNU      \_\_\_\_\_ NTU

Suspended particles content \_\_\_\_\_ mg/l

Water quality      ☐ constant      ☐ fluctuating

Total hardness \_\_\_\_\_ mmol/l      \_\_\_\_\_ °dH

Carbonate hardness \_\_\_\_\_ mmol/l      \_\_\_\_\_ °dH

Chloride \_\_\_\_\_ mg/l

Manganese \_\_\_\_\_ mg/l

Iron \_\_\_\_\_ mg/l

Water temperature \_\_\_\_\_ °C

### Other requirements:

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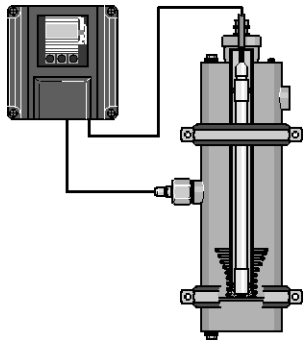
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# 1 UV Systems Dulcodes

## 1.4 UV System Dulcodes P



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Dulcodes P UV systems are used for the disinfection of potable water and service water and – depending on transmission – can be used with flows up to 4 m<sup>3</sup>/h.

### Features

- Flow: up to 4 m<sup>3</sup>/h (depending on transmission)
- Control with switching output, to which a shut-off valve or fault indicating device can be connected
- High-quality, factory-calibrated UV sensor
- Graphic display with display of UV intensity, total number of operating hours and number of lamp switching cycles
- Standard low-pressure lamp with a service life of approximately 10,000 operating hours
- Radiation chambers made of high-grade stainless steel 1.4404
- Control and ballast in a compact plastic housing

### Main applications

Potable water	Industrial water	Swimming pool water	Waste water	Salt water
✓	✓	—	—	—

### Technical Data

Type	Max. flow m <sup>3</sup> /h	Lamp power W	Connected load W	Radiation chamber length mm	Minimum clearance for maintenance work mm	Ø mm	Empty weight/ Operating weight kg	Connector nominal diameter
16P	1.5*	16	30	382	350	114	6/10	G 3/4"
45P	3.8*	45	60	940	900	114	10/20	G 1 1/4"

<b>Lamp type</b>	Standard low-pressure lamp (see p. → 1-2)
<b>Controller type</b>	Compact controller (see p. → 1-3)
<b>Permissible operating pressure</b>	10 bar
<b>Permissible ambient temperature</b>	5–45 °C
<b>Permissible water temperature</b>	5–40 °C

\* 98%/cm transmission; 400 J/m<sup>2</sup> UV dose

### Spare Parts for Dulcodes P UV Systems

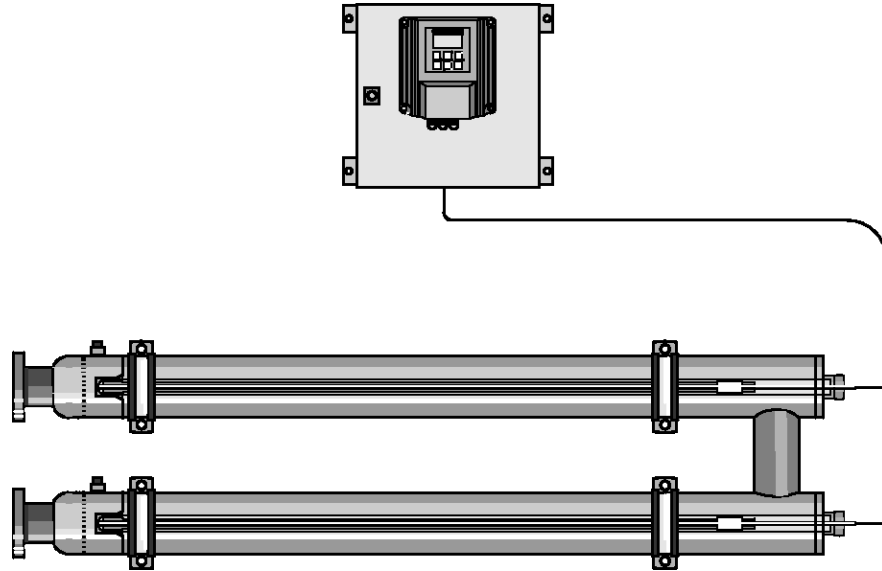
	Order no.
UV lamp 16 W	1002472
UV lamp 45 W	1002473
O-ring for fixing the lamp in the lamp protection tube	481016
Lamp protection tube for Dulcodes 16 P	1004450
Lamp protection tube for Dulcodes 45 P, 45 D and 130 D, 130 W	1002468
O-ring lamp protection tube/lamp cover	1004920
UVC sensor P/D/W/R G 3/4 1.4539 for systems delivered from Sept. 2006; U sensor	1004734
O-ring for UVC sensor	1002175
Sensor connection cable, 2 m long for systems supplied since September 2006	1029262
Screw plug G 1/4"	1002752
O-ring for G 1/4" screw plug	741256

# 1 UV Systems Dulcodes

1.5

## UV System Dulcodes D for Highly Turbid Water

Dulcodes D thin-film type UV systems with High-Flux lamps are used for the disinfection of high-turbidity or discoloured service water or waste water and – depending on transmission – can be used with flows up to 33 m³/h.



pk\_7\_050

### Features

- Flow: up to 33 m³/h (depending on transmission)
- Standard chambers made up of one or more longitudinal flow radiation chambers arranged one after the other, each with its own lamp
- High-efficiency, low-pressure High-Flux lamp with special amalgam technology, increased UV output, largely independent of temperature
- Lamp service life approximately 10,000 h
- Ballasts with BUS interface for ignition and monitoring of each individual lamp
- Variable lamp current, hence lamp-friendly ignition process and precise adjustment of the optimum lamp operating current
- Long-term stable UVC sensor for monitoring the disinfection capacity and transmission (UV transmission factor) of the water, factory-calibrated
- Large, graphic display for viewing the sensor signal
- Monitoring of lamp ageing, lamp protection tube fouling and changes in water quality
- Freely programmable control, e.g. for different flushing, warning and shut-down procedures
- Radiation chambers made of high-grade stainless steel 1.4404
- Control cabinets made of painted steel
- Complete cleaning system available as an accessory and consisting of acid tank, circulating pump, valves and hoses for rapid chemical cleaning of the lamp sleeve and radiation chamber

### Main applications

Potable water	Process water	Swimming pool water	Waste water	Salt water
—	✓	—	✓	—

# 1 UV Systems Dulcodes

## Technical Data

Type	Max. flow m <sup>3</sup> /h	Lamp power W	Connected load W	Radiation chamber length mm	Minimum clearance for maintenance work mm	Ø mm	Empty weight/ Operating weight kg	Connector nominal diameter
1x45 D**	2.0*	1x45	60	940	900	89	10/15	1"
1x130 D	4.6*	1x130	150	940	900	89	10/15	1"
1x230 D	8.2*	1x230	250	1,500	1,400	89	18/25	DN 65
2x230 D	16.0*	2x230	500	1,500	1,400	89	36/50	DN 65
3x230 D	25.0*	3x230	750	1,500	1,400	89	54/75	DN 65
4x230 D	33.0*	4x230	1,000	1,500	1,400	89	72/100	DN 65

\* 80 %/cm transmission; 400 J/m<sup>2</sup> UV dose

<b>Lamp type</b>	Standard low pressure lamp with 1x45 D High-Flux low pressure lamp with 1x130 D - 4x230 D (see p. → 1-2)
<b>Controller type</b>	Compact controller with 1x45 D De luxe controller with 1x130 D - 4x230 D (see p. → 1-3)
<b>Permissible operating pressure</b>	10 bar
<b>Permissible ambient temperature</b>	5–40 °C
<b>Permissible water temperature</b>	5–70 °C    **5 – 40 °C

## Spare Parts for Dulcodes D UV Systems

	Order no.
UV lamp 45 W	1002473
High-Flux UV lamp 130 W	1002486
High-Flux UV lamp 230 W	1002487
Lamp protection tube for Dulcodes 45 P, 45 D and 130 D, 130 W	1002468
Lamp protection tube for Dulcodes 1-6x230 D, 230 W	1002469
O-ring lamp protection tube/lamp cover	1004920
UVC sensor P/D/W/R G 3/4 1.4539 for systems delivered from Sept. 2006; U sensor	1004734
O-ring for UVC sensor	1002175
Sensor connection cable, 5 m long for systems supplied since September 2006	1021041
Screw plug G 1/4"	1002752
O-ring for G 1/4" screw plug	741256
Replacement filter mats for control cabinet ventilation (2 off required per control cabinet)	1004212
Sickle spanner (special tool required to change the lamp protection tube)	1002764

# 1 UV Systems Dulcodes

1.6

## UV System Dulcodes K with PE-HD Radiation Chamber

**Chemical-free and reliable disinfection of water containing salt, such as sea water or thermal water.**

**Flow up to 250 m³/h**

Disinfection of saline sea water or thermal water without corrosion problems caused by the UV system Dulcodes K. The UV system consists of a reactor and a UV sensor made of highly UV-resistant plastic.

The UV system Dulcodes K is absolutely corrosion-free. This is ensured by the UV-stabilised, highly compressed HD-PE reactor and a special sensor made of plastic. The reactor is temperature resistant through a special welding process and optimised to a pressure rating of more than 4 bar. The 130 or 290 W low-pressure lamps are powered by electronic ballasts and operated gently.

### Your benefits

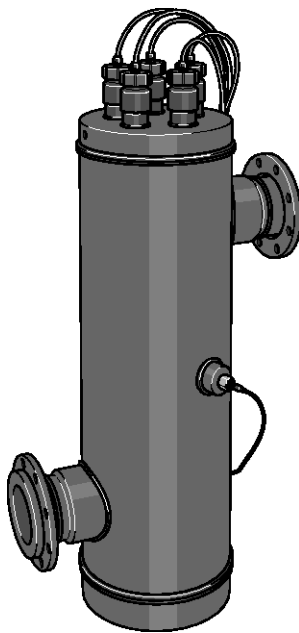
- Reactor made of UV-stabilised high-density HD-PE, absolutely corrosion-free and temperature stable.
- Long-term salt water-resistant UVC sensor for monitoring the disinfection capacity, contamination of the lamp protection tubes, lamp ageing and water transmission.
- Highly efficient Opti Flux 290 W lamps provide maximum disinfection and flow rate with a minimum number of lamps.
- Ballasts with BUS interface for the gentle ignition and operation of the lamps
- The replacement of lamps is reduced to the absolute minimum.
- Low maintenance costs and low follow-on costs, as there are fewer, high-performance lamps featuring amalgam technology with an excellent service life of up to 14,000 hours.

### Technical details

- Reactor made of UV-stabilised high-density HD-PE
- High-performance and highly efficient High-Flux (130 W) or Opti-Flux (290 W) low pressure amalgam lamps, largely temperature-independent
- Guaranteed (pro rata) lamp service life: High-flux lamp: 10,000 h; Opti-Flux lamp: 14,000 h
- Long-term stable UVC sensor made of PTFE for continuous system monitoring, factory calibrated in accordance with the DVGW standard.
- Control cabinet made of coated steel
- Deluxe control, freely programmable with large graphic display to show all important operating parameters, such as timing of the UV sensor signal (trend line), control type, operating status.
- Interfaces and connectors for:
  - Stopcock and flushing valve
  - Control of the feed pump
  - Warning and alarm relay for UV intensity
  - Collective malfunction alert relay
  - Pause contact
  - Relay for monitoring reactor temperature
  - Input for external fault
  - Standard signal output 4-20 mA of UV sensor signal

### Field of application

- Process water
- Swimming pool water
- Salt water



pk\_7\_047

# 1 UV Systems Dulcodes

## Technical Data

Type	Max. flow m <sup>3</sup> /h	Lamp power W	Connected load W	Radiation chamber length mm	Minimum clearance for maintenance work mm	Ø mm	Connector nominal diameter
1x130K	8.7*	1x130	150	1,371	1,400	125	DN 50
1x290K	26.6*	1x290	310	1,530	1,710	138	DN 80
2x290K	93.5*	2x290	600	1,535	1,710	188	DN 125
3x290K	192.7*	3x290	910	1,535	1,710	268	DN 200
4x290K	250.0*	4x290	1,200	1,535	1,710	268	DN 200

\* 98 %/cm transmission; 400 J/m<sup>2</sup> UV dose

<b>Lamp type</b>	High-Flux low-pressure lamp 130 W Opti Flux low-pressure UV lamp, 290 W (see page → 1-2)
<b>Controller type</b>	De luxe controller (see p. → 1-3)
<b>Permissible operating pressure</b>	4 bar
<b>Permissible ambient temperature</b>	5–40 °C
<b>Permissible water temperature</b>	5–30 °C

## Spare Parts for Dulcodes K UV Systems

	Order no.
High-Flux UV lamp 130 W	1002486
Opti Flux UV lamp 290 W	1040082
Lamp protection tube for Dulcodes 130 K	1006385
Lamp protection tube for Dulcodes 290 K and 290 W	1002471
O-ring lamp protection tube/lamp cover	1006332
UVC sensor K, red brass for systems supplied up to Nov. 2011	1006329
UVC-Sensor K, PTFE for systems supplied since Dec. 2011	1035201
O-ring for UVC sensor	1002175
O-ring for UVC sensor K, PTFE	1041049
Replacement filter mats for control cabinet ventilation (2 off required per control cabinet)	1004212

# 1 UV Systems Dulcodes

## 1.7

### UV System Dulcodes S for Chloramine Reduction in Pool Water

**Cost-effective solution for the treatment of bathing water – designed for the degradation of combined chlorine**

**Flow up to 569 m³/h**



The UV system Dulcodes S for water treatment and disinfection in swimming pools. Combined chlorine is broken down and the typical swimming pool odour is eliminated: no more irritation for eyes, nose and skin. A manual stage switch permits adaptation to the required capacity requirement.

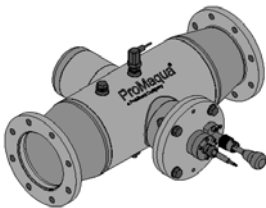
The UV system Dulcodes S is fitted with output-optimised medium-pressure lamps. They guarantee the efficient photochemical breakdown of combined chlorine in swimming pool water. The system is insensitive to the most adverse conditions in warm, humid plant rooms enriched by aggressive chemicals. The robust and conventional ballast technology remains completely unaffected by this.

Efficient cleaning of the lamp protection tubes during operation is possible with ease. The lamp protection tubes can either be cleaned by a manual wiper or by the optionally extendible motor-driven automatic wiper.

The Dulcodes S is a compact inline system. Thanks to its flexible flange options, the system can be used with ease for different nominal breadths of circulation rate. The UV reactor is designed in such a way that no UV radiation can escape from the reactor. This means that the system can be installed directly in a plastic pipe. The free choice of the fitting position simplifies installation and retrofitting in the extreme.

#### Your benefits

- Simple installation, thanks to the compact inline system, ensures minimum installation costs and fast retrofitting.
- Maximum flexibility when installing, thanks to free choice of fitting position and direct installation in plastic pipes, as no UV radiation escapes from the reactor.
- Automatic switching on and off based on the chloramine value, for example used in conjunction with the DULCOMARIN® II.
- Unbeatable simple and quick maintenance: All maintenance work can be carried out quickly and conveniently from one side.
- Manual power control for optimum adaptation of the system to the respective capacity requirement (not for Dulcodes 1 x 0.65 and 1S).
- Manual or automatic wiper system for the efficient removal of deposits on the lamp protection tube. The wiper system can be easily retrofitted.



P\_PMA\_DS\_0018\_SW1

#### Technical details

- NSF 50-certified and specifically recommended for use in swimming pools.
- Optimised use of energy, thanks to large radiation chamber and uniform irradiation of the entire water flow due to optimised system hydraulics
- Radiation chambers made of high-grade stainless steel 1.4404/AISI316L
- Powerline S medium-pressure lamps with high power input of up to 3 kW
- Guaranteed (pro rata) lamp service life of 8,000 hours
- Long-term stable UVC sensor for monitoring the lamp output, dirt on the lamp protection tube and changes in water quality
- Integral temperature switch to monitor the water temperature in the radiation chamber
- Manual or automatic motor-driven wiper for the efficient removal of deposits on the lamp protection tube
- Control cabinet made of coated steel
- Freely parameterisable control (Dulcodes S deluxe control). Large graphic display to show all important operating parameters, such as timing of the UV sensor signal (trend line), control type and operating status
- Standard signal output 4-20 mA of UV sensor signal
- Interfaces and connectors for:
  - Warning and alarm relay for UV intensity
  - Operating signal relay
  - Collective malfunction alert relay
  - Pause contact

#### Field of application

- Process water
- Swimming pool water



# 1 UV Systems Dulcodes

## Technical Data

Type	Max. flow m³/h	Lamp power kW	Connected load kW	Radiation chamber length mm	Minimum clearance for maintenance work mm	Min. distance from wall mm	Empty weight/ Operating weight kg	Connection nominal diameter can be selected mm
<b>1x0,65S</b>	20.0*	0.65	0.75	500	335	160	21/31	65/80
<b>1x1S</b>	58.0*	1.00	1.10	700	400	450	31/47	100/125
<b>1x2S</b>	102.0*	2.00	2.10	700	500	550	38/65	125/150
<b>1x3S</b>	205.0*	3.00	3.20	800	600	650	52/118	200/250
<b>2x2S</b>	278.0*	4.00	4.20	900	1,000	670	78/166	200/250
<b>2x3S</b>	379.0*	6.00	6.20	900	1,000	670	78/166	200/250
<b>3x3S</b>	569.0*	9.00	9.20	900	1,000	670	78/166	250/300

\* 98 %/cm transmission; 600 J/m² UV dose for the breaking down of combined chlorine

<b>Lamp type</b>	Powerline S medium-pressure lamp (see p. → 1-2)
<b>Controller type</b>	Powerline S comfort control (see p. → 1-3)
<b>Permissible operating pressure</b>	6 bar
<b>Permissible ambient temperature</b>	5–40 °C
<b>Permissible water temperature</b>	5–40 °C

## Spare Parts for Dulcodes S UV Systems

	Order no.
Powerline UV lamp 1 kW	1035179
Powerline UV lamp 2 kW	1035057
UV lamp Powerline 3 kW	1035180
Lamp protection tube for Dulcodes 1 A and 0.6 S	1035218
Lamp protection tube for Dulcodes 1 S	1035166
Lamp protection tube for Dulcodes 2 S	1035041
Lamp protection tube for Dulcodes 3 S	1035193
Wiper element (2 required per UV lamp)	1027879
Spare part set for UV S 1-3 kW motorised wiper	1037735
Spare part set for UV S 2x2 kW and 2x3 kW motorised wiper	1037756
Spare part set for UV S 3x3 kW motorised wiper	1037757
O-ring lamp protection tube/lamp cover	790410
UVC-U sensor M 1.4539	1034147
O-ring for UVC sensor	1002175
Sensor connection cable, 5 m long for systems supplied since September 2006	1021041
Replacement filter mats for control cabinet ventilation (2 off required per control cabinet)	1004212

# 1 UV Systems Dulcodes

1.8

## UV System Dulcodes A with Medium-pressure Lamps Arranged Perpendicular to the Flow

**Perfect for the treatment of higher flows. Whether for the disinfection of potable water or the degradation of combined chlorine in swimming pool water.**

**Flow up to 739 m³/h**



The UV system Dulcodes A helps to ensure water quality. The UV system works energy-efficiently and cleanly based on continuously variable medium pressure lamps and can therefore automatically compensate for variations in the water quality or level of contamination.

The UV system Dulcodes A has a compact design. Output-optimised medium pressure lamps ensure effective disinfection of potable water and the photochemical breakdown of oxidants and/or combined chlorine.

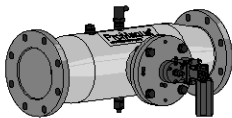
The system is fitted with electronic ballasts, which continuously adjust the lamp output, either via an external signal, such as the flow rate, or by specification of a setpoint.

A long-term stable UVC sensor ensures that the system operates safely and reliably. The motor-driven automatic wiper efficiently cleans the lamp protection tubes and minimises maintenance work with types of water that have a tendency to form films. After comprehensive certification and biosimetric validation, the systems comply with strict internationally recognised NSF, UL, CSA and USEPA standards.

### Your benefits

- Simple installation, thanks to the compact inline system, ensures minimal installation work and fast retrofitting
- Maximum flexibility when installing, thanks to the free choice of fitting position and direct installation in plastic pipes, as no UV radiation escapes from the reactor
- External power control via 0/4 - 20 mA standard signal for optimum adaptation of the system to changing operating conditions, such as flow fluctuations
- Automatic adjustment of the lamp output to a defined UV-C sensor signal with power increase to a raised, adjustable sensor signal via a digital input saves energy and extends the lamp service life.
- Unbeatable simple and quick maintenance: All maintenance work can be carried out quickly and conveniently from one side.
- Certified systems: NSF 50, CSA 22, UL508, comprehensively biosimetrically validated to UVDGM 2006

**NSF 50**  
**UVDGM 2006**  
**UL-CSA**



P\_PMA\_DS\_0018\_SW1a

### Technical details

- Optimised use of energy, thanks to large radiation chamber and uniform irradiation of the entire water flow due to optimised system hydraulics.
- Radiation chambers made of high-grade stainless steel 1.4404/AISI316L
- Powerline A medium-pressure lamps with high power input of up to 3 kW
- Guaranteed (pro rata) lamp service life of 8,000 hours
- Long-term stable UVC sensor for monitoring the lamp output, lamp protection tube fouling and changes in water quality
- Integral temperature sensor for monitoring the water temperature in the radiation chamber
- Automatic motor-driven wiper for efficient removal of deposits on the lamp protection tube
- Double, independent and automatic monitoring of the wiper function by revolution counter and limit switch
- Control cabinet made of coated steel
- Freely programmable control (Deluxe control Dulcodes A) with backlit display during normal operation (green), warning (yellow) and fault (red)
- Large graphic display to show all important operating parameters, such as the UV sensor signal, lamp power consumption, control type and operating status
- Interfaces and connectors for:
  - Stopcock and flushing valve
  - Control of the feed pump
  - Operating signal relay
  - Warning and alarm relay for UV intensity
  - Collective malfunction alert relay
  - Pause contact
  - Relay for monitoring reactor temperature
  - Temperature monitoring and fault indicating relay for control cabinet temperature
  - Input for external fault
  - Digital input for switch-over to second power stage
  - 4-20 mA standard signal input for flow-dependent lamp control or control dependent on measured value
  - Standard signal output 4-20 mA of UV sensor signal

# 1 UV Systems Dulcodes

## Field of application

- Potable water
- Process water
- Swimming pool water

## Technical Data

Type	Max. flow	Lamp power	Connected load	Radiation chamber length	Minimum clearance for maintenance work	Min. distance from wall	Empty weight/ Operating weight	Connector width DIN/ANSI
	m <sup>3</sup> /h	kW	kW	mm	mm	mm	kg	
1 x 1A	66.0* / 76.0**	1.00	1.10	700	400	450	31/47	DN 100/4"
1 x 2A	116.0* / 133.0**	2.00	2.10	700	500	550	38/65	DN 150/6"
1 x 3A	232.0* / 266.0**	3.00	3.20	800	600	650	52/118	DN 200/8"
2 x 2A	309.0* / 362.0**	4.00	4.20	900	1,000	670	78/166	DN 200/8"
2 x 3A	464.0* / 493.0**	6.00	6.20	900	1,000	670	78/166	DN 250/10"
3 x 3A	696.0* / 739.0**	9.00	9.20	900	1,000	670	78/166	DN 300/12"

\* 98 %/cm transmission; 600 J/m<sup>2</sup> UV dose for the breaking down of combined chlorine

\*\* 98 %/cm transmission; 400 J/m<sup>2</sup> UV dose for disinfection applications

<b>Lamp type</b>	Powerline A medium-pressure lamp (see page → 1-2)
<b>Permissible operating pressure</b>	10 bar (for systems 1 x 1A - 1 x 3A) 7 bar (for systems 2 x 2A - 3 x 3A)
<b>Permissible ambient temperature</b>	5–40 °C
<b>Permissible water temperature</b>	5–40 °C

## Spare Parts for Dulcodes A UV Systems

	Order no.
Powerline UV lamp 1 kW	1035179
Powerline UV lamp 2 kW	1041450
Powerline UV lamp 3 kW	1041451
Lamp protection tube for Dulcodes 1 A and 0.6 S	1035218
Lamp protection tube for Dulcodes 2 A	1041723
Lamp protection tube for Dulcodes 3 A	1041485
Wiper element (2 required per UV lamp)	1027879
Spare parts set for UV A 1-3 kW motor wiper	1042860
Spare part set for UV S 2x2 kW and 2x3 kW motorised wiper	1037756
Spare part set for UV S 3x3 kW motorised wiper	1037757
O-ring lamp protection tube/lamp cover	1023569
UVC-U sensor M -1, 4-20 mA	1041449
O-ring for UVC sensor	1002175
Replacement filter mats for control cabinet ventilation (2 off required per control cabinet)	1004212

# 1 UV Systems Dulcodes

1.9

## UV System Dulcodes Z with Certified Performance

**Chemical-free disinfection of potable water – naturally DVGW-certified**

**Flow up to 230 m³/h**



UV system Dulcodes Z for potable water treatment. Chemical-free disinfection, which conforms to all internationally established DVGW, ÖVGW and UVDGM standards. High-performance and energy-efficient high-output lamps.

UV system Dulcodes Z is equipped with energy-efficient Opti-Flux high performance lamps, incorporated in optimised reactors. The effectiveness of the disinfection necessary for certification was proved in comprehensive biosimetric measurements. Dulcodes Z thus facilitates maximum possible disinfection and flow performance with a minimum number of lamps. The long-term stable, DVGW-compliant UVC sensor, in conjunction with the central control, ensures optimum continuous operating reliability in potable water treatment.

### Your benefits

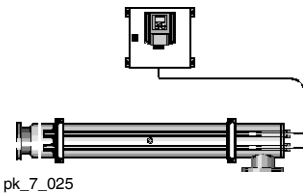
- DVGW and ÖVGW-certified, EPA and UVDGM-compliant
- Flexible use over a wide transmission and flow range by extended DVGW characteristic line certification.
- Minimum use of resources at maximum flow, thanks to uniform irradiation and homogeneous UV dosage with optimised flow guidance
- DVGW-compliant, long-term stable UVC sensor for monitoring the disinfection capacity, contamination of the lamp protection tubes, lamp ageing and water transmission.
- Increased output with fewer lamps.
- Energy-efficient high-performance Opti-Flux 300 W lamps permit greater flow per lamp.
- Operating costs reduced by longer maintenance cycles: guaranteed (pro rata) 14,000 operating hours.
- Electronic ballasts for the gentle ignition and operation of the lamps

### Technical details

- Hydraulically optimised reactor made of high-grade stainless steel 1.4404/AISI316L
- High-performance, energy-efficient Opti-Flux (300 W) low pressure amalgam lamp, largely temperature-independent
- 14,000 lamp service life guaranteed (pro rata)
- Long-term stable DVGW UVC sensor for continuous system monitoring, factory-calibrated and verifiable on site by means of reference radiometer which conforms to the DVGW/ÖVGW specification
- Control cabinet made of coated steel
- Electronic ballasts with BUS interface for the gentle ignition, operation and individual monitoring of the lamps
- Deluxe control, freely programmable with large graphic display to show all important operating parameters, such as timing of the UV sensor signal (trend line), control type, operating status.
- Interfaces and connectors for:
  - Stopcock and flushing valve
  - Control of the feed pump
  - Warning and alarm relay for UV intensity
  - Collective malfunction alert relay
  - Pause contact
  - Relay for monitoring reactor temperature
  - Input for external fault
  - Standard signal output 4-20 mA of UV sensor signal

### Field of application

- Potable water
- Process water
- Food & beverage industry



pk\_7\_025

# 1 UV Systems Dulcodes

## Technical Data

Type	Max. flow m <sup>3</sup> /h	Lamp power W	Connected load W	Radiation chamber length mm	Minimum clearance for maintenance work mm	Ø mm	Empty weight/ Operating weight kg	Connector nominal diameter
<b>75Z***</b>	4.5*	1x75	90	1,115	1,035	140	12/27	G 1 1/4"
<b>200Z</b>	10.0*	1x200	220	1,040	910	140	16/30	DN 50
<b>300Z</b>	20.0*	1x300	320	1,540	1,420	140	25/47	DN 80
<b>2x300Z</b>	60.0*	2x300	650	1,590	1,420	219	39/97	DN 100
<b>3x300Z</b>	110.0*	3x300	1,000	1,625	1,420	219	39/97	DN 150
<b>4x300Z</b>	165.0*	4x300	1,300	1,630	1,420	273	56/143	DN 150
<b>5x300Z</b>	230.0*	5x300	1,600	1,630	1,420	273	56/144	DN 200
<b>7x300Z</b>	230.0**	7x300	2,200	1,630	1,420	324	73/201	DN 200

\* 98%/cm transmission; 400 J/m<sup>2</sup> UV dose

\*\* 94%/cm transmission; 400 J/m<sup>2</sup> UV dose

### Lamp type

Standard low pressure lamp with Type 75 Z  
Opti-Flux low pressure lamp with Types 200 Z to 7x300 Z (see p. → 1-2)

### Controller type

Deluxe controller  
UVC sensor signal in W/m<sup>2</sup> which can be calibrated with the help of a reference radiometer (see p. → 1-3, Reference Radiometer RRM see p. → 1-24)

### Permissible operating pressure

10 bar

### Permissible ambient temperature

5–40 °C

### Permissible water temperature

5 - 70 °C \*\*\*5 – 30 °C

## Spare Parts for Dulcodes Z UV Systems

	Order no.
Opti-Flux UV lamp 75 W	1020911
Opti-Flux UV lamp 200 W	1021008
Opti-Flux UV lamp 300 W	1020929
Lamp protection tube for Dulcodes 75 W and 75 Z	1020845
Lamp protection tube for Dulcodes 200 Z	1021010
Lamp protection tube for Dulcodes 1-7x300 Z, Dulcodes R	1020846
O-ring lamp protection tube/lamp cover	1023569
UVC sensor Z 1.4404 DVGW	1022347
Sensor window G 1x20 for Dulcodes 75, 200, 2x300Z	1021113
Sensor window G 1x30 for Dulcodes 300, 3x300Z	1022377
Sensor window G 1x47.5 for Dulcodes 4-7x300Z	1023884
O-ring for sensor window	1023570
Lamp cable, 3.5 m long	1017867
Lamp cable, 7.5 m long	1024826
Sensor connection cable, 5 m long for systems supplied since September 2006	1021041
Extension for sensor cable, 5 m long	1024825
Screw plug G 1/4"	1002752
O-ring for G 1/4" screw plug	741256
Replacement filter mats for control cabinet ventilation (2 off required per control cabinet)	1004212

# 1 UV Systems Dulcodes

## 1.10

### UV System Dulcodes R with Wiper

#### Disinfection of potable, process and swimming pool water

#### Flow up to 274 m³/h



UV system Dulcodes R for the disinfection of potable, process and swimming pool water. The system is used particularly when constituents, such as hardness, iron, manganese or organic substances, are present. Deposits are easily removed by the wiper mechanism even at maximum operating pressure without any need to interrupt operation.

Low-pressure UV systems Dulcodes R with energy-efficient high-performance amalgam lamps Opti-Flux and manual wiper. The system consists of food-compatible PTFE wiper elements and easily removes even stubborn deposits without any need to interrupt operation. Even at maximum operating pressure! The wiper system operates fully chemical-free and does not require the operator to handle hazardous acids or alkali. A long-term stable UVC sensor, in conjunction with the central control, ensures optimum continuous operating reliability.

#### Your benefits

- Cleaning without interrupting operation: the manual wiper is easy to operate even when the system is pressurised. Thanks to their self-sharpening function, the wiper elements deliver maximum cleaning and have a long service life.
- Long-term stable UVC sensor for monitoring disinfection capacity, contamination of the lamp protection tubes, lamp ageing and water transmission
- Greater performance with fewer lamps: energy-efficient high-performance Opti-Flux 300 W lamps permit greater flow per lamp
- Longer maintenance cycles, reduced operating costs: 14,000 operating hours guaranteed (pro rata)
- Electronic ballasts for gentle ignition and lamp operation: replacement lamps are kept to a minimum.

#### Technical details

- Hydraulically optimised reactor made of high-grade stainless steel 1.4404/AISI316L
- High-performance and energy-efficient low-pressure Opti-Flux (300 W) amalgam lamp, largely temperature-independent
- 14,000 lamp service life guaranteed (pro rata)
- Long-term stable UVC sensor for continuous system monitoring, factory calibrated in accordance with the DVGW standard
- Control cabinet made of coated steel
- Electronic ballasts with BUS interface for the gentle ignition, operation and individual monitoring of the lamps
- Deluxe control, freely programmable with large graphic display to show all important operating parameters, such as timing of the UV sensor signal (trend line), control type, operating status.
- Standard signal output 4-20 mA of UV sensor signal
- Interfaces and connectors for:
  - Stopcock and flushing valve
  - Control of the feed pump
  - Warning and alarm relay for UV intensity
  - Collective malfunction alert relay
  - Pause contact
  - Relay for monitoring reactor temperature
  - Input for external fault

#### Field of application

- Potable water
- Process water
- Swimming pool water

# 1 UV Systems Dulcodes

## Technical Data

Type	Max. flow	Lamp power	Connected load	Radiation chamber length	Minimum clearance for maintenance work	Ø	Empty weight/ Operating weight	Connector nominal diameter
	m <sup>3</sup> /h	W	W	mm	mm	mm	kg	
<b>1x300R</b>	30.0*	1x300	320	1,562	1,438	140	45/67	DN 80
<b>2x300R</b>	95.0*	2x300	650	1,633	1,438	220	75/134	DN 150
<b>3x300R</b>	179.0*	3x300	1,000	1,638	1,438	273	90/182	DN 200
<b>4x300R</b>	274.0*	4x300	1,300	1,652	1,438	330	120/253	DN 250

\* \* 98%/cm transmission; 400 J/m<sup>2</sup> UV dose

<b>Lamp type</b>	Opti-Flux low-pressure UV lamp (see p. → 1-2)
<b>Controller type</b>	Deluxe controller (see p. → 1-3)
<b>Permissible operating pressure</b>	10 bar
<b>Permissible ambient temperature</b>	5–40 °C
<b>Permissible water temperature</b>	5–70 °C

## Spare Parts for Dulcodes R UV Systems

	Order no.
Opti-Flux UV lamp 300 W	1020929
Lamp protection tube for Dulcodes 1-7x300 Z, Dulcodes R	1020846
O-ring lamp protection tube/lamp cover	1023569
Wiper element (2 required per UV lamp)	1027879
UVC-U sensor P/D/W/R 1.4539 from Sep. 2006	1028115
O-ring for UVC sensor	1002175
Lamp cable, 3.5 m long	1017867
Lamp cable, 7.5 m long	1024826
Sensor connection cable, 5 m long for systems supplied since September 2006	1021041
Extension for sensor cable, 5 m long	1024825
O-ring for screw plug G 1/4"	792872
Replacement filter mats for control cabinet ventilation (2 off required per control cabinet)	1004212

# 1 UV Systems Dulcodes

## 1.11

### UV System Dulcodes W

**Proven, safe and chemical-free disinfection of water**

**Flow up to 600 m³/h**



UV system Dulcodes W for the disinfection of pathogenic micro-organisms in potable, process or swimming pool water. Energy-efficient and excellent disinfection performance thanks to high-output lamps.

UV system Dulcodes W offers proven disinfection performance against pathogenic micro-organisms in the water. The system's excellent performance is due to the high-output lamps. Their efficiency is enhanced by electronic control units, specifically adapted to the UV lamps. A long-term stable UVC sensor, in conjunction with the central control, ensures optimum continuous operating reliability.

#### Your benefits

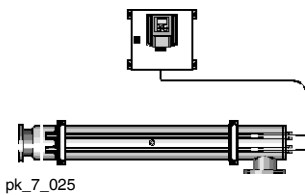
- Compact system with excellent disinfection performance with minimum energy consumption. This is provided for by the hydraulically optimised reactor with low-pressure UV lamps arranged longitudinally to the flow.
- Long-term stable UVC sensor for monitoring disinfection capacity, contamination of the lamp protection tubes, lamp ageing and water transmission.
- Excellent output with fewer lamps. Energy-efficient high-performance High-Flux lamps up to 230 W permit greater flow per lamp.
- Operating costs reduced by longer maintenance cycles: guaranteed (pro rata) 10,000 operating hours.
- Electronic ballasts for the gentle ignition and operation of the lamps

#### Technical details

- Hydraulically optimised reactor made of high-grade stainless steel 1.4404/AISI316L
- High-performance, energy-efficient High-Flux (80, 130 or 230 W) low pressure amalgam lamps, largely temperature-independent or standard 75 W mercury lamps
- 10,000 lamp service life guaranteed (pro rata)
- Long-term stable UVC sensor for continuous system monitoring, factory calibrated in accordance with the DVGW standard
- Control cabinet made of coated steel
- Electronic ballasts with BUS interface for the gentle ignition, operation and individual monitoring of the lamps.
- Freely programmable deluxe control with large graphic display to show all important operating parameters, such as timing of the UV sensor signal (trend line), control type, operating status.
- Interfaces and connectors for:
  - Stopcock and flushing valve
  - Control of the feed pump
  - Warning and alarm relay for UV intensity
  - Collective malfunction alert relay
  - Pause contact
  - Relay for monitoring reactor temperature
  - Input for external fault
  - Standard signal output 4-20 mA of UV sensor signal

#### Field of application

- Potable water
- Process water
- Swimming pool water





# 1 UV Systems Dulcodes

## Technical Data

Type	Max. flow	Lamp power	Connected load	Radiation chamber length	Minimum clearance for maintenance work	Ø	Empty weight/ Operating weight	Connector nominal diameter
	m <sup>3</sup> /h	W	W	mm	mm	mm	kg	
1x75W**	5.7*	75	90	1,115	910	140	12/27	G 1 1/4"
1x80W**	5.4*	80	100	630	600	114	8/14	G 1 1/4"
1x130W	8.7*	130	150	940	900	114	10/20	G 2
1x230W	20.0*	230	250	1,468	1,400	140	24/46	DN 65
2x230W	64.0*	2x230	500	1,640	1,500	220	41/96	DN 125
3x230W	117.0*	3x230	750	1,665	1,500	273	53/138	DN 150
4x230W	184.0*	4x230	1,000	1,690	1,600	324	65/150	DN 200
5x230W	228.0*	5x230	1,200	1,690	1,600	324	70/190	DN 200
6x230W	273.0*	6x230	1,400	1,790	1,600	406	75/200	DN 250
7x230W	369.0*	7x230	1,700	1,920	1,600	406	115/310	DN 250
8x230W	418.0*	8x230	1,900	1,920	1,600	406	115/310	DN 250
9x230W	467.0*	9x230	2,100	1,920	1,600	406	130/320	DN 250
10x230W	514.0*	10x230	2,400	1,920	1,600	406	130/320	DN 250
11x230W	561.0*	11x230	2,600	1,920	1,600	406	130/320	DN 250
12x230W	600.0*	12x230	2,800	1,920	1,600	406	130/320	DN 250

\* 98 %/cm transmission; 400 J/m<sup>2</sup> UV dose

<b>Lamp type</b>	High-Flux low pressure lamp (see p. → 1-2)
<b>Controller type</b>	Deluxe controller (see p. → 1-3)
<b>Permissible operating pressure</b>	10 bar
<b>Permissible ambient temperature</b>	5–40 °C
<b>Permissible water temperature</b>	5-70 °C    **5-30 °C

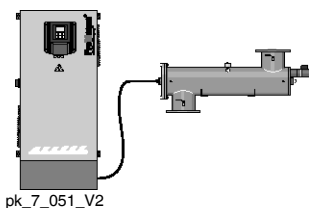
## Spare Parts for Dulcodes W UV Systems

	Order no.
Opti-Flux UV lamp 75 W	1020911
High-Flux UV lamp 80 W	1002485
High-Flux UV lamp 130 W	1002486
High-Flux UV lamp 230 W	1002487
Lamp protection tube for Dulcodes 75 W and 75 Z	1020845
Lamp protection tube for Dulcodes 80 W	1002467
Lamp protection tube for Dulcodes 45 P, 45 D and 130 D, 130 W	1002468
Lamp protection tube for Dulcodes 1-6x230 D, 230 W	1002469
Lamp protection tube for Dulcodes 2-5x230 W	1002470
Lamp protection tube for Dulcodes 290 K and 290 W	1002471
O-ring lamp protection tube/lamp cover	1004920
UVC-U sensor P/D/W/R 1.4539 from Sep. 2006	1028115
O-ring for UVC sensor	1002175
Screw plug G 1/4"	1002752
O-ring for G 1/4" screw plug	741256
Replacement filter mats for control cabinet ventilation (2 off required per control cabinet)	1004212
Sickle spanner (special tool required to change the lamp protection tube)	1002764

# 1 UV Systems Dulcodes

## 1.12

## UV System Dulcodes M with Powerline Medium-Pressure Lamps



Dulcodes M UV systems with Powerline medium-pressure lamps are used for treatment of large water quantities and – depending on transmission – can be used with flows up to 800 m<sup>3</sup>/h. Their special lamp makes these systems particularly suitable for photochemical reduction of chloramine in swimming pool water, chlorine dioxide in the beverage industry, or chlorine and ozone in other applications.

### Features

- Flow: up to 800 m<sup>3</sup>/h (depending on transmission)
- Powerline medium-pressure lamp with a mercury vapour pressure of greater than one bar, hence high connected loads of up to 10 kW per metre arc length
- High gas pressure and relatively high lamp operating temperature of 600 to 800 °C, hence broad emission spectrum
- Particularly suitable for the chemical photochemical degradation of chloramine in swimming pool water, chlorine dioxide in the beverage industry, or chlorine and ozone in other production water, for example, due to the broad emission spectrum of the lamps
- Lamp service life approximately 10,000 h
- Ballasts with BUS interface for ignition and monitoring of the lamp
- Variable lamp current, hence lamp-friendly ignition process and precise adjustment of the optimum lamp operating current
- Long-term stable UVC sensor for monitoring the disinfection capacity and transmission (UV transmission factor) of the water
- Integral temperature sensor for monitoring the water temperature in the radiation chamber
- Large, graphic display for viewing the sensor signal
- Monitoring of lamp ageing, lamp protection tube fouling and changes in water quality
- External power control via 0/4-20 mA standard signal for optimum adaptation of the system to changing operating conditions, such as flow fluctuations (from Dulcodes 4ML)
- Automatic adjustment of the lamp output to a defined UV-C sensor signal saves energy and extends the lamp service life (from Dulcodes 4ML)
- Freely programmable control, e.g. for different flushing, warning and shut-down procedures
- Automatic motor-driven wiper for efficient removal of deposits on the lamp protection tube
- Radiation chambers made of high-grade stainless steel 1.4404
- Control cabinets made of painted steel

### Main applications

Potable water	Industrial water	Swimming pool water	Waste water	Salt water
✓	✓	✓	—	—

### Technical Data

Type	Max. flow m <sup>3</sup> /h	Lamp power kW	Connected load kW	Radiation chamber length mm	Minimum clearance for maintenance work mm	Ø mm	Empty weight/ Operating weight kg	Connector nominal diameter
1x2ML	88.0*	2	2.3	850	1,750	220	146	DN 100
1x3ML	158.0*	3	3.2	850	1,750	220	156	DN 150
1x4ML	229.0*	4	4.2	1,200	2,450	270	190	DN 200
1x6ML	406.0*	6	6.2	1,200	2,450	320	230	DN 250
1x8ML	541.0*	8	8.2	1,500	3,050	320	240	DN 250
1x10ML	600.0*	10	10.2	1,500	3,050	320	240	DN 250
1x10ML	800.0*	10	10.2	1,500	3,050	400	283	DN 300

\* 98 %/cm transmission; 600 J/m<sup>2</sup> UV dose

<b>Lamp type</b>	Powerline medium pressure lamp (see p. → 1-2)
<b>Controller type</b>	Powerline deluxe controller (see p. → 1-3)
<b>Permissible operating pressure</b>	10 bar
<b>Permissible ambient temperature</b>	5–40 °C
<b>Permissible water temperature</b>	5–40 °C

# 1 UV Systems Dulcodes

## Spare Parts for Dulcodes M UV Systems

	Order no.
Powerline UV lamp 3 kW	1009385
Powerline UV lamp 4 kW	1009386
Powerline UV lamp 6 kW	1009387
Powerline UV lamp 8 / 10 kW	1009388
Lamp protection tube for Dulcodes 2 ML / 3 ML	1009214
Lamp protection tube for Dulcodes 4/6 ML	1009215
Lamp protection tube for Dulcodes 8/10 ML	1009216
O-ring lamp protection tube/lamp cover	1027553
UVC sensor M 1.4539	1025685
UVC-U sensor M 1.4539	1034147
O-ring for UVC sensor	1002175
Sensor connection cable, 5 m long for systems supplied since September 2006	1021041
Replacement filter mat for control cabinet ventilation (2 No. required per control cabinet)	791038
Wiper complete	1009976

# 1 UV Systems Dulcodes

## 1.13

### Accessories for Dulcodes UV Systems

#### Transmission Photometer UVT P200

Photometer for measuring 254 nm UV transmission.

Supplied in stable, compact, water-tight plastic box including 10 mm quartz cuvette. Storage of the in-situ calibration means that a calibration using deionised water prior to every calibration is not necessary.

#### Technical Data

<b>Dimensions L x W x H (mm)</b>	230 x 190 x 95
<b>Weight</b>	1.8 kg
<b>Voltage supply</b>	100 - 240 V AC 50/60 Hz, 12 V DC auto-adapter
<b>UV-C lamp</b>	Mercury medium pressure lamp
<b>Measuring resolution</b>	Transmission in 0.1%
<b>Measuring accuracy</b>	Transmission in $\pm 0.5\%$
<b>Measuring range</b>	5 – 100%/cm

	<b>Order no.</b>
<b>Transmission Photometer UVT P200</b>	1045245

#### Reference Radiometer RRM

Reference radiometer for checking and recalibrating DVGW-certified Dulcodes Z UV systems. The portable instrument complies with DVGW technical standard W 294/Part 3/2003 and is fitted with an insertion sensor inserted directly into the radiation chamber of the Dulcodes Z UV system in place of the sensor to be calibrated, so that the radiation intensity can be measured without interrupting operation. Suitable UV protective glasses should be worn as UV radiation escapes from the radiation chamber during this procedure.

#### Technical Data

<b>Measuring range</b>	20/200/2,000/20,000 W/m <sup>2</sup> (switchable)
<b>Display</b>	3-digit
<b>Voltage supply</b>	Battery, 9 V Type 6F22 or equivalent
<b>Wavelength range</b>	220 ... 290 nm, spectral adjustment in accordance with W 294
<b>Angular field of view</b>	40° in accordance with W 294, Item 7.2

	<b>Order no.</b>
<b>Reference radiometer RRM</b>	1025094

#### UV Protective Glasses

Protective glasses to protect against UV radiation that can be harmful to the eyes when working on open UV systems.

	<b>Order no.</b>
<b>UV protective glasses</b>	1025243

#### Protective Gloves

Protective gloves made of white cotton to avoid fingerprints on UV lamps and lamp sleeves. 1 pair universal size.

	<b>Order no.</b>
<b>Protective gloves</b>	1032815

# 1 UV Systems Dulcodes

## Sampling Cock

Fireproof sampling cock made of stainless steel.

	Order no.
Sampling cock	On request

## Cleaning System

Cleaning system for flushing the radiation chamber with a cleaning solution to remove deposits on the lamp tubes and internal surfaces of the UV system. Consists of chemical tanks, booster and metering pumps, valves and complete automatic or manual controller. Design and technical equipment are matched to the particular UV system and its application.

	Order no.
Cleaning system	On request

## Clip-on Thermostat

A thermostat is fitted to the outside of the radiation chamber. The thermostat monitors the water temperature of the water and can be connected to the control. The flushing valve opens when the pre-set limit temperature is exceeded. IP30 degree of protection. Switching on temperature range 0-90° C.

	Order no.
Clip-on thermostat	1043944
Universal mounting tape suitable for all sizes	1044851

## Fittings

Fittings provided for quick and easy wall mounting of the UV radiation chamber. Fitting parts comprise 2 screw-in pipe clips in high alloy steel (V2A), 2 base plates with M12 nut, 2 set screws and 4 M12 hexagon nuts.

Two-part clip with increased material cross-section to ensure high bearing strength and breaking resistance. A soundproofing layer ensures marked resistance in the sound level.

	For type	Order no.
Fittings A2	1x45D, 1x130D, 4x230D	1039826
	16P, 45P, 1x80W, 1x130W, 1x0,65S	1039827
	1x75W, 1x230W, 1x75Z, 1x200Z, 1x300Z, 1x300R	1039828
	2x230W, 2x300Z, 3x300Z, 2x300R, 1x2S	1039829
	3x230W, 4x300Z, 5x300Z, 3x300R	1039830

## Overvoltage Protection

Overvoltage protection for Dulcodes UV systems operated at 230 V 50-60 Hz.

The external overvoltage protection is intended for operations when the device's internal protection is not sufficient for surge voltages of 1 kV between the conductors and 2 kV to earth. An overvoltage trip can be fitted as a low protection surge arrester to significantly increase the stability of the Dulcodes systems to protect them when the supply mains is prone to disturbance energy.

It can only be determined by thorough investigation of the voltage behaviour on site whether the low protection surge arrester requires further measures, such as medium and main protection.

	Order no.
Fine protection PT 2-DE IS 230 IAC	733010

## Replacement Plug-in Insert After Tripping

	Order no.
Replacement plug-in insert PT 2-DE / S 230 / AC - ST	733011



## 2 Ozone Systems OZONFILT®

### 2.1 Ozone In Water Treatment

As the most powerful oxidant that can be used in water treatment, ozone permits a broad spectrum of possible applications:

#### Outstanding disinfection action against

- Bacteria and viruses
- Fungi and parasites

#### Oxidation of undesirable inorganic substances in the water

- Iron and manganese
- Arsenic
- Nitrite and sulphide

#### Oxidation of undesirable organic substances in the water

- Strong-smelling and strong-tasting compounds
- Humic substances and other compounds which affect the colour of the water
- Cyclic hydrocarbons
- Trihalomethanes, chloramines and other chlorine compounds

#### Micro-flocculating action

- After oxidation with ozone, substances and colloids dissolved in the water become insoluble and can be filtered

Significantly less environmentally harmful by-products result from the generation and use of ozone than other comparable oxidants and disinfectants. As a highly reactive gas, ozone is generated on site from oxygen, and introduced to the water directly, without interim storage. Because of its high reactivity, ozone decomposes into oxygen again in the water, with a half-life of several minutes. Therefore all components of an ozone handling system have to be perfectly coordinated to each other and the planned application, to achieve an optimum relationship between ozone generation and its effect.

With every new project, our engineers draw on experience that we have accumulated since 1971 in the following applications:

#### Potable water supply

- Oxidation of iron, manganese or arsenic
- Refinement and improvement of taste
- Disinfection

#### Food and beverage industry

- Disinfection of table water
- Disinfection of rinsers in the beverage industry
- Disinfection of process water

#### Swimming pools

- Reduction of chloramines and trihalomethanes, avoiding typical swimming pool odours
- Crystal clear water, thanks to micro-flocculating action
- Reliable microbiological barriers in therapy pools
- Reduction of investment and operating costs by the possibility of reducing the circulating power and throttling the fresh water inlet

#### Industry

- Cooling water treatment
- Combating legionella in cooling water circuits
- Disinfection of process water
- Removal of odorous substances in air scrubbers

#### Municipal waste water treatment

- Breakdown of trace substances
- Reduction of clarifier sludge
- COD reduction/breakdown
- Removal of colouring

## 2 Ozone Systems OZONFILT®

### 2.2 Performance Overview of Ozone Systems

ProMaqua® ozone systems operate based on the proven principle of silent electrical discharge. Ozone is produced from oxygen between two electrodes separated by an insulating dielectric by applying a high voltage of several thousands of volts. Depending on the system type, either dried ambient air or concentrated oxygen is used as the source of oxygen. ProMaqua® ozone systems are optimised to ensure maximum return and operating safety. They conform to the German DIN 19627 standard for ozone generation systems and are characterised by low energy and cooling water consumption.

#### Medium-frequency pressure systems

With the OZONFILT® OZVa and OZMa product range, the air or oxygen operating gas is fed to the ozone generator under pressure. Ozone is generated using medium-frequency high voltages.

The use of an integrated pressure swing dryer and a dielectric with optimum thermal conductivity makes the system extremely compact.

Operating under pressure means that the ozone generated can be introduced directly into water systems with back pressures of up to 2 bar. Additional booster pumps and injectors can therefore be dispensed with in many applications.

ProMaqua offers a wide range of ozone systems for the most diverse applications. The overview below shows the capacity ranges of our type series:

Output [g ozone/h]	OZVa 1-4	OZVa 5-7	OZMa 1-6 A	OZMa 1-6 O
1.000				
500				
200				
100				
50				
20				
10				
5				
2				
Operating gas	Air	Oxygen	Air	Oxygen
Ozone concentration	20 g/Nm³	100 g/Nm³	20 g/Nm³	100 g/Nm³

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#### Larger systems available on request

ProMaqua provides all the advice needed for the safe operation of an ozone plant:

- Evaluation of the situation on site by trained, expert field sales staff.
- In our water laboratory, we can measure all the key water parameters required for optimum plant design.
- Planning of the plant.
- Commissioning and plant service by our trained service technicians.



## 2 Ozone Systems OZONFILT®

### 2.3 Questionnaire on the Design of an Ozone System

#### Use of the ozone system:

- |   |   |
|---|---|
| <input type="checkbox"/> for treatment of | <input type="checkbox"/> Drinking water   |
|   | <input type="checkbox"/> Product water in the food and beverages industry, cosmetics or pharmaceutical industry |
|   | <input type="checkbox"/> Industrial water   |
|   | <input type="checkbox"/> Cooling water  |
|   | <input type="checkbox"/> Swimming pool water  |
|   | <input type="checkbox"/> Zoo  |
|   | <input type="checkbox"/> _____  |
| <input type="checkbox"/> for oxidation of | <input type="checkbox"/> Iron, manganese, nitrite, sulphide etc.  |
|   | <input type="checkbox"/> Organic matter   |
|   | <input type="checkbox"/> Discolouration   |
|   | <input type="checkbox"/> _____  |
| <input type="checkbox"/> _____            |   |

#### Water values:

Max. water flow rate	_____ m <sup>3</sup> /h	Maximum water pressure	_____ bar
Water flow rate	<input type="checkbox"/> constant	<input type="checkbox"/> fluctuating from	_____ m <sup>3</sup> /h to _____ m <sup>3</sup> /h
pH value	_____	Iron (Fe <sup>2+</sup> )	_____ mg/l
Temperature	_____ °C	Manganese (Mn <sup>2+</sup> )	_____ mg/l
Solid fraction	_____ mg/l	Nitrite (NO <sub>2</sub> <sup>-</sup> )	_____ mg/l
		Sulphide (S <sup>2-</sup> )	_____ mg/l
		TOC (total organic carbon)	_____ mg/l

#### Response time to application:

\_\_\_\_\_ m<sup>3</sup> volume reaction tank or \_\_\_\_\_ minutes residence time in entire system.

#### Type of metering:

- ☐ constant
- ☐ flow-proportional
- ☐ depending on measured value

Desired amount of metering: \_\_\_\_\_ mg/l

#### Other requirements:

\_\_\_\_\_

\_\_\_\_\_

## 2 Ozone Systems OZONFILT®

### 2.4 Ozone System OZONFILT® OZVa



**Generate ozone from compressed air or oxygen. Environmentally-friendly and cost-effective.**

**Ozone capacity 5 to 90 g ozone/h**

The OZONFILT® OZVa is high-performance and compact. For efficient ozone generation in the medium output range of up to 90 g/h from compressed air or oxygen.

Ozone systems OZONFILT® OZVa are pressurised systems in which the operating gas – air or oxygen – is fed into the ozone generator under pressure.

#### **Air is used as the operating gas in the ozone system OZONFILT® OZVa type 1 to 4**

The ozone is generated from the oxygen in the ambient air and simultaneously metered. The integrated air treatment unit is designed as a pressure swing dryer, ensuring that ozone can be generated operationally safely and reliably even with a high level of ambient air humidity with ozone concentrations of up to 20 g/Nm<sup>3</sup>. Using the suitable mixing equipment, ozone concentrations of between 3 and 12 ppm can be achieved in the water to be treated, depending on the temperature.

#### **Oxygen is used as the operating gas in the ozone system OZONFILT® OZVa type 5 to 7**

Oxygen operation permits ozone generation with ozone concentrations of up to 150 g/Nm<sup>3</sup>. Depending on the system type, ozone is produced in 1-3 generators from oxygen provided from special oxygen generators or bottles. Using the suitable mixing equipment, ozone concentrations of up to 90 ppm can be achieved in the water to be treated, depending on the temperature.

#### **Your benefits**

- Simple operation
- Ozone generation independent of pressure and mains voltage
- Direct injection without injector system at up to 2 bar back pressure
- Maximum efficiency with minimal consumption of energy and cooling water
- Complete protection of electrical components (high-voltage transformer and power stage) thanks to PCC technology (primary current-controlled)
- Low maintenance and operating costs
- Infinitely precise output control of between 3% and 100% of the nominal power with display of the ozone volume in "grammes/hour"

#### **Technical details**

- Compact mounting in painted steel cabinet or optionally in a stainless steel cabinet
- Wall cabinet for OZVa 1, 2 and 5; free-standing cabinet for OZVa 3, 4, 6 and 7
- Special dielectric with outstanding cooling performance: in spite of the low cooling water consumption, heat is quickly and efficiently discharged before the ozone produced can decompose due to excessive heat
- Different designs up to complete equipment including integral mixing unit
- Excellent efficiency: Over 90% of the ozone is dissolved in the water, thanks to the special construction of the mixing unit
- Pause input for external switching on/off
- Analogue input 4-20 mA for power control depending on the measured value combined with external measuring and control technology
- Digital inputs for connection of a gas detector or external fault alarm
- Digital alarm signal output
- Air conditioning: With ambient temperature above 40 °C, the system can be equipped with an integral air conditioner. Max. ambient temperature with air conditioning: 50 °C

#### **Field of application**

- **Potable water supply:** Oxidation of iron, manganese and arsenic, refinement and taste enhancement and disinfection
- **Waste water treatment:** Degradation/reduction of COD and microcontaminants, reduction of sewage sludge
- **Food and beverage industry:** Oxidation of iron and manganese, disinfection of potable water and rinsing water
- **Public swimming pools:** Degradation of disinfection by-products, reliable microbiological barrier and production of crystal-clear water thanks to its microfloculating effect
- **Industry:** Legionella prevention and disinfection of cooling water

## 2 Ozone Systems OZONFILT®

### 2.4.1

### OZONFILT® OZVa 1-4 Ozone Production Systems (Operating Gas - Air)

Under nominal conditions, the series OZVa 1 – 4 produces up to 40 g/h of ozone from oxygen in the ambient air at a concentration of 20 g/Nm<sup>3</sup>. Using the designated mixing devices, ozone concentrations of between 3 and 12 ppm can be achieved in the water to be treated, depending on the temperature (theoretical value at 30 and/or 0 °C).

Types OZVa 1 and 2 are installed in a control cabinet for wall mounting; types OZVa 3 and 4 are installed in a free-standing cabinet.

Provide an adequate supply of compressed air and a mixing unit designed for the operating conditions for operation of the ozone system.

#### Mixing equipment

OZVa 1 can be ordered in the following designs:

- Transparent mixing system with flow control mounted on the side of the system (see Fig. pk\_7\_001\_1\_V2)
- PVC static helical mixer mounted directly below the system, with 4 helical blades (pressure drop approx. 0.4 bar at maximum throughput) (see Fig. pk\_7\_042\_V2)
- Without mixing system for connection of 12/10 mm stainless steel pipes or 12/9 mm PTFE pipes

OZVa 2 can be ordered in the following designs:

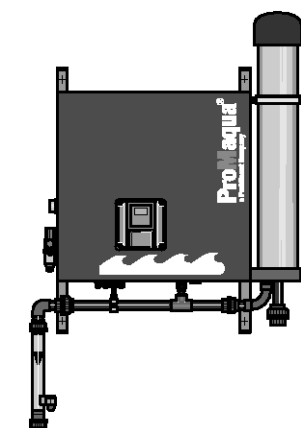
- PVC static helical mixer mounted directly below the system, with 4 helical blades (pressure drop approx. 0.4 bar at maximum throughput) (see Fig. pk\_7\_042\_V2)
- Without mixing system for connection of 12/10 mm stainless steel pipes or 12/9 mm PTFE pipes

OZVa 3 and 4 are delivered, in principle, as designs without mixing system; order a suitable mixing system separately (see Fig. pk\_07\_043\_V2).

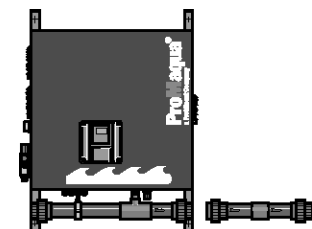
PVC or Stainless Steel Static Helical Mixer see p. → 2-24

#### Notes

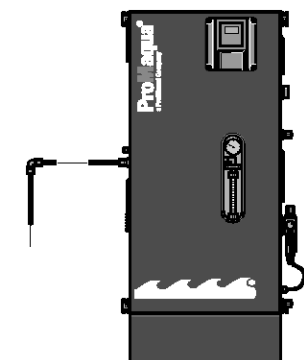
- The length of ozone gas-transporting pipes and the number of joints should be kept to a minimum. All rooms with a removable joint are to be monitored with a gas detector according to applicable German accident prevention regulations. All OZONFILT® systems are equipped for fitting a gas detector, such as a GMA 36 Ozon (see accessories).
- The ozone generator must be interlocked with the water flow into the metering point on all installations.
- A non-return valve should be installed upstream of the OZVa to prevent any return of ozonised water into the ozone-transporting pipe.



pk\_7\_001\_1\_V2  
OZONFILT® OZVa 1; capacity: 5 g/h



pk\_7\_042\_V2  
OZONFILT® OZVa 2; capacity: 15 g/h



pk\_7\_043\_V2  
OZONFILT® OZVa 3; capacity: 35 g/h

## 2 Ozone Systems OZONFILT®

### Technical Data

#### OZONFILT® OZVa 1-4 ozone production systems (operating gas - air)

##### Ambient parameters

Max. 85% air humidity of the ambient air, non-condensing, non-corrosive, dust-free, max. ambient temperature: 40 °C (with integrated air conditioning system: 50 °C)

		OZVa 1	OZVa 2	OZVa 3	OZVa 4
Number of generator modules		1	1	2	2
Ozone capacity, measured in accordance with DIN with air at 20 °C, cooling water at 15 °C	g/h	5	15	35	40
Air consumption (only ozone generation)	Nm³/h	0.25	0.75	1.75	2
Ozone concentration in the gas phase referenced to nominal conditions	g/Nm³ *	20	20	20	20
Specific energy requirement at nominal capacity	Wh/g	30	30	21	20
Power factor at full capacity	cos φ	0.70	0.98	0.98	0.98
Ozone connection		Integrated in mixing device or G 1/4" internal	Integrated in mixing device or G 1/4" internal	G 1/4" internal	G 1/4" internal

\* For air at 20 °C, cooling water at 15 °C

\*\* Nm³ = m³ under standard conditions (p = 1.013x10<sup>5</sup> Pa, T = 273 K)

##### Electrical connection

		OZVa 1	OZVa 2	OZVa 3	OZVa 4
Connected load	V/Hz/A	230/50;60/1,2	230/50;60/3	230/50;60/6	230/50;60/6
Enclosure rating		IP 43	IP 43	IP 43	IP 43

##### Overall dimensions (without mixer)

		OZVa 1	OZVa 2	OZVa 3	OZVa 4
Width	mm	840	840	710	710
Height	mm	840	805	1,400	1,400
Depth	mm	310	310	310	310

##### Weight

		OZVa 1	OZVa 2	OZVa 3	OZVa 4
Weight	kg	70	75	121	121

##### Ozone mixing

		OZVa 1	OZVa 2	OZVa 3	OZVa 4
Max. raw water temperature	°C	35	35	35	35
Permissible pressure at ozone outlet	bar	0.8–2.0	0.8–2.0	0.8–2.0	0.8–1.5

##### Air supply

		OZVa 1	OZVa 2	OZVa 3	OZVa 4
Required air volume	NI/min	6.2	17	38	42

##### Air quality

Oil and dust-free, non-corrosive, constant upstream pressure of 6-10 bar

##### Cooling water

		OZVa 1	OZVa 2	OZVa 3	OZVa 4
Cooling water requirement	l/h	10–60	20–60	50–100	70–100
Cooling water inlet pressure	bar	1–5	1–5	1–5	1–5
Cooling water inlet, PE pressure hose	mm	6 x 4	6 x 4	6 x 4	6 x 4
Cooling water outlet, open discharge	mm	6 x 4	6 x 4	6 x 4	6 x 4
Cooling water temperature at ambient temp. max. 35 °C	°C	<30	<30	<30	<30
Cooling water temperature at ambient temp. 35–40 °C	°C	<25	<25	<25	<25

##### Cooling water quality

No tendency to form lime scale; removable substances: < 0.1 ml/l ; iron: < 0.2 mg/l; manganese: < 0.05 mg/l; no corrosive components; conductivity: > 100 µS/cm

## 2 Ozone Systems OZONFILT®

### 2.4.2

#### OZONFILT® OZVa 5-7 Ozone Production Systems (Operating Gas - Oxygen)

The product range OZONFILT® OZVa 5 – 7 is a new development based on proven PSG technology, which produces ozone concentrations of up to 150 g/Nm<sup>3</sup> using oxygen as the operating gas. Using the designated mixing units, ozone concentrations of up to 90 ppm can be achieved (theoretical value at 0 °C) in the water to be treated.

Depending on the system type, ozone is produced in 1 – 3 generators from oxygen, provided from special oxygen generators or bottles. The nominal capacity of the individual generators is 30 g/h at 100 g/Nm<sup>3</sup>.

Type 5 is installed in a wall-mounted cabinet, types 6 and 7 are installed in a free-standing cabinet. In all three systems, ozone is transported to the mixing unit through a separate 12/10 mm stainless steel pipe or 12/9 mm PTFE pipe.

##### Mixing equipment

We recommend using stainless steel mixing systems because of the high ozone concentrations. Mixing systems made of PVC can have a reduced service life, depending on the operating conditions.

##### Important note

- Keep the length of pipes for conveying ozone and the number of joints to a minimum. Monitor all adjoining rooms with a gas detector, in line with the applicable German accident prevention regulations. All OZONFILT® systems are equipped for the fitting of a gas detector, such as type GMA 36 Ozone.
- Depending on the operating and installation conditions, it might also be necessary to monitor the room air for excessive oxygen content. The gas detector GMA 36 Oxygen can be used for this purpose.
- It is necessary for the ozone generation system to be interlocked with the water flow to the ozone metering on all installations.
- Install a non-return valve upstream of the OZVa to prevent any backflow of ozonised water into the pipe transporting the ozone.
- Ensure that all accessories that transport gas are resistant to ozone and oxygen (e.g. grease-free).
- Only use catalytic residual ozone destructors because of the high ozone concentrations. Activated charcoal-based residual ozone destructors ignite spontaneously if subjected to increased ozone concentrations.

Room Air Monitor see p. → 2-26

## 2 Ozone Systems OZONFILT®

### Technical Data

#### OZONFILT® OZVa 5-7 ozone production systems (Operating Gas - Oxygen)

##### Ambient parameters

Max. 85% air humidity of the ambient air, non-condensing, non-corrosive, dust-free, max. ambient temperature: 40 °C (with integrated air conditioning system: 50 °C)

		OZVa 5	OZVa 6	OZVa 7
Number of generator modules		1	2	3
Nominal ozone capacity at 100 g/Nm <sup>3</sup> ** and cooling water at 15 °C	g/h	30	60	90
Ozone capacity at 150 g/Nm <sup>3</sup> *	g/h	17.5	35.0	52.0
Ozone capacity at 80 g/Nm <sup>3</sup>	g/h	35	70	105
Specific energy requirement at nominal capacity	Wh/g	10	10	10
Power factor at full capacity	cos φ	0.98	0.98	0.98
Ozone connection		G 1/4" internal	G 1/4" internal	G 1/4" internal

##### Electrical connection

		OZVa 5	OZVa 6	OZVa 7
Connected load	V/Hz/A	230/50;60/3	230/50;60/6	230/50;60/10
Enclosure rating		IP 43	IP 43	IP 43

##### Overall dimensions (without mixer)

		OZVa 5	OZVa 6	OZVa 7
Width	mm	865	705	705
Height	mm	804	1,400	1,400
Depth	mm	310	345	345

##### Weight

		OZVa 5	OZVa 6	OZVa 7
Weight	kg	75	109	114

##### Ozone mixing

		OZVa 5	OZVa 6	OZVa 7
Max. raw water temperature	°C	35	35	35
Permissible pressure at ozone outlet	bar	0.8–2.0	0.8–2.0	0.8–2.0

##### Specification of operating gas: oxygen

		OZVa 5	OZVa 6	OZVa 7
Gas volume at nominal capacity 100 g/Nm <sup>3</sup>	NI/h	300	600	900
Gas volume at capacity 150 g/Nm <sup>3</sup>	NI/h	117*	234*	347*
Gas volume at capacity 80 g/Nm <sup>3</sup>	NI/h	438	875	1,313
Concentration min.	vol%	90	90	90
Dew point max.	°C	-50	-50	-50
Pressure	bar	3 – 6	3 – 6	3 – 6
Max. particles	µm	5	5	5
Max. hydrocarbons	ppm	20	20	20
Max. temperature	°C	30	30	30

##### Cooling water

		OZVa 5	OZVa 6	OZVa 7
Cooling water requirement	l/h	30	70	100
Cooling water inlet pressure	bar	1–5	1–5	1–5
Cooling water inlet, PE pressure hose	mm	6 x 4	6 x 4	6 x 4
Cooling water outlet, open discharge	mm	6 x 4	6 x 4	6 x 4
Cooling water temperature at ambient temp. max. 35 °C	°C	<30	<30	<30
Cooling water temperature at ambient temp. 35–40 °C	°C	<25	<25	<25

**Cooling water quality** No tendency to form lime scale. ; removable substances: < 0.1 ml/l; iron: < 0.2 mg/l; manganese: < 0.05 mg/l; no corrosive components; conductivity: > 100 µS/cm

\* Capacity 150 g/Nm<sup>3</sup> must be factory set as a special version

\*\* Nm<sup>3</sup> = m<sup>3</sup> under standard conditions (p = 1.013x10<sup>5</sup> Pa, T = 273 K)

## 2 Ozone Systems OZONFILT®

### 2.4.3

#### Ordering Information for OZONFILT® OZVa Systems

##### OZONFILT® OZVa 1 capacity 5 g/h

Type	Control cabinet surface	Order no.
Without mixing system	Grey powder-coated	1004239
Without mixing system	Stainless steel	1026124
With transparent mixing system with flow monitor 0.5–3 m³/h	Grey powder-coated	1026118
With transparent mixing system with flow monitor 0.5–3 m³/h	Stainless steel	1026125
With transparent mixing system with flow monitor, 3–5 m³/h	Grey powder-coated	1004235
With transparent mixing system with flow monitor, 3–5 m³/h	Stainless steel	1026126
With PVC static mixer, DN 40, 5–10 m³/h	Grey powder-coated	1026120
With PVC static mixer, DN 40, 5–10 m³/h	Stainless steel	1026127
With PVC static mixer, DN 50, 10–15 m³/h	Grey powder-coated	1026121
With PVC static mixer, DN 50, 10–15 m³/h	Stainless steel	1026128
With PVC static mixer, DN 32, 0.5–2.8 m³/h	Grey powder-coated	1026122
With PVC static mixer, DN 32, 0.5–2.8 m³/h	Stainless steel	1026129
With PVC static mixer, DN 32, 2.8–5 m³/h	Grey powder-coated	1026123
With PVC static mixer, DN 32, 2.8–5 m³/h	Stainless steel	1026130

##### OZONFILT® OZVa 2 capacity 15 g/h

Type	Control cabinet surface	Order no.
Without mixing system	Grey powder-coated	1005129
Without mixing system	Stainless steel	1026133
With PVC static mixer, DN 40, 5–10 m³/h	Grey powder-coated	1005127
With PVC static mixer, DN 40, 5–10 m³/h	Stainless steel	1026134
With PVC static mixer, DN 50, 10–15 m³/h	Grey powder-coated	1005806
With PVC static mixer, DN 50, 10–15 m³/h	Stainless steel	1026135
With PVC static mixer, DN 32, 0.5–2.8 m³/h	Grey powder-coated	1026132
With PVC static mixer, DN 32, 0.5–2.8 m³/h	Stainless steel	1026144
With PVC static mixer, DN 32, 2.8–5 m³/h	Grey powder-coated	1005125
With PVC static mixer, DN 32, 2.8–5 m³/h	Stainless steel	1026145

##### OZONFILT® OZVa 3 capacity 35 g/h

Type	Control cabinet surface	Order no.
Without mixing system	Grey powder-coated	1009083
Without mixing system	Stainless steel	1026146

##### OZONFILT® OZVa 4 capacity 40 g/h

Type	Control cabinet surface	Order no.
Without mixing system	Grey powder-coated	1009105
Without mixing system	Stainless steel	1026147

##### OZONFILT® OZVa 5 capacity 30 g/h operating gas oxygen

Type	Control cabinet surface	Order no.
Without mixing system	Grey powder-coated	1026148
Without mixing system	Stainless steel	1026149

## 2 Ozone Systems OZONFILT®

### OZONFILT® OZVa 6 capacity 60 g/h operating gas oxygen

Type	Control cabinet surface	Order no.
Without mixing system	Grey powder-coated	1023452
Without mixing system	Stainless steel	1026150

### OZONFILT® OZVa 7 capacity 90 g/h operating gas oxygen

Type	Control cabinet surface	Order no.
Without mixing system	Grey powder-coated	1026151
Without mixing system	Stainless steel	1026152



## 2 Ozone Systems OZONFILT®

### 2.4.4

### Ozone System OZONFILT® Compact OMVa

Individually adaptable thanks to modular construction

Ozone capacity 5 to 70 g ozone/h



The OZONFILT® Compact OMVa is a complete, ready-to-use ozone system. The components are perfectly coordinated to each other.

The ozone system OZONFILT® Compact OMVa has a modular construction mounted on a stainless steel frame. It can therefore be simply adapted to and integrated in the respective application.

A sufficient quantity and constant concentration of ozonised water is produced in the system's reaction tank. From there it is pumped to where it is needed. The required ozone concentration can be adjusted and is continuously controlled and held constant by a measuring and control circuit. Depending on the application, the ozonised water is pumped by system pressure or with one or more discharge pumps to where it is needed.

With the removal and replenishment of water in the storage tank, the air, which contains ozone, is discharged out via the water phase and via a residual ozone gas destructor. Ensure that no ozone escapes into the ambient air in normal operation.

#### Your benefits

- Excellent process reliability through the use of a pre-assembled, complete ozone treatment stage with perfectly matched components.
- Well-thought-out installation on a stainless steel frame for plug-and-play connection
- Modular construction which can still be customised
- Compression-proof ozone generator built in compliance with DIN 19627
- Destruction of residual ozone gas for the removal of traces of ozone gas
- Room air monitoring for traces of ozone gas via a gas detector with a sensor with long-term stability
- Metering ozone, depending on the measured values, ensures a constant ozone concentration in the reaction tank

#### Technical details

- Ozone metering point with a downstream mixing section made of stainless steel, with a series of static mixing elements for intensive mixing of the ozone/air mix.
- Stainless steel reaction tank.
- Ozone gas is safely converted to oxygen with the integral water separator in the residual ozone gas destruction unit.
- A gas detector alerts you as soon as the limit values for ozone in the ambient air are exceeded and ozone production is stopped.
- A central electric control ensures metering of ozone depending on the measured values and the control of all connected peripheral components.
- Clear and simple operation, as well as signal exchange with higher-order control systems

#### Ozone generation module (1), built in accordance with DIN 19627:

The ozone is produced with an OZONFILT® OZVa in a pressure-resistant ozone generator using an electronically produced and regulated medium-frequency.

#### Ozone mixing module (2):

This module comprises an ozone metering point and a downstream mixing section made of stainless steel, with a series of static mixing elements for intensive mixing of the ozone/air mix with the water to be treated. The lines carrying the ozone, and the pipework from the raw water connection to the inlet to the reaction tank are made throughout in stainless steel and have been factory-pressure tested.

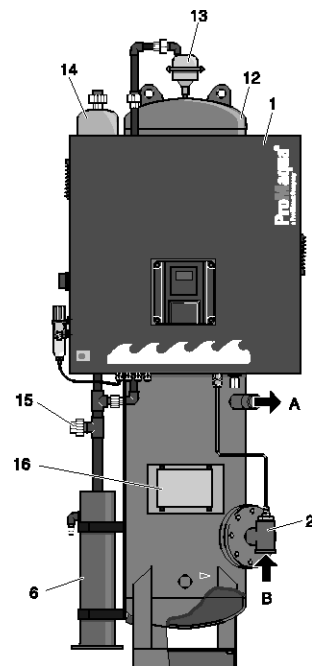
An injector for sucking out ozone is not needed with back pressures of up to 1.8 bar because the ozone is generated at positive pressure.

#### Reaction tank module (12):

The stainless steel reaction tank incorporates all the necessary fittings for water distribution and an automatic bleed valve (13). The ozone generation module (1), the residual ozone gas destructor (14) and room air monitor (16) are mounted on this storage tank (12).

#### Residual ozone gas destruction module (14):

The residual ozone gas destruction module (14) has an integrated water separator (6) to remove any traces of ozone gas in the exhaust air coming from the reaction tank (12). The connection for the exhaust air from any downstream filter system (15) that may be fitted is likewise provided.



pk\_7\_024\_V2

A to filtration  
B Raw water

## 2 Ozone Systems OZONFILT®

### Room air monitoring module (16):

The room air is monitored for traces of ozone gas using a calibrated gas detector with a long-term stable electrochemical sensor.

If the alarm threshold is exceeded, ozone generation is stopped and an alarm signalled. A buzzer is activated at the same time.

### Field of application

- **Food and beverage industry:** Oxidation of iron and manganese, disinfection of potable water and rinsing water
- **Swimming pools:** Degradation of disinfection by-products, reliable microbiological barrier and production of crystal-clear water thanks to its microflocculating effect

### Technical Data

Type		OMVa 5 – 200	OMVa 15 – 500	OMVa 35-1,000	OMVa 40-1,000	OMVa 70-2,000
Type: ozone generation system		OZVa 1	OZVa 2	OZVa 3	OZVa 4	OZMa 1A
Ozone output at 20 g/Nm <sup>3</sup>	g/h	5	15	35	40	70
Cooling water volume (15 °C)	l/h	10–60	20–60	50–100	70–100	90
Nominal throughput	m <sup>3</sup> /h	1.5 – 5	5 – 15	15 – 30	30 – 45	45 – 60
Enclosure rating		IP 43	IP 43	IP 43	IP 43	IP 43
Connected load	V/Hz/A	230/50;60/1.2	230/50;60/3	230/50;60/6	230/50;60/6	230/50;60

## 2 Ozone Systems OZONFILT®

### 2.5

#### Ozone System OZONFILT® OZMa

**Powerful and yet environmentally-friendly. Disinfect and oxidise ecologically and economically.**

**Ozone capacity 70 to 735 g ozone/h**



OZONFILT® OZMa represents maximum operational safety with minimal operating costs. The ozone generator is maintenance-free and generates up to 735 g/h of ozone from compressed air or oxygen.

The ozone systems OZONFILT® OZMa have been designed as pressurised systems, in which the operating gas – air or oxygen – is fed into the ozone generator under pressure.

**Air is used as the operating gas in the ozone system Ozonfilt® OZMaA types 1 to 6**

The ozone is generated from the oxygen in the ambient air and simultaneously metered. A demand-led, self-optimising pressure swing dryer reduces the consumption of compressed air to a minimum. Ozone can therefore be generated operationally safely and reliably even with a high level of ambient air humidity with ozone concentrations of up to 20 g/Nm<sup>3</sup>. Ozone concentrations of between 3 and 12 ppm can be achieved in the water to be treated with suitable mixing units, depending on the temperature.

**Oxygen is used as the operating gas in the ozone system Ozonfilt® OZMaO type 1 to 6**

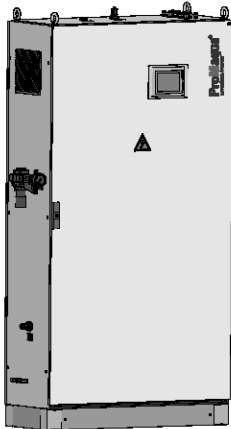
Operation with oxygen permits ozone generation with ozone concentrations of up to 150 g/Nm<sup>3</sup>. Depending on the system type, ozone is produced in 1-3 generators from oxygen provided from special oxygen generators or bottles. Using the suitable mixing equipment, ozone concentrations of up to 90 ppm can be achieved in the water to be treated, depending on the temperature.

#### Your benefits

- Economical: maintenance-free generator concept with virtually unlimited service life
- Up to 30% energy savings for air treatment, thanks to demand-led and self-optimising air drying compared with conventional air treatment.
- Automatic control of the operating gas depending on the ozone output, therefore reduced consumption of operating gas produced with intensive use of energy.
- High ozone concentration ensures optimum ozone solubility in water
- Direct injection without injector system at up to 2 bar back pressure
- Automatic ozone generation, virtually independent of fluctuations in main voltage and pressure
- Simple, safe and reliable operation and process visualisation thanks to large, colour and clear 7" touch panel
- Infinite adjustment and precise output control of between 3% and 100% of the nominal power with display of the ozone volume in "grammes/hour"

#### Technical details

- Compact mounting, ready-to-use in a painted steel cabinet or optionally in a stainless steel cabinet
- With integrated filter package for the removal of dust and small amounts of residual oil in the compressed air
- Special dielectric with excellent cooling: In spite of the low cooling water consumption, heat is quickly and efficiently discharged before the ozone produced can decompose due to excessive heat.
- PLC with integrated ozone measurement and PID control
- 7" touch panel with data logger and screen recorder
- Multiple communication interfaces (e.g. LAN, PROFIBUS® DP)
- Excellent efficiency: Over 90% of the ozone is dissolved in the water, thanks to the special construction of the mixing unit.
- Integration of a dew point sensor to monitor the quality of compressed air
- Integration of an air conditioning unit to adjust the temperature of the ozone system
- Pause input for external switching on/off
- Contact input for locking the system, for example in the absence of flow
- Digital input for connection of a gas detector
- Digital input for control of two power stages
- 0/4-20 mA input for external output control depending on the flow or measured value with a PIC controller
- Second freely configurable 0/ 4-20 mA input
- Contact output for operating status
- Contact output for collective malfunction alert
- Contact output for limit value transgression, ozone concentration in the water too low
- One freely configurable 0/ 4-20 mA output



P\_PMA\_OF\_0010\_SW

## 2 Ozone Systems OZONFILT®

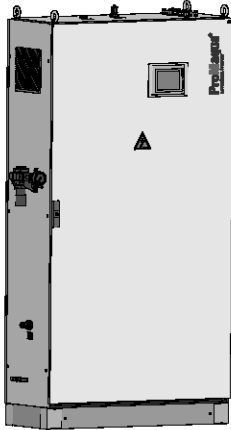
### Field of application

- **Potable water supply:** Oxidation of iron, manganese and arsenic, refinement and taste enhancement and disinfection
- **Waste water treatment:** Degradation/reduction of COD and microcontaminants, reduction of sewage sludge
- **Food and beverage industry:** Oxidation of iron and manganese, disinfection of potable water and rinsing water
- **Swimming pools:** Degradation of disinfection by-products, reliable microbiological barrier and production of crystal-clear water thanks to its microflocculating effect
- **Industry:** Legionella prevention and disinfection of cooling water

## 2 Ozone Systems OZONFILT®

### 2.5.1

### Ozone Generation Systems OZONFILT® OZMa 1-6 A (Operating Gas - Air)



P\_PMA\_OF\_0010\_SW

Under nominal conditions, the OZMa 1-6 A range produces up to 420 g/h of ozone from compressed air at a concentration of 20 g/Nm<sup>3</sup>. Using the designated mixing devices, ozone concentrations of between 3 and 12 ppm can be achieved in the water to be treated, depending on the temperature (theoretical value at 30 or 0 °C).

Different feature options can be achieved by combining different Identity code characteristics.

The plants are pre-mounted ready for connection in a painted steel cabinet (optional stainless steel control cabinet) and need only be connected to a single-phase voltage supply, compressed air, cooling water/ waste water and ozone metering point on the customer's site.

An adequate compressed air supply and a mixing device designed for the operating conditions should be integrated for operation of the ozone plant.

Order Information for OZONFILT® OZMa Systems see p. → 2-21, PVC or Stainless Steel Static Helical Mixer see p. → 2-24

#### Mixing equipment

All OZMa systems are delivered, in principle, without a mixing unit and a suitable mixing system has to be ordered separately. When selecting a suitable mixing system, please note that the mixing of ozone is more efficient the higher the water flow in the mixing system. Accordingly design the mixing system so that the flow of the water to be treated is at the upper range of the flow specification.

PVC or Stainless Steel Static Helical Mixer see p. → 2-24

#### Notes on installation

Keep the length of ozone gas transporting pipes and the number of joints to a minimum. All rooms with a removable joint should be monitored with a gas detector in line with the applicable German accident prevention regulations. All OZONFILT® systems are equipped for fitting a gas detector such as GMA 36 Ozon.

Ozonisation adds a large amount of gas to the water of which only a small percentage can dissolve. Adequate bleeding should therefore be integrated. Because the gases discharged in this way have a considerable residual ozone concentration, appropriate residual ozone destructors should be installed.

The ozone generator should be interlocked with the water flow into the metering point for all installations.

A non-return valve should be installed between OZMa and the ozone metering point to prevent any return of ozonised water into the ozone-transporting pipe.

Room Air Monitor see p. → 2-26, Residual Ozone Gas Destructor see p. → 2-25

## 2 Ozone Systems OZONFILT®

### Technical Data

#### Ozone Generation Systems OZONFILT® OZMa 1-3 A (Process Gas - Air)

##### Ambient parameters

Max. 85% air humidity of the ambient air, non-condensing, non-corrosive, dust-free, max. ambient temperature: 40 °C (with integrated air conditioning system: 50 °C)

		OZMa 1A	OZMa 2A	OZMa 3A
<b>Number of generator modules</b>		1	1	1
<b>Ozone capacity, measured in accordance with DIN with air at 20 °C, cooling water at 15 °C</b>	g/h	70	105	140
<b>Air consumption (only ozone generation)</b>	Nm³/h	3.50	5.25	7.00
<b>Ozone concentration in the gas phase referenced to nominal conditions</b>	g/Nm³ *	20	20	20
<b>Specific energy requirement at nominal capacity</b>	Wh/g	16.5	16.5	16.5
<b>Power factor at full capacity</b>	cos φ	0.95	0.95	0.95
<b>Ozone connection</b>		Rp 3/8"	Rp 3/8"	Rp 3/8"

\* Nm³= m³ at standard conditions (P = 1.013x10⁵Pa, T = 273 K)

##### Electrical connection

		OZMa 1A	OZMa 2A	OZMa 3A
<b>Connected load</b>	V/Hz/A	230/50;60/10	230/50;60/16	230/50;60/16
<b>Enclosure rating</b>		IP 43	IP 43	IP 43

##### Overall dimensions (without mixer)

		OZMa 1A	OZMa 2A	OZMa 3A
<b>Width</b>	mm	1,114	1,114	1,114
<b>Height</b>	mm	1,961	1,961	1,961
<b>Depth</b>	mm	405	405	405

##### Weight

		OZMa 1A	OZMa 2A	OZMa 3A
<b>Weight</b>	kg	270	280	300

##### Ozone mixing

		OZMa 1A	OZMa 2A	OZMa 3A
<b>Max. raw water temperature</b>	°C	35	35	35
<b>Permissible pressure at ozone outlet</b>	bar	0.8–2.0	0.8–2.0	0.8–2.0

##### Air supply

		OZMa 1A	OZMa 2A	OZMa 3A
<b>Required air volume</b>	Nl/min	73	110	147

##### Air quality

Oil and dust-free, Non-corrosive, Constant upstream pressure of 4.5 - 10 bar

##### Cooling water

		OZMa 1A	OZMa 2A	OZMa 3A
<b>Cooling water consumption (15 °C)</b>	l/h	90	135	180
<b>Cooling water consumption (30 °C)</b>	l/h	200	300	400
<b>Cooling water inlet pressure</b>	bar	2–5	2–5	2–5
<b>Cooling water inlet, PE pressure hose</b>	mm	8 x 5	8 x 5	12 x 9
<b>Cooling water outlet, open discharge</b>	mm	8 x 5	8 x 5	12 x 9

##### Cooling water quality

No tendency to form lime scale; removable substances: < 0.1 ml/l ; iron: < 0.2 mg/l; manganese: < 0.05 mg/l; no corrosive components; conductivity: > 100 µS/cm

## 2 Ozone Systems OZONFILT®

### Ozone Generation Systems OZONFILT® OZMa 4-6 A (Process Gas - Air)

#### Ambient parameters

Max. 85% air humidity of the ambient air, non-condensing, non-corrosive, dust-free, max. ambient temperature: 40 °C (with integrated air conditioning system: 50 °C)

		OZMa 4A	OZMa 5A	OZMa 6A
<b>Number of generator modules</b>		2	2	3
<b>Ozone capacity, measured in accordance with DIN with air at 20 °C, cooling water at 15 °C</b>	g/h	210	280	420
<b>Air consumption (only ozone generation)</b>	Nm³/h	10.50	14.00	21.00
<b>Ozone concentration in the gas phase referenced to nominal conditions</b>	g/Nm³ *	20	20	20
<b>Specific energy requirement at nominal capacity</b>	Wh/g	16.5	16.5	16.5
<b>Power factor at full capacity</b>	cos φ	0.95	0.95	0.95
<b>Ozone connection</b>		Rp 3/8"	Rp 3/8"	Rp 3/8"

\* Nm³= m³ at standard conditions (P = 1.013x10⁵Pa, T = 273 K)

#### Electrical connection

		OZMa 4A	OZMa 5A	OZMa 6A
<b>Connected load</b>	V/Hz/A	400/50;60/16	400/50;60/16	400/50;60/16
<b>Enclosure rating</b>		IP 43	IP 43	IP 43

#### Overall dimensions (without mixer)

		OZMa 4A	OZMa 5A	OZMa 6A
<b>Width</b>	mm	1,320	1,320	1,606
<b>Height</b>	mm	1,961	1,961	1,961
<b>Depth</b>	mm	605	605	605

#### Weight

		OZMa 4A	OZMa 5A	OZMa 6A
<b>Weight</b>	kg	420	445	589

#### Ozone mixing

		OZMa 4A	OZMa 5A	OZMa 6A
<b>Max. raw water temperature</b>	°C	35	35	35
<b>Permissible pressure at ozone outlet</b>	bar	0.8–2.0	0.8–2.0	0.8–2.0

#### Air supply

		OZMa 4A	OZMa 5A	OZMa 6A
<b>Required air volume</b>	NI/min	220	293	440

#### Air quality

Oil and dust-free, non-corrosive, constant upstream pressure of 4.5 - 10 bar

#### Cooling water

		OZMa 4A	OZMa 5A	OZMa 6A
<b>Cooling water consumption (15 °C)</b>	l/h	270	360	540
<b>Cooling water consumption (30 °C)</b>	l/h	600	800	1,200
<b>Cooling water inlet pressure</b>	bar	2–5	2–5	2–5
<b>Cooling water inlet, PE pressure hose</b>	mm	12 x 9	12 x 9	12 x 9
<b>Cooling water outlet, open discharge</b>	mm	12 x 9	12 x 9	12 x 9

#### Cooling water quality

No tendency to form lime scale; removable substances: < 0.1 ml/l ; iron: < 0.2 mg/l; manganese: < 0.05 mg/l; no corrosive components; conductivity: > 100 µS/cm

## 2 Ozone Systems OZONFILT®

### 2.5.2

#### Ozone Generation Systems OZONFILT® OZMa 1-6 O (Operating Gas - Oxygen)

Under nominal conditions, the OZMa 1-6 O range produces up to 735 g/h of ozone from oxygen at a concentration of up to 150 g/Nm<sup>3</sup>. Using the designated mixing devices, ozone concentrations in the water to be treated of up to 90 ppm can be achieved (theoretical value at 0 °C). Ozone concentration in g/Nm<sup>3</sup> and system feed rate in g/h can be varied depending on the operating conditions and can thus be individually matched to the application conditions. Examples for various combinations are listed in the technical data table.

Different feature options can be achieved by combining different Identity code characteristics.

The systems are pre-mounted ready for connection in a painted steel cabinet (optional stainless steel control cabinet) and should only be connected to a single-phase voltage supply, oxygen, cooling water/waste water and ozone metering point on the customer's site.

Order Information for OZONFILT® OZMa Systems see p. → 2-21

##### Mixing equipment

All OZMa systems are delivered, in principle, without a mixing unit and a suitable mixing system has to be ordered separately. When selecting a suitable mixing system, please note that the mixing of ozone is more efficient the higher the water flow in the mixing system. Accordingly design the mixing system so that the flow of the water to be treated is at the upper range of the flow specification.

We recommend using stainless steel mixing systems because of the high ozone concentrations. Mixing systems made of PVC can have a reduced service life, depending on the operating conditions.

PVC or Stainless Steel Static Helical Mixer see p. → 2-24

##### Notes on installation

Keep the length of ozone gas transporting pipes and the number of joints to a minimum. All rooms with a removable joint should be monitored with a gas detector in line with the applicable German accident prevention regulations. All OZONFILT® systems are equipped for fitting a gas detector such as GMA 36 Ozon.

Depending on the operating and installation conditions, it might be necessary to also monitor the room air for excessive oxygen content. The gas detector GMA 36 Oxygen can be used for this purpose.

All gas-transporting accessories should be resistant to ozone and oxygen (e. g. fat-free).

Ozonisation adds a large amount of gas to the water of which only a small percentage can dissolve. Adequate bleeding should therefore be integrated. Because the gases discharged this way have a considerable residual ozone concentration, appropriate residual ozone destructors should be installed. Because of the high ozone concentrations, only catalytic residual ozone destructors can be used. Activated charcoal-based residual ozone destructors ignite spontaneously if subjected to increased ozone concentrations.

The ozone generator must be interlocked with the water flow into the metering point for all installation.

A non-return valve should be installed between OZMa and ozone metering point to prevent any return of ozonised water into the ozone-transporting pipe.

Room Air Monitor see p. → 2-26, Residual Ozone Gas Destructor see p. → 2-25



## 2 Ozone Systems OZONFILT®

### Technical Data

#### Ozone Generation Systems OZONFILT® OZMa 1-3 O (Operating Gas - Oxygen)

##### Ambient parameters

Max. 85% air humidity of the ambient air, non-condensing, non-corrosive, dust-free, max. ambient temperature: 40 °C (with integrated air conditioning system: 50 °C)

		OZMa 1 O	OZMa 2 O	OZMa 3 O
Number of generator modules		1	1	1
Nominal ozone capacity at 100 g/Nm <sup>3</sup> ** and cooling water at 15 °C	g/h	105	158	210
Ozone capacity at 150 g/Nm <sup>3</sup> *	g/h	60	90	120
Ozone capacity at 80 g/Nm <sup>3</sup>	g/h	123	184	245
Specific energy requirement at nominal capacity	Wh/g	9	9	9
Power factor at full capacity	cos φ	0.95	0.95	0.95
Ozone connection		Rp 3/8"	Rp 3/8"	Rp 3/8"

### Electrical connection

		OZMa 1 O	OZMa 2 O	OZMa 3 O
Connected load	V/Hz/A	230/50;60/10	230/50;60/16	230/50;60/16
Enclosure rating		IP 43	IP 43	IP 43

### Overall dimensions

		OZMa 1 O	OZMa 2 O	OZMa 3 O
Width	mm	1,114	1,114	1,114
Height	mm	1,961	1,961	1,961
Depth	mm	400	400	400

### Weight

		OZMa 1 O	OZMa 2 O	OZMa 3 O
Weight	kg	220	230	250

### Ozone mixing

		OZMa 1 O	OZMa 2 O	OZMa 3 O
Max. raw water temperature	°C	35	35	35
Permissible pressure at ozone outlet	bar	0.8–2.0	0.8–2.0	0.8–2.0

### Specification of operating gas: oxygen

		OZMa 1 O	OZMa 2 O	OZMa 3 O
Gas volume at nominal capacity 100 g/Nm <sup>3</sup>	l/h	1,050	1,580	2,100
Gas volume at capacity 150 g/Nm <sup>3</sup>	l/h	400*	600*	800*
Gas volume at capacity 80 g/Nm <sup>3</sup>	l/h	1,540	2,300	3,100
Concentration min.	vol%	90	90	90
Dew point max.	°C	-50	-50	-50
Pressure	bar	3 – 6	3 – 6	3 – 6
Max. particles	µm	5	5	5
Max. hydrocarbons	ppm	20	20	20
Max. temperature	°C	30	30	30

### Cooling water

		OZMa 1 O	OZMa 2 O	OZMa 3 O
Cooling water consumption (15 °C)	l/h	120	180	240
Cooling water consumption (30 °C)	l/h	200	300	400
Cooling water inlet pressure	bar	1–5	1–5	1–5
Cooling water inlet, PE pressure hose	mm	12 x 9	12 x 9	12 x 9
Cooling water outlet, open discharge	mm	12 x 9	12 x 9	12 x 9

**Cooling water quality** No tendency to form lime scale, no corrosive components; sedimentable substances: < 0.1 ml/l; iron: < 0.2mg/l; manganese: < 0.05 mg/l; conductivity: > 100 µS/cm; chloride: < 250 mg/l

\* Output 150 g/Nm<sup>3</sup> as special version must be factory-set

\*\* Nm<sup>3</sup> = m<sup>3</sup> at standard conditions (P = 1.013x10<sup>5</sup>Pa, T = 273 K)

## 2 Ozone Systems OZONFILT®

### Ozone Generation Systems OZONFILT® OZMa 4-6 O (Operating Gas - Oxygen)

#### Ambient parameters

Max. 85% air humidity of the ambient air, non-condensing, non-corrosive, dust-free, max. ambient temperature: 40 °C (with integrated air conditioning system: 50 °C)

		OZMa 4 O	OZMa 5 O	OZMa 6 O
Number of generator modules		2	2	3
Nominal ozone capacity at 100 g/Nm <sup>3</sup> ** and cooling water at 15 °C	g/h	320	420	630
Ozone capacity at 150 g/Nm <sup>3</sup> *	g/h	180	240	360
Ozone capacity at 80 g/Nm <sup>3</sup>	g/h	370	490	735
Specific energy requirement at nominal capacity	Wh/g	9	9	9
Power factor at full capacity	cos φ	0.95	0.95	0.95
Ozone connection		Rp 3/8"	Rp 3/8"	Rp 3/8"

#### Electrical connection

		OZMa 4 O	OZMa 5 O	OZMa 6 O
Connected load	V/Hz/A	400/50;60/16	400/50;60/16	400/50;60/16
Enclosure rating		IP 43	IP 43	IP 43

#### Overall dimensions

		OZMa 4 O	OZMa 5 O	OZMa 6 O
Width	mm	1,320	1,320	1,320
Height	mm	1,961	1,961	1,961
Depth	mm	605	605	605

#### Weight

		OZMa 4 O	OZMa 5 O	OZMa 6 O
Weight	kg	320	345	415

#### Ozone mixing

		OZMa 4 O	OZMa 5 O	OZMa 6 O
Max. raw water temperature	°C	35	35	35
Permissible pressure at ozone outlet	bar	0.8–2.0	0.8–2.0	0.8–2.0

#### Specification of operating gas: oxygen

		OZMa 4 O	OZMa 5 O	OZMa 6 O
Gas volume at nominal capacity 100 g/Nm <sup>3</sup>	NI/h	3,200	4,200	6,300
Gas volume at capacity 150 g/Nm <sup>3</sup>	NI/h	1,200*	1,600*	2,400*
Gas volume at capacity 80 g/Nm <sup>3</sup>	NI/h	4,630	6,130	9,190
Concentration min.	vol%	90	90	90
Dew point max.	°C	-50	-50	-50
Pressure	bar	3 – 6	3 – 6	3 – 6
Max. particles	µm	5	5	5
Max. hydrocarbons	ppm	20	20	20
Max. temperature	°C	30	30	30

#### Cooling water

		OZMa 4 O	OZMa 5 O	OZMa 6 O
Cooling water consumption (15 °C)	l/h	200	280	420
Cooling water consumption (30 °C)	l/h	330	470	700
Cooling water inlet pressure	bar	1–5	1–5	1–5
Cooling water inlet, PE pressure hose	mm	12 x 9	12 x 9	12 x 9
Cooling water outlet, open discharge	mm	12 x 9	12 x 9	12 x 9

**Cooling water quality** No tendency to form lime scale, no corrosive components; sedimentable substances: < 0.1 ml/l; iron: < 0.2mg/l; manganese: < 0.05 mg/l; conductivity: > 100 µS/cm; chloride: < 250 mg/l

\* Output 150 g/Nm<sup>3</sup> as special version must be factory-set

\*\* Nm<sup>3</sup> = m<sup>3</sup> at standard conditions (P = 1.013x10<sup>5</sup>Pa, T = 273 K)

## 2 Ozone Systems OZONFILT®

### 2.5.3 Order Information for OZONFILT® OZMa Systems

OZMa	Type ozone generator
	<b>Air operation / Oxygen operation</b>
	<b>g/h g/h</b>
01	70 105
02	105 158
03	140 210
04	210 320
05	280 420
06	420 630
	<b>Operating gas</b>
A	Operating gas - air
O	Operating gas - oxygen
	<b>Type</b>
P	ProMaqua
S	Special version
C	ProMaqua with air-conditioning
	<b>Mechanical design</b>
0	Standard (packaging for transport by HGV)
1	Standard (packaging for sea/air freight)
2	In stainless steel cabinet (packaging for transport by HGV)
3	In stainless steel cabinet (packaging for sea/air freight)
M	Modified
	<b>Operating voltage</b>
A	Single-phase 230 V ±10%, 50/60 Hz (only types 01-03)
S	Three-phase 230/400 V ±10%, 50/60 Hz (only types 04-06)
	<b>Gas treatment</b>
0	Gas treatment not integrated (design operating gas - oxygen)
1	Gas treatment integrated without filter package (design operating gas - air)
2	Gas treatment integrated with filter package (design operating gas - air)
3	Gas treatment not integrated (oxygen operating gas version), including gas control valve
4	Gas treatment integrated without filter package (air operating gas version), including gas control valve
5	Gas treatment integrated with filter package (air operating gas version), including gas control valve
	<b>Preset language</b>
DE	german
EN	english
FR	french
IT	italian
ES	spanish
	<b>Control</b>
0	Basic version with digital input to control two power stages
1	External power control via 0/4-20 mA input, data logger
2	External power control, ozone measurement and visualisation via screen recorder, 2 freely configurable 0/4-20 mA inputs, 1 freely configurable 0/4-20 mA output
3	As 2 with additionally integrated PID controller for control of the ozone concentration independent of measured value and flow
	<b>Communication interfaces</b>
0	None
4	PROFIBUS® DP interface
	<b>Additional options</b>
0	None
1	Dew point sensor
	<b>Approvals</b>
01	CE-mark
	<b>Hardware</b>
0	Standard
	<b>Software</b>
0	Standard

#### Explanation on the Identity code:

Mechanical design: In design 0 and 1, the plant is installed in a standard control cabinet made of powder-coated steel.

Gas treatment: Without filter package for oil-free generated or de-oiled compressed air.  
With filter package for compressed air with residual oil content.

## 2 Ozone Systems OZONFILT®

### 2.6 Accessories and Spare Parts for Ozone Systems

#### 2.6.1 Compressors for OZONFILT® OZVa 1-4

##### Atlas Copco LFX compressors

The outstanding feature of this range of compressors is their outstanding value for money. They are equipped with active start unloading and automatic condensate discharge by solenoid valve. The compressors are not suitable for continuous operation and should only be used in less harsh operating conditions.

##### Technical Data

Type		LFX 0.7	LFX 1.5
Free air delivery rate at 7 bar	l/min	61	124
Power consumption at 7 bar	W	530	970
Number of cylinders		1	1
Sound pressure level	dB(A)	62	64
Air receiver capacity	l	20	20
Weight	kg	44	48
Suitable for OZVa Type		1 + 2	3 + 4

Type	Type	Order no.
LFX 0.7	230 V/50 Hz	1004458
LFX 0.7	230 V/60 Hz	1010719
LFX 1.5	230 V/50 Hz	1006343
LFX 1.5	230 V/60 Hz	1009638

##### Air filter kit

	Order no.
Air filter kit for Atlas Copco LFX compressors	1005789

##### Dürr ABK compressors

The outstanding feature of this continuously rated range of compressors is their extremely robust construction, making them ideally suitable for industrial use. They are equipped with active start unloading, automatic condensate discharge by solenoid valve and an hours-run meter. PTFE coated special aluminium pistons lead to the long service life and reliability of these compressor units.

##### Technical Data

Type		TA-080	HA-234
Free air delivery rate at 7 bar	l/min	62	152
Supply max.	VAC	230	230
Supply frequency	Hz	50/60	50
Power consumption at 7 bar	W	800	1,900
Number of cylinders		1	3
Sound pressure level	dB(A)	68	78
Air receiver capacity	l	25	55
Weight	kg	49	70
Suitable for OZVa Type		1 + 2	3 + 4

Type	Order no.
TA-080	1025398
HA-234	1025399

## 2 Ozone Systems OZONFILT®

### Air filter kit

	Order no.
<b>Air filter kit for Dürk ABK compressors*</b>	1025400

\* 1 filter kit is required per cylinder.

Compressors with refrigeration drying for operation in conditions of high humidity, and high-capacity screw compressors for connection to several ozone plants are available on request.

### 2.6.2

## Oxygen Generator for OZONFILT® OZVa 5-7

### OXYMAT 020 eco

This compact oxygen generator works on the principle of pressure swing filtration of the ambient air through a molecular sieve. Oxygen is generated with a purity of up to 95% and a dew point of – 70 °C when supplied with suitably dried compressed air. The system generates a pressure of 4 bar at the oxygen outlet and can be connected directly to the OZVa 5-7.

### Technical Data

(At 90% oxygen yield):

Type		OXYMAT 020 eco
<b>Capacity</b>	Nm <sup>3</sup> /h	1.6
<b>Air requirement (min. 6 bar)</b>	Nm <sup>3</sup> /min	0.31
<b>Power consumption incl. compressor</b>	kW	2.5
<b>Specific energy requirement</b>	kWh/Nm <sup>3</sup>	2.1

### Required components

	Order no.
<b>OXYMAT 020 eco, 110-240 V / 50-60 Hz</b>	1044799
<b>Pressure tank O<sub>2</sub> for Oxymat O 020 eco, 90 l, 11 bar, PED with revision opening</b>	1044986
<b>Screw compressor (oil injection), integrated refrigeration drying and 200 l air receiver, 400 V / 3 ph / 50 Hz</b>	On request
<b>Filter set 006</b>	1025387
<b>Hose set DN 19 x 1100 PS 45</b>	On request
<b>Connecting set with connections for 6x4 mm PTFE hose, between OXYMAT and OZVa</b>	1025395

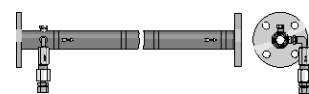
### Accessories

	Order no.
<b>PTFE hose 6x4 mm, admissible operating pressure 15 bar, sold in metres</b>	037426
<b>Service kit for Atlas Copco LE 2-10, (recommended after 8,000 running hours)</b>	1025390
<b>Service kit for Atlas Copco GX 2-10 FF, (recommended after 8,000 running hours)</b>	1025391
<b>Service kit filter 006</b>	1025392
<b>Service kit for screw compressor for OXYMAT 020 eco</b>	On request

## 2 Ozone Systems OZONFILT®

### 2.6.3

### PVC or Stainless Steel Static Helical Mixer



pk\_7\_072  
Static Helical Mixer

Designed for intensive mixing of gas with liquid flows. 4 helical blades ensure optimum mixing of the ozone with minimal pressure drop (0.1 bar per blade at maximum flow). The specified flow range of the static helical mixer should be complied with for optimum mixing results.

Version with loose flanges to DIN 2501 and integrated injection point made from stainless steel with couplings for 12 mm diam. stainless steel tube, or 12/9 mm PTFE hose, using stainless steel support inserts. In addition, the injection point is fitted with a non-return valve to protect the ozone plant from reverse flowing water. The mixers are manufactured as grease-free, so they are also suitable for Types OZVa 5-7. The stainless steel version has a G 1/4" pressure gauge tapping at the ozone mixing point.

Flow m³/h	Material	Overall length mm	Connector	Order no.
5 – 10	PVC-U	718	DN 40	1024324
10 – 15	PVC-U	718	DN 50	1024325
15 – 25	PVC-U	718	DN 65	1024326
25 – 35	PVC-U	1,100	DN 80	1024327
35 – 50	PVC-U	1,100	DN 100	1024328
50 – 90	PVC-U	1,300	DN 125	1034641
95 – 160	PVC-U	1,700	DN 150	1034640
5 – 10	1.4404	718	DN 40	1022503
10 – 15	1.4404	718	DN 50	1022514
15 – 25	1.4404	718	DN 65	1022515
25 – 35	1.4404	1,100	DN 80	1022516
35 – 50	1.4404	1,100	DN 100	1024154

Other sizes on request

### Connecting parts for the gas pipeline

	Order no.
Stainless steel pipe 12/10 mm, Sold in metres	015743
Stainless steel pipe 12/10 mm, grease-less, 1.4 m	1022463
PTFE hose 12/9 mm, grease-less, sold in metres	037428
Stainless steel support inserts, 2 No. for 12/9 mm PTFE hose, grease-less	1025397
Stainless steel coupling 12 mm - R 1/4, grease-less	1025755
Stainless steel fitting 12 mm - R 3/8, grease-less	1034642
Stainless steel 90° elbow D 12 - D 12, grease-less	1022462
Stainless steel pressure relief valve, Adjustable pressure range 0.07 – 2 bar, Connection size: 1/4" NPT, 2 additional inputs for connecting 2 pressure gauges.	1029032
Stainless steel back pressure valve for OZMa 1 – 3 A and OZMa 4 – 6 O, adjustable pressure range 0.5 – 10 bar, connector G 3/4" external thread, grease-free	1039408
Spare parts kit for back pressure valve order no. 1039408	1039410
Stainless steel back pressure valve for OZMa 4 – 6 A, adjustable pressure range 0.5 – 10 bar, connector G 1 1/4" external thread, grease-free	1039409
Spare parts kit for back pressure valve order no. 1039409	1039411

### 2.6.4

### Accessories for OZONFILT® OZMa

The remote control module for OZMa systems enables bidirectional communication with the system control. Communication takes place optionally via a LAN, MPI or USB communication interface.

	Order no.
Remote control module for OZMa systems	On request

## 2 Ozone Systems OZONFILT®

### 2.6.5

#### Bleed Valves

Suitable for types	Connector	Pressure bar	Order no.
<b>OZVa 1 – 7</b>	R 3/4" internal x R 1/2" external	0 – 6.0	302525
<b>OZMa 1 – 30/OZMa 1A</b>	R 1" internal x R 1/2" external	0 – 2.0	302526
<b>OZMa 2-4A / OZMa 4-60</b>	R 1" internal x R 3/4" external	0 – 2.0	303845

Bleed valves made of stainless steel 1.4571 in ozone-resistant version for mounting on reaction tanks.

### 2.6.6

#### Residual Ozone Gas Destructor

Residual ozone gas destruction is used to remove traces of ozone gas from the exhaust air coming from the reaction tank. Because the exhaust air from the reaction tank still contains water, the pipework should be suitably routed so as to ensure that the water is drained off at the inlet side.

A suitable drainage connection should be provided here too as the exhaust air after the residual ozone gas destructor is still up to 100% saturated with water vapour, and because small temperature fluctuations, even on the outlet side, can lead to flowback of condensate.

The exhaust air from any downstream filter plant that may be fitted can also be routed via this ozone gas destruction unit.

#### PVC version

Residual ozone destructor based on activated charcoal granules in a PVC housing.

	Type	Ozone quantity g/h	Order no.
<b>Residual ozone destructor 3 L</b>	10	10	879022
<b>Residual ozone destructor 14 L</b>	40	40	1004267
<b>Residual ozone destructor 30 L</b>	100	100	879019
<b>Residual ozone destructor 60 L</b>	200	200	879018

#### Note:

The stated ozone quantities refer to quantities added to the raw water. The residual ozone destructor is designed for the normal residual ozone concentration found in swimming pool applications. It should only be used in plants with air as operating gas and a maximum added quantity of 1.5 g of ozone/m<sup>3</sup> treated water.

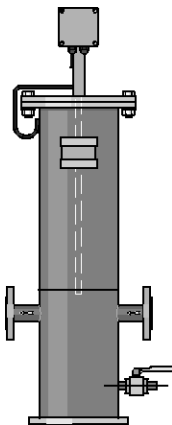
#### Stainless steel version

Residual ozone destructor based on a maintenance-free MnO catalytic converter with integrated heating, 230 V, 50-60 Hz. Connections Rp 1/2" or flanges to DIN 2642, PN10. Types 18 to 110 m<sup>3</sup>/h also fitted with Rp 1/2" ball valve as condensate drain.

Max. gas flow m <sup>3</sup> /h	Heating power W	Dimensions H x W x D mm	Connector	Order no.
<b>1.5</b>	100	700 x 110 x 180	Rp 1/2"	1018440
<b>8.0</b>	100	735 x 110 x 235	Rp 1/2"	1018406
<b>18.0</b>	140	1,154 x 275 x 240	DN 25	1019155
<b>28.0</b>	140	1,154 x 300 x 259	DN 25	1021037
<b>40.0</b>	500	1,156 x 330 x 264	DN 25	1026335
<b>73.0</b>	500	1,158 x 400 x 320	DN 32	1019971
<b>110.0</b>	500	1,160 x 450 x 375	DN 40	1027238

#### Note:

The catalytic residual ozone destructor should only be used in chlorine-free gas flows. The PVC version should therefore be used for swimming pool applications.



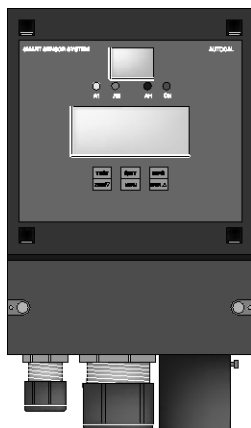
pk\_7\_073  
Residual ozone destructor

## 2 Ozone Systems OZONFILT®

### 2.6.7

#### Room Air Monitor

##### Gas warning device GMA 36 – ozone and oxygen



pk\_7\_004\_1  
Gas warning devices GMA 36

Calibratable gas warning device with digital display of the detected gas concentration. 2 relay outputs for issue of infringements of warning and alarm thresholds, to switch external alarm sounder and for interlocking with the ozone system. The warning message relay is self-resetting, the alarm relay is a latching type and should be acknowledged at the device. 1 self-resetting relay for connection to an alarm horn is switched in the event of fault conditions and when the alarm limit is exceeded.

The ozone sensor responds to all strongly oxidising gases, hence it responds to chlorine gas or chlorine dioxide too.

The GMA 36 oxygen warning device is intended for installations where an unacceptably high oxygen enrichment of the ambient air is possible.

##### Technical Data

Type		Ozone	Oxygen
Warning at approx.	ppm/vol%	0.3	23.0
Alarm at approx.	ppm/vol%	0.5	25.0
Permissible ambient temperature	°C	-15...45	-15...45
Protection class housing		IP 54	IP 54
Dimensions (without PGs, without sensor) H x W x D	mm	247 x 135 x 95	247 x 135 x 95
Supply	V/Hz	85 – 264/50 – 60	85 – 264/50 – 60
Power consumption	W	5	5
Warm-up phase max.	s	150	20
"Warning" relay contact, self-resetting	V/A	230/1	230/1
"Alarm" relay contact, latching	V/A	230/1	230/1
"Horn" relay contact, latching, can be acknowledged	V/A	230/1	230/1
Sensor measuring principle		electrochemical	electrochemical
Sensor service life (depending on environmental cond.)	years	2–3	2–3

	Type	Order no.
Gas warning device GMA 36	Ozone	1023155
Gas warning device GMA 36	Oxygen	1023971

##### Spare Parts

	Order no.
Replacement sensor for chlorine, chlorine dioxide, ozone	1023314
Replacement sensor for oxygen	1023851
Replacement sensor for gas warning devices in the Life CGM range	1003009

##### Mounting kit

	Order no.
Mounting kit for direct mounting of the CGM 1060 and GMA 36 ozone warning devices on the housing of the OZVa plants	1004248
Support bracket for mounting kit for all types of OZVa except OZVa 1/2 with transparent mixing system	1005854

##### Warning light and horn

Combined horn and red warning lamp. IP 33 enclosure made of impact-resistant ABS. Dome made of clear polycarbonate. Connected load: 230 V AC, 50 mA. Supplied complete with B 15 d / 7 watt bulb.

	Order no.
Warning light and horn	1010508



## 2 Ozone Systems OZONFILT®

### Gas tracing pump

Hand operated, non-continuously working test tube pump for fast and accurate measurement of ozone gas. Complete with 10 no. ozone gas test tubes 0.05-5 ppm in carrying case.

	Order no.
Gas tracing pump	1025533

### Potassium iodide starch paper

Roll with 4.8 m test strip for leak detection on pipelines carrying ozone gas.

	Order no.
Potassium iodide starch paper	1025575

### 2.6.8

### Cooling Water Heat Exchanger

A heat exchanger can be used as an alternative to the use of fresh water as cooling water. The cooling water is fed through the heat exchanger and ozone system in a circuit. The cooling water heat exchanger discharges the heat to the surroundings.

#### Technical Data

- Single circuit system with tank open to the atmosphere
- Air-cooled refrigeration unit
- Integral evaporator
- Plastic tank with water level display and level switch with alarm contact
- Microprocessor-controlled temperature controller with digital display
- Integral pump
- Manometer
- Powder-coated exterior housing

Order no:		1043847	1043848	1043849	1043850
Refrigerant	CFC-free	R404a	R404a	R134a	R134a
Useful cooling power at 20 °C	kW	2.5	3.6	4.9	6.0
Working range	°C	+10/+25	+10/+25	+5/+25	+5/+25
Pump	Type	P16-YA62D	P16-YA62D	P3-BR11B	P3-BR11B
Pump output	l/min	5.0	5.0	16.7	18.3
Pump pressure	bar	3.0	3.0	2.2	2.1
Content	l	13	13	30	30
Water connectors	Inch	< 1/2 " internal thread >		< G 3/4 " internal thread >	
Power consumption	kW	1.6	2.2	2.2	1.8
Mains connection	V/Hz	230/50 – 60	230/50 – 60	400/50	400/50
Weight	kg	35	47	123	125
Outside dimensions (WxDxH)	mm	480x745x445	480x745x445	580x650x920	580x650x920

	Suitable for type	Order no.
Cooling water heat exchanger	OZVa 1 – 7, OZMa 1 – 2 A, OZMa 1 – 2 O	1043847
	OZMa 3 A, OZMa 3 O, OZMa 4 O	1043848
	OZMa 4 A, OZMa 5 A, OZMa 5 O	1043849
	OZMa 6 A, OZMa 6 O	1043850

### 2.6.9

### Personal Protection Needs

#### Gas mask

Ozone-resistant, full-face respiratory protective mask with panoramic window shield to EN 136 Class 3. Medium size with EN 148-1 threaded pipe connection. Complete with combination filter NO-P3 and carrying case.

	Order no.
Gas mask	1025574

## 2 Ozone Systems OZONFILT®

### Warning label

Warning label in accordance with the "Guidelines for the use of ozone for water treatment" ZH 1/474, issued by the central office of the industrial safety associations. Version supplied as a combined adhesive label with markings as follows: warning sign, ozone plant room indication and prohibited activity signs.

	Order no.
Warning label	740921

### Emergency stop switch

For installation near the door of the ozone plant room. IP 65 PVC enclosure.

	Order no.
Emergency stop switch	700560

### 2.6.10

### Overvoltage Protection

Overvoltage protection for OZONFILT® systems operated at 230 V 50-60 Hz.

The external overvoltage protection is intended for the operating case where the device internal protection is insufficient for surge voltages of 1 kV between the conductors and of 2 kV to earth. To protect the system when the supply mains is prone to power transients an overvoltage trip can be fitted as a low protection surge arrester to significantly increase the stability of the ozone systems.

Whether the low protection surge arrester requires further measures such as medium and main protection can only be determined by thorough investigation of the voltage behaviour on site.

	Order no.
Fine protection PT 2-DE IS 230 IAC	733010

### 2.6.11

### Replacement Plug-in Insert After Tripping

	Order no.
Replacement plug-in insert PT 2-DE / S 230 / AC - ST	733011

## 3 Bello Zon® Chlorine Dioxide Systems

### 3.1 Chlorine Dioxide in Water Treatment

Chlorine dioxide is an exceptionally reactive gas, which is not stored due to its instability but rather must only be manufactured to meet requirements at its place of use in special systems.

Chlorine dioxide has a number of advantages over chlorine, which is predominantly used in the disinfection of water. Thus for instance, the disinfection effect does not reduce with increasing pH-value, as is the case with chlorine, rather it increases slightly. Chlorine dioxide remains stable in pipework systems over long periods of time and provides microbiological protection of the water for many hours and up to several days. Ammonia or ammonium, which cause considerable chlorine loss, do not react with chlorine dioxide so that the metered chlorine dioxide remains fully available for disinfection purposes. Chlorophenols, strongly smelling compounds, which result from the chlorination of water etc., are not formed with chlorine dioxide. Trihalogenmethanes (THMs), a substance class, which, like their main representative, chloroform, is suspected of being carcinogens, result from the reaction of chlorine with dissolved matter naturally found in water (humic acids, fulvic acids, etc.). If chlorine dioxide is used as an alternative disinfectant these substances are not produced.

#### Advantages of chlorine dioxide:

- Disinfectant effect regardless of the pH value.
- Excellent depositing effect, thanks to long-term stability in the pipework.
- Degradation of biofilms in pipework and tanks, thus reliable protection of entire water systems against legionella attack.
- No reaction with ammonia or ammonium.
- No formation of chlorophenols and other strongly smelling compounds that can be produced during water chlorination.
- No formation of trihalomethanes (THM) or other chlorinated hydrocarbons, no increase in AOX values.

#### 3.1.1 Chlorine Dioxide Applications

With every new project, our engineers draw on experience that we have accumulated since 1976 in the following applications:

##### Municipal potable water and waste water companies

- Disinfection of potable water
- Disinfection of waste water

##### Hotels, hospitals, care homes, sports centres etc.

- Combating legionella in cold and hot water systems
- Water disinfection in the cooling towers of air conditioning systems
- Disinfection of swimming pool filters

##### Food and beverage industry

- Disinfection of product and raw water
- Bottle cleaning, rinsers and pasteurisers
- Cold-sterile bottling systems
- Disinfectant in CIP systems
- Water vapour treatment (condensation) in the milk industry
- Water treatment for fruit, vegetable, seafood, fish and poultry processing

##### Market gardening

- Disinfection of irrigation water in plant cultivation

##### Industry

- Cooling water treatment
- Combating legionella in cooling water circuits
- Disinfection of process water
- Removal of odorous substances in air scrubbers
- Slime control in the paper industry

## 3 Bello Zon® Chlorine Dioxide Systems

### 3.1.2

#### Bello Zon® System Technology

Bello Zon® chlorine dioxide generation and metering systems use the chlorite/acid process. These systems generate a chlorine-free chlorine dioxide solution through the reaction of sodium chlorite solution with hydrochloric acid.

Decades of experience with Bello Zon® chlorine dioxide systems have shown that using the selected process parameters can achieve an excellent output of up to 99% (relative to the stoichiometric ratio).

In most applications, metering is proportional to the flow, i.e. the flow depends on the signal from an inductive or contact flow meter or is performed in parallel to a feed pump.

In circulation systems, such as bottle washing machines, cooling circuits, etc., where a chlorine dioxide loss need only be made good, the addition can also be controlled based on a measurement of chlorine dioxide.

#### Features

- Precise and reproducible chlorine dioxide production, thanks to the use of calibratable metering pumps for the starting chemicals.
- Convenient easy operation, thanks to microprocessor control with display of all relevant operating parameters and error messages in plain text.
- Display of the current production quantity as well as the flow rate of the connected flow meters with CDV and CDK.
- Integrated measurement of  $\text{ClO}_2$  and chlorite plus control of  $\text{ClO}_2$  with CDV and CDK.
- Highest safety level provided as standard, thanks to construction and operation in accordance with DVGW specifications W 224 and W 624.

#### Bello Zon® CDL

Innovative process control provides excellent long-term stability of the chlorine dioxide produced 0-120 g/h chlorine dioxide/h and for flows of up to 600<sup>3</sup>/h

#### Bello Zon® CDE

Bello Zon® CDEa is winning over customers, thanks to its ultra-simple operation and clearly laid out construction with standard components.

5-140 g/h chlorine dioxide. Max. flow at 0.2 ppm  $\text{ClO}_2$  metering is 700 m<sup>3</sup>/h

#### Bello Zon® CDV

Bello Zon® CDVc is the convenient system for the treatment of average to large volumes of water with chlorine dioxide.

1 to 2,000 g/h chlorine dioxide. Max. flow at 0.2 ppm  $\text{ClO}_2$  metering is 10,000 m<sup>3</sup>/h

#### Bello Zon® CDK

Bello Zon® CDKc is a deluxe system, persuading customers with its safe handling of chemicals and maximum possible potential savings.

8-12,000 g/h chlorine dioxide. Max. flow at 0.2 ppm  $\text{ClO}_2$  metering is 60,000 m<sup>3</sup>/h

#### ProMinent provides all the advice needed for the safe operation of a chlorine dioxide system:

- Evaluation of the situation on site by trained, expert field sales staff.
- Interpretation of water analysis.
- Project planning of the system.
- Commissioning and system maintenance by our trained service technicians.

## 3 Bello Zon® Chlorine Dioxide Systems

### 3.2 Performance Overview of Chlorine Dioxide Systems

Type [g/h]	CDLb	CDEa	CDVc	CDKc
15.000				
10.000				
5.000				8 – 12.000
1.000			1 – 2.000	
500				
100	0 – 120	5 – 140		
50				
10				
5				

#### Manufacturing method

Chlorite-Acid (depleted) 7,5 % NaClO <sub>2</sub> + 9 % HCl	Chlorite-Acid (depleted) 7,5 % NaClO <sub>2</sub> + 9 % HCl	Chlorite-Acid (depleted) 7,5 % NaClO <sub>2</sub> + 9 % HCl	Chlorite-Acid (concentrated) 24,5 % NaClO <sub>2</sub> + 25-37 % HCl
--	--	--	---

#### Application

Legionella combating	■			
Food and beverages industry	■	■	■	
Municipal drinking and waste water treatment	■	■	■	■
Industry (cooling tower, waste/ process water, etc.)	■	■	■	■

P\_PMA\_BEZ\_0125\_SW

Chlorine dioxide is establishing itself more and more as a universal disinfectant in applications such as the disinfection of drinking water and industrial water, washing food or in the treatment of cooling water and waste water. Its effect independent of the pH value of the water ensures systems remain free of biofilms.

- Efficient disinfection in connection with excellent eco-compatibility
- Safe and reliable plant technology
- Worldwide availability of know-how and service

## 3 Bello Zon® Chlorine Dioxide Systems

### 3.3 Questionnaire on the Design of a Chlorine Dioxide System

#### Use of the chlorine dioxide plant:

- |  |  |
|--|--|
| <input type="checkbox"/> for disinfection of | <input type="checkbox"/> Drinking water                          |
|  | <input type="checkbox"/> Industrial water                        |
|  | <input type="checkbox"/> Process water in the food industry      |
|  | <input type="checkbox"/> Waste water                             |
|  | <input type="checkbox"/> Cooling water                           |
|  | <input type="checkbox"/> _____                                   |
| <input type="checkbox"/> for oxidation of    | <input type="checkbox"/> Iron, manganese, nitrite, sulphide etc. |
|  | <input type="checkbox"/> Swimming pool water                     |
|  | <input type="checkbox"/> Odour                                   |
|  | <input type="checkbox"/> _____                                   |
| <input type="checkbox"/> _____               |  |

#### Water values:

Max. water flow rate	_____ m <sup>3</sup> /h	Maximum water pressure	_____ bar
Water flow rate	<input type="checkbox"/> constant	<input type="checkbox"/> fluctuating from	_____ m <sup>3</sup> /h to _____ m <sup>3</sup> /h
pH value	_____	Iron (Fe <sup>2+</sup> )	_____ mg/l
Temperature	_____ °C	Manganese (Mn <sup>2+</sup> )	_____ mg/l
Solid fraction	_____ mg/l	Nitrite (NO <sub>2</sub> <sup>-</sup> )	_____ mg/l
Alkalinity K <sub>S4,3</sub>	_____ mmol/l	Sulphide (S <sup>2-</sup> )	_____ mg/l
		TOC (total organic carbon)	_____ mg/l

#### Response time to application:

\_\_\_\_\_ m<sup>3</sup> volume reaction tank or \_\_\_\_\_ minutes residence time in entire system.

#### Type of metering:

- ☐ constant
- ☐ flow-proportional
- ☐ depending on measured value

Desired amount of metering: \_\_\_\_\_ mg/l

Desired concentration after chlorine dioxide metering: \_\_\_\_\_ mg/l

#### Other requirements:

\_\_\_\_\_

\_\_\_\_\_

## 3 Bello Zon® Chlorine Dioxide Systems

### 3.4 Bello Zon® Chlorine Dioxide Systems Type CDLb

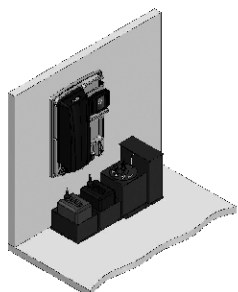
**Innovative process control provides excellent long-term stability of the chlorine dioxide produced**

**0-120 g/h chlorine dioxide/h and for flows of up to 600<sup>3</sup>/h**

The chlorine dioxide system Bello Zon® CDLb works in a safe and reliable batch operation. The integral or separate storage module is suitable as a solution for both continuous and intermittent metering tasks.



P\_PMA\_BEZ\_0077\_SW



P\_PMA\_BEZ\_0122\_SW

The chlorine dioxide system Bello Zon® CDLb uses the chlorite/acid process. A chlorine-free chlorine dioxide solution is generated from a sodium chlorite solution using hydrochloric acid in a batch process. Thanks to the innovative reactor design and gradual process flow, the production of chlorine dioxide is exceptionally safe in this manner. Depending on the type, the system can produce up to 120 g chlorine dioxide per hour. This is then buffered in an integral or separate receiver module at a concentration of 1,000 or 2,000 mg/l. Thanks to the 60 g of chlorine dioxide buffered in the separate receiver module, these systems need not be dimensioned according to their peak load but rather based on their mean consumption. This drastically reduces investment costs compared with conventional systems.

The innovative process produces a chlorine dioxide solution of exceptional long-term stability and provides excellent efficiency of over 90% in the chlorine dioxide reaction. No chlorine dioxide can escape from the system due to the closed gas transport system, guaranteeing economical, environmentally friendly operation with minimal use of chemicals. The modular construction of the system means it is suitable for a range of different applications. Possible applications of the chlorine dioxide system Bello Zon® CDLb are primarily in the prevention of legionella and in disinfection in the food and beverage industry. Other applications are in cooling and potable water treatment and in swimming pool filter disinfection.

#### Your benefits

- Safe process control
- No loss of chlorine dioxide due to closed gas transport system
- Excellent stability of the chlorine dioxide solution
- Minimal investment costs
- Operation of several points of injection
- Filter disinfection
- Complies with the high standards stipulated in W 224 and W 624 DVGW German Association for Gas and Water data sheets

#### Technical details

<b>Voltage supply</b>	100 – 230 V, 50/60 Hz (16 A)
<b>Inputs</b>	2 freely configurable digital inputs for the functions Pause, High metering, Intermittent metering or Manual metering, as well as an external collective malfunction signal 4 digital inputs for monitoring (warning / empty message) the chemical supply 1 digital input for contact water meter 0.25-20 Hz 1 frequency input for water meter 10-10,000 Hz
<b>Outputs</b>	1 operating signal relay 1 alarm signal relay 1 warning signal relay 1 voltage output +5 V as supply voltage for a water meter with Hall sensor
<b>Operating fluids</b>	Sodium chlorite 7.5%, purity according to EN 938 Hydrochloric acid 9% purity according to EN 939 Potable water
<b>Enclosure rating</b>	IP 65

#### Field of application

- Prevention of legionella in hotels, hospitals etc.
- Disinfection in the food and beverage industry (bottle rinsers, CIP (cleaning in place), bottle washing machines, washing of fruit and vegetables)
- Market gardening (irrigation water and sprinkler irrigation water)
- Treatment of cooling water and potable water
- Swimming pools (filter backwashing and prevention of legionella)

### 3 Bello Zon® Chlorine Dioxide Systems

#### Technical Data

Type	Generation capacity g/h	Solution concentration mg/l	Capacity l/h	Dimensions (approx.) H x W x D (mm) mm	Weight kg
CDLb 06	6*	1000	8	1,236 x 878 x 306	41
CDLb 12	12*	2000	8	1,236 x 878 x 306	42
CDLb 22	22*	2000	13	1,236 x 878 x 306	46
CDLb 55	55* 1)	2000	30	1,550 x 800 x 345	73
CDLb 120	120** 1)	2000	**	1,300 x 880 x 425	55

\* Option: Integrated receiver tank and integrated metering pump with suitable capacity up to 7 bar back pressure.

\*\* With external receiver module and separate metering pump

1) Without cover

#### Interfaces

Type CDLb		6 g/h	12 g/h	22 g/h	55 g/h	120 g/h
Water inlet	ProMinent/Neutral	12-9	12-9	12-9	12-9	Di20/DN15
	Swiss	Di20/DN15	Di20/DN15	Di20/DN15	Di20/DN15	Di20/DN15
Connector dimensions of metering pump for acid and chlorite		6x4	6x4	6x4	6x4	6x4
ClO <sub>2</sub> outlet	With internal storage/pump/multifunctional valve	6-4	6-4	12-9	12-9	
	With internal storage tank/pump	6-4	6-4	12-9	12-9	
	With internal storage tank, without pump	6-4	6-4	8-5	12-9	
	With external storage tank, without pump (reactor outlet)	12-9	12-9	12-9	12-9	Di25/DN20
	External storage tank (suction lance connector)	Di25/DN20	Di25/DN20	Di25/DN20	Di25/DN20	Di25/DN20

#### 3.4.1 Identity code ordering system for chlorine dioxide systems Bello Zon® CDLb

CDLb	ClO <sub>2</sub> production capacity
02	CDLb 06 = 6 g/h
04	CDLb 12 = 12 g/h
06	CDLb 22 = 22 g/h
08	CDLb 55 = 55 g/h, cover not included, see Accessories
10	CDLb 120 = 120 g/h, cover not included, see Accessories
<b>Equipment</b>	
0	With receiver tank, pump and multifunctional valve (not with CDLb 120) *
1	With receiver tank and pump (not with CDLb 120) *
2	With receiver tank, without pump (not for CDLb 120)
3	With 30 l receiver module, without pump
<b>Design</b>	
P	ProMinent
S	Swiss, DN 15 water connection, rigid piping
N	Neutral
<b>Operating voltage</b>	
0	230 V, 50/60 Hz
1	115 V, 50/60 Hz
<b>Suction lance, suction assembly</b>	
0	None
1	With suction lance
2	With suction lance and collecting pan
3	With suction lance, collecting pan, angle valve and PE hose 12x9 (10 m)
<b>Pre-set language</b>	
DE	german
EN	english
ES	spanish
FR	french
IT	italian
PL	polish
CZ	czech

\* ClO<sub>2</sub> discharge pumps are not equipped with a fault indicating relay. It is available as an accessory.

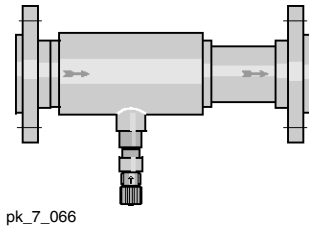


## 3 Bello Zon® Chlorine Dioxide Systems

### 3.4.2

### Accessories and Maintenance Sets for Chlorine Dioxide Systems Bello Zon® CDLb

#### Point of injection



Corrosion-resistant point of injection made of PVC-U or PVC-C for warm water applications with integrated mixer elements and maintenance-free PVDF metering valve.

	Material	Installation length mm	Order no.
<b>CDL DN 50 point of injection</b>	PVC-U	450	1027611
<b>CDL DN 65 point of injection</b>	PVC-U	400	1026490
<b>CDL DN 80 point of injection</b>	PVC-U	400	1027612
<b>CDL DN 100 point of injection</b>	PVC-U	470	1034693
<b>CDL DN 125 point of injection</b>	PVC-U	550	1047692
<b>CDL DN 150 point of injection</b>	PVC-U	680	1047693
<b>CDL DN 65 point of injection</b>	PVC-C	400	1029326
<b>CDL DN 80 point of injection</b>	PVC-C	400	1029327

#### Temperature/pressure resistance – metering station CDL

Water temperature (°C)	Maximum permissible operating pressure (bar)	
	PVC-U	PVC-C
40	12	12
50	7	9.5
60	4.5	7.5
70	–	5
80	–	3

#### Back pressure valve and angle valve

Back pressure valve type MFV with wall bracket and 6 x 4 mm hose connection is ideal for fitting in the chlorine dioxide metering line. Angle valve for the transition from the customer's pipeline to the 12x9 hose connector on the CDLb.

	Order no.
<b>MFV pressure relief valve with wall mounting bracket</b>	1027652
<b>Angle valve D15 G 1/2" brass</b>	1046115

#### Fault indicating relay for the ClO<sub>2</sub> pump

Fault indicating relay retrofit kit for the ClO<sub>2</sub> discharge pump

	Order no.
<b>Relay 3-pin</b>	1029309

#### Hood for CDLb

	Order no.
<b>Hood for CDLb 55 PE black</b>	1045889
<b>Hood for CDLb 120 PE black</b>	1045890

#### Safety collecting pan for chemical containers

Collecting pan with two separate compartments - 1 No. 25 l Bello Zon® acid and 1 No. 10 l Bello Zon® chlorite chemical container.

Dimensions (HxWxD): 290 x 700 x 350 mm

	Order no.
<b>Safety collecting pan CDLa</b>	1026744

## 3 Bello Zon® Chlorine Dioxide Systems

### Safety collecting pan for chemical tanks (CDLb)

Collecting pan for a 25 l Bello Zon® acid or Bello Zon® chlorite chemical canister.

Dimensions (HxWxD): 266 x 400 x 500 mm

	Order no.
Safety collecting pan CDLb	791726

### Service kits for CDLa

The kits contain all parts subject to wear and tear that need to be replaced at regular service intervals. The 1-year kit should be used every year and the 3-year kit in addition every 3 years.

	Order no.
1-year service kit for pressure relief valve	1029442

### For CDLa with ClO<sub>2</sub> pump

	Type	Order no.
1-yearly maintenance set	CDL 5	1027263
3-yearly maintenance set, 230 V	CDL 5	1049659
1-yearly maintenance set	CDL 10	1031549
3-yearly maintenance set, 230 V	CDL 10	1049665
3-yearly maintenance set, 100 V	CDLa 5	1049655
3-yearly maintenance set, 115 V	CDLa 5	1049657
3-yearly maintenance set, 100 V	CDLa 10	1049661
3-yearly maintenance set, 115 V	CDLa 10	1049663

### For CDLa without ClO<sub>2</sub> pump

	Type	Order no.
1-yearly maintenance set	CDL5	1042829
3-yearly maintenance set, 230 V	CDL5	1049660
1-yearly maintenance set	CDL10	1042830
3-yearly maintenance set, 230 V	CDL10	1049666
3-yearly maintenance set, 100 V	CDLa 5	1049656
3-yearly maintenance set, 115 V	CDLa 5	1049658
3-yearly maintenance set, 100 V	CDLa 10	1049662
3-yearly maintenance set, 115 V	CDLa 10	1049664

### Maintenance sets for Bello Zon® CDLb

#### For CDLb with receiver tank, pump and multifunctional valve

	Type	Order no.
Annual maintenance set	CDLb 06, CDLb 12	1044484
Annual maintenance set	CDLb 22	1044501
Annual maintenance set	CDLb 55	1044509
3-yearly maintenance set, 230 V	CDLb 06, CDLb 12	1044494
3-yearly maintenance set, 230 V	CDLb 22	1044502
3-yearly maintenance set, 230 V	CDLb 55	1044510
3-yearly maintenance set, 115 V	CDLb 06, CDLb 12	1045212
3-yearly maintenance set, 115 V	CDLb 22	1045216
3-yearly maintenance set, 115 V	CDLb 55	1045220

### 3 Bello Zon® Chlorine Dioxide Systems

#### For CDLb with receiver tank and pump

	Type	Order no.
Annual maintenance set	CDLb 06, CDLb 12	1044495
Annual maintenance set	CDLb 22	1044503
Annual maintenance set	CDLb 55	1044511
3-yearly maintenance set, 230 V	CDLb 06, CDLb 12	1044496
3-yearly maintenance set, 230 V	CDLb 22	1044504
3-yearly maintenance set, 230 V	CDLb 55	1044512
3-yearly maintenance set, 115 V	CDLb 06, CDLb 12	1045213
3-yearly maintenance set, 115 V	CDLb 22	1045217
3-yearly maintenance set, 115 V	CDLb 55	1045221

#### For CDLb with receiver tank without pump

	Type	Order no.
Annual maintenance set	CDLb 06, CDLb 12	1044497
Annual maintenance set	CDLb 22	1044505
Annual maintenance set	CDLb 55	1044513
3-yearly maintenance set, 230 V	CDLb 06, CDLb 12	1044498
3-yearly maintenance set, 230 V	CDLb 22	1044506
3-yearly maintenance set, 230 V	CDLb 55	1044514
3-yearly maintenance set, 115 V	CDLb 06, CDLb 12	1045214
3-yearly maintenance set, 115 V	CDLb 22	1045218
3-yearly maintenance set, 115 V	CDLb 55	1045222

#### For CDLb with 30 l receiver module without pump

	Type	Order no.
Annual maintenance set	CDLb 06, CDLb 12	1044499
Annual maintenance set	CDLb 22	1044507
Annual maintenance set	CDLb 55	1044515
Annual maintenance set	CDLb 120	1044517
3-yearly maintenance set, 230 V	CDLb 06, CDLb 12	1044500
3-yearly maintenance set, 230 V	CDLb 22	1044508
3-yearly maintenance set, 230 V	CDLb 55	1044516
3-yearly maintenance set, 230 V	CDLb 120	1044519
3-yearly maintenance set, 115 V	CDLb 06, CDLb 12	1045215
3-yearly maintenance set, 115 V	CDLb 22	1045219
3-yearly maintenance set, 115 V	CDLb 55	1045223
3-yearly maintenance set, 115 V	CDLb 120	1044519

## 3 Bello Zon® Chlorine Dioxide Systems

### 3.5

### Chlorine Dioxide Systems Bello Zon® CDLb with Multiple Points of Injection

The modular customised solution for several ClO<sub>2</sub> points of injection with only one generation system.

0-120 g/h preparation capacity with storage of up to 60 g of chlorine dioxide for peak metering.  
Max. flow at 0.2 ppm ClO<sub>2</sub> metering is 600 m<sup>3</sup>/h



Flexible solutions for the production and metering of ClO<sub>2</sub> adapted to the tasks, requirements and expected pricing by our customers. Perfectly coordinated modular chlorine dioxide system, which can operate up to 6 points of injection.

Chlorine dioxide systems Bello Zon® CDLb for multiple metering are divided into three different concepts, enabling them to respond perfectly to our customers' demands.

The "Modular, loose components" concept consists of a system and all components that are needed for metering. They are provided as a kit for assembly on site. The second concept, "Modular, metering components pre-assembled on a panel" consists of a system and a metering panel on which all the metering components are mechanically and, optionally, electrically pre-assembled. The third concept, "Plug and Play on a stainless steel frame" consists of a stainless steel frame, on which the system and the metering components are mechanically and electrically assembled.

#### Your benefits

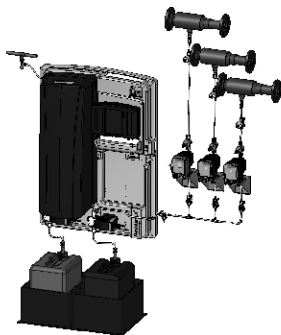
- Up to 6 points of injection can be mapped as standard The simplest provision of several points of injection according to requirements
- Cost-effective provision of several points of injection
- Outstanding operating safety and reliability, thanks to intrinsic process control
- Ultra-simple process integration

#### Technical details

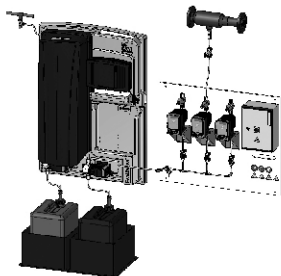
- External storage module
- Internal storage tank (only with the "Modular, loose components" and "Modular, metering components pre-assembled on a panel" concepts)
- Terminal box with optional main switch (only with the "Modular, metering components pre-assembled on a panel" concept)
- Stainless steel cabinet with main switch and emergency relay (only with the "Plug and Play on stainless steel frame" concept)

#### Field of application

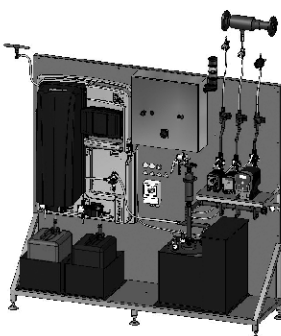
- All applications which require more than one point of injection
- Disinfection in the food and beverage industry. Especially with bottle rinsers, CIP (cleaning in place), bottle washing machine and in fruit / vegetable washing
- Legionella control and prevention, e.g. in hotels or hospitals (cold and hot water metering)
- Market gardening: germ-free irrigation and sprinkler irrigation water
- Treatment of cooling water and potable water
- Filter disinfection, e.g. in swimming pools



P\_PMA\_BEZ\_0022\_SW1  
Concept 1



P\_PMA\_BEZ\_0021\_SW1  
Concept 2



P\_PMA\_BEZ\_0020\_SW1  
Concept 3

## 3 Bello Zon® Chlorine Dioxide Systems

### 3.6

#### Chlorine Dioxide System Bello Zon® CDEa

**Bello Zon® CDEa is winning over customers, thanks to its ultra-simple operation and clearly laid out construction with standard components.**

**5-140 g/h chlorine dioxide. Max. flow at 0.2 ppm ClO<sub>2</sub> metering is 700 m<sup>3</sup>/h**



Chlorine dioxide system, which continuously produces ClO<sub>2</sub> according to the acid/chlorite method with diluted chemicals. Extremely simple operation, clear construction, analogue control, manual control or via contacts.

A ready-to-use chlorine dioxide system for the continuous production and metering of chlorine dioxide with diluted chemicals. The emphasis is on ultra-simple operation and clearly laid out system design with standard components.

The stroke lengths of the metering pumps are continuously monitored. This rules out inadmissible operating statuses arising from incorrect pump stroke length adjustments.

The system is extremely easy to operate and, alongside a central Start-Stop key, also has colour-differentiated LEDs to display all the operating statuses.

The system can be controlled in an analogue or manual manner or via contacts

#### Your benefits

- Minimal training required thanks to extremely simple operation
- Minimal investment costs
- Short lead times
- Excellent operating safety
- Simple process integration

#### Technical details

##### Power supply

- 100-230 V, 50/60 Hz

##### Inputs

- 1 digital input for the Pause function
- 1 digital input for contact water meter 0.25-20 Hz
- 1 analogue input 0/4-20mA

##### Outputs

- 1 alarm signal relay
- 1 warning signal relay

##### Operating substances

- Sodium chlorite 7.5%, purity according to EN 938
- Hydrochloric acid 9% purity according to EN 939
- Particle-free water

##### Degree of protection

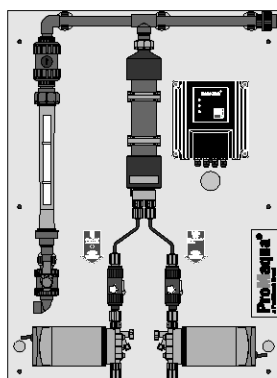
- IP 54

##### Bypass pipework

- DN 20

##### Field of application

- Municipal potable water and waste water treatment
- Industrial process and cooling water
- Disinfection in the food and beverage industry



P\_PMA\_BEZ\_0126\_SW1

### 3 Bello Zon® Chlorine Dioxide Systems

#### Technical Data

Type	Chlorine dioxide capacity*		Max. operating pressure **	Operating temp. °C	Connector size, chlorite and acid metering pumps	Dimensions H x W x D mm	Dimensions of the bypass connector DN	Weight kg
	min.-max./hour g/h	min./day g/d						
CDEa 45	5–45	16	7 / 8 **	15–40	6x4	958 x 700 x 195	20	21
CDEa 80	8–80	30	7 / 8 **	15–40	6x4	958 x 700 x 195	20	22
CDEa 140	14–140	50	7 / 8 **	15–40	8x5	1,200 x 700 x 195	20	24

\* The metering figures relate to 5 bar back pressure and an ambient temperature of 20 °C. The minimum capacity/per hour is based on the fact that when the system is operating at below 10 % of the nominal capacity, continuous metering is no longer possible, due to the then low pumping frequency of the metering pumps. Where systems are operating continuously, change the reactor content at least 2 x daily. Do not operate at below the specific minimal output/day.

\*\* 8 bar at maximum 35 °C ambient temperature

Subject to technical and design changes

Type	Order no.
CDEa 45	1047456
CDEa 80	1047457
CDEa 140	1047458

#### Scope of supply:

Bello Zon® CDEa systems are supplied connection-ready on a wall panel. Connection to the site bypass line is via DN 20 PVC threaded connectors with straight solvent unions. Order suction lances for the chemical pumps, safety collecting pans for the chemical drums and other accessories, like flushing equipment with a vacuum relief valve separately.

## 3 Bello Zon® Chlorine Dioxide Systems

### 3.7

### Chlorine Dioxide System Bello Zon® CDVc

**Bello Zon® CDVc is the convenient system for the treatment of average to large volumes of water with chlorine dioxide.**

**1 to 2,000 g/h chlorine dioxide. Max. flow at 0.2 ppm ClO<sub>2</sub> metering is 10,000 m<sup>3</sup>/h**



Chlorine dioxide system for monitoring and metering chlorine dioxide and diluted chemicals. Maximum output and safety due to special reactor concept. Bello Zon® CDVc can be easily and safely integrated into any water treatment process.

Continuous water treatment using the chlorine dioxide system Bello Zon® CDVc can be simply and safely integrated into any process. The special reactor concept generates chlorine dioxide safely and simply with maximum output.

Food-compatible PVDF is used instead of PVC generally used in the industry. This results in improved operating safety and reliability and improved purity of the chlorine dioxide generated. The central system controller manages the precise production of the chlorine dioxide. All parameters relevant for water treatment are recorded and logged.

The stroke lengths of ProMinent® metering pumps are monitored online. This rules out hazardous operating statuses arising from incorrect pump stroke length adjustments.

The precise production of chlorine dioxide is managed by the central system control. Chlorine dioxide, chlorite, pH or redox potential sensors DULCOTEST® are directly connected to the two mA inputs. The chlorine dioxide in the treated water, as well as its main by-product chlorite, is thus monitored and documented online. The chlorine dioxide concentrations in the water can be adjusted automatically depending on the measurement by the integrated PID controller.

The integrated data logger documents all status messages and measured values, which the screen writer then visualises on the clear colour display.

The systems meet all the requirements of the DVGW specifications W 224 and W 624 with regard to construction and operation and are designed for operation with diluted chemicals Bello Zon® chlorite (7.5% NaClO<sub>2</sub>) and acid (9% HCl).

#### Your benefits

- Efficient operation, thanks to production, metering and monitoring of ClO<sub>2</sub> with just one system
- Maximum operating safety and purity of the ClO<sub>2</sub> produced through the use of PVDF reactors and stroke length-monitored pumps
- No need for external control due to integrated measuring and control technology
- Perfect quality management, thanks to integrated storage of all operating parameters and measured values
- Automatic monitoring of operating parameters and maintenance intervals
- Simple and safe operation, thanks to clear navigation in plain text

#### Technical details

##### Power supply

- 100-230 V, 50/60 Hz

##### Inputs

- 2 freely configurable analogue inputs (0/4-20 mA)
- 7 digital inputs for monitoring
- 1 digital input for contact water meter 0.25-20 Hz
- 1 frequency input for water meter 10-10,000 Hz

##### Outputs

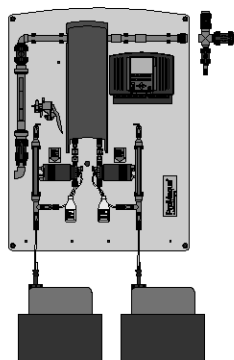
- 1 operating signal relay
- 1 alarm signal relay 1 warning signal relay
- Mains output for controlling the bypass pump
- 1 freely configurable analogue output (0/4-20 mA)
- 1 voltage output +5 V as supply voltage for water meter with Hall sensor

##### Operating substances

- Sodium chlorite 7.5%, purity according to EN 938
- Hydrochloric acid 9% purity according to EN 939
- Particle-free water

##### Degree of protection

- IP 65



P\_PMA\_BEZ\_0009\_SW  
CDVc 20-120 (figure shows optional configuration)

## 3 Bello Zon® Chlorine Dioxide Systems

### Field of application

- Municipal potable water and waste water treatment
- Industrial process and cooling water
- Disinfection in the food and beverage industry, above all with inlet water treatment.
- Market gardening: Germ-free irrigation water and sprinkler irrigation water

### Technical Data

Type	Chlorine dioxide dosing capacity*		Max. operating pressure**	Operating temp.	Dimensions*** H x W x D (mm)	Weight*** kg	Power consumption (max.) ****	
	min.-max./hour	min./day					230 V	115 V
	g/h	g/d		°C	mm		A	A
CDVc 20	1–20	6.4	8	10–40	1,344 x 1,002 x 200	26	2.7	0.9
CDVc 45	2–45	16.0	8	10–40	1,344 x 1,002 x 200	27	2.7	0.9
CDVc 120	6–120	40.0	8	10–40	1,344 x 1,002 x 200	28	2.7	0.9
CDVc 240	12–240	80.0	8	10–40	1,342 x 1,000 x 248	45	2.7	1.2
CDVc 600	30–600	140.0	8	15–40	1,711 x 1,200 x 273	75	2.8	1.4
CDVc 2000	100–2,000	468.0	5	15–40	1,900 x 1,400 x 370	120	4.1	3.2

\* The metering figures relate to 5 bar back pressure and an ambient temperature of 20 °C. The minimum capacity/per hour is based on the fact that when the system is operating at below 5% of the nominal power, continuous metering is no longer possible because of the correspondingly low pumping frequency of the metering pumps. When systems are not operating continuously, the reactor contents should be changed at least twice daily. The system should not, therefore, be operated below the stated minimum capacity/day.

\*\* At 35 °C ambient temperature

\*\*\* Without bypass pump, flushing valve and water supply line

\*\*\*\* 230 V values with bypass pump, 115 V values without bypass pump

### Interfaces

Type	Chlorine dioxide dosing capacity*		Hose connection dimensions of metering pumps	Dimensions of the bypass connector
	min.-max./hour	min./day		
	g/h	g/d		DN
CDVc 20	1–20	6.4	6x4	25
CDVc 45	2–45	16.0	6x4	25
CDVc 120	6–120	40.0	6x4	25
CDVc 240	12–240	80.0	8x5	25
CDVc 600	30–600	140.0	8x5	25
CDVc 2000	100–2,000	468.0	DN 10	40



## 3 Bello Zon® Chlorine Dioxide Systems

### 3.7.1 Identity Code Ordering System for CDVc Systems

CDVc	System type, metering output ClO <sub>2</sub>
02	CDVc 20= 20 g/h
04	CDVc 45= 45 g/h
06	CDVc 120= 120 g/h
08	CDVc 240= 240 g/h
10	CDVc 600= 600 g/h
14	CDVc 2000= 2,000 g/h
<b>Type</b>	
P	ProMaqua
<b>Power supply</b>	
U	100-230 V ± 10%, 50/60 Hz
A	230 V ± 10%, 50/60 Hz
B	100-115 V ± 10%, 50/60 Hz (not available for version with „bypass“ 04)
<b>Bypass version</b>	
02	PVC-U bypass with float flow meter and pump, <b>unit l/h</b>
04	Bypass PVC-U with float flow meter and bypass pump (not CDVc 2000), only selectable with operating voltage A and 50 Hz mains frequency, <b>unit l/h</b>
08	PVC-U bypass with float flow meter, <b>unit gpm</b>
<b>Calibration device</b>	
0	Without calibration device, but with measuring cylinder
1	With calibration device
<b>Suction lance, suction fitting, chemicals</b>	
0	None
1	Suction lance for 5-60 l container (only CDV 20-600)
2	Suction lance for 200 l container (only CDV 20-600)
3	Flexible suction fitting up to 5 m with two-phase level switch (only CDV 20-600 g/h)
4	Suction lance for 25 l tank with 2 drip pans 40 l without leakage sensor (only CDV 20-600 g/h)
<b>Mechanical design</b>	
0	Standard
<b>Preset language</b>	
DE	German
EN	English
FR	French
IT	Italian
ES	Spanish
<b>Control</b>	
0	Basic version *)
1	With measuring and control properties (only in connection with version inputs and outputs 1 or 3)
2	With measuring and control properties, data logger and screen recorder (only in connection with version inputs and outputs 1 or 3)
<b>Extended inputs and outputs</b>	
0	None
1	2 analogue inputs, freely configurable for controller output and flow rate
2	1 analogue output, freely configurable
3	2 analogue inputs and 1 analogue output, freely configurable
<b>Communication interfaces</b>	
0	Standard
<b>Approvals</b>	
01	CE-mark
<b>Temperature monitoring</b>	
0	Without temperature monitoring
<b>Hardware</b>	
0	Standard
<b>Software</b>	
0	Standard

- \* 4 contact inputs for leakage, external fault, high dosage and pause plus 3 contact outputs for operating, warning and alarm messages.  
1 digital and 1 frequency input for connection of flow meters.

## 3 Bello Zon® Chlorine Dioxide Systems

### 3.7.2

#### Maintenance Sets for Bello Zon® CDV Chlorine Dioxide Systems

The maintenance kits contain all of the wear parts that may need to be replaced during regular system maintenance.

##### Maintenance sets for CDVc systems

	Order no.
Maintenance set, complete CDVc 20	1034758
Maintenance set, complete CDVc 45	1034759
Maintenance set, complete CDVc 120	1034760
Maintenance set, complete CDVc 240	1034761
Maintenance set, complete CDVc 600	1034762
Maintenance kit, complete CDVc 2000 up to delivery date 03/2011	1034763
Maintenance kit, complete CDVc 2000 from delivery date 04/2011	1048801

##### Maintenance sets for CDVb systems

	Order no.
Maintenance set, complete CDVb 15	1022252
Maintenance set, complete CDVb 35	1022253
Maintenance set, complete CDVb 60	1022264
Maintenance set, complete CDVb 120	1022265
Maintenance set, complete CDVb 220	1024614

##### Maintenance sets for CDVa systems

	Order no.
Maintenance set, complete 230 V CDVa 35	791842
Maintenance set, complete 230 V CDVa 60	791913
Maintenance set, complete 230 V CDVa 120	791915
Maintenance set, complete 230 V CDVa 220	740824
Maintenance set, complete 230 V CDVa 400	740765
Maintenance set, complete 230 V CDVa 600	740826
Maintenance set, complete 230 V CDVa 2000	1005333
Maintenance set, complete 115 V CDVa 35	791860
Maintenance set, complete 115 V CDVa 60	791914
Maintenance set, complete 115 V CDVa 120	791916
Maintenance set, complete 115 V CDVa 220	740825
Maintenance set, complete 115 V CDVa 400	740819
Maintenance set, complete 115 V CDVa 600	740827
Maintenance set, complete 115 V CDVa 2000	1005344

Additional spare parts are listed in the operation instructions for the systems.

## 3 Bello Zon® Chlorine Dioxide Systems

### 3.8

#### Chlorine Dioxide System Bello Zon® CDKc

**Bello Zon® CDKc is a deluxe system, persuading customers with its safe handling of chemicals and maximum possible potential savings.**

**8-12,000 g/h chlorine dioxide. Max. flow at 0.2 ppm  $\text{ClO}_2$  metering is 60,000 m<sup>3</sup>/h**

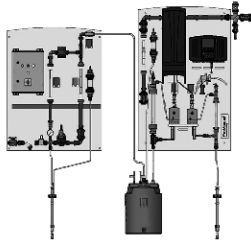


Chlorine dioxide system for continuous production, metering and monitoring of chlorine dioxide with concentrated chemicals. Bello Zon® CDKc is a ready-to-use convenient system with integrated intrinsically safe pre-dilution station.

This chlorine dioxide system includes an intrinsically safe pre-dilution station for concentrated hydrochloric acid. The consumption of hydrochloric acid can therefore be adapted on site to the individual operating conditions. Savings of up to a quarter of the hydrochloric acid volume are possible. The special reactor concept generates chlorine dioxide safely and simply with maximum output. Food-compatible PVDF is used instead of PVC generally used in the industry. This results in improved operating safety and reliability and improved purity of the chlorine dioxide generated. The central system controller manages the precise production of the chlorine dioxide. All parameters relevant for water treatment are recorded and logged. The stroke lengths of ProMinent® metering pumps are monitored online. This rules out hazardous operating statuses owing to incorrect operation with regard to pump stroke length adjustment. The precise production of chlorine dioxide is managed by the central system control. Chlorine dioxide, chlorite, pH or redox potential sensors DULCOTEST® are directly connected to the two mA inputs. The chlorine dioxide in the treated water, as well as its main by-product chlorite, is thus monitored and documented online. The chlorine dioxide concentrations in the water can be adjusted automatically depending on the measurement using the integrated PID controller. The integrated data logger documents all status messages and measured values, which the screen writer then visualises on the clear colour display. The systems meet all the requirements of DVGW data sheets W 224 and W 624, with regard to construction and operation, and are intended for operation with concentrated chemicals (24.5%  $\text{NaClO}_2$ ) and acid (25-36%  $\text{HCl}$ ).

#### Your benefits

- Cost saving through minimal acid consumption
- Cost-effective operation by the use of inexpensive concentrated output chemicals
- Efficient operation, thanks to production, metering and monitoring of  $\text{ClO}_2$  with just one system
- Maximum operating safety and purity of the  $\text{ClO}_2$  produced through the use of PVDF reactors
- Integrated measuring and control technology
- Perfect quality management, thanks to integrated storage of all operating parameters and measured values



P\_PMA\_BEZ\_0096\_SW  
CDKc 420 (figure shows optional configuration) <sup>1)</sup>

#### Technical details

##### Power supply

- 100-230 V, 50/60 Hz

##### Inputs

- 2 freely configurable analogue inputs (0/4-20 mA)
- 7 digital inputs for monitoring
- 1 digital input for contact water meter 0.25-20 Hz
- 1 frequency input for water meter 10-10,000 Hz

##### Outputs

- 1 operating signal relay
- 1 alarm signal relay
- 1 warning signal relay
- Mains output for controlling the bypass pump
- 1 freely configurable analogue output (0/4-20 mA)
- 1 voltage output +5 V as supply voltage for water meter with Hall sensor

##### Operating substances

- Sodium chlorite 7.5%, purity according to EN 938
- Hydrochloric acid 9% purity according to EN 939
- Particle-free water

##### Degree of protection

- IP 65

##### Field of application

- Municipal potable water and waste water treatment
- Industrial process and cooling water

### 3 Bello Zon® Chlorine Dioxide Systems

#### Technical Data

Type <sup>1)</sup>	Chlorine dioxide dosing capacity* <sup>1)</sup>		Max. operating pressure**	Operating temp.	Connection dimensions of chlorite and acid metering pumps	Dimensions of the bypass connector
	min.-max./hour	min./day				
	g/h	g/d	bar	°C		DN
CDKc 150	8-150	56	8	10-40	6x4	25
CDKc 400	20-400	140	8	10-40	8x5	25
CDKc 900	45-900	300	8	10-40	8x5	32
CDKc 2000	100-2,000	700	5	10-40	8x5	40
CDKc 2800	140-2,800	700	5	15-40	8x5	40
CDKc 7300	365-7,300	1,750	3	15-40	DN 10	40
CDKc 12000	600-12,000	1,750	2	18-40	DN 10	40

Type <sup>1)</sup>	Dimensions*** H x W x D (mm)	Weight*** kg	Power consumption (max.) ****		Power uptake W
			230 V A	115 V A	
CDKc 150	1,380 x 880 x 320	55	0.7	1.2	130
CDKc 400	1,650 x 880 x 445	80	0.9	1.2	180
CDKc 900	1,920 x 920 x 510	95	1.4	2.5	250
CDKc 2000	1,880 x 1,320 x 570	160	2.2	3.5	410
CDKc 2800	1,880 x 1,320 x 570	160	2.2	3.5	410
CDKc 7300	2,250 x 1,850 x 460	175	5.5	6.4	640
CDKc 12000	2,250 x 1,850 x 460	180	5.5	6.4	640

\* The metering figures relate to 5 or 2 bar back pressure and an ambient temperature of 20 °C. The minimum capacity/per hour is based on the fact that when the system is operating at below 5% of the nominal power, continuous metering is no longer possible, due to the correspondingly low pumping frequency of the metering pumps. When systems are not operating continuously, the reactor contents must be changed at least twice daily. The system should not, therefore, be operated below the stated minimum capacity/day.

\*\* At 35 °C ambient temperature

\*\*\* Without bypass pump, flushing valve and water supply line

\*\*\*\* 230 V figure with bypass pump (CDKc 150-900), 115 V figures without bypass pump

<sup>1)</sup> **Subject to technical and design changes.**

Dimensions of the pre-dilution unit (H x W x D) for CDKc 150 - 12,000: 1,200 x 900 x 300 mm

## 3 Bello Zon® Chlorine Dioxide Systems

### 3.8.1 Identity Code Ordering System for CDKc Systems

CDKc	Capacity of ClO <sub>2</sub> including HCl pre-dilution and flushing assembly
20	CDKc 150 = 150 g/h
21	CDKc 400 = 400 g/h
22	CDKc 900 = 900 g/h
23	CDKc 2,000 = 2,000 g/h
24	CDKc 2,800 = 2,800 g/h
25	CDKc 7,300 = 7,300 g/h
26	CDKc 12,000 = 12,000 g/h
<b>Version</b>	
P	ProMaqua
<b>Operating voltage</b>	
A	230 V ±10%, 50/60 Hz (for version with bypass 04)
B	100 – 115 V ±10%, 50/60 Hz (not available for version with bypass 04)
<b>Bypass version, bypass monitoring</b>	
02	Bypass PVC-U with float flow meter
04	Bypass PVC-U with float flow meter and pump (VA) only with 230 V operating voltage (only with CDKc 150-900 g/h)
<b>Calibrating device</b>	
1	With calibrating device
<b>Suction lance, suction fitting for chemicals</b>	
0	None
2	Suction lance for 200 l container, not available for CDKc 7300 and CDKc 12000
3	Flexible suction assembly 5 m, not available for CDKc 7300 and CDKc 12000
<b>Mechanical design</b>	
0	Standard
<b>Preset language</b>	
DE	German
EN	English
FR	French
IT	Italian
ES	Spanish
<b>Control</b>	
0	Basic version *)
1	With measuring and control properties (only in connection with version inputs and outputs 1 or 3)
2	With measuring and control properties, data logger and screen recorder (only in connection with version inputs and outputs 1 or 3)
<b>Extended inputs and outputs</b>	
0	None
1	2 analogue inputs, freely configurable for controller output and flow rate
2	1 analogue output, freely configurable
3	2 analogue inputs and 1 analogue output, freely configurable
<b>Communication interfaces</b>	
0	Standard
<b>Approvals</b>	
01	CE mark
<b>Temperature monitoring</b>	
0	Without temperature monitoring
<b>Hardware</b>	
0	Standard
<b>Software</b>	
0	Standard

- \* 4 contact inputs for leakage, external fault, high dosage and pause plus 3 contact outputs for operating, warning and alarm messages.  
1 digital and 1 frequency input for connection of flow meters.

## 3 Bello Zon® Chlorine Dioxide Systems

### 3.8.2

#### Maintenance Kits for Bello Zon® Type CDK Chlorine Dioxide Systems

The spare parts kits include all wearing parts that need replacing in the course of regular maintenance.

	Order no.
Maintenance kit, complete 230 V CDKa 150	740740
Maintenance kit, complete 230 V CDKa 420	740743
Maintenance kit, complete 230 V CDKa 750	1000172
Maintenance kit, complete 230 V CDKa 1500	1000856
Maintenance kit, complete 230 V CDKa 6000	1004814
Maintenance kit, complete 230 V CDKa 10000	1006647
Maintenance kit, complete 115 V CDKa 150	740741
Maintenance kit, complete 115 V CDKa 420	740744
Maintenance kit, complete 115 V CDKa 750	1000173
Maintenance kit, complete 115 V CDKa 1500	1000855
Maintenance kit, complete 115 V CDKa 6000	1004815
Maintenance kit, complete CDKc 150 (type 20)	1043841
Maintenance kit, complete CDKc 170 (type 02)	1036454
Maintenance kit, complete CDKc 400 (type 21)	1043842
Maintenance kit, complete CDKc 420 (type 04)	1036455
Maintenance kit, complete CDKc 900 (type 22)	1043843
Maintenance kit, complete CDKc 900 (type 06)	1036456
Maintenance kit, complete CDKc 2000 (type 23)	1043864
Maintenance kit, complete CDKc 2100 (type 08)	1036457
Maintenance kit, complete CDKc 2800 (type 24)	1043865
Maintenance kit, complete CDKc 3000 (type 10)	1036458
Maintenance kit, complete CDKc 7500 (type 25)	1043866
Maintenance kit, complete CDKc 7500 (type 12)	1036459
Maintenance kit, complete CDKc 12000 (type 26)	1043867
Maintenance kit, complete CDKc 12000 (type 14)	1040079

Additional spare parts are listed in the operating instructions for the systems.

## 3 Bello Zon® Chlorine Dioxide Systems

### 3.9 Bypass Line Accessories

#### Premixers Made of PVC

CDVb 15-120 premixers are fully integrated in the plant, provided they are ordered with the Identity Code. The premixer on the CDVb 220 can also be ordered by Identity Code but is supplied loose with the plant. On all other plants, the premixer can be ordered partly by Identity Code or partly as a separate order. The standard delivery package of the premixer includes all PVC couplings, screw hose clips and other fixing materials. On the CDVa 2000 and CDKa 1500–10000, the pre-mixer is in two parts.

Plant	Volume l	Length mm	Connection nominal diameter	Order no.
CDVb 220, CDKa 150	1.5	594	DN 25	740649
CDVa 400, CDKa 420	4.5	756	DN 25	740650
CDVa 600, CDKa 750	7.0	1,306	DN 32	740832
CDVa 2000, CDKa 1500	13.4	2x1,316	DN 40	1001000
CDKa 6000/10000	13.4	2x1,330	DN 50	1003121

#### Bypass Pump

Booster pumps made of cast iron (GG) or stainless steel (SS) for operation in the bypass line. Electrical version 220-230 V, 50 Hz, with integrated overload protection.

The required bypass flow should be considered when selecting a suitable bypass pump. The following flow data is recommended for the different plants:

Plant type	Bypass line	Diameter (mm)	Flow rate (m3/h)
CDV 15 – 600	DN 25	32	0.5 - 2
CDV 2,000	DN 40	50	2 - 10
CDKa 150 – 420	DN 25	32	0.5 - 2
CDKa 750	DN 32	40	1 - 3.5
CDKa 1,500	DN 40	50	1.5 - 10
CDKa 6,000 – 10,000	DN 50	63	6 - 10
CDKc 150 - 900	DN 25	32	0.5 - 2
CDKc 2,000 - 2,800	DN 40	50	2 - 10
CDKc 7,300	DN 40	50	6 - 10
CDKc 12,000	DN 40	50	10 - 15

PVC should be used as the material for the bypass. The thickness should at least correspond to the pressure range PN 10, or even better PN 16 (bar).

#### Technical Data

Type	Material	Connection suction/ discharge side inch	Pump capacity at 2 bar m³/h	Nominal rating W	Nominal current A	Order no.
ZHM 3	SS	RP 1"/1"	1.2	500	2.3	1051081

**Caution: Do not allow pump to come into contact with ClO<sub>2</sub>!**

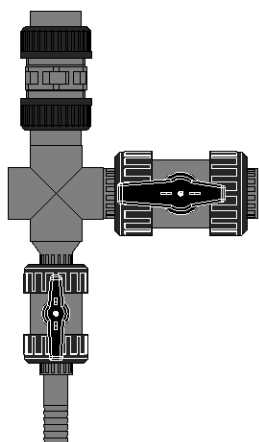
#### Accessories

	Order no.
Bracket for bypass pump	791474
Angle-seat valve PVC DN 25 for throttling the bypass pump	1001877

### 3 Bello Zon® Chlorine Dioxide Systems

#### Flushing Assembly

Install a flushing valve downstream of the chlorine dioxide system so that the reactor and pre-mixer can be flushed through, either for maintenance purposes or after a long system shut-down. The complete flushing equipment kit comprises a DN 20 or DN 25 PVC stopcock and a DN 15 PVC flushing valve with a hose nozzle and a DN 25 vacuum relief valve. It is already included as standard in the scope of supply of all new systems.

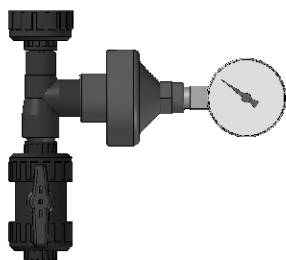


P\_PMA\_AC\_0257\_SW  
Flushing assembly

	Order no.
Flushing equipment PVC-U, EPDM, DN 20 for CDE	1047718
Flushing equipment PVC-U, EPDM, DN 25 for CDV, CDK	1033405

#### Bypass Pressure Gauge CDVc/CDKc

The fitting is used during commissioning to adjust the water pressure in the bypass. It is connected to the flushing valve on the flushing assembly for this purpose. The pressure measurement bypass consists of a PVC stopcock DN 15 and a diaphragm seal with manometer.



P\_PMA\_AC\_0258\_SW1

	Order no.
Bypass pressure measurement DN 20 for CDEa, CDVc, CDKc	1050092

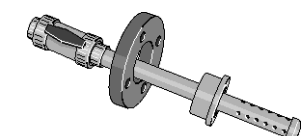
#### Ball-check Valve

A back pressure-resistant ball-check valve should be fitted on installations with long bypass lines, especially if the pipe slopes downwards and the point of injection is below the Bello Zon® system, as well as on installations with fluctuating back pressure.

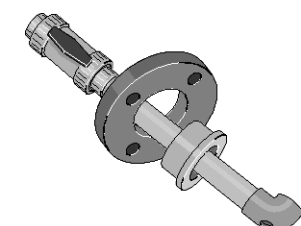
Type	Nominal diameter	Connector	Material	Order no.
DHV-U	DN 20	G 1 1/4"	PCB	1037775
DHV-U	DN 25	G 1 1/2"	PCB	1037774
DHV 712-R	DN 40	G 2 1/4"	PCB	1000052

#### PVC-U Chlorine Dioxide Point of Injection

Use an immersion pipe for homogeneous distribution of the chlorine dioxide enriched bypass water in the main water supply pipe, to optimise the mixing and distribution of the chlorine dioxide. Shorten the immersion pipe on site to the required length. The scope of delivery includes a ball valve DN 25 as a shut-off valve for this purpose. The immersion pipe is installed using a DN 50 DIN flange supplied by others.



pk\_7\_011\_2  
Injection pipe from DN 100



pk\_7\_012\_2  
Injection pipe to DN 80

	Order no.
Injection pipe for pipe diameters up to DN 80	1018754
Injection pipe for pipe diameters from DN 100	1018753



### 3 Bello Zon® Chlorine Dioxide Systems

#### Contact Water Meter

For direct connection to Bello Zon® systems.

Nominal diameter	Rated flow m³/h	Max. flow rate m³/h	Pulse rate l	Order no.
DN 40	10	20	0.3	1041357
DN 50	15	30	1	1041358
DN 80	40	110	1	1041359

#### Inductive Magnetic Flow Meters

The flow meter with transducer MAG 5100 W is especially suitable for water flow measurement in the fields of ground water, potable water, waste water and sludge.

	Connector nominal diameter	Order no.
Inductive magnetic flow meter	DN 50	1034685
	DN 65	1034686
	DN 80	1034687
	DN 100	1034688

## 3 Bello Zon® Chlorine Dioxide Systems

### 3.10 Chemical Supply Accessories

#### Suction Lances and Accessories

Suction lances have a rigid construction that can be precisely matched to the chemical tank. Suction assemblies consist of flexible suction pipes. All suction lances and suction assemblies are made of PVC with FKM seals and are fitted with foot valves and two-stage level switches including cable and round plug. Relevant parts should be selected from the ProMinent motor-driven pump accessories range for system types not listed here.

	Suitable for system types	Order no.
Suction lance for connection to 5-60 litre non-reusable tank with 2 m long suction hose (6/4 mm)	CDVc 20-120, CDEa 45-80, CDLb	802077
Suction lance for connection to 5-60 litre non-reusable tank with 2 m long suction hose (8/5 mm)	CDVc 240-600, CDEa 140	802078
Suction lance for connection to 200 litre drums with 3 m long suction hose (6/4 mm)	CDVc 20-120, CDEa 45-80, CDLb	802079
Suction lance for connection to 200 litre drums with 3 m long suction hose (8/5 mm)	CDVc 240-600, CDEa 140	802080
Flexible suction fitting with D55 screw cap and 5 m suction hose (6/4mm)	CDVc 20-120, CDEa 45-80, CDLb	1034602
Flexible suction fitting with D55 screw cap and 5 m suction hose (8/5 mm)	CDVc 240-600, CDEa 140	1034644
Suction lance DN 25 PP for connection to 200 litre drums, excluding cable	CDVc 2000	1039397
Suction lance DN 25 PP for connection to 1,000 litre IBC container, excluding cable	CDVc 2000	1039399
Gas-tight suction lance for 200 litre drums with bleed valve, connection for 6/4 and 8/5 mm suction lines and connector for 6/4 mm return line	CDKc 150-2800	1036371
Gas-tight suction lance for 60-litre canister with bleed valve, connector for 6/4 and 8/5 mm suction line and connector for 6/4 mm return line	CDKc 150-2800	1030891
Flexible suction assembly with 5 m suction hose (6/4 mm) and gas-tight D55 screw cap with opening for a return line	CDKc 150-2800	1036174
Flexible suction assembly with 5 m suction hose (8/5 mm) and gas-tight D55 screw cap with opening for a return line	CDKc 150-2800	1036175

#### Safety Collecting Pans for Chemical Tanks

Usable capacity l	Type	Order no.
40	Without leakage monitor	791726
40	With leakage monitor	791728
70	Without leakage monitor	740309
70	With leakage monitor	740308
140	Without leakage monitor	740723
140	With leakage monitor	1003190

Scope of delivery:

- Without leakage monitor: one pan
- With leakage monitor: two pans + level switch + electronics card for Bello Zon® control (CDVa, CDVb, CDKa)

## 3 Bello Zon® Chlorine Dioxide Systems

### Extension cable, 3-core



For 2-stage level switches, with round plug and round plug coupling.

	Cable length m	fig.	Order no.
Extension cable, 3-core	3	pk_1_126	1005559

### Calibration Free-standing Cylinder for Bello Zon® CDEa

	Order no.
Measuring cylinder, tall, 500 ml PP	790661

### Leakage Monitor for CDVc and CDKc Systems

Name of the item	Order no.
Level switch with litz wire 5 m	1003191

Consisting of 1 level switch to be fitted in the 40, 70 or 140 l safety drip pans without leakage monitor and connected to the control of the Bello Zon® CDVc and CDKc.

### Drip Pan with Grating to Install Two 200 l Barrels

Material	Weight kg	External dimension WxDxH mm	Effective area WxD mm	Collecting volume l
Polyethylene	ca. 22	1,230 x 820 x 435	1,160 x 750	220

Meets the requirements of the German Water Resources Act (WHG) and possesses a general building supervision approval from DIBt, Berlin.

Name of the item	Order no.
Drip pan with grating	1027211

### Bello Zon® Acid

Component 1 for Bello Zon® chlorine dioxide production system.

Name of the item	Order no.
Bello Zon® Acid 25 l	1027594
Bello Zon® Acid 200 l	950131

### Bello Zon® Chlorite

Component 2 for Bello Zon® chlorine dioxide production system.

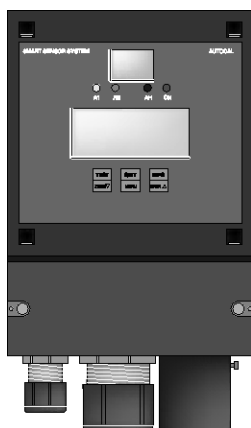
Name of the item	Order no.
Bello Zon® Chlorite 10 l	1026422
Bello Zon® Chlorite 25 l	1027595
Bello Zon® Chlorite 200 l	950136

## 3 Bello Zon® Chlorine Dioxide Systems

### 3.11 Safety Accessories and Analysis

#### Gas Warning Device GMA 36 – chlorine dioxide

The gas warning device GMA 36 for chlorine dioxide is designed as a compact measuring and switching unit for monitoring the surrounding air for dangerous concentrations of chlorine dioxide.



pk\_7\_004\_1  
Gas warning devices GMA 36

#### Technical Data

<b>Type</b>	Chlorine dioxide
<b>Warning at approx.</b>	0.1 ppm/vol%
<b>Alarm at approx.</b>	0.3 ppm/vol%
<b>Permissible ambient temperature</b>	-15...45°C
<b>Protection class housing</b>	IP 54
<b>Dimensions (without PGs, without sensor) H x W x D</b>	247 x 135 x 95 mm
<b>Supply</b>	85 – 264 / 50 – 60 V/Hz
<b>Power consumption</b>	5 W
<b>Warm-up phase max.</b>	150 s
<b>"Warning" relay contact, self-resetting</b>	230 / 1 V/A
<b>"Alarm" relay contact, latching</b>	230 / 1 V/A
<b>"Horn" relay contact, latching, can be acknowledged</b>	230 / 1 V/A
<b>Sensor measuring principle</b>	Electrochemical
<b>Sensor service life (depending on environmental cond.)</b>	2–3 years

**Note:** The sensor responds to all oxidising gases

	Order no.
Gas warning device GMA 36 – chlorine dioxide	1023156

#### Spare Parts

	Order no.
<b>Replacement sensor</b> For chlorine, chlorine dioxide, ozone	1023314
<b>Replacement sensor</b> For gas warning devices in the Life CGM range	1003009

#### Warning Label for Chlorine Dioxide System

Soft PVC film, yellow/black, 300 x 200 mm, self-adhesive.

Text	Language	Order no.
"Behälter und Geräte nicht wechselweise benutzen"	German	607320
"Never mix up chemical containers"	English	607318
"Non usare serbatoi e apparecchi alternativamente"	Italian	791886

#### Warning Label for Chlorine Dioxide Room

PVC film yellow/black, 200 x 80 mm

Text	Language	Order no.
"Zutritt nur für unterwiesene Personen"	German	607322
"Entry for authorised persons only"	English	607319
"Vietato l'accesso ai non addetti ai lavori"	Italian	791885

## 3 Bello Zon® Chlorine Dioxide Systems

### Acid Fume Separator

Acid fume separator SDA-90 filled with 0.7 l of acid-absorbing granules for absorption of hydrochloric acid fumes. Connection: DN 25 PP coupling with G 1 1/2" union nut.

	Order no.
Acid fume separator	1009987
Replacement pack of absorbent material 0.7 l	1010500

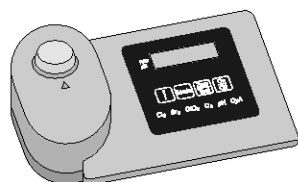
### Photometers DT1, DT2 and DT4

- Portable, compact photometer
- Simple operation with text support
- Safe, simple measurement of chlorine, chlorine dioxide, fluoride, chlorite, H<sub>2</sub>O<sub>2</sub>, bromine, ozone, pH and cyanuric acid
- Calibratable

### Technical Data

<b>Measuring ranges of the DT1B</b>	0.05 ... 6.0 mg/l free chlorine (DPD1) +total chlorine (DPD1+3) 5 ... 200 mg/l free chlorine (high range) 0.1 ... 13.0 mg/l bromine (DPD1) 0.05 ... 11 mg/l chlorine dioxide (DPD1) 0.03 ... 4.0 mg/l ozone (DPD4) 6.5 ... 8.4 pH (phenol red) 1 ... 80 mg/l cyanuric acid
<b>Measuring ranges of the DT2C</b>	0.05 ... 2.0 mg/l fluoride 0.05 ... 6.0 mg/l free chlorine and total chlorine 0.05 ... 11.0 mg/l chlorine dioxide
<b>DT4 ranges</b>	0.03 ... 2.5 mg/l chlorite 0.05 ... 11 mg/l chlorine dioxide 0.05 ... 6 mg/l chlorine
<b>Measuring tolerance</b>	Dependent upon measured value and measuring method
<b>Battery</b>	4 AA/LR6 batteries
<b>Permissible ambient temperature</b>	5...40 °C
<b>Relative humidity</b>	30 ... 90% (non-condensing)
<b>Material</b>	Housing material: ABS Keypad: Polycarbonate
<b>Dimensions L x W x H (mm)</b>	190 x 110 x 55
<b>Weight</b>	0.4 kg

		Order no.
Photometer DT1B	Complete with carrying case	1039315
Photometer DT2C	Complete with carrying case	1039316
Photometer DT4B	Complete with carrying case	1039318



P\_DT\_0074\_SW  
Photometer

The standard delivery package for the photometers includes accessories, cuvettes and reagents

### Measuring kit for chlorine dioxide depletion tests

The case contains the equipment needed for a ClO<sub>2</sub> depletion test. A photometer and the starting chemicals are also needed.

**Important: Only allow trained personnel to use the case!**

	Order no.
Measuring case	1042890

## 3 Bello Zon® Chlorine Dioxide Systems

### Consumables for Analysis

	Order no.
DPD 1 buffer, 15 ml	1002857
DPD 1 reagent, 15 ml	1002858
DPD 3 solution, 15 ml	1002859
Phenol red tablets R 175 (100 in each)	305532
Cyanuric acid tablets (100 in each)	1039744
SPADNS reagent, 250 ml for fluoride detection	1010381
Calibration standard fluoride 1 mg/l, for calibration of the photometer during fluoride determination	1010382
3 spare cells: round cells with covers for DPD phenol red and cyanuric acid detection (DT1 and DT2B)	1007566
3 spare cells for fluoride detection (DT2A and B)	1010396
DPD reagent set, 15 ml each: 3 x DPD 1 buffer, 1 x DPD 1 reagent, 2 x DPD 3 solution	1007567
Chlorine dioxide tablets no. 1	1039732
Chlorine dioxide tablets no. 2	1039733
Chlorine HR tablets (100 off)	Chlorine_tablets
ACiDiTYiNG tablets (100 off)	AC_tablets

DPD reagents for measurement of excess chlorine, ozone or chlorine dioxide in the water, in conjunction with a Lovibond comparator.

	Amount	Order no.
DPD tablets no. 1	100	501319
DPD tablets no. 2	100	501320
DPD tablets no. 3	100	501321
DPD tablets no. 4	100	501322

## 4 Electrolysis Systems CHLORINSITU® and Dulco®Lyse

### 4.1

#### Electrolysis Systems CHLORINSITU®

Chlorine and sodium hydroxide are produced in-situ in electrolysis by passing an electric current through salt water.

In **open or tubular cell electrolysis** (type CHLORINSITU® II), the electrochemical reaction takes place in a flow chamber, so that the freshly produced active chlorine immediately reacts with the sodium hydroxide to form sodium hypochlorite. A saturated brine is used as a salt solution, which is produced in a separate salt dissolving tank from salt of a defined quality. The advantage of tubular cell electrolysis lies in the simple construction of the equipment, its ease of maintenance and low investment compared with **diaphragm electrolysis systems**. The disadvantage is the relatively poor output (50%) of brine, higher entrainment of chloride into the water to be treated, higher power consumption and relatively low chlorine concentrations (5 g/l FAC) in the end product.

In **diaphragm electrolysis**, the electrochemical reaction takes place in two electrode chambers separated by a diaphragm, so that the formation of the freshly produced active chlorine and sodium hydroxide is physically separated. Systems of type CHLORINSITU® III and CHLORINSITU® III Compact bring the reaction mixtures of both electrode chambers together again after the electrochemical reaction to produce a stock solution of sodium hypochlorite (25 g/l FAC), which can be stored temporarily and metered as needed.

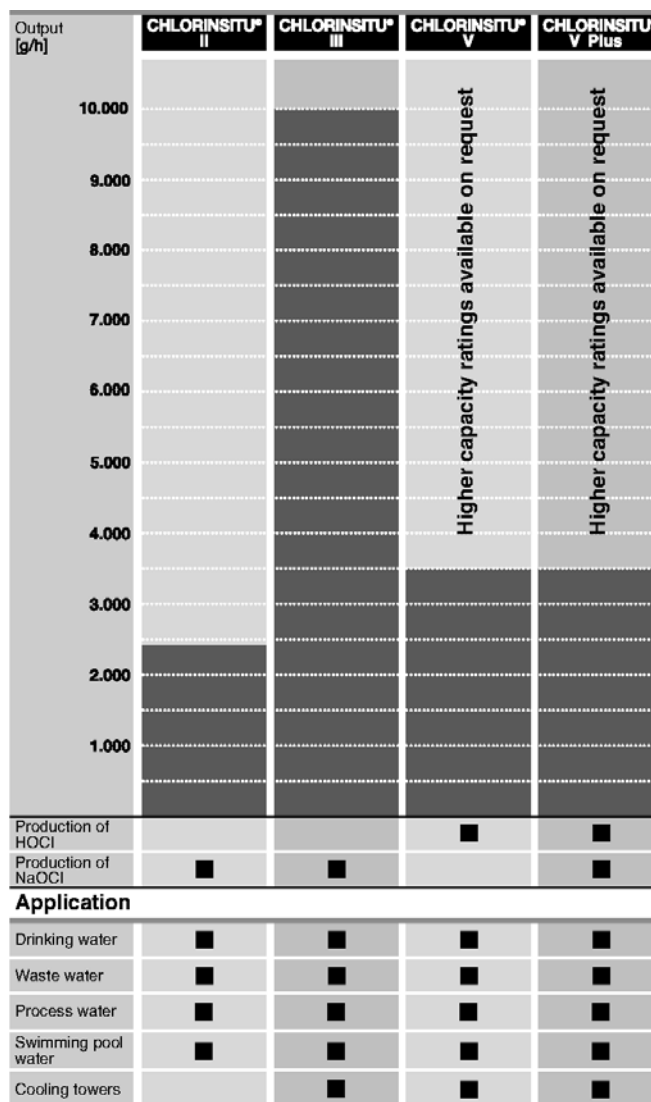
With systems of type CHLORINSITU® IV Compact and CHLORINSITU®, the highly pure active chlorine is fed into the water to be treated through an injector and under constant vacuum, where it dissolves as hypochlorous acid. In systems of type CHLORINSITU® V plus, any excess active chlorine gas produced is combined with the sodium hydroxide, as in the CHLORINSITU® III system, to form sodium hypochlorite and is then stored temporarily. The systems therefore only need to be designed for average chlorine demand, as peaks of capacity can be compensated for from the sodium hypochlorite temporary storage tank. In all systems of types CHLORINSITU® IV Compact, CHLORINSITU® V and CHLORINSITU® V Plus, the sodium hydroxide produced during electrolysis is stored temporarily and metered in, as required, to correct the pH value.

The advantage of diaphragm systems lies in their excellent efficiency (85% brine output) and minimal entrainment of chloride compared with open tubular cell systems. With systems of type CHLORINSITU® V and CHLORINSITU® V Plus, the entrainment of chloride and chlorate from the electrolysis cell into the water to be treated can be avoided completely. In diaphragm cell electrolysis system for producing sodium hypochlorite, the higher output results in solutions with a significantly higher chlorine content than is the case with tubular cell electrolysis.

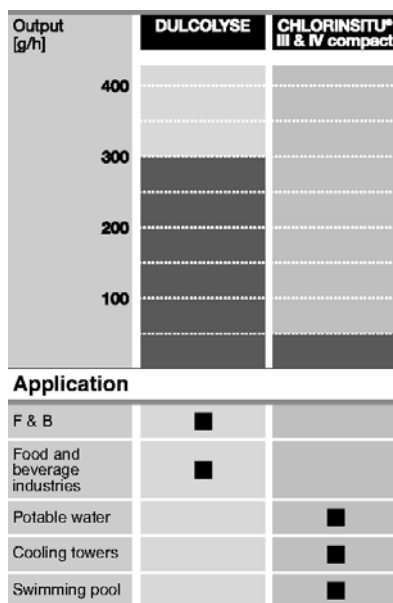
- Disinfection from natural sodium chloride
- No handling of hazardous chemicals
- Economical method thanks to low salt and energy consumption
- Ultra-pure active chlorine thanks to production in-situ and short temporary storage periods
- The fresh active chlorine is generated under a constant vacuum, absolutely reliably and with maximum operating safety, thanks to the units being designed as vacuum systems
- Chlorine generation and pH correction with one system (CHLORINSITU® IV Compact, CHLORINSITU® V and CHLORINSITU® V Plus)
- The extremely pure active chlorine is produced to meet demand and is available at atmospheric pressure
- Improved working conditions for operating personnel
- No risk of confusing dangerous chemical tanks

## 4 Electrolysis Systems CHLORINSITU® and Dulco®Lyse

### 4.2 Performance Overview



P\_PMA\_EL\_0008\_SW



P\_PMA\_EL\_0035\_SW

**Note: larger systems available on request**



## 4 Electrolysis Systems CHLORINSITU® and Dulco®Lyse

### 4.3 Questionnaire on the Design of an Electrolysis System

#### Use of the electrolysis plant:

- ☐ for disinfection of
- ☐ Drinking water
  - ☐ Industrial water
  - ☐ Cooling water
  - ☐ Swimming pool water
  - ☐ \_\_\_\_\_

#### Water values:

Max. water flow rate	_____ m <sup>3</sup> /h	Maximum water pressure	_____ bar
Water flow rate	<input type="checkbox"/> constant	<input type="checkbox"/> fluctuating from	_____ m <sup>3</sup> /h to _____ m <sup>3</sup> /h
pH value	_____	Iron (Fe <sup>2+</sup> )	_____ mg/l
Temperature	_____ °C	Manganese (Mn <sup>2+</sup> )	_____ mg/l
Solid fraction	_____ mg/l	Nitrite (NO <sub>2</sub> <sup>-</sup> )	_____ mg/l
Acid capacity K <sub>s4,3</sub>	_____ mmol/l	Sulphide (S <sup>2-</sup> )	_____ mg/l
Total hardness	_____ mmol/l	TOC (total organic carbon)	_____ mg/l
Total hardness	_____ °dH	Ammonia	_____ mg/l

#### Response time to application:

\_\_\_\_\_ m<sup>3</sup> volume reaction tank or \_\_\_\_\_ minutes residence time in entire system.

#### Type of metering:

- ☐ constant
- ☐ flow-proportional
- ☐ depending on measured value

Desired dosing rate: \_\_\_\_\_ mg/l

#### Disinfection method used up to now:

\_\_\_\_\_

Consumption of disinfectant up to now: \_\_\_\_\_ kg/week

#### Other requirements:

\_\_\_\_\_

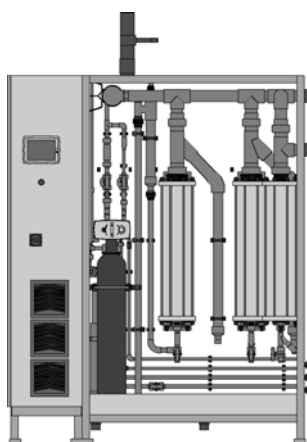
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P\_PMA\_EL\_0001\_SW

## 4 Electrolysis Systems CHLORINSITU® and Dulco®Lyse

### 4.4 Electrolysis System CHLORINSITU® II



Electrolysis systems of the type CHLORINSITU® II generate sodium-calcium hypochlorite with a concentration of 5 g/l. A saturated solution of sodium chloride is produced in a salt dissolving tank, included in the scope of delivery for this purpose, which, after appropriate dilution, is electrolysed in an open tubular cell. The resulting solution is collected in a storage tank and, from there, metered according to requirements using separate metering pumps. Due to its moderate pH value of 8.5 – 9, it affects the pH of the treated water significantly less than if conventional sodium-calcium hypochlorite with a pH of 12 – 13.5 were used. Much less acid is used to adjust the pH value, enabling savings of up to 80%. The hydrogen always produced during electrolysis is diluted with fresh air through an ATEX 95-approved fan and discharged safely. Both the salt-dissolving and diluting water comes from a softener unit integrated in the system, preventing the formation of lime deposits and ensuring the long service life of the electrolytic cell. There is therefore no need for acid purification. The systems are controlled using a modern PLC with a large, illuminated display and integrated Remote Control Engineer for remote diagnosis and troubleshooting. Electrolysis systems of type CHLORINSITU® II are especially suitable for applications where a robust and clearly laid out technology is required and where the entrainment of residual sodium chloride into the water being treated is not a problem.

- Robust, simple technology
- Safe system control with remote diagnosis by Remote Control Engineer
- Cost-effective operation thanks to the use of sodium chloride as an inexpensive raw material and lower chemical consumption for pH adjustment
- Compact, space-saving design
- Improved working conditions for operating personnel
- No risk of confusing dangerous chemical tanks

#### Technical Data

Power supply 1 x 230 V (50 – 150 g/h) (VAC/1P/N/PE/50 Hz)

Power supply 3 x 400 V (> 200 g/h) (VAC/3P/N/PE/50 Hz)

Type/ output	Fuse	Power uptake	Max. salt consumption	Max. consumption of process water	Product outlet H	Dimensions L x W x H (mm)	Brine tank	Recommended capacity storage tank
g/h	A	kW	kg/d	l/h	mm		l	l
50	16	0.78	4	10	1,188	1,050 x 600 x 1,550	130	300
100	16	1.15	8	20	1,589	1,250 x 600 x 2,000	130	500
150	16	1.53	12	30	1,589	1,250 x 600 x 2,000	200	700
200	3 x 16	1.90	16	40	1,589	1,250 x 600 x 2,000	200	1,000
300	3 x 16	2.65	24	60	1,589	1,250 x 600 x 2,000	200	1,500
400	3 x 16	3.40	32	80	1,589	1,250 x 600 x 2,000	200	2,000
500	3 x 20	4.15	40	100	1,589	1,250 x 600 x 2,000	380	2,500
600	3 x 25	4.90	48	120	1,589	1,250 x 600 x 2,000	380	3,000
800	3 x 35	6.40	65	160	1,589	1,250 x 600 x 2,000	380	3,500
1,000	3 x 35	7.90	80	200	1,589	1,250 x 600 x 2,000	520	4,500
1,200	3 x 50	9.40	95	240	1,589	1,250 x 600 x 2,000	520	5,500
1,400	3 x 50	10.90	110	280	1,589	1,250 x 600 x 2,000	520	6,000
1,600	3 x 63	12.40	130	320	1,589	1,250 x 600 x 2,000	760	7,000
1,800	3 x 63	13.90	155	360	1,589	1,650 x 600 x 2,000	760	8,000
2,000	3 x 63	15.40	175	400	1,589	1,650 x 600 x 2,000	760	9,000
2,200	3 x 80	16.90	190	440	1,589	1,650 x 600 x 2,000	760	10,000
2,400	3 x 80	18.40	210	480	1,589	1,650 x 600 x 2,000	760	11,000

#### Scope of delivery:

Electrolysis systems of type Chlorinsitu® II are mounted ready-wired with a PLC on a powder-coated stainless steel frame in the control cabinet. They include a Remote Control Engineer for remote diagnosis and troubleshooting, integrated water softener system, open tubular cells, ATEX 95-compliant bleed system and separate salt dissolving tanks and level monitoring unit. The system also includes liquid level sensors for monitoring the storage tank to be set up on site for sodium-calcium hypochlorite. A duplex water softener is fitted as standard for systems producing more than 1,800 g/h. Automatic monitoring of water hardness downstream of the softening system can be offered as an option.

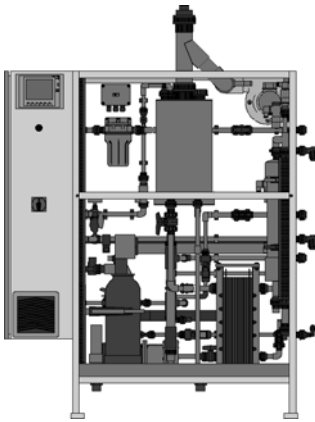
#### Note:

Electrolysis systems of type CHLORINSITU® II, III, V and V Plus are offered and planned to meet customer specifications. This is true both for the system documentation and the subsequent supply of spare parts and maintenance.

## 4 Electrolysis Systems CHLORINSITU® and Dulco®Lyse

### 4.5

### Electrolysis System CHLORINSITU® III



P\_PMA\_EL\_0004\_SW

Electrolysis systems of type CHLORINSITU® III generate sodium hypochlorite with a higher concentration of approximately 25 g/l with minimal entrainment of sodium chloride (85% output) from the diaphragm cell into the finished product. A saturated solution of sodium chloride is produced in a salt dissolving tank, included in the scope of delivery for this purpose, which is then electrolysed in a diaphragm cell. Sodium hydroxide and hydrogen are produced in the cathode chamber while ultra-pure active chlorine and a diluted residual brine are produced in the anode chamber, separated by the diaphragm from the cathode chamber. The resulting active chlorine is bound to the sodium hydroxide through an injector under a constant vacuum and is collected as sodium hypochlorite in a storage tank. The vacuum is kept constant by a frequency-controlled circulation pump. This creates less mechanical stress on the diaphragm in the electrolysis cell and in other parts of the system. The complete sodium hypochlorite solution can be metered, as required, by separate metering pumps. Due to its moderate pH value of 9.5 – 10, it affects the pH of the treated water significantly less than if conventional sodium-calcium hypochlorite with a pH of 12 – 13.5 were used. Much less acid is used to adjust the pH value, enabling savings of up to 70%. The hydrogen always produced during electrolysis is diluted with fresh air through an ATEX 95-approved fan and discharged safely. The salt-dissolving water comes from a softener integrated in the system, thereby preventing the formation of lime deposits and ensuring the long service life of the diaphragm cell. The efficiency of the electrolysis is constantly monitored by various flow meters, the addition of water depending on the sodium hydroxide production and a dynamic level control in the storage tanks.

The systems are controlled using a modern PLC Programmable Logic Controller with a large, illuminated display and integrated Remote Control Engineer for remote diagnosis and troubleshooting.

Electrolysis systems of type CHLORINSITU® III are especially suitable for applications in which sodium hypochlorite solution low in chloride and chlorate is required.

- Sodium hypochlorite solution low in chloride and chlorate with a high chlorine concentration (25 g/l FAC)
- Minimal acid consumption for pH correction; savings of up to 70% are possible
- Safe system control with remote diagnosis by Remote Control Engineer
- Excellent service life of the diaphragm cells, thanks to constant vacuum
- A frequency-controlled circulation pump maintains the vacuum constant in the enclosed anode area
- Maximum operating safety due to their design as negative pressure systems
- Dynamic level control in the storage tank ensures optimised chlorine production
- Active process control of production by largely internal measuring and control technology
- Cost-effective operation thanks to the use of sodium chloride as an inexpensive raw material and lower chemical consumption for pH adjustment
- Robust, simple technology
- Compact, space-saving design

## 4 Electrolysis Systems CHLORINSITU® and Dulco®Lyse

### Technical Data

Power supply 3 x 400 V (VAC/3P/N/PE/50 Hz)

Type/ output	Fuse	Power uptake	Max. salt consumption	Max. consumption of process water	Max. consumption of cooling water	Dimensions L x W x H (mm)	Brine tank	Recommended capacity storage tank
g/h	A	kW	kg/d	l/h	l/h		l	l
100	3 x 16	1.10	5	4	80	1,250 x 600 x 1,550	130	200
200	3 x 16	1.50	10	8	80	1,250 x 600 x 1,550	130	300
300	3 x 16	1.90	15	12	100	1,250 x 600 x 1,550	200	400
400	3 x 16	2.30	20	16	100	1,250 x 600 x 1,550	200	500
500	3 x 16	2.70	25	20	125	1,250 x 600 x 1,550	200	600
600	3 x 20	3.10	30	24	125	1,650 x 600 x 2,000	380	700
750	3 x 25	3.70	35	30	150	1,650 x 600 x 2,000	380	800
1,000	3 x 25	4.70	50	40	150	1,650 x 600 x 2,000	380	1,200
1,250	3 x 35	5.70	60	50	150	1,650 x 600 x 2,000	380	1,500
1,500	3 x 35	6.70	70	60	180	1,650 x 600 x 2,000	380	1,700
1,750	3 x 35	7.70	80	70	180	1,650 x 600 x 2,000	380	2,000
2,000	3 x 50	8.70	100	80	200	1,750 x 1,200 x 2,000	520	2,200
2,500	3 x 63	10.70	125	100	250	1,750 x 1,200 x 2,000	520	3,000
3,000	3 x 63	12.70	150	120	300	1,750 x 1,200 x 2,000	520	3,300
3,500	3 x 80	14.70	175	140	350	1,750 x 1,200 x 2,000	520	4,000
5,000	3 x 90	20.70	250	200	500	3,100 x 1,800 x 2,070	1,180	5,800
7,000	3 x 100	29.40	350	280	700	3,100 x 1,800 x 2,070	1,180	6,000
8,500	3 x 130	35.70	425	340	850	4,300 x 1,800 x 2,070	1,180	7,500
10,000	3 x 160	40.70	500	400	1,000	4,300 x 1,800 x 2,070	1,180	11,000

#### Scope of delivery:

Electrolysis systems of type Chlorinsitu® III are mounted ready-wired with a PLC on a powder-coated stainless steel frame in the control cabinet. They include a Remote Control Engineer for remote diagnosis and troubleshooting, integrated water softener system, diaphragm electrolysis cells, ATEX 95-compliant bleed system and separate salt dissolving tanks and level monitoring unit. Dynamic level control to monitor the storage tank to be provided on site for sodium hypochlorite. A chlorine gas warning unit and automatic monitoring of water hardness downstream of the softening system come as standard with systems producing more than 600 g/h.

#### Note:

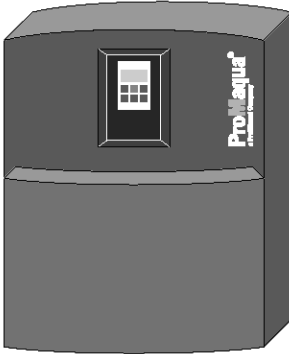
Electrolysis systems of type CHLORINSITU® II, III, V and V Plus are offered and planned to meet customer specifications. This is true both for the system documentation and the subsequent supply of spare parts and maintenance.

## 4 Electrolysis Systems CHLORINSITU® and Dulco®Lyse

### 4.6 Electrolysis Systems CHLORINSITU® III Compact and IV Compact

#### 4.6.1

#### Electrolysis System CHLORINSITU® III Compact



P\_PMA\_EL\_0007\_SW

Electrolysis systems of type CHLORINSITU® III Compact produce a disinfectant based on active chlorine. A saturated solution of sodium chloride is produced in a salt dissolving tank, included in the scope of delivery for this purpose, which is then electrolysed in a diaphragm cell. Sodium hydroxide and hydrogen are produced in the cathode chamber while ultra-pure active chlorine and a diluted residual brine are produced in the anode chamber, separated by the diaphragm from the cathode chamber. The active chlorine produced reacts in the reactor with the sodium hydroxide produced to form sodium hypochlorite with a concentration of approx. 25 g/l FAC. The hydrogen generated is discharged to the fresh air through a bleed line. The salt-dissolving water comes from a softener integrated in the system, thereby preventing the formation of lime deposits and ensuring the long service life of the electrolytic cell.

The microprocessor controller integrated in the system digitally indicates the current output and monitors all key functions. All operating and error messages are shown in plain text on the clear display. The output can be controlled manually, automatically (controller option) or externally.

Electrolysis systems of type CHLORINSITU® III Compact are especially suitable for use with smaller swimming pools in residential properties and hotels (indoor pools with a total circulation capacity of up to 40 m³/hour, chlorinated in accordance with the DIN standard).

##### Benefits

- Sodium hypochlorite solution low in chloride and chlorate with a high chlorine concentration (25 g/l FAC)
- Minimal acid consumption for pH correction, making savings of up to 70% possible
- Cost-effective operation thanks to the use of sodium chloride as an inexpensive raw material and minimal chemical consumption for pH adjustment
- Optional integrated chlorine and pH control
- Robust, simple technology
- Compact space-saving design, ready mounted on a wall panel

##### Technical Data

Power supply 1 x 230 Volt (VAC/1P/N/PE/50 Hz)

Type/output	Power uptake	Max. salt consumption	Max. consumption of process water	Dimensions L x W x H (mm)	Brine tank I
g/h	kW	g/h	l/h		
25	0.11	65	1.5	590 x 355 x 650	130
50	0.22	130	3	590 x 355 x 650	130

##### Scope of delivery:

Electrolysis systems of type CHLORINSITU® III Compact are ready mounted and wired for use on a wall panel. Chlorine electrolysis system with integrated microprocessor control and softener system. They include a diaphragm electrolysis cell, separate salt dissolving tank with level monitor and a level control for a storage tank (tank not included with the scope of delivery). A storage tank is also required as well as a metering pump for each point of injection (pump not included in the scope of delivery). Only a chlorine and pH control can be integrated as an option. The measuring and control technology then has to be offered separately for several pools.

	Order no.
CHLORINSITU® III Compact 25	1041399
CHLORINSITU® III Compact 50	1041401
CHLORINSITU® III Compact 25 with integrated chlorine and pH controller	1041400
CHLORINSITU® III Compact 50 with integrated chlorine and pH controller	1041402

##### Spare parts and maintenance kits

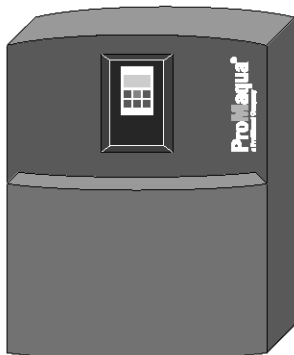
**Important note:** Both the sensors and the metering pump(s) have to be maintained on systems with pH and/or chlorine control.

	Type	Order no.
Annual maintenance set	CHLORINSITU® III Compact 25	1041407
Annual maintenance set	CHLORINSITU® III Compact 50	1041409
3-yearly maintenance set	CHLORINSITU® III Compact 25	1041408
3-yearly maintenance set	CHLORINSITU® III Compact 50	1041410
Membrane cell	CHLORINSITU® III Compact 25	1041419
Membrane cell	CHLORINSITU® III Compact 50	1041420
Spare parts kit	CHLORINSITU® III Compact 25/50	1045233

## 4 Electrolysis Systems CHLORINSITU® and Dulco®Lyse

### 4.6.2

### Electrolysis System CHLORINSITU® IV Compact



P\_PMA\_EL\_0007\_SW

Electrolysis system of type CHLORINSITU® IV generate ultra-pure active chlorine in a vacuum process. A saturated solution of sodium chloride is produced in a salt dissolving tank, included in the scope of delivery for this purpose, which is then electrolysed in a diaphragm cell. Sodium hydroxide and hydrogen are produced in the cathode chamber while ultra-pure active chlorine and dilute residual brine are produced in the anode chamber, separated by the diaphragm from the cathode chamber. The resulting active chlorine is suctioned off through an injector integrated in the system and dissolved as hypochlorous acid in the water being treated. The hydrogen generated is discharged to the fresh air through a bleed line. The sodium hydroxide is disposed of or optionally used by a metering pump integrated in the system to correct the pH of the water being treated. The salt-dissolving water comes from a softener integrated in the system, thereby preventing the formation of lime deposits and ensuring the long service life of the electrolytic cell.

The microprocessor controller integrated in the system digitally indicates the current output and monitors all key functions. All operating and error messages are shown in plain text on the clear display. The output can be controlled manually, automatically (controller option) or externally.

Electrolysis systems of type CHLORINSITU® IV Compact are especially suitable for use with smaller swimming pools in residential properties and hotels (indoor pools with a total circulation capacity of up to 25 m³/hour, chlorinated in accordance with the DIN standard).

- Production and metering of ultra-pure hypochlorous acid
- Cost-effective operation thanks to the use of sodium chloride as an inexpensive raw material and no consumption of chemicals for pH correction
- Water disinfection and pH correction with a single system
- Safe vacuum system technology
- Optional integrated chlorine and pH control
- Robust, simple technology
- Compact space-saving design, ready mounted on a wall panel

#### Technical Data

Power supply 1 x 230 Volt (VAC/1P/N/PE/50 Hz)

Type/output	Power uptake	Max. salt consumption	Max. consumption of process water	Dimensions	Brine tank
g/h	kW	g/h	l/h	L x W x H (mm)	l
25	0.11	65	1.5	590 x 355 x 650	130
50	0.22	130	3	590 x 355 x 650	130

#### Scope of delivery:

Electrolysis systems of type CHLORINSITU® IV Compact are ready mounted and wired for use on a wall panel. Chlorine electrolysis system with integrated microprocessor control and water softening system, diaphragm electrolysis cell with negative pressure monitoring, separate salt dissolving tanks with level control, integrated injector and integral feeder assembly for sodium hydroxide (optional). A booster pump is also needed (not included in the scope of delivery) for the single possible point of injection. A chlorine and pH control can be integrated as an option. Several pools cannot be fed from one Chlorinsitu® IV Compact system.

	Order no.
CHLORINSITU® IV Compact 25	1036461
CHLORINSITU® IV compact 25 with pH correction	1036462
CHLORINSITU® IV Compact 25 with integrated chlorine and pH controller	1041405
CHLORINSITU® IV Compact 25 with integral pH and chlorine controller and pH correction	1041403
CHLORINSITU® IV Compact 50	1036463
CHLORINSITU® IV Compact 50 with pH correction	1036464
CHLORINSITU® IV Compact 50 with integrated chlorine and pH controller	1041406
CHLORINSITU® IV Compact 50 with integral pH and chlorine controller and pH correction	1041404

## 4 Electrolysis Systems CHLORINSITU® and Dulco®Lyse

### Spare parts and maintenance kits

**Important note:** Both the sensors and the metering pump(s) have to be maintained on systems with pH and/or chlorine control.

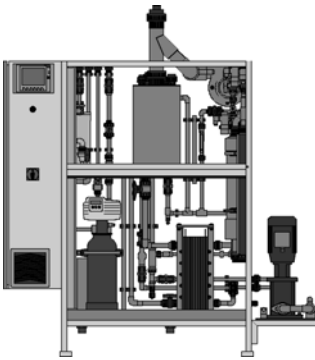
	Type	Order no.
<b>Annual maintenance set</b>	CHLORINSITU® IV Compact 25	1041415
<b>Annual maintenance set</b>	CHLORINSITU® IV Compact 25 with pH correction	1043267
<b>Annual maintenance set</b>	CHLORINSITU® IV Compact 50	1041417
<b>Annual maintenance set</b>	CHLORINSITU® IV Compact 50 with pH correction	1043269
<b>3-yearly maintenance set</b>	CHLORINSITU® IV Compact 25	1041416
<b>3-yearly maintenance set</b>	CHLORINSITU® IV Compact 25 with pH correction	1043268
<b>3-yearly maintenance set</b>	CHLORINSITU® IV Compact 50	1041418
<b>3-yearly maintenance set</b>	CHLORINSITU® IV Compact 50 with pH correction	1043270
<b>Membrane cell</b>	CHLORINSITU® IV Compact 25	1041419
<b>Membrane cell</b>	CHLORINSITU® IV Compact 50	1041420
<b>Spare parts set</b>	CHLORINSITU® IV Compact 25/50	1045232



## 4 Electrolysis Systems CHLORINSITU® and Dulco®Lyse

### 4.7

#### Electrolysis System CHLORINSITU® V



P\_PMA\_EL\_0013\_SW

Electrolysis systems of type CHLORINSITU® V generate ultra-pure active chlorine in a vacuum process. A saturated solution of sodium chloride is produced in a salt dissolving tank, included in the scope of delivery for this purpose, which is then electrolysed in a diaphragm cell. Chloride-free sodium hydroxide and hydrogen are produced in the cathode chamber, while ultra-pure chlorine gas and dilute residual brine are produced in the anode chamber, separated by the diaphragm from the cathode chamber. The active chlorine produced is suctioned off through an injector (contained in the scope of delivery) and fully dissolved as hypochlorous acid in the water being treated (through a bypass). The superchlorinated water is then distributed throughout the various pools via one of more proportionately controllable motor-driven ball valves. The vacuum is kept stable by a single frequency-controlled booster pump. This permits significant savings in terms of energy. The chloride-free sodium hydroxide is stored temporarily and can be used for pH value correction. A standard diaphragm metering pump is first used to correct the base pH (pH 6.8 – 7) of the superchlorinated water. The fine correction of the pH value is fed via additional alkali metering pumps per circuit or point of injection. To achieve this, an external pH value controller is connected directly to the system's control. The hydrogen produced is diluted with fresh air through an ATEX 95-approved fan and discharged safely. The diluted residual brine is fully discarded. To this end, the diluted brine is seriously diluted with softened water, neutralised by the addition of sodium hydroxide and disposed off in the sewer. All residual chloride and chlorate are thus disposed of and are fundamentally not mixed with the process water. Electrolysis systems of type Chlorinsitu® V can thus be compared with pure chlorine gas in terms of their oxidation strength, chloride and chlorate content in the process water. The salt-dissolving water comes from a softener integrated in the system, thereby preventing the formation of lime deposits and ensuring the long service life of the diaphragm cell. The efficiency of electrolysis is constantly monitored by various flow meters, the addition of water depending on the sodium hydroxide production and the base pH correction.

The systems are controlled using a modern PLC with a large, illuminated display and integrated Remote Control Engineer for remote diagnosis and troubleshooting. Chlorine metering control and pH value correction are provided as standard via contact inputs.

Options (always customer-specific and project-managed):

- Analogue input
- MOD-bus or PROFIBUS®
- Several points of injection
- Several booster pumps are possible with differing water qualities (e.g. brine and fresh water pools)

Electrolysis systems of type CHLORINSITU® V are suitable for all applications that require the simultaneous metering of hypochlorous acid and pH value correction.

- Production and metering of ultra-pure hypochlorous acid without temporary storage
- Chlorination and pH adjustment with a single system
- Safe system control with remote diagnosis by Remote Control Engineer
- Excellent service life of the diaphragm cells, thanks to constant vacuum
- A frequency-controlled circulation pump maintains the vacuum constant in the enclosed anode area
- Maximum operating safety due to their design as negative pressure systems
- Active process control of production by largely internal measuring and control technology
- Cost-effective operation thanks to the use of sodium chloride as an inexpensive raw material and no consumption of chemicals for pH correction
- Complete disposal of the diluted brine, nothing is fed back into the process water to be treated
- Comparable with pure chlorine gas in terms of oxidation strength, chloride and chlorate content in the process water
- Robust technology
- Compact, space-saving design



## 4 Electrolysis Systems CHLORINSITU® and Dulco®Lyse

### Technical Data

Power supply 3 x 400 V (VAC/3P/N/PE/50 Hz)

Type/output	Fuse	Power uptake	Max. salt consumption	Max. consumption of process water	(External) consumption of cooling water	Dimensions L x W x H (mm)	Brine tank
g/h	A	kW	kg/d	l/h	l/h		l
100	3 x 16	1.10	5	60	–	1,655 x 600 x 1,550	130
200	3 x 16	1.50	10	60	–	1,655 x 600 x 1,550	130
300	3 x 16	1.90	15	60	–	1,655 x 600 x 1,550	200
400	3 x 16	2.30	20	60	–	1,655 x 600 x 1,550	200
500	3 x 16	2.70	25	60	–	1,655 x 600 x 1,550	200
600	3 x 20	3.10	30	90	–	1,950 x 600 x 2,000	380
750	3 x 25	3.70	35	90	–	1,950 x 600 x 2,000	380
1,000	3 x 25	4.70	50	90	–	1,950 x 600 x 2,000	380
1,250	3 x 35	5.70	60	90	–	1,950 x 600 x 2,000	380
1,500	3 x 35	6.70	70	90	–	1,950 x 600 x 2,000	380
1,750	3 x 35	7.70	80	90	–	1,950 x 600 x 2,000	380
2,000	3 x 50	8.70	100	175	200	1,750 x 1,200 x 2,000	520
2,500	3 x 63	10.70	150	175	250	1,750 x 1,200 x 2,000	520
3,000	3 x 63	12.70	175	175	300	1,750 x 1,200 x 2,000	520
3,500	3 x 80	14.70	175	175	350	1,750 x 1,200 x 2,000	520

Capacities > 3,500 g/h upon request

#### Scope of delivery:

Electrolysis systems of type Chlorinsitu® V are ready mounted, wired for use, on a powder coated stainless steel frame with a Programmable Logic Controller (PLC) in the control cabinet, Remote Control Engineer for remote diagnosis and troubleshooting, integral water softening unit, diaphragm electrolysis cells, ATEX-95-compliant bleed system and separate salt dissolving tank with level monitoring. The scope of delivery also includes a frequency-controlled central injector system matched to the system to meter active chlorine and sodium hydroxide for pH correction and a single booster pump. A chlorine gas warning unit and automatic monitoring of water hardness downstream of the softening system come as standard with systems producing more than 600 g/h.

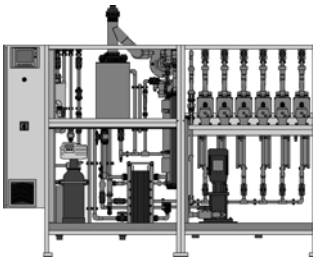
#### Note:

Electrolysis systems of type CHLORINSITU® II, III, V and V Plus are offered and planned to meet customer specifications. This is true both for the system documentation and the subsequent supply of spare parts and maintenance.

## 4 Electrolysis Systems CHLORINSITU® and Dulco®Lyse

### 4.8

#### Electrolysis System CHLORINSITU® V Plus



P\_PMA\_EL\_0012\_SW

Electrolysis systems of type CHLORINSITU® V Plus generate ultra-pure active chlorine combined with a sodium hypochlorite solution in a vacuum process. A saturated solution of sodium chloride is produced in a salt dissolving tank, included in the scope of delivery for this purpose, which is then electrolysed in a diaphragm cell. Chloride-free sodium hydroxide and hydrogen are produced in the cathode chamber, while ultra-pure active chlorine and diluted residual brine are produced in the anode chamber, separated by the diaphragm from the cathode chamber. The resulting ultra-pure active chlorine is further processed in two ways. Firstly, as with CHLORINSITU® V systems, the gas is suctioned off through an injector that forms part of the scope of delivery (vacuum system) and dissolved as hypochlorous acid in the water being treated (via a bypass). The superchlorinated water is then distributed throughout the various pools via one of more proportionately controllable motor-driven ball valves. The vacuum is kept stable by a single frequency-controlled booster pump. This permits significant savings in terms of energy. If the complete production output is not needed, excess active chlorine can also be combined with the sodium hydroxide produced and then temporarily stored as sodium hypochlorite, as is the case with CHLORINSITU® III type systems. The system thus does not have to be dimensioned according to the maximum active chlorine demand, rather according to the average daily demand. Peaks in demand are met by the additional metering of sodium hypochlorite from the temporary storage, which, as with hypochlorous acid, is fed through a central injector system.

The chloride-free sodium hydroxide is stored temporarily and can be used for pH value correction. A standard diaphragm metering pump or the addition of sodium hypochlorite is first used to correct the base pH (pH 6.8 – 7) of the superchlorinated water. The fine correction of the pH value is fed via additional alkali metering pumps per circuit or point of injection. To achieve this, an external pH value controller is connected directly to the system's control. The hydrogen produced is diluted with fresh air through an ATEX 95-approved fan and discharged safely. The diluted residual brine is fully discarded. To this end, the diluted brine is seriously diluted with softened water, neutralised by the addition of sodium hydroxide and disposed off in the sewer. Any residual chloride and chlorate are thus disposed of and are fundamentally not mixed with the process water. Electrolysis systems of type Chlorinsitu® V Plus can thus be compared with pure chlorine gas in terms of their oxidation strength, chloride and chlorate content in the process water. The salt-dissolving water comes from a softener integrated in the system, thereby preventing the formation of lime deposits and ensuring the long service life of the diaphragm cell. The efficiency of the electrolysis is constantly monitored by various flow meters, the addition of water depending on the sodium hydroxide production and the base pH correction.

The systems are controlled using a modern PLC with a large, illuminated display and integrated Remote Control Engineer for remote diagnosis and troubleshooting. Chlorine metering control and pH value correction are provided as standard via contact inputs.

Options (always customer-specific and project-managed):

- Simultaneous production and metering of ultra-pure hypochlorous acid and sodium-calcium hypochlorite
- Analogue input
- MOD-bus or PROFIBUS®
- Several points of injection
- Several injector systems (sodium hypochlorite and active chlorine)
- Several booster pumps with differing water qualities (e.g. brine and fresh water pools)

Electrolysis systems of type CHLORINSITU® V Plus are suitable for all applications that require simultaneous hypochlorous acid metering, combined with sodium hypochlorite metering to cover peak demand and simultaneous pH value correction.

- Production and metering of ultra-pure hypochlorous acid combined with sodium hypochlorite production
- Chlorination and pH adjustment with a single system
- Safe system control with remote diagnosis by Remote Control Engineer
- Excellent service life of the diaphragm cells, thanks to constant vacuum
- A frequency-controlled circulation pump maintains the vacuum constant in the enclosed anode area
- Maximum operating safety due to their design as negative pressure systems
- Active process control of production by largely internal measuring and control technology
- Cost-effective operation thanks to the use of sodium chloride as an inexpensive raw material and no consumption of chemicals for pH adjustment
- Peak demand can be met by the presence of a daily supply of sodium hypochlorite
- Complete disposal of the diluted brine, nothing is fed back into the process water to be treated
- Comparable with pure chlorine gas in terms of oxidation strength, chloride and chlorate content in the process water
- Robust technology
- Compact, space-saving design

## 4 Electrolysis Systems CHLORINSITU® and Dulco®Lyse

### Technical Data

Power supply 3 x 400 V (VAC/3P/N/PE/50 Hz)

Type/ output	Fuse	Power uptake	Max. salt consumption	Max. consumption of process water*	(External) consumption of cooling water	Dimensions L x W x H (mm)	Brine tank	Recommended capacity storage tank
g/h	A	kW	kg/d	l/h	l/h		l	l
100	3 x 16	1.10	5	60	–	1,655 x 600 x 1,550	130	50
200	3 x 16	1.50	10	60	–	1,655 x 600 x 1,550	130	100
300	3 x 16	1.90	15	60	–	1,655 x 600 x 1,550	200	150
400	3 x 16	2.30	20	60	–	1,655 x 600 x 1,550	200	200
500	3 x 16	2.70	25	60	–	1,655 x 600 x 2,000	200	250
600	3 x 20	3.10	30	90	–	1,950 x 600 x 2,000	380	300
750	3 x 25	3.70	40	90	–	1,950 x 600 x 2,000	380	400
1,000	3 x 25	4.70	55	90	–	1,950 x 600 x 2,000	380	500
1,250	3 x 35	5.70	60	90	–	1,950 x 600 x 2,000	380	600
1,500	3 x 35	6.70	75	90	–	1,950 x 600 x 2,000	380	750
1,750	3 x 35	7.70	85	90	–	1,950 x 600 x 2,000	380	850
2,000	3 x 50	8.70	100	175	200	1,750 x 1,200 x 2,000	520	1,000
2,500	3 x 63	10.70	125	175	250	1,750 x 1,200 x 2,000	520	1,250
3,000	3 x 63	12.70	150	175	300	1,750 x 1,200 x 2,000	520	1,500
3,500	3 x 80	14.70	175	175	350	1,750 x 1,200 x 2,000	520	1,750

\* The consumption of process water depends on the ratio of chlorine gas to stock production. The value is given here for a ratio of 70% : 30%.

Capacities > 3,500 g/h upon request

#### Scope of delivery:

Electrolysis systems of type Chlorinsitu® V Plus are ready mounted, wired for use, on a powder-coated stainless steel frame with a PLC Programmable Logic Controller in the control cabinet, Remote Control Engineer for remote diagnosis and troubleshooting, integral water softening unit, diaphragm electrolysis cells, ATEX-95-compliant bleed system and separate salt dissolving tank with level monitoring. The scope of delivery also includes a frequency-controlled central injector system matched to the system to meter active chlorine and sodium hydroxide for pH correction and a single booster pump. A level control to monitor the storage tank to be provided on site for sodium hypochlorite. A chlorine gas warning unit and automatic monitoring of water hardness downstream of the softening system come as standard with systems producing more than 600 g/h.

#### Note:

Electrolysis systems of type CHLORINSITU® II, III, V and V Plus are offered and planned to meet customer specifications. This is true both for the system documentation and the subsequent supply of spare parts and maintenance.

## 4 Electrolysis Systems CHLORINSITU® and Dulco®Lyse

### 4.9 Questionnaire on the Design of an ECA Water System

#### Application

- ☐ Bottler flushing
- ☐ CIP
- ☐ Other \_\_\_\_\_

#### Applicational details

Number of bottlers: \_\_\_\_\_

Flushing duration: \_\_\_\_\_

Required volume to be added to bottler: \_\_\_\_\_ Recommendation with material SS 316 L 2-4 ppm

Number of CIP points of injection: \_\_\_\_\_

Duration of CIP: \_\_\_\_\_

Required volume to be added for CIP: \_\_\_\_\_ Recommendation 10-15 ppm

#### Water data:

Max. volume of water  
to be treated \_\_\_\_\_ m<sup>3</sup>/h

maximum water pressure \_\_\_\_\_ bar

Water flow ☐ constant

☐ fluctuating from \_\_\_\_\_ m<sup>3</sup>/h to \_\_\_\_\_ m<sup>3</sup>/h

pH value \_\_\_\_\_

(iron (Fe<sup>2+</sup>) \_\_\_\_\_ mg/l)

Temperature \_\_\_\_\_ °C

(manganese (Mn<sup>2+</sup>) \_\_\_\_\_ mg/l)

Proportion of solids \_\_\_\_\_ mg/l

(nitrite (NO<sub>2</sub><sup>-</sup>) \_\_\_\_\_ mg/l)

Acid capacity K<sub>s4,3</sub> \_\_\_\_\_ mmol/l

(sulphide (S<sup>2-</sup>) \_\_\_\_\_ mg/l)

Total hardness \_\_\_\_\_ mmol/l

(TOC (total organic carbon) \_\_\_\_\_ mg/l)

Total hardness \_\_\_\_\_ °dH

(ammonium \_\_\_\_\_ mg/l)

#### Reaction time to application:

\_\_\_\_\_ m<sup>3</sup> volume of reaction tank or \_\_\_\_\_ minutes dwell time in the total system.

#### Disinfection method used to date:

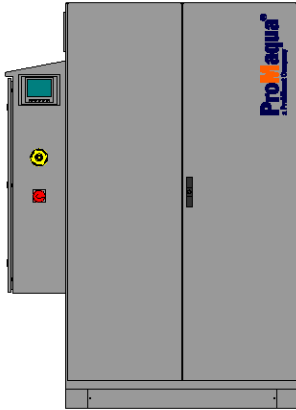
Disinfectant consumed to date: \_\_\_\_\_ kg/week

#### Other requirements:

P\_PMA\_ECA\_0001\_SW

## 4 Electrolysis Systems CHLORINSITU® and Dulco®Lyse

### 4.10 Electrolysis System Dulco®Lyse



Dulcolyse\_100-300gram\_SW1

Dulcolyt (Electro-Chemically Activated water) from the Dulco®Lyse is used where reliable disinfection is required, at the same time protecting the system technology from corrosion.

Electrolysis systems of type Dulco®Lyse generate ultra-pure hypochlorous acid in a vacuum process. A saturated solution of sodium chloride is produced in a salt dissolving tank, included in the scope of delivery for this purpose, which is then electrolysed in a diaphragm cell. Chloride-free sodium hydroxide and hydrogen are produced in the cathode chamber, while ultra-pure chlorine gas and dilute residual brine are produced in the anode chamber, separated by the diaphragm from the cathode chamber. The active chlorine produced is immediately separated from the residual brine and dissolved as hypochlorous acid. The sodium hydroxide is temporarily stored and added to hypochlorous acid through a metering pump. The result is a neutral, highly-effective and extremely low-chloride and low-chlorate disinfection solution, temporarily stored in the product tank until metered through separate metering stations. The hydrogen produced is diluted with fresh air through an ATEX-approved fan and discharged safely. The diluted residual brine is fully discarded. To this end, the diluted brine is seriously diluted with softened water, neutralised by the addition of sodium hydroxide and disposed off in the sewer. Any residual chloride and chlorate are thus disposed of and are fundamentally not mixed with the process water. Dulcolyse systems can thus be compared with pure chlorine gas in terms of their oxidation strength, chloride and chlorate content in the process water. The salt-dissolving water comes from a softening system integrated in the Dulco®Lyse system, thereby preventing the formation of lime deposits and ensuring the long service life of the electrolysis cell.

The systems are controlled by a modern PLC with a large, illuminated display and integrated Remote Control Engineer for remote diagnosis and troubleshooting.

Advantages of the Dulco®Lyse system for the production and provision of pure, low-chlorine ECA water:

- Handling of chemicals is reduced (only sodium chloride is required)
- Compact, space-saving design
- Cost-effective operation, thanks to use of inexpensive sodium chloride as a raw material
- Safe system control with remote diagnosis by integral Remote Control Engineer

#### Technical Data

Power supply 1 x 230 Volt (VAC/1P/N/PE/50 Hz)

	Type/ output	Dulcolyt production at 400 ppm	Power uptake	Dimensions H x W x D	Salt solution tank volume
	g/h	l/h	kW	mm	l
<b>Dulco®Lyse 100</b>	100	250	1.10	2,100 x 1,200 x 600	130
<b>Dulco®Lyse 200</b>	200	500	1.50	2,100 x 1,200 x 600	130
<b>Dulco®Lyse 300</b>	300	750	1.90	2,100 x 1,200 x 600	200

#### Scope of delivery:

Dulco®Lyse electrolysis systems are assembled ready-wired in a stainless steel housing

- PLC (programmable logic controller) in attached control cabinet
- Integrated softening system
- Electrolysis cell(s)
- ATEX-certified bleeding system
- Integrated salt tank with level monitoring

	Order no.
<b>Dulco®Lyse 100</b>	1041424
<b>Dulco®Lyse 200</b>	1043987
<b>Dulco®Lyse 300</b>	1043988

#### Spare parts and maintenance sets

	Type	Order no.
<b>Annual maintenance set</b>	Dulco®Lyse 100 – 300	1041427
<b>3-yearly maintenance set</b>	Dulco®Lyse 100 – 300	1041430
<b>Spare parts set</b>	Dulco®Lyse 100 – 300	1044366

## 4 Electrolysis Systems CHLORINSITU® and Dulco®Lyse

### 4.11

### Accessories

#### Water hardness measuring kit

For manual determination of the overall hardness

	Order no.
Water hardness measuring kit for overall hardness	505505

# 5 Measuring, Control and Metering Systems for Swimming Pool Water Treatment

## 5.1

## DULCODOS® Pool Swimming Pool Metering Systems

The metering systems DULCODOS® Pool ensure the best water quality. The systems are available in four different designs. It is easy to work out which type is best suited to your requirements.

### Chlorine or active oxygen?

Historically, swimming pool water has always been treated with chlorine. Because it is an effective disinfectant and is highly oxidising, chlorine is also the chemical of choice for public pools. Clear and hygienically safe water is guaranteed.

The metering systems DULCODOS® Pool reliably keep the operating parameters in an optimum range and unpleasant side-effects, such as the smell of chlorine or burning eyes, are very rare.

Active oxygen is less effective than chlorine. It can be used for very gentle and environmentally-sound water treatment in pools with fewer users.

### ■ Soft

DULCODOS® Pool Soft is especially suited to private pools used by a small number of people. It works with active oxygen substances, which are less effective than chlorine. Water treatment with active oxygen is a good alternative for ecologically-minded pool owners or if users are allergic to chlorine. DULCODOS® Pool Soft uses no chlorine chemicals.

### ■ Basic

DULCODOS® Pool Basic regulates the pH and chlorine content using the redox potential. This is the direct measurement of effective oxidation in the water and is therefore an indication of the disinfectant effect and concentration of the metered chlorine. The concentration of chlorine cannot be determined with accuracy with this process. ORP measurements allow a particular range of chlorine to be set. DULCODOS® Pool Basic is robust and requires little maintenance.

### ■ Comfort

DULCODOS® Pool Comfort uses highly specific chlorine sensors to measure the chlorine content. The concentration of chlorine in the water can be determined and set with accuracy. The effectiveness of the pool filter is boosted by an integrated feeder assembly for flocculant, resulting in crystal-clear water! Numerous features to enhance operating convenience, such as measured values being mapped by a screen plotter or remote control from your PC, iPad or other tablet device using an integrated web server, make the metering system very popular with customers.

### ■ Professional

In addition to the features described above, DULCODOS® Pool Professional also measures the combined chlorine. This is an important parameter in public pools. It can be incorporated in the building management system via OPC and KNX and alarm messages can be sent by text or e-mail. Eco!Mode operating mode reduces the energy consumption of the filter pumps. The integrated soft PLC control can be used to operate several peripheral devices and functions. The swimming pool controller becomes the central control unit for all the swimming pool technology.

## 5 Measuring, Control and Metering Systems for Swimming Pool Water Treatment

### ■ Choice of pumps

The metering systems DULCODOS® Pool allow you to choose which metering pump to fit on your complete system. The choice of pump depends entirely on the size of your pool and how often it is used.

**Peristaltic pumps DULCO®flex** are suited to applications requiring few chemicals, such as small pools or those used infrequently. The pump reliably eliminates bubbles of gas formed during periods of non-use. Depending on the amount of use, the metering hose has to be replaced once or twice a year. **Motor-driven metering pumps alpha** have a higher capacity and longer maintenance intervals. Like peristaltic pumps, they are silent.

**Solenoid metering pumps Beta®** are not controlled by switching them on and off, like DULCO®flex or alpha, instead, their metering frequency is adjusted continuously, enabling the pump to have an extremely precise control action.

Pumps with **CAN bus system** can be used in the DULCODOS® Pool Professional series. They communicate all operating messages, such as two-stage monitoring of the chemical reservoir, to the control.

### ■ Accessories

Whether you are looking for collecting pans for chemical tanks or portable test devices for measurement parameters – or even software for digital control: optional accessories make it even easier for you to operate the system.

### ■ Service

Installation, commissioning, training in how the system works, operation and maintenance: When you buy a DULCODOS® Pool system, it comes with service you can rely on – even if your pool is already quite old.



# 5 Measuring, Control and Metering Systems for Swimming Pool Water Treatment

## 5.2

### Metering System DULCODOS® Pool Soft

**Ecologically convincing: chlorine-free water treatment with active oxygen in private swimming pools – fully automatically and correctly.**

**For swimming pools with volumes up to 100 m³**

Chlorine-free water treatment system for environmentally operated private pools. Safe water disinfection with active oxygen as a turnkey complete solution.



Complete system DULCODOS® Pool Soft for pH adjustment and chlorine-free disinfection with active oxygen. To prevent any germs in the pool from building up resistance to active oxygen, it is not metered continuously, but injected at intervals controlled by a timer.

Peristaltic pumps of the product range DULCO®flex, motor-driven metering pumps type alpha or solenoid metering pumps type Beta® are used, depending on demand and the circulation volume.

Sensors, controllers and metering pumps form a unit with the chemical storage tanks, which can get to work without a lot of installation effort on your part.

The control device performs numerous functions to enhance operating convenience, such as mapping measured values using a screen plotter and an SD memory card or remote access via the integral WEB server and LAN interface (optional).

#### Your benefits

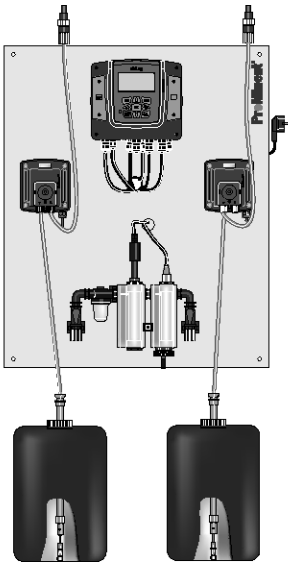
- Simple, quick assembly
- Simple, menu-driven operation
- Chlorine-free
- Constantly good water quality
- Versatile monitoring functions

#### Technical details

- 2-channel controller DULCOMETER® diaLog DACa with measurement/control of the pH value and metering of active oxygen using an integrated timer function, mounted on a wall plate ready for use.
- In-line probe housing with sample water monitoring, sample water filter and measuring probe for pH value
- Monitoring of the chemical reservoir
- Dosing monitor to protect against over-metering
- Screen plotter for graphic mapping of measured values, data logger with SD card
- Embedded web server with LAN interface (optional)
- Metering pumps alpha, DULCO®flex or Beta® to control the pH value and active oxygen content.
- Connector for point of injection: Injection valves with 1/2" screw thread
- Connectors for metering pumps/points of injection: PVC hose 10 x 4 mm
- Sample water connector: PE hose 8 x 5 mm
- Digital pause input
- Alarm relay output
- Electrical connection: 230 VAC, 50/60 Hz
- Dimensions with metering pumps alpha or Beta®:
  - 595 x 745 x 150 mm (W x H x D) mounting plate for measuring technology
  - 595 x 400 x 150 mm (W x H x D) mounting plate for pumps
- Dimensions with metering pumps DULCO®flex: 595 x 745 x 150 mm (W x H x D)
- Weight: approx. 10 kg or 6 kg (without pumps)

#### Field of application

- Private swimming pool



P\_DD\_0042\_SW1

# 5 Measuring, Control and Metering Systems for Swimming Pool Water Treatment

## Identity Code Ordering System for DULCODOS® Pool Soft

DSPa	Measured variable														
DO2	pH / Timer control H <sub>2</sub> O <sub>2</sub>														
Hardware-additional functions															
0 Standard															
Software-additional functions															
1 Screen plotter with measured data backup including SD card															
Communication interfaces															
0 None															
5 Embedded web server, LAN (available from mid-2015)															
Electrical connection															
A 230 V, 50/60 Hz, European standard plug															
B 230 V, 50/60 Hz, Swiss plug															
Sensor equipment															
0 With sensors															
1 Without sensors															
Version															
0 With ProMinent® logo															
1 Without ProMinent® Logo															
Language															
A Swedish															
D German															
E English															
F French															
G Czech															
I Italian															
N Dutch															
P Polish															
R Russian															
S Spanish															
Metering pumps for acids/alkalis															
0 Without metering pumps															
1 0.8 l/h (DULCO®flex DF2a 0208)															
2 1.6 l/h (DULCO®flex DF2a 0216)															
3 2.4 l/h (DULCO®flex DF2a 0224)															
4 1.8 l/h (alpha ALPc 1002 PVT)															
5 3.5 l/h (alpha ALPc 1004 PVT)															
6 1.5 l/h (Beta® BT4b 0401 PVT)															
7 2.8 l/h (Beta® BT4b 0402 PVT)															
8 4.5 l/h (Beta® BT4b 0404 PVT)															
Multifunctional valve for acid/alkali pump															
0 Without															
1 With MFV (only for alpha and Beta®)															
Metering pumps for disinfection															
0 Without metering pumps															
1 0.8 l/h (DULCO®flex DF2a for 0208) for pools up to a volume of 20 m³															
2 1.6 l/h (DULCO®flex DF2a for 0216) for pools up to a volume of 40 m³															
3 2.4 l/h (DULCO®flex DF2a for 0224) for pools up to a volume of 60 m³															
4 1.8 l/h (alpha ALPc 1002 PVT) for pools up to a volume of 45 m³															
5 3.5 l/h (alpha ALPc 1004 PVT) for pools up to a volume of 90 m³															
6 1.5 l/h (Beta® BT4b 0401 PVT) for pools up to a volume of 25 m³															
7 2.8 l/h (Beta® BT4b 0402 PVT) for pools up to a volume of 50 m³															
8 4.5 l/h (Beta® BT4b 0404 PVT) for pools up to a volume of 100 m³															
Multifunctional valve for disinfection pump															
0 Without															
1 With MFV (only for alpha and Beta®)															
Installation															
0 Supplied loose without mounting plate															
1 Assembled on a base plate															
Approvals															
0 With CE certification															
DSPa	DO2	0	1	0	A	0	0	D	2	0	2	0	1	0	Identity code as a representative example

## 5 Measuring, Control and Metering Systems for Swimming Pool Water Treatment

### 5.3 Metering System DULCODOS® Pool Basic

**Convenient and simple: pure water in private swimming pools – fully automatically and correctly.**  
For swimming pools with a circulation capacity of up to 200 m³/h



The chlorine metering system DULCODOS® Pool Basic is a complete solution for private swimming pools where the chlorine content is controlled using the low-maintenance measurement of the redox potential.

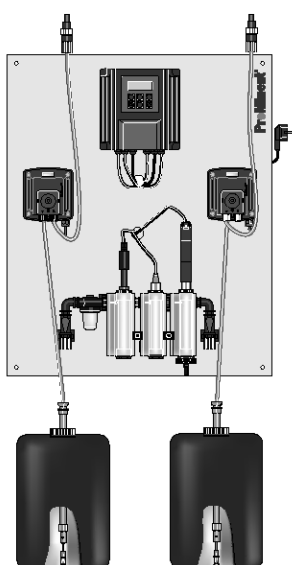
Complete system for the fully automatic adjustment of pH and chlorine content (using the measured variable redox potential) in swimming pool water. Peristaltic pumps of the product range DULCO®flex or motor-driven metering pumps type alpha are used, depending on demand and the circulation volume. Sensors, controllers and metering pumps form a single perfectly coordinated unit with the chemical storage tanks, which can reliably get to work without a lot of installation effort on your part.

#### Your benefits

- Simple, quick assembly
- Simple, menu-driven operation
- Constantly good water quality
- Versatile monitoring functions

#### Technical details

- 2-channel swimming pool controller Splash Control PPCa with measurement, control and metering functions for pH and redox potential (chlorine metering)
- In-line probe housing with sample water monitoring, sample water filter and measuring probe for pH value and redox potential, fitted on a wall panel.
- 2 metering pumps alpha or DULCO®flex
- Monitoring of the chemical reservoir
- Dosing monitor to protect against over-metering
- Connectors for points of injection: Injection valves with 1/2" screw thread
- Connectors for metering pumps/points of injection: PVC hose 10 x 4 mm
- Sample water connector: PE hose 8 x 5 mm
- Digital pause input
- Alarm relay output
- Electrical connection: 230 VAC, 50/60 Hz
- Dimensions: 595 x 745 x 150 mm (W x H x D)
- Weight: approx. 10 kg or 6 kg (without pumps)



pk\_7\_100\_SW1

#### Field of application

- Private swimming pool

# 5 Measuring, Control and Metering Systems for Swimming Pool Water Treatment

## Identity Code Ordering System for DULCODOS® Pool Basic

DSPa	Measured variable														
PR0	pH / ORP														
	Hardware-additional functions														
	0	Standard													
		Software-additional functions													
		0	None												
			Communication interfaces												
			0	None											
				Electrical connection											
				A	230 V, 50/60 Hz, European standard plug										
				B	230 V, 50/60 Hz, Swiss plug										
					Sensor equipment										
					0	With sensors									
					A	Without sensors									
						Version									
						0	With ProMinent® logo								
						1	Without ProMinent® Logo								
							Language								
							D	German							
							E	English							
							F	French							
							G	Czech							
							I	Italian							
							N	Dutch							
							R	Russian							
							S	Spanish							
								Metering pumps for acids/alkalis							
								0	Without metering pumps						
								1	0,8 l/h (DULCO®flex DF2a 0208)						
								2	1,6 l/h (DULCO®flex DF2a 0216)						
								3	2,4 l/h (DULCO®flex DF2a 0224)						
								4	1,8 l/h (alpha ALPc 1002 PVT)						
								5	3,5 l/h (alpha ALPc 1004 PVT)						
									Multifunctional valve for acid/alkali pump						
									0	Without					
									1	With MFV (alpha only)					
										Metering pumps for disinfection					
										0	Without metering pumps				
										1	0.8 l/h DULCO®flex for up to 45/10 m³/h circulation HB/FB*				
										2	1.6 l/h DULCO®flex for up to 90/20 m³/h circulation HB/FB*				
										3	2.4 l/h DULCO®flex for up to 140/30 m³/h circulation HB/FB*				
										4	1.8 l/h alpha for up to 100/20 m³/h circulation HB/FB*				
										5	3.5 l/h alpha for up to 200/40 m³/h circulation HB/FB*				
											Multifunctional valve for disinfection pump				
											0	Without			
											0	With MFV (alpha only)			
												Installation			
												0	Supplied loose without mounting plate		
												1	Assembled on a base plate		
													Approvals		
													0	With CE certification	
DSPa	PRO	0	0	0	A	0	0	D	2	0	2	0	1	0	Identity code as a representative example

\* Calculated for 12 percent sodium-calcium hypochlorite  
HB = Indoor swimming pool  
FB = Outdoor swimming pool

# 5 Measuring, Control and Metering Systems for Swimming Pool Water Treatment

## 5.4

### Metering System DULCODOS® Pool Comfort

**Convenient and simple: crystal-clear water in private swimming pools – fully automatically and correctly.**

**For swimming pools with a circulation capacity of up to 225 m³/h**

The chlorine metering system DULCODOS® Pool Comfort is the convenient solution for pH adjustment and disinfection of swimming pools with liquid chlorine products. Remote access is possible via LAN interface.

#### Your benefits

Complete system DULCODOS® Pool Comfort for pH adjustment and disinfection with liquid chlorine products. Peristaltic pumps of the product range DULCO®flex, motor-driven metering pumps type alpha or solenoid metering pumps type Beta® are used, depending on demand and the circulation volume.

An integrated flocculant metering station (optional) ensures crystal-clear water.

Sensors, controllers and metering pumps form a unit with the chemical storage tanks, which can get to work without a lot of installation effort on your part.

The control device performs numerous functions to enhance operating convenience, such as mapping measured values using a screen plotter and an SD memory card or remote access via the integral WEB server and LAN interface (optional).

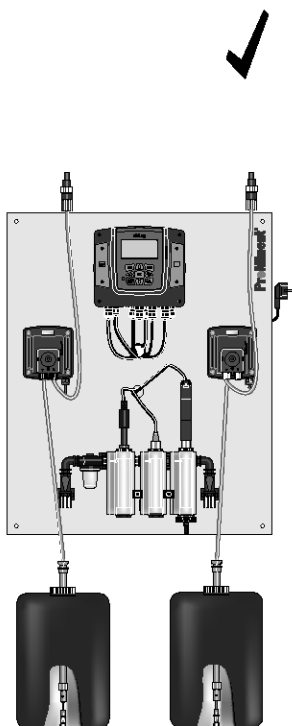
- Simple, quick assembly
- Simple, menu-driven operation
- Brilliant water quality
- Versatile monitoring functions

#### Technical details

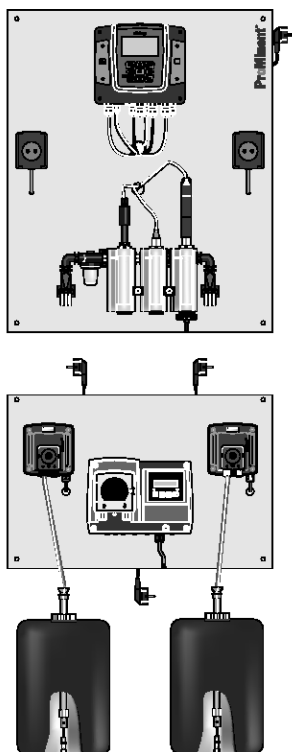
- 2-channel controller DULCOMETER® diaLog DACa with measurement/control and metering functions for pH and chlorine concentration, mounted on a wall plate ready for use
- Integrated flocculant metering station (optional)
- In-line probe housing with sample water monitoring, sample water filter and measuring probes for pH and chlorine content (DC2 for free chlorine, DC4 for free chlorine in the presence of isocyanuric acid stabiliser)
- Monitoring of the chemical reservoir
- Dosing monitor to protect against over-metering
- Screen plotter for graphic mapping of measured values, data logger with SD card
- Embedded web server with LAN interface (optional)
- Metering pumps alpha, DULCO®flex or Beta® to control the pH value and chlorine content, DULCO®flex for metering flocculant (optional).
- Connector for point of injection: Injection valves with 1/2" screw thread
- Connectors for metering pumps/points of injection: PVC hose 10 x 4 mm
- Sample water connector: PE hose 8 x 5 mm
- Digital pause input
- Alarm relay output
- Electrical connection: 230 VAC, 50/60 Hz
- Dimensions with metering pumps alpha or Beta® and/or with "flocculant metering" option:
  - 595 x 745 x 150 mm (W x H x D) mounting plate for measuring technology
  - 595 x 400 x 150 mm (W x H x D) mounting plate for pumps
- Dimensions with metering pumps DULCO®flex: 595 x 745 x 150 mm (W x H x D)
- Weight: approx. 10 kg or 6 kg (without pumps)

#### Field of application

- High-end private pool



P\_DD\_0037\_SW1



P\_DD\_0045\_SW1

# 5 Measuring, Control and Metering Systems for Swimming Pool Water Treatment

## Identity Code Ordering System for DULCODOS® Pool Comfort

DSPa	Measured variable
DC2	pH / free chlorine (chlorine sensor CLE 3-mA-2ppm)
DC4	pH / free chlorine in the presence of the stabiliser isocyanuric acid (chlorine sensor CGE 2-mA-2ppm)
<b>Hardware-additional functions</b>	
0	Standard
<b>Software-additional functions</b>	
1	Screen plotter with measured data backup including SD card
<b>Communication interfaces</b>	
0	None
5	Embedded web server, LAN (available from mid-2015)
<b>Electrical connection</b>	
A	230 V, 50/60 Hz, European standard plug
B	230 V, 50/60 Hz, Swiss plug
<b>Sensor equipment</b>	
0	With sensors
B	Measured variable DC2 without sensors
C	Measured variable DC4 without sensors
<b>Version</b>	
0	With ProMinent® logo
1	Without ProMinent® Logo
<b>Language</b>	
A	Swedish
D	German
E	English
F	French
G	Czech
I	Italian
N	Dutch
P	Polish
R	Russian
S	Spanish
<b>Metering pumps for acids/alkalis</b>	
0	Without metering pumps
1	0,8 l/h (DULCO®flex DF2a 0208)
2	1,6 l/h (DULCO®flex DF2a 0216)
3	2,4 l/h (DULCO®flex DF2a 0224)
4	1,8 l/h (alpha ALPc 1002 PVT)
5	3,5 l/h (alpha ALPc 1004 PVT)
6	1,5 l/h (Beta® BT4b 0401 PVT)
7	2,8 l/h (Beta® BT4b 0402 PVT)
8	4,5 l/h (Beta® BT4b 0404 PVT)
<b>Multifunctional valve for acid/alkali pump</b>	
0	Without
1	With MFV (only for alpha and Beta®)
<b>Metering pumps for disinfection</b>	
0	Without metering pumps
1	0.8 l/h DULCO®flex for up to 45/10 m³/h circulation HB/FB*
2	1.6 l/h DULCO®flex for up to 90/20 m³/h circulation HB/FB*
3	2.4 l/h DULCO®flex for up to 140/30 m³/h circulation HB/FB*
4	1.8 l/h alpha for up to 100/20 m³/h circulation HB/FB*
5	3.5 l/h alpha for up to 200/40 m³/h circulation HB/FB*
6	1.5 l/h Beta® for up to 85/20 m³/h circulation HB/FB*
7	2.8 l/h Beta® for up to 160/35 m³/h circulation HB/FB*
8	4.5 l/h Beta® for up to 260/55 m³/h circulation HB/FB*
<b>Multifunctional valve for disinfection pump</b>	
0	Without
1	With MFV (only for alpha and Beta®)
<b>Installation</b>	
0	Supplied loose without mounting plate
1	Assembled on a base plate
B	Base plate with flocculant pump DF4a fitted
<b>Approvals</b>	
0	With CE certification

DSPa DC4 0 1 0 A 0 0 D 2 0 2 0 1 0 Identity code as a representative example

\* Calculated for 12 percent sodium-calcium hypochlorite  
HB = Indoor swimming pool  
FB = Outdoor swimming pool

# 5 Measuring, Control and Metering Systems for Swimming Pool Water Treatment

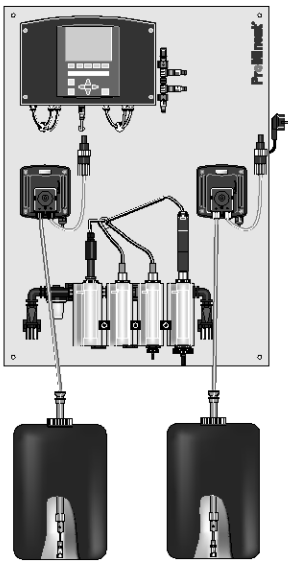
## 5.5

### Metering System DULCODOS® Pool Professional

**Professional and demanding: crystal-clear water in public swimming pools – fully automatically and correctly, with minimal energy consumption, thanks to Eco!Mode.**

**For swimming pools with a circulation capacity of up to 1,130 m³/h**

Chlorine metering system for individual adjustment and monitoring of all common hygiene auxiliary parameters in public pools. DULCODOS® Pool Professional ensures crystal-clear water quality and lowers operating costs thanks to Eco!Mode.



P\_DD\_0035\_SW1

Complete system DULCODOS® Pool Professional for individual adjustment and monitoring of all common hygiene auxiliary parameters in public pools, such as pH, redox potential and free and combined chlorine. Peristaltic pumps of the product range DULCO®flex, motor-driven metering pumps type alpha or solenoid metering pumps type Beta® are used, depending on demand and the circulation volume.

An integrated flocculant metering station (optional) ensures crystal-clear water.

In Eco!Mode, the circulating volume of the swimming pool pumps is optimised depending on the water quality, enabling you to efficiently save energy.

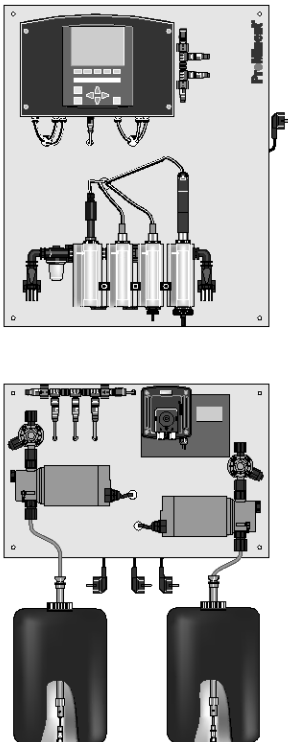
The integrated SoftPLC allows the system to control optional peripheral devices and functions, such as UV systems, water attractions, lighting, heating and water top-up.

The system has many different communication interfaces that enable it to be integrated in networks or a building management system and it can also be remotely monitored and controlled with an Apple® iPad or tablet PC.

Sensors, controllers, metering pumps and the process chemical storage tanks form a single unit with the other peripheral swimming pool technology used, which can handle your work without a lot of installation effort on your part.

#### Your benefits

- Simple, quick assembly
- Brilliant water quality
- Eco!Mode helps cut operating costs
- Versatile communication interfaces
- Central control of peripheral devices and functions too



pk\_7\_105\_SW1

#### Technical details

- Multi-channel, multi-parameter controller DULCOMETER® DULCOMARIN® II with measuring, control and metering functions for pH, redox potential, free and combined chlorine in various combinations depending on the type, ready-wired for use and mounted on a wall panel
- Optional integrated flocculant metering station
- In-line probe housing with sample water monitoring, sample water filter and all sensors
- Monitoring of the chemical reservoir with a pre-alarm (options A and F)
- Dosing monitor to protect against over-metering
- Screen plotter for graphic mapping of measured values, data logger with SD card
- Embedded web server with LAN interface (optional)
- OPC and KNX for integration in building management systems, alarm function by text or e-mail (optional)
- Integrated SoftPLC for control of peripheral devices (option F)
- Metering pumps alpha, DULCO®flex or Beta® to control the pH value and chlorine content, DULCO®flex for metering flocculant (optional)
- Connector for point of injection: Injection valves with 1/2" screw thread
- Connectors for metering pumps/points of injection: PVC hose 10 x 4 mm
- Sample water connector: PE hose 8 x 5 mm.
- Digital pause input
- 3 contact inputs, freely configurable (option A)
- 5 contact inputs, freely configurable (option F)
- CAN bus for connection of chlorine measuring cells and metering pumps Beta® and DULCO®flex DF4a
- Temperature measuring input Pt 100/Pt 1000
- Alarm relay output
- 3 output relay outputs, freely configurable
- 3 relay outputs for the control of metering pumps (option A)
- 6 output relay outputs, freely configurable (option F)
- 4 analogue outputs 0/4-20 mA, freely configurable (option A)
- 2 analogue outputs 0/4-20 mA, freely configurable (option F)
- Electrical connection: 230 VAC, 50/60 Hz.

## 5 Measuring, Control and Metering Systems for Swimming Pool Water Treatment

- Dimensions with metering pumps alpha, Beta® or DULCO®flex DF4a and/or with "flocculant metering" option:
  - 595 x 745 x 150 mm (W x H x D) mounting plate for measuring technology
  - 595 x 400 x 150 mm (W x H x D) mounting plate for pumps
- Dimensions with metering pumps DULCO®flex DF2a: 595 x 745 x 150 mm (W x H x D)
- Weight: approx. 12 kg or 7 kg (without pumps)

### Field of application

- High-end private pool
- Public swimming pool
- Therapy pool

Type	pH	ORP	Measured variables: Chlorine	Chlorine/isocyanuric acid	Combined chlorine
PC5	x	x			
PC6	x		x		
PC7	x	x	x		
PC8	x	x	x		x
PC9	x			x	
PCA	x	x		x	
PCD	x	x		x	x

Type PC5: pH and redox potential (chlorine metering)

Type PC6: pH and free chlorine

Type PC7: pH, redox potential and free chlorine

Type PC8: pH, redox potential, free chlorine and combined chlorine

Type PC9: pH and free chlorine in the presence of the stabiliser isocyanuric acid

Type PCA: pH, redox potential and free chlorine in the presence of the stabiliser isocyanuric acid

Type PCD: pH, redox potential, free chlorine in the presence of the stabiliser isocyanuric acid and combined chlorine



# 5 Measuring, Control and Metering Systems for Swimming Pool Water Treatment

## Identity Code Ordering System for DULCODOS® Pool Professional

DSPa	Measured variable
PC5	pH / ORP
PC6	pH / free chlorine (chlorine sensor CLE 3.1-CAN)
PC7	pH / ORP / free chlorine (chlorine sensor CLE 3.1-CAN)
PC8	pH / ORP / free chlorine / total chlorine (chlorine sensors CLE 3.1-CAN and CTE 1-CAN)
PC9	pH / total chlorine (chlorine sensor CGE 2-CAN)
PCA	pH / ORP / total chlorine (chlorine sensor CGE 2-CAN)
PCD	pH / ORP / free chlorine / total chlorine (chlorine sensors CGE 2-CAN and CTE 1-CAN)
<b>Hardware-additional functions</b>	
0	Standard
A	4 standard signal outputs, 0/4-20 mA measured value (A module)
F	Functional module (F-module)
<b>Software-additional functions</b>	
1	Screen plotter with measured data backup including SD card
<b>Communication interfaces</b>	
0	None
5	Embedded web server, LAN
6	OPC server + Embedded web server + KNX function + alarm by text or e-mail
<b>Electrical connection</b>	
A	230 V, 50/60 Hz, European standard plug
B	230 V, 50/60 Hz, Swiss plug
<b>Sensor equipment</b>	
0	With sensors
A	Measured variable PC5 without sensors
E	Measured variable PC6 without sensors
F	Measured variable PC7 without sensors
G	Measured variable PC8 without sensors
H	Measured variable PC9 without sensors
I	Measured variable PCA without sensors
L	Measured variable PCD without sensors
<b>Version</b>	
0	With ProMinent® logo
1	Without ProMinent® Logo
<b>Language</b>	
D	German
E	English
F	French
I	Italian
P	Polish
S	Spanish
<b>Metering pumps for acids/alkalis</b>	
0	Without metering pumps
1	0.8 l/h (DULCO®flex DF2a 0208)
2	1.6 l/h (DULCO®flex DF2a 0216)
3	2.4 l/h (DULCO®flex DF2a 0224)
4	1.8 l/h (alpha ALPc 1002 PVT)
5	3.5 l/h (alpha ALPc 1004 PVT)
A	1.5 l/h (Beta® CANopen BT4a 0401 PVT)
B	2.8 l/h (Beta® CANopen BT4a 0402 PVT)
C	5.3 l/h (Beta® CANopen BT4a 0405 PVT)
D	1.5 l/h (DULCO®flex DF4a 04015 CAN Bus)
E	6.0 l/h (DULCO®flex DF4a 03060 CAN Bus)
F	8.3 l/h (Beta® CANopen BT4a 0408 PVT)
<b>Multifunctional valve for acid/alkali pump</b>	
0	Without
1	With MFV (only for alpha and Beta®)
<b>Metering pumps for disinfection</b>	
0	Without metering pumps
1	0.8 l/h DULCO®flex DF2a for up to 45/10 m³/h circulation HB/FB*
2	1.6 l/h DULCO®flex DF2a for up to 90/20 m³/h circulation HB/FB*
3	2.4 l/h DULCO®flex DF2a for up to 140/30 m³/h circulation HB/FB*
4	1.8 l/h alpha for up to 100/20 m³/h circulation HB/FB*
5	3.5 l/h alpha for up to 200/40 m³/h circulation HB/FB*
A	1.5 l/h Beta® CANopen for up to 85/20 m³/h circulation HB/FB*
B	2.8 l/h Beta® CANopen for up to 160/35 m³/h circulation HB/FB*
C	5.3 l/h Beta® CANopen for up to 300/65 m³/h circulation HB/FB*
D	1.5 l/h DULCO®flex DF4a CANopen for up to 85/20 m³/h circulation HB/FB*
E	6.0 l/h DULCO®flex DF4a CANopen for up to 340/70 m³/h circulation HB/FB*
F	19.5 l/h Beta® CANopen for up to 1050/225 m³/h circulation HB/FB*
<b>Multifunctional valve for disinfection pump</b>	
0	Without
1	With MFV (only for alpha and Beta®)
<b>Installation</b>	
0	Supplied loose without mounting plate
1	Assembled on a base plate
B	Base plate with flocculant pump DF4a fitted
<b>Approvals</b>	
0	With CE certification

DSPa PC7 A 1 5 A 0 0 D B 0 B 0 1 0 Identity code as a representative example

\* Calculated for 12 percent sodium-calcium hypochlorite  
HB = Indoor swimming pool  
FB = Outdoor swimming pool

# 5 Measuring, Control and Metering Systems for Swimming Pool Water Treatment

## 5.6 Maintenance Kits

The following are needed for the maintenance of a measuring, control and metering system DULCODOS® Pool:

- 2 no. maintenance kits for metering pumps
- 1 no. maintenance kit for the measured variable

### 5.6.1 Maintenance Kits for Metering Pumps

The following table shows the assignment of the maintenance kits to the types of metering pumps used.

	Product range	Type	Order no.
Hose, complete 4.8 x 8.0 PharMed	DF2a	0208, 0216, 0224	1009480
Hose, complete 1.6 x 4.8 PharMed	DF4a	04015	1030722
Hose, complete 3.2 x 6.4 PharMed	DF4a	03060	1030723
Spare parts kit 1005-2/1605-2 PVT	ALPc, BT4a	1002PVT/1004PVT (ALPc), 0405PVT (BT4a)	1023110
Spare parts kits 1601 – 2 PVT, PPT, NPT	BT4a, BT4b	0401PVT (BT4a), 0401PVT (BT4b)	1023108
Spare parts kits 1602 – 2 PVT, PPT, NPT	BT4a, BT4b	0402PVT (BT4a), 0402PVT (BT4b)	1023109
Spare parts kits 0708 – 2/1008 – 2 PVT, PPT, NPT	BT4a	0408PVT	1023111
Spare parts kit 9.2/33.5/12 x 9 PVT	BT4a	0220PVT	1023113
Spare parts kits 1604 – 2 PVT, PPT, NPT	BT4b	0404PVT	1035332

### 5.6.2 Maintenance Kits for Measured Variables

Maintenance kits are put together for the measured variables of the DSPa. Depending on the measured variable, the maintenance kits consist of:

- Buffer solutions
- Electrolytes
- Diaphragm caps
- 1 stainless steel screen 300 µm for the water filter
- 1 NBR flat seal for the water filter

The following table shows the assignment of the maintenance kits to the types of DULCODOS® Pool.

	Type	Order no.
DSPA maintenance kit PR0, PC5, 333, 335, 735, 736	Basic, Professional PC5	1050631
DSPA maintenance kit DO2	Soft	1050632
DSPA maintenance kit DC2, PC6, 640, 645, 745	Comfort DC2, Professional PC6	1050633
DSPA maintenance kit DC4, PC9	Comfort DC4, Professional PC9	1050644
DSPA maintenance kit PC7, PCB, 781, 785, 786	Professional PC7	1050645
DSPA maintenance kit PC8	Professional PC8	1050646
DSPA maintenance kit PCA	Professional PCA	1050647
DSPA maintenance kit PCD	Professional PCD	1050648

### 5.6.3 Buffer Solutions

Quality buffer solutions are provided for calibration of pH and ORP sensors.

The following table shows the assignment of the buffer solutions to the sensors.

	Measured variable	Order no.
Buffer solution pH 4, 50 ml, red	pH	506251
Buffer solution pH 7, 50 ml, green	pH	506253
Buffer solution ORP 465 mV, 50 ml	ORP	506240

# 5 Measuring, Control and Metering Systems for Swimming Pool Water Treatment

## 5.7 Test Equipment

### 5.7.1 Portable Meter Portamess<sup>®</sup> Measured Variable pH/ORP

Robust manual measuring instrument to withstand the most severe mechanical and chemical loading.

Measuring range pH -2.00 to + 16.00, ORP -1,300 ... +1,300 mV

pH and ORP measurement with Portamess<sup>®</sup> pH/ORP - battery-powered, hand-held meter with automatic or manual temperature compensation.



pk\_5\_099

The Portamess<sup>®</sup> pH/ORP is used to measure the pH and ORP value in the industrial, environmental, food and waste water sectors. The unit complies with the requirements of the EMC Act and the NAMUR NE 21 recommendations. Calibration can be done with buffer solutions made of different, pre-selectable buffer sets.

#### Your benefits

- Robust and leak-tight
- Long lifespan: Over 2,000 h operating time with only 3 x AA batteries
- Always in sight: Large LC display

#### Technical details

- **Measuring ranges** pH: -2.00 ... +16.00, ORP: -1,300 ... +1,300 mV
- **Measuring errors** pH: < 0.01, ORP: < 0.1% of the measured value  $\pm 0.3$  mV
- **Sensor adaptation:** 8 buffer sets to choose from
- **Temperature compensation:** Manual
- **Degree of protection:** IP 66
- **Operating time:** 2,000 hours with 3 no. AA cells
- **Dimensions:** H x W x D 160 x 133 x 30
- **Weight:** 560 g with batteries
- **Scope of delivery:** Measuring instrument, field case, operating instructions in German, English and French.
- **Caution:** Order the pH sensor separately.

#### Field of application

- Industry
- Environmental protection
- Food production
- Water or waste water inspection
- Hard-wearing membrane keypad
- Large, easy-to-read LCD display
- Integrated sensor quiver to protect the sensor
- Sturdy housing (IP 66 degree of protection)
- Robust, watertight, gold-plated sockets

#### Accessories

	Capacity ml	Order no.
PHEKT-014F	–	1036537
Coaxial cable Ø 5 mm, 0.8 m - SD*	–	305098
Buffer pH 7.0	50	506253
Buffer pH 4.0	50	506251

\* Fitting for all ProMinent<sup>®</sup> pH sensors with SN6 connection

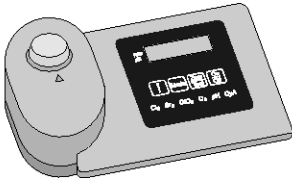
# 5 Measuring, Control and Metering Systems for Swimming Pool Water Treatment

## 5.7.2

### Photometer

#### Precise measurement results through high-quality interference filters

Photometers measure nearly all disinfectants and the pH value based on the photometric principle. They are portable, compact and make safe, simple measurement possible.



P\_DT\_0074\_SW  
Photometer

The photometers DT1B, DT2C, DT3B and DT4B are used, among other things, as a reference method for calibrating the electrochemical sensors for chlorine, chlorine dioxide, fluoride, chlorite, H<sub>2</sub>O<sub>2</sub>, bromine and ozone. They have been adapted to today's requirements and can be used in almost all areas of water analysis. High-quality interference filters and long-term stable LEDs are used as the light source in the high-precision optics. The entire measuring unit is maintenance-free. Precise and reproducible analysis results are achieved with minimum time and effort. The units are winning customers over with their excellent operating convenience, ergonomic design, compact dimensions and ease of use.

#### Your benefits

- Portable and compact
- Simple to operate with text support
- Safe, simple measurement of chlorine, chlorine dioxide, fluoride, chlorite, H<sub>2</sub>O<sub>2</sub>, bromine, ozone, pH and trichloroisocyanuric acid
- Can be calibrated
- Memory function for the last measurements
- Backlit display
- Real-time clock
- Countdown
- Watertight, degree of protection IP 68

#### Technical details

##### Measuring ranges of the DT1B:

- 0.05... 6.0 mg/l free chlorine (DPD1) + total chlorine (DPD1+3)
- 5 ... 200 mg/l free chlorine (high range)
- 0.1 ... 13.0 mg/l bromine (DPD1)
- 0.05 ... 11 mg/l chlorine dioxide (DPD1)
- 0.03 ... 4.0 mg/l ozone (DPD4)
- 6.5 ... 8.4 pH (phenol red)
- 1 ... 80 mg/l cyanuric acid

##### Measuring ranges of the DT2C:

- 0.05 ... 2.0 mg/l fluoride
- 0.05... 6.0 mg/l free chlorine and total chlorine
- 0.05 ... 11.0 mg/l chlorine dioxide

##### Measuring ranges of the DT3B:

- 1 ... 50 / 40 ... 500 mg/l hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>)

##### Measuring ranges of the DT4B:

- 0.03 ... 2.5 mg/l chlorite
- 0.05 ... 11 mg/l chlorine dioxide
- 0.05 ... 6 mg/l chlorine

**Measuring tolerance:** depending on the measured value and measuring method

**Battery:** 4 no. AA/LR6 batteries

**Permissible ambient temperature range:** 5...40 °C

**Relative humidity:** 30 ... 90% (non-condensing)

**Degree of protection:** IP 68

**Housing material:** ABS

**Keypad:** polycarbonate film

**Dimensions:** 190 x 110 x 55 mm (L x W x H)

**Weight:** 0.4 kg

#### Field of application

- Swimming pools
- Potable water
- Process water

## 5 Measuring, Control and Metering Systems for Swimming Pool Water Treatment

	Order no.
Photometer DT1B	1039315
Photometer DT2C	1039316
Photometer DT3B	1039317
Photometer DT4B	1039318

Photometers supplied with accessories, container vessels and reagents.

### Consumable items

	Order no.
DPD 1 buffer, 15 ml	1002857
DPD 1 reagent, 15 ml	1002858
DPD 3 solution, 15 ml	1002859
Phenol red tablets R 175 (100 in each)	305532
Cyanuric acid tablets (100 in each)	1039744
SPADNS reagent, 250 ml for fluoride detection	1010381
Calibration standard fluoride 1 mg/l, for calibration of the photometer during fluoride determination	1010382
3 spare cells: round cells with covers for DPD phenol red and cyanuric acid detection (DT1 and DT2B)	1007566
3 spare cells for fluoride detection (DT2A and B)	1010396
DPD reagent set, 15 ml each: 3 x DPD 1 buffer, 1 x DPD 1 reagent, 2 x DPD 3 solution	1007567
Chlorine dioxide tablets no. 1	1039732
Chlorine dioxide tablets no. 2	1039733
Chlorine HR tablets (100 off)	Chlorine_tablets
ACiDiTYiNG tablets (100 off)	AC_tablets

### Spare parts

#### Chlorite Photometer

	Order no.
Stirrer for purging of chlorine dioxide (DT4)	1022754
3 spare cells: round cells with covers for DPD phenol red and cyanuric acid detection (DT1 and DT2B)	1007566

#### H<sub>2</sub>O<sub>2</sub> measurement

	Order no.
Reagent for H <sub>2</sub> O <sub>2</sub> (DT3), 15 ml	1023636
Spare cell, 5x , for H <sub>2</sub> O <sub>2</sub> (DT3)	1024072



## 6 Membrane Technology and Membrane Filtration

### 6.1 Overview of Membrane Technology

#### Systems for membrane filtration

In water treatment, membrane filtration is the process for removing particles and salts in the water ensuring the lowest operating costs. ProMaqua offers versatile and high-quality system technology in this field. This is complemented by the extensive ProMaqua® product range to produce customer-specific complete solutions.

Membrane filtration is a physical process to separate substances with the help of semi-permeable membranes. There are four types of processes, depending on the size of the particles/molecules to be removed:

- Microfiltration
- Ultrafiltration
- Nanofiltration
- Reverse osmosis

The following table shows the separation limits of the individual processes:

	<b>Microfiltration</b>	<b>Ultrafiltration</b>	<b>Nanofiltration</b>	<b>Reverse osmosis</b>
Particle size	> 0.1 µm	0.1 – 0.01 µm	0.01 – 0.001 µm	< 0.001 µm
Particle type	Suspended particles, colloidal turbidity, oil emulsions	Macromolecules, bacteria, cells, viruses, proteins	Low-molecular organic compounds, ions	Ions

ProMaqua experts, with their detailed industry knowledge, are not only able to put together the optimum system for the relevant application but also deliver complete water treatment solutions from one source, supported by the extensive ProMinent product range.

## 6 Membrane Technology and Membrane Filtration

### 6.2 Performance Overview of Ultrafiltration

Ultrafiltration is a membrane process which is increasingly used in water treatment to separate undesired water components. Parasites, bacteria, viruses and high-molecular organic substances as well as other particles are retained.

The applications of ultrafiltration are widespread and may include different types of water.

Typical applications include drinking water, river water, process water, swimming pool water, salt water and waste water.

The tasks range from potable water purification to meet physical and microbiological limit values in accordance with the German Drinking Water Ordinance up to the pre-treatment of seawater for desalination by reverse osmosis.

The systems are matched to a specific task by individually selecting the membrane type and the operating mode. ProMaqua® uses extremely robust and resistant UF membranes and the dead-end principle to ensure optimisation with regard to investment costs, required space and operating costs. With this selection, all raw waters with the exception of waste water can be filtered largely without using chemicals.

The dead-end operation represents the standard operating mode. The raw water flows into the capillaries. The pure water (filtrate) passes through the membrane while the other constituents are retained on the surface of the membrane.

The constituents form a layer on the membrane. The membrane is backwashed fully automatically in regular intervals to remove the filter cake.

#### Ultrafiltration systems basically consist of:

- Stainless steel or high-grade coated steel rack
- Pre-filter to protect the membranes, if required. This filter can optionally be designed as a backwashing filter.
- UF membrane modules
- Pneumatically controlled valves made of high-quality materials
- Electronic pressure measurement
- Filtration pump and backwash pump with frequency converter made of suitable high-quality materials
- Magnetically inductive flow metering to control the flow rates for filtration and backwashing.
- Integrated filling system for the backwash water tank. The backwash water tank is also integral to small systems. With larger systems, tanks from our product range can be integrated or an application-specific solution found depending on the customer's requirements.
- PLC control with touch screen panel or microprocessor control unit.

The PLC control simultaneously monitors all important parameters, such as pressure, pressure difference and flow rates. This ensures that the membranes are optimally protected. The control of pre- and post-treatment processes can be integrated, if required.

#### Advantages of ultrafiltration systems

- Filtrate values of less than 0.1 NTU independent of the turbidity of the raw water.
- Molecular weight cut off of the diaphragms (MWCO) approx. 100 kDa (kilodalton).
- Best possible retention rates for bacteria (99.9999 %) and viruses (99.99 % based on MS2 phages).
- Very easy to use and simple to combine with other systems owing to PLC Programmable Logic Controller with touch screen.
- Optimum operating processes due to modern measuring and control technology.
- Complete solutions with perfectly coordinated pre- and post-treatment are available on request.

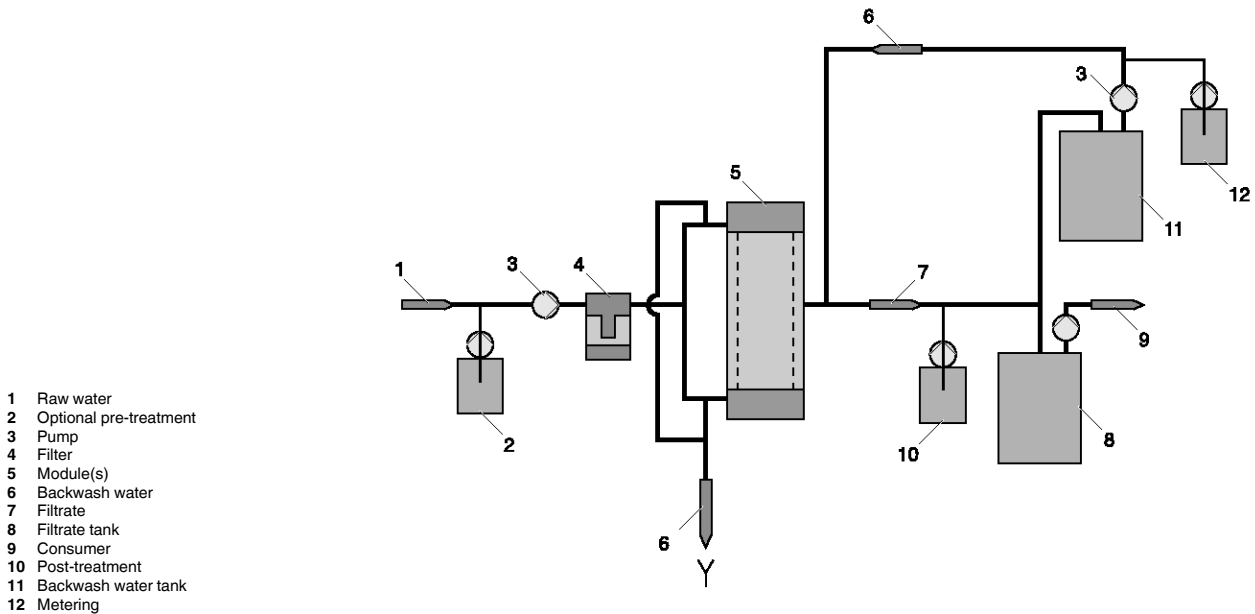


## 6 Membrane Technology and Membrane Filtration

### Areas of application of ultrafiltration systems

Typical areas of application include the removal of particles, turbidity and pathogens in public or private potable water supplies. Ultrafiltration is predominantly used for the treatment of fresh water, in particular surface water, spring water or well water. In principle, brackish water and salt water can also be treated, e.g. as pre-treatment for subsequent desalination by nanofiltration or reverse osmosis. Further areas of application include the treatment of swimming pool water, process water from the food and beverage industry.

A typical general system layout is shown below:



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Our engineers use their wide experience in water treatment to determine the ultrafiltration system to meet the specific raw water requirements. If desired and/or required, the best-suited pre- and post-treatment is also defined. Numerous further ProMinent® and ProMaqua® products are available for this purpose. Thus, customers are offered a complete package of solutions from one single source.

The filtration capacity of ultrafiltration systems ranges from 1 to 80 m³/h. Other capacities are available on request. Please contact us, we will be glad to assist you.

## 6 Membrane Technology and Membrane Filtration

### 6.3

### Performance Overview of Nanofiltration

#### Partial desalination for industrial applications - compact and cost-effective

#### Permeate outputs from 1 to 50 m³/h, higher outputs possible on request

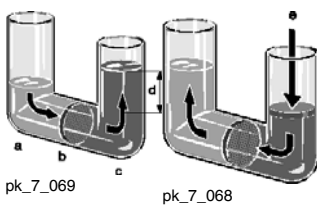


As a nanofiltration system, the Dulcosmose® NF, a compact and value-for-money unit, can take over partial desalination in industrial applications. Maximum permeate output at low operating pressures ensures low investment and operating costs thanks to the latest "ultra low pressure" diaphragm.

Equipped with the latest generation of "ultra low-pressure" diaphragms, this system achieves maximum permeate performance with low operating pressures and high outputs, thereby lowering investment and operating costs.

As the system runs with low operating pressures, the entire system can be fitted with inexpensive PVC pipework. This system is also available with an integral, semi-automated cleaning system and permeate and/or raw water flushing option.

The system can easily be adapted to meet specific customer requirements. Pipework material, other types of diaphragm for enhanced salt retention or discolouration, integration of measuring and control technology (such as conductivity, redox potential or pH measurement) and metering technology (in pre- and post-treatment) to visualisation of the entire process with peripheral components on a PLC.



pk\_7\_069  
pk\_7\_068

a Diluted solution (permeate)  
b Semi-permeable membrane  
c Concentrated solution (concentrate)  
d Hydrostatic head corresponding to the osmotic product  
e Pressure

Osmosis                      Nanofiltration

#### Your benefits

- Efficient operation with a low pressure diaphragm with outputs of up to 85% and high salt retention rates of up to 90% (depending on the type of diaphragm used).
- Reduced maintenance and service costs, as well as long diaphragm service lives, thanks to integrated cleaning concepts and flushing options.
- Optional permeate flushing of the entire system, including the diaphragms, after switching off to avoid deposits and extend the life of the diaphragms.
- Best ProMinent manufacturing quality: High proportion of in-house manufacturing.
- Pure quality: Use of long-life, high-quality components.
- Service-friendly construction of systems on a corrosion-resistant powder-coated steel or stainless steel frame.
- Simple and safe to operate: Microprocessor control with direct connection option for peripheral system components and integrated conductivity measurement with plain text display in the graphic display.
- One-stop shop: no interface problems, smooth running with short times between definition of the task to joint commissioning and on-site system supervision with our global subsidiaries.

#### Technical details

- Turnkey systems constructed on a high-quality, double powder-coated steel or stainless steel frame.
- Highly efficient low-pressure diaphragms with maximum output and system retention rates, built into epoxy-glass resin or stainless steel pressure pipes
- Pre-filter 5 µm with manometer for determining differential pressure
- Pressure switch to protect the high-pressure pump
- Flow meter to display permeate, concentrate and concentrate return volume
- Semi-automatic cleaning system for chemical module cleaning for long module service lives
- Central control for the entire system and peripheral components by the company's own microprocessor controller with graphic display and integrated temperature-compensated conductivity measurement.
- Optional permeate flushing of the entire system, including the diaphragms, after switching off
  - 2 switching inputs for level control of the cleaning tank
  - 2 switching inputs for level control of the permeate tank
  - Pause switching input for external On/Off
  - External fault switching input
  - Temperature measuring input (PT 100)
  - Active permeate valve output (filling of cleaning tank)
  - Active output for flushing valve for initial permeate disposal (depending on conductivity), raw water, permeate and interval flushing (idle time management)
  - Active output for controlling a metering pump (anti-scalant)
  - Analogue output 0/4...20 mA conductance
- Optional industrial PLC with touch panel and process visualisation

## 6 Membrane Technology and Membrane Filtration

### Field of application

- Low-cost alternative to reverse osmosis systems for special desalination tasks, such as the elimination of multiple charged ions or the removal of dyes
- Partial water softening or water softening in public drinking water
- Partial desalination in the chemical and pharmaceutical industry, food and beverage industry, metal processing industry and in electroplating

Nanofiltration is based on the same principle as reverse osmosis. The difference: The separation limit is slightly lower. Admittedly this type of membrane filtration retains ions dissolved in water, but to a significantly lesser extent than with reverse osmosis. Ultimately that saves operating costs.

Typical salt retention rates are around 80 – 90%. Multi-value ions (e.g. Ca and Mg) are retained better than single-value ions (e.g. Na, K) so that nanofiltration systems are often also used as an alternative to traditional water softening.

In principle with nanofiltration, the raw water to be softened is introduced into a chamber, separated by a semi-permeable diaphragm. An artificial pressure is generated in the chamber against the osmotic pressure gradient. The diaphragm is permeable to pure water and smaller ions. All other components of the water are retained. This produces partially softened water (permeate) and a concentrated solution (concentrate). ProMaqua uses high-quality nanofiltration diaphragms for this process.

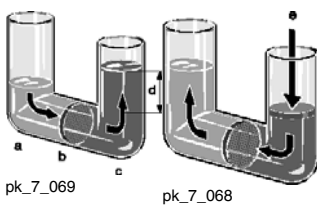
## 6 Membrane Technology and Membrane Filtration

### 6.4 Performance Overview of Reverse Osmosis

Reverse osmosis is a sub-sector within membrane filtration. It is the process with the highest separation limit and represents the reversal of the natural process of osmosis. It is therefore used as a method for desalinating aqueous solutions. With suitable high-performance diaphragms, it is possible today to remove over 99% of all salts from an aqueous solution.

In principle with reverse osmosis, the raw water to be softened is introduced into a chamber, separated by a semi-permeable diaphragm. An artificial pressure is generated in the chamber against the osmotic pressure gradient. As the diaphragm is only permeable to pure water, not to the ions and other particles dissolved in it, a proportion of pure desalinated water (permeate) and a proportion of concentrated solution (concentrate) is produced from the raw water. ProMaqua uses high-quality low-pressure diaphragms for this process.

#### Basically, Dulcosmose® Reverse Osmosis Systems Consist of:



- a Diluted solution (permeate)
  - b Semi-permeable membrane
  - c Concentrated solution (concentrate)
  - d Hydrostatic head corresponding to the osmotic product
  - e Pressure
- Osmosis                      Reverse Osmosis

- Stainless steel, PP or powder-coated steel frame
- Pre-filter 5 µm
- High-quality inlet valve, made of appropriate materials, depending on the salt content of the raw water
- Pressure switch to protect the high-pressure pump
- High-pressure pump, made of suitable high-grade materials, depending on the salt content of the raw water
- Low-pressure diaphragms, designed as spiral winding modules, integrated into epoxy-glass resin pressure pipes
- Float flow meter and manometer
- Stainless steel control and regulating valves to regulate pressure and concentrate
- ProMaqua's own conductivity measuring cell and reverse osmosis control with diverse programming options also for controlling external pre- or post-treatment components
- Semi-automatic chemical cleaning system

#### Advantages of Dulcosmose® Reverse Osmosis Systems

- Simple and reliable operation, thanks to modern microprocessor control with integrated conductivity measurement and clear text display of the operating status
- Efficient operation with pure water output of up to 85% and separation of more than 99% of dissolved ions
- Minimal energy consumption by the use of "low energy" reverse osmosis diaphragms and energy recovery from the concentrate flow (salt water desalination)
- Long service lives of the diaphragms, thanks to integrated cleaning concept and permeate and/or raw water flushing option
- Well thought-out, service-friendly construction of the systems on stainless steel or PP frames or made of powder-coated steel
- Minimal investment and operating costs, as components are used, optimised and matched to the individual case
- On request, complete solutions with precisely coordinated pre- and post-treatment, such as ProMinent metering and measuring and control technology, i.e. simple networking, perfect operation and overall monitoring of the different components of the system

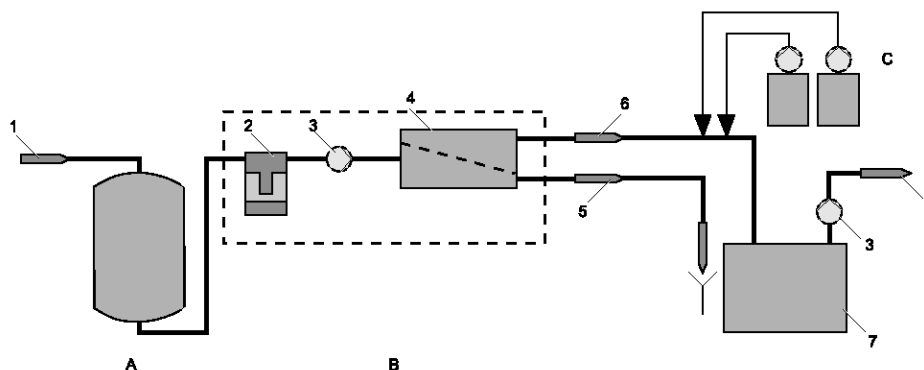
## 6 Membrane Technology and Membrane Filtration

### Applications of Dulcosmose® Reverse Osmosis Systems

Typical applications are desalination duties in municipal or private potable water supply, in the chemical and pharmaceutical industries, food and beverage industry, metal processing industry, electroplating, in boiler feed water treatment and in power stations, for example.

A typical general plant diagram is shown below:

- 1 Raw water
- 2 Filter
- 3 Pump
- 4 Module(s)
- 5 Concentrate
- 6 Permeate
- 7 Permeate tank
- 8 User
- A Pre-treatment
- B Reverse osmosis
- C Post-treatment



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Basically, three types of raw water with different salt contents can be considered for desalination:

- Potable water (typically up to 1,000 mg/l)
- Brackish water (typically up to 2,000 - 5,000 mg/l)
- Sea water (typically higher than 35,000 mg/l)

Our engineers use their years of experience in the treatment of this raw water to determine - based on the particular raw water analysis - the optimum version of reverse osmosis plant for the customer. At the same time, the most suitable pre-treatment and post-treatment stages are selected using other ProMinent® products. So a complete package is put together for the customer, from a single source. One of our specialities here is the supply of complete plants installed in a standard transport container.

ProMaqua also has wide experience in building other special plants, e.g. two-pass plants for higher permeate quality requirements. Please contact us - we'll be happy to advise you.

Type		ecoPRO	TW	BW	SW
Permeat-output [m³/h]	50				
	25				
	10				
	5				
	2,5				
	1				
	0,5				
	0,25				
	0,1				
Salinity		< 1.000 mg/l	< 1.000 mg/l	< 5.000 mg/l	< 40.000 mg/l
Drinking water					

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## 6 Membrane Technology and Membrane Filtration

### 6.5 Questionnaire

#### 6.5.1 Questionnaire on the Design of a UF System

**Application:** Drinking water production ☐

Process water for food/beverage industry ☐

Circulation water for swimming pools ☐

Flushing water for swimming pools ☐

Other: \_\_\_\_\_ ☐

**Type of raw water** Drinking water ☐

Surface water (lake, river water) ☐

Source water ☐

Ground water ☐

Brackish water, sea water ☐

**Design principles: (please state maximum (peak), minimum and average values)**

Clear water requirement: \_\_\_\_\_ m<sup>3</sup>/h

Chloride: \_\_\_\_\_ ppm

Clear water requirement: \_\_\_\_\_ m<sup>3</sup>/day

Iron in solution: \_\_\_\_\_ ppm

Temperature: \_\_\_\_\_ °C

Particular iron: \_\_\_\_\_ ppm

Turbidity: \_\_\_\_\_ NTU

Manganese in solution: \_\_\_\_\_ ppm

COD: \_\_\_\_\_ ppm

Particular manganese: \_\_\_\_\_ ppm

TOC/DOC: \_\_\_\_\_ ppm

Fluctuations? Yes ☐ No ☐

Total hardness: \_\_\_\_\_ °dH

**Remarks (current pre-treatment, special requirements)**

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## 6 Membrane Technology and Membrane Filtration

### 6.5.2 Questionnaire on the Design of an RO System

Clean water requirement: \_\_\_\_\_ m<sup>3</sup>/h

Clean water requirement: \_\_\_\_\_ m<sup>3</sup>/day

Operating hours: \_\_\_\_\_ h/day

Required  
clean water pressure: \_\_\_\_\_ bar

Raw water  
temperature, min./max.: \_\_\_\_\_ °C

#### Required quality of clean water:

Conductivity: \_\_\_\_\_ µS/cm

pH value: \_\_\_\_\_

#### Bacteriological quality:

Drinking Water Directive ☐

Germ-free and sterile ☐

Intended use of clean water:

\_\_\_\_\_

#### Type of raw water:

Drinking water ☐

Well water ☐

Brackish water ☐

Lake water ☐

or \_\_\_\_\_ ☐

Fluctuations: yes ☐  
no ☐

#### State fluctuations:

Conductivity: \_\_\_\_\_ µS/cm

pH value: \_\_\_\_\_

Ca: \_\_\_\_\_ mg/l

Mg: \_\_\_\_\_ mg/l

K: \_\_\_\_\_ mg/l

Na: \_\_\_\_\_ mg/l

Ba: \_\_\_\_\_ mg/l

Sr: \_\_\_\_\_ mg/l

Fe: \_\_\_\_\_ mg/l

Mn: \_\_\_\_\_ mg/l

Al: \_\_\_\_\_ mg/l

Available space HxWxD: \_\_\_\_\_ m

Location of the system: \_\_\_\_\_ Floor

Location of the users: \_\_\_\_\_ Floor

Existing clean water tank: \_\_\_\_\_ m<sup>3</sup>

Existing clean water pump: \_\_\_\_\_ m<sup>3</sup>/h  
\_\_\_\_\_ bar

Lift yes ☐  
no ☐

H x W x D: \_\_\_\_\_ mm

Door dimensions

H x W \_\_\_\_\_ mm

Crane on site: yes ☐  
no ☐

Lifting capacity: \_\_\_\_\_ t

Raw water pressure: \_\_\_\_\_ bar

Raw water connection: \_\_\_\_\_ "

Clean water pipes  
available yes ☐  
no ☐

Material: \_\_\_\_\_ Ø  
\_\_\_\_\_ "

Mains voltage: \_\_\_\_\_ V/Hz

HCO<sub>3</sub>: \_\_\_\_\_ mg/l

SO<sub>4</sub>: \_\_\_\_\_ mg/l

Cl: \_\_\_\_\_ mg/l

NO<sub>3</sub>: \_\_\_\_\_ mg/l

F: \_\_\_\_\_ mg/l

PO<sub>4</sub>: \_\_\_\_\_ mg/l

CO<sub>2</sub> (free): \_\_\_\_\_ mg/l

SiO<sub>2</sub>: \_\_\_\_\_ mg/l

COD\*: \_\_\_\_\_ mg/l

\*COD = chemical oxygen demand

## 6 Membrane Technology and Membrane Filtration

### 6.6 Ultrafiltration System Dulcoclean®

#### 6.6.1 Ultrafiltration Systems Dulcoclean® UF

Pure, crystal-clear potable water at all times

8 - 75 m³/h filtrate output



Ultrafiltration system Dulcoclean® UF reliably and safely uses diaphragm technology to remove turbidity, particles and microbiological contamination.

The ultrafiltration system Dulcoclean® UF is used in water treatment to separate the finest particles and turbidity. The diaphragms provides a sterile barrier, so that bacteria, parasites and viruses are safely removed from the water – even with fluctuating water quality, as can occur after heavy rainfall. The quality of the filtrate remains consistently good! In potable water treatment, the filtration process is ideally used before final disinfection.

In regular cycles, back washes are performed to prevent blockages in the modules. Cleaning is supported by the addition of chemicals, where necessary, and adapted to the raw water quality present

##### Your benefits

- Very high retention rates for bacteria and viruses (based on MS2 phages) of 99.999% and/or 99.99%
- Minimal consumption of energy and water by economical dead-end operation
- Maximum operational reliability due to fully automated system control with PLC and data storage and by user-friendly touch panel with clear process visualisation
- All relevant events are recorded electronically for system optimisation and can be easily evaluated.
- Constant filtrate output and efficient back flushing by speed-controlled filtration and backwash pumps
- Complete solutions with perfectly coordinated pre- and post-treatment and waste water treatment

##### Technical details

- Compact design can be installed in existing plant rooms or in a container
- Fitted with extremely resistant and shatter-proof PES ultrafiltration diaphragms

##### Field of application

- Municipal potable water treatment: Potable water is produced from surface, spring or well water.
- Food and beverage industry: Improved water quality.
- Desalination: Pre-treatment for downstream desalination plants (RO, NF or ion exchange)

Dulcoclean® ultrafiltration systems are suitable for use with the following water values in the feed:

<b>pH range</b>	3.0 ... 12.0
<b>Free chlorine</b>	Max. 1.2 mg/l
<b>Turbidity</b>	0.5 ... 30 NTU
<b>DOC</b>	0.5 ... 12 mg/l
<b>Suspended solids</b>	50 mg/l

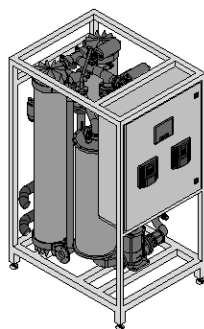
Deviating values influence the performance data and require a separate design of the system. Please contact our experts.

Dulcoclean® type	Filtration capacity* at 15 °C m³/h	Approx. backwash water per rinse m³	Raw/rinsing water connector [Rp/DN]	Approx. dimensions LxWxH [mm]
UF 2	8 - 15	0.34	1 1/2 "/2 "	1,200 x 920 x 2,100
UF 3	12 - 22.5	0.51	2 "/DN 65	1,600 x 920 x 2,100
UF 4	16 - 30	0.68	2 "/DN 80	1,600 x 920 x 2,100
UF 6	24 - 45	1.02	DN 65/DN 80	2,000 x 920 x 2,100
UF 8	32 - 60	1.36	DN 80/DN 100	2,400 x 920 x 2,100
UF 10	40 - 75	1.70	DN 100/DN 125	2,800 x 920 x 2,100

\* Filtrate performance depends on the water quality

Systems with filtration capacity of more than 18 m³/h are designed on a project basis. Offers are available on request. Please contact us.

Optionally available are a fully automatic neutralisation system for the treatment of acid and alkaline backwash water, an integrity test as well as customised data logging.



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## 6 Membrane Technology and Membrane Filtration

### 6.7 Reverse Osmosis System Dulcosmose®

#### 6.7.1

#### Reverse Osmosis Systems Dulcosmose® ecoPRO

Potable water desalination for industrial applications - compact and cost-effective

Permeate output 100 - 2,700 l/h



Reverse osmosis system Dulcosmose® ecoPro ensures low investment and operating costs with maximum permeate output at low operating pressures.

As the system runs with low operating pressures, the entire system can be fitted with inexpensive PVC pipework and/or with pressure hoses. The system sizes ecoPRO 600-2,700 are also available with integrated semi-automatic cleaning system and raw water flushing option. The cleaning system can also be simply retrofitted. Equipped with the latest generation of "ultra low-pressure" diaphragms, this system achieves maximum permeate performance with low operating pressures, thereby lowering investment and operating costs.

##### Your benefits

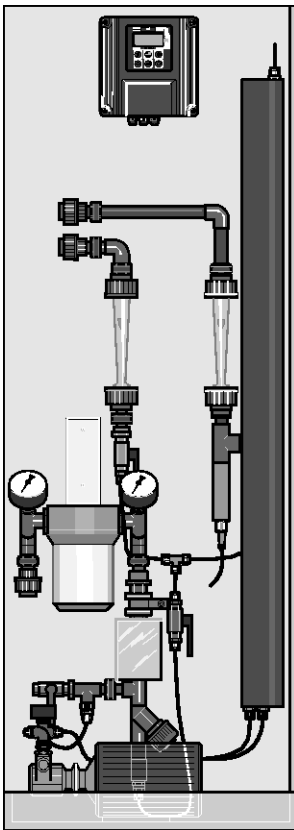
- Efficient operation with low pressure diaphragms with outputs of up to 85% and salt retention rates of up to 97%
- Reduced maintenance and service costs as well as long diaphragm service lives, thanks to integrated cleaning concepts and flushing options
- Service-friendly construction of systems on a corrosion-resistant powder-coated steel or PP frame
- Simple and safe to operate: Microprocessor control with direct connection option for peripheral system components and integrated conductivity measurement with plain text display in the graphic display
- One-stop integration into customised complete solutions by perfectly coordinated pre- and post-treatment from ProMinent.

##### Technical details

- Types ecoPRO 100 – 1,500 are mounted on an extremely stable and corrosion-free PP frame.
- Larger types ecoPRO 1,800 – 2,700 are mounted on a high-quality, double powder-coated steel frame.
- Highly efficient operation with outputs of up to 85% and system retention rates of up to 97% integrated in epoxy-glass resin pressure pipes
- Pre-filter 5µm with manometer for determining differential pressure
- Pressure switch to protect the high-pressure pump
- Flow meter to display permeate and concentrate volume
- Optional semi-automatic cleaning system for chemical module cleaning for long module service lives
- 2 switching inputs for level control of the cleaning tank
- 2 switching inputs for level control of the permeate tank
- Pause switching input for external On/Off
- External fault switching input
- Temperature measuring input (Pt 100)
- Active permeate valve output (filling of cleaning tank)
- Active output for flushing valve for initial permeate disposal (depending on conductivity), raw water, permeate and interval flushing (idle time management)
- Active output for controlling a metering pump (anti-scalant)
- Analogue output 0/4 - 20 mA conductance

##### Field of application

- Power plants: Provision of boiler feed water
- Electroplating / metal processing industry: Provision of rinsing water
- Beverage industry: Provision of rinsing water, product water and process and return dilution water
- Food industry: Provision of rinsing water and process water
- Chemical industry: Provision of rinsing water and process water
- Provision of rinsing water and process water for laboratory purposes and industrial rinsing machines
- Pure water for laboratory applications, hospital uses (autoclaves, high-speed steam generators)
- Feed water for cooling and air conditioning plants (air humidification and air scrubbers)
- Process water in printing plants, the pharmaceutical or cosmetics industry
- Car-washing systems: Provision of rinsing water



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## 6 Membrane Technology and Membrane Filtration

### Dulcosmose® ecoPRO reverse osmosis systems on PP rack; capacity range 100-1,500 l/h

This range is the cost-effective standard system for modern potable water desalination. Equipped with the latest generation of "ultra low-pressure" membranes, these systems achieve maximum permeate capacity at low operating pressures, thereby ensuring reduced investment and running costs. The low operating pressures enable the systems to be fitted cost-effectively with PVC pipes or pipes with pressure hoses throughout.

The ecoPRO 600-1500 models are additionally available with an integrated semi-automatic cleaning system and raw water flushing option. The semi-automatic cleaning system can also be simply retrofitted.

The ecoPRO 100-1500 range was designed for the following values in feed water:

<b>Max. salt content ecoPro 100-500</b>	650 mg/l*
<b>Max. salt content ecoPro 600-1,500</b>	1,000 mg/l*
<b>pH range</b>	3.0 ... 10.0
<b>Silt density index max.</b>	3
<b>Free chlorine max.</b>	0.1 mg/l
<b>Total Fe, Mn max.</b>	0.2 mg/l
<b>Total hardness max.</b>	0.1 °dH
<b>Bacteria count max.</b>	100 KBE/ml
<b>Turbidity max.</b>	0.5 NTU
<b>COD max.</b>	5 mg/l**

\* Differing salinities affect the performance data accordingly

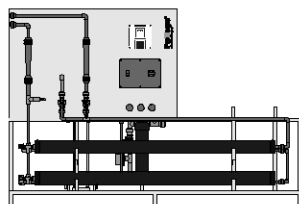
\*\* As for O<sub>2</sub>

#### Systems with 2.5 or 4" diaphragms, system salt retention 90-97%

Plant	Permeate capacity at 15 °C water temperature l/h	Number of 2.5" and 4" membranes No.	Connected load kW	Dimensions H x W x D mm	Weight kg
ecoPRO 100	100	1	0.37	1,400 x 500 x 320	47
ecoPRO 200	200	2	0.55	1,400 x 500 x 320	63
ecoPRO 300	300	1	1.10	1,500 x 600 x 400	88
ecoPRO 550	550	2	1.10	1,500 x 600 x 400	112
ecoPRO 600	600	2	1.50	1,650 x 700 x 720	167
ecoPRO 900	900	3	1.50	1,650 x 700 x 720	192
ecoPRO 1200	1,200	4	1.50	1,650 x 700 x 720	217
ecoPRO 1500	1,500	5	2.20	1,650 x 700 x 720	243

## 6 Membrane Technology and Membrane Filtration

### Dulcosmose® ecoPRO reverse osmosis systems on powder-coated steel rack; capacity range 1,800-2,700 l/h



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This range is the standard model for modern potable water desalination. Equipped with the latest generation of "ultra-low-pressure" membranes, these systems guarantee maximum permeate output at low operating pressures and thus low investment and operating costs. The low operating pressures enable cost-effective PVC pipes to be used. These systems are also available with an integrated semi-automatic cleaning system and with raw water flushing option.

The ecoPRO 1800-2700 range was designed for the following values in feed water:

<b>Salt content max.</b>	1,000 mg/l*
<b>pH range</b>	3.0 ... 10.0
<b>Silt density index max.</b>	3
<b>Free chlorine max.</b>	0.1 mg/l
<b>Total Fe, Mn max.</b>	0.2 mg/l
<b>Total hardness max.</b>	0.1 °dH
<b>Bacteria count max.</b>	100 KBE/ml
<b>Turbidity max.</b>	0.5 NTU
<b>COD max.</b>	5 mg/l**

\* Differing salinities affect the performance data accordingly

\*\* As for O<sub>2</sub>

**Systems with 4" diaphragms, system salt retention 90-97%**

Plant	Permeate capacity at 15 °C water temperature l/h	Number of 4" membranes No.	Connected load kW	Dimensions H x W x D mm	Weight kg
<b>ecoPRO 1800</b>	1,800	6	2.2	1,750 x 2,600 x 750	260
<b>ecoPRO 2400</b>	2,400	8	3.0	1,750 x 2,600 x 750	299
<b>ecoPRO 2700</b>	2,700	9	3.0	1,750 x 3,500 x 750	315

## 6 Membrane Technology and Membrane Filtration

### 6.7.2

#### Reverse Osmosis Systems Dulcosmose® TW

**Potable water desalination for industrial applications - compact and cost-effective**

**Permeate output 3 - 50 m³/h**



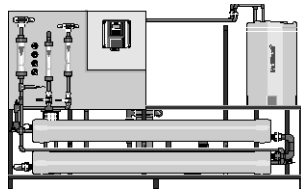
Reverse osmosis system Dulcosmose® TW is the all-purpose model for modern potable water desalination. Maximum permeate output at low operating pressures ensures low investment and operating costs.

As the system runs with low operating pressures, the entire Dulcosmose® TW can be fitted with inexpensive PVC pipework. This system is also available with an integral, semi-automated cleaning system and permeate and/or raw water flushing option. Equipped with the latest generation of "ultra low-pressure" diaphragms, this system achieves maximum permeate output with low operating pressures, thereby lowering investment and operating costs.

The system is very adaptable to specific customer requirements. Pipework material, other types of diaphragm for enhanced salt retention, integration of measuring and control technology and metering technology to visualisation of the entire process with peripheral components via a PLC.

##### Your benefits

- Efficient operation with low pressure diaphragms with outputs of up to 85% and high salt retention rates of up to more than 99% (depending on the type of diaphragm used)
- Reduced maintenance and service costs as well as long diaphragm service lives thanks to integrated cleaning concepts and flushing options, such as permeate flushing
- Service-friendly construction of systems on a corrosion-resistant powder-coated steel or stainless steel frame
- Simple and safe to operate: Microprocessor control with direct connection option for peripheral system components and integrated conductivity measurement with plain text display in the graphic display
- One-stop shop: no interface problems, smooth running with short times between definition of the task to joint commissioning and on-site system supervision with our global subsidiaries.



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##### Technical details

- Turnkey systems constructed on a high-quality, double powder-coated steel or stainless steel frame
- Highly efficient low-pressure diaphragms with maximum output and system retention rates of over 99% integrated in epoxy-glass resin pressure pipes
- Pre-filter 5µm with manometer for determining differential pressure
- Pressure switch to protect the high-pressure pump
- Flow meter to display permeate, concentrate and concentrate return volume
- Semi-automatic cleaning system for chemical module cleaning for long module service lives
- 2 switching inputs for level control of the cleaning tank
- 2 switching inputs for level control of the permeate tank
- Pause switching input for external On/Off
- External fault switching input
- Temperature measuring input (PT 100)
- Active permeate valve output (filling of cleaning tank)
- Active output for flushing valve for initial permeate disposal (depending on conductivity), raw water, permeate and interval flushing (idle time management)
- Active output for controlling a metering pump (anti-scalant)
- Analogue output 0/4...20 mA conductance
- Optional industrial PLC with touch panel and process visualisation

##### Field of application

- Power plants: Provision of boiler feed water
- Electroplating / metal processing industry: Provision of rinsing water
- Beverage industry: Provision of rinsing water, product water and process and return dilution water
- Food industry: Provision of rinsing water and process water
- Chemical industry: Provision of rinsing water and process water
- Provision of rinsing water and process water for laboratory purposes and industrial rinsing machines
- Pure water for laboratory applications, hospital uses (autoclaves, high-speed steam generators)
- Feed water for cooling and air conditioning plants (air humidification and air scrubbers)
- Process water in printing plants, the pharmaceutical or cosmetics industry

## 6 Membrane Technology and Membrane Filtration

The product range Dulcosmose® TW was designed for the following values in feed water:

<b>Salt content max.</b>	1,000 mg/l*
<b>pH range</b>	3.0 ... 10.0
<b>Silt density index max.</b>	3
<b>Free chlorine max.</b>	0.1 mg/l
<b>Total Fe, Mn max.</b>	0.2 mg/l
<b>Total hardness max.</b>	0.1 °dH
<b>Bacteria count max.</b>	100 KBE/ml
<b>Turbidity max.</b>	0.5 NTU
<b>COD max.</b>	5 mg/l**

\* Differing salinities affect the performance data accordingly

\*\* As for O<sub>2</sub>

Systems with 8" diaphragms, system salt retention 90-97%

Plant	Permeate capacity at 15 °C water temperature l/h	Number of 8" membranes No.	Connected load kW	Dimensions H x W x D mm
PRO 0300TW	3,000	3	3.0	1,800 x 4,000 x 1,000
PRO 0400TW	4,000	4	3.0	1,800 x 3,000 x 1,000
PRO 0500TW	5,000	5	4.0	1,800 x 4,000 x 1,000
PRO 0600TW	6,000	6	4.0	1,800 x 4,000 x 1,000
PRO 0700TW	7,000	6	5.5	1,800 x 4,000 x 1,000
PRO 0800TW	8,000	7	5.5	1,800 x 4,000 x 1,000
PRO 0900TW	9,000	7	7.5	1,800 x 4,000 x 1,000
PRO 1000TW	10,000	8	11.0	1,800 x 3,000 x 1,000
PRO 1100TW	11,000	9	11.0	1,800 x 4,000 x 1,000
PRO 1200TW	12,000	10	11.0	1,800 x 4,000 x 1,000
PRO 1300TW	13,000	11	11.0	1,800 x 4,000 x 1,000
PRO 1400TW	14,000	12	11.0	1,800 x 4,000 x 1,000
PRO 1500TW	15,000	12	11.0	1,800 x 4,000 x 1,000
PRO 2000TW	20,000	18	11.0	1,800 x 7,000 x 1,200
PRO 2500TW	25,000	24	15.0	1,800 x 7,000 x 1,200*
PRO 3000TW	30,000	28	18.5	1,800 x 7,000 x 1,200*
PRO 4000TW	40,000	34	22.0	1,800 x 7,000 x 1,200*
PRO 5000TW	50,000	48	22.0	1,800 x 7,000 x 1,200*

\* Separate cleaning tank

On request, these plants can also be supplied with different membrane types for further salt rejection, and with measuring and control equipment (conductivity, ORP, pH measurement) and metering equipment (in pre-treatment and post-treatment).

## 6 Membrane Technology and Membrane Filtration

### 6.7.3

#### Reverse Osmosis Systems Dulcosmose® BW

**Brackish water is transformed into drinking water**

**Permeate output 2,000 - 50,000 l/h.**



Reverse osmosis system Dulcosmose® BW is the standard model for the modern desalination of brackish water. Equipped with the latest generation of "high rejection low-pressure" diaphragms, this system achieves maximum permeate output with moderate operating pressures, thereby lowering investment and operating costs.

A reverse osmosis system of type of BW has PVC pipework on the low-pressure side. The system has high-grade stainless steel (type DIN 1.4571) on the high-pressure side. Stainless steel pipes are welded under shielding gas and a forming gas atmosphere and subsequently passivated in a pickling bath. The integrated semi-automatic cleaning system with permeate and/or raw water flushing ensures exceptionally long diaphragm service lives, as scaling and fouling effects are minimised. The system is very adaptable to specific customer requirements. Pipework material, other types of diaphragm for enhanced salt retention, integration of measuring and control technology and metering technology to visualisation of the entire process with peripheral components via a PLC.

##### Your benefits

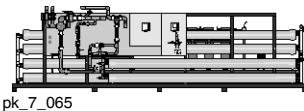
- Efficient operation with low pressure diaphragms with maximum output and salt retention rates of up to over 99 %
- Reduced maintenance and service costs as well as long diaphragm service lives, thanks to integrated cleaning concepts and flushing options
- Service-friendly construction of systems on a corrosion-resistant powder-coated steel or stainless steel frame
- Simple and safe to operate: Central control of the entire system by microprocessor controller or industrial PLC with touch panel and process visualisation.
- Application-optimised design taking into account economic aspects, such as the durability of the diaphragms, energy efficiency and process automation
- One-stop shop: no interface problems, smooth running with short times between definition of the task to joint commissioning and on-site system supervision with our global subsidiaries

##### Technical details

- Turnkey systems constructed on a high-quality, double powder-coated steel or stainless steel frame.
- Highly efficient low-pressure diaphragms with maximum output and system retention rates of over 99% integrated in epoxy-glass resin pressure pipes
- Pre-filter 5µm with manometer for determining differential pressure
- Pressure switch to protect the high-pressure pump
- Flow meter to display permeate, concentrate and concentrate return volume
- Semi-automatic cleaning system for chemical module cleaning for long module service lives
- 2 switching inputs for level control of the cleaning tank
- 2 switching inputs for level control of the permeate tank
- Pause switching input for external On/Off
- External fault switching input
- Temperature measuring input (PT 100)
- Active permeate valve output (filling of cleaning tank)
- Active output for flushing valve for initial permeate disposal (depending on conductivity), raw water, permeate and interval flushing (idle time management)
- Active output for controlling a metering pump (anti-scalant)
- Analogue output 0/4...20 mA conductance
- Optional industrial PLC with touch panel and process visualisation

##### Field of application

- Decentralised, public or private supply of potable water.



pk\_7\_065

## 6 Membrane Technology and Membrane Filtration

The product range Dulcosmose® BW was designed for the following values in feed water:

<b>Salt content max.</b>	5,000 mg/l*
<b>pH range</b>	3.0 ... 10.0
<b>Silt density index max.</b>	3
<b>Free chlorine max.</b>	0.1 mg/l
<b>Total Fe, Mn max.</b>	0.2 mg/l
<b>Total hardness max.</b>	water must be chemically stabilised
<b>Bacteria count max.</b>	100 KBE/ml
<b>Turbidity max.</b>	0.5 NTU
<b>COD max.</b>	5 mg/l**

\* Deviating salt contents have a corresponding influence on the performance data.

\*\* As for O<sub>2</sub>

Systems with 8" diaphragms, system salt retention 95-99%

Plant	Permeate capacity at 25 °C water temperature	Number of 4" and 8" membranes	Connected load	Dimensions H x W x D
	l/h		kW	mm
PRO 0200BW	2,000	9	4.0	1,800 x 3,500 x 750
PRO 0300BW	3,000	3	5.5	1,800 x 4,000 x 1,000
PRO 0400BW	4,000	4	5.5	1,800 x 3,000 x 1,000
PRO 0500BW	5,000	5	5.5	1,800 x 4,000 x 1,000
PRO 0600BW	6,000	6	7.5	1,800 x 4,000 x 1,000
PRO 0700BW	7,000	7	7.5	1,800 x 4,000 x 1,000
PRO 0800BW	8,000	8	15.0	1,800 x 4,000 x 1,000
PRO 0900BW	9,000	9	15.0	1,800 x 4,000 x 1,000
PRO 1000BW	10,000	10	15.0	1,800 x 4,000 x 1,000
PRO 1100BW	11,000	11	15.0	1,800 x 4,000 x 1,000
PRO 1200BW	12,000	12	15.0	1,800 x 5,000 x 1,000
PRO 1300BW	13,000	13	15.0	1,800 x 6,000 x 1,000
PRO 1400BW	14,000	14	15.0	1,800 x 5,000 x 1,000
PRO 1500BW	15,000	15	18.5	1,800 x 5,000 x 1,000
PRO 2000BW	20,000	21	18.5	1,800 x 6,000 x 1,200
PRO 2500BW	25,000	26	30.0	1,800 x 6,000 x 1,200*
PRO 3000BW	30,000	29	30.0	1,800 x 6,000 x 1,200*
PRO 4000BW	40,000	42	45.0	1,800 x 7,000 x 1,200*
PRO 5000BW	50,000	51	60.0	1,800 x 7,000 x 1,200*

\* Separate cleaning tank

On request, these plants can also be supplied with different membrane types for other salt rejection, and with measuring and control equipment (conductivity, ORP, pH measurement) and metering equipment (in pre-treatment and post-treatment).

## 6 Membrane Technology and Membrane Filtration

### 6.7.4

#### Reverse Osmosis Systems Dulcosmose® SW

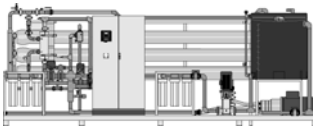
Salt water is transformed into drinking water.

Permeate output 780 - 29,000 l/h



The reverse osmosis system Dulcosmose® SW is the standard model for modern desalination of salt water. Equipped with the latest generation of "high rejection low-pressure" diaphragms, this system achieves maximum permeate output with moderate operating pressures, thereby lowering investment and operating costs.

A reverse osmosis system of type of SW has PVC pipework on the low-pressure side. The high-pressure side of the system has a potable water-compatible, highly corrosion-resistant inner seal due to the high NaCl content. The integrated semi-automatic cleaning system with permeate and/or raw water flushing ensures exceptionally long diaphragm service lives, as scaling and fouling effects are minimised. The system can be adapted with ease to specific customer requirements. Pipework material, other types of diaphragm for enhanced salt retention, integration of measuring and control technology and metering technology to visualisation of the entire process with peripheral components via a PLC. Everything can be selected at random. Optional for all systems: They can be fitted with a system for energy recovery from the concentrate flow. The latest generation of what are known as pressure controllers is used.



pk\_7\_074

##### Your benefits

- Efficient operation with low pressure diaphragms with outputs of up to 50% and high salt retention rates of up to over 99%
- Reduced maintenance and service costs as well as long diaphragm service lives, thanks to integrated cleaning concepts and flushing options
- Service-friendly construction of systems on a corrosion-resistant powder-coated steel or stainless steel frame
- Simple and safe to operate: Central control of the entire system by microprocessor controller or industrial PLC with touch panel and process visualisation
- Application-optimised design taking into account economic aspects, such as the durability of the diaphragms, energy efficiency and process automation
- One-stop shop: no interface problems, smooth running with short times between definition of the task to joint commissioning and on-site system supervision with our global subsidiaries
- Integrated energy recovery system based on state-of-the-art pressure controllers

##### Technical details

- Turnkey systems constructed on a high-quality, double powder-coated steel or stainless steel frame
- Highly efficient low-pressure diaphragms with maximum output and system retention rates of over 99% integrated in epoxy-glass resin pressure pipes
- Pre-filter 5µm with manometer for determining differential pressure
- Pressure switch to protect the high-pressure pump
- Flow meter to display permeate and concentrate volume
- Semi-automatic cleaning system for chemical module cleaning for long module service lives
- Central PLC of the entire system and peripheral components, adapted to customer requirements.

##### Field of application

- Decentralised, public or private supply of potable water.



## 6 Membrane Technology and Membrane Filtration

The product range Dulcosmose® SW was designed for the following values in feed water:

<b>Salt content max.</b>	40,000 mg/l*
<b>pH range</b>	3.0 ... 10.0
<b>Silt density index max.</b>	3
<b>Free chlorine max.</b>	0.1 mg/l
<b>Total Fe, Mn max.</b>	0.2 mg/l
<b>Total hardness max.</b>	water must be chemically stabilised
<b>Bacteria count max.</b>	100 KBE/ml
<b>Turbidity max.</b>	0.5 NTU
<b>COD max.</b>	5 mg/l**

\* Differing salinities affect the performance data accordingly

\*\* As for O<sub>2</sub>

Plants with 4" and 8" membranes, salt rejection of the plants 99%

Plant	Permeate capacity at 25 °C water temperature	Number of 4" and 8" membranes No.	Connected load without energy recovery	Connected load with energy recovery	Dimensions H x W x D mm
	l/h		kW	kW	
PRO 0078SW	780	6	5.5		1,800 x 3,500 x 1,000
PRO 0185SW	1,850	3	11.0		1,800 x 4,000 x 1,000
PRO 0240SW	2,400	4	15.0		1,800 x 4,000 x 1,000
PRO 0300SW	3,000	5	18.5	11.2*	1,800 x 4,000 x 1,000
PRO 0360SW	3,600	6	18.5	14.7*	1,800 x 4,000 x 1,000
PRO 0490SW	4,900	8	30.0	20.5*	1,800 x 5,000 x 1,200
PRO 0610SW	6,100	10	37.0	20.5*	1,800 x 6,000 x 1,200
PRO 0730SW	7,300	12	41.0	24.0*	1,800 x 5,000 x 1,400
PRO 0920SW	9,200	15	75.0	27.5*	1,800 x 6,000 x 1,500
PRO 0980SW	9,800	16	75.0	35.5*	1,800 x 5,000 x 1,500
PRO 1230SW	12,300	20	75.0	35.5*	1,800 x 6,000 x 1,500**
PRO 1470SW	14,700	24	90.0	41.0*	1,800 x 7,000 x 1,500**
PRO 1840SW	18,400	30	110.0	56.0*	1,800 x 7,000 x 1,500**
PRO 2210SW	22,100	36	132.0	66.0*	1,800 x 7,000 x 1,500**
PRO 2580SW	25,800	42	150.0	66.0*	1,800 x 7,000 x 1,500**
PRO 2900SW	29,000	48	180.0	90.0*	1,800 x 7,000 x 1,500**

\* Energy recovery by pressure exchanger technology

\*\* Separate cleaning tank

On request, these plants can also be supplied with different membrane types for other salt rejection, and with measuring and control equipment (conductivity, ORP, pH measurement) and metering equipment (in pre-treatment and post-treatment).



## 7 Sand Filter INTERFILT® SK

### 7.1

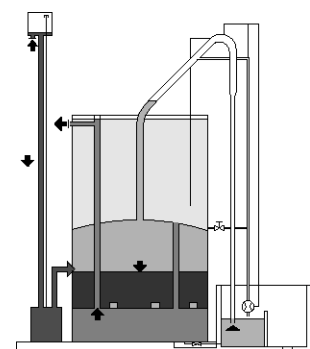
### Sand Filter INTERFILT® SK

**Economical water treatment with gravity filters - using the gravity of the water alone**

**Filtration capacity 6.5 – 62.0 m³/h**



The gravity filter INTERFILT® SK is an open sand filter system for extremely economical water treatment. The filter system operates with differential pressure-controlled backwashing and an integral backwashing water tank.



pk\_7\_029

The automatic gravity filter uses the principle of differential pressure and essentially consists of the cylindrical tank, its fittings, the automatic backwashing system with injector, the raw water feed and baffle tube, filter nozzles and filter filling unit

#### Your benefits

- No controls: The filter needs no moving parts, like valves, flow meter, controller or display equipment, for filtering/backwashing and post-rinsing
- No pumps: The required volume of backwashing water is stored in the storage tank below the filter, making a back-flushing pump redundant.
- No compressed air, pressurised water and electrical energy: The filter controls and performs all processes independently
- No operating personnel: The filter works fully automatically, without external intervention
- No wearing parts: No moving parts – no wear and tear.

#### Technical details

- Material: Polyethylene PE-HD
- Filter material: Filter sand DIN EN 12904, other filter materials on request

The filter essentially consists of:

- Cylindrical tank
- Fittings
- Automatic backwashing system with injector
- Raw water feed and baffle tank
- Filter nozzles and
- Filter filling unit

#### Field of application

- Cooling water, partial flow filtration
- River water, process water and potable water treatment
- Removal of iron from well water
- Waste water cleaning to reduce the content of suspended matter, CSB, BSB<sub>5</sub> and phosphate (4th cleaning stage)

#### Optional additional equipment:

- Cover for cylindrical tank
- Frost protection insulation with supplementary electric heating
- Combined air/water backwashing
- PE-HD backwashing water sump tank
- Other options on request

## 7 Sand Filter INTERFILT® SK

### Technical Data

#### Type list and capacity data

Type	Filter diameter mm	Filter capacity m³/h	Back wash Water ~ m³	Weight empty ~ t	Weight in operation ~ t
<b>SK- 9</b>	900	6.5	1.4	1.2	4.5
<b>SK- 12</b>	1,200	11.5	2.5	1.5	7.1
<b>SK- 15</b>	1,500	18.0	4.5	1.9	10.5
<b>SK- 18</b>	1,800	26.0	5.5	2.3	15.0
<b>SK- 21</b>	2,100	35.0	8.5	2.8	19.5
<b>SK- 24</b>	2,400	46.0	10.0	3.0	25.0
<b>SK- 28</b>	2,800	62.0	14.0	3.5	30.0

Flow rate:	3 ... 10 m/h
Backwash intervals: (depending on type and amount of pollutants)	Approx. 8 ... 36 h
Head loss:	120 ... 150 mbar
Clean water solids figure: (depending on raw water and filter material)	0 ... 3 mg/l
Backwash flow rate::	
At the start	44 m/h
In the middle	37 m/h
At the end	30 m/h
Cylinder height: (same for all types)	4,500 mm
Overall height:	6,500 mm
Depending on filter diameter	
Backwash and refilling time:	13 ... 15 min.
Filter sand in accordance with EN 12904	
– Height of bed	600 mm
– Grain size range	0.71 ... 1.25 mm
Filter nozzles:	
– Type	Lamellar nozzle
– Material	PPN
– Slot width	0.2 mm

As system components are produced individually according to application, we will inform you of prices on request.

We reserve the right to change components and their construction, as long as these do not affect their performance or function.



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