ProMinent®

Measuring, Control and Sensor Technology

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Heidelberg, January 2026

Measuring, Control and Sensor Technology



Precision is the name of the game here

Precise sensor technology and high-performance measuring, Control and Sensor Technology guarantee process reliability when metering liquid media.

Chapter 1

Monitoring a limit value or the construction of a closed control circuit is routine with our sensors - for an enormous variety of measuring applications. The **DULCOTEST** product family is application-oriented and ensures precise measurement of a wide range of values. In real time.

Chapter 2

Controllers from ProMinent are adapted to the respective application in almost any process environment. They are available in different performance classes and can be integrated into any process environment.

Chapter 3

Completely assembled **DULCOTROL** online measuring units and online control units are suitable for measured variables in the drinking water, food and beverage and waste water ranges. They can be configured using a simple, application-oriented ordering system.

Chapter 4

Reliable monitoring of the absence of free chlorine is essential in many water treatment processes. The breakthrough of even the smallest concentrations of free chlorine can irreversibly destroy diaphragms and cause major damage. The chlorine monitoring system **DULCOZERO FCL** reliably alarms the sudden chlorine breakthrough, even after a long absence of free chlorine.

Chapter 5

The compact **DULCODOS Cooling Water** Measuring and Control System makes it easy to monitor and treat cooling water - specially tailored to the applications of cooling water treatment in evaporative cooling systems and wet separators.

Chapter 6

The **DULCODOS Pool** Metering Systems are the result of years of application-oriented development at ProMinent. ProMinent helps you to save costs by providing you with carefully thought-out complete solutions.

Chapter 7

With **DULCONNEX**, ProMinent offers you a smart complete solution for the digital networking of your system components.

Focus on you

ProMinent is close to hand no matter where you are: 55 dedicated sales, production and service companies guarantee service and availability in close proximity to our customers. For many years this has meant a local presence for our customers in over 100 countries.



Our sales team will be happy to be of assistance should you have any questions about metering technology or water treatment. You will find the contact details of your local contact at

We are here for you

The selection of a product depends on a wide variety of factors.

If you have any questions about water treatment, our team will be happy to help you. Give us a call! We look forward to hearing from you.

Monday to Friday 8.00 - 16.30

Sales ProMinent Germany

Technical consulting

On the phone, we support you in selecting the right products and, in many cases, in optimizing entire applications. For more complex requirements, our consultants will pass the task on to a colleague in the field, who will then clarify your questions in a personal meeting on site.

After Sales Service

Our service technicians are there for you. Whether for initial installation or for maintenance and repair work. We are here for you!

Table of contents

Measuring, Control and Sensor Technology	Page
1 Sensor Technology DULCOTEST	**9**
1.1 Overview of Sensor Technology DULCOTEST	9
1.1.1 Selection Guide	9
1.2 Amperometric Sensors DULCOTEST	13
1.2.1 Amperometric Sensors for Chlorine, Bromine, Chlorine Dioxide, Chlorite, Ozone, Dissolved Oxygen, Peracetic Acid and Hydrogen Peroxide	13
1.2.2 DULCOTEST Sensors for Chlorine	14
1.2.3 DULCOTEST Sensors for Free Chlorine	16
1.2.4 DULCOTEST Sensors for Total Available Chlorine	29
1.2.5 DULCOTEST Sensors for Total Chlorine	31
1.2.6 DULCOTEST Sensors for Bromine	36
1.2.7 DULCOTEST Sensors for Chlorine Dioxide	41
1.2.8 DULCOTEST Sensors for Chlorite	46
1.2.9 DULCOTEST Sensors for Ozone	48
1.2.10 DULCOTEST Sensors for Peracetic Acid	50
1.2.11 DULCOTEST Sensors for Hydrogen Peroxide	53
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature	57
1.3.1 Selection Guide for pH Sensors, ORP Sensors	57
1.3.2 pH Sensors with SN6 or VARIO Pin Plug-In Head	60
1.3.3 pH Sensors with Fixed Cable	78
1.3.4 ORP Sensors with SN6 Plug-in Head	84
1.3.5 ORP Sensors with Fixed Cable	97
1.3.6 DULCOTEST Sensors for Fluoride	99
1.4 DULCOTEST Sensors for Conductivity	101
1.4.1 Conductivity Sensors	101
1.4.2 2-Electrode Conductivity Sensors	106
1.4.3 Inductive Conductivity Sensors	126
1.5 Optical sensors	130
1.5.1 DULCOEYE LT sensor for low turbidity	130
1.5.2 Turbidity Measuring Point DULCOTEST DULCO turb C	131
1.5.3 Sensors DULCOTEST® for Dissolved Oxygen	133
1.6 Accessories Sensor Technology	135
1.6.1 Sensor Accessories	135
1.6.2 Consumable Items for Sensors	138
1.6.3 Sensor Bypass Armature Modular BAMa	141
1.6.4 Identity Code Ordering System for Sensor Bypass Armature BAMa	146
1.6.5 Accessory for sensor bypass fitting type DGMa	148
1.6.6 In-line Probe Housing for Sensors	149
1.6.7 Immersion Fittings for Sensors	150
1.6.8 Installation Fittings / Adapters	154
2 Measuring and Control Technology	**158**
2.1 Measuring and Control Units DULCOMETER	158
2.1.1 Overview of Controllers DULCOMETER	158

Table of contents

Measuring, Control and Sensor Technology		Page
	2.1.2 Survey of Applications in Measuring and Control Technology	160
2.2	Controller DULCOMETER diaLog C	161
	2.2.1 Controller DULCOMETER diaLog C	161
	2.2.2 Identity code ordering system diaLog C	163
2.3	Controller DULCOMETER diaLog X	164
	2.3.1 Controller DULCOMETER diaLog X	164
	2.3.2 Identity Code Ordering System for DULCOMETER diaLog X	167
2.4	Controller DULCOMETER diaLog DACb	169
	2.4.1 Controller DULCOMETER diaLog DACb	169
	2.4.2 Identity Code Ordering System for diaLog DACb, Wall Mounting IP 67	173
	2.4.3 Function Upgrade for Measuring and Control System diaLog DACb	175
	2.4.4 DACb Application and Ordering Examples	176
	2.4.5 Application Examples, Treatment of Swimming Pool Water	177
	2.4.6 Application Examples, Potable Water Monitoring	179
	2.4.7 Application Examples, Wastewater Monitoring	182
	2.4.8 Application Examples in the Food Industry	184
	2.4.9 Odour Reduction Application Examples (Clarification Plants)	185
2.5	Controller DULCOMETER D1Cb/D1Cc	186
	2.5.1 Controller DULCOMETER D1Cb/D1Cc	186
	2.5.2 Identity Code Ordering System DULCOMETER D1Cb, Wall Mounting	189
	2.5.3 Identity Code Ordering System DULCOMETER D1Cc, Control Panel Mounting	191
	2.5.4 Identity Code Ordering System D1Ub, Subsequent Function Extension for D1Cb	193
	2.5.5 Identity Code Ordering System D1Uc, Subsequent Function Extension for D1Cc	193
	2.5.6 D1Cb and D1Cc Application and Ordering Examples	194
	2.5.7 Application Examples, Treatment of Swimming Pool Water	195
	2.5.8 Application Examples, Potable Water Monitoring	197
	2.5.9 Application Examples, Wastewater Monitoring	199
	2.5.10 Application Examples in the Food Industry	200
2.6	Controller DULCOMETER Compact	201
	2.6.1 Controller DULCOMETER Compact	201
	2.6.2 Identity Code Ordering System for DULCOMETER Compact	203
	2.6.3 Application and Ordering Examples for DULCOMETER Compact	204
	2.6.4 Application Examples, Treatment of Swimming Pool Water	205
	2.6.5 Application Examples, Potable Water Monitoring	206
	2.6.6 Application Examples, Wastewater Monitoring	207
2.7	Controllers for Swimming Pool Water Treatment	208
	2.7.1 Controller DULCOPOOL	208
	2.7.2 Controller DULCOPOOL Pro	209
2.8	Measuring and Control System DULCOMARIN 3 for Water Treatment in Public Swimming Pools	211
	2.8.1 Measuring and Control System DULCOMARIN 3	211
	2.8.2 Configuration Examples for the Measuring and Control System DULCOMARIN 3	215
	2.8.3 Identity Code Ordering System DULCOMARIN 3	220
	2.8.4 Functional Module (F-module) for DULCOMARIN 3	222

Table of contents

Measuring, Control and Sensor Technology	Page
2.8.5 Webcam Function for DULCOMARIN 3	223
2.8.6 Modbus RTU Gateway for PROFINET for DULCOMARIN 3	224
2.8.7 Control Module for Chlorine Gas Metering Devices (R Module)	225
2.8.8 Chlorine Sensors for DULCOMARIN II and DULCOMARIN 3	226
2.9 Controllers for Cooling Tower Control	227
2.9.1 Overview of Cooling Tower Control	227
2.9.2 Controller DULCOMETER diaLog X	228
2.9.3 Identity Code Ordering System for DULCOMETER diaLog X	231
2.9.4 Controller AEGIS II	233
2.9.5 Identity code ordering system for AEGIS II	236
2.9.6 Controller SlimFLEX 5a	238
2.9.7 Controller AEGIS S	240
2.9.8 DULCOTEST Sensor for Conductivity, Type CTFS	242
2.9.9 Conductivity Sensor ICT 8-mA	243
2.10 DULCOMETER Transmitters	244
2.10.1 Transmitter DULCOMETER DMTa	244
2.10.2 Identity Code Ordering System Measuring Transducer DMTa	246
2.10.3 Application Example: Measurement of Free Chlorine with Connection to a PLC	247
2.11 Measuring and Test Systems	248
2.11.1 DULCOMETER AirGuard - Measurement of trichloramine in the air in the swimming pool hall	248
2.11.2 Photometer	249
2.12 Accessories for Measuring and Control Devices	251
2.12.1 Transmitter 4 ... 20 mA (two-wire system)	251
3 Measuring and Control Systems for Potable Water and Waste Water Treatment	**253**
3.1 Overview of Ordering System for Measuring and Control Points DULCOTROL DWCa	253
3.1.1 Selection Guide	253
3.1.2 Description of the Identity Code Specifications in the DULCOTROL DWCa Ordering System	253
3.2 Measuring and Control Points DULCOTROL DWCa_P Potable Water/F&B	255
3.2.1 Overview of DULCOTROL DWCa_Potable Water/F&B	255
3.2.2 Permissible Measured Variable Combinations for DULCOTROL DWCa_P Potable Water/F&B	256
3.2.3 Identity Code Ordering System, DULCODOS DWCa_P Potable Water/ F&B	257
3.2.4 Examples of DULCOTROL DWCa_P Potable Water/F&B	259
3.3 Measuring and Control Points DULCOTROL DWCa_W Wastewater	260
3.3.1 Overview of DULCOTROL DWCa_W Wastewater	260
3.3.2 Permissible Measured Variable Combinations for DULCOTROL DWCa_W Wastewater	261
3.3.3 Identity Code Ordering System, DULCOTROL DWCA_W Wastewater	262
3.3.4 Examples of DULCOTROL DWCa_W Wastewater	264
3.4 Techn. Description of the Scope of Delivery of Measuring and Control Systems DULCOTROL DWCa	265
3.4.1 Technical Description of Controllers	265
3.4.2 Technical Description of Sensors	266

Table of contents

Measuring, Control and Sensor Technology			Page
	3.4.3	Technical Description of Sensor Fittings	268
	3.4.4	Technical Description of the Hydraulic Connector/Pipework	269
	3.4.5	Technical Description of Optional Accessories	269
3.5		DULCOTROL measuring and control points	270
	3.5.1	Measuring and control point for low turbidity DULCOTROL LT	270
	3.5.2	Identity code ordering system, DULCOTROL LT measuring and control point for low turbidity	272
4		**Monitoring systems for the absence of free chlorine**	**273**
4.1		DULCOZERO monitoring systems	273
	4.1.1	DULCOZERO FCL monitoring system for the absence of free chlorine	273
5		**Measuring and Control System for Cooling Water Treatment**	**277**
5.1		Measuring and Control System for Cooling Water Treatment	277
	5.1.1	Measuring and Control System DULCODOS Cooling Water	277
6		**Metering Systems for Swimming Pool Water Treatment**	**282**
6.1		DULCODOS Pool Swimming Pool Metering Systems	282
	6.1.1	Overview	282
	6.1.2	Metering System DULCODOS Pool Soft	284
	6.1.3	Identity Code Ordering System for DULCODOS Pool Soft	285
	6.1.4	Metering System DULCODOS Pool Basic	287
	6.1.5	Identity Code Ordering System for DULCODOS Pool Basic	288
	6.1.6	Metering System DULCODOS Pool Comfort	290
	6.1.7	Identity Code Ordering System for DULCODOS Pool Comfort	291
	6.1.8	Metering System DULCODOS Pool Professional	293
	6.1.9	Identity Code Ordering System for DULCODOS Pool Professional	296
6.2		Maintenance Kits	298
	6.2.1	Maintenance Kits for Metering Pumps	298
	6.2.2	Buffer Solutions	298
7		**Digital Solutions**	**299**
7.1		DULCONNEX: IIoT Solution for Digital Fluid Management	299
	7.1.1	Smart Process Monitoring – Any time, Anywhere	299
	7.1.2	Reference Cooling Tower	300
	7.1.3	Reference Swimming Pool	300
	7.1.4	Your Benefits of Digital Fluid Management	301
	7.1.5	DULCONNEX Gateway	302
	7.1.6	DULCONNEX Blue	303
	7.1.7	DULCONNEX Platform	305
	7.1.8	DULCONNEX Inventory Management	307
	7.1.9	DULCONNEX API	308

New Measuring, Control and Sensor Technology Products

NEW

Controller DULCOMETER diaLog C

The DULCOMETER diaLog C sets new standards in measuring and control technology. Whether as a transmitter or 2-side controller (PID) with one channel - it is ideal for use in industrial water treatment. Thanks to its intuitive operation and digital networking, it is smartly integrated into your processes.



- Precise control of a measured variable in both directions
- Flexibility and efficiency in metering through control of two metering pumps
- Stable processes even under variable conditions thanks to intelligent disturbance variable processing
- Safety and automation options thanks to versatile output relay
- Intuitive operation - without any previous knowledge thanks to clearly structured, multilingual menu navigation
- Convenient and time-saving configuration, data transmission and remote maintenance thanks to versatile communication options

For further information see page →161

Measuring and control point for low turbidity DULCOEYE LT

The new DULCOEYE Turbidity Sensor from ProMinent is a high-precision solution for the optical measurement of low turbidity. With state-of-the-art technology and intelligent design, this sensor simplifies liquid analysis.



- **Precise measurement results in laboratory quality**
  The long-term stable light source and optimized signal processing ensure maximum precision. An intelligent algorithm automatically detects and compensates for air bubbles - for reliable measurement results without interference.
- **Low maintenance and reliable**
  The hydrodynamic self-cleaning system and high-quality components reduce maintenance requirements and increase operational reliability.
- **Resource-saving and efficient**
  The small-volume flow cell and calibration vessel reduce water consumption and enable fast response times.
- **Flexible calibration and verification options**
  Compatible with formazine and solid-state verification.
- **Ready for immediate use**
  Thanks to factory calibration and plug-and-play function, the sensor is ready for immediate use - without any additional effort.
- **Simple and safe operation**
  The user-friendly design and practical accessories enable intuitive operation - without any training.

For further information see page →270

New Measuring, Control and Sensor Technology Products

DULCOMETER AirGuard

The DULCOMETER AirGuard measuring system continuously monitors the concentration of trichloramine in the air in real time. It is ideally suited for public indoor swimming pools. In the event of increased concentrations, the innovative system reacts immediately and triggers the adjustment of the fresh air supply.



- Virtually continuous measurement of trichloramine in the indoor pool air
- Fast response in the form of a supply of fresh air is possible by real-time measurements
- Safety for swimmers and staff
- Autonomous analysis system
- No laboratory work, no handling of chemicals and no manual intervention needed

For further information see page →248

New Remote Control Feature on the DULCONNEX Platform

Take full control of your measurement and metering equipment – anytime, anywhere.

The new Remote Control feature on the DULCONNEX Platform empowers users to monitor and control measurement and dosing devices from anywhere, at any time. Whether adjusting setpoints, calibration offsets, or dosing volumes, changes can be made instantly and securely - right from your desktop.



- It enables an esasier compliance with regulatory documentation requirements - Thanks to continuous logging, automated report generation and the simple export function, the manual effort required to provide proof of proper operation is significantly reduced.

1.1 Overview of Sensor Technology DULCOTEST

1.1.1 Selection Guide

Selection guide for pH sensors DULCOTEST

Sensor type	Typical applications	Remarks	pH range	Max. temperature and max. pressure	Loading with particles/solid matter in the application	Reference	Diaphragm
PHES	Drinking water, swimming pool water		1 to 12	60°C / 3 bar	None to low levels	Ag/AgCl	1x ceramic
PHEK	Swimming pool water, aquariums	Plastic sensor shaft for greater safety during handling, e.g. end customers in the private swimming pool sector	1 to 12	60°C / 3 bar	None to low levels	Ag/AgCl	1x ceramic
PHEP/PHEPT	Drinking water, process water	PHEPT with integrated temperature sensor	1 to 12	80°C / 6 bar	None to low levels	Ag/AgCl with AgCl reservoir	1x ceramic
PHED	Process water, electroplating	Chemically contaminated water, e.g. Cr6+, CN-	1 to 12	80°C / 8 bar	None to low levels	Ag/AgCl with AgCl reservoir	2x ceramic; double junction
PHEN	Process water, cooling water, waste water: chemically contaminated, clear PHEN-3D type for conductivities > 50 µS/cm	Reference electrolyte is introduced into the sensor using external bottles and can be topped up	1 to 12	80°C / no overpressure	None to low levels	Ag/AgCl with AgCl reservoir	1x ceramic
PHER	Industrial and public waste water, cooling water, process water: containing solids	Dirt-repellent PTFE diaphragm	1 to 12	80°C / 6 bar	Low to medium levels	Ag/AgCl with AgCl reservoir	1x PTFE
PHER-DJ	Waste water, cooling water, process water: contaminated with solids and chemicals, reverse osmosis (conductivity ≥ 10 µS/cm), acid and alkaline gas scrubbers (without fluoride, HF)	Dirt-repellent PTFE diaphragm and a double junction to protect the reference system	1 to 12	80°C / 6 bar	Low to medium levels	Ag/AgCl with AgCl reservoir	2xPTFE; double junction
PHEI	Waste water, cooling water, process water: contaminated with solids and chemicals	Long service life thanks to large volume of reference electrolyte, double junction and large PTFE diaphragm, 3/4" NPT screw-in thread	1 to 12	80°C / 6 bar	Low to medium levels	Ag/AgCl with AgCl reservoir	1x PTFE; 1x ceramic; double junction
PHEX	Waste water, process water: high solids content, no chemical contamination. Suspensions, sludge, emulsions	Open ring diaphragm	1 to 12	25°C / 16 bar and 100°C / 6 bar	Medium to high levels	Ag/AgCl with AgCl reservoir	Open ring diaphragm
PHEF	Media containing fluoride with low pH values, e.g. etching solutions containing fluoride in electroplating	Special pH glass with increased resistance to HF	0 to 12	50°C / 7 bar	Low to medium levels	Ag/AgCl	1x HDPE
PHEF-DJ	Media containing fluoride with low pH values, e.g. gas scrubbers where gases containing fluoride are scrubbed	Special pH glass with increased resistance to HF	1 to 12	60°C / 6 bar	Low to medium levels	Ag/AgCl with AgCl reservoir	2xPTFE; double junction
PHEP-H	Process water with high pH values (> pH 12)	Special pH glass with increased resistance to high pH values	3 to 14	80°C / 6 bar	None to low levels	Ag/AgCl with AgCl reservoir	1x ceramic

Note: All DULCOTEST pH and ORP sensors are made using lead-free glass (RoHS-compliant)

1.1 Overview of Sensor Technology DULCOTEST

Selection guide for ORP sensors DULCOTEST

Sensor type	Typical applications	Remarks	Material of sensor pin	Max. temperature and max. pressure	Loading with particles/solid matter in the application	Reference	Diaphragm
RHES Pt	Drinking water, swimming pool water		Platinum (Pt)	60°C / 3 bar	None to low levels	Ag/AgCl	1x ceramic
RHES Au	Swimming pool water	ORP sensors with gold electrodes are not susceptible to hydrogen, which is produced through the generation of chlorine by open electrolysis systems. What's more, gold electrodes are well suited to ozone applications.	Gold (Au)	60°C / 3 bar			
RHEK Pt	Swimming pool water, aquariums	Plastic sensor shaft for greater safety during handling; e.g. end customers in the private swimming pool sector	Platinum (Pt)	60°C / 3 bar	None to low levels	Ag/AgCl	1x ceramic
RHEKL Pt	Swimming pool water, aquariums	Two diaphragms mean that horizontal installation is possible	Platinum (Pt)	60°C / 3 bar	None to low levels	Ag/AgCl	2x ceramic
RHEP Pt	Drinking water, process water		Platinum (Pt)	80°C / 6 bar	None to low levels	Ag/AgCl with AgCl reservoir	1x ceramic
RHEP Au	Drinking water, process water	ORP sensors with gold electrodes are not susceptible to hydrogen, which is produced through the generation of chlorine by open electrolysis systems What's more, gold electrodes are well suited to ozone applications	Gold (Au)	80°C / 6 bar	None to low levels	Ag/AgCl with AgCl reservoir	1x ceramic
RHEN Pt	Process water, cooling water, waste water: chemically contaminated, clear	Reference electrolyte is introduced into the sensor using external bottles and can be topped up	Platinum (Pt)	80°C / no overpressure	None to low levels	Ag/AgCl with AgCl reservoir	1x ceramic
RHER Pt	Industrial and public waste water, cooling water, process water: containing solids	Dirt-repellent PTFE diaphragm	Platinum (Pt)	80°C / 6 bar	Low to medium levels	Ag/AgCl with AgCl reservoir	1x PTFE
RHER-DJ	Waste water, cooling water, process water: contaminated with solids and chemicals, reverse osmosis (conductivity ≥ 10 µS/cm), acid and alkaline gas scrubbers (without fluoride, HF)	Dirt-repellent PTFE diaphragm and a double junction to protect the reference system	Platinum (Pt)	80°C / 6 bar	Low to medium levels	Ag/AgCl with AgCl reservoir	2xPTFE; double junction
RHEIC	Waste water, cooling water, process water: contaminated with solids and chemicals	Long service life thanks to large volume of reference electrolyte, double junction and large PTFE diaphragm 3/4" NPT screw-in thread	Platinum (Pt)	80°C / 6 bar	Low to medium levels	Ag/AgCl with AgCl reservoir	1x PTFE; 1x ceramic; double junction
RHEX	Waste water, process water: high solids content, no chemical contamination. Suspensions, sludge, emulsions	Open ring diaphragm	Platinum (Pt)	25°C / 16 bar and 100°C / 6 bar	Medium to high levels	Ag/AgCl with AgCl reservoir	Open ring diaphragm

Note: All DULCOTEST pH and ORP sensors are made using lead-free glass (RoHS-compliant)

1.1 Overview of Sensor Technology DULCOTEST

Selection guide for DULCOTEST amperometric sensors

Measured variable	Applications	Graduated measuring ranges	Compatible Controllers	Sensor type
Free chlorine	Drinking water, swimming pool water	0.01-100 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOPOOL Pro	CLE 3-mA-xppm CLE 3.1-mA-xppm
Free chlorine	Process and waste water	10 - 200 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc	CLR 1-mA
Free chlorine	Drinking water, swimming pool water	0.01 - 10 mg/l	DULCOMARIN	CLE 3-CAN-10ppm CLE 3.1-CAN-10ppm
Free chlorine	Swimming pool, uncontaminated drinking and process water, inline electrolysis (tubular cell electrolysis), in case of deposits with hydrodynamic cleaning	0.02-10 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOPOOL Pro, AEGIS II	CLO 3-mA-xppm
Free chlorine	Swimming pool, uncontaminated drinking and process water, in situ electrolysis (without diaphragm), in case of deposit formation together with hydrodynamic cleaning	0.01-10 mg/l	DULCOMARIN 3	CLO 3-CAN-10ppm
Free chlorine	Hot water up to 70 °C (Legionella), in situ electrolysis, in case of scale formation together with hydrodynamic cleaning	0.02-2 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc	CLO 4-mA-2ppm
Free chlorine	Drinking water, swimming pool water	0.01-50 mg/l	DMT	CLE 3-DMT-xppm
Free chlorine	Drinking water, swimming pool water	0.05-5 mg/l	Compact	CLB 4-µA-xppm
Free chlorine	Drinking water, swimming pool water	0.05-5 mg/l	Compact	CLB 5-µA-xppm
Free chlorine	Cooling water, process water, waste water, water with higher pH values (stable); seawater (free chlorine is present as bromine)	0.01-10 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, AEGIS II, AEGIS S	CBR 1-mA-xppm
Total available chlorine/ free chlorine	Swimming pool water with organochlorine disinfectants and in situ electrolysis (without diaphragm)	0.02 - 10 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOPOOL Pro	CGE 3-mA-ppm
Total available chlorine/free chlorine	Swimming pool water with organochlorine disinfectants and in situ electrolysis (without diaphragm)	0.01-10 mg/l	DULCOMARIN 3	CGE 3-CAN-10ppm
Total chlorine	Drinking water, industrial water, process water and waste water	0.01-20 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc	CTE 2-mA-xppm
Total chlorine	Drinking water, service water, process water and waste water	0.01-10 mg/l	DMT	CTE 1-DMT-xppm
Total chlorine	Drinking water, service water, process water and waste water	0.01-10 mg/l	DULCOMARIN 3	CTE 2-CAN-10ppm
Combined chlorine	Swimming pool water	0.02-2 mg/l	diaLog C, diaLog DACb, DULCOPOOL Pro	CTE 2-mA-2 ppm CLE 3.1-mA-2 ppm
Combined chlorine	Swimming pool water	0.01-10 mg/l	DULCOMARIN 3	CTE 2-CAN-10ppm CLE 3.1-CAN-10ppm
Total available bromine	Cooling water, waste water, swimming pool, whirlpool water, bromine with BCDMH	0.01-10 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOPOOL Pro, AEGIS II, AEGIS S	BCR 1-mA (replaces former type BRE 1)
Total available bromine	Cooling, swimming pool, whirlpool water with organic or inorganic bromine compounds	0.02-10 mg/l	DULCOMARIN 3	BRE 3-CAN-10ppm
Free + bound bromine	Cooling water, process water, waste water, water with higher pH values (stable); seawater	0.02-20 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, AEGIS II, AEGIS S	CBR 1-mA-xppm
Free + bound bromine	Cooling water, process water, waste water, water with higher pH values (stable); seawater	0.02-20 mg/l	DULCOMARIN 3	CBR 1-CAN-10ppm
Chlorine dioxide	Drinking water	0.01-10 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc	CDE 2-mA-xppm
Chlorine dioxide	Bottle washer	0.02-2 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc	CDP 1-mA-xppm
Chlorine dioxide	Hot water up to 60 °C, cooling water, waste water, irrigation water	0.01-10 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOMARIN 3, AEGIS II, AEGIS S	CDP 1-mA-xppm CDR 1-CAN-10ppm
Chlorite	Drinking water, washing water	0.02-2 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOMARIN 3	CLT 1-mA-xppm CLT-1-CAN-10ppm

1.1 Overview of Sensor Technology DULCOTEST

Measured variable	Applications	Graduated measuring ranges	Compatible Controllers	Sensor type
Ozone	Drinking water, swimming pool water	0.02-2 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOPOOL Pro	OZE 3-mA-2 ppm
Ozone	Process water, service water, cooling water	0.01-10 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOPOOL Pro, AEGIS S	OZR 1-mA-xppm
Dissolved oxygen	Clarification plant|sewage plant, fish farming, drinking water, surface water	0.1-20 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc	DO 3-mA-xppm
Peracetic acid	CIP (cleaning in place), aseptic food filling	1-2,000 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc	PAA 1-mA-xppm
Peracetic acid	Waste water, low concentrations	0.02-20 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc	PAA 2-3E-mA-xppm
Hydrogen peroxide	Clear water, rapid control	1-2,000 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc	PEROX-H2.10
Hydrogen peroxide	Cooling, waste and process water	20-2,000 mg/l	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc	PER1-mA-2000 ppm
Hydrogen peroxide	Swimming pool water, plant water, low concentrations	0.2-500 mg/l	diaLog C, diaLog X, diaLog DACb, DULCOPOOL Pro	PEROX H-3E-mA-xppm

Conductivity sensor selection guide

Conductivity > 20 mS/cm and/or film-forming medium and/or chemically aggressive medium

Yes ↓

Inductive conductivity measurement

↓

Compact controller can be used in the application?

Yes ↓

Do the following conditions exist?
Aggressive chemicals, with the exception of lyes and/or temperatures > 80 °C and/or measured value < 200 µS/cm

Yes ↓

Series ICT 2
Installation in pipes with stainless steel flange accessory

For immersion with accessory: immersion fitting IMA - ICT 2

↓ No

Type ICT 5
for installation in pipes

Type ICT 5-IMA
for immersion

↓ No

Type ICT 8
for installation in pipes with adapter accessory, for immersion with immersion fitting accessory

↓ No

Conductive conductivity measurement

↓

Further selection according to summary table:

- **Measuring range**
- **Material (chemical compatibility)**
- **Temperature**
- **Hydraulic process connection**
- **Electrical connection**
- **Compatibility of measuring and control units**

↓

Product ranges LF, LMP, CK, CCT

1.2 Amperometric Sensors DULCOTEST

1.2.1 Amperometric Sensors for Chlorine, Bromine, Chlorine Dioxide, Chlorite, Ozone, Dissolved Oxygen, Peracetic Acid and Hydrogen Peroxide

Advantages at a glance:

- 12 measuring parameters available with analog construction each for easy installation on the same fittings and Controllers
- Application-specific sensor versions enable optimum operation under different process conditions
- Efficient process control through precise measurement in real time
- No interference from turbidity and coloration thanks to the amperometric measuring principle
- Membrane-covered measuring electrodes enable reliable operation and long service life even under adverse and variable process conditions

The following points must be observed for the optimum function of the amperometric sensors:

- Use of DULCOMETER Controllers
- Installation only in ProMinent bypass valves type BAMa, DGMa or DLG III
- Defined flow rate for BAMa sensor bypass valves: 5...100 l/h, depending on design and for DGMa and DLG III sensor bypass valves 30...60 l/h
- Chlorine measurement only with stable pH
- regular adjustment with a Photometer (e.g. DT types)

Important:

All amperometric Sensors with mA output signal have no galvanic isolation. When used with external devices (e.g. PLC), the supply voltage and the analog input signal must be galvanically isolated.

1.2 Amperometric Sensors DULCOTEST

1.2.2 DULCOTEST Sensors for Chlorine

Different forms of dissolved chlorine are present in water:

Free (effective) chlorine:	Cl_2, HOCl (hypochlorous acid), OCl- (hypochlorite) recommended sensors: **types CLE, CLO, CLB, CBR, CGE 3, reference method: DPD1**
Combined chlorine:	Mono-, di-, trichloramine. The measurement result of the type for free chlorine is subtracted from the measurement result of the type CTE (total chlorine). Reference method: DPD4 minus DPD1
Total chlorine:	Sum of free and combined chlorine; recommended sensor: **type CTE, reference method DPD4**
Total available chlorine (organically bound chlorine):	chlorine combined to (iso)cyanic acid/isocyanurate and resulting free (effective) chlorine; recommended sensor: **type CGE 3, reference method DPD1**
Applications:	Chlorine measurement in drinking water, swimming pool water, cooling water, industrial water, process water and waste water or water of comparable quality as well as seawater/salt water up to 15 % chloride content. For chlorine measurements at high pH values (8...9.5) we recommend the sensor types CTE for total chlorine, CGE 3 for total available chlorine. For the measurement of free chlorine at high pH values, we recommend the sensor types CBR, CGE 3, CLO and CLB
Device connection:	The sensors type CLE, CLO, CLB and CBR must not be used in the presence of isocyanuric acid/chlorine stabilizers! In the case of chlorination by inline electrolysis, also known as tubular cell electrolysis (membrane-free electrolysis process), types CLE3.1, CBR1, CTE1 and CGE2 are disturbed by the hydrogen produced. The types CLO, CGE3, CLE3, CLB and CTE3 can be used for this application. The sensors with the type designation -mA are used for the Controllers D1Cb and DAC. A selection of mA sensors is also compatible with the AEGIS II and diaLog X devices. Sensors with the type designation DMT are used for the DMT transducers. Sensors with the identifier CAN are used with the swimming pool controller DULCOMARIN. The CLB sensors with the identifier -µA do not have a signal converter and only work together with the Compact controller.

1.2 Amperometric Sensors DULCOTEST

Selection Guide

		CLE 3/ [CLR 1]	CLE 3.1	CLO 3	CLO 4	CLB 4/ CLB 5	CBR 1	CGE 3	CTE 2	CTE 3	BCR 1
Measured variable	Free chlorine	x, [x]	x	x	x	x	x1	x			
	total available chlorine (cyanuric acid derivatives)							x			
	Total chlorine								x	x	x2
Selectivity free chlorine	increased		x								
	yes	x, [x]		x	x	x	x	x			
	no								x	x	x
Application	public swimming pool	x	x	x			x	x	x3	x4	
	private swimming pool	x	x	x		x		x	x3	x4	x5
	Drinking water	x	x		x	x	x	x	xx	x	
	Cooling water						x				x
	Waste water	[x]					x		x	x	x
Disinfectant	Chlorine gas, hypochlorite, electrolysis with diaphragm	x, [x]	x	x	x	x	x	x	x		
	Electrolysis without diaphragm (inline electrolysis, tubular cell electrolysis)	x, [x]		x	x	x		x		x	
	cyanuric acid derivatives containing chlorine							x		x	
	BCDMH										x
	N-bromamidosulfonate										x
Specifications	Measuring range [ppm]	0,01-100, [10-200]	0,01-10	0,02-10	0,02-2	0,05-5	0,01-10	0,02-10	0,01-10	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	5,5-9,5	5,5-9,5	5,5-9,5	5,0-9,5
	Temperature [°C]	5-45	5-45	5-45	5-70	5-45	5-9.5	5-45	5-45	5-45	5-45
	max. pressure [bar]	1	1	8	8	3	1	3	3	3	1
Installation	open drain	x	x	x	x	x	x	x	x	x	x
	direct installation in circuit			x	x	x					

x[1] as well as free and combined bromine

x[2] as well as total available bromine

x[3] in combination with the sensor for free chlorine type CBR 1 for determining combined chlorine

x[4] in combination with the sensor for free chlorine type CBR 1 for determining combined chlorine if the inline electrolysis (tubular cell electrolysis) disinfection process is being used

x[5] and pools on cruise ships

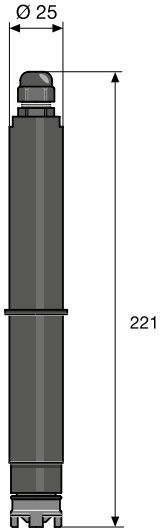
1.2.3 DULCOTEST Sensors for Free Chlorine

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 substances in the water



Technical Data

Measured variable	Free chlorine with a pH value < 8
Reference method	DPD1
pH-range	5.5…8.0
Temperature	5…45 °C
Max. pressure	1.0 bar
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
Output signal	4-20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated
Selectivity	Free chlorine as against combined chlorine, even if there is not an excess of it
Disinfection process	Chlorine gas, hypochlorite, electrolysis with diaphragm, disinfectants with organic chlorine, e. g. based on cyanuric acid, are unsuitable
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	D1C, DAC, diaLog X, DULCOPOOL Pro
Typical applications	CLE 3-mA-0,5 ppm: potable water; CLE 3-mA-2.0/10 ppm: swimming pools (surfactant-free).
Resistance to	Salts, acids, alkalis. Not surfactants
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
CLE 3-mA-0.5 ppm	0.01…0.5 mg/l	792927
CLE 3-mA-2 ppm	0.02…2.0 mg/l	792920
CLE 3-mA-5 ppm	0.05…5.0 mg/l	1033392
CLE 3-mA-10 ppm	0.10…10.0 mg/l	792919
CLE 3-mA-20 ppm	0.20…20.0 mg/l	1002964
CLE 3-mA-50 ppm	0.50…50.0 mg/l	1020531
CLE 3-mA-100 ppm	1.00…100.0 mg/l	1022786

Chlorine sensors complete with 100 ml of electrolyte

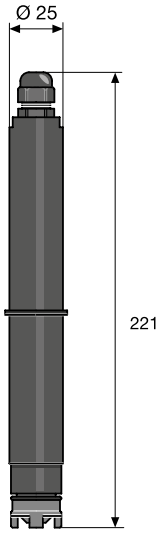
A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.

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 substances in the water



Technical Data

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 2-mA or type CTE 3-mA depending on application
Reference method	DPD1
pH-range	5.5…8.0
Temperature	5…45 °C
Max. pressure	1.0 bar
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
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
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOPOOL Pro, AEGIS II
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 DAC.
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	0.05…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.

Measuring lines, see sensor accessories, page → 135

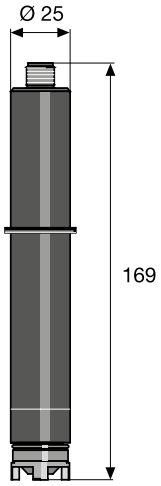
1.2 Amperometric Sensors DULCOTEST

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 substances in the water



Technical Data

Measured variable	Free chlorine
Reference method	DPD1
pH-range	5.5…8.0
Temperature	5…45 °C
Max. pressure	1.0 bar
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	3.3 V DC (5 P)
Output signal	0…1 V DC, uncalibrated, not temperature-compensated, not electrically isolated
Temperature measurement	About the integrated Pt 1000. The temperature compensation is carried out in DMT.
Selectivity	Free chlorine as against combined chlorine, even if there is not an excess of it
Disinfection process	Chlorine gas, hypochlorite, electrolysis with diaphragm, disinfectants with organic chlorine, e. g. based on cyanuric acid, are unsuitable
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	DMTa
Typical applications	CLE 3-mA-0,5 ppm: potable water; CLE 3-mA-2.0/10 ppm: swimming pools (surfactant-free).
Resistance to	Salts, acids, alkalis. Not surfactants
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
CLE 3-DMT-5 ppm	0.01…5.0 mg/l	1005511
CLE 3-DMT-50 ppm	0.10…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.

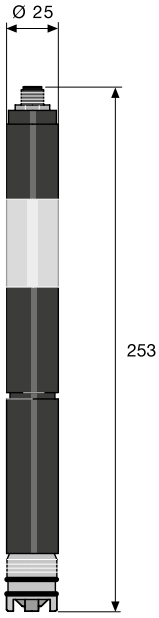
Measuring lines, see sensor accessories, page → 135.

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 substances in the water
- Operation on the CAN-bus with all the associated benefits



Technical Data

Measured variable	Free chlorine
Reference method	DPD1
pH-range	5.5…8.0
Temperature	5…45 °C
Max. pressure	1.0 bar
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	Via CAN-interface (11 – 30 V)
Output signal	Uncalibrated, temperature compensated, electrically isolated
Selectivity	Free chlorine as against combined chlorine, even if there is not an excess of it
Disinfection process	Chlorine gas, hypochlorite, electrolysis with diaphragm, disinfectants with organic chlorine, e. g. based on cyanuric acid, are unsuitable
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	DULCOMARIN 3
Typical applications	CLE 3-mA-0,5 ppm: potable water; CLE 3-mA-2.0/10 ppm: swimming pools (surfactant-free).
Resistance to	Salts, acids, alkalis. Not surfactants
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
CLE 3-CAN-10 ppm	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.

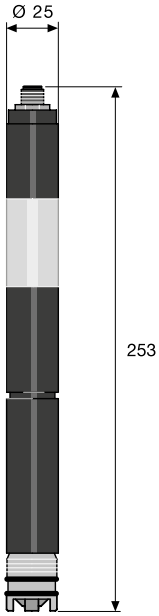
1.2 Amperometric Sensors DULCOTEST

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 substances in the water
- Operation on the CAN-bus with all the associated benefits



Technical Data

Measured variable	Free chlorine with high levels of combined chlorine; for determining the combined chlorine with a DULCOMARIN and sensor for total chlorine type CTE 2-CAN or type CTE 3-CAN depending on application
Reference method	DPD1
pH-range	5.5…8.0
Temperature	5…45 °C
Max. pressure	1.0 bar
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
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
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	DULCOMARIN 3
Typical applications	Drinking water with higher levels of combined chlorine; swimming pool. To determine the combined chlorine from the difference: Total chlorine minus free chlorine in the controller DULCOMARIN.
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

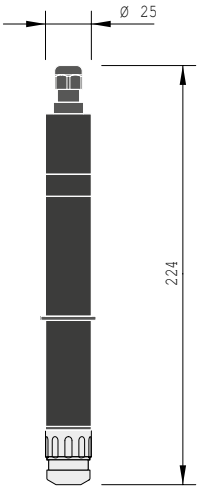
A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.

Sensor for free chlorine CLO 3-mA

Sensor for the measurement of free chlorine in clear water, as well as in seawater, and when using electrolysis processes for disinfection, up to 45 °C (1 bar) or 8 bar (25 °C). For operation with controllers with 4-20 mA input. Also suitable for use in film-forming water with optional “hydrodynamic cleaning”.

Your Benefits

- Measured variable: free chlorine, no significant cross-sensitivity to combined chlorine (chloramines)
- Use when sample water is returned to the process line
- Use at higher pressures
- Avoidance of problems caused by electrolysis systems in which the electrodes are immersed directly into the sample water
- Measurement of free chlorine up to pH 9
- Measurement in seawater possible
- Also suitable for use in film-forming water with optional “hydrodynamic cleaning”.



Technical Data

Measured variable	Free chlorine
Reference method	DPD1
pH-range	5.0…9.0
Temperature	5…45 °C
Max. pressure	8.0 bar (25 °C)
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
Output signal	4-20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated
Selectivity	Free chlorine as against combined chlorine
Disinfection process	Chlorine gas, hypochlorite, electrolysis with diaphragm, electrolysis without diaphragm with electrodes in the process
Process integration	Bypass: open outlet or return of the sample water into the process line, inline: direct installation into the tubes with the INLI fitting
Sensor fitting	BAMa: up to 7 bar/20 °C DGMa up to 6 bar/30 °C DLG III up to 1 bar/55 °C INLI up to 7 bar/40 °C
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOPOOL Pro, AEGIS II
Typical applications	Swimming pools, drinking water, process water and in seawater, and can also be used together with diaphragm-free electrolysis processes. Can also be used in conjunction with hydrodynamic cleaning even in biofilm-forming water, or water containing lime, iron or manganese.
Resistance to	Surfactants, films with using hydrodynamic cleaning
Measuring principle, technology	Amperometric, 3 electrodes, no diaphragm

	Measuring range	Order no.
CLO 3-mA-2 ppm	0.02…2.0 mg/l	1131658
CLO 3-mA-10 ppm	0.10…10.0 mg/l	1131662

Accessories for hydrodynamic cleaning

	Order no.
Cleaning set CLO/DGMa with flow nozzle CLO for DGMa and cleaning balls (approx. 100)	1104286
Flow nozzle CLO	1104264
Cleaning balls (approx. 100)	1104267
Cleaning set CLO/BAMa for CLO sensors in conjunction with sensor bypass armature BAMa	1113881

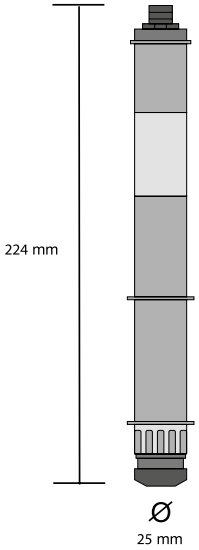
1.2 Amperometric Sensors DULCOTEST

Sensor for free chlorine CLO 3-CAN

Sensor for the measurement of free chlorine in clear water even when using electrolysis processes for disinfection, up to 45 °C (1 bar) or 8 bar (25 °C). For use on controllers with CAN-bus connection. Also suitable for use in film-forming water with optional “hydrodynamic cleaning”.

Your Benefits

- Measured variable: free chlorine, no significant cross-sensitivity to combined chlorine (chloramines)
- Use when sample water is returned to the process line
- Use at higher pressures
- Avoidance of problems caused by electrolysis systems in which the electrodes are immersed directly into the sample water
- Measurement in seawater possible
- Also suitable for use in film-forming water with optional “hydrodynamic cleaning”.



Technical Data

Measured variable	Free chlorine
Reference method	DPD1
pH-range	5.0…9.0
Temperature	5…45 °C
Max. pressure	8.0 bar (25 °C)
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	11…30 V (via CAN interface)
Output signal	Digital (CANopen), uncalibrated, temperature-compensated, electrically isolated
Selectivity	Free chlorine as against combined chlorine
Disinfection process	Chlorine gas, hypochlorite, electrolysis with diaphragm, electrolysis without diaphragm with electrodes in the process
Process integration	Bypass: open outlet or return of the sample water into the process line, inline: direct installation into the tubes with the INLI fitting
Sensor fitting	BAMa: up to 7 bar/20 °C DGMa up to 6 bar/30 °C DLG III up to 1 bar/55 °C INLI up to 7 bar/40 °C
Controllers	DULCOMARIN 3
Typical applications	Swimming pools, drinking water, process water and seawater, and can also be used together with diaphragm-free electrolysis processes. Can also be used in conjunction with hydrodynamic cleaning even in water that forms biofilms, or containing lime, iron or manganese.
Resistance to	Salts, acids, lyes, surfactants, films of dirt, films when using hydrodynamic cleaning
Measuring principle, technology	Amperometric, 3 electrodes, no diaphragm

	Measuring range	Order no.
CLO 3-CAN-10 ppm	0.01…10.0 mg/l	1133203

Accessories for hydrodynamic cleaning

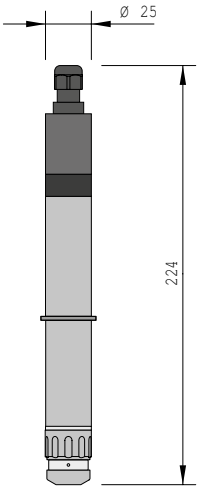
	Order no.
Cleaning set CLO/DGMa with flow nozzle CLO for DGMa and cleaning balls (approx. 100)	1104286
Flow nozzle CLO	1104264
Cleaning balls (approx. 100)	1104267
Cleaning set CLO/BAMa for CLO sensors in conjunction with sensor bypass armature BAMa	1113881

Sensor for free chlorine CLO 4-mA

Sensor for the measurement of free chlorine in clear water, as well as in seawater, and when using electrolysis processes for disinfection, up to 70 °C or 8 bar (25 °C). For operation with controllers with 4-20 mA input. Also suitable for use in film-forming water with optional “hydrodynamic cleaning”.

Your Benefits

- Measured variable: free chlorine, no significant cross-sensitivity to combined chlorine (chloramines)
- Use when sample water is returned to the process line
- Use at higher pressures/temperatures
- Avoidance of problems caused by electrolysis systems in which the electrodes are immersed directly into the sample water
- Measurement of free chlorine up to pH 9
- Measurement in seawater possible
- Also suitable for use in film-forming water with optional “hydrodynamic cleaning”



Technical Data

Measured variable	Free chlorine
Reference method	DPD1
pH-range	5.0…9.0
Temperature	5…70 °C
Max. pressure	8.0 bar (25 °C)
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
Output signal	4-20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated
Selectivity	Free chlorine as against combined chlorine
Disinfection process	Chlorine gas, hypochlorite, electrolysis with diaphragm, electrolysis without diaphragm with electrodes in the process
Process integration	Bypass: open outlet or return of the sample water into the process line, inline: direct installation into the tubes with the INLI fitting
Sensor fitting	BAMa: up to 3 bar/70 °C DGMa up to 1 bar/60 °C DLG III up to 1 bar/55 °C INLI up to 2 bar/70 °C
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOPOOL Pro, AEGIS II
Typical applications	Hot water up to 70 °C, combating legionella, drinking water, process water and in seawater, can also be used together with diaphragm-free electrolysis processes. Can also be used in conjunction with hydrodynamic cleaning even in biofilm-forming water, or water containing lime, iron or manganese.
Resistance to	Surfactants, films with using hydrodynamic cleaning
Measuring principle, technology	Amperometric, 3 electrodes, no diaphragm

	Measuring range	Order no.
CLO 4-mA-2 ppm	0.02…2.0 mg/l	1131644

Accessories for hydrodynamic cleaning

	Order no.
Cleaning set CLO/DGMa with flow nozzle CLO for DGMa and cleaning balls (approx. 100)	1104286
Flow nozzle CLO	1104264
Cleaning balls (approx. 100)	1104267
Cleaning set CLO/BAMa for CLO sensors in conjunction with sensor bypass armature BAMa	1113881

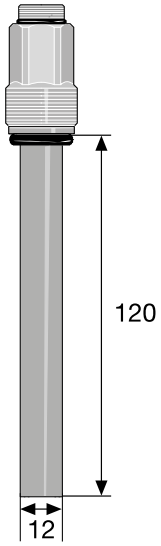
1.2 Amperometric Sensors DULCOTEST

Sensor for free chlorine CLB 4-µA

Cost-effective, simple sensor for the measurement of free chlorine in clear water, also in seawater and with a changing media temperature. Can also be used with electrolysis processes 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
- Avoidance of problems caused by electrolysis systems without a diaphragm in which the electrodes are immersed directly into the sample water
- Measurement of free chlorine up to pH 9 and use at high pressure of up to 3 bar thanks to absence of a diaphragm
- Measurement in seawater possible



Technical Data

Measured variable	Free chlorine
Measuring range	0.05 – 5.0 mg/l, can be used for short-term shock chlorination up to 10 mg/l
Reference method	DPD1
pH-range	5.0…9.0
Temperature	5…45 °C
Max. pressure	3.0 bar
Flow	DGMa, DLG III: 60...80 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	Only for compact controllers
Output signal	Unamplified primary flow signal, temperature-compensated, uncalibrated, no electrical isolation.
Selectivity	Free chlorine as against combined chlorine
Disinfection process	Chlorine gas, hypochlorite, electrolysis with diaphragm, electrolysis without diaphragm with electrodes in the process
Process integration	Bypass: open sample water outlet, inline: direct installation into the pipework
Sensor fitting	BAMa, DGMa, DLG III
Controllers	Compact
Typical applications	Swimming pools, potable water, seawater, can also be used with diaphragm-free electrolysis processes for chlorine generation, also suitable for use with fluctuating medium temperatures.
Resistance to	surfactants
Measuring principle, technology	Amperometric, 3 electrodes, no diaphragm

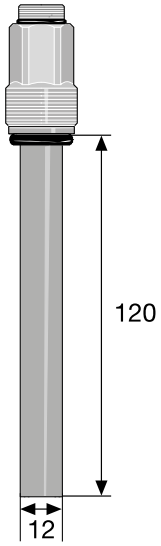
	Measuring range	Order no.
CLB 4-µA-5 ppm	0.05…5.0 mg/l	1130517

Sensor for free chlorine CLB 5-µA

Cost-effective, simple sensor for the measurement of free chlorine in clear water, also in seawater and with a constant media temperature. Can also be used with electrolysis processes 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
- Avoidance of problems caused by electrolysis systems without a diaphragm in which the electrodes are immersed directly into the sample water
- Measurement of free chlorine up to pH 9 and use at high pressure of up to 3 bar thanks to absence of a diaphragm
- Measurement in seawater possible



Technical Data

Measured variable	Free chlorine
Measuring range	0.05 - 5.0 mg/l: linear, can be used for shock chlorination up to 10.0 mg/l
Reference method	DPD1
pH-range	5.0…9.0
Electrolytic conductivity	0.05...50 mS/cm
Temperature	5…45 °C
Max. pressure	3.0 bar
Flow	DGMa, DLG III: 60...80 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	Only for compact controllers
Output signal	Non-amplified primary current signal, not temperature-compensated, uncalibrated, not electrically isolated
Temperature measurement	None
Selectivity	Free chlorine as against combined chlorine
Disinfection process	Chlorine gas, hypochlorite, electrolysis with diaphragm, electrolysis without diaphragm with electrodes in the process
Process integration	Bypass: open sample water outlet, inline: direct installation into the pipework; fixed or replaceable (replaceable fitting)
Sensor fitting	BAMa, DGMa, DLG III
Electrical Connection	Fixed cable, 1 m, 4 wires with cable end sleeves
Controllers	Compact
Typical applications	Swimming pools, potable water, sea water; also suitable for use with diaphragm-free electrolysis processes for chlorine generation.
Resistance to	surfactants
Measuring principle, technology	Amperometric, 3 electrodes, no diaphragm

	Measuring range	Order no.
CLB 5-µA-5 ppm	0.05…5.0 mg/l	1104626

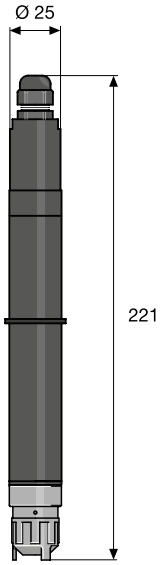
1.2 Amperometric Sensors DULCOTEST

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



Technical Data

Measured variable	free chlorine, free bromine, combined bromine, DBDMH (1,3-di-brom-5,5-dimethyl-hydantoin)
Reference method	DPD1
pH-range	5.0…9.5
Temperature	1…40 °C
Max. pressure	1.0 bar
Flow	DGMa: 20...80 l/h DLG III: 40...100 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
Output signal	4-20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated
Selectivity	Free chlorine as against combined chlorine
Disinfection process	Chlorine gas, hypochlorite, electrolysis with diaphragm, bromide + hypochlorite
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOPOOL Pro, AEGIS II
Typical applications	Cooling water, process water, waste water, water with higher pH values (stable pH), contaminated swimming pool water. Raw water for drinking water treatment.
Resistance to	Salts, acids, alkalis, surfactants, dirt films
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
CBR 1-mA-0.5 ppm	0.01…0.5 mg/l *	1038016
CBR 1-mA-2 ppm	0.02…2.0 mg/l *	1038015
CBR 1-mA-5 ppm	0.05…5.0 mg/l *	1052138
CBR 1-mA-10 ppm	0.10…10.0 mg/l *	1038014

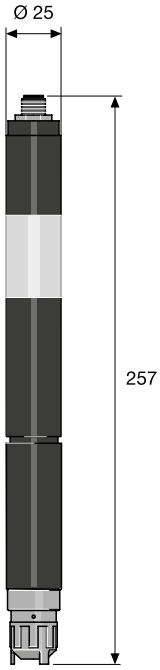
* Measuring range based on chlorine. When measuring bromine, the lower and upper limit of the measuring range are increased by the factor 2.25, therefore for example CBR 1-mA-0.5ppm: 0.02 ...1.1 ppm.

Sensor for free chlorine CBR 1-CAN

Sensor for free chlorine and bromine in contaminated water, also suitable for high pH values of up to 9.5. For use on controllers with CAN-bus connection.

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



Technical Data

Measured variable	free chlorine, free bromine, combined bromine, DBDMH (1,3-di-brom-5,5-dimethyl-hydantoin)
Reference method	DPD1
pH-range	5.0…9.5
Temperature	1…40 °C
Max. pressure	1.0 bar
Flow	DGMa: 20...80 l/h DLG III: 40...100 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	11…30 V DC (via CAN interface)
Output signal	Digital (CANopen), uncalibrated, temperature-compensated, electrically isolated
Selectivity	Free chlorine as against combined chlorine
Disinfection process	Chlorine gas, hypochlorite, electrolysis with diaphragm, bromide + hypochlorite
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	DULCOMARIN 3
Typical applications	Cooling water, process water, waste water, water with higher pH values (stable pH), contaminated swimming pool water. Raw water for drinking water treatment.
Resistance to	Dirt films, biofilms, surfactants
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
CBR 1-CAN-10 ppm	0.01…10.0 mg/l	1122056

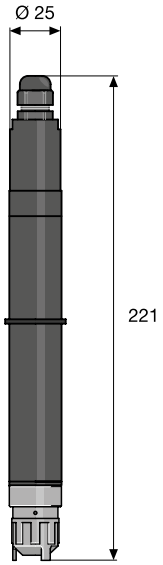
1.2 Amperometric Sensors DULCOTEST

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



Technical Data

Measured variable	Free chlorine
Reference method	DPD1
pH-range	5.5…8.0
Temperature	5…45 °C
Max. pressure	1.0 bar
Flow	DGMa, DLG III: 40...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
Output signal	4-20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated
Selectivity	Free chlorine as against combined chlorine
Disinfection process	Chlorine gas, hypochlorite, electrolysis with diaphragm
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	diaLog C, diaLog DACb, D1Cb/D1Cc, DULCOPOOL Pro
Typical applications	Salad, vegetable and poultry washing water, contaminated process and wastewater.
Resistance to	Salts, acids, alkalis, surfactants, dirt films
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
CLR 1-mA-200 ppm	10.0…200 mg/l	1047978
CLR 1-mA-2000 ppm	10.0…2,000 mg/l	1148507

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.

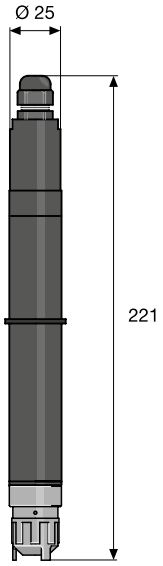
1.2.4 DULCOTEST Sensors for Total Available Chlorine

Sensor for total available and free chlorine CGE 3-mA

Sensor for total available chlorine, such as derivatives of chloro(iso)cyanuric acid, without disturbance when used in swimming pools where disinfection is provided by electrolysis processes. Also suitable for use as a sensor for free chlorine. 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
- Measured variable: free chlorine without interference with the presence of 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 substances 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



Technical Data

Measured variable	Free chlorine and total available chlorine: Total of organically bound 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
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
Output signal	4-20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated
Selectivity	total available chlorine and free chlorine as against combined chlorine (chloramines)
Disinfection process	Disinfectants with organic chlorine, e.g. based on cyanuric acid, chlorine gas, hypochlorite, electrolysis
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOPOOL Pro, AEGIS II
Typical applications	Swimming pool water; combined disinfection processes with chloro(iso)cyanuric acid derivatives and electrolysis. Water of a similar quality to potable water with a higher pH of up to 9.5.
Resistance to	Surfactants, cyanuric acid
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-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

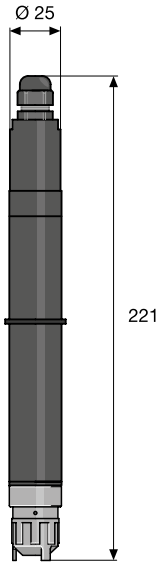
A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.

Sensor for total available and free chlorine CGE 3-CAN

Sensor for total available chlorine, such as derivatives of chloro(iso)cyanuric acid when used in swimming pools. Also suitable for use as a sensor for free chlorine. 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
- Measured variable: free chlorine without interference with the presence of 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 substances 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



Technical Data

Measured variable	Free chlorine and total available chlorine: Total of organically bound 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
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	Via CAN interface (11 – 30 V DC)
Output signal	Uncalibrated, temperature compensated, electrically isolated
Selectivity	total available chlorine and free chlorine as against combined chlorine (chloramines)
Disinfection process	Disinfectants with organic chlorine, e.g. based on cyanuric acid, chlorine gas, hypochlorite, electrolysis
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	DULCOMARIN 3
Typical applications	Swimming pool water, disinfection processes with chloro(iso)cyanuric acid derivatives and electrolysis. Water of a similar quality to potable water with a higher pH of up to 9.5.
Resistance to	Surfactants, cyanuric acid
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
CGE 3-CAN-10 ppm	0.01…10.0 mg/l	1047977

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.

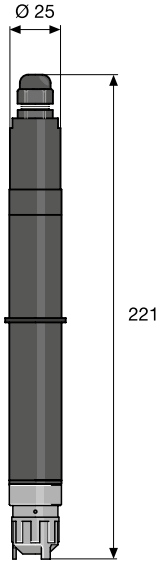
1.2.5 DULCOTEST Sensors for Total Chlorine

Sensor for Total Chlorine CTE 2-mA

Long-term stable sensor for total chlorine, including free chlorine and chloramine. Fault-free use in inline electrolysis (tubular cell electrolysis). Reliable measurement result even at a high pH value in various waters. For use on controllers with mA input.

Your Benefits

- Measured variables: Total chlorine, chlorine compounds in which chlorine acts as an oxidising substance, e.g. free chlorine (HOCl and OCl-), chloramines, etc.
- Improved measurement accuracy due to equalisation of the sensitivities for free and combined chlorine
- Increased long-term stability due to membrane-covered sensor with innovative membrane design. This also prevents interference from changing flow rates or water constituents
- Hydrophilic membrane ensures permeability for different water-soluble oxidising agents to the measuring electrode
- Special reaction system of the electrolyte enables the determination of components that contain oxidising chlorine as well as use at high pH of up to 9.5



Measured variable	Total chlorine
Reference method	DPD4
pH-range	5.5…9.5
Temperature	5…45 °C
Max. pressure	3.0 bar
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
Output signal	Uncalibrated, temperature-compensated, not electrically isolated
Electrical Connection	with 2-wire signal cable via 4-pin connector on the sensor and open ends on the measuring device
Selectivity	Non-selective, cross-sensitive towards many oxidation agents
Disinfection process	Chlorine gas, hypochlorite, electrolysis with diaphragm, monochloramine, derivatives of chloro-cyanuric acid. Not suited to inline electrolysis (tubular cell electrolysis, use type CTE3 for this).
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOPOOL Pro, AEGIS II
Typical applications	Drinking water, process water, waste water. In swimming pools combined with sensors for free chlorine to determine combined chlorine
Resistance to	surfactants
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
CTE 2-mA-0,5 ppm	0.01…0.5 mg/l	1136433
CTE 2-mA-2 ppm	0.02…2.0 mg/l	1133340
CTE 2-mA-5 ppm	0.05…5.0 mg/l	1136464
CTE 2-mA-10 ppm	0.10…10.0 mg/l	1133338
CTE 2-mA-20 ppm	0.20…20.0 mg/l	1136465

Accessories

	Length m	Order no.
Measuring line (external cable), 2-core, 5-pin plug	2	707702
Measuring line (external cable), 2-core, 5-pin plug	5	707703
Measuring line (external cable), 2-core, 5-pin plug	10	707707

The measuring cable is not included with the sensor and must be ordered separately.

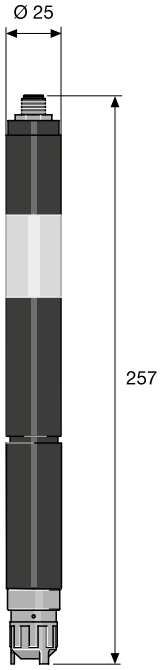
1.2.5 DULCOTEST Sensors for Total Chlorine

Sensor for Total Chlorine CTE 2-CAN

Long-term stable sensor for total chlorine, including free chlorine and chloramines. Reliable measurement even at high pH values in various waters. For operation with measuring and control devices with CAN bus connection

Your Benefits

- Measured variables: Total chlorine, chlorine compounds in which chlorine acts as an oxidising substance, e.g. free chlorine (HOCl and OCl^-), chloramines, etc.
- Improved measurement accuracy due to equalisation of the sensitivities for free and combined chlorine
- Increased long-term stability due to membrane-covered sensor with innovative membrane design. This also prevents interference caused by changing flow rates or water constituents
- Hydrophilic membrane ensures permeability for different water-soluble oxidising agents to the measuring electrode
- Special reaction system of the electrolyte enables the determination of components containing oxidising chlorine as well as use at high pH of up to 9.5
- Operation on the CAN bus with all the associated advantages



Measured variable	Total chlorine
Reference method	DPD4
pH-range	5.5…9.5
Temperature	5…45 °C
Max. pressure	3.0 bar
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	Via CAN interface (11 – 30 V DC)
Output signal	Uncalibrated, temperature compensated, electrically isolated
Electrical Connection	via CAN signalling cable with M12, 5-pin plug on the sensor and M12, 5-pin socket on the measuring device
Selectivity	Non-selective, cross-sensitive towards many oxidation agents
Disinfection process	Chlorine gas, hypochlorite, electrolysis with diaphragm, monochloramine. Not suited to inline electrolysis (tubular cell electrolysis, use type CTE3 for this).
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	DULCOMARIN 3
Typical applications	Drinking water, process water, waste water. In swimming pools combined with sensors for free chlorine to determine combined chlorine
Resistance to	surfactants
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
CTE 2-CAN-10 ppm	0.01…10.0 mg/l	1136030

Chlorine sensors complete with 50 ml electrolyte and CAN signalling cable M12, 5-pin, length: 0.5 m

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.

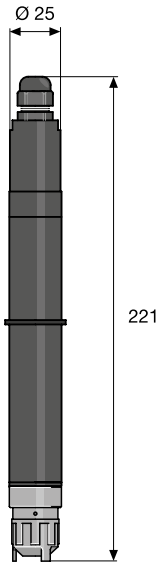
1.2.5 DULCOTEST Sensors for Total Chlorine

Sensor for Total Chlorine CTE 3-mA

Long-term stable sensor for total chlorine, including free chlorine and chloramines. Trouble-free use in in-line electrolysis (tubular cell electrolysis) in pool & wellness thanks to optimisation of the working electrode. Reliable measurement even at high pH values. For operation on measuring and control devices with mA input

Your Benefits

- Measured variables: Total chlorine, chlorine compounds, in which chlorine acts as an oxidising agent, e.g. free chlorine (HOCl and OCl^-), chloramines etc.
- Suited to determining the combined chlorine (total chlorine minus free chlorine) in the pool & wellness industry when inline electrolysis (tubular cell electrolysis) is used for chlorination
- Improved measurement accuracy by adjusting sensitivity levels for free and combined chlorine
- Minimal dependence on flow and avoidance of interference caused by substances in the water as the measuring electrodes are protected by an innovative diaphragm system.
- 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



Measured variable	Total chlorine
Reference method	DPD4
pH-range	5.5…9.5
Temperature	5…45 °C
Max. pressure	3.0 bar
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
Output signal	Uncalibrated, temperature-compensated, not electrically isolated
Electrical Connection	with 2-wire signal cable via 4-pin connector on the sensor and open ends on the measuring device
Selectivity	Non-selective, cross-sensitive towards many oxidation agents
Disinfection process	Chlorine gas, hypochlorite, electrolysis with membrane, inline electrolysis (tubular cell electrolysis), monochloramine
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOPOOL Pro, AEGIS II
Typical applications	Determination of combined chlorine in swimming pools combined with sensors for free chlorine following the difference method. Also suitable for the disinfection process: Inline electrolysis (tubular cell electrolysis)
Resistance to	surfactants
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
CTE 3-mA-2 ppm	0.02…2.0 mg/l	1133132
CTE 3-mA-5 ppm	0.05…5.0 mg/l	1136466
CTE 3-mA-10 ppm	0.10…10.0 mg/l	1133337
CTE 3-mA-20 ppm	0.20…20.0 mg/l	1136467

Chlorine sensors complete with 50 ml electrolyte and a replacement membrane cap

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.

1.2 Amperometric Sensors DULCOTEST

Accessories

	Length m	Order no.
Measuring line (external cable), 2-core, 5-pin plug	2	707702
Measuring line (external cable), 2-core, 5-pin plug	5	707703
Measuring line (external cable), 2-core, 5-pin plug	10	707707

The measuring cable is not included with the sensor and must be ordered separately.

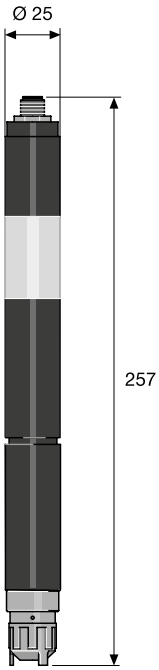
1.2.5 DULCOTEST Sensors for Total Chlorine

Sensor for Total Chlorine CTE 3-CAN

Long-term stable sensor for total chlorine, including free chlorine and chloramines. Reliable measurement even at high pH values in various waters. Can be used for inline electrolysis in swimming pools with gold electrode. For operation with measuring and control devices with CAN bus connection

Your Benefits

- Measured variables: Total chlorine, chlorine compounds, in which chlorine acts as an oxidising agent, e.g. free chlorine (HOCl and OCl^-), chloramines etc.
- Suited to determining the combined chlorine (total chlorine minus free chlorine) in the pool & wellness industry when inline electrolysis (tubular cell electrolysis) is used for chlorination
- Improved measurement accuracy by adjusting sensitivity levels for free and combined chlorine
- Minimal dependence on flow and avoidance of interference caused by substances in the water as the measuring electrodes are protected by an innovative diaphragm system
- 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



Measured variable	Total chlorine
Reference method	DPD4
pH-range	5.5…9.5
Temperature	5…45 °C
Max. pressure	3.0 bar
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	Via CAN interface (11 – 30 V DC)
Output signal	Uncalibrated, temperature compensated, electrically isolated
Electrical Connection	via CAN signalling cable with M12, 5-pin plug on the sensor and M12, 5-pin socket on the measuring device
Selectivity	Non-selective, cross-sensitive towards many oxidation agents
Disinfection process	Chlorine gas, hypochlorite, electrolysis with membrane, inline electrolysis (tubular cell electrolysis), monochloramine
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	DULCOMARIN 3
Typical applications	Determination of combined chlorine in the swimming pool in combination with sensors for free chlorine using the differential method. Also suitable for the disinfection process: Inline electrolysis (tubular cell electrolysis)
Resistance to	surfactants
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
CTE 3-CAN-10 ppm	0.10…10.0 mg/l	1136031

Chlorine sensors complete with 50 ml electrolyte and a replacement membrane cap as well as a CAN signalling cable M12, 5-pin, length: 0.5 m

A mounting kit, order no. 815079, is required for initial fitting of the chlorine sensors in the in-line probe housing DLG III.

1.2.6 DULCOTEST 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-**Dim**ethyl-**H**ydantoin), marketed under trade names such as Brom-Sticks®
- DBDMH (1,3-**Dib**romo-5,5-**Dim**ethyl-**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^-) 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 (e.g. with DT 1B), calculated and displayed as bromine, is recommended as a comparison method for calibrating the bromine sensor. If the photometric DPD measurement method for 'chlorine' is used, the measured value must be multiplied by a factor of 2.25 for conversion to 'bromine'.

Sensor selection

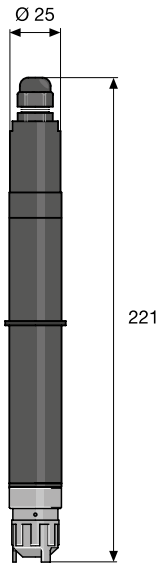
- The sensor type BCR 1 and calibrating/checking it by means of the DPD4 method is recommended for measuring stabilised bromination agents, such as BCDMH and N-bromamide sulfonate.
- The sensor type CBR 1 and calibrating/checking it by means of the DPD1 method is recommended for measuring free bromine from sodium hypochlorite and bromide or free bromine from DBDMH (splits off free bromine only) or bromine compounds, which are produced during disinfection (using sodium 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 measuring and control system DULCOMARIN II.

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 and total chlorine 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



Technical Data

Measured variable	Total available bromine from **BCDMH** (1-bromo-3-chloro-5,5-dimethylhydantoin) and **N-bromamido-sulphonate, total chlorine**
Reference method	DPD4
pH-range	5.0…9.5
Temperature	5…45 °C
Max. pressure	1.0 bar
Flow	DGMa, DLG III: 60...80 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
Output signal	4-20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated
Selectivity	Non-selective, cross-sensitive towards many oxidation agents
Disinfection process	BCDMH (1-bromo-3-chloro-5,5-dimethyl-hydantoin), N-bromamide sulfonate
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOPOOL Pro, AEGIS II
Typical applications	Cooling water, process water, wastewater, swimming pool water, water with higher pH values (stable pH).
Resistance to	Dirt films, biofilms, surfactants
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
BCR 1-mA-0.5 ppm	0.01…0.5 mg/l	1041697
BCR 1-mA-2 ppm	0.02…2.0 mg/l	1040115
BCR 1-mA-10 ppm	0.10…10.0 mg/l	1041698

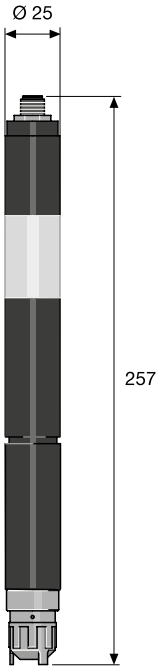
Sensor for total available bromine BRE 3-CAN

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. swimming pool controller DULCOMARIN)



Technical Data

Measured variable	Total available bromine
Reference method	For DBDMH, free bromine: DPD1. For BCDMH: DPD4
pH-range	5.0…9.5
Temperature	5…45 °C
Max. pressure	3.0 bar
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	Via CAN-interface (11 – 30 V)
Output signal	Uncalibrated, temperature compensated, electrically isolated
Selectivity	Non-selective, cross-sensitive towards many oxidation agents
Disinfection process	DBDMH (1,3-dibromo-5,5-dimethyl-hydantoin), BCDMH (1-bromo-3-chloro-5,5-dimethyl-hydantoin), free bromine (HOBr, OBr^-)
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	DULCOMARIN 3
Typical applications	swimming pools/whirlpools.
Resistance to	surfactants
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
BRE 3-CAN-10 ppm	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.

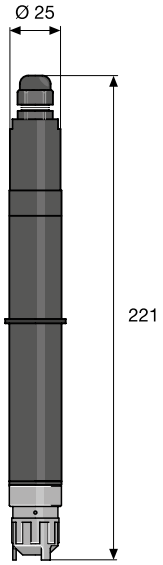
Measuring lines, see sensor accessories, page → 135

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



Technical Data

Measured variable	Free chlorine
Reference method	DPD1
pH-range	5.0…9.5
Temperature	1…40 °C
Max. pressure	1.0 bar
Flow	DGMa: 20...80 l/h DLG III: 40...100 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
Output signal	4-20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated
Selectivity	Free chlorine as against combined chlorine
Disinfection process	Chlorine gas, hypochlorite, electrolysis with diaphragm, bromide + hypochlorite
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOPOOL Pro, AEGIS II
Typical applications	Cooling water, process water, waste water, water with higher pH values (stable pH), contaminated swimming pool water. Raw water for drinking water treatment.
Resistance to	Salts, acids, alkalis, surfactants, dirt films
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
CBR 1-mA-0.5 ppm	0.01…0.5 mg/l *	1038016
CBR 1-mA-2 ppm	0.02…2.0 mg/l *	1038015
CBR 1-mA-5 ppm	0.05…5.0 mg/l *	1052138
CBR 1-mA-10 ppm	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.

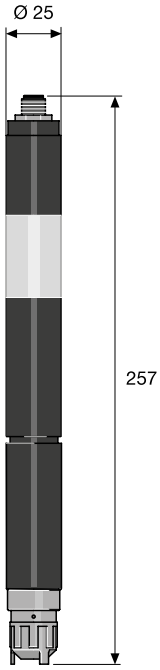
1.2 Amperometric Sensors DULCOTEST

Sensor for free chlorine CBR 1-CAN

Sensor for free chlorine and bromine in contaminated water, also suitable for high pH values of up to 9.5. For use on controllers with CAN-bus connection.

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



Technical Data

Measured variable	free chlorine, free bromine, combined bromine, DBDMH (1,3-di-brom-5,5-dimethyl-hydantoin)
Reference method	DPD1
pH-range	5.0…9.5
Temperature	1…40 °C
Max. pressure	1.0 bar
Flow	DGMa: 20...80 l/h DLG III: 40...100 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	11…30 V DC (via CAN interface)
Output signal	Digital (CANopen), uncalibrated, temperature-compensated, electrically isolated
Selectivity	Free chlorine as against combined chlorine
Disinfection process	Chlorine gas, hypochlorite, electrolysis with diaphragm, bromide + hypochlorite
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	DULCOMARIN 3
Typical applications	Cooling water, process water, waste water, water with higher pH values (stable pH), contaminated swimming pool water. Raw water for drinking water treatment.
Resistance to	Dirt films, biofilms, surfactants
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
CBR 1-CAN-10 ppm	0.01…10.0 mg/l	1122056

1.2.7 DULCOTEST Sensors for Chlorine Dioxide

Selection Guide

Sensor type		CDE 2-mA	CDP 1-mA	CDR 1-mA
Application		Potable water	Bottle washing system	Cooling water, wastewater, agriculture, hot water
Measuring ranges		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	1.0
pH range		4.0 … 11.0	5.5 … 10.5	1.0 … 10.0
Response time	s	120	60	180
Run-in period	h	2-6	4-12	2-6
Surfactant-resistance		no	yes	yes
Contamination resistance		no	under certain conditions	yes
Cross-sensitivity		Ozone	Ozone, chlorine	Ozone

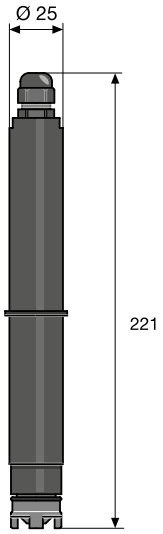
1.2 Amperometric Sensors DULCOTEST

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



Technical Data

Measured variable	Chlorine dioxide (ClO_2)
Reference method	DPD1
pH-range	4.0…11.0
Cross sensitivity	Ozone
Temperature	5…45 °C
Max. pressure	1.0 bar
Flow	DGMa, DLG III: 60...80 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
Output signal	4-20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated
Response time sensor t_{90}	120 s
Selectivity	Chlorine dioxide selective towards free chlorine, chlorite and chlorate
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	diaLog C, diaLog DACb, D1Cb/D1Cc
Typical applications	Uncontaminated drinking water (surfactant-free).
Resistance to	Salts, acids, alkalis. Not surfactants
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-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

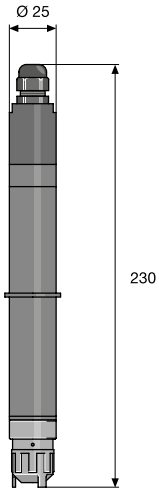
Note: a mounting kit (order no. 815079) is required for initial fitting of the chlorine dioxide sensors in the in-line probe housing DLG III.

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



Technical Data

Measured variable	Chlorine dioxide (ClO_2)
Reference method	DPD1
pH-range	5.5…10.5
Cross sensitivity	Ozone, chlorine
Temperature	10…45 °C
Max. pressure	3.0 bar
Flow	DGMa, DLG III: 40...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
Output signal	4-20 mA ≈ measuring range, not temperature-compensated, uncalibrated, not electrically isolated
Temperature measurement	Separate temperature measurement needed for compensation
Response time sensor t_{90}	60 s
Selectivity	Chlorine dioxide as against chlorite and chlorate
Process integration	Bypass: open sample water outlet
Sensor fitting	We would recommend installing the sensor together with a Pt 100 temperature sensor in fittings BAMa, DGMa, DLG III
Controllers	diaLog C, diaLog DACb, D1Cb/D1Cc
Typical applications	Process water containing surfactants (bottle washing machines).
Resistance to	Surfactants, slight films of dirt
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-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

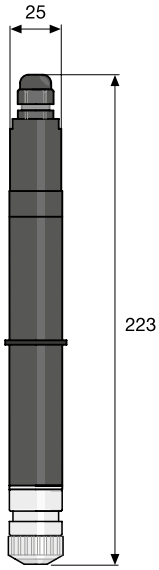
Note: a mounting kit (order no. 815079) is required for initial fitting of the chlorine dioxide sensors in the in-line probe housing DLG III.

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



Technical Data

Measured variable	Chlorine dioxide (ClO_2)
Reference method	DPD1
pH-range	1.0…10.0
Cross sensitivity	Ozone
Temperature	1…55 °C
Max. pressure	1.0 bar
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16…24 V DC
Output signal	4-20 mA temperature-compensated, uncalibrated, not electrically isolated
Response time sensor t_{90}	180 s
Selectivity	Chlorite
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, AEGIS S
Typical applications	Contaminated industrial, process water, containing surfactants, cooling water, irrigation water, slightly contaminated wastewater, warm water.
Resistance to	Surfactants, slight films of dirt, water-soluble chemicals, solids/dirt, biofilms
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
CDR 1-mA-0.5 ppm	0.01…0.5 mg/l	1033762
CDR 1-mA-2 ppm	0.02…2.0 mg/l	1033393
CDR 1-mA-10 ppm	0.10…10.0 mg/l	1033404

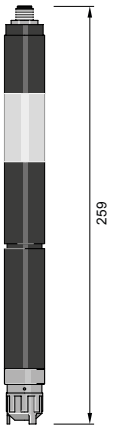
Note: a mounting kit (order no. 815079) is required for initial fitting of the chlorine dioxide sensors in the in-line probe housing DLG III.

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



Technical Data

Measured variable	Chlorine dioxide (ClO_2)
Reference method	DPD1
pH-range	1.0…10.0
Cross sensitivity	Ozone
Temperature	1…55 °C
Max. pressure	3.0 bar
Flow	DGMa, DLG III: 30...100 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	Via CAN-interface (11 – 30 V)
Output signal	Uncalibrated, temperature compensated, electrically isolated
Response time sensor t_{90}	180 s
Selectivity	Chlorite
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	DULCOMARIN 3
Typical applications	Contaminated industrial, process water, containing surfactants, cooling water, irrigation water, slightly contaminated wastewater.
Resistance to	Surfactants, water-soluble pollutants, solids/dirt, biofilms
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
CDR 1-CAN-10 ppm	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

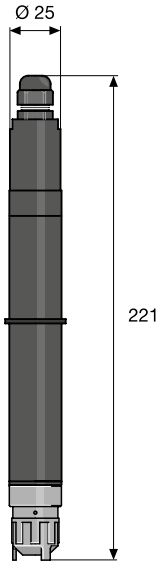
1.2.8 DULCOTEST Sensors for Chlorite

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



DVGW recommended

Technical Data

Measured variable	Chlorite anion (ClO_2^-)
Reference method	DPD method, chlorite in the presence of chlorine dioxide
pH-range	6.5…9.5
Cross sensitivity	reducing chemicals, e. g. Fe^{2+}, Mn^{2+}
Temperature	1…40 °C
Max. pressure	1.0 bar
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
Output signal	4-20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated
Selectivity	Chlorite selective towards chlorine dioxide, chlorate and free chlorine
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	diaLog C, diaLog DACb, D1Cb/D1Cc
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, diaphragm-covered

	Measuring range	Order no.
CLT 1-mA-0.5 ppm	0.02…0.5 mg/l	1021596
CLT 1-mA-2 ppm	0.10…2.0 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.

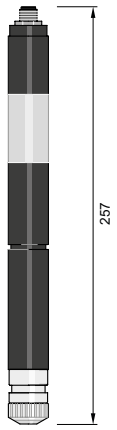
The DT4 photometer is recommended for calibration of the chlorite sensor.

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



Technical Data

Measured variable	Chlorite anion (ClO_2^-)
Reference method	DPD method, chlorite in the presence of chlorine dioxide
pH-range	6.5…9.5
Cross sensitivity	reducing chemicals, e. g. Fe^{2+}, Mn^{2+}
Temperature	1…40 °C
Max. pressure	1.0 bar
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	Via CAN-interface (11 – 30 V)
Output signal	Uncalibrated, temperature compensated, electrically isolated
Response time sensor t_{90}	3 min.
Selectivity	Chlorite selective towards chlorine dioxide, chlorate and free chlorine
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	DULCOMARIN 3
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, diaphragm-covered

	Measuring range	Order no.
CLT 1-CAN-2 ppm	0.05…2.0 mg/l	1041156

Complete with 100 ml of electrolyte, connecting cable - CAN M12 5-pin 0.5 m, T-distributor M12 5-pin CAN

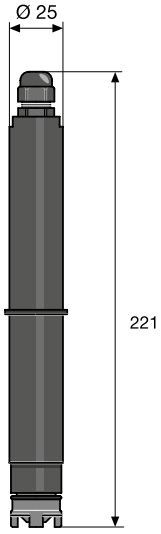
1.2.9 DULCOTEST Sensors for Ozone

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



Technical Data

Measured variable	Ozone (O_3)
Reference method	DPD4
pH-range	4.0…11.0
Cross sensitivity	Chlorine dioxide
Temperature	5…40 °C
Max. pressure	1.0 bar
Flow	DGMa, DLG III: 20...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
Output signal	4-20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated
Selectivity	Ozone as against free chlorine, combined chlorine, hydrogen peroxide
Process integration	Bypass: open sample water outlet
Sensor fitting	DGM, DLG III
Controllers	diaLog C, diaLog DACb, D1Cb/D1Cc, DULCOPOOL Pro
Typical applications	Potable water and swimming pool water.
Resistance to	Salts, acids, alkalis. Not surfactants
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
OZE 3-mA	0.02…2.0 mg/l	792957

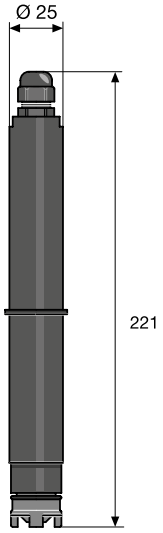
Note: A mounting kit (order no. 815079) is required for initial fitting of the ozone sensors in the in-line probe housing DLG III.

Ozone sensor OZR 1-mA

Sensor for measuring and monitoring the absence of ozone, also suitable for use in contaminated 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
- 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



Technical Data

Measured variable	Ozone (O_3)
Reference method	DPD4
pH-range	4.0…11.0
Cross sensitivity	chlorine dioxide, peracetic acid, bromine, bromamine
Temperature	5…40 °C
Max. pressure	1.0 bar
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
Output signal	4-20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated
Response time t_{90} after 1 month with 0.00 ppm ozone	<210 s
Selectivity	Non-selective
Process integration	Bypass: open sample water outlet
Sensor fitting	DGM, DLG III
Controllers	diaLog C, diaLog DACb, D1Cb/D1Cc, DULCOPOOL Pro
Typical applications	Potable water, swimming pool water, process, service or cooling water, monitoring the ozone breakdown of filters.
Resistance to	Salts, acids, alkalis, surfactants, dirt films
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
OZR 1-mA-0.5 ppm	0.01…0.5 mg/l	1118883
OZR 1-mA-2 ppm	0.02…2.0 mg/l	1051647
OZR 1-mA-10 ppm	0.1…10.0 mg/l	1118925

Note: A mounting kit (order no. 815079) is required for initial fitting of the ozone sensors in the in-line probe housing DLG III.

1.2 Amperometric Sensors DULCOTEST

1.2.10 DULCOTEST Sensors for Peracetic Acid

DULCOTEST sensors of types PAA 1 and PAA 2-3E are diaphragm-covered amperometric sensors for the selective measurement of peracetic acid. You have the option of two sensor types for applications with different requirements:

Type PAA 1 with extra thick, pore-free diaphragm for average and higher concentrations of peracetic acid for applications in the food and beverage industry.

Type PAA 2-3E for low concentrations of peracetic acid for monitoring peracetic acid limit values in clarification plant processes or for applications in the pharmaceutical industry and medical technology.

Selection Guide

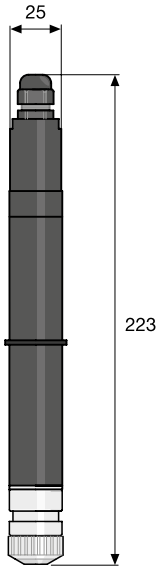
Feature	PAA 1-mA	PAA 2-3E-mA
Resistance to chemicals and deposits (dirt, limescale, surfactants)	very good, due to non-porous diaphragm	good, due to hydrophilic diaphragm
Max. Max. temperature	up to 45 °C	up to 40 °C
Shaft / membrane material	PVC-C / silicone	PVC-U / PET
Measuring range	Standard type: 1 ... 200 mg/l , 10 ... 2,000 mg/l Special type: up to 20,000 mg/l	0.02 ... 2.0 mg/l, 0.2 ... 20.0 mg/l
Response time T90	up: 180 seconds down: 120 seconds	up, down: < 30 seconds
Intermittent operation without peracetic acid	possible	not possible
Electrical connection	Terminal	Plug

Peracetic Acid Sensor PAA 1-mA

Sensor for the measurement of peracetic acid without cross-sensitivity to hydrogen peroxide. For disinfecting contaminated water from washing foodstuffs and from cleaning procedures (e.g. CIP).

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



Technical Data

Measured variable	Peracetic acid
Reference method	Titration
pH-range	1.0…9.0
Temperature	5…45 °C
Admissible temperature fluctuation	0.3 °C/min
Response time sensor t_{90}	≈ 3 min
Max. pressure	3.0 bar
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
Output signal	4-20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated
Selectivity	Peracetic acid selective towards hydrogen peroxide
Cross sensitivity	Ozone, chlorine dioxide, chlorine, bromine
Process integration	Bypass: open sample water outlet
Sensor fitting	BAMa, DGMa, DLG III
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, AEGIS II
Typical installations	Flushing with Cleaning In Place (CIP), washing vegetables, fruit and meat, rinsers, also suitable for use in the presence of surfactants. The selective measurement of peracetic acid in the presence of hydrogen peroxide is possible.
Resistance to	Salts, acids, alkalis, surfactants, dirt films
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-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 sensor bypass fitting DLG III.

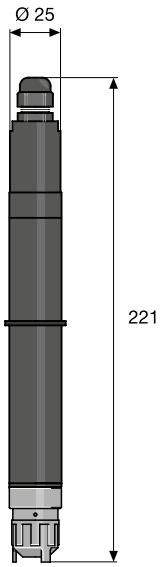
1.2 Amperometric Sensors DULCOTEST

Peracetic acid sensor PAA 2-3E-mA

Sensor for measuring even low concentrations of peracetic acid without cross-sensitivity to hydrogen peroxide even in wastewater (pre-cleaned)

Your Benefits

- Measured variable: peracetic acid, without cross-sensitivity to the accompanying chemical, hydrogen peroxide
- Low dependence on flow, reduced faults caused by substances in the water and films of dirt, thanks to a membrane protecting the measuring electrodes
- Sensitive measuring range from 0..02 mg/l provided by potentiometric system containing 3 electrodes
- Measured values for monitoring or fast control due to short sensor response time < 30 s
- An integrated transmitter and the signal cable's plug-in connector make for an easy installation



Technical Data

Measured variable	Peracetic acid
Calibration	DPD4, titration
pH-range	3.0…8.0
Temperature	0…40 °C
Admissible temperature fluctuation	< 0.3 °C/min
Response time sensor t_{90}	< 45 s
Max. pressure	3.0 bar
Electrolytic conductivity	0.05...50 mS/cm
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
Output signal	4-20 mA ≈ measuring range, temperature-compensated, uncalibrated, not electrically isolated
Selectivity	Peracetic acid selective towards hydrogen peroxide
Cross sensitivity	Ozone, chlorine dioxide, chlorine, bromine
Process integration	Bypass: open outlet or return of the sample water into the process line
Sensor fitting	BAMa, DGMa, DLG III
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, AEGIS II
Typical applications	Disinfecting pre-cleaned wastewater, measurement and control of low peracetic acid concentrations in the pharmaceutical industry and medical technology.
Resistance to	Salts, acids, alkalis, surfactants, dirt films
Measuring principle, technology	Amperometric, 3 electrodes, diaphragm-covered

	Measuring range	Order no.
PAA 2-3E-mA-2 ppm	0.02…2.0 mg/l	1120263
PAA 2-3E-mA-20 ppm	0.2…20.0 mg/l	1119538

Accessories

	Length m	Order no.
Measuring line (external cable), 2-core, 5-pin plug	2	707702
Measuring line (external cable), 2-core, 5-pin plug	5	707703
Measuring line (external cable), 2-core, 5-pin plug	10	707707

1.2.11 DULCOTEST Sensors for Hydrogen Peroxide

The DULCOTEST sensors PER 1, PEROX H2.10 P and PEROX H-3E 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 drinking water, landfill seepage water, contaminated ground water
- Disinfection of cooling, process and production water in the food and beverage industries as well as in swimming pools
- Exhaust air scrubbing in municipal clarification plants and industrial flue gas cleaning
- Elimination of chlorine in water treatment

Sensors are selected using the following decision-making table:

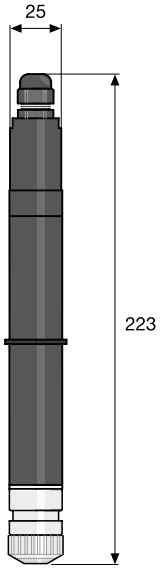
Requirement	Type		
	PER1	**PEROX H2.10 P**	**PEROX H-3E**
Sample matrix contaminated with dirt and chemicals	Very suitable due to water-impermeable hydrophobic diaphragm/separate electrolyte, but sensitive to hydrogen sulphide (H2S), oxidizing agents	Not cross-sensitivity to free chlorine and peracetic acid. More susceptible due to more water-permeable diaphragm. Process water serves as electrolyte	Well suited due to less water-permeable hydrophilic diaphragm/separate electrolyte. Not cross-sensitive to free chlorine
Electrical influence due to interference potentials in the measuring medium	Insensitive as counter electrode is separated from the process	More sensitive as counter electrode in the medium	Insensitive as counter electrode is largely separated from the process
Temperature range	up to 50 °C	up to 40 °C	up to 45 °C
Easy handling during installation and maintenance	Suitable due to temperature compensation and Transmitters integrated in the sensor	Separate temperature sensor for fast processes. Separate plug-on transducer	Transmitters integrated into the sensor. Signal cable can be plugged into the sensor. Separate temperature measurement for processes with rapid temperature changes
Response time as t90	480 s	20 s	45 s
Rapid temperature changes	Slow due to integrated temperature sensor	Fast due to separate temperature sensor	Slow due to integrated temperature sensor
Measuring intervals in the absence of H2O2(> 1 week)	unsuitable	Suitable due to pulsed polarization technology	Suitable due to pulsed polarization technique
Measuring range can vary by orders of magnitude in phases or is unclear when ordering	Selection of suitable sensor necessary	Suitable, as measuring range can be switched manually on the sensor transducer	Selection of suitable sensor necessary
Measuring range	20 ... 2,000 mg/l Measuring ranges up to 100,000 ppm on request	1 ... 2,000 mg/l	0.1 ... 500 mg/l
pH-range	1,0 ... 11,0	2,5 ... 10,0	2,5 ... 8,0
Measuring electrodes	2 probes	2 probes	3 probes
Typical application	Cooling water, waste water, bleaching process	Exhaust air scrubber, drinking water, swimming pool, pharmaceuticals	Swimming pool, plant irrigation water, chlorine elimination

Hydrogen peroxide sensor PER 1-mA

Sensor for the measurement of hydrogen peroxide even in chemically contaminated and polluted water. Available with measuring ranges for medium to very high concentrations

Your Benefits

- Hydrogen peroxide as the measured variable, with measuring ranges from 20 ppm to 100,000 ppm (10%. With > 2%, as special versions) available
- Diaphragm-covered sensor minimises faults caused by changing flow or substances in the water
- Resistance to films of dirt thanks to use of a pore-free diaphragm
- Can be used in wide pH range of 1...11
- Operating temperature up to 50 °C



Technical Data

Measured variable	Hydrogen peroxide
Calibration	Photometric with manual DT3B photometer
pH-range	1.0…11.0
Temperature	0…50 °C
Admissible temperature fluctuation	< 0.3 °K/min
Response time sensor t_{90}	approx. 480 sec
Max. pressure	1.0 bar
Flow	DGMa, DLG III: 30...80 l/h BAMa: 5...60 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
Output signal	4...20 mA temperature-compensated, uncalibrated, not electrically isolated
Selectivity	Hydrogen peroxide selective towards sulphite
Cross sensitivity	Ozone, chlorine dioxide, peracetic acid, chlorine, bromine
Process integration	Bypass: open outlet or return of the sample water into the process line
Sensor fitting	BAMa, DGMa, DLG III
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc
Typical applications	Cooling and wastewater treatment, bleaching processes, H_2O_2 product qualification, water with higher H_2O_2 concentrations of up to 100,000 ppm.
Resistance to	Salts, acids, alkalis, surfactants, dirt films, not against hydrogen sulphide (H_2S)
Measuring principle, technology	Amperometric, 2 electrodes, diaphragm-covered

	Measuring range	Order no.
PER 1-mA-2000 ppm	20…2,000 mg/l	1022510

Important note: Measuring ranges up to 100,000 ppm on request

Photometer → 249

Accessories

		Order no.
Photometer DT3B	(for calibration)	1039317
Polishing paste	(to electrode cleaning)	559810

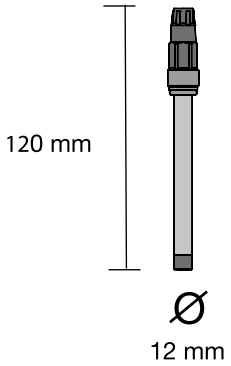
Note: A mounting kit (order no. 815079) is required for initial fitting of the sensors in the sensor bypass fitting DLG III.

Hydrogen peroxide sensor PEROX H2.10 P-mA

Sensor for measuring hydrogen peroxide without cross-sensitivity to chlorine. It can also be used for fast control processes even with the temporary absence of hydrogen peroxide in clear water in a wide pH range of 2.5...10.

Your Benefits

- Measured variable hydrogen peroxide without cross-sensitivity to chlorine
- Diaphragm-covered sensor minimises faults caused by changing flow
- Fast processes can be controlled through the sensor's rapid response time in conjunction with fast external temperature measurement for temperature correction
- Can be used in wide pH range of 2.5...10
- Reliable measurement even after periods of absence of hydrogen peroxide thanks to pulsed, self-regenerating measuring electrode



Technical Data

Measured variable	Hydrogen peroxide
Calibration	Photometric with manual DT3B photometer
Measuring range	1...20, 10...200, 100...2000 mg/l, switchable
pH-range	2.5…10.0
Temperature	0…40 °C
Admissible temperature fluctuation	< 1 °K/min (with external T measurement)
Response time sensor t_{90}	approx. 20 sec
Min. conductivity	For measuring range 20 mg/l: 5 µS/cm For measuring range 200 mg/l: 200 µS/cm Up to 1,000 mg/l: 500 µS/cm Up to 2,000 mg/l: 1 mS/cm
Max. pressure	2.0 bar
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (three-wire system)
Output signal	4...20 mA not temperature-compensated, uncalibrated, not electrically isolated
Selectivity	Hydrogen peroxide selective towards free chlorine
Process integration	Bypass: open outlet or return of the sample water into the process line
Sensor fitting	BAMa, DGMa, DLG III
Controllers	diaLog C, diaLog DACb, D1Cb/D1Cc
Typical applications	Exhaust air scrubbers, treatment of clear and chemically uncontaminated water, controls with the necessary very short response times
Resistance to	Salts, acids, lyes, surfactants.
Measuring principle, technology	amperometric, 2 pulsing electrodes, diaphragm-covered

	Order no.
PEROX-H2.10 P-mA	792976
PEROX transducer V1 for D1Ca	1034100
PEROX Transducer V2	1047979

Accessories

		Order no.
Photometer DT3B	(for calibration)	1039317
Polishing paste	(to electrode cleaning)	559810

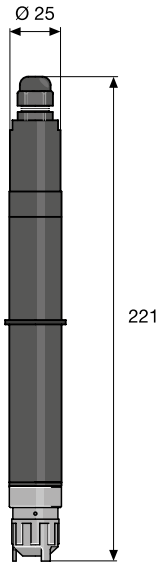
Photometer → 249

Hydrogen peroxide sensor PEROX H 3E-mA

Sensor for the measurement of hydrogen peroxide without cross-sensitivity to free chlorine peracetic acid. Suitable for use with fast control processes, even in moderately contaminated water, and for reliable measurement from 0.2 ppm H_2O_2

Your Benefits

- Measured variable hydrogen peroxide without cross-sensitivity to free chlorine and peracetic acid
- Sensitive measuring range from 0.2 mg/l
- Fast processes can be controlled through the sensor's rapid response time in conjunction with fast external temperature measurement for temperature correction
- Reliable measurement even after periods of absence of hydrogen peroxide thanks to pulsed, self-regenerating measuring electrode
- Low measuring range provided by a system containing 3 electrodes
- Membrane-covered sensor minimises faults caused by changing flow
- An integrated transmitter and the signal cable's plug-in connector make for an easy installation



Technical Data

Measured variable	Hydrogen peroxide
Calibration	Photometric with manual DT3B photometer
pH-range	2.5…8.0
Temperature	0…45 °C
Admissible temperature fluctuation	< 1 °K/min (with external T measurement)
Response time sensor t_{90}	< 45 s
Electrolytic conductivity	0.05...50 mS/cm
Max. pressure	3.0 bar
Flow	DGMa, DLG III: 30...60 l/h BAMa: 5...100 l/h (depending on design)
Supply voltage	16...24 V DC (2-wire)
Output signal	4...20 mA not temperature-compensated, uncalibrated, not electrically isolated
Electrical Connection	via a 4-pin plug on the sensor via an open-ended signal cable on the unit
Selectivity	Hydrogen peroxide selective to free chlorine, peracetic acid, sulphite
Process integration	Bypass: open outlet or return of the sample water into the process line
Sensor fitting	BAMa, DGMa, DLG III
Controllers	diaLog C, diaLog X, diaLog DACb
Typical applications	Swimming pool, plant irrigation water, chlorine elimination. Can also be used for moderately contaminated water, controls with the necessary short response times and low H_2O_2 concentrations
Resistance to	Salts, acids, alkalis, surfactants, dirt films
Measuring principle, technology	amperometric, 3 pulsing electrodes, diaphragm-covered

	Measuring range	Order no.
PEROX H-3E-10ppm	0.10…10.0 mg/l	1058563
PEROX H-3E-50ppm	0.50…50.0 mg/l	1105779
PEROX H-3E-200ppm	2.0…200 mg/l	1105778
PEROX H-3E-500ppm	5.0…500 mg/l	1117570

Accessories

	Order no.
Pt 100 SE - temperature sensor for direct temperature measurement or temperature compensation during measurement of pH, fluoride, conductivity, chlorine dioxide or hydrogen peroxide	305063
DT3B photometer for calibrating the sensors for hydrogen peroxide, complete with transport case	1039317

	Length m	Order no.
Measuring line (external cable), 2-core, 5-pin plug	2	707702
Measuring line (external cable), 2-core, 5-pin plug	5	707703
Measuring line (external cable), 2-core, 5-pin plug	10	707707

1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

1.3.1 Selection Guide for pH Sensors, ORP Sensors

The following generally applicable points should be observed 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 type)
- 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 depending on the application
- The storage period should be as short as possible

Measuring lines for pH/ORP measurement, see page → 135, quality buffer solutions for pH, see page → 138

1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

Selection guide for pH sensors DULCOTEST

Sensor type	Typical applications	Remarks	pH range	Max. temperature and max. pressure	Loading with particles/solid matter in the application	Reference	Diaphragm
PHES	Drinking water, swimming pool water		1 to 12	60°C / 3 bar	None to low levels	Ag/AgCl	1x ceramic
PHEK	Swimming pool water, aquariums	Plastic sensor shaft for greater safety during handling, e.g. end customers in the private swimming pool sector	1 to 12	60°C / 3 bar	None to low levels	Ag/AgCl	1x ceramic
PHEP/PHEPT	Drinking water, process water	PHEPT with integrated temperature sensor	1 to 12	80°C / 6 bar	None to low levels	Ag/AgCl with AgCl reservoir	1x ceramic
PHED	Process water, electroplating	Chemically contaminated water, e.g. Cr6+, CN-	1 to 12	80°C / 8 bar	None to low levels	Ag/AgCl with AgCl reservoir	2x ceramic; double junction
PHEN	Process water, cooling water, waste water: chemically contaminated, clear PHEN-3D type for conductivities > 50 µS/cm	Reference electrolyte is introduced into the sensor using external bottles and can be topped up	1 to 12	80°C / no overpressure	None to low levels	Ag/AgCl with AgCl reservoir	1x ceramic
PHER	Industrial and public waste water, cooling water, process water: containing solids	Dirt-repellent PTFE diaphragm	1 to 12	80°C / 6 bar	Low to medium levels	Ag/AgCl with AgCl reservoir	1x PTFE
PHER-DJ	Waste water, cooling water, process water: contaminated with solids and chemicals, reverse osmosis (conductivity ≥ 10 µS/cm), acid and alkaline gas scrubbers (without fluoride, HF)	Dirt-repellent PTFE diaphragm and a double junction to protect the reference system	1 to 12	80°C / 6 bar	Low to medium levels	Ag/AgCl with AgCl reservoir	2xPTFE; double junction
PHEI	Waste water, cooling water, process water: contaminated with solids and chemicals	Long service life thanks to large volume of reference electrolyte, double junction and large PTFE diaphragm, 3/4" NPT screw-in thread	1 to 12	80°C / 6 bar	Low to medium levels	Ag/AgCl with AgCl reservoir	1x PTFE; 1x ceramic; double junction
PHEX	Waste water, process water: high solids content, no chemical contamination. Suspensions, sludge, emulsions	Open ring diaphragm	1 to 12	25°C / 16 bar and 100°C / 6 bar	Medium to high levels	Ag/AgCl with AgCl reservoir	Open ring diaphragm
PHEF	Media containing fluoride with low pH values, e.g. etching solutions containing fluoride in electroplating	Special pH glass with increased resistance to HF	0 to 12	50°C / 7 bar	Low to medium levels	Ag/AgCl	1x HDPE
PHEF-DJ	Media containing fluoride with low pH values, e.g. gas scrubbers where gases containing fluoride are scrubbed	Special pH glass with increased resistance to HF	1 to 12	60°C / 6 bar	Low to medium levels	Ag/AgCl with AgCl reservoir	2xPTFE; double junction
PHEP-H	Process water with high pH values (> pH 12)	Special pH glass with increased resistance to high pH values	3 to 14	80°C / 6 bar	None to low levels	Ag/AgCl with AgCl reservoir	1x ceramic

Note: All DULCOTEST pH and ORP sensors are made using lead-free glass (RoHS-compliant)

1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

Selection guide for ORP sensors DULCOTEST

Sensor type	Typical applications	Remarks	Material of sensor pin	Max. temperature and max. pressure	Loading with particles/solid matter in the application	Reference	Diaphragm
RHES Pt	Drinking water, swimming pool water		Platinum (Pt)	60°C / 3 bar	None to low levels	Ag/AgCl	1x ceramic
RHES Au	Swimming pool water	ORP sensors with gold electrodes are not susceptible to hydrogen, which is produced through the generation of chlorine by open electrolysis systems. What's more, gold electrodes are well suited to ozone applications.	Gold (Au)	60°C / 3 bar			
RHEK Pt	Swimming pool water, aquariums	Plastic sensor shaft for greater safety during handling; e.g. end customers in the private swimming pool sector	Platinum (Pt)	60°C / 3 bar	None to low levels	Ag/AgCl	1x ceramic
RHEKL Pt	Swimming pool water, aquariums	Two diaphragms mean that horizontal installation is possible	Platinum (Pt)	60°C / 3 bar	None to low levels	Ag/AgCl	2x ceramic
RHEP Pt	Drinking water, process water		Platinum (Pt)	80°C / 6 bar	None to low levels	Ag/AgCl with AgCl reservoir	1x ceramic
RHEP Au	Drinking water, process water	ORP sensors with gold electrodes are not susceptible to hydrogen, which is produced through the generation of chlorine by open electrolysis systems What's more, gold electrodes are well suited to ozone applications	Gold (Au)	80°C / 6 bar	None to low levels	Ag/AgCl with AgCl reservoir	1x ceramic
RHEN Pt	Process water, cooling water, waste water: chemically contaminated, clear	Reference electrolyte is introduced into the sensor using external bottles and can be topped up	Platinum (Pt)	80°C / no overpressure	None to low levels	Ag/AgCl with AgCl reservoir	1x ceramic
RHER Pt	Industrial and public waste water, cooling water, process water: containing solids	Dirt-repellent PTFE diaphragm	Platinum (Pt)	80°C / 6 bar	Low to medium levels	Ag/AgCl with AgCl reservoir	1x PTFE
RHER-DJ	Waste water, cooling water, process water: contaminated with solids and chemicals, reverse osmosis (conductivity ≥ 10 µS/cm), acid and alkaline gas scrubbers (without fluoride, HF)	Dirt-repellent PTFE diaphragm and a double junction to protect the reference system	Platinum (Pt)	80°C / 6 bar	Low to medium levels	Ag/AgCl with AgCl reservoir	2xPTFE; double junction
RHEIC	Waste water, cooling water, process water: contaminated with solids and chemicals	Long service life thanks to large volume of reference electrolyte, double junction and large PTFE diaphragm 3/4" NPT screw-in thread	Platinum (Pt)	80°C / 6 bar	Low to medium levels	Ag/AgCl with AgCl reservoir	1x PTFE; 1x ceramic; double junction
RHEX	Waste water, process water: high solids content, no chemical contamination. Suspensions, sludge, emulsions	Open ring diaphragm	Platinum (Pt)	25°C / 16 bar and 100°C / 6 bar	Medium to high levels	Ag/AgCl with AgCl reservoir	Open ring diaphragm

Note: All DULCOTEST pH and ORP sensors are made using lead-free glass (RoHS-compliant)

1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

1.3.2 pH Sensors with SN6 or VARIO Pin Plug-In Head

pH sensors with plug-in head are connected to a shielded coaxial cable with the appropriate socket. The rotatable threaded sleeve on the sensor head prevents the cable from twisting when inserting and removing the sensor (e.g. when calibrating). The cable can therefore remain connected. This avoids the penetration of troublesome water onto the plug-in contacts.

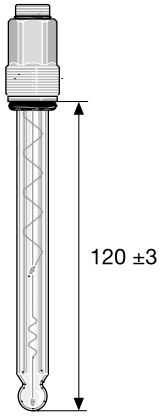
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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 cable 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)



Technical Data

pH-range	1…12
Temperature	0…60 °C
Max. pressure	3.0 bar
Min. conductivity	150 µS/cm
Electrolyte	Gel containing potassium chloride
Diaphragm	Ceramic
Sensor shaft	Glass
Shaft diameter	12 mm
Installation length	100 ±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
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Swimming pools, whirlpools, potable water
Resistance to	Disinfectant
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm, separate temperature measurement for temperature compensation needed

	Installation length	Order no.
PHES-112-SE SLg100	100 ±3 mm	1051745
PHES 112 SE	120 ±3 mm	150702
PHES-112-SE SLg225	225 ±3 mm	150092

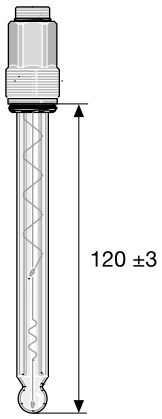
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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 cable 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)



Technical Data

pH-range	1…12
Temperature	0…60 °C
Max. pressure	3.0 bar
Min. conductivity	50 µS/cm
Electrolyte	Gel containing potassium chloride
Diaphragm	3 ceramic diaphragms
Sensor shaft	Glass
Shaft diameter	12 mm
Installation 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
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Low conductivity water.
Resistance to	Disinfectant
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm, separate temperature measurement for temperature compensation needed

	Installation length	Order no.
PHES 112 SE 3D	120 ±3 mm	1045759

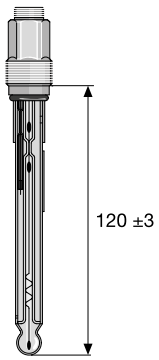
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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 cable 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)



Technical Data

pH-range	1…12
Temperature	0…80 °C
Max. pressure	6.0 bar
Min. conductivity	150 µS/cm
Electrolyte	Gel containing potassium chloride
Diaphragm	Ceramic
Sensor shaft	Glass
Shaft diameter	15 mm
Installation 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
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Drinking water, clear process water
Resistance to	Disinfectant
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm, separate temperature measurement for temperature compensation needed

	Installation length	Order no.
PHEP 112 SE	120 ±3 mm	150041
PHEP 112 SE SLg100	100 ±3 mm	150951

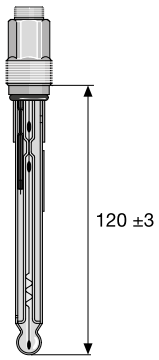
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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)



Technical Data

pH-range	3…14
Temperature	0…100 °C
Max. pressure	6.0 bar (25 °C), 3.0 bar (100 °C)
Min. conductivity	150 µS/cm
Electrolyte	Gel containing potassium chloride with KCl reservoir
Diaphragm	Ceramic
Sensor shaft	Glass
Shaft diameter	15 mm
Installation 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
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Monitoring or control of chemical processes with neutral to highly-alkaline media and temperatures up to 100 °C.
Resistance to	Disinfectant, high alkalinity
Measuring principle, technology	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

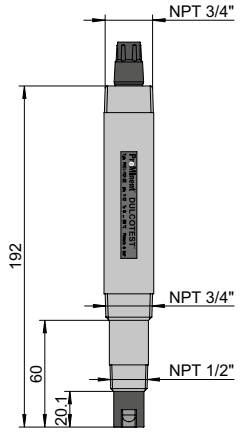
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

pH Sensor PHEI 112 SE

Reliable online measurement of pH values in industrial wastewater/water - with DULCOTEST sensors

Your Benefits

- Solid high-grade plastic housing with integrated process connection for direct installation in the process with ½" and ¾" NPT thread
- Large dirt-repellent Teflon diaphragm protects against unwanted blocking of the reference
- Double junction reference system for stability with chemically polluted water
- Large electrolyte reservoir for long service lives



Technical Data

pH-range	1…12
Temperature	0…80 °C
Max. pressure	6.0 bar
Min. conductivity	50 µS/cm
Electrolyte	Gel containing potassium chloride with a large KCl reservoir of gel
Diaphragm	1 x PTFE ring diaphragm and 1x ceramic diaphragm
Sensor shaft	Plastic
Shaft diameter	17 ±0.2 mm (below the ½" NPT thread), 22 ±0.2 mm (below the ¾" thread)
Installation length	20 ±0.2 mm (from the lower end of the ½" thread), 60 ±0.2 mm (from the lower end of the ¾" thread)
Fitting position	Vertical up to +25°
Thread	½" and ¾" NPT thread
Electrical Connection	SN6 plug-in head, rotatable with a ProMinent cable
Enclosure rating	IP 65
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Municipal and industrial waste water, cooling water, process water: contaminated with solids and chemicals.
Resistance to	Disinfectant, solids content (turbid water), water-soluble chemicals
Measuring principle, technology	direct potentiometric measurement, 2 probes, double junction, gel electrolyte, large Teflon diaphragm, separate temperature measurement for temperature compensation needed

	Order no.
PHEI 112 SE	1076610

Accessories

	Order no.
Adapter for fitting DGMa, DLG III; M34 x 3/4" NPT PVDF-natural	1077156
Adapter for fitting BAMa; G1-3/4 NPT PVDF	1113353

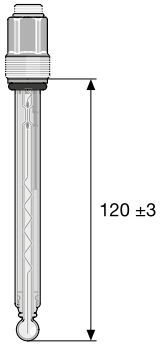
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

pH Sensor PHER 112 SE

pH sensor optimised for use in contaminated water containing solids and for low conductivity of > 50 µS/cm at up to 80 °C/6 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)



Technical Data

pH-range	1…12
Temperature	0…80 °C
Max. pressure	6.0 bar
Min. conductivity	50 µS/cm
Electrolyte	Gel containing potassium chloride with KCl reservoir
Diaphragm	PTFE ring diaphragm
Sensor shaft	Glass
Shaft diameter	12 mm
Installation 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
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Municipal and industrial waste water, cooling water, process water: containing moderate amounts of solids without high levels of chemical contamination.
Resistance to	Disinfectant, solids content (turbid types of water)
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, Teflon ring diaphragm, polymer electrolyte, separate temperature measurement for temperature compensation needed

	Order no.
PHER 112 SE	1001586

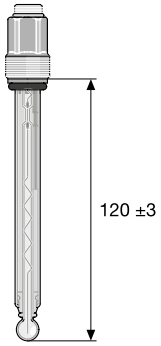
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

PH sensor PHER-DJ 112 SE

pH sensor with double diaphragm (double junction) optimised for use in contaminated water containing solids and for low conductivity of > 10 µS/cm at up to 80 °C/6 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)



Technical Data

pH-range	1…12
Temperature	0…80 °C
Max. pressure	6.0 bar
Min. conductivity	10 µS/cm
Electrolyte	Gel containing potassium chloride with KCl reservoir
Diaphragm	2x PTFE ring diaphragm
Sensor shaft	Glass
Shaft diameter	12 mm
Installation 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
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Municipal and industrial waste water, cooling water, process water: contaminated with solids and chemicals, reverse osmosis, acid and alkaline gas scrubbers (without fluoride, HF), water with low conductivity
Resistance to	Disinfectant, solids content (turbid types of water)
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, Teflon ring diaphragm, polymer electrolyte, separate temperature measurement for temperature compensation needed

	Installation length	Order no.
PHER-DJ 112 SE	120 ±3 mm	1108991

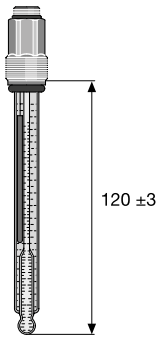
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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 cable 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)



Technical Data

pH-range	1…12
Temperature	0…100 °C
Max. pressure	16.0 bar (25 °C), 6.0 bar (100 °C)
Min. conductivity	500 µS/cm
Electrolyte	Polymer containing potassium chloride (solid)
Diaphragm	Circular gap diaphragm (solid electrolyte)
Sensor shaft	Glass
Shaft diameter	12 mm
Installation 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
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Waste process water: high solids content, no chemical contamination. Suspensions, sludge, emulsions. Not suitable in clear waters, not suitable for media with oxidation agents.
Resistance to	Solids content (turbid types of water), sludge, emulsions
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, no diaphragm, polymer electrolyte, separate temperature measurement for temperature compensation needed

	Installation length	Order no.
PHEX 112 SE	120 ±3 mm	305096
PHEX 112 SE SLg225	225 ±3 mm	150061

From stock Heidelberg

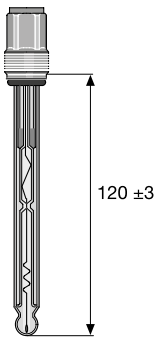
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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)



Technical Data

pH-range	1…12
Temperature	0…80 °C
Max. pressure	8.0 bar
Min. conductivity	150 µS/cm
Electrolyte	Gel containing potassium chloride
Diaphragm	Double junction
Sensor shaft	Glass
Shaft diameter	12 mm
Installation 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
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Clear process, cooling and waste water polluted by chemicals
Resistance to	Disinfectants, water-soluble chemicals
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, double junction, gel electrolyte, separate temperature measurement for temperature compensation needed

	Order no.
PHED 112 SE	741036

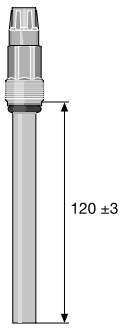
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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^-) 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_4. Extended service life in the presence of fluoride (F^-) at a pH of < 7
- The flat shape of the glass diaphragm and large ring diaphragm facilitate use in contaminated water, which also contains abrasive solids



Technical Data

pH-range	0…12
Temperature	0…50 °C
Max. pressure	7.0 bar
Min. conductivity	150 µS/cm
Electrolyte	Gel containing potassium chloride
Diaphragm	HDPE ring diaphragm, flat (Double Junction)
Sensor shaft	Epoxy
Shaft diameter	12 mm
Installation length	120 ±3 mm
Fitting position	Vertical up to +25°
Thread	PG 13.5
Electrical Connection	SN6 plug-in head
Enclosure rating	IP 65
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	A significantly longer service life can be achieved compared with standard pH sensors in media containing hydrofluoric acid, e.g. wastewater 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

	Order no.
PHEF 012 SE	1010511

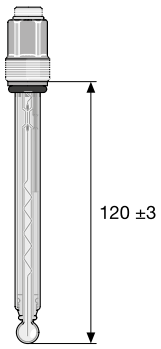
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

pH sensor PHEF-DJ 112 SE

pH sensor with double diaphragm (double junction) optimised for acid water containing fluoride at up to 60 °C/8 bar

Your Benefits

- Electrochemical combination probe: pH and reference electrode integrated
- Precise and reliable pH measurement in water containing fluoride with low pH enables efficient processes and excellent process reliability
- A special pH glass and dirt-repellent double junction can extend the service life of the sensor and thereby minimise downtimes as well as maintenance requirements
- The combination of hydrofluoric acid-resistant glass and PTFE double junction makes the sensor suited to gas scrubbing applications where fluoride and dirt may be encountered at the same time
- Twist protection for the sensor cable connection ensures that the cable can remain connected during installation and removal of the sensor, reducing moisture on the plug-in contacts



Technical Data

pH-range	1…12
Temperature	0…60 °C
Max. pressure	6.0 bar
Min. conductivity	10 µS/cm
Electrolyte	Gel containing potassium chloride with KCl reservoir
Diaphragm	2 x PTFE ring diaphragm, double junction
Sensor shaft	Glass
Shaft diameter	12 mm
Installation 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
Process integration	Bypass: open outlet or return of the sample water into the process pipe, Inline: direct installation in the pipework|tubing; fixed or replaceable (retractable fitting), Tank, flume: immersion in the immersion pipe
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, SlimFLEX 5a, AEGIS S
Typical applications	A significantly longer service life can be achieved compared with standard pH sensors in media containing hydrofluoric acid, e.g. wastewater from the semiconductor industry or electroplating applications and air scrubbers. Low conductivity water.
Resistance to	Disinfectant, dirt
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, gel electrolyte, PTFE diaphragm, separate temperature measurement needed for temperature compensation

	Order no.
PHEF-DJ 112 SE	1114185

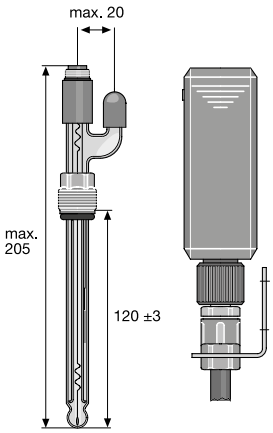
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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)



Technical Data

pH-range	1…12
Temperature	0…80 °C
Max. pressure	Operation at atmospheric pressure
Min. conductivity	150 µS/cm
Electrolyte	KCL electrolyte, refillable
Diaphragm	Ceramic
Sensor shaft	Glass
Shaft diameter	12 mm
Installation 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
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, SlimFLEX 5a, AEGIS S
Typical applications	Process water, cooling water, waste water: chemically contaminated, clear
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.
PHEN 112 SE	305090

Delivered without PE storage tank and hose

Accessories

	Order no.
PE storage tank with connectors and tube	305058

For the PE storage tank, we recommend fitting approx. 0.5 - 1 m above the level of the measurement medium.

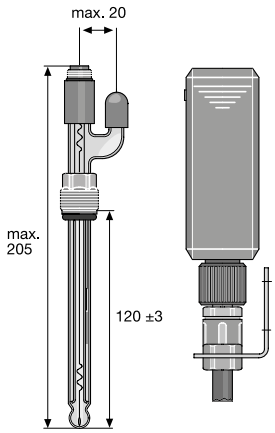
	Capacity	Order no.
KCl solution, 3 molar	250 ml	791440
KCl solution, 3 molar	1,000 ml	791441

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 through 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 cable 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 of > 50 µS/cm and where solids are present
- Lead-free glass for advanced and environmentally-friendly production, use and disposal (RoHS-compliant)



Technical Data

pH-range	1…12
Temperature	0…80 °C
Max. pressure	Operation at atmospheric pressure
Min. conductivity	50 µS/cm
Electrolyte	KCL electrolyte, refillable
Diaphragm	3 ceramic diaphragms
Sensor shaft	Glass
Shaft diameter	12 mm
Installation 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
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, SlimFLEX 5a, AEGIS S
Typical applications	Wastewater, water with low conductivity, e.g. from reverse osmosis.
Resistance to	Disinfectant, solids content (turbid types of water)
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, liquid electrolyte, 1 ceramic diaphragm, separate temperature measurement for temperature compensation needed

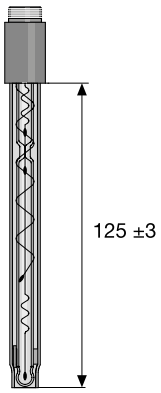
	Order no.
PHEN 112 SE 3D	150078

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)



Technical Data

pH-range	1…12
Temperature	0…60 °C
Max. pressure	3.0 bar
Min. conductivity	150 µS/cm
Electrolyte	Gel containing potassium chloride
Diaphragm	Ceramic
Sensor shaft	Polycarbonate
Shaft diameter	12 mm
Installation length	120 ±3 mm
Fitting position	Vertical up to +25°
Thread	none
Electrical Connection	SN6 plug-in head
Enclosure rating	IP 65
Process integration	Immersion by tripod or manually
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Hand-held measurement in swimming pools, potable water.
Resistance to	Disinfectant
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm, separate temperature measurement for temperature compensation needed

	Order no.
PHEK 112 S	305051

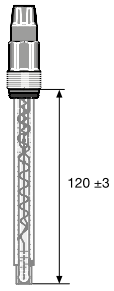
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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 cable 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)



Technical Data

pH-range	1…12
Temperature	0…60 °C
Max. pressure	3.0 bar
Min. conductivity	150 µS/cm
Electrolyte	Gel containing potassium chloride
Diaphragm	Ceramic
Sensor shaft	Polycarbonate
Shaft diameter	12 mm
Installation 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
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Swimming pool, potable water, aquariums
Resistance to	Disinfectant
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm, separate temperature measurement for temperature compensation needed

	Order no.
PHEK 112 SE	1028457

From stock Heidelberg

1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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 cable 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

Technical Data

pH-range	1…12
Temperature	0…60 °C
Max. pressure	3.0 bar
Min. conductivity	150 µS/cm
Electrolyte	Gel containing potassium chloride
Diaphragm	Ceramic
Sensor shaft	Polycarbonate
Shaft diameter	12 mm
Installation length	120 ±3 mm
Fitting position	Vertical to horizontal
Thread	PG 13.5
Electrical Connection	SN6 plug-in head, rotatable with a ProMinent cable
Enclosure rating	IP 65
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Swimming pools, potable water, aquaria. Horizontal installation possible.
Resistance to	Disinfectant
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm, separate temperature measurement for temperature compensation needed

	Order no.
PHEK-L 112 SE	1034918

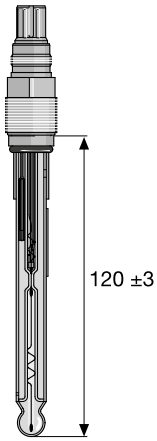
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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 cable 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)



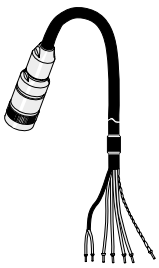
Technical Data

pH-range	1…12
Temperature	0…80 °C
Max. pressure	6.0 bar
Min. conductivity	150 µS/cm
Electrolyte	Gel containing potassium chloride
Diaphragm	Ceramic
Sensor shaft	Glass
Shaft diameter	15 mm
Installation length	120 ±3 mm
Fitting position	Vertical up to +25°
Thread	PG 13.5
Electrical Connection	VARIO Pin plug-in head
Enclosure rating	IP 67
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, SlimFLEX 5a, AEGIS S
Typical applications	Drinking water, clear process water, process water with temperature change
Resistance to	Disinfectant
Measuring principle, technology	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.



	Length	Order no.
VARIO Pin signal lead VP 6-ST/ 2 m	2 m	1004694
VARIO Pin signal lead VP 6-ST/ 2 m	5 m	1004695
VARIO Pin signal lead VP 6-ST/ 2 m	10 m	1004696

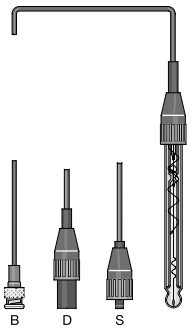
1.3.3 pH Sensors with Fixed Cable

pH sensors with fixed cable contain a shielded coaxial cable, which is firmly connected to the sensor head. A rotatable threaded sleeve on the sensor head prevents the cable from twisting when inserting and removing the sensor.

The technical data corresponds to pH sensors with SN6 plug-in head (see page → 78)

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

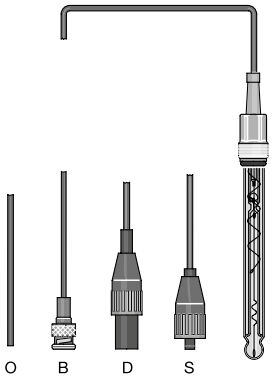
- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for use in swimming pools and for potable water
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ('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)

	Cable thickness mm	Lead length m	Device plug	Order no.
PHES 112 F 301 S	3	1	SN6	304976
PHES 112 F 301 B	3	1	BNC	304980
PHES 112 F 303 B	3	3	BNC	304981

Further types on request.

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

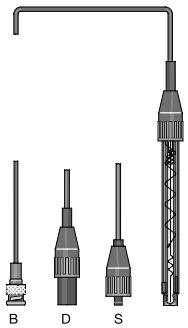
- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for use in swimming pools and for drinking water
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ('bleeding') of the electrolyte
- Long service life due to the material, which is inert to aggressive disinfectants
- Stable reference system
- Rotatable threaded sleeve on the sensor head 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 thickness mm	Lead length m	Device plug	Order no.
PHES 112 FE 301 S	3	1	SN6	150926
PHES 112 FE 303 S	3	3	SN6	304984
PHES 112 FE 310 S	3	10	SN6	304985
PHES 112 FE 301 B	3	1	BNC	150079
PHES 112 FE 303 B	3	3	BNC	304988
PHES 112 FE 503 D	5	3	DIN	304986
PHES 112 FE 303 O	3	3	none	150101
PHES 112 FE 310 O	3	10	none	304990

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

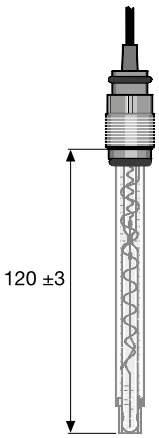
- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for use in swimming pools and for potable water
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- With plastic shaft to prevent glass breakage
- 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)

	Cable thickness mm	Lead length m	Device plug	Order no.
PHEK 112 F 301 B	3	1	BNC	304996
PHEK 112 F 501 D	5	1	DIN	304995

Further types on request.

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 drinking 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
- Rotatable threaded sleeve on the sensor head 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)

pH sensor with polycarbonate plastic shaft, glass diaphragm protection, with fixed coaxial cable and device plug, without screw-in thread.

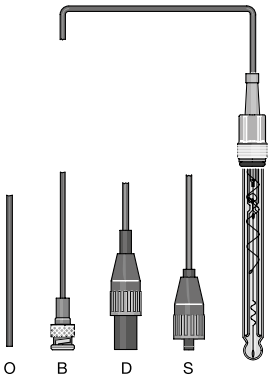
	Cable thickness mm	Lead length m	Device plug	Order no.
PHEK 112 FE 303 B	3	3	BNC	1028458

Further types on request.

1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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

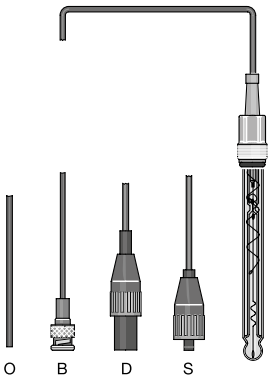
- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for exacting process requirements
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ('bleeding') of 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 thickness mm	Lead length m	Device plug	Order no.
PHEP 112 FE 303 S	3	3	SN6	150673
PHEP 112 FE 301 B	3	1	BNC	150557
PHEP 112 FE 303 B	3	3	BNC	150676
PHEP 112 FE 305 O	3	5	none	150689
PHEP 112 FE 510 O	5	10	none	150929

Further types on request.

pH Sensor PHER 112 FE

pH sensor optimised for use in contaminated water containing solids and for low conductivity of > 50 µS/cm at up to 80 °C/6 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)

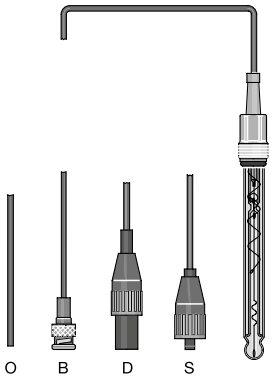
	Cable thickness mm	Lead length m	Device plug	Order no.
PHER 112 FE 301 B	3	1	BNC	150690
PHER 112 FE 302 O	3	2	none	150163
PHER 112 FE 505 O	5	5	none	150873
PHER 112 FE 510 O	5	10	none	150874
PHER 112 FE 510 S IP68	5	10	SN6	1112930
PHER 112 FE 510 O IP68	5	10	none	1112996

Further types on request.

1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

PH sensor PHER-DJ 112 SE

pH sensor with double diaphragm (double junction) optimised for use in contaminated water containing solids and for low conductivity of > 10 µS/cm at up to 80 °C/6 bar.



Your Benefits

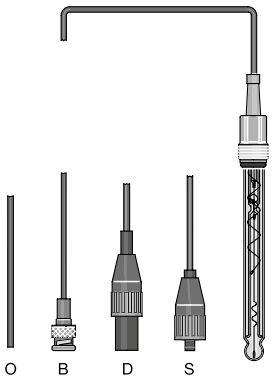
- Electrochemical combination electrode: pH and reference electrode integrated
- The large dirt-repellent Teflon® diaphragm prevents the reference system from becoming blocked up
- Long service life when solids are present
- High-viscosity electrolyte combined with a salt reservoir prevents the electrolyte 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)

	Cable thickness mm	Lead length m	Device plug	Order no.
PHER-DJ 112 FE 510 S IP68	5	10	SN6	1113190
PHER-DJ 112 FE 510 O IP68	5	10	none	1113189

Further types on request.

pH sensor PHEF-DJ 112 FE

pH sensor optimised for acid water containing fluoride at up to 60 °C/8 bar



Your Benefits

- Electrochemical combination electrode: pH and reference electrode integrated
- Precise and reliable pH measurement in water containing fluoride with low pH values
- Large dirt-repellent Teflon® diaphragms prevent the reference system from becoming blocked up
- High-viscosity electrolyte combined with a salt reservoir prevents the electrolyte from 'bleeding'
- 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)

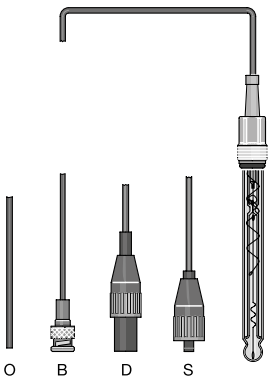
	Cable thickness mm	Lead length m	Device plug	Order no.
PHEF-DJ 112 FE 505 S IP68	5	5	SN6	1121511
PHEF-DJ 112 FE 510 S IP68	5	10	SN6	1121479
PHEF-DJ 112 FE 505 O IP68	5	5	none	1121510
PHEF-DJ 112 FE 510 O IP68	5	10	none	1121512

Further types on request.

1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

pH Sensor PHEX 112 FE

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

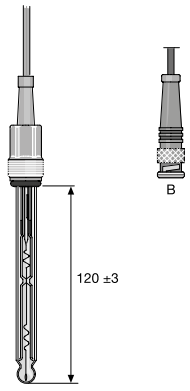
- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for extremely high solids content
- The solid electrolyte makes the diaphragm redundant and prevents the reference system from becoming blocked up
- Long service life when sludge is present due to lack of a diaphragm
- Long service life as the solid electrolyte prevents the electrolyte from 'bleeding'
- Stable reference system
- 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 thickness mm	Lead length m	Device plug	Order no.
PHEX 112 FE 310 S	3	10	SN6	150023
PHEX 112 FE 510 S	5	10	SN6	150025
PHEX 112 FE 510 S IP68	5	10	SN6	1112998
PHEX 112 FE 510 O	5	10	none	150084
PHEX 112 FE 510 O IP68	5	10	none	1112997

Further types on request.

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

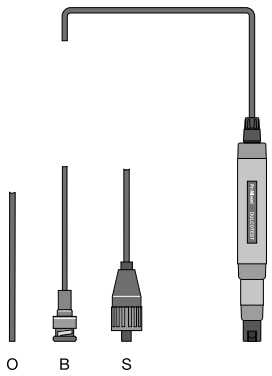
- Electrochemical combination electrode: pH and reference electrode integrated
- Diaphragm and reference system optimised for use in chemically contaminated but clear water
- Double junction: two coupled ceramic diaphragms protect the reference system
- Long service life when chemical pollutants are 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 thickness mm	Lead length m	Device plug	Order no.
PHED 112 FE 303 B	3	3	BNC	741038
PHED 112 FE 301 B	3	1	BNC	741037
PHED 112 FE 302 O	3	2	none	1032717

Further types on request.

pH sensor PHEI 112 FE

Reliable online measurement of pH values in industrial wastewater/water - with DULCOTEST sensors



Your Benefits

- Solid high-grade plastic housing with integrated process connection for direct installation in the process with ½" and ¾" NPT thread
- Large dirt-repellent Teflon diaphragm protects against unwanted blocking of the reference
- Double junction reference system for stability with chemically polluted water
- Large electrolyte reservoir for long service lives

Important information:

	Cable thickness mm	Lead length m	Device plug	Order no.
PHEI 112 FE 510 S	5	10	SN6	1094723
PHEI 112 FE 505 O	5	5	none	1094720
PHEI 112 FE 510 O	5	10	none	1094722

1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

1.3.4 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 rotatable threaded sleeve on the sensor head prevents the cable from twisting when inserting and removing the sensor. The cable can therefore remain connected. This avoids moisture from contacting the plug-in contacts.

Selection guide for ORP sensors DULCOTEST, see page → 9

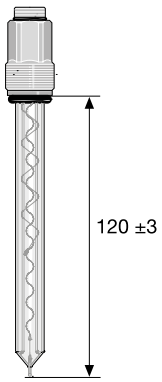
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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 cable 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)



Technical Data

Temperature	0…60 °C
Max. pressure	3.0 bar
Min. conductivity	150 µS/cm
Electrolyte	Gel containing potassium chloride
ORP electrode	Platinum
Diaphragm	Ceramic
Sensor shaft	Glass
Shaft diameter	12 mm
Installation length	100 ±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
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Swimming pools, whirlpools, potable water
Resistance to	Disinfectant
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm

	Installation length	Order no.
RHES-Pt-SE SLg100	100 ±3 mm	1051746
RHES-Pt-SE	120 ±3 mm	150703

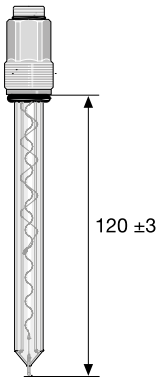
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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 caused by products from those 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 thanks to material, which is inert to aggressive disinfectants
- Stable reference system
- Rotating sensor head sleeve. This means that the cable 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)



Technical Data

Temperature	0…60 °C
Max. pressure	3.0 bar
Min. conductivity	150 µS/cm
Electrolyte	Gel containing potassium chloride
ORP electrode	Gold
Diaphragm	Ceramic
Sensor shaft	Glass
Shaft diameter	12 mm
Installation 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
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, SlimFLEX 5a, AEGIS S
Typical applications	Swimming pools, whirlpools, drinking water with disinfection using inline electrolysis (tubular cell electrolysis)
Resistance to	Disinfectant, by-products from electrolysis process and from ozone treatment process
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm

	Installation length	Order no.
RHES-Au-SE	120 ±3 mm	1044544
RHES-AU-SE Slg 100	100 ±3 mm	1092570

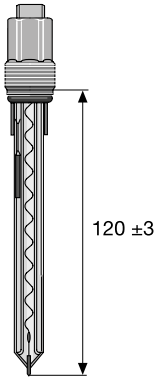
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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 thanks to material, which is inert to aggressive chemicals
- Stable reference system for high pressure/temperature requirements
- Rotating sensor head sleeve. This means that the cable 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)



Technical Data

Temperature	0…80 °C
Max. pressure	6.0 bar
Min. conductivity	150 µS/cm
Electrolyte	Gel containing potassium chloride
ORP electrode	Platinum
Diaphragm	Ceramic
Sensor shaft	Glass
Shaft diameter	15 mm
Installation 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
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Drinking water, clear process water
Resistance to	Disinfectant, not suitable for media containing ozone, cyanides, electrolysis processes (electrodes directly in the sample water)
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm

	Installation length	Order no.
RHEP-Pt-SE	120 ±3 mm	150094
RHEP-PT -SE SLG100	100 ±3 mm	150952

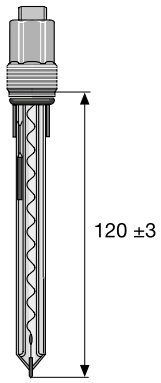
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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 caused by products from those 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 cable 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)



Technical Data

Temperature	0…80 °C
Max. pressure	6.0 bar
Min. conductivity	150 µS/cm
Electrolyte	Gel containing potassium chloride
ORP electrode	Gold
Diaphragm	Ceramic
Sensor shaft	Glass
Shaft diameter	15 mm
Installation 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
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, SlimFLEX 5a, AEGIS S
Typical applications	Clear process water, disinfection using inline electrolysis (tubular cell electrolysis), cyanide detoxification, ozone monitoring.
Resistance to	Disinfectant, by-products from electrolysis process and from ozone treatment process, cyanides
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm

	Installation length	Order no.
RHEP-Au-SE	120 ±3 mm	1003875

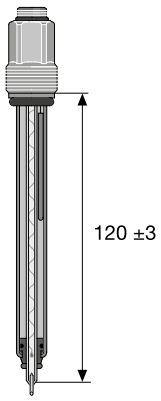
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

ORP Sensor RHER-Pt-SE

ORP sensor optimised for use in contaminated water containing solids and for low conductivity of > 50 µS/cm at up to 80 °C/6 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)



Technical Data

Temperature	0…80 °C
Max. pressure	6.0 bar
Min. conductivity	50 µS/cm
Electrolyte	KCl containing polymer with KCl reservoir
ORP electrode	Platinum
Diaphragm	PTFE ring diaphragm
Sensor shaft	Glass
Shaft diameter	12 mm
Installation length	120 ±3 mm
Fitting position	Vertical up to +25°
Thread	PG 13.5
Electrical Connection	SN6 plug-in head/other versions on request
Enclosure rating	IP 65
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Municipal and industrial waste water, cooling water, process water: containing moderate amounts of solids without high levels of chemical contamination
Resistance to	Disinfectant, solids content (turbid types of water)
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, Teflon ring diaphragm, polymer electrolyte

	Installation length	Order no.
RHER-Pt-SE	120 ±3 mm	1002534

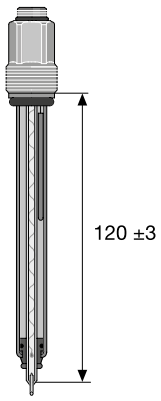
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

ORP sensor RHER-DJ-Pt-SE

✓ ORP sensor optimised for use in contaminated water containing solids and for low conductivity of > 10 µS/cm at up to 80 °C/6 bar

The benefits for you

- 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 cable 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)



Technical Data

Temperature	0…80 °C
Max. pressure	6.0 bar
Min. conductivity	10 µS/cm
Electrolyte	KCl containing polymer with KCl reservoir
ORP electrode	Platinum
Diaphragm	2 x PTFE ring diaphragm, double junction
Sensor shaft	Glass
Shaft diameter	12 mm
Installation length	120 ±3 mm
Fitting position	Vertical up to +25°
Thread	PG 13.5
Electrical Connection	SN6 plug-in head/other versions on request
Enclosure rating	IP 65
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Municipal and industrial waste water, cooling water, process water: contaminated with solids and chemicals, reverse osmosis (conductivity ≥ 10 µS/cm), acid and alkaline gas scrubbers (without fluoride, HF), water with low conductivity
Resistance to	Disinfectant, solids content (turbid types of water)
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, Teflon ring diaphragm, polymer electrolyte

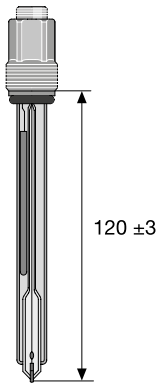
	Installation length	Order no.
RHER-DJ-Pt-SE	120 ±3 mm	1112882

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 cable 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)



Technical Data

Temperature	0…100 °C
Max. pressure	16.0 bar (25 °C), 6.0 bar (100 °C)
Min. conductivity	500 µS/cm
Electrolyte	Polymer containing potassium chloride (solid)
ORP electrode	Platinum
Diaphragm	Circular gap (solid electrolyte)
Sensor shaft	Glass
Shaft diameter	12 mm
Installation length	120 ±3 mm
Fitting position	Vertical up to +25°
Thread	PG 13.5
Electrical Connection	SN6 plug-in head/other versions on request
Enclosure rating	IP 65
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Waste water, process water: high solids content, no chemical contamination. Suspensions, sludge, emulsions. Not suitable in clear waters, not suitable for media with oxidation agents.
Resistance to	Solids content (turbid types of water), sludge, emulsions
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, no diaphragm, polymer electrolyte

	Installation length	Order no.
RHEX-Pt-SE	120 ±3 mm	305097

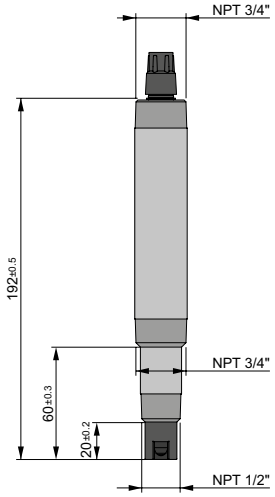
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

ORP Sensor RHEIC-Pt-SE

ORP sensor optimised for use in industrial wastewater/water – with DULCOTEST sensors.

Your Benefits

- Mechanically resistant platinum dome permits lengthy use even when exposed to abrasive particles
- Large dirt-repellent Teflon diaphragm protects against unwanted blockage of the reference
- Double junction reference system for stability with chemically polluted water
- Large electrolyte reservoir for long service lives
- Solid high-grade plastic housing with integrated process connection for direct installation in the process with ½" and ¾" NPT thread



Technical Data

Temperature	0…80 °C
Max. pressure	6.0 bar
Min. conductivity	50 µS/cm
Electrolyte	Gel containing potassium chloride with a large KCl reservoir of gel
ORP electrode	Platinum
Diaphragm	PTFE ring diaphragm
Sensor shaft	Plastic
Shaft diameter	17 ±0.2 mm (below the ½" NPT thread), 22 ±0.2 mm (below the ¾" thread)
Installation length	20 ±0.2 mm (from the lower end of the ½" thread), 60 ±0.2 mm (from the lower end of the ¾" thread)
Fitting position	Vertical up to +25°
Thread	½" and ¾" NPT thread
Electrical Connection	SN6 plug-in head, rotatable with a ProMinent cable
Enclosure rating	IP 65
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Municipal and industrial waste water, cooling water, process water: contaminated with solids and chemicals
Resistance to	Disinfectant, solids content (turbid water), water-soluble chemicals
Measuring principle, technology	direct potentiometric measurement, 2 probes, double junction, gel electrolyte, large Teflon diaphragm, separate temperature measurement for temperature compensation needed

	Order no.
RHEIC-Pt-SE	1082281

Accessories

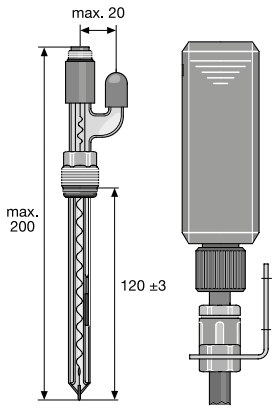
	Order no.
Adapter M34/PG13.5	1077156

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)



Technical Data

Temperature	0…80 °C
Max. pressure	Operation at atmospheric pressure
Min. conductivity	150 µS/cm
Electrolyte	KCL electrolyte, refillable
ORP electrode	Platinum
Diaphragm	Ceramic
Sensor shaft	Glass
Shaft diameter	12 mm
Installation length	120 ±3 mm
Fitting position	Vertical up to +25°
Thread	PG 13.5
Electrical Connection	SN6 plug-in head/other versions on request
Enclosure rating	IP 65
Process integration	By tripod or manually
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, SlimFLEX 5a, AEGIS S
Typical applications	Process water, cooling water, waste water: chemically contaminated, clear
Resistance to	Disinfectant, chemicals dissolved in water
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, liquid electrolyte, 1 ceramic diaphragm

	Installation length	Order no.
RHEN-Pt-SE	120 ±3 mm	305091

Delivered without PE storage tank and hose

Accessories

	Capacity ml	Order no.
PE storage tank with connectors and tube	-	305058
KCl solution, 3 molar	250 ml	791440
KCl solution, 3 molar	1,000 ml	791441

For the PE storage tank, we recommend fitting approx. 0.5 - 1 m above the level of the measurement medium.

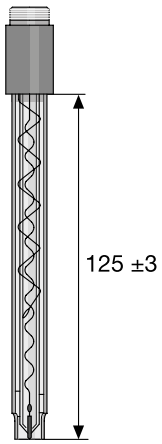
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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)



Technical Data

Temperature	0…60 °C
Max. pressure	Operation at atmospheric pressure
Min. conductivity	150 µS/cm
Electrolyte	Gel containing potassium chloride
ORP electrode	Platinum
Diaphragm	Ceramic
Sensor shaft	Polycarbonate
Shaft diameter	12 mm
Installation length	125 ±3 mm
Fitting position	Vertical up to +25°
Thread	none
Electrical Connection	SN6 plug-in head, rotatable with a ProMinent cable
Enclosure rating	IP 65
Process integration	By tripod or manually
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Manual measurement e.g. swimming pools, potable water, aquarium water
Resistance to	Disinfectant
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm

	Installation length	Order no.
RHEK-Pt-S	125 ±3 mm	305052

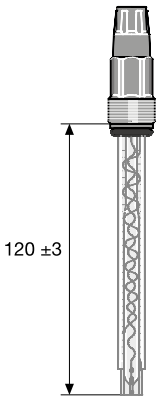
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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 cable 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)



Technical Data

Temperature	0…60 °C
Max. pressure	3.0 bar
Min. conductivity	150 µS/cm
Electrolyte	Gel containing potassium chloride
ORP electrode	Platinum
Diaphragm	Ceramic
Sensor shaft	Polycarbonate
Shaft diameter	12 mm
Installation 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
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Swimming pool, potable water, aquariums
Resistance to	Disinfectant
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm

	Installation length	Order no.
RHEK-Pt-SE	120 ±3 mm	1028459

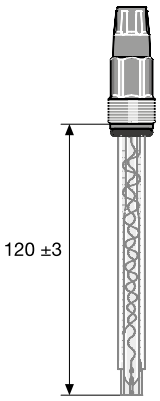
1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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 cable 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



Technical Data

Temperature	0…60 °C
Max. pressure	3.0 bar
Min. conductivity	150 µS/cm
Electrolyte	Gel containing potassium chloride
ORP electrode	Platinum
Diaphragm	Ceramic
Sensor shaft	Polycarbonate
Shaft diameter	12 mm
Installation length	120 ±3 mm
Fitting position	Vertical to horizontal
Thread	PG 13.5
Electrical Connection	SN6 plug-in head, rotatable with a ProMinent cable
Enclosure rating	IP 65
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, Compact, DMTa, DULCOMARIN 3, DULCOPOOL Pro, DULCOPOOL, AEGIS II, Slim-FLEX 5a, AEGIS S
Typical applications	Swimming pools, potable water, aquariums, horizontal installation possible
Resistance to	Disinfectant
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm

	Installation length	Order no.
RHEK-L Pt-SE	120 ±3 mm	1034919

1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

1.3.5 ORP Sensors with Fixed Cable

ORP sensors with fixed cable contain a shielded coaxial cable, which is firmly connected to the sensor head. A rotatable threaded sleeve prevents the cable from twisting when inserting and removing the sensor.

The technical data for the sensors is similar to the respective sensor with plug-in head SN6

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

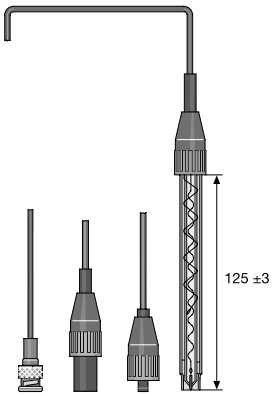
- Electrochemical combination electrode: ORP and reference electrode integrated
- Diaphragm and reference system optimised for use in swimming pools
- Ceramic diaphragm with special material, optimised size and optimised pore diameter
- Long service life due to reduced diffusion ('bleeding') of the electrolyte
- 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 thickness mm	Lead length m	Device plug	Order no.
RHES-Pt-FE 303 S	3	3	SN6	304949
RHES-Pt-FE 301 B	3	1	BNC	150758
RHES-Pt-FE 303 B	3	3	BNC	150038

Further types on request.

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. Without threaded sleeve on the sensor head



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 thickness mm	Lead length m	Device plug	Order no.
RHES-Pt-F 303 B	3	3	BNC	304983

Further types on request.

1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

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

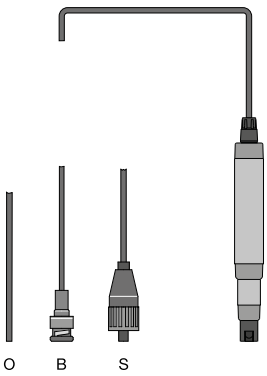
Your Benefits

- 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 thickness mm	Lead length m	Device plug	Order no.
RHEK-Pt-F 301 S	3	1	SN6	304997
RHEK-Pt-F 301 B	3	1	BNC	150953
RHEK-Pt-F 501 D	5	1	DIN	304998

Further types on request.

ORP sensor RHEIC-Pt-FE



Your Benefits

- Mechanically resistant platinum dome permits lasting use even when exposed to abrasive particles
- Large dirt-repellent Teflon diaphragm protects against unwanted blockage of the reference
- Double junction reference system for stability with chemically polluted water
- Large electrolyte reservoir for long service lives
- Solid high-grade plastic housing with integrated process connection for direct installation in the process with ½" and ¾" NPT thread

	Cable thickness mm	Lead length m	Device plug	Order no.
RHEIC-PT-FE 510 S	5	10	SN6	1096793
RHEIC-PT-FE 505 O	5	5	none	1096775
RHEIC-PT-FE 510 O	5	10	none	1096784

Further types on request.

1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

1.3.6 DULCOTEST Sensors for Fluoride

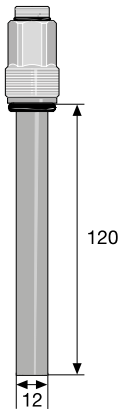
DULCOTEST fluoride sensors are ion-selective sensors, which function according to the potentiometric measuring principle and are suitable for determining the concentration of fluoride anions in aqueous solutions. The measuring point with the FPV1 type measuring transducer was optimised for use in monitoring 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 wastewater free of solid material.

Fluoride Sensor FLEP 010-SE / FLEP 0100-SE

✓ Highly selective, online fluoride sensor, for the fluoridation of potable water and monitoring of industrial wastewater in the semiconductor industry and electroplating with a pH of up to 9.5

Your Benefits

- Highly selective measurement of fluoride by 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 wastewater. Higher measuring ranges on request



Technical Data

Measured variable	Fluoride ion concentration
Reference method	Photometrically
Measuring range	**With transmitter FPV1:** 0.05...10 mg/l **With transmitter FP100V1:** 0.5...100 mg/l
pH-range	5.5…9.5
Temperature	1…35 °C
Max. pressure	7.0 bar (no pressure surges)
Min. conductivity	100 µS/cm
Shaft diameter	12.0 mm
Installation length	120 mm
Thread	PG 13.5
Electrical Connection	SN6 plug-in head
Enclosure rating	IP 65
Process integration	Bypass: Open outlet or return of the sample water to the process line, tank, channel: Immersion in the immersion tube
Flow	10…200 l/h
Intake flow (recommended)	20 l/h
Response time T95 (open)	30 s (for conc. > 0.5 ppm)
Shelf life	6 months
Sensor fitting	Bypass fitting DLG IV
Controllers	diaLog C, diaLog DACb, D1Cb/D1Cc, DULCOMARIN 3
Typical applications	Monitoring the fluoridation of potable water in waterworks, industrial wastewater in the semiconductor industry and electroplating.
Resistance to	Disinfectant, solids content (turbid types of water)
Measuring principle, technology	Direct potentiometric measurement, 2 electrodes, gel electrolyte, ceramic diaphragm, separate temperature measurement needed for temperature compensation. Low pH values of < 5 reduce the concentration of free fluoride ions by forming undissociated hydrofluoric acid (HF). High pH values > 9.5 influence the signal and the slope at concentrations in the lower ppm range. The calibration line flattens off there (gentler slope) and the fluoride sensor is outside its linear range.

	Order no.
FLEP 010-SE / FLEP 0100-SE	1028279

Notes: A 4-20 mA transmitter, a reference electrode and sensor for temperature compensation are needed in addition to the fluoride electrode. Measuring ranges from 5 … 1,000 mg/l and 50 … 10,000 mg/l available on request.

1.3 Sensors DULCOTEST for pH, ORP, Fluoride and Temperature

Accessories

	Order no.
Measuring transducer 4-20 mA FPV1	1028280
Measuring transducer 4-20 mA FP 100 V1	1031331
Two-wire measuring line 2 x 0.25 mm² Sold by the meter, 4 mm diameter	725122
Reference electrode REFP-SE	1018458
Reference electrode REFR-DJ-SE	1083790
Pt 100-SE temperature sensor	305063
Polishing paste	559810

Panel-mounted fluoride measuring station

The panel-mounted measuring points that could previously be ordered with order numbers 1010602 (230 V) and 1010603 (115 V) can now be ordered as measuring points of the DULCOTROL DWCa product line.

Overview of DULCOTROL DWCa_P Potable Water/ F&B, see page → 255

DULCOTEST Temperature Sensors

✓ Temperature measurement with DULCOTEST sensors: Can be used for direct temperature measurement or temperature compensation during measurement of pH, fluoride, conductivity, chlorine dioxide or hydrogen peroxide.

Your Benefits

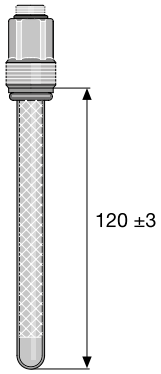
- Select Pt 100 or Pt 1000, depending on measuring range and accuracy required.
- Sturdy design with dimensions of a standard pH sensor; the sensor element is integrated in a chemically inert glass sleeve.
- Easily installed in a similar way to standard pH sensors with a PG 13.5 thread in existing fittings.
- 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).

Technical Details

- Type Pt 100: for wide range measurements and with the controllers D1C, DAC and DULCOMARIN 3
- Type Pt 1000: for high resolution with transmitter DMT and controllers DAC and DULCOMARIN 3

Field of Application

- Temperature measurement is universally used either to directly measure the temperature or for temperature compensation.



Technical Data

Temperature	0…100 °C
Max. pressure	10.0 bar
Thread	PG 13.5
Electrical Connection	SN6
Typical applications	Temperature measurement and pH temperature correction.

	Order no.
Pt 100-SE temperature sensor	305063
Pt 1000-SE temperature sensor	1002856

1.4 DULCOTEST Sensors for Conductivity

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 availability of the measured information.
- Completely pre-assembled sets containing fittings and sensors for simple, fast and trouble-free installation.

Note the following points for optimum operation 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

Conductivity > 20 mS/cm and/or film-forming medium and/or chemically aggressive medium

Yes ↓

Inductive conductivity measurement

↓

Compact controller can be used in the application?

Yes ↓

Do the following conditions exist?
Aggressive chemicals,
with the exception of lyes and/or
temperatures > 80 °C and/or
measured value < 200 µS/cm

Yes ↓

Series ICT 2
Installation in pipes with stainless steel flange accessory

For immersion with accessory: immersion fitting IMA - ICT 2

↓ No

Type ICT 5
for installation in pipes

Type ICT 5-IMA
for immersion

↓ No

Type ICT 8
for installation in pipes
with adapter accessory,
for immersion with
immersion fitting accessory

↓ No

Conductive conductivity measurement

↓

Further selection according to summary table:

- **Measuring range**
- **Material (chemical compatibility)**
- **Temperature**
- **Hydraulic process connection**
- **Electrical connection**
- **Compatibility of measuring and control units**

↓

Product ranges LF, LMP, CK, CCT

1.4 DULCOTEST Sensors for Conductivity

Overview Table for Conductivity Sensors

Sensor type	Measuring range	Cell constant	Medium temperature max. °C	Max. pressure bar	Sensor shaft	Temperature compensation	Process integration	Electrical Connection	Controllers
LMP 001	0.01…50 µS/cm	0.01 cm^{-1} ±5 %	70	16.0	PP	Pt 100	Flow, 3/4" male thread Bypass: Fitting BAMa	DIN 4-pin angle plug	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
LMP 001-HT	0.01…50 µS/cm	0.01 cm^{-1} ±5 %	120	16.0	PVDF	Pt 100	Flow, 3/4" male thread Bypass: Fitting BAMa	DIN 4-pin angle plug	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
LMP 01	0.1…500 µS/cm	0.10 cm^{-1} ±5 %	70	16.0	PP	Pt 100	Flow, 3/4" male thread Bypass: Fitting BAMa	DIN 4-pin angle plug	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
LMP 01-TA	0.1…500 µS/cm	0.10 cm^{-1} ±5 %	70	16.0	PP	Pt 100	Sensor in immersion fitting, 1m integrated	5 m fixed cable	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
LMP 01-HT	0.1…500 µS/cm	0.10 cm^{-1} ±5 %	120	16.0	PVDF	Pt 100	Flow, 3/4" male thread Bypass: Fitting BAMa	DIN 4-pin angle plug	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
LFT 1 FE	0.01…20 mS/cm	1.00 cm^{-1} ±5 %	80	16.0	Epoxy	Pt 100	PG13.5 male thread Flow via adapter Bypass: Fittings BAMa, DGMa, DLG III	5 m fixed cable (4 x 0.5 mm^2)	DMTa, DULCOMARIN 3, AEGIS S
LFTK 1 FE-5m-shd	0.01…20 mS/cm	1.00 cm^{-1} ±5 %	80	16.0	Epoxy	Pt 1000	PG 13.5 male thread Flow via adapter Bypass: Fittings BAMa, DGMa, DLG III	5 m fixed cable (4 x 0.25 mm^2), screened	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
LFTK 1 FE-3m-shd	0.01…20 mS/cm	1.00 cm^{-1} ±5 %	80	16.0	Epoxy	Pt 1000	PG 13.5 male thread Flow via adapter Bypass: Fittings BAMa, DGMa, DLG III	3 m fixed cable (4 x 0.25 mm^2), screened	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
LFT 1 DE	0.01…20 mS/cm	1.00 cm^{-1} ±5 %	80	16.0	Epoxy	Pt 100	PG 13.5 male thread Flow via adapter Bypass: Fittings BAMa, DGMa, DLG III	DIN 4-pin angle plug	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S

1.4 DULCOTEST Sensors for Conductivity

Sensor type	Measuring range	Cell constant	Medium temperature max. °C	Max. pressure bar	Sensor shaft	Temperature compensation	Process integration	Electrical Connection	Controllers
LFTK 1 DE	0.01…20 mS/cm	1.00 cm^{-1} ±5 %	80	16.0	Epoxy	Pt 1000	PG 13.5 male thread Flow via adapter Bypass: Fittings BAMa, DGMa, DLG III	DIN 4-pin angle plug	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
LFT 1 1/2"	0.01…20 mS/cm	1.00 cm^{-1} ±5 %	80	16.0	Epoxy	Pt 100	G1/2” male thread Flow via adapter Bypass: Fittings BAMa, DGMa, DLG III	DIN 4-pin angle plug	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
LFTK 1 1/2"	0.01…20 mS/cm	1.00 cm^{-1} ±5 %	80	16.0	Epoxy	Pt 1000	G1/2” male thread Flow via adapter Bypass: Fittings BAMa, DGMa, DLG III	DIN 4-pin angle plug	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
CK 1	0.01…20 mS/cm	1.00 cm^{-1} ±5 %	150	16.0	PES	None, only for applications with constant temperature	Flow: R 1" male thread	DIN 4-pin angle plug	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
CKPt 1	0.01…20 mS/cm	1.00 cm^{-1} ±5 %	150	16.0	PES	Pt 100	Flow: R 1" male thread	DIN 4-pin angle plug	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
LM 1	0.1…20 mS/cm	1.00 cm^{-1} ±5 %	70	16.0	PP	-	Flow: G 3/4" male thread Bypass: Fitting BAMa	DIN 4-pin angle plug	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
LM 1-TA	0.1…20 mS/cm	1.00 cm^{-1} ±5 %	70	16.0	PP	-	Sensor in immersion fitting, 1m integrated	5 m fixed cable, screened	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
LMP 1	0.1…20 mS/cm	1.00 cm^{-1} ±5 %	70	16.0	PP	Pt 100	Flow: G 3/4" male thread Bypass: Fitting BAMa	DIN 4-pin angle plug	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
LMP 1-TA	0.1…20 mS/cm	1.00 cm^{-1} ±5 %	70	16.0	PP	Pt 100	Sensor in immersion fitting, 1m integrated	5 m fixed cable, screened	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S

1.4 DULCOTEST Sensors for Conductivity

Sensor type	Measuring range	Cell constant	Medium temperature max. °C	Max. pressure bar	Sensor shaft	Temperature compensation	Process integration	Electrical Connection	Controllers
LMP 1-HT	0.1…20 mS/cm	1.00 cm^{-1} ±5 %	120	16.0	PVDF	Pt 100	Flow: G 3/4" male thread Bypass: Fitting BAMa	DIN 4-pin angle plug	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
CCT 1-mA	0.2…20 mS/cm	cm^{-1}	50	8.0	PVC	NTC	Bypass: Fittings BAMa, DGMa, DLG III Flow: Fitting INLI	4-wire cable, 0.25 mm^2, cable diameter 5.7	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOMARIN 3, AEGIS II, AEGIS S
CCT 1-mA	1…100 mS/cm	cm^{-1}	50	8.0	PVC	NTC	Bypass: Fittings BAMa, DGMa, DLG III Flow: Fitting INLI	4-wire cable, 0.25 mm^2, cable diameter 5.7	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOMARIN 3, AEGIS II, AEGIS S
CTFS	0.1…10 mS/cm	10.00 cm^{-1} ±5 %	50	7.0	PP	Semiconductor	NPT 3/4" male thread Flow via adapter Bypass: Fittings BAMa, DGMa, DLG III	3 m fixed cable, extendible to 50 m, with cable type: 0.5 mm^2 or AWG 22.	diaLog X, AEGIS II, SlimFLEX 5a, AEGIS S
ICT 5	0.2…2,000 mS/cm	6.25 cm^{-1} ±5 %	80	10.0	PP	Pt 1000	Flow DN 40	10 m fixed cable, 7x 0.35 mm^2 via a terminal	Compact
ICT 5-IMA	0.2…2,000 mS/cm	6.25 cm^{-1} ±5 %	60	0.0	PP	Pt 1000	Immersion, sensor integrated in 1 m immersion fitting	10 m fixed cable, 7x 0.35 mm^2 via a terminal	Compact
ICT 2	0.02…2,000 mS/cm	1.98 cm^{-1}	125	16.0	PFA	Pt 100, class A, completely extrusion-coated	G 3/4" male thread for - flow via flange - immersion: on immersion pipe, 1m (accessories)	5 m fixed cable, 6x 0.35 mm^2 via a terminal	Compact
ICT 8-mA	0.2…200 mS/cm	cm^{-1}	50	6	PP	Semiconductor	1/2" BSP male thread for flow: on PVC pipes DN50 immersion: on immersion pipe, 1m	-	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOMARIN 3, AEGIS II

General information:

1 The transducer DMTa is provided to convert the measurement signal into a temperature-compensated 4-20 mA signal.

2 Terminal assignment for the DIN 4-pin angle plug:

- Electrodes: Earth and 2
- Pt 100/1000: 1 and 3

3 With DIN-4-pin angle plugs, the cable must be screened if the sensor is connected to measuring instrument types DCCa, DMTa, DACa, AEGIS II or diaLog X.

4 An adapter set PG 13.5/1" (order no. 1002190) is needed for installation in the in-line probe housing type DLG III (1" hole).

5 Sensor adapters PG13.5 (1113802), G 3/4" (1113801), G1"(1113803), NPT 3/4"(1080293) are needed for installation in the bypass armature type BAMa.

Measuring line for conductive conductivity sensors, see page → 137

1.4 DULCOTEST Sensors for Conductivity

1.4.2 2-Electrode Conductivity Sensors

Conductive conductivity sensors measure the electrolytic conductivity indirectly via the charge transfer between two probes immersed in the medium to be measured. The sensor types with cell constants k = 0.01 and k = 0.1 cm^{-1} are especially suitable for measuring the lowest electrolytic conductivities of < 1 µS/cm in pure and ultra-pure water.

The sensor types with cell constants k=1 cm^{-1} are used in numerous kinds of water without film-forming components up to 20 mS/cm. The cost-effective sensor range LF(T) is used in clear, chemically uncontaminated water.

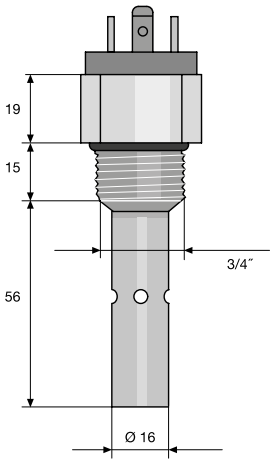
The sensor ranges LM(P), CK and CKPt can also be used in chemically contaminated kinds of water and at higher temperatures.

Conductivity Sensor LMP 001

✓ Sensor for 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 DCCa, DACb, DMTa, D1Ca

Your Benefits

- Measured variable: electrolytic conductivity above 0.01 µS/cm
- Cost-effective sensor for clear, chemically contaminated water
- Integrated Pt 100 for temperature compensation replaces separate temperature sensor and the corresponding sensor fitting



Technical Data

Measuring range	0.01…50 µS/cm
Cell constant	0.01 cm^{-1} ±5 %
Temperature measurement	Pt 100
Medium temperature	0 … 70 °C
Max. pressure	16.0 bar (50 °C)
Sensors	Stainless steel 1.4571
Sensor shaft	PP
Thread	3/4"
Installation length	71 mm
Process integration	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	Clean water applications, monitoring ion exchangers and reverse osmosis systems.
Resistance to	Ingredients in the water of the target application, taking into account the compatibility of the material
Controllers	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes. Integrated temperature measurement

	Order no.
LMP 001	1020508

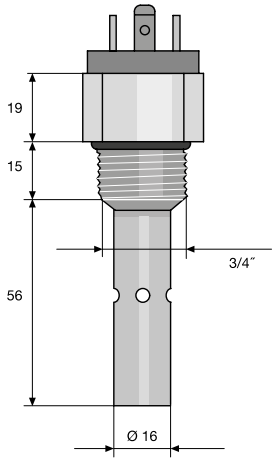
Note the general information on page → 105 (Overview table for conductivity sensors)

Conductivity Sensor LMP 001-HT

Sensor for 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 DCCa, DACb, DMTa, D1Ca

Your Benefits

- Measured variable: electrolytic conductivity above 0.01 µS/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



Technical Data

Measuring range	0.01…50 µS/cm
Cell constant	0.01 cm^{-1} ±5 %
Temperature measurement	Pt 100
Medium temperature	0 … 120 °C
Max. pressure	16.0 bar (100 °C)
Sensors	Stainless steel 1.4571
Sensor shaft	PVDF
Thread	3/4"
Installation length	71 mm
Process integration	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	General applications at higher temperatures, clean water applications, condensate.
Resistance to	Ingredients in the water of the target application, taking into account the compatibility of the material
Controllers	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes. Integrated temperature measurement

	Order no.
LMP 001-HT	1020509

Note the general information on page → 105 (Overview table for conductivity sensors)

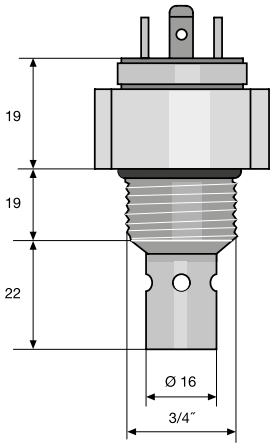
1.4 DULCOTEST Sensors for Conductivity

Conductivity Sensor LMP 01

Sensor for 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 DCCa, DACb, DMTa, D1Ca

Your Benefits

- Measured variable: electrolytic conductivity above 0.1 µS/cm
- Cost-effective sensor for clear, chemically contaminated water
- Integrated Pt 100 for temperature compensation replaces separate temperature sensor and the corresponding sensor fitting



Technical Data

Measuring range	0.1…500 µS/cm
Cell constant	0.10 cm^{-1} ±5 %
Temperature measurement	Pt 100
Medium temperature	0 … 70 °C
Max. pressure	16.0 bar (50 °C)
Sensors	Stainless steel 1.4571
Sensor shaft	PP
Thread	3/4"
Installation length	46 mm
Process integration	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	Monitoring ion exchangers, reverse osmosis systems and desalination systems.
Resistance to	Ingredients in the water of the target application, taking into account the compatibility of the material
Controllers	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes. Integrated temperature measurement

	Order no.
LMP 01	1020510

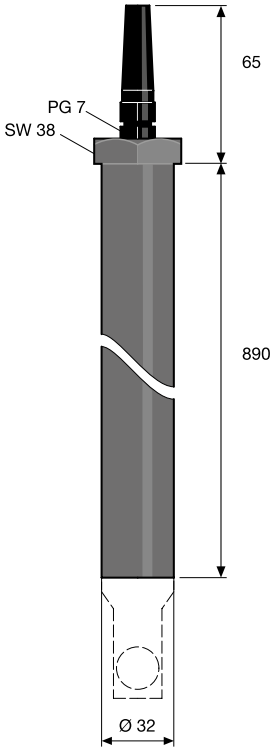
Note the general information on page → 105 (Overview table for conductivity sensors)

Conductivity Sensor LMP 01-TA

Sensor for 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 DCCa, DACb, DMTa, D1Ca

Your Benefits

- Measured variable: electrolytic conductivity above 0.1 µS/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



Technical Data

Measuring range	0.1…500 µS/cm
Cell constant	0.10 cm^{-1} ±5 %
Temperature measurement	Pt 100
Medium temperature	0 … 70 °C
Max. pressure	16.0 bar (50 °C)
Sensors	Stainless steel 1.4571
Sensor shaft	PP
Thread	M 28 x 1.5 for TA-LM in-line probe fitting
Installation length	Max. 1 m
Process integration	Immersion through an immersion tube
Electrical Connection	5 m fixed cable
Enclosure rating	IP 65
Typical applications	Monitoring ion exchangers, reverse osmosis systems and desalination systems.
Resistance to	Ingredients in the water of the target application, taking into account the compatibility of the material
Controllers	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes. Integrated temperature measurement

		Order no.
LMP 01-TA	Sensor integrated in immersion fitting	1020512
LMP 01-FE	Replacement sensor for LMP 01-TA with 5 m fixed cable	1020626

Note the general information on page → 105 (Overview table for conductivity sensors)

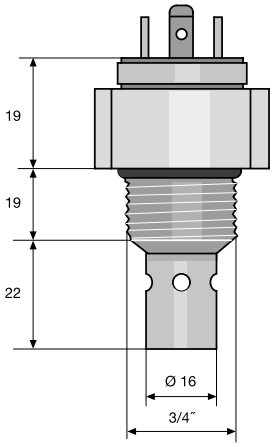
1.4 DULCOTEST Sensors for Conductivity

Conductivity Sensor LMP 01-HT

Sensor for 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, DACb, DMTa, D1Ca

Your Benefits

- Measured variable: electrolytic conductivity above 0.1 µm/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



Technical Data

Measuring range	0.1…500 µS/cm
Cell constant	0.10 cm^{-1} ±5 %
Temperature measurement	Pt 100
Medium temperature	0 … 120 °C
Max. pressure	16.0 bar (100 °C)
Sensors	Stainless steel 1.4571
Sensor shaft	PVDF
Thread	3/4"
Installation length	46 mm
Process integration	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	General applications at higher temperatures: industrial, process water, condensate.
Resistance to	Ingredients in the water of the target application, taking into account the compatibility of the material
Controllers	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes. Integrated temperature measurement

	Order no.
LMP 01-HT	1020511

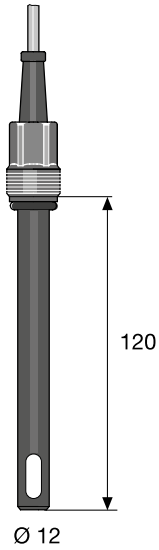
Note the general information on page → 105 (Overview table for conductivity sensors)

Conductivity Sensor LFT 1 FE

Cost-effective sensor for measurement of electrolytic conductivity in clear, uncontaminated water. With integrated temperature measurement and fixed cable connector. For operation with controllers DMTa, D1Ca

Your Benefits

- Measured variable: electrolytic conductivity above 10 µS/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
- Fixed cable on the sensor head for difficult ambient conditions



Technical Data

Measuring range	0.01…20 mS/cm
Cell constant	1.00 cm^{-1} ±5 %
Temperature measurement	Pt 100
Medium temperature	0 … 80 °C (at 1 bar)
Max. pressure	16.0 bar (25 °C)
Sensors	Special graphite
Sensor shaft	Epoxy
Thread	PG 13.5
Installation length	120 ±3 mm
Process integration	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
Electrical Connection	5 m fixed cable (4 x 0.5 mm^2)
Enclosure rating	IP 65
Typical applications	Drinking water, swimming pool water, process water. The sensors of the LF. .. series have only limited applicability for taking measurements in cleaning solutions containing surfactants and media containing solvents.
Resistance to	Unsuitable for chemically contaminated water and water containing film-forming ingredients
Controllers	DMTa, DULCOMARIN 3, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes. Integrated temperature measurement

	Order no.
LFT 1FE	1001374

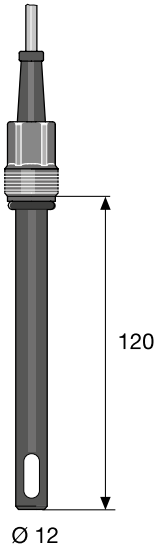
Note the general information on page → 105 (Overview table for conductivity sensors)

Conductivity Sensor LFTK 1 FE-5m-shd

Cost-effective sensor for measurement of electrolytic conductivity in clear, uncontaminated water. With integrated temperature measurement and fixed cable connector (5 m). For operation with controllers DCCa, DACb, DMTa, AEGIS II, diaLog X

Your Benefits

- Measured variable: electrolytic conductivity above 10 µS/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



Technical Data

Measuring range	0.01…20 mS/cm
Cell constant	1.00 cm^{-1} ±5 %
Temperature measurement	Pt 1000
Medium temperature	0 … 80 °C (at 1 bar)
Max. pressure	16.0 bar (25 °C)
Sensors	Special graphite
Sensor shaft	Epoxy
Thread	PG 13.5
Installation length	120 ±3 mm
Process integration	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
Electrical Connection	5 m fixed cable (4 x 0.25 mm^2), screened
Enclosure rating	IP 65
Typical applications	Drinking water, swimming pool water, process water.
Resistance to	Unsuitable for chemically contaminated water and water containing film-forming ingredients
Controllers	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes. Integrated temperature measurement

	Order no.
LFTK 1 FE-5m-shd	1046132

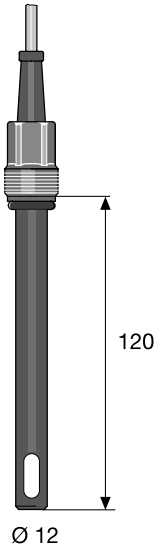
Note the general information on page → 105 (Overview table for conductivity sensors)

Conductivity Sensor LFTK 1 FE-3m-shd

Cost-effective sensor for measurement of electrolytic conductivity in clear, uncontaminated water. With integrated temperature measurement and fixed cable connector (3 m). For operation with controllers DCCa, DACb, DMTa, AEGIS II, diaLog X

Your Benefits

- Measured variable: electrolytic conductivity above 10 µS/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



Technical Data

Measuring range	0.01…20 mS/cm
Cell constant	1.00 cm^{-1} ±5 %
Temperature measurement	Pt 1000
Medium temperature	0 … 80 °C (at 1 bar)
Max. pressure	16.0 bar (25 °C)
Sensors	Special graphite
Sensor shaft	Epoxy
Thread	PG 13.5
Installation length	120 ±3 mm
Process integration	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
Electrical Connection	3 m fixed cable (4 x 0.25 mm^2), screened
Enclosure rating	IP 65
Typical applications	Drinking water, swimming pool water, process water. The sensors of the LF. .. series have only limited applicability for taking measurements in cleaning solutions containing surfactants and media containing solvents.
Resistance to	Unsuitable for chemically contaminated water and water containing film-forming ingredients
Controllers	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes. Integrated temperature measurement

	Order no.
LFTK 1 FE-3m-shd	1046010

Note the general information on page → 105 (Overview table for conductivity sensors)

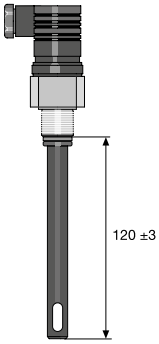
1.4 DULCOTEST Sensors for Conductivity

Conductivity Sensor LFT 1 DE

Cost-effective sensor for measurement of electrolytic conductivity in clear, uncontaminated water. With integrated temperature measurement and DIN 4-pin plug. For operation with controllers DCCa, DACb, DMTa, D1Ca, AEGIS II, diaLog X

Your Benefits

- Measured variable: electrolytic conductivity above 10 µS/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



Technical Data

Measuring range	0.01…20 mS/cm
Cell constant	1.00 cm^{-1} ±5 %
Temperature measurement	Pt 100
Medium temperature	0 … 80 °C (at 1 bar)
Max. pressure	16.0 bar (25 °C)
Sensors	Special graphite
Sensor shaft	Epoxy
Thread	PG 13.5
Installation length	120 ±3 mm
Process integration	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
Electrical Connection	DIN 4-pin angle plug
Enclosure rating	IP 65
Typical applications	Drinking water, swimming pool water, process water. The sensors of the LF. .. series have only limited applicability for taking measurements in cleaning solutions containing surfactants and media containing solvents.
Resistance to	Unsuitable for chemically contaminated water and water containing film-forming ingredients
Controllers	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes. Integrated temperature measurement

	Order no.
LFT 1 DE	1001376

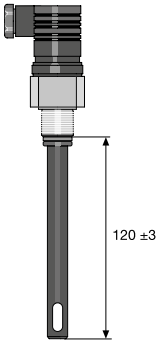
Note the general information on page → 105 (Overview table for conductivity sensors)

Conductivity Sensor LFTK 1 DE

Cost-effective sensor for measurement of electrolytic conductivity in clear, uncontaminated water with integrated temperature measurement and DIN 4-pin plug. For operation with controllers DCCa, DACb, DMTa, AEGIS II, diaLog X

Your Benefits

- Measured variable: electrolytic conductivity above 10 µS/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



Technical Data

Measuring range	0.01…20 mS/cm
Cell constant	1.00 cm^{-1} ±5 %
Temperature measurement	Pt 1000
Medium temperature	0 … 80 °C (at 1 bar)
Max. pressure	16.0 bar (25 °C)
Sensors	Special graphite
Sensor shaft	Epoxy
Thread	PG 13.5
Installation length	120 ±3 mm
Process integration	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
Electrical Connection	DIN 4-pin angle plug
Enclosure rating	IP 65
Typical applications	Drinking water, swimming pool water, process water. The sensors of the LF. .. series have only limited applicability for taking measurements in cleaning solutions containing surfactants and media containing solvents.
Resistance to	Unsuitable for chemically contaminated water and water containing film-forming ingredients
Controllers	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes. Integrated temperature measurement

	Order no.
LFTK 1 DE	1002822

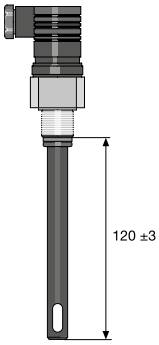
Note the general information on page → 105 (Overview table for conductivity sensors)

Conductivity sensor LFT 1 1/2"

Cost-effective sensor for measurement of electrolytic conductivity in clear, uncontaminated water. With integrated temperature measurement and DIN 4-pin plug and 1/2-inch screw-in thread. For operation with controllers DCCa, DACb, DMTa, D1Ca, AEGIS II, diaLog X

Your Benefits

- Measured variable: electrolytic conductivity above 10 µS/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



Technical Data

Measuring range	0.01…20 mS/cm
Cell constant	1.00 cm^{-1} ±5 %
Temperature measurement	Pt 100
Medium temperature	0 … 80 °C (at 1 bar)
Max. pressure	16.0 bar (25 °C)
Sensors	Special graphite
Sensor shaft	Epoxy
Thread	1/2"
Installation length	120 ±3 mm
Process integration	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
Electrical Connection	DIN 4-pin angle plug
Enclosure rating	IP 65
Typical applications	Drinking water, swimming pool water, process water. The sensors of the LF. .. series have only limited applicability for taking measurements in cleaning solutions containing surfactants and media containing solvents.
Resistance to	Unsuitable for chemically contaminated water and water containing film-forming ingredients
Controllers	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes. Integrated temperature measurement

	Order no.
LFT 1 1/2"	1001378

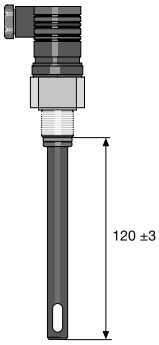
Note the general information on page → 105 (Overview table for conductivity sensors)

Conductivity sensor LFTK 1 1/2"

Cost-effective sensor for measurement of electrolytic conductivity in clear, uncontaminated water. With integrated temperature measurement and DIN 4-pin plug and 1/2-inch screw-in thread. For operation with controllers DCCa, DACb, DMTa, AEGIS II, diaLog X

Your Benefits

- Measured variable: electrolytic conductivity above 10 µC/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



Technical Data

Measuring range	0.01…20 mS/cm
Cell constant	1.00 cm^{-1} ±5 %
Temperature measurement	Pt 1000
Medium temperature	0 … 80 °C (at 1 bar)
Max. pressure	16.0 bar (25 °C)
Sensors	Special graphite
Sensor shaft	Epoxy
Thread	1/2"
Installation length	120 ±3 mm
Process integration	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
Electrical Connection	DIN 4-pin angle plug
Enclosure rating	IP 65
Typical applications	Drinking water, swimming pool water, process water. The sensors of the LF. .. series have only limited applicability for taking measurements in cleaning solutions containing surfactants and media containing solvents.
Resistance to	Unsuitable for chemically contaminated water and water containing film-forming ingredients
Controllers	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes. Integrated temperature measurement

	Order no.
LFTK 1 1/2"	1002823

Note the general information on page → 105 (Overview table for conductivity sensors)

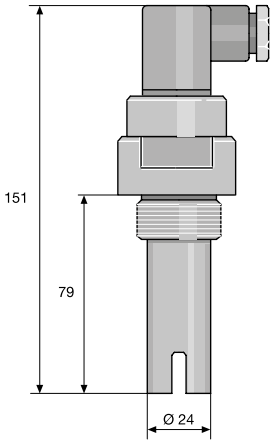
1.4 DULCOTEST Sensors for Conductivity

Conductivity Sensor CK 1

Sensor for measurement of electrolytic conductivity for clear, chemically contaminated water with higher but constant temperature with DIN 4-pin plug. For operation with controllers DCCa, DACb, DMTa, D1Ca, AEGIS II, diaLog X

Your Benefits

- Measured variable: electrolytic conductivity above 10 µS/cm
- Resistant to water ingredients in target applications thanks to injection-moulded design without adhesive or seals
- High temperature resistance up to 150 °C



Technical Data

Measuring range	0.01…20 mS/cm
Cell constant	1.00 cm^{-1} ±5 %
Temperature measurement	None, only for applications with constant temperature
Medium temperature	0 … 150 °C (at 1 bar)
Max. pressure	16.0 bar (20 °C)
Sensors	Special graphite
Sensor shaft	PES
Thread	R 1"
Installation length	79 mm
Process integration	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
Electrical Connection	DIN 4-pin angle plug
Enclosure rating	IP 65
Typical applications	Cooling, industrial, process water, tank and pipe, cleaning systems in breweries, dairies, media separation.
Resistance to	Ingredients in the water of the target application, taking into account the compatibility of the material
Controllers	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes

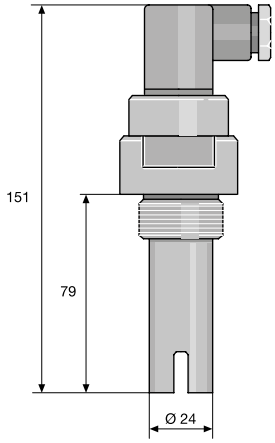
	Order no.
CK 1	305605

Conductivity Sensor CKPt 1

Sensor for measurement of electrolytic conductivity for clear, chemically contaminated water and higher temperatures. With integrated temperature measurement and DIN 4-pin plug. For operation with controllers DCCa, DACb, DMTa, D1Ca, AEGIS II, diaLog X

Your Benefits

- Measured variable: electrolytic conductivity above 10 µS/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



Technical Data

Measuring range	0.01…20 mS/cm
Cell constant	1.00 cm^{-1} ±5 %
Temperature measurement	Pt 100
Medium temperature	0 … 150 °C (at 1 bar)
Max. pressure	16.0 bar (20 °C)
Sensors	Special graphite
Sensor shaft	PES
Thread	R 1"
Installation length	79 mm
Process integration	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
Electrical Connection	DIN 4-pin angle plug
Enclosure rating	IP 65
Typical applications	Cooling, industrial, process water, tank and pipe, cleaning systems in breweries, dairies, media separation.
Resistance to	Ingredients in the water of the target application, taking into account the compatibility of the material
Controllers	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes. Integrated temperature measurement

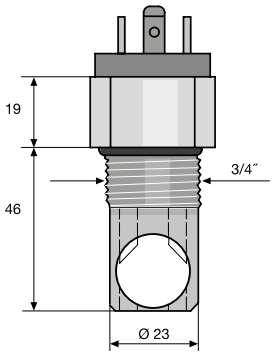
	Order no.
CKPt 1	305606

Conductivity Sensor LM 1

Sensor for measurement of electrolytic conductivity for clear and also chemically contaminated water. With DIN 4-pin plug. For operation with controllers DCCa, DACb, DMTa, D1Ca, AEGIS II, diaLog X

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



Technical Data

Measuring range	0.1…20 mS/cm
Cell constant	1.00 cm^{-1} ±5 %
Temperature measurement	None, only for applications with constant temperature
Medium temperature	0 … 70 °C (at 1 bar)
Max. pressure	16.0 bar (50 °C)
Sensors	Graphite
Sensor shaft	PP
Thread	3/4"
Installation length	46 mm
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes

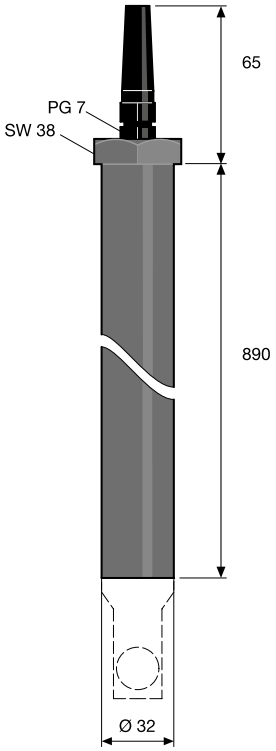
	Order no.
LM 1	740433

Conductivity Sensor LM 1-TA

Sensor for measurement of electrolytic conductivity for clear and also chemically contaminated water. Fully assembled in an immersion fitting. For operation with controllers DCCa, DACb, DMTa, D1Ca, AEGIS II, diaLog X

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



Technical Data

Measuring range	0.1…20 mS/cm
Cell constant	1.00 cm^{-1} ±5 %
Temperature measurement	None, only for applications with constant temperature
Medium temperature	0 … 70 °C (at 1 bar)
Max. pressure	16.0 bar (50 °C)
Sensors	Graphite
Sensor shaft	PP
Thread	M 28 x 1.5 for TA-LM in-line probe fitting
Installation length	Max. 1 m
Process integration	Tank, channel: Immersion through an immersion tube
Electrical Connection	5 m fixed cable, screened
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
Controllers	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes

		Order no.
LM 1-TA	Sensor integrated in immersion fitting	1020528
LM 1-FE	Replacement sensor for LM 1-TA	1020627

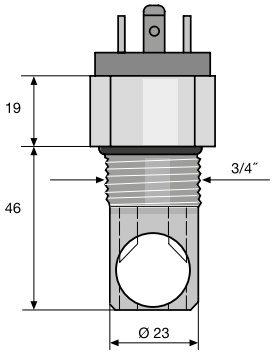
1.4 DULCOTEST Sensors for Conductivity

Conductivity Sensor LMP 1

Sensor for measurement of electrolytic conductivity for clear and also chemically contaminated water. With integrated temperature measurement with DIN 4-pin plug. For operation with controllers DCCa, DACb, DMTa, D1Ca, AEGIS II, diaLog X

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



Technical Data

Measuring range	0.1…20 mS/cm
Cell constant	1.00 cm^{-1} ±5 %
Temperature measurement	Pt 100
Medium temperature	0 … 70 °C (at 1 bar)
Max. pressure	16.0 bar (50 °C)
Sensors	Graphite
Sensor shaft	PP
Thread	3/4"
Installation length	46 mm
Process integration	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
Controllers	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes. Integrated temperature measurement

	Order no.
LMP 1	1020513

Note the general information on page → 105 (Overview table for conductivity sensors)

Conductivity Sensor LMP 1-TA

Sensor for measurement of electrolytic conductivity for clear and also chemically contaminated water. With integrated temperature measurement, fully assembled in an immersion fitting. For operation with controllers DCCa, DACb, DMTa, D1Ca, AEGIS II, diaLog X

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

Technical Data

Measuring range	0.1…20 mS/cm
Cell constant	1.00 cm^{-1} ±5 %
Temperature measurement	Pt 100
Medium temperature	0 … 70 °C (at 1 bar)
Max. pressure	16.0 bar (50 °C)
Sensors	Graphite
Sensor shaft	PP
Thread	M 28 x 1.5 for TA-LM in-line probe fitting
Installation length	1
Process integration	Tank, channel: Immersion through an immersion tube
Electrical Connection	5 m fixed cable, screened
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
Controllers	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes

		Order no.
LMP 1-TA	Sensor integrated in immersion fitting	1020525
LMP 1-FE	Replacement sensor for LMP 1-TA	1020727

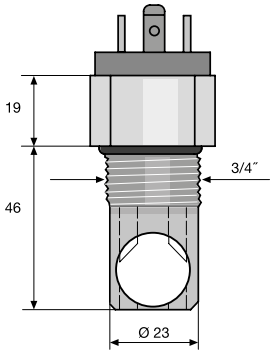
Note the general information on page → 105 (Overview table for conductivity sensors)

Conductivity Sensor LMP 1-HT

Sensor for measurement of electrolytic conductivity for clear and also chemically contaminated water. For high temperatures, with integrated temperature measurement and DIN 4-pin plug. For operation with controllers DCCa, DACb, DMTa, D1Ca, AEGIS II, diaLog X

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



Technical Data

Measuring range	0.1…20 mS/cm
Cell constant	1.00 cm^{-1} ±5 %
Temperature measurement	Pt 100
Medium temperature	0 … 120 °C (at 1 bar)
Max. pressure	16.0 bar (100 °C)
Sensors	Graphite
Sensor shaft	PVDF
Thread	3/4"
Installation length	46 mm
Process integration	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	General applications at higher temperatures process water, process water from electroplating, media separation, with CIP (cleaning in place).
Resistance to	Ingredients in the water of the target application, taking into account the compatibility of the material
Controllers	diaLog C, diaLog X, diaLog DACb, Compact, DMTa, DULCOMARIN 3, AEGIS II, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes. Integrated temperature measurement

	Order no.
LMP 1-HT	1020524

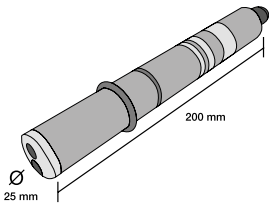
Note the general information on page → 105 (Overview table for conductivity sensors)

Conductivity sensor CCT 1-mA

Sensor for measurement of electrolytic conductivities for clear and also chemically contaminated water. With integrated temperature measurement and factory-calibrated 4...20 mA output signal.

Your Benefits

- Measured variable: electrolytic conductivity up to 100 mS/cm
- Fail-safe 4-20 mA output signal for flexible connection to measuring equipment with standard 4-20 mA input
- Integrated temperature sensor for temperature compensation replaces separate temperature sensor and the corresponding sensor fitting
- Simple connection to a process with the ProMinent bypass fittings BAMa, DGMA, DLGIII and INLI



Technical Data

Temperature measurement	NTC, integrated
Medium temperature	0 … 50 °C (at 1 bar)
Max. pressure	8.0 bar (25 °C)
Sensor head	PMMA
Sensors	Special graphite
Sensor shaft	PVC
Installation length	51 mm / 71 mm
Process integration	Bypass via bypass fittings BAMa, DGMa, DLGIII or installation into G1" PP pipe via sensor fitting INLI
Electrical Connection	4-wire cable, 0.25 mm^2, cable diameter 5.7
Supply voltage	12…36 V DC
Output signal	4…20 mA, temperature-compensated, factory-calibrated, electrically isolated
Enclosure rating	IP 65
Typical applications	Cooling water, process water, swimming pool water, general water with higher salt content up to 20 mS/cm.
Resistance to	Ingredients in the water of the target application, taking into account the compatibility of the material
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOMARIN 3, AEGIS II, AEGIS S
Measuring principle, technology	Conductive, 2 electrodes. Integrated temperature measurement, integrated 4...20 mA transducer

	Measuring range	Order no.
CCT 1-mA-20 mS/cm	0.2…20 mS/cm	1081545
CCT 1-mA-100 mS/cm	1…100 mS/cm	1152842

Note the general information on page → 105 (Overview table for 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.

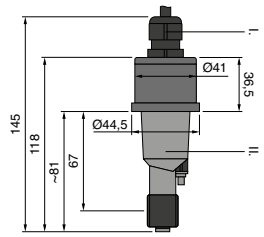
The sensors are used to measure electrolytic conductivity over a wide measuring range, even in heavily contaminated and/or aggressive media and, as such, offer particularly low maintenance operation. The sensors are particularly suitable for measuring high conductivities, as no electrode polarisation 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 5

✓ Cost-effective inductive conductivity sensor, suitable for high electrolytic conductivities above 200 µS/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
- Complete with injection moulded PP sensor head, no apparent bonds, seals
- 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
- Simple installation in PVC pipework 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



Technical Data

Measuring range	0.2…2,000 mS/cm
Cell constant	6.25 cm^{-1}
Measuring accuracy	±2% based on the measured value ±30 µS/cm
Temperature sensor	Pt 1000, wetted material Stainless steel 1.4301
Medium temperature	-10...80 °C -10...60 °C for installation in PVC pipes, -10...80 °C for installation in PP pipes
Max. pressure	10.0 bar at 20 °C, 6.0 bar at 60 °C, 0.0 bar at 80 °C
Min. pressure	-0.1 bar (-10 … 80 °C)
Sensor material	PP
Seals	EPDM
Electrical Connection	10 m fixed cable, 7x 0.35 mm^2 via a terminal
Enclosure rating	IP 65
Typical applications	Contaminated wastewater, blowdown control in cooling towers, control of electroplating and rinsing baths, cleaning in Place (CIP), product monitoring, seawater, brine swimming pools.
Resistance to	Ingredients in the water of the target application, taking into account compatibility to PP/EPDM, deposit-forming media
Process integration	With union nut, PVC, 1 1/2 inch female thread, including DN 40 bonded nozzle with 1 1/2 inch male thread for fitting in DN 40 PVC standard pipes (included in the scope of delivery). The corresponding set-in nozzle for fitting in PP standard pipes is available as an accessory
Controllers	Compact
Measuring principle, technology	Inductive, 2 coils. Integrated temperature measurement

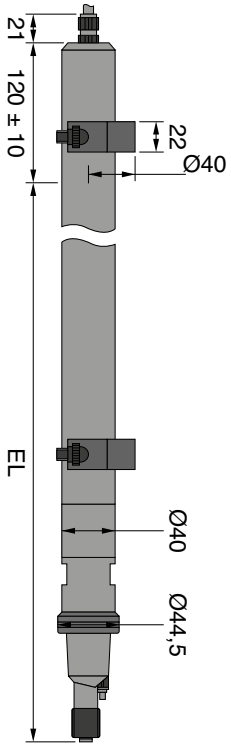
	Order no.
ICT 5	1095248

Conductivity Sensor ICT 5-IMA

Cost-effective inductive conductivity sensor, suitable for high electrolytic conductivities above 200 µS/cm. Also suitable for chemically contaminated water and film-forming media. Completely integrated into 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
- Complete with injection moulded PP sensor head, no apparent bonds, seals
- 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
- Simple installation in tanks, containers etc. thanks to sensor ready mounted in the immersion tube



Technical Data

Measuring range	0.2…2,000 mS/cm
Cell constant	6.25 cm^{-1}
Measuring accuracy	±2% based on the measured value ±30 µS/cm
Temperature sensor	Pt 1000, wetted material Stainless steel 1.4301
Medium temperature	-10…60 °C
Max. pressure	0.0 bar
Min. pressure	-0.1 bar (-10 … 60 °C)
Sensor material	PP
Immersion pipe material	PP
Sensor guard material	SS 1.4301, AISI 304
Seals	EPDM
Electrical Connection	10 m fixed cable, 7x 0.35 mm^2 via a terminal
Enclosure rating	IP 65
Typical applications	Contaminated wastewater, blowdown control in cooling towers, control of electroplating and rinsing baths, cleaning in Place (CIP), product monitoring, seawater, brine swimming pools.
Resistance to	Ingredients in the water of the target application, taking into account compatibility to PP/EPDM, deposit-forming media
Process integration	Immersion with immersion length 1 m
Controllers	Compact
Measuring principle, technology	Inductive, 2 coils. Integrated temperature measurement

	Order no.
ICT 5-IMA	1095249

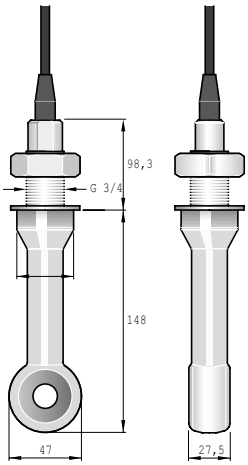
1.4 DULCOTEST Sensors for Conductivity

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



Technical Data

Measuring range	0.02…2,000 mS/cm
Cell constant	1.98 cm^{-1}
Measuring accuracy	± (5 µS/cm + 0.5 % of measured value at T < 100 °C)
	± (10 µS/cm + 0.5 % of measured value at T > 100 °C)
Temperature compensation	Pt 100, class A, completely extrusion-coated
Medium temperature	0…125 °C, when used together with D1C, temperature compensation is limited to 100 °C
Max. pressure	16.0 bar
Sensor material	PFA, completely extrusion-coated
Electrical Connection	5 m fixed cable, 6x 0.35 mm^2 via a terminal
Enclosure rating	IP 67
Typical applications	Production processes in the chemical industry, phase separation of product mixtures, determination of concentrations of aggressive chemicals.
Resistance to	Electrolytic conductivity of > 20 mS/cm, PFA-compatible aggressive chemicals (no concentrated lyes), deposit-forming media
Process integration	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).
Controllers	Compact
Measuring principle, technology	Inductive, 2 coils. Integrated temperature measurement

Installation kit for type ICT 2 sensors →135

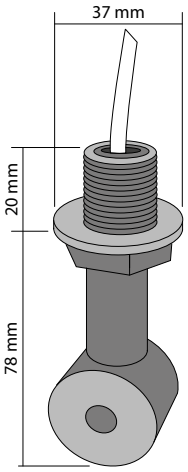
	Order no.
ICT 2	1023352

Conductivity sensor ICT 8-mA

Inductive sensor for the measurement of electrolytic conductivity. Suitable for contaminated water. With integrated temperature correction and factory-calibrated 4...20 mA output signal.

Your Benefits

- Measured variable: electrolytic conductivity up to 200 mS/cm without polarisation effect
- The inductive (non-contact) measuring principle permits applications in water with solids content and in film-forming media
- Fail-safe 4-20 mA output signal for flexible connection to measuring equipment with standard 4...20 mA input
- Integrated temperature correction replaces separate temperature sensor and sensor fitting



Technical Data

Measuring range	three configurable measuring ranges 0.2...2.0 mS/cm / 0.5...20 mS/cm / 1...200 mS/cm
Temperature correction	integrated in the sensor electronics, temperature co-efficient: 1.7%/K
Medium temperature	max. 50 °C at 1 bar
Sensor material	PP
Seals	EPDM
Installation length	75 mm
Electrical Connection	Fixed cable, 6-wire (6x0.25 mm^2). The cable length is 2 m between the sensor and 4-20 mA cable transmitter and 10 m between the cable transmitter and monitor.
Typical applications	Desalination control in cooling towers, contaminated wastewater, control of electroplating and rinsing baths, salt water desalination, adjustment of the salt content in swimming pool water
Resistance to	Water ingredients in the target application, taking into account compatibility to PP/EPDM and combating film-forming media
Process integration	1/2" male thread (BSP) for mounting using flange, installation in PVC pipes, DN 50 by means of installation adapter ICT8, DN 50, PVC, order no. 1106570, immersion using immersion pipe, 1 m, order no. 1105964
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOMARIN 3, AE-GIS II
Measuring principle, technology	Inductive, 2 coils. Integrated temperature measurement, integrated 4...20 mA transducer

	Order no.
ICT 8 -mA-200 mS/cm	1098530

1.5 Optical sensors

1.5.1 DULCOEYE LT sensor for low turbidity

Smart sensor technology for clear results - the new DULCOEYE LT optical sensor from ProMinent

NEW

The new DULCOEYE Turbidity Sensor from ProMinent is a high-precision solution for the optical measurement of low turbidity. With state-of-the-art technology and intelligent design, this sensor simplifies liquid analysis.

Your benefits

- **Precise measurement results in laboratory quality**
  The long-term stable light source and optimized signal processing ensure maximum precision. An intelligent algorithm automatically detects and compensates for air bubbles - for reliable measurement results without interference.
- **Low maintenance and reliable**
  The hydrodynamic self-cleaning system and high-quality components reduce maintenance requirements and increase operational reliability.
- **Resource-saving and efficient**
  The small-volume flow cell and calibration vessel reduce water consumption and enable fast response times.
- **Flexible calibration and verification options**
  Compatible with formazine and solid-state verification.
- **Ready for immediate use**
  Thanks to factory calibration and plug-and-play function, the sensor is ready for immediate use - without any additional effort.
- **Simple and safe operation**
  The user-friendly design and practical accessories enable intuitive operation - without any training.



Technical Data

Measuring range	0…100 NTU
Measuring principle, technology	nephelometric (90° light scattering according to DIN EN ISO 7027-1)
Unit of measurement	NTU, FNU, FTU
Light source	860 nm infrared LED
Accuracy	2 % ± 0.02 NTU whichever is greater
Repeatability	< 0,5 %
Resolution	0.001 NTU
Response time sensor t_{90}	5 s
Supply voltage	11...30 V DC
Calibration	1-point or 2-point calibration
Operating temperature	0…45 °C
Storage temperature	-10…50 °C
Ambient conditions	Indoor installation (no direct sunlight), maximum 90 % relative air humidity (non-condensing)
Digital output	RS-485
Housing material	316 L stainless steel
Enclosure rating	IP 65
Weight	ca. 1.000 g + Kabel
Operating pressure	1 – 3 bar
Flow	20…30 l/h
Controllers	diaLog C

Note: It gets even easier; DULCOEYE LT is also available pre-assembled on a plate with all the necessary components.

Spare parts and accessories

	Order no.
Flow cell with solenoid valve	1152854
Flow cell with ball valve	1152855
Connector and hose set	1152856
Solenoid valve	1152926
Ball valve	1152861
Calibration vessel	1152857
Vessel holder	1152859
Solenoid valve connector ¼“	1152860
O-ring	1152908
Cleaning cloth	1152912

1.5.2 Turbidity Measuring Point DULCOTEST DULCO turb C

Reliable on-line measurement of turbidity with DULCOTEST DULCO turb C measuring points

Measuring range 0 – 1,000 NTU

Turbidity measurements with DULCOTEST DULCO turb C: Compact measuring instrument that uses light scatter to measure turbidity, with a large measuring range and different designs to comply with ISO and EPA standards. Available with or without automatic cleaning.

The DULCOTEST measuring points for turbidity DULCO turb C with TUC 1, TUC 2, TUC 5, TUC 6 versions are compact, on-line turbidity measuring points consisting of a sensor, flow fitting and measuring instrument. The measuring instrument allows the measured value to be displayed, calibration, the measured value to be forwarded using a 4– 20 mA signal and limit violations and equipment failure to be indicated. The measuring cuvette integrated in the measuring instrument allows the device to be operated in the process line bypass. The optical measuring equipment does not make contact with the measured medium.

The intended application is the treatment of potable water, in which DULCO turb C can be used in all treatment stages from raw water and filter monitoring to measurement of fine turbidity in dispensed potable water. Further applications include the monitoring of turbidity in slightly polluted process water, wastewater as well as water requiring treatment from the food and beverage industry up to turbidity values of 1,000 NTU. In contrast to the TUC 1/TUC 2 types, the measuring points TUC 5, TUC 6 are the successor models to types TUC 3 and TUC 4 and like these include an ultrasound-based self-cleaning function. When used in deposit-forming waters, this is particularly useful for extending the maintenance intervals. The new measuring instruments are virtually identical to the old devices. The only differences are that they are operated using 5 keys rather than 4 keys and feature a USB connector with the associated software functions:

- Data capture and storage of 1 year's worth of measurement and calibration data
- Variable recording intervals of between 1 and 60 minutes, which can be selected by the user
- Downloading of data via a USB flash drive
- Software updates via USB flash drive
- 4-20 mA and RS-485 Modbus outputs at the same time

The measuring principle is similar to a scattered light measurement. The light beam radiated into the measuring cuvette filled with sample water is scattered on turbidity particles and the scattered light is measured at right angles (90°) to the radiated light (nephelometric measurement). The unit of measurement for turbidity can be given as a NTU (Nephelometric Turbidity Unit) or as an FNU (Formazin Nephelometric Unit). The measuring process in types TUC 1/TUC 5 (infrared light) corresponds to the global standard ISO 7027 and the European standard DIN EN 27027. The measuring process in types TUC 2/TUC 6 (white light) corresponds to the US standard USEPA 180.1.

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 wastewater 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.

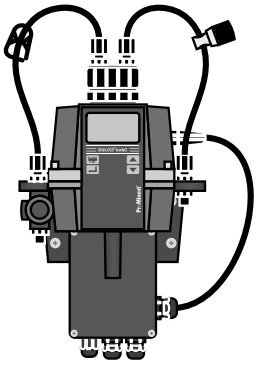
Technical Details

- The measuring process in types TUC 1/TUC 5 (infrared light) corresponds to the global standard ISO 7027 and the European standard DIN EN 27027.
- The measuring process in types TUC 2/TUC 6 (white light) corresponds to the US standard USEPA 180.1.

Field of Application

- Potable water treatment, for all treatment steps: from raw water and filter monitoring to measuring fine turbidity in the potable water that is to be discharged
- Monitoring of turbidity in slightly polluted industrial water, wastewater and water requiring treatment in the food and beverage industry up to a turbidity value of 1,000 NTU

1.5 Optical sensors



Technical Data

Measuring range	a) TUC1, TUC2; factory calibrated: 0...1000 NTU, other measuring ranges: 0...10 NTU and 0...100 NTU b) TUC5, TUC6; factory-calibrated 0...100 NTU, other measuring ranges: 0...10 NTU and 0...1000 NTU
Accuracy	± 2 % of the indicated value or ± 0.02 NTU below 40 NTU depending on which value is greater ± 5 % of the indicated value above 40 NTU
Resolution	0.0001 NTU below 10 NTU
Response time	Configurable
Display	Multiple row LCD display with background lighting
Alarm relay	Two programmable alarms, 120-240 VAC, 2 A Form C relay
Output signal	4…20 mA, 600 Ω, electric isolation: dual insulation, interference surge category II
Communication interface	Bi-directional RS-485, Modbus
Max. pressure	Integrated pressure regulator regulates TUC1, TUC2: 1380 kPa (200 psi) TUC 5, TUC6: 700 kPa (101,5 psi) based on the flow rate
Flow	6…60 l/h
Temperature	1…50 °C
Materials in Contact With the Medium	Polyamide (PA), silicone, polypropylene (PP), Viton®, stainless steel, borosilicate glass
Voltage supply	100 – 240 V AC, 47 – 63 Hz, 80 VA
Hydraulic connections	Black hose, inside 4.75 mm, outside 8 mm, installation in the bypass for the process main line
Ambient conditions	Not suitable for operation outdoors. Maximum operating altitude 2000 m above sea level. Maximum 95% relative air humidity (non-condensing).
Standard	Infrared light: ISO 7027, DIN EN 27027
Dimensions H x W x D	35 x 30 x 30 cm
Shipping weight	2.5 kg

	Standard	Ultrasonic cleaning	Order no.
TUC 1	Infrared light: ISO 7027, DIN EN 27027	No	1037696
TUC 2	White light: US EPA 180.1	No	1037695
TUC 5	Infrared light: ISO 7027, DIN EN 27027	Yes	1115440
TUC 6	White light: US EPA 180.1	Yes	1115441

Spare Parts

	Order no.
Drying agent	1037701
TUC 1/TUC 2 cuvette (set with 3 no.)	1037877
Cuvette TUC 3/TUC 4/TUC 5/TUC 6	1037878
Infrared lamp TUC 1/TUC 3/TUC 5	1037702
White light lamp TUC 2/TUC 4/TUC 6	1037703
Hose set TUC 1/TUC 2/TUC 3/TUC 4	1037879
Hose set for TUC 5 and TUC 6	1116180
Pressure regulating valve	1037885

Accessories

	Order no.
Calibration kit: 0.02 / 10 / 1000 NTU	1037699
Calibration kit: 0.02 / 1 / 100 NTU	1137591
Flow control	1037880
Air bubble trap	1037700

1.5 Optical sensors

1.5.3 Sensors DULCOTEST 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).

1.5 Optical sensors

Dissolved oxygen sensor DO 3-mA

Widely used sensor for the measurement of oxygen dissolved in water above 0.1 ppm to oxygen saturation. For installation in standard immersion pipes or in the bypass line of the process flow. Use in aeration tanks of clarification plants, waterworks, in fish breeding or to monitor surface water. Minimal maintenance due to visual measuring principle.

Your Benefits

- Measured variable: Dissolved oxygen, minimal maintenance in contaminated water due to visual measuring principle
- Factory calibration stable for a long time. Calibration only needed following replacement of the visual sensor cap
- Rod-shaped construction for simple installation into standard immersion pipes and ProMinent bypass fittings
- No flow dependence and minimised faults due to ingredients in the water due to the visual measuring principle of quenching
- Long lifetime of fluorescence dye and simple replacement by replacement of the sensor cap



Technical Data

Measured variable	Dissolved oxygen
Calibration	On atmospheric oxygen or by reference measurement in the process water
Measuring accuracy	±0.1 mg/l
Response time sensor t_{90}	< 60 s at 25 °C from air to nitrogen
Temperature	0…50 °C
Temperature correction	integrated Pt1000, fed to the outside
Max. pressure	2.0 bar
Flow	Measurement even possible without flow
Supply voltage	18…30 V DC
Electrical Connection	Fixed lead, 10 m
Output signal	4… 20 mA assigned to the measuring range, temperature-corrected, calibrated and electrically isolated
Enclosure rating	IP 65
Process integration	a) Immersion by immersion pipe (PVC, d40/DN 32, provided by the customer). The connection can be made using the immersion pipe adapter (reducing nipple, order no. 356924) and the 45° bracket (order no. 356335). Both parts are included in the scope of delivery and can be ordered as an accessory (also see accessories). b) Installation into ProMinent bypass fittings, type BAMa with mounting kit G1 sensor DO 3 BAMa (1113807) and adapter (1117395), type DGMa with mounting kit 791818 and type DLG III with mounting kit 815079. These mounting kits must be ordered separately.
Controllers	**DACb as of firmware 02.01.01.02** with complete calibration functionality and all correction variables (temperature, salinity, air pressure, height above sea level). Displayed units: [ppm] and [% oxygen saturation] **DACa, AEGIS II, diaLog X, D1C:** calibration only possible by the input of a reference concentration determined from the process water. Only temperature correction variable. Displayed unit: [ppm]
Typical applications	Control of oxygen input into the aeration tank (clarification plant), control of oxygen input in water works, breeding of fish and shrimps, conditioning of the water of large aquaria in zoos, assessment of the biological condition of surface water.
Resistance to	Contaminated water and the following chemical compounds: carbon dioxide, hydrogen sulfide, sulfur dioxide, ethylene oxide and against gamma sterilisation.
Interference by	Oxidant (e.g. chlorine, chlorine dioxide, ozone) and many organic solvents (e.g. chloroform, toluene, acetone)
Measuring principle, technology	optical: Measurement of the relaxation time of a pulsed fluorescence beam

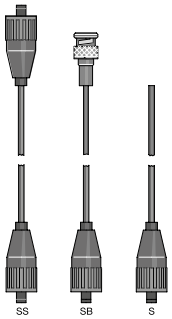
	Measuring range	Order no.
DO 3-mA-20 ppm	0.10…20.0 mg/l	1094609

1.6.1 Sensor Accessories

General information:

- Always keep measuring lines as short as possible
- Route measuring lines separately from parallel power lines.
- Use fully pre-assembled measuring line combinations wherever possible

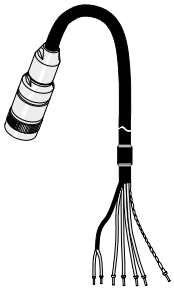
Measuring Lines for pH and ORP Measurement



- Pre-assembled to facilitate installation
- Factory tested to ensure function reliability
- IP 65

Version		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, Ø 5 mm 0.8 m - SN6 - pre-assembled	1024105
SN6 - open end	Cable combination, coaxial, Ø 5 mm 2 m - SN6 - pre-assembled	1024106
SN6 - open end	Cable combination, coaxial, Ø 5 mm 5 m - SN6 - pre-assembled	1024107
SN6 - open end	Coaxial cable, Ø 5 mm, 10.0 m	305040
SN6 - BNC	Coaxial cable Ø 3 mm, 0.8 m – SB	1033988
SN6 - BNC	Coaxial cable, Ø 3 mm, 2.0 m – SB	1033011
SN6 - BNC	Coaxial cable Ø 3 mm, 10.0 m - SB	305099
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



Pre-assembled 6-wire measuring line with VARIO Pin plug for connection to sensor type PHEPT 112 VE.

	Lead length m	Order no.
VARIO Pin signal lead VP 6-ST/ 2 m	2	1004694
VARIO Pin signal lead VP 6-ST/ 2 m	5	1004695
VARIO Pin signal lead VP 6-ST/ 2 m	10	1004696

LK Coaxial Signal Cable

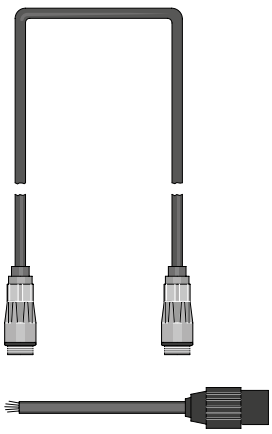


For pH and ORP measurements.

	Order no.
Coaxial low noise, 5 mm diameter, black, sold by the metre	723717
Coaxial low noise, 3 mm diameter, black, sold by the metre	1047889

Please specify length when ordering.

1.6 Accessories Sensor Technology



Measuring Lines for 4P Type Chlorine Sensors

The measuring line is needed to connect ...-4P sensors with the measuring/control device D_4a.

- Simple installation, as no self-assembly is required
- High operational safety due to factory functional check
- 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.
Universal cable, 5-pin round plug	2	1001300
Universal cable, 5-pin round plug	5	1001301
Universal cable, 5-pin round plug	10	1001302

Cabling Accessories for CAN Type Chlorine Sensors

	Length m	Order no.
T-distributor M12 5 pole CAN	-	1022155
Termination resistor M12 coupling	-	1022154
Termination resistor M12 plug	-	1022592
Connecting cable - CAN M12 5-pin.	0.5	1022137
Connecting cable - CAN M12 5-pin.	1.0	1022139
Connecting cable - CAN M12 5-pin.	2.0	1022140
Connecting cable - CAN M12 5-pin.	5.0	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

Measuring lines for CTE 2 and CTE 3 type chlorine sensors, PER 2-3E-mA type peracetic acid sensors and PEROX H-3E-mA type hydrogen peroxide sensors

	Length m	Order no.
Measuring line (external cable), 2-core, 5-pin plug	2	707702
Measuring line (external cable), 2-core, 5-pin plug	5	707703
Measuring line (external cable), 2-core, 5-pin plug	10	707707

Measuring Lines for Pt 100 and Pt 1000

Measuring line: 2-core, conductor: 0.5 mm^2.

	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 mm², cable diameter: 5.7 mm, screened

	Length m	Order no.
Measuring Line for Conductive Conductivity Sensors	1	1046024
Measuring Line for Conductive Conductivity Sensors	3	1046025
Measuring Line for Conductive Conductivity Sensors	5	1046026
Measuring Line for Conductive Conductivity Sensors	10	1046027

2-Wire Measuring Line

2-core, conductor: 0.25 mm², cable diameter: 4 mm

For amperometric sensors and transformers, each with 4-20 mA output.

	Order no.
Two-wire measuring line 2 x 0.25 mm² Sold by the meter, 4 mm diameter	725122

Connector Cable

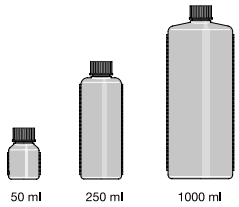
For liquid potential equalisation on DGMa, DLG III, DLG IV with connector, 5 m long.

	Length m	Order no.
Connector cable	5	818438

Test and Calibration Kit for Inductive Conductivity

	Order no.
Test and calibration kit	1026958

1.6.2 Consumable Items for Sensors

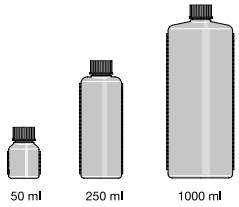


pH Quality Buffer Solutions

Accuracy ±pH 0.02 (±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_2 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.
pH 4.0 buffer - red colour	50	506251
pH 4.0 buffer - red colour	250	791436
pH 4.0 buffer - red colour	1,000	506256
pH 7.0 buffer - green colour	50	506253
pH 7.0 buffer - green colour	250	791437
pH 7.0 buffer - green colour	1,000	506258
pH 9.0 buffer - colourless	50	506254
pH 9.0 buffer - colourless	250	150693
pH 9.0 buffer - colourless	1,000	506259
pH 10.0 buffer - blue colour	50	1134110
pH 10.0 buffer - blue colour	250	1134111
pH 10.0 buffer - blue colour	1,000	1134112



ORP Quality Buffer Solutions

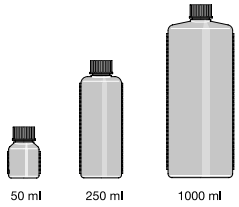
Accuracy ± 5 mV. Their shelf life depends on how often they are used and how strong the carryover of chemicals is.

Buffer solutions should be replaced a max. of 3 months after first opening.

Please note: The ORP buffer solution 465 mV is classified an as irritant (GHS07).

	Capacity ml	Order no.
ORP buffer 465 mV	30	1042307
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

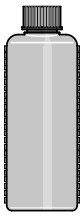
DPD reagents for calibration of amperometric sensors, see page → 249



3 Molar KCl Solutions

3-molar KCl solution is most suited to the storage of pH and ORP sensors (e.g. in sensor quills) and as an electrolyte for refillable sensors (e.g. PHEN, RHEN).

	Capacity ml	Order no.
KCl solution, 3 molar	50	505533
KCl solution, 3 molar	250	791440
KCl solution, 3 molar	1,000	791441



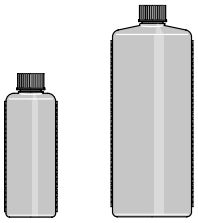
250 ml

Cleaning Solutions

Cleaning solution pepsin:

For cleaning pH sensors whose diaphragms have been contaminated with protein.

	Capacity ml	Order no.
Cleaning fluid Pepsin	250 ml	791443



250 ml 1000 ml

Conductivity Calibration Solution

For the precise calibration of conductivity sensors.

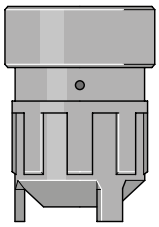
	Capacity ml	Order no.
Conductivity calibration 1413 µS/cm	250	1027655
Conductivity calibration 1413 µS/cm	1,000	1027656
Conductivity calibration 12.88 mS/cm	250	1027657
Conductivity calibration 12.88 mS/cm	1,000	1027658



Electrolyte for Amperometric Sensors

	Capacity ml	Order no.
Electrolyte for CLE, CLR 1 type chlorine sensors	100	506270
Electrolyte for CLO 1, CLO 3 type chlorine sensors	100	1035191
Electrolyte for CLO 2, CLO 4 type chlorine sensors	100	1035480
Electrolyte for CTE 2, CTE 3 type chlorine sensors	50	1133159
Electrolyte for CBR 1 type chlorine, bromine sensors	100	1038017
Electrolyte for CGE, CTE 1, BRE sensor types	50	792892
Electrolyte for BCR 1 type bromine sensors	50	1044843
Electrolyte for CDM 1, CDE 3 type chlorine dioxide sensors	100	506271
Electrolyte for CDE 2 and CDR 1 type chlorine dioxide sensors	100	506272
Electrolyte for CDP 1 type chlorine dioxide sensors	100	1002712
Electrolyte for OZE 3 type ozone sensors	100	506273
Electrolyte for CLT 1 type chlorite sensors	50	1022015
Electrolyte for PAA 1, OZR 1 type peracetic acid, ozone sensors	100	1023896
Electrolyte for PAA 2 type peracetic acid sensors	50	1120350
Electrolyte for PER 1 type hydrogen peroxide sensors	50	1025774
Electrolyte for PEROX H 3E type hydrogen peroxide sensors	100	1121673

1.6 Accessories Sensor Technology



Spare diaphragm caps for amperometric sensors

	Order no.
Membrane cap for types CLE II T, CDM 1 and OZE 1	790486
Diaphragm cap for types: CLE 2.2, CLE 3, CLE 3.1, CDE 1.2, CDE 2, OZE 2 and OZE 3	790488
Sensor cap for CLO 1, CLO 3	1035197
Sensor cap for CLO 2, CLO 4	1035198
Diaphragm cap for CGE 3, CGE 2, CTE 1 (2/5/10 ppm), BRE 1 (10 ppm), BRE 2, PEROX H-3E (50/200/500 ppm), PAA 2-3E	792862
Diaphragm cap for CTE 1 (0.5 ppm), CBR 1, BCR 1, PEROX H-3E (10 ppm)	741274
Diaphragm cap for CTE 2 (2/5/10/20 ppm)	1133342
Diaphragm cap for CTE 2 (0.5 ppm)	1137687
Diaphragm cap for CTE 3	1133130
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 kits for amperometric sensors

	Capacity ml	Order no.
Accessory set for CGE 3, CGE 2, CTE 1 (2/5/10 ppm) and BRE 1 (10 ppm), BRE 2 (2 diaphragm caps + electrolyte)	50	740048
Accessory set for CTE 1 (0.5 ppm) (2 membrane caps + electrolyte)	50	741277
Accessory set for CTE 2 (2/5/10/20 ppm) (diaphragm cap + electrolyte)	50	1133397
Accessory set for CTE 3 (diaphragm cap + electrolyte)	50	1133395
Accessory set for CLE 3, CLE 3.1 (2 diaphragm caps + electrolyte)	100	1024611
Accessory set CDP 1 (2 diaphragm caps + electrolyte)	100	1002744
Accessory set for PAA 1 and OZR 1 (2 diaphragm 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, CLO 3 (electrolyte, grinding disc, plug)	100	1035482
Accessory set for CLO 2, CLO 4 (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
Accessory set for CLE 3, CLE 3.1 (2 diaphragm caps + electrolyte)	50	1022100
Accessory set for PEROX H-3E (10 ppm) (2 diaphragm caps + electrolyte)	100	1121674
Accessory set for PEROX H-3E (50/200/500 ppm) (2 diaphragm caps + electrolyte)	100	1121675

Spare Parts for Dissolved Oxygen Sensors

	Order no.
Sensor cap for type DO 3-mA-20 ppm	1096350
Protective cap for type DO 3-mA-20 ppm	1096352

1.6.3 Sensor Bypass Armature Modular BAMa

Modular sensor bypass armature BAMa: flexible process connection for all ProMinent sensors for water treatment

Up to 9 functional modules can be freely configured in a single fitting.

The modular bypass armature BAMa accommodates ProMinent sensors for water treatment. The armature is simply installed in a bypass of the main process line. It is available in various variants, each perfectly designed for special water treatment applications – from drinking water, water for pool & wellness to industrial water.



Depending on the application, the modular bypass armature can be selected in different variants:

For saving sample water: This variant of the BAMa allows all flow-dependent sensors in the 5...25 l/h range to be operated for clear water. This is very beneficial for applications, where sample water cannot or must not be returned to the process, e.g. drinking water monitoring or product water during the manufacture of beverages.

For process water which is clear or has low levels of solids where the sample water is returned to the process: This design can be operated between 20...60 l/h as a result of which self-cleaning of armatures and sensors is improved. Typical applications include water treatment processes in the pool & wellness sector.

For process water which has moderate levels of solids and/or for higher temperatures and/or pressure requirements: This BAMa configuration is designed for operation with flows of 20...100 l/h and is ideally suited for many applications, e.g. in industrial water treatment.

The modular bypass armature BAMa and its various components can be perfectly combined for individual sample water conditioning. Additionally, a flow controller can be installed as well as can components for taking and treating sample water, such as a filter, flow limiter, metering module, ventilation, potential equalisation and earthing. For amperometric sensors without diaphragm, an integrated hydrodynamic cleaning unit can be ordered.

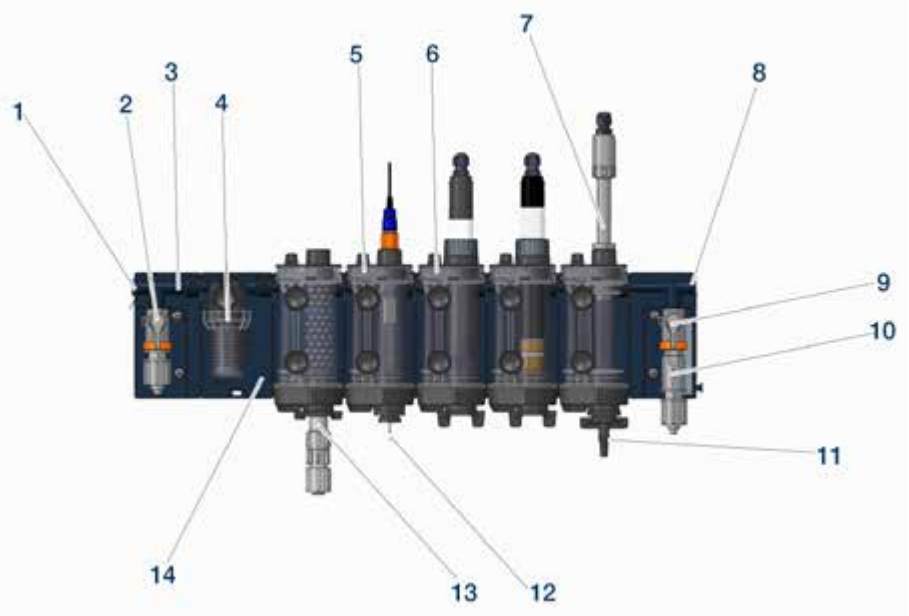
Your Benefits

- The sensors can be quickly and easily fitted and dismantled thanks to bayonet fittings.
- All parts requiring maintenance can be cleaned very well as they are easy to access without tools.
- Water consumption is minimised to just 5 l/h for flow-dependent sensors under ideal measurement conditions.
- The good particle mobility allows the bypass armature to be used in an even wider range of applications.
- Construction and material permit temperatures of up to 70 °C at a max. pressure of 3 bar, making it even more flexible to use.
- Thanks to higher pressure levels of up to 7 bar at 20 °C, sample water can return to the process, where permitted.
- The BAMa provides numerous options for setting optimum measurement conditions.

1.6 Accessories Sensor Technology

Can be ordered using identity code as an option

- Space-saving filter module, fully integrated in the fitting: Length: 65 mm / diameter 28 mm, filter bowl made from PET copolymer, filter insert made from stainless steel 1.4404, 300 µm pore diameter
- The module with float flow control using a reed switch is available in the following designs for use in clear process water: "**BAMA_ 1…**" and "**BAMA_ 2…**". Wetted materials: PVC, FKM
- The module with thermal flow control is available in the design "**BAMA_ 3…**" and makes operation possible in media containing solids and at higher pressure levels / temperatures. Wetted material: Stainless steel 1.4404
- The flow limiter for eliminating peaks in flow as hydraulic conditions change over time is always fitted in conjunction with the filter module and is only available in the designs "**BAMA_ 1…**": Limitation to max. 12 l/h and "**BAMA_ 2…**": Limitation to max.54 l/h
- Metering module including injection valve and mixing zone, for metering of chemicals in the sample water flow for the purpose of treating sample water (e.g. adjusting pH or electrolytic conductivity). Sensors, which are not suitable for untreated sample water, can therefore be used. The metering module can also be used to chemically clean the fitting. A suitable metering pump, accessories and the appropriate treatment medium must be ordered separately.
- Hydrodynamic cleaning of the open chlorine sensors without protective diaphragm, types CLO3 / CLO4, is integrated in the sensor module
- Potential equalisation on the sensor module and also an electric earthing connector on the input module ensure faultless operation of pH and ORP sensors in the event of electrical influence



1 Earthing connector
2 Hydraulic inlet with shut-off valve, horizontal or vertical connector (inlet), factory-fitted as vertical, but may be converted by the operator to horizontal
3 Direction of flow/arrow
4 Particle filter, 300 micrometre (optional)
5 Sensor modules for pH and ORP sensors (PG 13.5 connector)
6 Sensor modules for amperometric sensors (G1" connector)
7 Flow meter/control by means of float and reed switch or thermal flow sensor
8 G 1/4 connector for venting
9 Hydraulic outlet with shut-off valve, horizontal or vertical connector (outlet), factory-fitted as vertical, but may be converted by the operator to horizontal
10 Flow limiter
11 Sample valve
12 Potential equalisation connector
13 Injection valve with mixing device
14 Module carrier

Technical Data

Flow through the sensor bypass armature Modular BAMa

Application	'BAMa 1…' e.g. drinking water	'BAMA_ 2…' e.g. pool&wellness sector	'BAMa 3…' industrial water
Flow	5…25 l/h	20…60 l/h	20…100l/h

Operating pressure/operating temperature/particle mobility

BAMa design Pressure/temperature	'BAMA_ 1…' at max. 25 l/h	'BAMA_ 2…' at max. 60 l/h	'BAMA_ 3…' at max. 100 l/h
Minimum priming pressure without flow limiter and with clean filter for a total of 9 modules	0.025 bar	0.050 bar	0.500 bar
Minimum priming pressure with flow limiter and with clean filter for a total of 9 modules	1.5 bar	1.5 bar	2.0 bar
Maximum operating pressure *	7.0 bar at 20 °C	7.0 bar at 20 °C	7.0 bar at 20 °C
Maximum operating temperature *	60 °C at 3.5 bar	60 °C at 3.5 bar	70°C at 3.0 bar
Particle mobility (specified with non-agglomerating, non-sedimentary model particles)	< 300 µm	< 300 µm	< 1000 µm

* Maximum operating pressure and maximum operating temperature are limited by the specification of the weakest component fitted.

- Because the flow limiter may only be used in clear water, it is only available as standard for the **'BAMA_ 1…'** applications (e.g. potable water, limitation to 12 l/h, order no. 1113408) and **'BAMA_ 2…'** (e.g. pool&wellness sector, limitation to 54 l/h, order no. 1112443) applications together with the filter module. Blockages are thereby avoided. The flow limiter is installed on the hydraulic outlet ex-factory.
- When using sensors with a maximum operating pressure of ≤ 1.0 bar, the flow limiter can be ordered as an accessory and installed on-site at the hydraulic inlet module, provided that the system is handling filtered, clean sample water with no solids content with a particle size < 300 µm. Due to the pressure drop of 1.4 bar at the outlet of the pressure limiter, the permitted operating pressure at the inlet of the sensor bypass armature Modular BAMa is increased to max. 2.4 bar for pressure-sensitive sensors.
- Because of the continuous configuration, an additional priming pressure of 0.5 bar is to be expected when using a filter and this must be added to the minimum priming pressure values stated above.

Wetted materials

Measurement module, flow module, metering module, flow element of filter housing	SAN, transparent
Module carrier, hydraulic inlet/outlet	PPE+PS+GF10%
Sensor adapter; flow element bracket	PPE+PS+GF30%
Filter insert	Stainless steel 1.4404
Filter bowl	PET copolymer
Ball funnel, flow nozzle	PVDF
O-rings, seals	FKM
Thermal flow sensor	Stainless steel, 1.4404
Calibration beaker	PE
Shut-off valve, sample drain valve	a) PVC in applications BAMA _1 (e.g. drinking water) and BAMA_2 (e.g. pool & wellness sector) b) PVDF in the application BAMA _ 3 (e.g. industrial water
Flow sensor with float	PVC
Thermal flow sensor	Stainless steel 1.4404
Flow limiter	PVC
Potential equalisation pin	Stainless steel 1.4404
Cleaning balls, balls in the metering module	Glass

1.6 Accessories Sensor Technology

Hydraulic connectors

Hose 8x5 and 12x6 mm
Hose 1/2x3/8 and 3/8x1/4 inch
Pipe DN10 horizontal
Pipe 1/2 inch MPT horizontal

Float flow meter

Flow range for BAMA_1 application (e.g. drinking water)	5…25 l/h
Flow range for BAMA_2 application (e.g. pool & wellness sector)	20…60l/h
Max. operating pressure	2 bar
Max. operating temperature	30 °C
Output signal	Switching signal
Max. switching power	3W
Max. switching voltage	42 V
Max. switching current	0.25 A
Max. constant current	1.2 A
Max. contact resistance	150 mOhm
Degree of protection of the reed switch	IP 65
Wetted materials	PVC, FKM

Thermal flow meter

Flow range	20…100 l/h
Accuracy at the switching point 30 l/h	Better than ±10%
Output signal	Switching signal; analogue signal; frequency signal; IO link;
Electrical design	PNP, NPN
Max. load	300 Ω
Continuous current load of the switching output	200 mA DC
Max. voltage drop at switching output	2.5 V DC
Degree of protection	IP65
Wetted materials	Stainless steel, 1.4404

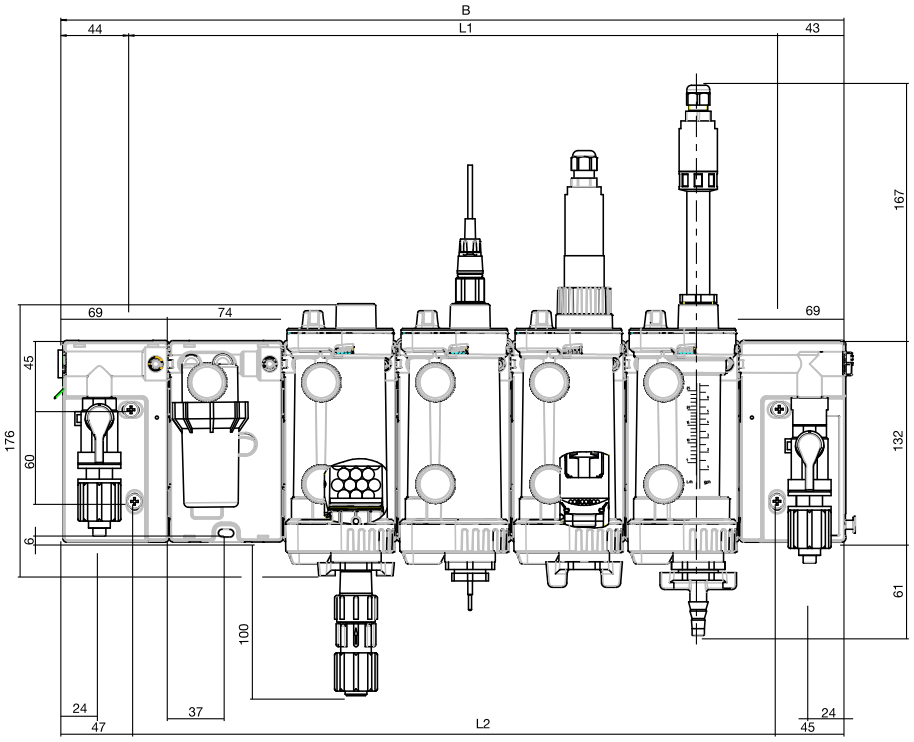
Flow limiter

Minimum pressure drop	1.4 bar
Maximum pressure drop	10 bar
Flow limitation for BAMA_1 application (e.g. drinking water)	max. 12 l/h
Flow limitation for BAMA_2 application (e.g. pool & wellness sector)	max. 54 l/h
Application	Can only be used for filtered water < 300 µm

Ambient conditions

Ambient temperature	-10…60 °C
Storage temperature	10…70°C
Vibration	Complies with IEC 68, Part 2-6
EMC	In accordance with the data for the electrical components
UV	Not long-term stable in direct sunlight when used outdoors
Air humidity	When using flow sensors and other electrical components: max: 90%, non-condensing

Dimensions / weights



BAMa design example: BAMa_EU_1_2_1_1_X_D_D_C_1_X_00_01_00_EN (with float flow control, e.g. for drinking water)

Number of modules	1	2	3	4	5	6	7	8	9
Width b (mm)	213	288	362	437	511	586	660	735	809
Weight (g) excluding sensors	547	842	1137	1432	1727	2022	2317	2612	2907

BAMa module	Weight (g)
Hydraulic inlet	124
Hydraulic outlet	128
Module carrier	120
Measuring module	175
Flow module	230
Filter	75
Lip valve	44
Hose connector kit	35

1.6 Accessories Sensor Technology

1.6.4 Identity Code Ordering System for Sensor Bypass Armature BAMa

BAMa	Regional design														
	EU	Europe (Standard)													
	US	North America													
		Application													
		1	5 … 25 l/h, max. 60 °C at 3.5 bar (e.g. drinking water or water similar to clear water with sample water consumption saving)												
		2	20 … 60 l/h, max. 60 °C at 3.5 bar (e.g. pool & wellness sector or similarly treated water with sample water return)												
		3	20 … 100 l/h, max. 70 °C at 3.0 bar (e.g. industrial water or similar with a solids content and higher temperature requirements)												
			Flow monitor module												
			X	None, (For application 3 only)											
			1	Float + scale [l/h], [gph]											
			2	Float + scale + reed switch (max. 2 bar)											
			3	Thermal flow monitorig, (For application 3 only)											
				Number of modules, PG13.5 (sensors for pH, ORP, conductivity: LF(T) line, fluoride FLEP, hydrogen peroxide H2.10P, temperature PT100, PT1000)											
				X	No module										
				1	One module + sensor adapter PG 13.5										
				2	Two modules + sensor adapter PG 13.5										
				3	Three modules + sensor adapter PG 13.5										
				4	Four modules + sensor adapter PG 13.5										
					Number of modules, G 1" (amperometric sensors, conductivity sensors CCT1, CTFS via adapter G 1" - 3/4" NPT (1133584), sensor for dissolved oxygen DO3 with adapter 1117395)										
					X	No module									
					1	One module + sensor adapter G 1"									
					2	Two modules + sensor adapter G 1"									
					3	Three modules + sensor adapter G 1"									
					4	Four modules + sensor adapter G 1"									
					5	Five modules + sensor adapter G 1"									
						Number of modules, G 3/4" (conductivity sensors LM(P) line)									
						X	None								
						1	One module + sensor adapter G 3/4"								
							Metering module								
							X	None							
							D	With metering module							
								Sample water treatment							
								0	None						
								F	With filter, 300 µm, stainless steel						
								D	With filter and flow limiter, (For applications 1 and 2 only)						
									Sensor cleaning						
									0	None					
									C	Hydrodynamic cleaning for CLO 3/4 type chlorine sensor, (For applications 2 and 3 only)					
										Hydraulic connections					
										1	Hose 8x5 and 12x6 mm, (EU region only)				
										2	Hose, 1/2 "x 3/8", (US region only)				
										4	Pipe, DN 10, horizontal, (EU region only)				
										5	Pipe, 1/4" MNPT, horizontal, (US region only)				
											Status illuminated indicator				
											X	None			
												Version			
												00	With ProMinent logo		
												01	Without ProMinent logo		
													Accessories		
													00	None	
													01	Potential plug + electrical earthing	
														Approvals	
														00	None
														01	CE, (Only needed with accessories 01)
														14	CE + UKCA, (Only needed with accessories 01)
															Documentation language
															DE German
															EN English
															FR French
															ES Spanish

Retrofit kits

	Order no.
Sensor module, complete	1113795
Sensor module CLO / CLZ (with ball funnel)	1125044
Filter module, complete	1113798
Cleaning set CLO/BAMa for CLO / CLZ sensors in conjunction with sensor bypass armature BAMa	1113881
Metering module, complete	1113424

Accessories

	Order no.
Reed switch PVC, for flow module	1118867
Thermal flow control (SA 4300)	1122791
Potential equalisation/earthing, complete	1113409
Sample valve for PG 13.5 module	1004737
Flow limiter, 12 litres, complete, f/f PVC	1117504
Flow limiter, 54 litres, complete, f/f PVC	1117493
Hydraulic short circuit, complete	1117462
Vent valve (lip valve) G 1/4 - 6x4, PVC	1113427

Consumable Items

	Order no.
Filter insert, 300 µm, stainless steel	1105632
Cleaning balls (approx. 100)	1104267
Glass balls for metering module	1122617

1.6.5 Accessory for sensor bypass fitting type DGMa

Recommended Accessories

	Order no.
Plug for potential equalisation	791663
Flow sensor for flow upgrade modules	791635
Calibration cup	791229
Sample valve for PG 13.5 module	1004737
Sample valve for 25 mm module	1004739

Extension Modules for DGMa

For simple upgrade of an existing DGMa at a later date.

	Order no.
Flow expansion module with scale in l/h	1023923
Flow expansion module with scale in gph	1023973
Flow sensor for flow upgrade modules	791635
Expansion module for PG 13.5 sensors	1023975
Expansion module for 25 mm sensors	1023976

Connector Cable

For liquid potential equalisation on DGMa, DLG III, DLG IV with connector, 5 m long.

	Order no.
Connector cable	818438

Shut-off Ball Valve for DGMa

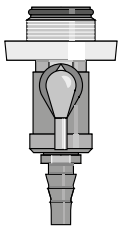
To isolate the bypass from the process flow

	Order no.
Stopcock	1010380

Mounting Kit Sensor, DGMa

For fitting amperometric sensors with R 1" connection

	Order no.
Mounting kit, sensor/DGMa	791818

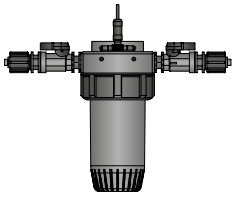


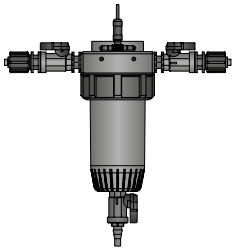
Sample Valve for DGMa

For PG 13.5 and 25 mm modules designed as a convenient ball valve.

	Order no.
Sample valve for PG 13.5 module	1004737
Sample valve for 25 mm module	1004739

1.6.6 In-line Probe Housing for Sensors





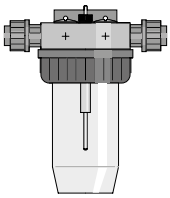
DLG III Type In-Line Probe Housing

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.

Material	In-line probe housing: PVC hard Clear cup: Polyamide Ball valve: PVC hard
Max. pressure	1.0 bar
Max. temperature	55 °C
Typical applications	Cooling water, slightly contaminated wastewater, turbid water, no sludge.

	Version	Max. temperature °C	Order no.
DLG III A with PVC hose connectors	for PE line Ø 8/5 mm	55	914955
DLG III A with flushing connector and PVC hose connection	for PE line Ø 8/5 mm	55	1029096
DLG III B with PVC adhesive connectors	for pipe connection Ø 16 DN 10	55	914956
Assembly kit for fitting amperometric sensors		55	815079



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.

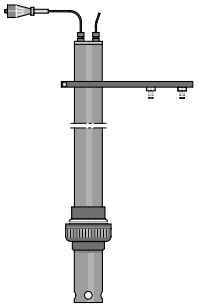
Material	In-line probe housing: PVC hard or PP Clear cup: Polyamide
Max. pressure	1.0 bar
Connection for sample water line	Union with d 16/DN 10 insert

	Version	Max. temperature °C	Order no.
DLG IV PP	for Ø 16/DN 10 pipe work connector	80	1005331
DLG IV PVC	for Ø 16/DN 10 pipe work connector	55	1005332

DLG Sampling Water Cup

	Order no.
DLG III sampling water cup with back flush device	1029095

1.6.7 Immersion Fittings for Sensors

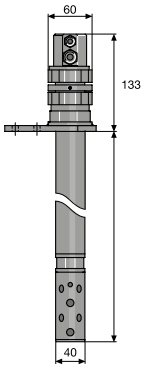


PVC Immersion Assembly Type ETS 1 P

Immersion fitting to hold **one** conductivity, Pt 100, pH or ORP sensor with SN6 plug-in head and PG 13.5 screw-in thread. In addition, a stainless steel rod is integrated as a liquid reference potential.

Sensor connector (inner)	SN6 connector
Signal lead connector (outer)	Coax SN6 male connector
Material	Rigid PVC
Type of fitting	Clamping flange with mounting plate
Immersion depth	Variable
Max. temperature	55 °C

	Order no.
ETS 1 P	914950



PP Immersion Assembly Type IPHa 1-PP

Immersion fitting for holding **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 integrated 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.

Note: Measuring lines are not included in the scope of delivery.

Material	Fitting: PP Seals: FKM
Max. temperature	80 °C
Pressure	Installation at atmospheric pressure
Immersion depth	Max. 1, or 2 m; variable
Immersion lance diameter	40 mm

Dimensions Table: Flange

Fixed flange	DN 40
Hole circle Ø K	110 mm
Screws	4 x M16
Thickness d_2	18 mm
Diameter Ø D	150 mm

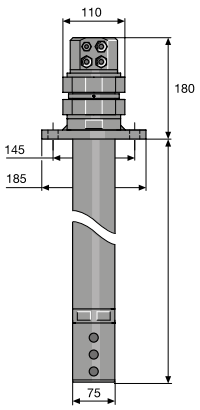
	Installation length m	Order no.
IPHa 1-PP	1	1008600
IPHa 1-PP	2	1008601

Other materials available on request.

FKM = Fluorine Rubber

Accessories for Fitting Type IPHa 1

	Order no.
Immersion pipe mounting for IPHa 1-PP	1008624
Clamped threaded connector with fixed flange DN 40 according to DIN 2642 for IPHa 1-PP	1008626
Clamped threaded connector for welding connection for IPHa 1-PP	1008628
Protective (weatherproofed) cover for assembly head for IPHa 1-PP	1008630
Water-retaining basin for IPHa 1-PP	1008632



PP Immersion Assembly Type IPHa 3 -PP

To hold max. **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 integrated as a liquid reference potential. The outside diameter is 75 mm. Immersion depths of 1 and 2 m are offered, however customers can shorten the immersion pipe themselves. The fitting head contains four cable connectors; measuring lines of 3-7 mm diameter can be led out. Measuring lines are not included in the scope of delivery. Technical data as for fitting IPHa 1, except the immersion tube diameter is 75 mm.

Material	Fitting: PP Seals: FKM
Max. temperature	80 °C
Pressure	Installation at atmospheric pressure
Immersion depth	Max. 1, or 2 m; variable
Immersion lance diameter	75 mm

Dimensions Table: Flange

Fixed flange	DN 65
Hole circle Ø K	145 mm
Screws	4 x M16
Thickness d_2	18 mm
Diameter Ø D	185 mm

	Installation length m	Order no.
IPHa 3-PP	1	1008602
IPHa 3-PP	2	1008603

Other materials available on request.

FKM = Fluorine Rubber

Accessories for Fitting Type IPHa 3

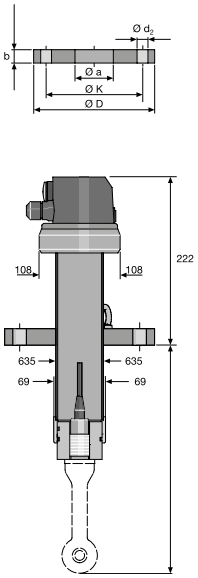
	Order no.
Immersion pipe mounting for IPHa 3-PP	1008625
Clamped threaded connector with fixed flange DN 65 according to DIN 2642 for IPHa 3-PP	1008627
Clamped threaded connector for welding connection for IPHa 3-PP	1008629
Protective (weatherproofed) cover for assembly head for IPHa 3-PP	1008631
Water-retaining basin for IPHa 3-PP	1008633

Weatherproof Cover for In-line Probe Fitting Type IMA-ICT 1

For use of immersion fitting IMA- ICT 1.

	Order no.
Weatherproof cover PP	1023368

Immersion Assembly Type IMA-ICT 2



To hold one inductive conductivity sensor of type ICT 2.

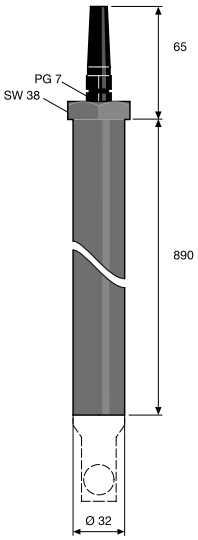
Material	Fitting: Stainless steel 1.4404 Seal: FKM
Max. temperature	125 °C
Max. pressure	10 bar
Installation length	1 m
Immersion lance diameter	70 mm
Flange	Stainless steel flange DN 80 PN 16

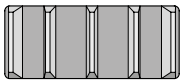
Dimensions Table: Flange

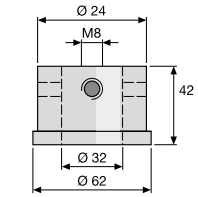
Flange	DN 80/PN 16
Ø D	200 mm
Ø K	160 mm
Ø d_2	8 x 18 mm
b	20 mm
Ø a	63.5 mm
Screws	M 16

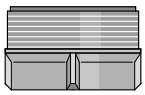
	Order no.
IMA-ICT 2	1023353

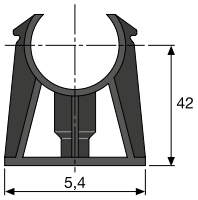
Adaptation to processes through flange installation in tank from top.

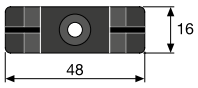












Immersion Assembly Type TA-LM

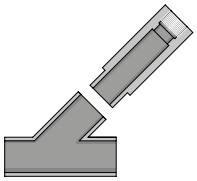
To hold **one** conductivity sensor of type LM and LMP with M 28 thread for side fasting with pipe clips (2 contained in the scope of supply) or with union nut/collar bush/screw-in part for fastening in a tank cover.

Union nut and screw-in part are to supplied by the customer (standard parts).

Material	PP
Max. temperature	70 °C
Enclosure rating	IP 65
Max. pressure	5.0 bar
Immersion lance diameter	32 mm
Pipe length	890 mm

	Length mm	Order no.
TA-LM	890	1020632
Headed bush d50	-	1020634
Extension tube 1000	910	1020633

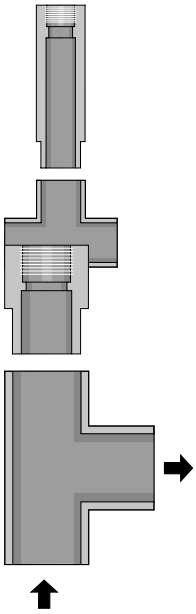
1.6.8 Installation Fittings / Adapters



Adapter Set (T-piece and Adapter)

For direct installation 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-joint DN 25	PVC	1001494
45° T-piece DN 20	PVC	1001491
45° T-piece DN 25	PVC	1001492



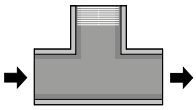
PVC Adapter Set for Type LM ... Sensors

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.

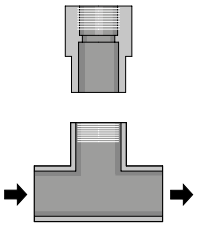
	Material	Order no.
90° T-joint DN 25	PVC	356410
Adapter DN 25 with 3/ 4" thread	PVC	356923
90° T-joint DN 25	PP	358674
Adapter with 3/4" thread	PP	356953



For LM(P) 01 Conductivity Sensors

The sensors are fitted in the outlet of the T-piece.

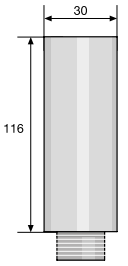
	Material	Order no.
90° T-piece DN 20 – 3/4"	PVC	356455
90° T-piece DN 20 – 3/4"	PP	356471



For LM(P) 1 Conductivity Sensors

The sensors are fitted in the outlet of the T-piece.

	Material	Order no.
Straight solvent union DN 25 – 3/4”	PVC	1020616
90° T-joint DN 25	PVC	356410



Adapter PP, PG 13.5

For direct installation 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.
Adapter DN 20	PP	R 1/2”	1001834
Adapter DN 25	PP	R 3/4”	1001835

Adapter, Stainless Steel, PG 13.5

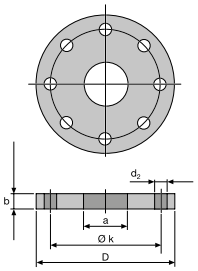
For direct installation of conductivity, Pt 100, pH or ORP sensors with PG 13.5 screw-in thread in, for example, pipework, tanks:

Max. temp: 180 °C (at atmospheric pressure)

FKM (fluorine rubber) sealing ring

	Material	Outer thread	Order no.
Adapter DN 20	SS	R 1/2”	1020737
Adapter DN 25	SS	R 3/4”	1020738

Installation Kit for Type ICT 2 Sensors



Fixed flange SS 316L	ANSI 2" 300 lbs	DN 50 PN 16
Hole circle	127	125
Screws	M 16	M 16
Thickness	22.2	18
Diameter	165.1	165

For direct fitting of the inductive conductivity sensor ICT 2 in pipework and tanks.

	Order no.
Installation kit for type ICT 2 sensors	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

Set-in Nozzle for T-piece (PP), Sensor Type ICT 1

For connection of the inductive conductivity sensor ICT 1 in PP T-piece.

	Order no.
Set-in nozzle external thread 2 1/4” DN 40 including FKM O-ring	1023371

T-piece Adapter (PP) for Sensor Type ICT 5

For installation of the inductive conductivity sensor ICT 5 in PP pipework.

	Order no.
T-piece, PP, 1 1/2” external thread - DN 40 including EPDM O-ring	1096349

Solvent Threaded Union (PVC) for Sensor Type ICT 5

For installation of the inductive conductivity sensor ICT 5 in PVC pipework.

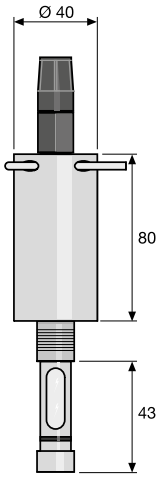
	Order no.
Solvent threaded union, PVC, 1 1/2" external thread DN40 incl. O-ring	1096348

Installation Adapter for Sensor ICT 8 in PVC Pipes

For installation of the inductive conductivity sensor ICT 8 in PVC pipework DN 50.

	Order no.
Installation adapter, PVC, DN 50 complete	1106570

Retractable Sensor Housing for pH, ORP Sensors WA-PH 1

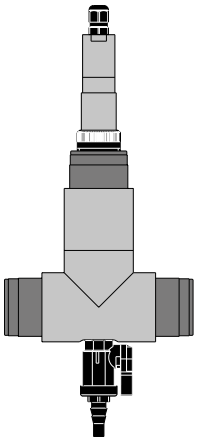


To hold **one** pH sensor with PG 13.5 screw-in thread and length of between 110-125 mm for fitting in the storage tank or in the flow. The sensor can be removed and fitted for calibration and cleaning without draining the liquid from the storage tank or without interrupting the process in the flow.

Material	PP
Max. temperature	70 °C
Max. pressure	5.0 bar
Thread	3/4"

	Order no.
WA-PH 1	1020631

Installation Fitting INLI for Chlorine Sensor CLO



The fitting permits the installation of the sensor for free chlorine types CLO (order no. 1131658, 1131662, 1131644) and the sensor for conductivity type CCT 1-mA (order no. 1081545) for operation in the process line (G 1") or in the bypass to the process line. Use either with a free outlet or return 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.

Max. temperature	70 °C (at 2 bar)
Max. pressure	7 bar (at 40 °C)
Flow for operation of the sensor CLO	400 - 800 l/h
Material	
T-piece and fittings	PP
O-ring	EPDM
Sample valve	PVDF/FPM
Stopcock	PVDF/FPM
Reducer	Stainless steel 1.4571
Connectors	
Sensor	G 1"
Sample valve	G 1/4"
Hose on sample valve	6 x 4 mm
Sample water line	G 1"

	Order no.
Installation fitting for chlorine sensor CLO	1047238

Accessories

	Order no.
Stopcock	1048213

Spare Parts

	Order no.
Sampling cock	1047266

Adapter for the Dissolved Oxygen Sensor Type DO 3-mA-20 ppm



The adapter, DN 32, PVC, is a spare part for the dissolved oxygen sensor type DO 3-mA-20 ppm. One side of the adapter has an Rp1" thread for connecting the sensor. The other side of the adapter has a glued connector for connecting to a standard PVC pipe, DN 32 (supplied by the customer) via a 45° angle (order no. 356335).

	Order no.
Reduction nipple, PVC-U, metric RP1"	356924

45° Bracket for the Dissolved Oxygen Sensor Type DO 3-mA-20 ppm



The 45° angle, d 40-DN 32, PVC, is a spare part for the dissolved oxygen sensor type DO 3-mA-20 ppm. One side is connected (bonded) to a standard PVC pipe, DN 32 (supplied by the customer). The other side of the angle is connected to the sensor adapter (Order no. 356924) (bonded).

	Order no.
Angle 45° 21.15.01 d40/ DN 32, PVC	356335

2.1 Measuring and Control Units DULCOMETER

2.1.1 Overview of Controllers DULCOMETER

DULCOMETER controllers provide maximum process reliability with a comprehensive range of uses. Different measured variables can be precisely determined. Depending on the application, the control action of the DULCOMETER controllers is precisely adapted to the respective requirements. Different designs enable versatile use.

The advantages at a glance:

- Excellent measuring reliability, for example by means of symmetrical input with pH/ORP
- Excellent measuring precision, for example by means of high-ohmic input with pH/ORP
- Minimal susceptibility to interference, for example by AC voltage interference suppression
- Two-wire system for measurements not prone to interference
- Versatile use thanks to the many options and different designs

Function	diaLog C	diaLog X	DACb	Compact	D1Cb/D1Cc
Measured variables					
pH / ORP	+	+	+	+	+
Turbidity (digital)	+				
Chlorine	+	+	+	+	+
Chlorine dioxide	+	+	+		+
Chlorite	+	+	+		+
Bromine	+	+	+		+
Conductivity conductive	+	+	+	+	
Conductivity inductive	+			+	
Conductivity via mA	+	+	+		+
Peracetic acid	+	+	+		+
Hydrogen peroxide	+	+	+		+
Ozone	+	+	+		+
Dissolved oxygen	+	+	+		+
Fluoride	+	+	+		+
Ion-selective sensors	+	+	+		
0/4...20 mA standard signal general measured variables	+	+	+		+
Power supply					
90 - 253V~	+	+	+	+	+
24 V DC			+		
Mounting type, degree of protection					
Wall mounting IP 65					+
Wall and pillar assembly (combined housing) IP 66 / IP 67	+	+	+	+	
Control cabinet mounting IP 54	1/4 DIN		1/4 DIN	1/2 DIN	1/4 DIN
Measurement					
Number of measuring channels	1	up to 16 (with extension)	2/3	1	1
Sensor monitoring for pH	+	+	+	+	d1Cb only
Temperature compensation for pH	+	+	+	+	+
Temperature compensation for conductivity	+	+	+	+	
pH compensation for chlorine	manual	+	+		
Control					
PID controller	+	+	+	+	+
1-side controller (e.g. for pH acid or alkali)	+	+	+	+	
2-sided controller (e.g. for pH acid and alkali)	+	+	+		+

Function	diaLog C	diaLog X	DACb	Compact	D1Cb/D1Cc
Control inputs					
Digital control inputs	+, 2	up to 24 (with extension)	+, 4/7	+, 1	+, 1
Control outputs					
Dosing pump control via pulse frequency	+, 2	to 12 (with extension)	+, 2/4	+	+, 2
Control of solenoid valve/motor-driven metering pump	+	+	+	+	+
Processing of disturbance variables Flow via mA		+	+		
Disturbance variable processing flow via frequency (e.g. from contact water meter)	+	+	+		
Dosing time monitoring and control variable switch-off	+	+	+	+	+
Output relay configurable as limit value relay	+, 1	to 9 (with extension)	+, 2	+, 1	+, 2
Cycle timer		+	+, 2		+, 2
Real-time timer		+	+, 2		
Outputs					
Analogue output 0/4...20 mA	+, 1	+ (configurable)	+, 2/3	+, 1	+, 1
Special functions					
Data logger	+	+	+		
Web server via LAN		+	+		
Parameter set switching via timer			+		
Parameter set switching via contact	+		+		
PROFIBUS® DP		+ (gateway)	+		
PROFINET		+ (gateway)	+		
Modbus RTU	+	+	+		
LTE mobile radio module for connection to DULCONNEX		+	+		
Subsequent function extension via activation code		freely parameterizable	+		+
Operating hours counter	+	+	+		+

2.1 Measuring and Control Units DULCOMETER

2.1.2 Survey of Applications in Measuring and Control Technology

Company name	. . . . .	Cust. no. . . . .
Address:	. . . . .	
Contact:	. . . . .	
Phone:	. . . . .	E-mail: . . . . .
Industrial segment/sector:	. . . . .	
Description of the application:	. . . . .	
Is there an analysis of the measuring solution?	□ yes, there is	□ no

Required measuring parameters:

Temperature (min.):	max.:	typically: . . . . .
Pressure (min.):	max.:	typically: . . . . .
pH value (min.):	max.:	typically: . . . . .
ORP value (min.):	max.:	typically: . . . . .
Conductivity of the solution (approx.):	. . . . . µS/cm	. . . . . mS/cm
Does the solution contain fluoride (F-)? If so, concentration:	. . . . . mg/l	. . . . . g/l
Clear or turbid solution?	□ clear	□ turbid

Does the solution contain solids? If so, which / how many: . . . . . .

Other comments

. . . . . .
. . . . . .
. . . . . .

2.2.1 Controller DULCOMETER diaLog C

Two paths, one goal: precision. Flexible and powerful measurement and control.

NEW

The DULCOMETER diaLog C sets new standards in measuring and control technology. Whether as a transmitter or 2-side controller (PID) with one channel - it is ideal for use in industrial water treatment. Thanks to its intuitive operation and digital networking, it is smartly integrated into your processes.



The DULCOMETER diaLog C can be used flexibly - both as a transmitter and as a single-channel 2-sided controller (PID). It can control the input measured variable by raising and lowering it to a setpoint in both directions.

Two pulse frequency outputs enable the simultaneous control of two metering pumps - which significantly increases flexibility and efficiency in metering, particularly advantageous in complex applications.

An interference variable - such as the flow - can be added or multiplicatively incorporated into the control via a digital input. For example, for pH control in flow neutralization systems. In this way, the controller reacts dynamically to external influences and adjusts the dosing accordingly.

The integrated output relay can be used flexibly as an alarm, limit switch or for the control of motor-driven metering pumps or solenoid valves and offers full control.

The DULCOMETER diaLog C takes the influence of temperature on the measurement into account - either automatically via a temperature sensor or manually by specifying a fixed value. This is particularly important for measured variables that are highly temperature-dependent.

The multilingual menu navigation is clearly structured and easy to understand. This makes commissioning and operation easy even without prior technical knowledge - ideal for changing users. The pH calibration can also be carried out conveniently via a wizard.

Your Benefits

- Precise control of a measured variable in both directions
- Flexibility and efficiency in metering through control of two metering pumps
- Stable processes even under variable conditions thanks to intelligent disturbance variable processing
- Safety and automation options thanks to versatile output relay
- Intuitive operation - without any previous knowledge thanks to clearly structured, multilingual menu navigation
- Convenient and time-saving configuration, data transmission and remote maintenance thanks to versatile communication options

Technical Details

- 1-channel 2-side controller
- Wall-mounted and control panel installation possible
- Intuitive operation, keypad, multi-color LED display
- 1 mV/temperature input (measuring module), optional
- 1 serial input (measuring module), optional
- 1 mA input (measuring module), optional
- 2 digital inputs
- 2 outputs (pulse frequency)
- 1 output relay/alarm relay
- 1 analogue output 0/4..20 mA

Field of Application

- Measurement of turbidity parameters with the DULCOEYE LT low turbidity sensor
- Measurement and control of water parameters in treatment plants for industrial and process water
- Monitoring individual water parameters of drinking water
- Measurement and control of hygiene parameters
- Universal individual measurement and control of all common ProMinent measured variables

2.2 Controller DULCOMETER diaLog C

Technical Data

Inputs and outputs	**Inputs** Sensor input max. 2 W 2 x contact input 12 V / 50 A, galvanically isolated **Outputs** Power relay 24 V DC ... 230 V AC, galvanically isolated Current output 4 ... 20 mA, galvanically isolated 2 x Optomos output max. 60 V, 2 A, 0.25 W, galvanically isolated Digital output for sensor bypass fitting BAMa 5 V / 25 mA, not galvanically isolated 1 x kV ESD (HBM)
Storage temperature	-20…70 °C
Relative humidity	max. 90 %
Enclosure rating	Wall and pillar assembly (combined housing) IP 66 / IP 67 Control cabinet assembly IP 54, 1/4 DIN
Operating temperature	-10…60 °C
Overvoltage category	Category II
Sound pressure level max.	27 dB(A)
Electrical Connection	100 – 240 V, 50/60 Hz
Power uptake	14 W
Communication interface	Modbus RTU

2.2 Controller DULCOMETER diaLog C

2.2.2 Identity code ordering system diaLog C

DCCb	Regional design											
	EU	Europe										
	US	North America										
		Type of mounting										
		W	Wall/pipe mounting IP66/IP67									
		S	Panel mounting IP54									
			Version									
			00	With ProMinent logo								
			01	without ProMinent logo								
				Operating voltage								
				6	100 - 240 V 50/60 Hz							
					Measured variable							
					CL	amperometric Sensors (mA signal)						
					PR	pH/ORP						
						Connection of the measured variables						
						0	internal to terminal					
							Communication interface 1					
							0	without				
							A	Modbus RTU (Slave)				
							C	CAN				
							D	DULCONNEX				
								Communication interface 2				
								0	without			
								B	Bluetooth			
									Data logger			
									0	No data logger		
									1	With data logger		
										Approvals		
										00	not relevant	
										01	CE	
										14	CE + UKCA	
											Certificates	
											0	None
											1	Calibration certificate
												Documentation language
												XX No documentation
												BG Bulgarian
												CS Czech
												DA Danish
												DE German
												EL Greek
												EN English
												ES Spanish
												ET Estonian
												FI Finnish
												FR French
												HR Croatian
												HU Hungarian
												IT Italian
												JP Japanese
												KO Korean
												LT Lithuanian
												LV Latvian
												NL Dutch
												PL Polish
												PT Portuguese
												RO Romanian
												RU Russian
												SL Slovakian
												SL Slovenian
												SV Swedish
												TH Thai
												TR Turkish
												ZH Chinese

2.3 Controller DULCOMETER diaLog X

2.3.1 Controller DULCOMETER diaLog X

From small to large - extremely flexible for all water treatment systems

The DULCOMETER diaLog X multi-parameter controller ensures that complex water treatment systems are operated as efficiently as possible. The controller is highly flexible and suitable for many sensor parameters.



Application-specific software modules are available for the DULCOMETER diaLog X to make configuration to the process as simple and precise as possible, without the need for programming. Using freely configurable function blocks, the DULCOMETER diaLog X can map almost any customer application.

The controller is scalable and manages several systems simultaneously and decentrally. The combination of main and satellite unit increases flexibility. The main unit can be extended by up to two satellite units. This makes the DULCOMETER diaLog X suitable for almost all customer applications in water treatment, even on a large scale.

The system can be conveniently controlled remotely thanks to the wide range of communication options. A customisable web server enables easy management, tracking and visualisation of data, even remotely by DULCONNEX.

DULCONNEX

Your Benefits

- Excellent flexibility thanks to modular construction and easily extendible IO modules (input/output), allowing more sensors and pumps to be connected.
- Up to two satellite units can be added for additional inputs and outputs, allowing more sensors and pumps to be connected.
- Intuitive operation via the HMI (Human-Machine Interface) thanks to a clearly legible industrial display and robust keys for standard commands, such as calibration and monitoring.
- Simple configuration of process settings as well as monitoring and visualisation of process data via a web server with freely configurable and preconfigured software modules.
- Extensive overview and control of processes, e.g. cooling tower processes: All process data and alarms can be communicated to the process control system via fieldbuses such as Modbus RTU.
- Advanced communication options: Various network protocols such as FTP or MQTT enable remote access and data management via Wi-Fi and LAN (Ethernet).

Technical Details

Extensive inputs and outputs

- Up to 24 flexible sensor inputs and mA outputs (8 per device), e.g. CTFS sensor, linear polarization resistance (LPR) corrosion sensor
- Up to 30 output relays and pulse outputs (10 per device) for controlling pumps and other actuators
- Up to 24 digital inputs (8 per device) for the control of level switches, water meters and remote switches

Communication options

- Built-in Modbus RTU and via gateways (BACnet, Modbus TCP, PROFINET)
- Web interface via Wi-Fi and Ethernet, FTP server (others on request). The client interface is an intuitive remote control via a Wi-Fi or network connection to your PC or smartphone, e.g. for configuration settings or setpoint settings.
- Configurable and managed via DULCONNEX.

Technical Data

Measured variables and measuring ranges	**Conductivity:** with the digital sensor CTFS via serial module D1: 0.1 - 10 mS/cm via conductivity module L3 depending on the sensor used (LMP, LFT): 50 µS/cm - 20 mS/cm via mA module AA with the inductive Conductivity Sensors ICT: 8 to 2 mS/cm, 20 mS/cm, 200 mS/cm **Connection type mV:** pH: 0.00 ... 14.00 ORP voltage: -1500 ... +1500 mV **Connection type mA (amperometric variables, measuring ranges according to the sensors:** Bromine Chlorine Chlorine dioxide Chlorite Fluoride dissolved Oxygen Ozone Peracetic Acid Hydrogen peroxide **Temperature:** via Pt 100/Pt 1000, measuring ranges 0 ... 150 °C
Inputs and outputs	**Inputs** 4 plug-in module slots per unit for 2-channel serial sensor input module 2-channel conductivity input module 2-channel mV input module 2-channel mV/mA input module 2-channel mA input module **Outputs** 2-channel mA output module 6 output relays as changeover contacts, of which 3 are potential-free and 3 are AC/DC 4 pulse frequency outputs for controlling metering pumps 8 digital control inputs for contact water meter, flow switch and pause for locking
Resolution	pH: 0.01 pH ORP: 1 mV Amperometric analysis (chlorine etc.): 0.001/0.01 ppm, 0.01 vol. %
Accuracy	0.3% based on the full-scale reading
Temperature compensation	Pt 100/Pt 1000 for pH
Control characteristic	P/PI/PID control
Electrical Connection	100 – 230 V, 50/60 Hz
Ambient temperature	-5 … 50 °C at max. 95% relative air humidity (non-condensing)
Tests and approvals	CE, MET, UK CA
Housing material	PC with flameproofing equipment
Dimensions	276 x 424 x 137 mm (H x W x D)
Enclosure rating	Wall-mounted: IP 67
Field bus connection	Modbus RTU, additional field buses via gateway

2.3 Controller DULCOMETER diaLog X

Description of modules

Module AA mA/mA sensor input (slot 1-4):

- 2 sensor inputs for connecting, e.g. chlorine sensors, such as CBR or pH transducer pHV1

Module V2 mV/mV temperature sensor input (slot 1-4):

- 2 sensor inputs for connecting pH and ORP sensors and temperature sensors Pt100/ Pt1000, e.g. of type PHER, RHER, PHEI, RHEIC, Pt100SE

Module H1 mA/mA output (slot 1-4):

- 2 electrically isolated 0/4-20 mA analogue outputs for the output of measured values or control variables

Module D1 serial sensor module for monitoring (slot 1-4):

- Module 2 digital sensor inputs for connecting CTFS or CRS corrosion sensors

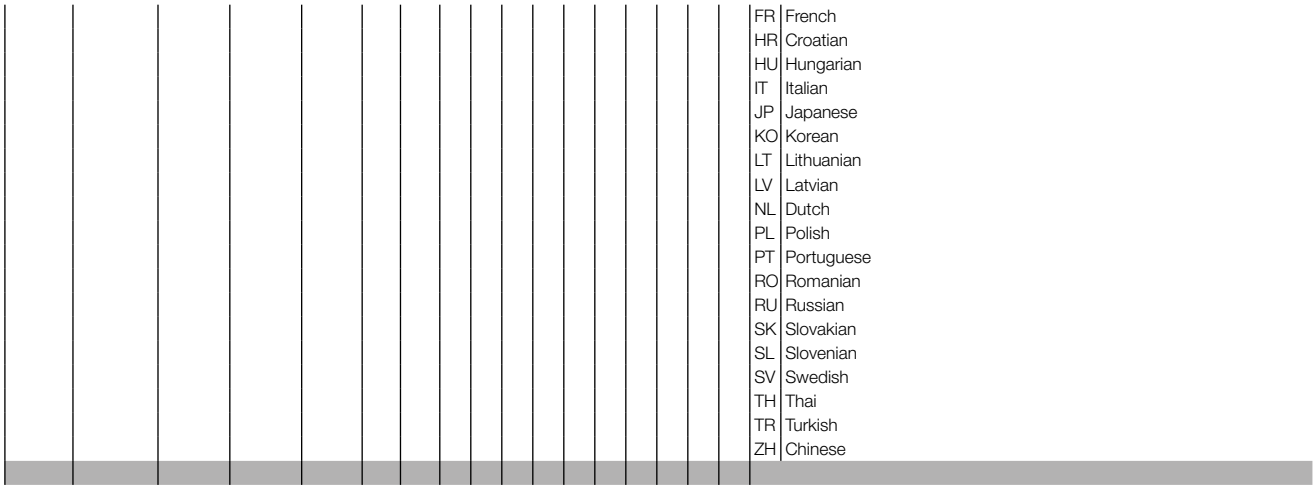
Module V1 mV/temperature + mA module (slot 1-4):

- 1 sensor input for pH or ORP sensor and temperature sensor Pt100/Pt1000
- 1 sensor input for connecting, e.g. chlorine sensors, such as CBR or pH transducer pHV1

2.3.2 Identity Code Ordering System for DULCOMETER diaLog X

AGIX	Regional design																					
	EU	Europe																				
	US	North America																				
		Type of mounting																				
		W	Wall mounting																			
			Version																			
			00	with ProMinent logo																		
				Function																		
				XX	General water treatment applications																	
				CT	Cooling tower																	
					Operating unit																	
					A	Master unit																
					B	Satellite (extension unit)																
						Supply voltage																
						6	100 - 230 V, 50/60 Hz															
							Communication interface															
							W0	LAN+WLAN, Modbus RTU														
								Extension slot 1														
								XX	None													
								D1	Serial sensor module for CFTS and CRS													
								L3	LF/temperature sensor input													
								V1	mV/temperature + mA module													
								H1	mA/mA output													
								AA	mA/mA sensor input													
								V2	mV/mV temperature sensor input													
									Extension slot 2													
									XX	None												
									D1	Serial sensor module for CFTS and CRS												
									L3	LF/temperature sensor input												
									V1	mV/temperature + mA module												
									H1	mA/mA output												
									AA	mA/mA sensor input												
									V2	mV/mV temperature sensor input												
										Extension slot 3												
										XX	None											
										D1	Serial sensor module for CFTS and CRS											
										L3	LF/temperature sensor input											
										V1	mV/temperature + mA module											
										H1	mA/mA output											
										AA	mA/mA sensor input											
										V2	mV/mV temperature sensor input											
											Extension slot 4											
											XX	None										
											D1	Serial sensor module for CFTS and CRS										
											L3	LF/temperature sensor input										
											V1	mV/temperature + mA module										
											H1	mA/mA output										
											AA	mA/mA sensor input										
											V2	mV/mV temperature sensor input										
												Pump activation (P/V)										
												0	Relay without presetting									
													Pre-wired outputs									
													0	None								
														Corrosion inhibitor metering outputs								
														0	None							
															Biocide outputs							
															0	None						
																Approvals						
																01	CE					
																07	MET (USA)					
																08	CE + MET (EU)					
																09	CE + EAC (Russia)					
																14	UKCA (UK)					
																	Documentation language					
																	XX	No documentation				
																	BG	Bulgarian				
																	CS	Czech				
																	DA	Danish				
																	DE	German				
																	EL	Greek				
																	EN	English				
																	ES	Spanish				
																	ET	Estonian				
																	FI	Finnish				

2.3 Controller DULCOMETER diaLog X



FR	French
HR	Croatian
HU	Hungarian
IT	Italian
JP	Japanese
KO	Korean
LT	Lithuanian
LV	Latvian
NL	Dutch
PL	Polish
PT	Portuguese
RO	Romanian
RU	Russian
SK	Slovakian
SL	Slovenian
SV	Swedish
TH	Thai
TR	Turkish
ZH	Chinese

2.4 Controller DULCOMETER diaLog DACb

2.4.1 Controller DULCOMETER diaLog DACb

Water parameter analysis made easy – with the DULCOMETER diaLog DACb

Do you wish for a simple controller for water analysis? One that is easy to operate and with which you can freely select between all common measured variables per channel? There is one: our all-rounder DULCOMETER diaLog DACb! What is more, it is Ethernet-/LAN-capable and can be ideally integrated into existing networks.



The controller DULCOMETER diaLog DACb is our compact all-rounder for water analysis. With its specially designed functionalities, e.g. processing of interference variables and switchover of control parameters, it closes the control circuit between DULCOTEST sensors and ProMinent metering pumps. The measuring and control channels of the DULCOMETER diaLog DACb can be individually configured to meet customer requirements. Everything that you need for the reliable treatment of industrial and process water, drinking water as well as swimming pool water.

Your Benefits

- Simple operation thanks to a clearly arranged display
- More for your money: two measuring and control channels now in the basic configuration
- Versatile use: all common measured variables can be set per channel and subsequently altered
- Control from anywhere: LAN-capable and convenient remote access via integrated web server
- Maximum flexibility: individually adjustable to different operating statuses, e.g. day-night mode
- Excellent process reliability: avoidance of incorrect metering through time-based monitoring of control variables
- Global application options: 24 operating languages can be selected and changed
- Minimal time and effort: effortless duplication of device settings
- Precise monitoring and documentation: event, calibration and measured data logger with easy-to-access SD memory card
- Optimum communication: integration into customer networks by means of different fieldbus systems (PROFIBUS® DP, Modbus RTU)
- Connection to DULCONNEX, ProMinent's cloud-based IIoT solution, via an internal LTE mobile phone module and the CAN bus gateway. An optional fieldbus can also still be used

Technical Details

- Measured variables: pH, ORP, chlorine, chlorine dioxide, chlorite, bromine, conductivity, peracetic acid, hydrogen peroxide, ozone, dissolved oxygen and fluoride
- Installation, degree of protection: Combination housing (wall mounting, control panel mounting, pillar assembly) IP 67 and IP 66
- Control: three measuring and control channels, each with independent monodirectional PID controller (optional: two bidirectional PID controllers)
- 24 V DC protective low voltage supply e.g. by means of solar system or in the wet area of waterworks
- Temperature compensation for pH and for chlorine dioxide process sensor CDP, pH compensation for chlorine
- Digital inputs for the processing of control signals, e.g. of sample water limit contacts, remote stop control and to monitor the liquid levels in chemical storage tanks
- Control outputs for electronically controlled metering pumps and solenoid valves
- Interference variable processing: simple control of water parameters in flowing water by processing the flow in the control algorithm
- Adaptation of the controller setpoint to changed process conditions is possible via remote control by means of the mA signal of a PLC or with more stringent requirements via the field bus option

Field of Application

- Measurement and control of water parameters in industrial and process water treatment plants
- Monitoring of water parameters for potable water
- Measurement of pH value and disinfection parameters in the food and beverage industry
- Measurement and control of hygiene parameters in swimming pools
- Monitoring of chlorine dioxide concentration in systems for legionella control and prevention, for example in schools, hotels or hospitals
- Measurement of disinfection parameters of irrigation and sprinkler irrigation water in horticulture

2.4 Controller DULCOMETER diaLog DACb

Technical Data

Measured variables and measuring ranges	**Connection type mV:** pH: 0.00 ... 14.00 ORP potential: -1500 ... +1500 mV **Type of connection mA (amperometric measured variables, measuring ranges corresponding to sensors):** Chlorine Chlorine dioxide Chlorite Bromine Ozone Hydrogen peroxide (PER 1 and PEROX H-3E) Hydrogen peroxide (PEROX H2.10 P with PEROX transducer V2 order. no. 1047979) Peracetic acid Dissolved oxygen **Type of connection mA (potentiometic measured variables, measuring ranges corresponding to transmitters):** pH ORP potential **Fluoride:** via module VA and function upgrade package 3 and 4 **Conductivity mA** via sensor CCT 1-mA-20 mS/cm **Temperature:** via Pt 100/Pt 1000, measuring range 0 ... 150 °C
Resolution	pH: 0.01 ORP voltage: 1 mV temperature: 0.1 °C amperometric analysis (chlorine etc.): 0.001/0.01 ppm, 0.01 vol.%, 0.1 vol.%
Accuracy	0.3% based on the full-scale reading
Measurement input	pH/ORP (input resistance > 0.5 x 10^{12} Ω)
Temperature compensation	Pt 100/Pt 1000 for pH, chlorine dioxide (CDP) sensor and fluoride
Correction range temp.	0…100 °C
pH compensation range for chlorine	Sensor CLE 3 and CLE 3.1: 6.5 ... 8.5, sensor CBR: 6.5 ... 9.5
Disturbance signals	Flow via 0/4 … 20 mA signal or contact water meter, 1 - 500 Hz. The multiplicative interference variable can influence all channels, while the additive interference variable only influences one channel.
Control characteristic	P/PID control
Control	2 or 3 bidirectional controls
Analogue outputs	2 (3) x 0/4 ... 20 mA electrically isolated, max. load 450 Ω, range and assignment (measured, correction, control variable) can be set
Control outputs	2 (4) pulse frequency outputs for controlling metering pumps 2 relays (limit value or pulse length control)
Alarm relay	250 V ~3 A, 700 VA contact type, changeover
Digital control inputs	4 (7) 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 – 230 V, 50/60 Hz, 25 VA, optional 24 V DC
Field bus connection	PROFIBUS® DP, Modbus RTU, PROFINET
Ambient temperature	0 ... 50 °C (for use indoors or with a protective enclosure)
Enclosure rating	Wall-mounted: IP 66 and IP 67 (NEMA 4X) Mounted in control cabinet: IP 54 for control cabinet door
Tests and approvals	CE and MET (corresponding to UL as per IEC 61010)
Housing material	PC with flameproofing equipment
Dimensions	250 x 220 x 122 mm (WxHxD)
Weight	1.3 kg

Standard equipment with basic measured variable

- PID controller with pulse frequency-based metering pump control for 2 metering pumps.
- 2 analogue outputs for measured value, correction value or control variable (depending on the optional equipment).
- 4 digital inputs for sample water fault detection, level switch, pause and parameter switch-over.
- 2 output relays can be programmed either as output for limit value, cycle timer, real-time timer or 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.
- 24 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.
- Device parametrisation is saved and transferred on an SD card.
- Calibration and event data logger (without SD card, data is saved in the controller).
- Interference variable processing (flow) via frequency (contact water meter).
- Subsequent upgrade of the software function by means of an activation key or firmware update.

Description of the possible measured variables as basic measured variables:

Module VA mV/temperature + mA sensor input:

- 1 sensor input for pH or ORP sensor and temperature sensor Pt100/Pt1000
- 1 sensor input for connecting, e.g. chlorine sensors, such as CBR or pH transducer pHV1 and fluoride including interference variable or pH compensation for chlorine.

Module AA mA/mA sensor input:

- 2 sensor inputs for connecting, e.g. chlorine sensors, such as CBR or pH transducer pHV1, including interference variable or pH compensation for chlorine.

Module VV mV/mV temperature sensor input:

- 2 sensor inputs for connecting pH and ORP sensors and temperature sensors Pt100/Pt1000, e.g. of type PHER, RHER, PHEI, RHEIC, Pt100SE

Module L3 conductivity temperature sensor input:

- 2 sensor inputs for connecting conductive conductivity sensors and temperature sensors Pt100/Pt1000, e.g. of type LFT, LMP

Optional equipment for third pH measuring channel

Package 2

- Third measuring and control variable pH via mV or mA with or pH compensation for chlorine without external setpoint specification via analogue signal for channel 1 without flow interference variable via mA for channel 1
- Third analogue output.
- Three additional digital inputs, e.g. for level monitoring, pause and sample water alarm.
- Control two additional metering pumps.

Package 3

- Third complete measuring and control channel, any measured variable, with PID controller.
- Third analogue output for measured value, correction value or control variable (depending on the optional equipment).
- Three additional digital inputs, e.g. for level monitoring, pause and sample water alarm.
- Temperature compensation of the pH, chlorine dioxide (CDP) and fluoride measurement.

Package 4

- Combination of packages 2 and 3 (only one channel for amperometric sensors is available with the mA interference variable).

Communication options

- Measurement data logger with SD card.
- Visualisation of the measured data using a web server via LAN and PC/tablet PC and web browser.
- PROFIBUS DP, Profinet or Modbus RTU.

Hardware upgrade

- Protective RC circuit for output relay: Protects the output relay if inductive loads are to be switched (e.g. solenoid valves or motors). Not with 24 V DC electrical connector.

2.4 Controller DULCOMETER diaLog DACb

A complete measuring station comprises:

- Transmitter/controller DACb (see identity code)
- Fitting: BAMa, DGMa..., DLG III ..., immersion fitting
- pH sensor (depending on identity code)
- ORP sensor (depending on identity code)
- 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 fittings, see page → 150; pH sensors with SN6 plug-in head or VARIO Pin, see page → 60; ORP sensors with fixed cable, see page → 97; sensors for chlorine, see page → 14; 4 … 20 mA transmitter (two-wire system), see page → 251; sensor accessories, see page → 135)

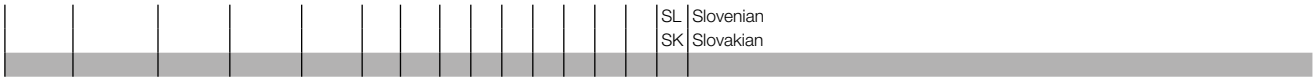
Accessories for Controller DULCOMETER diaLog DACb

	Order no.
Cable combination, coaxial, Ø 5 mm 0.8 m - SN6 - pre-assembled	1024105
Cable combination, coaxial, Ø 5 mm 2 m - SN6 - pre-assembled	1024106
Cable combination, coaxial, Ø 5 mm 5 m - SN6 - pre-assembled	1024107
SN6 coaxial connector, retrofit component, D1Cb, DAC, DCCa	1036885
Fitting kit for DAC control panel installation	1041095
Retrofit kit DACa/DACb RC module	1075226
512 MB SD memory card, industrial	732483

2.4.2 Identity Code Ordering System for diaLog DACb, Wall Mounting IP 67

DACb	Type of mounting												
	W	Wall mounting											
	S	Control panel mounting											
		Version											
		00	With ProMinent logo										
			Operating voltage										
			4	24 V DC									
			6	100 - 230 V 50/60 Hz									
				Basic measured variables									
				VA	2 measuring and control channels, connector type mV/temperature + mA, e.g. for pH + chlorine sensors or pH + fluoride								
				AA	2 measuring and control channels, connector type mA + mA, e.g. for chlorine dioxide/chlorite sensors								
				VV	2 measuring and control channels, connector type mV/temperature + mV temperature, e.g. for pH + ORP or two pH sensors								
				L3	2 measuring and control channels, connector type: conductive conductivity and temperature via Pt100/Pt1000								
					Extended functions								
					0	None							
					2	Package 2: external setpoint specification via mA, all acting on channel 1, additionally: 2 pump outputs, 3 digital control inputs, 1 mA output								
					3	Package 3: third measured variable of your choice + control, additionally: 2 pump outputs, 3 digital control inputs, 1 mA output								
					4	Package 4: Combination of packages 2 and 3								
						Software default settings							
						0	No default						
							Connection of the measured variables						
							0	All sensor inputs via terminal					
							1	Max. 2 mV inputs via SN 6 coaxial connector					
								Digital sensors/actuators					
								0	None				
								1	Sensor/actuator M12-CAN for DULCONNEX connection				
									Communication interface				
									0	None			
									A	Modbus RTU, terminal			
									B	Profibus DPV1, terminal			
									D	LTE mobile phone module for connection to DULCONNEX			
									E	LAN with web server, connection via M12 C coded			
									G	Profinet (2xM12)			
										Data logger			
										0	No data logger		
										1	With data logger		
											Hardware expansion		
											0	None	
											1	Protective RC circuit for switching inductive loads via the output relay, e.g. DF2a, solenoid valves	
												Approvals	
												01	CE (Standard)
												03	CE + EAC
												07	MET (USA)
												08	CE + MET (Europe)
													Certificates
													0 None
													Documentation language
													00 No document
													DE German
													EN English
													ES Spanish
													FR French
													BG Bulgarian
													CS Czech
													DA Danish
													SV Swedish
													ET Estonian
													EL Greek
													FI Finnish
													HR Croatian
													HU Hungarian
													IT Italian
													JA Japanese
													KO Korean
													LT Lithuanian
													LV Latvian
													NL Dutch
													PL Polish
													PT Portuguese
													RO Romanian

2.4 Controller DULCOMETER diaLog DACb



2.4.3 Function Upgrade for Measuring and Control System diaLog DACb

Requirement:

Channel 3 must be available in the controller. Missing hardware can only be retrofitted in the factory.

Channel 3 can be enabled from either package 2 or package 3. The packages correspond to the ones also described in the identity code. The data logger function can always be enabled.

The enable code can only be used for the relevant controller with the specified serial number.

The enable code can be transmitted via email and is then entered via the controller keypad. The enabled function is then immediately available and need only be activated and parametrised.

The following information must be available to determine the enable code:

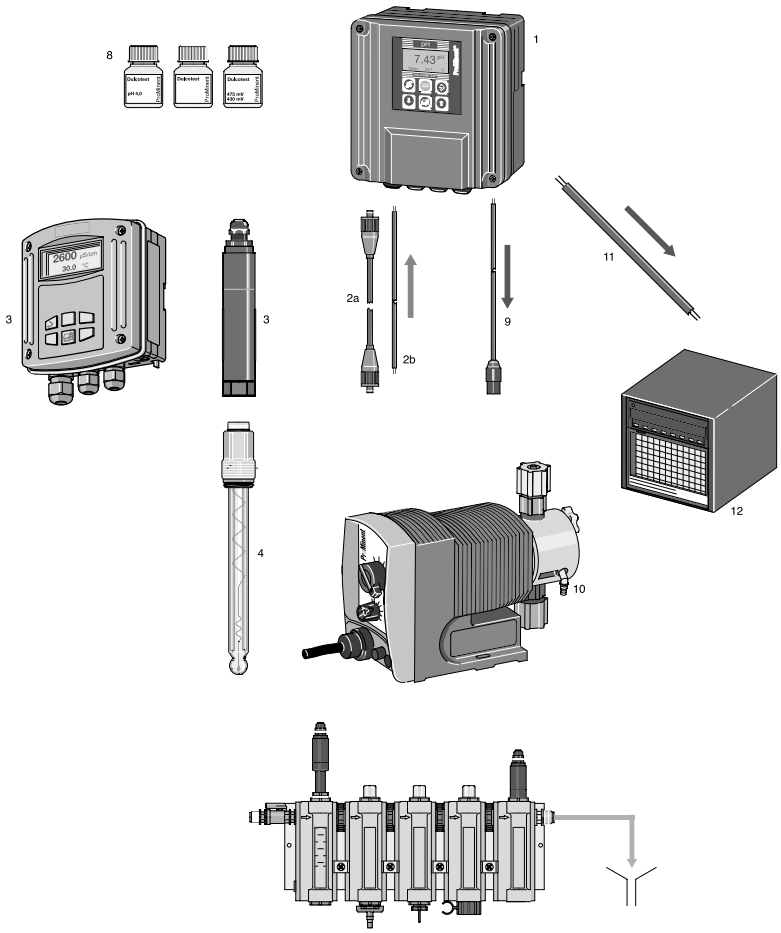
- The serial number of the controller in question (see operating menu under “Diagnostics”, “Device information”) and
- the desired upgrade package.

		Order no.
Upgrade: Package 2 to package 3	Based on package 2	1047874
Upgrade: Package 2 to package 4	Based on package 2	1047875
Upgrade: Package 3 to package 4	Based on package 3	1047876
Upgrade: Data logger	Based on 0=no data logger	1047877

2.4.4 DACb 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, wastewater and the food industry.

Measuring and Control Systems Consist of



1 Controller e.g. DACb
2a Measuring line e.g. coaxial cable for pH and ORP sensors Pt 100/, Pt 1000
2b 2-core measuring line for amperometric sensors with mA signal and transducer
3 4 ... 20 mA transducer (for two wire system), DMTa or pH V1
4 Sensor, e.g. pH single-rod sensor
5 Installation fitting e.g. sensor bypass armature modular BAMa
6 Stopcock for sample water line
7 Sample valve
8 Buffer solutions (pH/ORP)
9 Control cable (control of a metering pump)
10 Actuator e.g. beta/ X metering pump

Examples for:

1 Treatment of swimming pool water

2 Monitoring of potable water

3 Monitoring of waste water (pH neutralisation)

4 Applications in the food industry

5 Odour reduction applications (clarification plants)

2.4.5 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

Qty		Order no.
1	2-channel controller for pH and ORP diaLog DACb with data logger and protective RC circuit	DACBW006VV0000011010EN
1	pH Sensor PHES 112 SE	150702
2	Cable combination, coaxial, Ø 5 mm 2 m - SN6 - pre-assembled	1024106
1	ORP Sensor RHES-Pt-SE	150703
1	Bypass fitting BAMa with two PG 13.5 modules and sensor adapter	BAMAEU222XXXF01X000001EN
4 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122

Benefits

- Simple operation, controller with plain text operator guidance in 24 languages
- Recording of measured data
- Automatically correct pH value and correct disinfectant concentration
- All products are selected to operate correctly with each other

Hotel swimming pool (public swimming pool) with measurement and control of the chlorine concentration and the pH value and measurement of the redox potential

Task and conditions of use

The pool water of a hotel swimming pool, frequently used by guests, is to be treated. Sulfuric acid is used to correct the pH and sodium-calcium hypochlorite is used as the disinfectant. The disinfectant is to be regulated by measuring the chlorine (a comparative calibration with a DPD 1 measurement should be carried out at regular intervals, likewise calibration of the pH sensor). An ORP measurement is to provide information about the disinfection effect. The measured values are to be recorded. The responsible caretaker would like to see the measured values and messages on his smartphone. To achieve this, a DACb is connected to an existing Wi-Fi network. Type DF2a peristaltic pumps are to be controlled. The sample water flow is to be monitored and, in the event of failure, the controller is to stop.

Components of the measuring/control station

Qty		Order no.
1	3-channel controller for pH, ORP and chlorine diaLog DACb with data logger, web interface and protective RC circuit	DACBW006VV3000E11010EN
1	pH Sensor PHES 112 SE	150702
1	Cable combination, coaxial, Ø 5 mm 2 m - SN6 - pre-assembled	1024106
1	ORP Sensor RHES-Pt-SE	150703
1	Sensor connection cable, coaxial 2 m, SN 6 pre-assembled	1005672
1	Sensor for free chlorine CBR 1-mA-2 ppm	1038015
1	Bypass fitting BAMa with two PG 13.5 modules and sensor adapter	BAMAEU222XXXF01X000001EN
8 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122

Benefits

- Simple operation, controller with plain text operator guidance in 24 languages
- View measured values and messages on a PC or smartphone
- Recording of measured data
- Automatically correct pH value and correct concentration of disinfectant
- All products are pre-selected to coordinate with each other

2.4 Controller DULCOMETER diaLog DACb

Private swimming pool with measurement of free chlorine and pH value

Task and conditions of use

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

Qty		Order no.
1	2-channel controller for pH and chlorine diaLog DACb with data logger	DACBW006VA0000011010EN
1	Chlorine sensor CLE 3-mA 2 ppm	792920
8 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122
1	pH Sensor PHES 112 SE	150702
1	Cable combination, coaxial, Ø 5 mm 2 m - SN6 - pre-assembled	1024106
1	Bypass fitting BAMa with one PG 13.5 module and one G 1" module and sensor adapter	BAMAEU2211XXF01X000001EN

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 matched

2.4.6 Application Examples, Potable Water Monitoring

Measurement and control of ozone in waterworks for pre-oxidation of the raw water

Tasks and applications

In the treatment of potable water in a waterworks a measuring and control station is needed at the pre-oxidation stage at the inlet to the waterworks 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

Qty		Order no.
1	2-channel controller for ozone diaLog DACb with data logger	DACBW006VA0000011010EN
1	Ozone sensor OZE 3-mA-2 ppm	792957
8 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122
1	Bypass fitting BAMa with a G 1" module and sensor adapter	BAMAEU22X1XXF01X000000EN

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 matched

Measurement and control of free chlorine with feedforward control in a waterworks

Task and conditions of use

A measuring and control system is needed for the ‘free chlorine’ disinfectant in the treatment of drinking water in a waterworks. Metering is largely proportional to the flow (MID 4...20 mA). However control should also be proportionately dependent on measured value to compensate for peaks in chlorine consumption, 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 the 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

Qty		Order no.
1	2-channel controller for chlorine diaLog DACb with data logger	DACBW006VA0000011010EN
1	Chlorine sensor CLE 3-mA-0.5 ppm	792927
8 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122
1	Bypass fitting BAMa with a G 1" module and sensor adapter	BAMAEU22X1XXF01X000000EN

2.4 Controller DULCOMETER diaLog DACb

Benefits

- Precise, self-regulating disinfection by a fully automated measuring and control system
- Flow-proportional control can be safeguarded by proportionate control dependent on measured value to combat peaks in consumption
- Reliable, safe operation thanks to alarm signalling in the event of limit violation 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 control measurement of chlorine

Task and conditions of use

The chlorine concentration in the outlet of a waterworks 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 measuring/control station

Qty		Order no.
1	2-channel controller for chlorine with interference variable processing diaLog DACb with data logger and PROFIBUS-DP	DACBW006VA0000B11010EN
1	Chlorine sensor CLE 3-mA-0.5 ppm	792927
8 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122
1	Bypass fitting BAMa with a G 1" module and sensor adapter	BAMAEU22X1XXF01X000000EN

Benefits

- Precise, self-regulating disinfection by a fully automated measuring and control system
- Flow-proportional control can be safeguarded by proportionate control dependent on measured value to combat peaks in consumption
- Reliable, safe operation thanks to alarm signalling in the event of limit violation 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

Task and conditions of use

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 magnetic 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 measuring/control station

Qty		Order no.
1	2-channel controller for chlorine dioxide diaLog DACb with data logger	DACBW006VA0000011010EN
1	Chlorine dioxide sensor CDE 2-mA-0.5 ppm	792930
8 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122
1	Bypass fitting BAMa with a G 1" module and sensor adapter	BAMAEU22X1XXF01X000000EN

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 matched

Legionella prevention in public buildings

Task and conditions of use

The chlorine dioxide and the chlorite concentration are to be monitored and recorded in the freshwater 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

Qty		Order no.
1	2-channel controller for chlorine dioxide and chlorite diaLog DACb with data logger	DACBW006AA0000011010EN
1	Chlorine dioxide sensor CDE 2-mA-0.5 ppm	792930
15 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122
1	Chlorite sensor CLT 1-mA-0.5 ppm	1021596
1	Bypass fitting BAMa with two G 1" modules and sensor adapter	BAMAEU22X2XXF01X000001EN

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 matched

Oxidation of well water with hydrogen peroxide

Task and conditions of use

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

Qty		Order no.
1	2-channel controller for hydrogen peroxide diaLog DACb with data logger	DACBW006VA0000011010EN
1	Hydrogen peroxide sensor PER 1-mA-2000 ppm	1022510
8 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122
1	Bypass fitting BAMa with one G 1" module and sensor adapter	BAMAEU22X1XXF01X000001EN

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 matched

2.4 Controller DULCOMETER diaLog DACb

2.4.7 Application Examples, Wastewater Monitoring

Neutralisation of the wastewater of an industrial plant (non-steady receipt of water)

Task and conditions of use

Turbid wastewater with a significantly fluctuating pH value and intermittent occurrence is to be neutralised in batch operation. The wastewater is pumped into an interim tank and is neutralised using acid and alkali. The pH value should be measured and regulated in a stirred batch storage 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 DACb 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 end position 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 is also recorded in the data logger. If a limit value transgression occurs, the shut-off valve closes automatically. A neutral zone is additionally defined in the controller. If the pH value comes within this neutral zone, no control takes place. There may be solids in the wastewater.

Components of the pH measuring/control station in the collection tank

Qty		Order no.
1	2-channel controller for pH and ORP diaLog DACb with data logger and protective RC circuit	DACBW006VV0000011010EN
1	Cable combination coaxial 5 m-SN6, shield connection	1024107
1	pH Sensor PHER 112 SE	1001586
1	Pt 100 SE temperature sensor	305063
1	Cable combination of control line 5 m SN6, open end (Pt 100, Pt 1000)	1003208
1	Immersion fitting with 3 sensor slots IPHa 3-PP	1008602
1	Cable combination coaxial 5 m - SN6 - pre-assembled	1008633

Components of the measuring/control station in the outlet

Qty		Order no.
1	pH Sensor PHER 112 SE	1001586
1	Cable combination coaxial 5 m-SN6, shield connection	1024107
1	Retractable process assembly WA-PH 1	1020631

Note: other sensors may also be used depending on the quality of the wastewater (see selection guide for pH sensors DULCOTEST)

With seriously contaminated wastewater with solid matter content

Qty		Order no.
1	pH Sensor PHEX 112 SE	305096

with clear wastewater

Qty		Order no.
1	pH Sensor PHEP 112 SE	150041

Benefits

- Simple operation, controller with plain text operator guidance in 24 languages
- Recording of all measured data and the opened or closed status of the shut-off valve
- pH limit value monitoring of drainage water
- pH control and final checking in a controller
- All products are selected to operate correctly with each other

Neutralisation of the wastewater of an industrial plant (continuous receipt of water)

Task and conditions of use

In an industrial plant, wastewater 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 sliding and retractable assembly in the pipework with which the pH value is adjusted. Further along the pipework the pH value is monitored once again as a final check.

The flow signal of the flow meter is evaluated as a multiplicative interference variable in the DACb 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. In the event of a similar control deviation (deviation of the actual value from the setpoint), for example, with a small flow, less acid or alkali is needed than with a larger flow. This information makes it easier for the controller to adhere to the setpoint. In the absence of this flow information, a PID controller alone could not perform such a task or could only perform it with great difficulty. What's more, a neutral zone is defined in the controller. If the pH value is within this neutral zone, no control takes place.

There may be solids in the wastewater.

The DACb controller data logger automatically records the pH values and temperatures of both pH measuring points. Any limit violations that may have occurred are also recorded in the data logger.

Components of the measuring/control station in the collection tank

Qty		Order no.
1	2-channel controller for 2 x pH and temperature diaLog DACb with data logger	DACBW006VV0000011010EN
1	pH Sensor PHER 112 SE	1001586
1	Cable combination coaxial 5 m-SN6, shield connection	1024107
1	Retractable process assembly WA-PH 1	1020631

Components of the measuring/control station in the outlet

Quantity		Order no.
1	pH Sensor PHER 112 SE	1001586
1	Cable combination coaxial 5 m-SN6, shield connection	1024107
1	Retractable process assembly WA-PH 1	1020631

Note: other sensors may also be used depending on the quality of the wastewater (see selection guide for pH sensors DULCOTEST)

With seriously contaminated wastewater with solid matter content

Quantity		Order no.
1	pH Sensor PHEX 112 SE	305096

With clear wastewater

Quantity		Order no.
1	pH Sensor PHEP 112 SE	150041

Benefits

- Simple operation, controller with plain text operator guidance in 24 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 wastewater
- pH control and final checking in a controller
- All products are selected to operate correctly with each other

2.4.8 Application Examples in the Food Industry

Bottler disinfection in the beverage industry

Task and conditions of use

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 DACb controller. From time to time the chlorine dioxide concentration must be increased.

An alternative parameter set can be activated in the DACb via a switch input. In this way, a switchover, regularly required, can be carried out smoothly without the need for continual adaptation of the setpoint in the controller menu.

The measured data is to be recorded.

Components of the measuring/control station

Qty		Order no.
1	2-channel controller for chlorine dioxide diaLog DACb with data logger	DACBW006VA0000011010EN
1	Chlorine dioxide sensor CDR 1-mA-2 ppm	1033393
10 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122
1	Bypass fitting BAMa with one G 1" module and sensor adapter	BAMAEU22X1XXF01X000001EN

Benefits

- Simple operation, controller with plain text operator guidance in 24 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

Task and conditions of use

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

Qty		Order no.
1	3-channel controller for the measurement and control of chlorine dioxide concentration and the measurement of the pH value and electrolytic conductivity, diaLog DACb, with data logger and web interface	DACBW006VA3000E10010EN
1	Chlorine dioxide sensor CDR 1-mA-2 ppm	1033393
5 m	Coaxial cable, Ø 5 mm, 10.0 m	305040
1	pH Sensor PHER 112 SE	1001586
1	Cable combination coaxial 5 m - SN6 - pre-assembled	1008633
1	Conductivity sensor CCT 1-mA-20 mS/cm	1081545
5 m	Cable type LKT 4 x 0.5 mm² and shield for connection of the CCT 1	723612
1	Bypass fitting BAMa with one module PG 13.5 and two modules G 1" and sensor adapter	BAMAEU2212XXF01X000000EN
5 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122

Benefits

- Simple operation, controller with plain text operator guidance in 24 languages
- Processing of the irrigation water flow signal as an interference variable
- Recording of all measured data
- All products are pre-selected to coordinate with each other

2.4.9 Odour Reduction Application Examples (Clarification Plants)

Exhaust air scrubbers, clarification plants or fragrance production

Task and conditions of use

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

Qty		Order no.
1	2-channel controller for pH and chlorine diaLog DACb with data logger	DACBW006VA0000011010EN
1	pH Sensor PHES 112 SE	150702
1	Sensor connection cable, coaxial 2 m, SN 6 pre-assembled	1005672
1	H_2O_2 sensor PEROX-H2.10 P	792976
1	PEROX transducer V2, measuring range switchable up to 20/200/2,000 mg/l	1034100
5 m	Two-wire measuring line 2 x 0.25 mm^2 Ø 4 mm	725122
1	Pt 100 SE temperature sensor	305063
1	Cable combination of control line 5 m SN6, open end (Pt 100, Pt 1000)	1003208
1	Reference electrode REFP-SE	1018458
1	DLG IV PVC	1005332
1	Polishing paste (90 g tube)	559810
1	Magnetic stirrer 100– 240 V	790915
1	Magnetic stirring rod 15x6 PTFE (magnetic “fish“)	790917
1	Photometer DT3B	1039317

Benefits

- Simple operation, controller with plain text operator guidance in 24 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

2.5 Controller DULCOMETER D1Cb/D1Cc

2.5.1 Controller DULCOMETER D1Cb/D1Cc

The water analysis workhorse

The controller DULCOMETER D1Cb/D1Cc can be used for control tasks in potable water treatment, wastewater 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 variables 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 Programmable Logic Controller. The mA output can optionally also be configured as an interference 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 20 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

- Measured variables: pH, ORP, chlorine, chlorine dioxide, chlorite, bromine, conductivity, peracetic acid, hydrogen peroxide, ozone, dissolved oxygen and fluoride
- Method of installation, degree of protection: D1Cb wall mounting IP 65, D1Cc control panel mounting IP 54, 1/4 DIN
- Measurement: 1 measuring channel, temperature compensation for pH
- Control: PID controller, bidirectional controller (e.g. with pH acid and alkali)
- Control inputs: 1 digital control input

Field of Application

- Measurement and control of water parameters in industrial and process water treatment plants
- Wastewater 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

Technical Data

Measuring range	**Connection type mV:** pH 0.00 … 14.00 ORP - 1000 … +1000 mV **Connection 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...2000 ppm Peracetic acid: 1...20/10...200/100...2000 mg/l Dissolved oxygen: 0.1...10/0.1...20 ppm pH: 0.00...14.00 ORP: 0...+1000 mV Conductivity: 0...20/200/1000 mS/cm via mA transducer Temperature: 0...100 °C via mA transducer
Resolution	pH: 0.01 pH ORP: 1 mV Amperometric analysis (chlorine etc.): 0.001/0.01 ppm, 0.01 vol. %
Accuracy	0.5% of the upper range value
Measurement input	pH/ORP (input resistance > 0.5 x 10^{12} Ω)
Correction variable	Temperature via Pt 100/Pt 1000
Min. temperature correction range	0 °C
Max. temperature correction range	100 °C
Control characteristic	P/PID control
Control	2-way 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
Control outputs	2 pulse frequency outputs for controlling the metering pump 2 relays (limit value or pulse length)
Alarm relay	250 V ~3 A, 700 VA contact type, changeover
Electrical Connection	100 – 230 V, 50/60 Hz, 15 VA
Ambient temperature	-5 … 50 °C
Enclosure rating	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

- Can be flexibly upgraded thanks to the option for activating functions at a later date by means of activation code (see D1Ub/D1Uc upgrade identity code)
- Equipped for the most important basic requirements in water treatment
- Illuminated graphic display
- Operator guidance through plain text menu available in 20 languages in the controller
- Automatic buffer detection for pH calibration

Identity code ordering system D1Ub, subsequent function upgrade for D1Cb, see page → 193

A complete measuring station comprises:

- Transmitter/controller D1Cb/D1Cc (see identity code)
- Fitting: BAMa, DGMa..., DLG III ..., immersion fitting
- pH sensor (depending on identity code)
- ORP sensor (depending on identity code)
- Chlorine, chlorine dioxide, chlorite, bromine, dissolved oxygen sensor
- Transducer for pH or ORP (depending on identity code)
- Sensor cable

Accessories for Controller DULCOMETER D1Cb/D1Cc

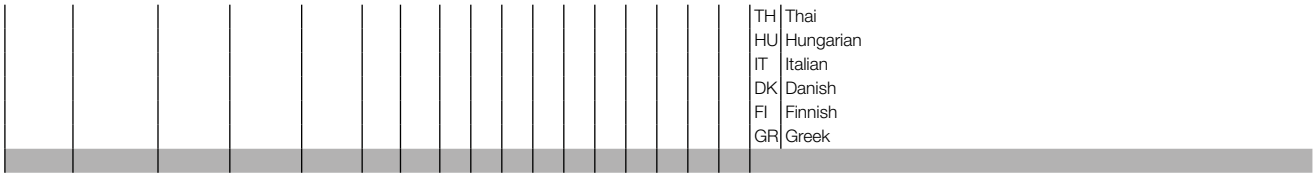
	Order no.
Cable combination, coaxial, Ø 5 mm 0.8 m - SN6 - pre-assembled *	1024105
Cable combination, coaxial, Ø 5 mm 2 m - SN6 - pre-assembled *	1024106
Cable combination, coaxial, Ø 5 mm 5 m - SN6 - pre-assembled *	1024107
SN6 coaxial connector, retrofit component, D1Cb, DAC, DCCa	1036885
Protective RC circuit retrofit kit for controller DULCOMETER D1Cb	1034238
Spare parts kit (frame, support brackets) for controllers DULCOMETER D1Cc	790130

* for connection where measured variable = 5

2.5.2 Identity Code Ordering System DULCOMETER D1Cb, Wall Mounting

| | | |

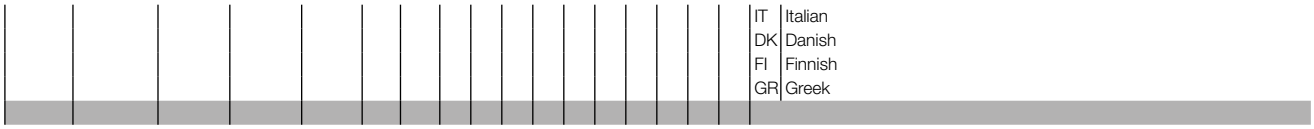
2.5 Controller DULCOMETER D1Cb/D1Cc



2.5.3 Identity Code Ordering System DULCOMETER D1Cc, Control Panel Mounting

| D1Cc | Type of mounting | | |

2.5 Controller DULCOMETER D1Cb/D1Cc



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.

	Order no.
Controller in basic setting D1CbW00601000U01000G0000	1036423

Subsequent activation of functions is possible at any time using an activation key.

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

2.5.4 Identity Code Ordering System D1Ub, Subsequent Function Extension for D1Cb

D1Ub	Default - measured variable								
	0	Universal (choice of measured variable upon commissioning)							
		Connection of measured variable							
		1	Standard signal 0/4-20 mA, all measured variables and mV input for pH/ORP (standard)						
			Correction variable						
			0	None					
			2	Temperature Pt100/Pt1000 via terminal (for pH and conductivity)					
			4	Manual temperature input (for pH and conductivity)					
				Control input					
				0	None				
				1	Pause control				
					Signal output				
					0	None			
					1	1 analogue signal output 0/4-20 mA			
						Power control			
						G	Alarm and 2 limit value relays or 2 timer relays		
						M	Alarm and 2 solenoid valve relays or 2 timer relays		
							Pump control		
							0	None	
							2	2 pumps via pulse frequency	
								Control characteristic	
								0	None
								1	P control
								2	PID control
									Language
									00 No default setting

2.5.5 Identity Code Ordering System D1Uc, Subsequent Function Extension for D1Cc

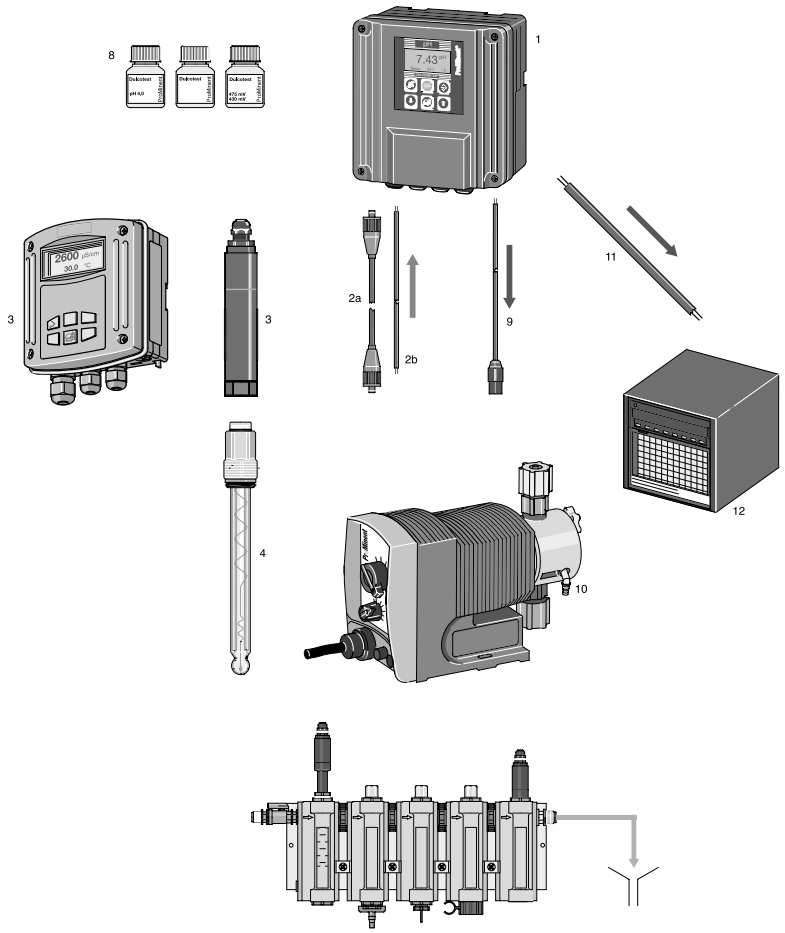
D1Uc	Software defaults								
	V	Software pre-set							
		Default - measured variable							
		0	Universal (choice of measured variable upon commissioning)						
			Connection of measured variable						
			1	Standard signal 0/4-20 mA, all measured variables and mV input for pH/ORP (standard)					
				Correction variable					
				0	None				
				2	Temperature Pt100/Pt1000 via terminal (for pH and conductivity)				
				4	Manual temperature input (for pH and conductivity)				
					Control input				
					0	None			
					1	Pause control			
						Signal output			
						0	None		
						1	1 analogue signal output 0/4-20 mA		
							Power control		
							G	Alarm and 2 limit value relays or 2 timer relays	
							M	Alarm and 2 solenoid valve relays or 2 timer relays	
								Pump control	
								0	None
								2	2 pumps via pulse frequency
									Control characteristic
									0 None
									1 P control
									2 PID control
									Language
									00 No default setting

2.5.6 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, wastewater and the food industry.

Measuring and Control Systems Consist of

1 Controller e.g. DACb
2a Measuring line e.g. coaxial cable for pH and ORP sensors Pt 100/, Pt 1000
2b 2-core measuring line for amperometric sensors with mA signal and transducer
3 4 ... 20 mA transducer (for two wire system), DMTa or pH V1
4 Sensor, e.g. pH single-rod sensor
5 Installation fitting e.g. sensor bypass armature modular BAMa
6 Stopcock for sample water line
7 Sample valve
8 Buffer solutions (pH/ORP)
9 Control cable (control of a metering pump)
10 Actuator e.g. beta/ X metering pump



Examples for:

1 Treatment of swimming pool water

2 Monitoring of drinking water

3 Monitoring of wastewater (pH neutralisation)

4 Application examples in the food industry

2.5.7 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 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

Qty		Order no.
1	1 channel controller D1Cb, pH	D1CBW00601010VP-5010M21EN
1	pH Sensor PHES 112 SE	150702
1	Cable combination, coaxial, Ø 5 mm 2 m - SN6 - pre-assembled	1024106
1	1 channel controller D1Cb, ORP	D1CBW00601010VR-5010M21EN
1	ORP Sensor RHES-Pt-SE	150703
1	Sensor connection cable, coaxial 2 m, SN 6 pre-assembled	1005672
1	Bypass fitting BAMa with two PG 13.5 modules and sensor adapter	BAMAEU222XXXF01X000001EN
4 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122

Benefits

- Simple operation, controller with plain text operator guidance in 20 languages
- Automatically correct pH value and correct disinfectant concentration
- All products are selected to operate correctly with each other

Private swimming pool with measurement and metering of acid and bromine

Task and conditions of use

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

Qty		Order no.
1	1 channel controller D1Cb, pH	D1CBW00601010VP-5010M21EN
1	pH Sensor PHES 112 SE	150702
1	Sensor connection cable, coaxial 2 m, SN 6 pre-assembled	1005672
1	1 channel controller D1Cb, bromine	D1CBW00601010VB-1010M21EN
1	Bromine sensor BCR 1-mA-10 ppm	1041698
6 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122
1	Bypass fitting BAMa with one PG 13.5 module and one G 1” module and sensor adapter	BAMAEU2211XXF01X000001EN

Benefits

- Simple operation, controller with plain text operator guidance in 20 languages
- Automatically correct pH value and correct disinfectant concentration
- All products are selected to operate correctly with each other

2.5 Controller DULCOMETER D1Cb/D1Cc

Private swimming pool with measurement of free chlorine and pH value

Task and conditions of use

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

Qty		Order no.
1	1 channel controller D1Cb, pH	D1CBW00601010VP-5010M21EN
1	pH Sensor PHES 112 SE	150702
1	Sensor connection cable, coaxial 2 m, SN 6 pre-assembled	1005672
1	1 channel controller D1Cb, chlorine	D1CBW00601010VC-5010M21EN
1	Chlorine sensor CLE 3-mA 2 ppm	792920
6 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122
1	Bypass fitting BAMa with one PG 13.5 module and one G 1” module and sensor adapter	BAMAEU2211XXF01X000001EN

Benefits

- Simple operation, controller with plain text operator guidance in 20 languages
- Automatically correct pH value and correct disinfectant concentration
- All products are selected to operate correctly with each other

2.5.8 Application Examples, Potable Water Monitoring

Waterworks with control measurement of chlorine

Task and conditions of use

The chlorine concentration in the outlet of a waterworks 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 measuring/control station

Qty		Order no.
1	1 channel controller D1Cb, chlorine	D1CBW00601010VD-1010G21EN
1	Chlorine sensor CLE 3-mA-0.5 ppm	792927
4 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122
1	Bypass fitting BAMa with one G 1" module and sensor adapter	BAMAEU22X1XXF01X000001EN

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 matched

Legionella prevention in public buildings

Task and conditions of use

The chlorine dioxide and the chlorite concentration are to be monitored and recorded in the freshwater 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

Qty		Order no.
1	1 channel controller D1Cb, chlorine dioxide	D1CBW00601010VD-1010M21EN
1	Chlorine dioxide sensor CDE 2-mA-0.5 ppm	792930
4 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122
1	1 channel controller D1Cb, chlorite	D1CBW00601010VI1010M21EN
1	Chlorite sensor CLT 1-mA-0.5 ppm	1021596
1	Bypass fitting BAMa with two G 1" modules and sensor adapter	BAMAEU22X2XXF01X000001EN

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 matched

Oxidation of well water with hydrogen peroxide

Task and conditions of use

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

Qty		Order no.
1	1 channel controller D1Cb, hydrogen peroxide	D1CBW00601010VH-1010G21EN
1	Hydrogen peroxide sensor PER 1-mA-2000 ppm	1022510
4 m	Two-wire measuring line 2 x 0.25 mm^2 Ø 4 mm	725122
1	Bypass fitting BAMa with one G 1" module and sensor adapter	BAMAEU22X1XXF01X000001EN

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 matched

2.5.9 Application Examples, Wastewater Monitoring

Neutralisation of the wastewater of an industrial plant

Task and conditions of use

In an industrial plant, wastewater 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 wastewater. The measured values are transferred via the 4-20 mA analogue signal.

Components of the pH measuring/control station in the collection tank

Qty		Order no.
1	1 channel controller D1Cb, pH	D1CBW00601010VP-5010M21EN
1	pH Sensor PHER 112 SE	1001586
1	Cable combination coaxial 5 m-SN6, shield connection	1024107
1	Pt 100 SE temperature sensor	305063
1	Cable combination of control line 5 m SN6, open end (Pt 100, Pt 1000)	1003208
1	Immersion fitting with 3 sensor slots IPHa 3-PP	1008602
1	Cable combination coaxial 5 m - SN6 - pre-assembled	1008633

Components of the measuring/control station in the outlet

Qty		Order no.
1	1 channel controller D1Cb, pH	D1CBW00601010VP-5010M21EN
1	pH Sensor PHER 112 SE	1001586
1	Cable combination coaxial 5 m-SN6, shield connection	1024107
1	Retractable process assembly WA-PH 1	1020631

Note: other sensors may also be used depending on the quality of the wastewater (see selection guide for pH sensors DULCOTEST)

For seriously contaminated wastewater with solid matter content

Qty		Order no.
1	pH Sensor PHEX 112 SE	305096

with clear wastewater

Qty		Order no.
1	pH Sensor PHEP 112 SE	150041

Benefits

- The wastewater pH value is within the specified limit values
- Simple operation, controller with plain text operator guidance in 20 languages
- pH limit value monitoring of drainage water
- All products are selected to operate correctly with each other

2.5.10 Application Examples in the Food Industry

Bottler disinfection in the beverage industry

Task and conditions of use

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 DACb controller. From time to time the chlorine dioxide concentration must be increased.

An alternative parameter set can be activated in the DACb via a switch input. In this way, a switchover, regularly required, can be carried out smoothly without the need for continual adaptation of the setpoint in the controller menu.

The measured data is to be recorded.

Components of the measuring/control station

Qty		Order no.
1	1 channel controller D1Cb, chlorine	D1CBW00601010VD-1010G21EN
1	Chlorine dioxide sensor CDR 1-mA-2 ppm	1033393
10 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122
1	Bypass fitting BAMa with one G 1" module and sensor adapter	BAMAEU22X1XXF01X000001EN

Benefits

- Hygienic trouble-free bottling
- Simple operation, controller with plain text operator guidance in 20 languages
- All products are selected to be fully compatible

Irrigation water disinfection for useful plants

Task and conditions of use

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

Qty		Order no.
1	1 channel controller D1Cb, chlorine	D1CBW00601010VD-1010G21EN
1	Chlorine dioxide sensor CDR 1-mA-2 ppm	1033393
10 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122
1	Bypass fitting BAMa with one G 1" module and sensor adapter	BAMAEU22X1XXF01X000001EN

Benefits

- Irrigation water does not harm the seedlings
- Simple operation, controller with plain text operator guidance in 20 languages
- Switchover of control parameters via an external potential-free contact
- All products are selected to operate correctly with each other

2.6 Controller DULCOMETER Compact

2.6.1 Controller 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 for pH and ORP
- Always the optimum measured value resolution by using auto-ranging with the conductivity measurement
- Depending on the requirement, various display options for conductivity, such as: conductivity, TDS (Total Dissolved Solids), salinity and specific resistance
- Safety thanks to sensor monitoring with pH for glass breakage and line breakage
- Various installation options: wall-mounted, installation on an upright or in a control cabinet

Technical Details

- Measured variables: pH, ORP, chlorine, conductive and inductive conductivity
- Method of installation, degree of protection: Combination housing (wall mounting, control panel mounting, pillar assembly) IP 67, control panel IP 54
- Measurement: 1 measuring channel, temperature compensation for conductivity and pH
- Control: PID controller, monodirectional controller (e.g. with pH acid or alkali)
- Control inputs: 1 digital control input

Field 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

2.6 Controller DULCOMETER Compact

Technical Data

Measuring range	pH: 0 ... 14 ORP: -1000 ... +1000 mV Chlorine: 0.05 ... 5 ppm, shock metering up to 10 ppm, max. 12 h with chlorine sensors CLB 4-µA-5 ppm and CLB 5-µA-5 ppm Conductive conductivity: 0.5 µS/cm ... 20 mS/cm (auto-ranging) Inductive conductivity with ICT 2: 20 µS/cm ... 2000 mS/cm (auto-ranging) Inductive conductivity with ICT 5: 200 µS/cm ... 2000 mS/cm (auto-ranging)
Resolution	pH: 0.01 pH ORP: 1 mV Chlorine: 0.01 ppm Conductivity: 0.1 µS/cm (depends on the measuring range)
Accuracy	0.5% of the upper range value
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 pause control/ sample water fault functions
Outputs	1 pulse frequency output for controlling 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 ... 12.0 cm^{-1}
Voltage supply	100 ... 230 V, 50/60 Hz, 5 W
Permissible operating temperature	-10 ... +60 °C
Enclosure rating	IP 67, based on NEMA 4 X Indoor
Dimensions	135 x 125 x 75 mm (H x W x D)
Weight	0.5 kg

2.6.2 Identity Code Ordering System for DULCOMETER Compact

DCCa	Type of mounting								
	W	Wall/pipe mounting IP 67							
	S	With fitting kit for control panel mounting IP 54							
		Version							
		00	With ProMinent logo						
			Operating voltage						
			6	90 … 253 V, 48/63 Hz					
				Measured variable					
				C0	Free chlorine				
				PR	pH/ORP (switchable)				
				L3	Conductive conductivity (unit designation: COND_C)				
				L6	Inductive conductivity (unit designation: COND_I)				
					Hardware extension				
					0	None			
					2	SN 6 input for pH/ORP			
						Approvals			
						01	CE (Standard)		
							Certificates		
							0	None	
								Documentation language	
								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

Accessories

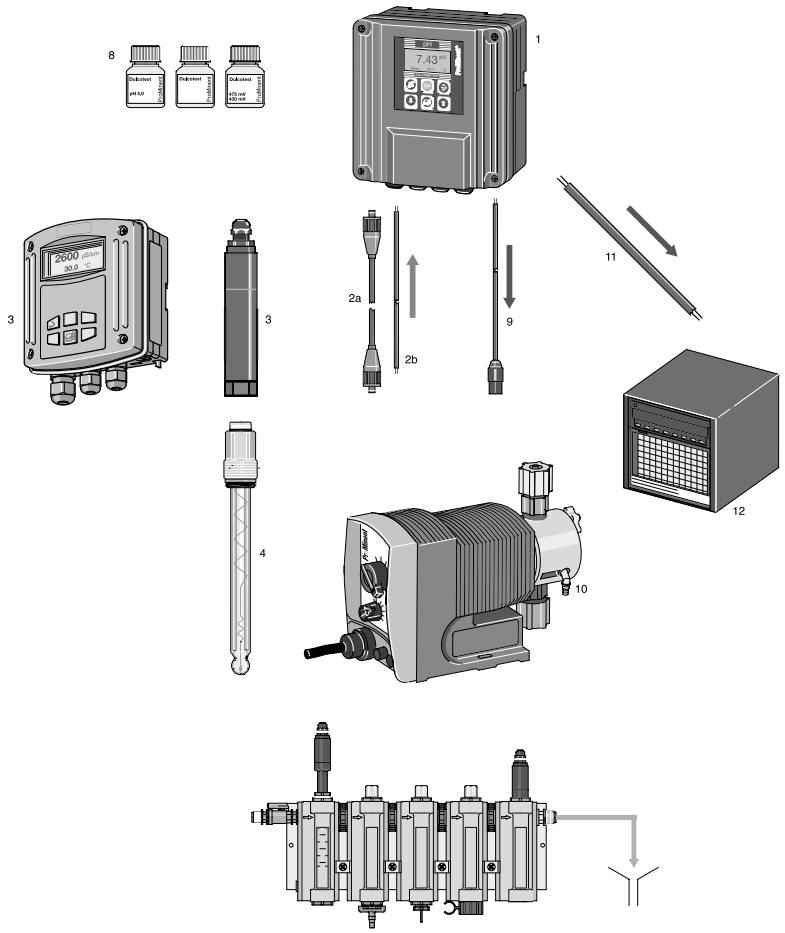
	Order no.
Cable combination, coaxial, Ø 5 mm 0.8 m - SN6 - pre-assembled	1024105
Cable combination, coaxial, Ø 5 mm 2 m - SN6 - pre-assembled	1024106
Cable combination, coaxial, Ø 5 mm 5 m - SN6 - pre-assembled	1024107
SN6 coaxial connector, retrofit component, D1Cb, DAC, DCCa	1036885
Assembly set for installation in control cabinet	1037273

2.6.3 Application and Ordering Examples for DULCOMETER Compact

The application examples contain typical combinations of components for measuring stations in applications in the areas of swimming pool, drinking water, wastewater and the food industry.

Measuring and Control Systems Consist of

1 Controller e.g. DACb
2a Measuring line e.g. coaxial cable for pH and ORP sensors Pt 100/, Pt 1000
2b 2-core measuring line for amperometric sensors with mA signal and transducer
3 4 ... 20 mA transducer (for two wire system), DMTa or pH V1
4 Sensor, e.g. pH single-rod sensor
5 Installation fitting e.g. sensor bypass armature modular BAMa
6 Stopcock for sample water line
7 Sample valve
8 Buffer solutions (pH/ORP)
9 Control cable (control of a metering pump)
10 Actuator e.g. beta/ X metering pump



Examples for:

1 Treatment of swimming pool water

2 Monitoring of drinking water

3 Monitoring of wastewater (pH neutralisation)

2.6.4 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

Qty		Order no.
1	Compact controller for pH	DCCaW006PR0010EN
1	pH Sensor PHES 112 SE	150702
1	Cable combination, coaxial, Ø 5 mm 2 m - SN6 - pre-assembled	1024106
1	Compact controller for ORP	DCCaW006PR0010EN
1	ORP Sensor RHES-Pt-SE	150703
1	Sensor connection cable, coaxial 2 m, SN 6 pre-assembled	1005672
1	Bypass fitting BAMa with two PG 13.5 modules and sensor adapter	BAMAEU222XXXF01X000001EN
4 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122

Benefits

- Operation is simple and independent of the operating language
- Automatically correct pH value and correct concentration of disinfectant
- All products are matched

Private swimming pool with measurement of free chlorine and pH value

Task and conditions of use

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

Qty		Order no.
1	Compact controller for pH	DCCaW006PR0010EN
1	pH Sensor PHES 112 SE	150702
1	Sensor connection cable, coaxial 2 m, SN 6 pre-assembled	1005672
1	Compact controller for chlorine	DCCaW006C00010EN
1	Sensor for free chlorine CLB 4-µA-5 ppm	1130517
1	Bypass fitting BAMa with one PG 13.5 module and one G 1” module and sensor adapter	BAMAEU2211XXF01X000001EN
4 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	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 be fully compatible

2.6.5 Application Examples, Potable Water Monitoring

Waterworks with control measurement of chlorine and pH

Tasks and applications

The chlorine concentration in the outlet of a waterworks 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

Qty		Order no.
1	Compact controller for chlorine	DCCaW006C00010EN
1	Sensor for free chlorine CLB 4-µA-5 ppm	1130517
1	Bypass fitting BAMa with one PG 13.5 module and sensor adapter	BAMAEU221XXXF01X000001EN
2 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122

Components of the pH measuring/control station

Qty		Order no.
1	Compact controller for pH	DCCaW006PR0010EN
1	pH Sensor PHEP 112 SE	150041
1	Sensor connection cable, coaxial 2 m, SN 6 pre-assembled	1005672
1	Bypass fitting BAMa with one PG 13.5 module and sensor adapter	BAMAEU221XXXF01X000001EN
2 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	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 matched

Waterworks with control measurement of conductivity

Task and conditions of use

The conductive conductivity in the outlet of a waterworks 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

Qty		Order no.
1	Compact controller for conductive conductivity	DCCaW006L30010DE
1	Conductivity sensor measuring range 20 mS/cm, type LFTK 1	1002822
1	Screened sensor cable LF, 5 m	1046026
1	Bypass fitting BAMa with one PG 13.5 module and sensor adapter	BAMAEU221XXXF01X000001EN
2 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	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 matched

2.6.6 Application Examples, Wastewater Monitoring

Neutralisation of the wastewater of an industrial plant

Task and conditions of use

In an industrial plant, wastewater 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 wastewater. The measured values are transferred via the 4-20 mA analogue signal.

Components of the pH measuring/control station in the collection tank

Qty		Order no.
1	Compact controller for pH	DCCaW006PR0010EN
1	pH Sensor PHER 112 SE	1001586
1	Cable combination coaxial 5 m-SN6, shield connection	1024107
1	Pt 1000 Temperature sensor	1002856
1	Cable combination of control line 5 m SN6, open end (Pt 100, Pt 1000)	1003208
1	Immersion fitting with 3 sensor slots IPHa 3-PP	1008602

Components of the measuring/control station in the outlet

Qty		Order no.
1	Compact controller for pH	DCCaW006PR0010EN
1	pH Sensor PHER 112 SE	1001586
1	Cable combination coaxial 5 m-SN6, shield connection	1024107
1	Retractable process assembly WA-PH 1	1020631

Note: other sensors may also be used depending on the quality of the wastewater (see selection guide for pH sensors DULCOTEST)

For seriously contaminated wastewater with solid matter content

Qty		Order no.
1	pH Sensor PHEX 112 SE	305096

with clear wastewater

Qty		Order no.
1	pH Sensor PHEP 112 SE	150041

Benefits

- Operation is simple and independent of the operating language
- pH limit value monitoring for the wastewater
- All products are matched

2.7 Controllers for Swimming Pool Water Treatment

2.7.1 Controller DULCOPOOL

Simple management of private pools

Measurement parameters: pH, ORP

The controller DULCOPOOL enables simple management of private swimming pools. It is operated using a touch display. DULCOPOOL uses two peristaltic pumps, which are integrated in the device, to control the pH and chlorine concentration totally automatically.



DULCOPOOL measures pH and ORP. The ORP is used to control the concentration of chlorine in the swimming pool water in order to ensure proper disinfection and guarantee the safety of pool users.

DULCOPOOL is very easy to operate and maintain. The compact structure and clear design make light work of installation and make simple management of private pools possible.

The device is equipped with Modbus RTU for connecting to SmartHome systems as standard. What's more, DULCOPOOL is easy to operate by smartphone (Android and iOS) with Wi-Fi functionality. This requires the MyHydro Connect app, which is available for free from the iOS App Store and the Google Play Store.

Your Benefits

- Simple and quick to install
- The device configuration can be uploaded and stored using a USB stick
- Simple menu-based operation via 4" touch display
- Low-noise operation due to peristaltic metering pumps
- Connection to SmartHome systems
- Wi-Fi capability with iOS and Google Play apps for monitoring, operating and configuring the controller with a 1:1 connection to a smartphone or via a Wi-Fi network. This requires the MyHydro Connect app, which is available for free from the iOS App Store and the Google Play Store.
- And to make things get even simpler: DULCOPOOL is also available as DULCODOS POOL Basic, a pre-assembled system with all the necessary accessories

Technical Details

- pH and ORP sensor input via a BNC connection
- 3 different metering quantities: 0.8, 1.6 and 2.4 l/h
- Sample water monitoring input stops metering and issues an alarm
- Monitoring of low levels in the chemical tank
- Metering monitor for protection against over-metering with metering stop and over-metering alarm
- Adjustable sensor run-in period for ORP
- Modbus RTU interface (RS485) as standard
- Digital input, pause control
- 1-point calibration (pool value) possible
- Alarm relay or time-controlled relay output
- Electrical connection: 230 V AC, 50/60 Hz , max. 850 W, 3.5 A
- Degree of protection: IP 54

	Order no.
DULCOPOOL, Wi-Fi, 0,8 l/h	1127845
DULCOPOOL, Wi-Fi, 1,6 l/h	1127844
DULCOPOOL, Wi-Fi, 2.4 l/h	1127842

2.7.2 Controller DULCOPOOL Pro

Simple management and maximum efficiency

Measurement parameters: pH, ORP, free chlorine, total chlorine, bromine, ozone and hydrogen peroxide

The controller DULCOPOOL Pro controls various sizes of swimming pool ranging from private and hotel pools to Olympic-sized pools and all the attractions that come with them. Thanks to its touch display and web interface, the controller can be operated with ease and integrated into SmartHome systems or PLCs.



DULCOPOOL Pro is a multi-parameter controller for individual swimming pools. It enables all types of chlorine and other important disinfection parameters to be measured. Up to five parameters can be monitored simultaneously.

To ensure precise control of the pH and chlorine concentration, DULCOPOOL Pro supports various types of metering pump. The concentration of disinfectant required in the pool water is thereby kept constant.

The integrated calendar keeps track of all maintenance work and allows the service personnel to plan tasks such as calibrating and replacing sensors.

Above and beyond this, there are eight different timers. These control additional functions, such as fountains, backflushing, circulation and temperature control.

Technical support is available via remote access and provides the user with an all-round solution.

Standard interfaces make seamless integration into SmartHome systems or PLCs possible. What's more, the controller can be called up and monitored via an integrated web interface, which is accessed via LAN and Wi-Fi-enabled devices.

Your Benefits

- Quick and easy installation with data logging function
- Intuitive menu navigation via 5" touch display with extensive monitoring functions and maintenance calendar
- Remote access:
  - Via DULCOnneX Gateway (no gateway required) with WiFi or LAN cable to on-site Internet connection
  - Web interface (embedded web server) via WiFi in station mode or LAN cable, i.e. on-site router required
- Connection to SmartHome systems via Modbus RTU and TCP interface
- With connection option to DULCONNEX, the cloud-based IIoT solution from ProMinent, as standard
- Control of other functions such as fresh water make-up via skimmer level switch, fountain, backwash, circulation and temperature control via eight different timers
- Chlorine gas control with 3-point step controller as standard
- Technical support via remote access
- Uncomplicated commissioning and maintenance thanks to built-in simulation tool for inputs and outputs
- Configuration via PC tool, incl. upload and download via USB stick for documentation and cloning of device settings
- It gets even easier: DULCOPOOL Pro is also available as a pre-assembled system with all the necessary accessories as DULCODOS POOL Comfort and Soft

	Order no.
DULCOPOOL Pro, EN, DE, FR, ES	1126493

In the scope of delivery

	Order no.
LAN cable for DULCOPOOL Pro / AEGIS S	1132290

2.7 Controllers for Swimming Pool Water Treatment

Technical Data

Measured variables	pH ORP Active chlorine - free - total Bromine (seawater) Ozone Stabilised chlorine (isocyanuric acid) Turbidity Conductivity Flow Temperature (via mA) Calculations: Chloramine ~ Active chlorine ~ Salt content
Combinations of measured variables	pH, free chlorine pH, free chlorine, temperature pH, ORP, free chlorine, temperature pH, free chlorine, total chlorine (calculated combined chlorine) pH, ORP, free chlorine, total chlorine, temperature
Inputs and outputs	**Inputs** 2 potentiometric inputs for pH and ORP 2 galvanically isolated 4-20 mA inputs for amperometric sensors, e.g. free and total chlorine 2 non-isolated 4-20-mA-inputs, e.g. for conductivity, turbidity and temperature sensors 4 digital inputs, e.g. for tank level, remote pause, sample water alarm 8 timers for controlling the relays or mA outputs for circulation 1 USB port for backing up data, configuration and updates Up to 10 measured/calculated parameters, e.g. combined chlorine and salt content Control for all kinds of actuators, such as metering pumps, solenoid valves, UV system **Outputs** 2 output relays, 230 V 2 potential-free contact relays (max. 240 pulses/min) 2 electronic relays (max. 500 pulses/min), for controlling electronic pumps, e.g. beta4b 4 analogue outputs 0/4-20 mA, e.g. for recorders, for controlling circulating pumps 12 V, max. 500 mA output to supply a conductivity sensor
Communication	Modbus RTU (RS 485) (as standard) Modbus TCP (as standard) LAN and Wi-Fi (as standard) For LAN and Modbus TCP, the connecting cable, order no. 1132290, DULCOPOOL Pro LAN cable, contained in the scope of delivery, is also included
Electrical Connection	100 – 230 V, 50/60 Hz, 30 VA
Enclosure rating	IP 65

Accessories

	Order no.
Temperature sensor T-45-mA-BNC, 0-45 °C	1118060
Cable to temperature sensor: BNC cable 1 m (can be extended up to 20 m)	1074730

Adapter for installation in the circulation pipe

For installation in the sensor bypass fitting BAMa, corresponding PG 13.5 installation adapters and, if necessary, a module are required.

	Order no.
90° T-piece DN 20	1001493
90° T-joint DN 25	1001494
45° T-piece DN 20	1001491
45° T-piece DN 25	1001492

2.8 Measuring and Control System DULCOMARIN 3 for Water Treatment in Public Swimming Pools

2.8.1 Measuring and Control System DULCOMARIN 3

New features and functions – one big step for DULCOMARIN, one gigantic step for your pool system.

The measuring and control system DULCOMARIN 3 is your digital link to the technology of the future. It controls the entire range of swimming pools – from adventure pools to private pools – and is used as a multi-pool system for up to 16 filter circuits.



The measuring and control system DULCOMARIN 3 is a reliable system for the treatment of swimming pool water.

Handling is via the system's 7" touch display. The intuitive menu navigation is also supported by videos and shows step-by-step calibration of the sensors. The DULCOMARIN 3 can also be controlled remotely via the Internet. Attractions, lighting, circulating pumps, filter backwashing and a counterflow system for various training profiles can also be triggered via DMX. The system can be extended at any time to meet future requirements.

The circulation capacity of the pumps adapts to the water quality in Eco! operating mode. Chemicals are metered precisely according to demand based on the measured values, reducing ongoing energy costs and saving chemicals.

DULCOMARIN 3 is available in two designs. The DULCOMARIN 3 Compact design is the right unit for one filter circuit. Networking is provided by the LAN-based cNet. When used as a multi-pool system, the DULCOMARIN 3 Global Unit is the central element of the measuring and control system. There is a local unit for each individual pool, which transmits all data to the superordinate global unit, where all information relating to the individual local units is collated. To keep operation as simple as possible, menu navigation is designed to be intuitive and is also supported by videos.

DULCOMARIN 3 has numerous interfaces:

- LAN/Ethernet and optional Wi-Fi, USB interface for future software expansion and for the transfer of data logger files.
- Connection to a PLC or building management system as standard via OPC UA, BACnet IP and Modbus RTU and with an optional gateway to PROFINET.

Your Benefits

- Energy- and cost-efficient control of your swimming pool
- Access to the DULCOMARIN 3 via any internet-enabled device (web browser and VNC app required)
- Simple calibration of the sensors with video support
- Status messages and alerts by email
- View and evaluate the measured values of all pools over time on the integrated screen recorder
- Simple, unlimited connection via LAN and WiFi - just like in your home network
- Can be expanded at a later date using the ProMinent internal cNet bus system
- Intelligent chlorine sensors: store the sensor data and are always in the optimum measuring range thanks to Auto Ranging
- Intelligent metering pumps: provide information on operating parameters such as chemical levels and pump capacity in the metering range from 0.7 l/h to 1,000 l/h
- Wide range of communication options via
  - RTU mode
  - OPC UA
  - BACnet IP
  - Web interface
  - VNC server
  - A gateway to Profinet is optionally available
- View historical measurement data directly on the controller: this is made possible by the built-in paperless recorder with data logger via USB
- Optional conductive conductivity measurement. Compatible with all ProMinent Conductivity Sensors, e.g. LFTK 1 DE
- Optional 2-channel mA input, e.g. for turbidity measurement
- Saving the device configuration in the controller and on a USB stick

2.8 Measuring and Control System DULCOMARIN 3 for Water Treatment in Public Swimming Pools

Technical Details

- Measured variables: pH, ORP, free chlorine, total chlorine, combined chlorine, conductive conductivity, any measured variables via up to 6 analogue inputs for any sensors via 0/4-20 mA signals, temperature
- Precision: 0.3 % of the measuring range limit value
- Control characteristic: P/PI/PID control
- Digital inputs: 8 potential-free control inputs e.g. for sample water errors, pause control, parameter switch-over
- Modular slots: 4 to accommodate 2-channel I/O modules in each, selectable via identity code and retrofit-table
- Pump relay (pulse frequency): 4
- Output relay: 3 potential-free changeover contacts, 3 changeover contacts with power supply, voltage-switching
- All output relays can be replaced
- Signal current output: via 2-channel I/O modules 2 x 0/4-20 mA or 4 x 0/4-20 mA
- Interfaces: USB, LAN (Ethernet), Wi-Fi
- Supply voltage: 100 – 230 V, 50/60 Hz, optional 24 V DC
- Dimensions: 430 x 290 x 150 mm (L x W x H)

Field of Application

- Regulation and control of the entire swimming pool
- Water parks
- Public swimming pools
- High-end private pool

What is Eco!Mode operating mode?

Eco!Mode permits the circulation capacity to be lowered when the DIN hygiene parameters of pH, ORP, free and combined chlorine are within the permitted limits. A circulating pump with frequency converter and analogue input is needed for this. The reduction can be activated via a remote control input, 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 being observed, then the circulation capacity is increased again to nominal capacity. Reducing pump capacity saves energy and, in so doing, reduces CO_2 emissions. If the DIN hygiene parameters are no longer being observed, then chlorine metering is again increased to the normal setpoint.

What is a web server?

A web server interface is a software application, which runs in the DULCOMARIN 3 processor and is fitted in the controller as standard. The web server provides web pages which are an exact match of the DULCOMARIN 3 menus. So it's exactly the same as operating on-site on the controller itself.
The web server allows the DULCOMARIN 3 to be visualised with ease without special visualisation software being required on the PC. The web server is completely independent of the PC/tablet operating system, just the installed web browser is needed.
The DULCOMARIN 3 can be connected to a network or PC via a LAN/Ethernet interface. Connecting via the in-built Wi-Fi is possible as an option.
Standard network components from appropriate retailers can be used as accessories for cabling, router, Wi-Fi etc.
The same information can be accessed via the web server as on the DULCOMARIN 3 itself, e.g. viewing and changing setpoints of all measurement and control variables, adapting alarm thresholds, viewing screen plotters. The processes for adapting the bus configuration and setting up users can only be undertaken directly on the controller itself or via a VNC viewer.

The web server runs in parallel with the VNC viewer and Modbus RTU.

What is a VNC viewer?

VNC stands for Virtual Network Computing and is a way of remotely controlling the DULCOMARIN 3 controller via a PC with a Windows operating system or via a tablet/smartphone with Android or IOS.
The person with remote control sees what the local operator is operating and vice versa. This means that help and support can be easily provided remotely. The DULCOMARIN 3 needs to be accessible via the Internet.
VNC programs are available to download from the app stores provided by the above-mentioned operating system providers e.g.:
realvnc.com/de/connect/download/vnc/

What is cNet?

The cNet is a LAN-based, ProMinent-specific network that establishes the networking of one Global Unit and up to 16 Local Units. The cNet must not be connected to an existing LAN network. For cNet networking, you need 1 connection cable LAN M12 - RJ45 5.0 m and 1 LAN coupling IP 68 (within the scope of delivery) for each device. All other LAN connections are realized with conventional LAN cables and LAN switches available on the market. One LAN switch is required per 100 m.
One global unit and 4 local units can be connected to the 5-port LAN switch provided.
CANopen specifications complied with by all devices:
All devices comply with the harmonized CAN specification 2.0 (ISO99 - 1, ISO99 - 2) on the hardware side. This contains the CAN protocol (ISO 11898 - 1) and information on the physical application layer in accordance 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 device complies with the CAN-Open specification CIA-DS401, which is the basis of the European standard EN50325 - 4. The controller device profile CiA-404 is fulfilled.

Important: Only so-called unmanaged LAN/Ethernet switches can be used for cNet cabling! See "Accessories for LAN and cNet cabling" below.

2.8 Measuring and Control System DULCOMARIN 3 for Water Treatment in Public Swimming Pools

Accessories for the DULCOMARIN 3 Measuring and Control System

Retrofit module

	Order no.
Module 2x mA output	1092565
Module 2x conductive conductivity temperature sensor input	1081809
Module 2x mA sensor input	1081806
Module 2x mV sensor input	1081807

General Accessories

	Order no.
PHES 112 SE	150702
RHES-Pt-SE	150703
Cable combination, coaxial, Ø 5 mm 0.8 m - SN6 - pre-assembled	1024105
Cable combination, coaxial, Ø 5 mm 2 m - SN6 - pre-assembled	1024106
Cable combination, coaxial, Ø 5 mm 5 m - SN6 - pre-assembled	1024107
Two-wire measuring line 2 x 0.25 mm² Sold by the meter, 4 mm diameter	725122

Accessories for LAN and cNet Cabling

	Order no.
Connecting cable LAN M12 - RJ45 5.0 m	1026715
Connecting cable LAN M12 - RJ45 10.0 m	1026716
LAN coupling IP 68	1104183
TP-LINK TL-SG108 V4 network switch 8 port	1109816
Industrial 5-port LAN switch (for one Global Unit and 4 Local Units)	734799
Plug power unit 24 VDC for LAN switch	1083061
LAN cable cat. 5, 10 m grey	1109856
LAN cable cat. 5, 25 m grey	1109857
LAN cable cat. 5, 50 m grey	1109858

Accessories for CANbus Cabling

	Length m	Order no.
T-distributor M12 5 pole CAN	-	1022155
Termination resistor M12 plug	-	1022592
Connecting cable - CAN M12 5-pin.	0.3	1024568
Connecting cable - CAN M12 5-pin.	0.5	1022137
Connecting cable - CAN M12 5-pin.	1.0	1022139
Connecting cable - CAN M12 5-pin.	2.0	1022140
Connecting cable - CAN M12 5-pin.	5.0	1022141
Connecting cable - CAN M12 5-pin.	10	1046383
Connecting cable - CAN M12 5-pin.	25	1055588
Connecting cable - CAN M12 5-pin.	50	1055589

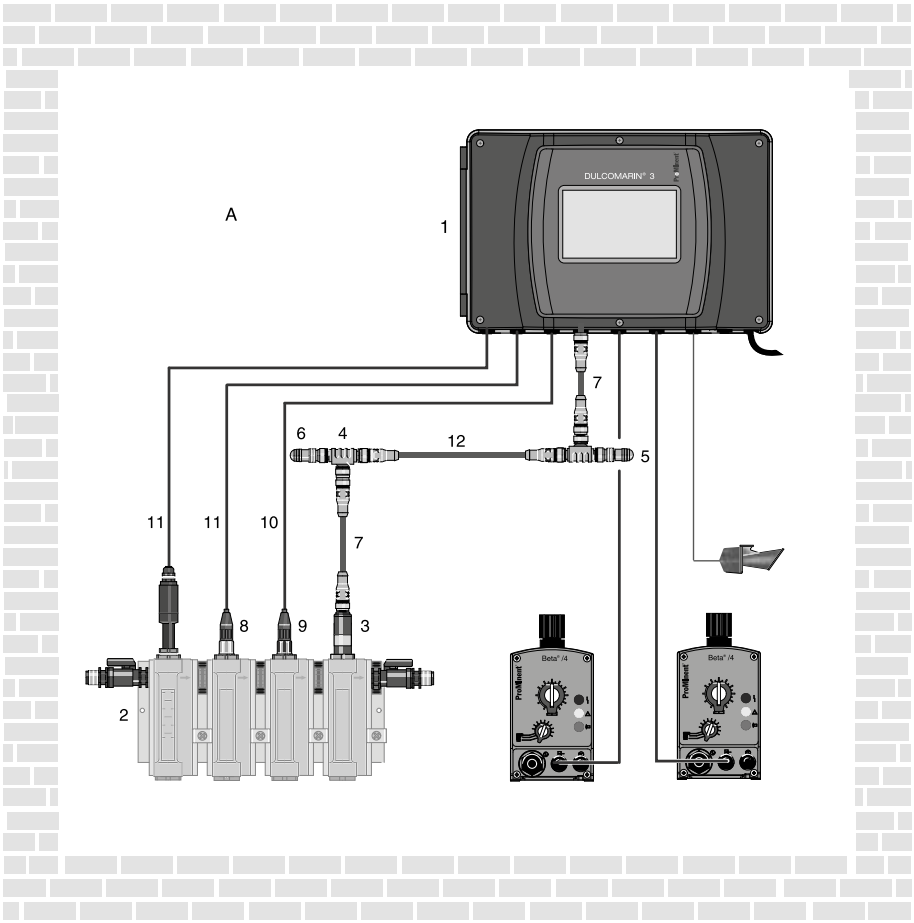
Important:
Do not allow the maximum CAN bus length (excluding branch lines) to exceed 400 m! The length of the LAN cable between the DULCOMARIN 3 and a LAN switch may not exceed 100 m. Then a LAN switch needs to be refitted. There is no limit to the length of the cable if this rule is observed.

2.8.2 Configuration Examples for the Measuring and Control System DULCOMARIN 3

Configuration example: 1-pool system

The example shown of a **measuring and control system for pH, ORP, free chlorine and temperature for a filtration circuit** consists of the following components (no metering technology):

A Plant room

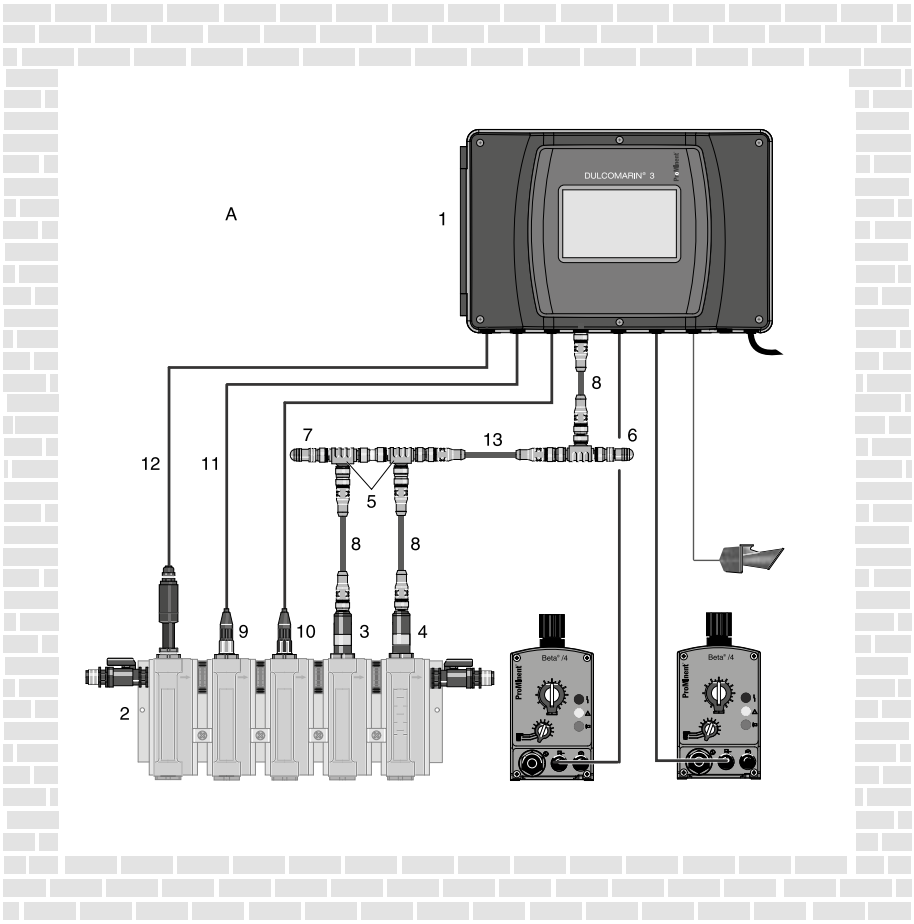


Pos.	Qty	Name	Order no.
1	1	DULCOMARIN 3 Compact for 1 pool	DCPAEUWPMA6L001XX-EN01
2	1	Bypass armature BAMa with two PG 13.5 modules and one G 1" module and sensor adapter	BAMAEU2221XXF01X-000000EN
3	1	Chlorine sensor CGE 3-CAN-10 ppm	1047977
4	3	T-distributor M12 5 pol. CAN	1022155
5	1	Termination resistor M12 coupling	1022154
6	1	Termination resistor M12 plug	1022592
7	2	Connecting cable - CAN M12 5-pole 0.5 m	1022137
8	1	pH Sensor PHES 112 SE	150702
9	1	ORP Sensor RHES-Pt-SE	150703
10	2	Cable combination, coaxial, Ø 5 mm 2 m - SN6 - pre-assembled	1024106
11	2 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122
12	1	Connecting cable - CAN M12 5-pole 25 m	1055588
12	1	Connecting cable - CAN M12 5-pole 50 m	1055589
12	1	Connecting cable - CAN, sold by the metre	1022160

Configuration example: 1-pool system

The example shown of a **measuring and control system for pH, ORP, free and combined chlorine and temperature for a filtration circuit** consists of the following components (no metering technology):

A Plant room



Pos.	Qty	Name	Order no.
1	1	DULCOMARIN 3 Compact for 1 pool	DCPAEUWPMA6L001XX-EN01
2	1	Bypass fitting BAMa with two PG 13.5 modules and two G 1" modules and sensor adapter	BAMAEU2222XXF01X-000001EN
3	1	Chlorine sensor CTE 2-CAN-10 ppm	1136030
4	1	Chlorine sensor CGE 3-CAN-10 ppm	1047977
5	3	T-distributor M12 5 pol. CAN	1022155
6	1	Termination resistor M12 coupling	1022154
7	1	Termination resistor M12 plug	1022592
8	3	Connecting cable - CAN M12 5-pole 0.5 m	1022137
9	1	pH Sensor PHES 112 SE	150702
10	1	ORP Sensor RHES-Pt-SE	150703
11	2	Cable combination, coaxial, Ø 5 mm 2 m - SN6 - pre-assembled	1024106
12	2 m	Two-wire measuring line 2 x 0.25 mm² Ø 4 mm	725122
13	1	Connecting cable - CAN M12 5-pole 25 m	1055588
13	1	Connecting cable - CAN M12 5-pole 50 m	1055589
13	1	Connecting cable - CAN, sold by the metre	1022160

Configuration example: Multipool system

The Multipool system differs only in terms of the identity code of the controllers:

The Global Unit (there needs to be one yet there may only be one). The Global Unit itself can control a filtration circuit or act as a pure operating unit in the pool caretaker's office:

Example

Global Unit with measuring and control function for one filtration circuit:

DCPAEUWPMGA6W100001XXEN01

Global Unit in the pool caretaker's office, without measuring and control function:

DCPAEUWPMGA6W000001XXEN01

Local Unit: there can be up to 16, but it does not support Wi-Fi:

DCPAEUWPMHA60100001XXEN01

The following is needed to network the controllers to each other:

	Order no.
Connecting cable LAN M12 - RJ45 5.0 m	1026715
LAN coupling IP 68	1104183
Industrial 5-port LAN switch (for one Global Unit and 4 Local Units)	734799
Plug power unit 24 VDC for LAN switch	1083061

To be provided by the customer

- **Specification for the LAN switch**
  - Network switch 100 to 2000 MBit/s, screened RJ-45 ports, metal housing, optimised for data traffic, e.g. TP link TL-SG108 V3 8. The switch must not be a managed switch!
- **Specification for the LAN cable**
  - CAT 5 or higher specification, at least 100 Mbit/s data rate
  - Maximum length to LAN switch: 100 m
  - You can opt for a fibreglass connection for longer lengths

The DULCOMARIN 3 Compact and Multipool systems differ only by the identity code of the controllers.

What is a DULCOMARIN 3 Compact Unit?

DULCOMARIN 3 Compact is intended for controlling a filtration circuit. It can measure and regulate the pH, ORP, free chlorine, combined chlorine, total available chlorine and temperature-measured variables. The controller is usually installed in the plant room. To ensure that you can monitor all values at all times, the unit can be fully operated using a PC with VNC viewer, which is located in the pool caretaker's office. The connection is either via the standard LAN or optional Wi-Fi. Conventional LAN-Office components can be used. A VNC viewer needs to be installed on the terminal device (e.g. PC). A LAN connecting cable M12 - RJ45 is needed to connect to a LAN network or PC. With a DULCOMARIN with software version 01.00.10.00 or later the operating mode can be freely adjusted between Compact, Global and Local Unit.

What is a DULCOMARIN 3 Multipool Global Unit?

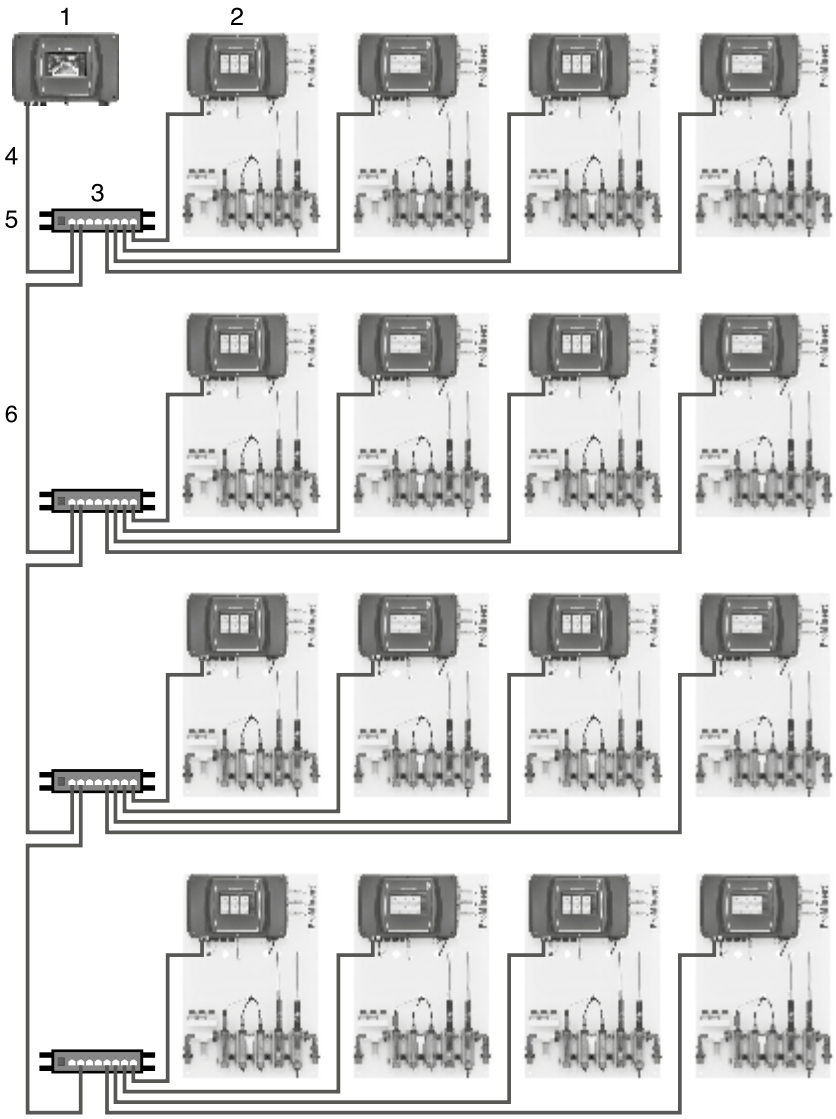
A DULCOMARIN 3 Multipool system consists of a Global Unit with a 7" touch display. It could be described as the central control unit via which all controllers of all pools, the Local Units, can be operated in full. There needs to be one Global Unit installed in each system yet there may only be one. It can control a filtration circuit or act as a pure operating panel in the pool caretaker's office. If the Global Unit itself controls a filtration circuit, i.e. it is located in the plant room, then it can be fully operated using a PC or tablet PC with a VNC viewer, located in the pool caretaker's office. The connection is either via the standard LAN or optional Wi-Fi. Conventional LAN-Office components can be used. A web browser or VNC viewer needs to be installed on the terminal device (e.g. PC). A LAN connecting cable M12 - RJ45 is needed to connect to a LAN network or PC. The Global Unit can also optionally be equipped with Wi-Fi. Full operability is then possible using a web browser and VNC viewer. A ProMinent-specific LAN-based cNet connector is available for networking with the Local Units. A LAN connecting cable M12 - RJ45 is needed for this. The cNet may not be connected to existing LAN networks.

What is a DULCOMARIN 3 Multipool Local Unit?

A DULCOMARIN 3 Multipool system can control up to 16 filtration circuits, i.e. 16 Local Units with a 7" touch display are needed. The controller can be used to operate the local pool. Every Local Unit controls one filtra-

tion circuit. They are connected to the Global Unit via cNet. A LAN connecting cable M12 - RJ45 cable and a LAN coupling IP 68 are needed for this. Conventional LAN cables and LAN switches can be used for the connection from the LAN coupling onwards.

Configuration example: Multipool system



1 Global unit
2 Up to 16 local units
3 LAN switch, e.g. TP-link 8 port switch
4 Connecting cable LAN M12 - RJ45 5.0 m
5 LAN coupling IP68
6 Customer's LAN cable, up to 100 m in length

Global Unit with measuring and control function for one filtration circuit:

Identity code: DCPAEUWPM **GA** 6W **1** 00001XXEN01

Or as a pre-assembled measuring and control station with sensors and optional metering pumps:

Identity code: DSPAPD80 **GW** A00D000010

Global Unit in the pool caretaker's office, without measuring and control function:

Identity code: DCPAEUWPM **GA** 6W **0** 00001XXEN01

There may be up to 16 **Local Units**, but it does not support Wi-Fi:

Identity code: DCPAEUWPMHA60100001XXEN01

Or as a pre-assembled measuring and control station with sensors and optional metering pumps:

Identity code: DSPAPD80 **H0** A00D000010

Technical specifications if provided by the customer

LAN switches

Network switch 100 to 2000 MBit/s, screened RJ-45 ports, metal housing, optimised for data traffic, e.g. TP link TL-SG108 V3 8. The switch must not be a managed switch!

LAN cable

CAT 5 or higher specification, at least 100 Mbit/s data rate

Maximum length to LAN switch: 100 m

You can opt for a conventional fibreglass connection with longer lengths

2.8 Measuring and Control System DULCOMARIN 3 for Water Treatment in Public Swimming Pools

2.8.3 Identity Code Ordering System DULCOMARIN 3

| | | |


14 CE + UKCA

2.8 Measuring and Control System DULCOMARIN 3 for Water Treatment in Public Swimming Pools

2.8.4 Functional Module (F-module) for DULCOMARIN 3

Swimming pool water - everything at a glance

With the function module (F module) of the DULCOMARIN 3 controller, you can conveniently control the water circuit of your swimming pool. You save energy, chemicals and the water quality remains high.



Together with the DULCOMARIN 3, the functional module (F-module) controls the water circuit of your swimming pool and is connected to a compact unit via CAN bus.

The compact unit clearly visualises the water circuit and documents the supply of fresh water.

The circulation capacity of the circulating pumps adapts to the water quality in Eco!Mode operating mode, thereby reducing ongoing energy costs and saving chemicals.

Your Benefits

- Visualisation of the entire system via the 7" display on the controller, the web server and VNC viewer
- Activation of Eco!Mode to reduce the rate of circulation in line with water quality
- Overview of the daily volume of fresh water
- Control of the swimming pool's water circuit

Technical Details

The following functions are possible with the F-module:

Control

Circulation operation for one or two parallel circulating pumps and one or two parallel filters, automatic backflushing (control of a rod valve), primary filtrate (control of a rod valve), internal circuit, electric return shut-off valve, lowering of the water level in idling mode

Measure

Flow control of circulation, water level check, sample water valve, flow monitor, recording of current circulating flow, recording of fresh water top-up, lifting system, error and water alarm (cellar)

Wellness

Pool water heating function, heating control, solar heating, JetStream, flood/neck shower, massage nozzle, underwater light

Clean

Guttering cleaning function, popular attractions, open/close pool cover

Communication

Incorporating up to 2 F-modules per filter circuit, connection between DULCOMARIN 3 and F-module via CAN bus

Inputs and outputs:

- 6 feeding output relays
- 1 alarm relay
- 2 analogue outputs for controlling frequency converters
- 5 digital control inputs, e.g. for level monitoring of raw water tank, flow control, contact water meter for monitoring circulation and fresh water supply

Supply voltage: 100 - 240 V, 50/60 Hz

Power consumption: Depends on connected consumers, see installation and operating instructions, DULCOMARIN 3 function extension with F-module.

Identity code: DCPAEUWPMXD60Y000XXXXDE01

2.8.5 Webcam Function for DULCOMARIN 3

See more with the webcam function for DULCOMARIN 3: swimming pool control from anywhere

The webcam function for DULCOMARIN 3 makes swimming pool control even easier: you can see your pool comfortably on your PC or mobile device.



Using the new webcam function, you can conveniently see your pool on the DULCOMARIN 3 display and via the web browser on your PC or mobile device.

The webcam for DULCOMARIN 3 runs in conjunction with the F-module. It is pre-configured and is connected via the cNet port. Being of protection class IP 67, the webcam can be used indoors and outdoors.

Technical Details

Included in the scope of delivery:

- Webcam
- Power supply 230V / 12 V DC / 1 A
- 1 m network cable
- Drilling template
- Mounting materials
- Instructions

	Order no.
Web cam for DULCOMARIN 3	1113164

Accessories

	Order no.
Connecting cable LAN M12 - RJ45 5.0 m	1026715
LAN coupling IP 68	1104183
LAN cable cat. 5, 10 m grey	1109856
LAN cable cat. 5, 25 m grey	1109857
LAN cable cat. 5, 50 m grey	1109858

2.8 Measuring and Control System DULCOMARIN 3 for Water Treatment in Public Swimming Pools

2.8.6 Modbus RTU Gateway for PROFINET for DULCOMARIN 3

Simple connection of DULCOMARIN 3 to programmable logic controllers

The Modbus RTU to Profinet gateway makes swimming pool control simple. Data from up to 16 pools is transmitted to a central PLC.



The new gateway Modbus RTU for Profinet makes simple connections and communication between DULCOMARIN 3 and a programmable logic controller (PLC) possible via Profinet. Data for up to 16 swimming pools can then be transferred to one central PLC.

Your Benefits

- All DULCOMARIN 3 measurement data is contained in the Profinet protocol
- Setting setpoints and switching over to Eco!Mode via Profinet
- Simple commissioning thanks to preconfigured module
- A sample project that works with the Siemens TIA Portal is available to download

Technical Details

- Supply voltage: 24 V DC ± 6 V (provided on-site)
- Power consumption: 24 V, max. 130 mA
- Reverse polarity protection
- Connection on Modbus RTU side: D-Sub plug, 9-pin (cable included in the scope of delivery)
- Connection on Profinet side: RJ45 (a Profinet cable is not included in the scope of delivery)
- Ambient temperature (operation), 0 to + 60 °C
- Mounting type: DIN rail, DIN EN 60715
- Dimensions (L x W x H): 100 x 52 x 70 mm (not including plug)
- Weight: approx. 150 g
- Degree of protection: IP 20

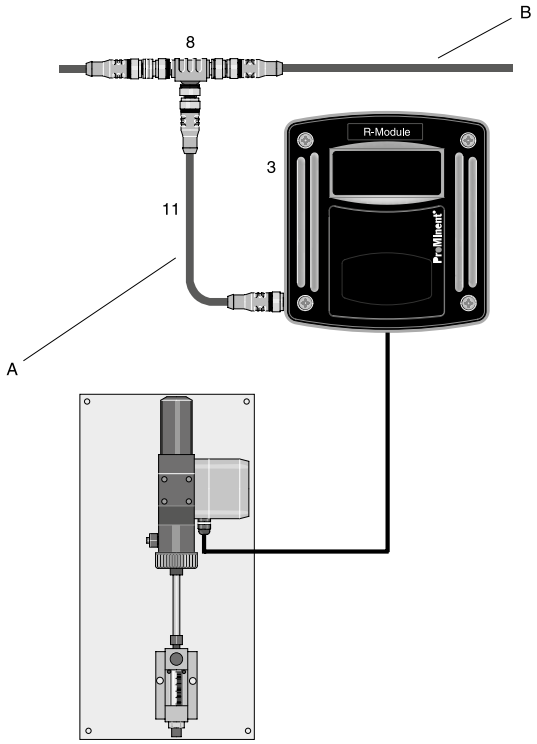
Included in the scope of delivery:

- Gateway, pre-configured
- 10 m connecting cable from DULCOMARIN 3 to gateway
- GSDML file in download

	Order no.
Gateway between Modbus RTU and Profinet	1117191

2.8.7 Control Module for Chlorine Gas Metering Devices (R Module)

A Branch line
B Main bus cable



The R module permits control of chlorine gas metering devices, which have a response signal potentiometer.

It includes 2 output relays for opening and closing and one input for a 1 … 10 kΩ response signal potentiometer.

The R 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 R module in the above example consists of the following components (not including the chlorine gas metering device):

Pos.	Qty	Name	Order no.
3	1	R module DXMa R W 2 0 00 01	DXMARW200001
8	1	T-distributor M12 5 pol. CAN	1022155
11	1	Connecting cable - CAN M12 5-pole 0.5 m	1022137

Our Sales department would be glad to assist with any questions you may have.

2.8 Measuring and Control System DULCOMARIN 3 for Water Treatment in Public Swimming Pools

2.8.8 Chlorine Sensors for DULCOMARIN II and DULCOMARIN 3

The technical data for the sensors can be found in the chapters indicated.

Sensor type	Measured variable	Determination of combined chlorine	Compatible with contamination	Compatible with chlorine electrolysis	Compatible with trichloroiso-cyanuric acid
CGE 3-CAN-10 ppm order no. 1047977	Free chlorine	Yes, with CTE 2-CAN-10 ppm, order no. 1136030	Suitable for higher levels of contamination, surfactants	Yes	Yes
CTE 2-CAN-10 ppm order no.: 1136030	Total chlorine	Yes, with CBR 1-CAN-10 ppm, order no. 1023425	Suitable for higher levels of contamination, surfactants	No	No
CLO 1-CAN-10 ppm order no.: 1122057	Free chlorine	No	Tolerance against biofilm formation with hydrodynamic cleaning	Yes	
CLE 3-CAN-10 ppm order no.: 1023425	Free chlorine	No	Limited suitability	Yes	No
CBR 1-CAN-10 ppm order no.: 1023425	Free chlorine	Yes, with CTE 2-CAN-10 ppm, order no. 1136030	Suitable for higher levels of contamination, surfactants	No	No

The sensors CLO 1-CAN-10 ppm (order no.: 1122057) and CGE 3-CAN-10 ppm (order no. 1047977) only work with DULCOMARIN II with software version 3036 or higher.

Important: DULCOMARIN II devices with a software version of 3027 or earlier cannot be updated.

2.9 Controllers for Cooling Tower Control

2.9.1 Overview of Cooling Tower Control

Controller selection table

Function	diaLog X	AEGIS II	SlimFLEX 5a	AEGIS S
Number of cooling towers controlled	6	2	1	1
Bleeding/desludging				
Conductive conductivity-dependent	+	+	+	+
Inductive conductivity-dependent (via mA)	+	+		+
Alternatively, dependent on the volume of water added	+	+	+	+
Alternatively, as a percentage based on a time base of 5 minutes	+	+	+	
Biocide metering	Free configurable	Up to 2 per cooling tower	Up to 2	Up to 2
Forced bleeding with timer-controlled biocide metering	Time-dependent and/or measured value-dependent	Time-dependent and/or measured value-dependent	Time-dependent and/or measured value-dependent	Time-dependent and/or measured value-dependent
Bleed lock after timer-controlled biocide metering	+	+	+	+
Metering of chemicals (inhibitors, dispersants)	Free configurable	Up to 4	Up to 2	Up to 2
Contact water meter-controlled	+	+	+	+
Alternatively, dependent on the bleed valve opening time	+	+	+	+
Alternatively, as a percentage based on a time base of 5 minutes	+	+	+	-
Controlled via fluorescence sensor	+	+	+	-
Control of metering pumps and bleed dampers				
Pulse frequency outputs for metering chemicals	4-12	4	-	-
Changeover contact output relay, with power supply, for controlling a bleed damper or metering pumps	3-9	2	2	1
Changeover contact output relay, potential-free for controlling metering pumps	3-9	3	3	4
Corrosion measurement				
For two different metals, e.g. stainless steel, copper, construction steel, admiralty metal	+	+	-	-
0/4…20 mA analogue outputs	Free configurable	Up to 4	Up to 2	2
Special functions				
Fieldbus, Modbus		+, RTU		+, RTU and TCP
PROFIBUS-DP, BACnet® via external gateways on request	+	+	-	-
Subsequent function upgrade via plug-in modules	+	+	+	-
LAN connector	+, web server	+, web server	+, web server	+
WLAN/Wi-Fi	+, web server	+, web server	+, web server	+
E-mail reporting/alerts	+	+	+	-
Graphic display of metering and bleeding on the web server	+	+	+	-
Data logger	+	+	+	+
Power supply				
100 - 230 V AC	+	+	+	+
Method of installation, degree of protection				
Wall mounting	IP 66, IP 67	IP 65	IP 65	IP 65

2.9.2 Controller DULCOMETER diaLog X

From small to large - extremely flexible for all water treatment systems

The DULCOMETER diaLog X multi-parameter controller ensures that complex water treatment systems are operated as efficiently as possible. The controller is highly flexible and suitable for many sensor parameters.



Application-specific software modules are available for the DULCOMETER diaLog X to make configuration to the process as simple and precise as possible, without the need for programming. Using freely configurable function blocks, the DULCOMETER diaLog X can map almost any customer application.

The controller is scalable and manages several systems simultaneously and decentrally. The combination of main and satellite unit increases flexibility. The main unit can be extended by up to two satellite units. This makes the DULCOMETER diaLog X suitable for almost all customer applications in water treatment, even on a large scale.

The system can be conveniently controlled remotely thanks to the wide range of communication options. A customisable web server enables easy management, tracking and visualisation of data, even remotely by DULCONNEX.

DULCONNEX

Your Benefits

- Excellent flexibility thanks to modular construction and easily extendible IO modules (input/output), allowing more sensors and pumps to be connected.
- Up to two satellite units can be added for additional inputs and outputs, allowing more sensors and pumps to be connected.
- Intuitive operation via the HMI (Human-Machine Interface) thanks to a clearly legible industrial display and robust keys for standard commands, such as calibration and monitoring.
- Simple configuration of process settings as well as monitoring and visualisation of process data via a web server with freely configurable and preconfigured software modules.
- Extensive overview and control of processes, e.g. cooling tower processes: All process data and alarms can be communicated to the process control system via fieldbuses such as Modbus RTU.
- Advanced communication options: Various network protocols such as FTP or MQTT enable remote access and data management via Wi-Fi and LAN (Ethernet).

Technical Details

Extensive inputs and outputs

- Up to 24 flexible sensor inputs and mA outputs (8 per device), e.g. CTFS sensor, linear polarization resistance (LPR) corrosion sensor
- Up to 30 output relays and pulse outputs (10 per device) for controlling pumps and other actuators
- Up to 24 digital inputs (8 per device) for the control of level switches, water meters and remote switches

Communication options

- Built-in Modbus RTU and via gateways (BACnet, Modbus TCP, PROFINET)
- Web interface via Wi-Fi and Ethernet, FTP server (others on request). The client interface is an intuitive remote control via a Wi-Fi or network connection to your PC or smartphone, e.g. for configuration settings or setpoint settings.
- Configurable and managed via DULCONNEX.

Technical Data

Measured variables and measuring ranges	**Conductivity:** with the digital sensor CTFS via serial module D1: 0.1 - 10 mS/cm via conductivity module L3 depending on the sensor used (LMP, LFT): 50 µS/cm - 20 mS/cm via mA module AA with the inductive Conductivity Sensors ICT: 8 to 2 mS/cm, 20 mS/cm, 200 mS/cm **Connection type mV:** pH: 0.00 ... 14.00 ORP voltage: -1500 ... +1500 mV **Connection type mA (amperometric variables, measuring ranges according to the sensors:** Bromine Chlorine Chlorine dioxide Chlorite Fluoride dissolved Oxygen Ozone Peracetic Acid Hydrogen peroxide **Temperature:** via Pt 100/Pt 1000, measuring ranges 0 ... 150 °C
Inputs and outputs	**Inputs** 4 plug-in module slots per unit for 2-channel serial sensor input module 2-channel conductivity input module 2-channel mV input module 2-channel mV/mA input module 2-channel mA input module **Outputs** 2-channel mA output module 6 output relays as changeover contacts, of which 3 are potential-free and 3 are AC/DC 4 pulse frequency outputs for controlling metering pumps 8 digital control inputs for contact water meter, flow switch and pause for locking
Resolution	pH: 0.01 pH ORP: 1 mV Amperometric analysis (chlorine etc.): 0.001/0.01 ppm, 0.01 vol. %
Accuracy	0.3% based on the full-scale reading
Temperature compensation	Pt 100/Pt 1000 for pH
Control characteristic	P/PI/PID control
Electrical Connection	100 – 230 V, 50/60 Hz
Ambient temperature	-5 … 50 °C at max. 95% relative air humidity (non-condensing)
Tests and approvals	CE, MET, UK CA
Housing material	PC with flameproofing equipment
Dimensions	276 x 424 x 137 mm (H x W x D)
Enclosure rating	Wall-mounted: IP 67
Field bus connection	Modbus RTU, additional field buses via gateway

Description of modules

Module AA mA/mA sensor input (slot 1-4):

- 2 sensor inputs for connecting, e.g. chlorine sensors, such as CBR or pH transducer pHV1

Module V2 mV/mV temperature sensor input (slot 1-4):

- 2 sensor inputs for connecting pH and ORP sensors and temperature sensors Pt100/ Pt1000, e.g. of type PHER, RHER, PHEI, RHEIC, Pt100SE

Module H1 mA/mA output (slot 1-4):

- 2 electrically isolated 0/4-20 mA analogue outputs for the output of measured values or control variables

Module D1 serial sensor module for monitoring (slot 1-4):

- Module 2 digital sensor inputs for connecting CTFS or CRS corrosion sensors

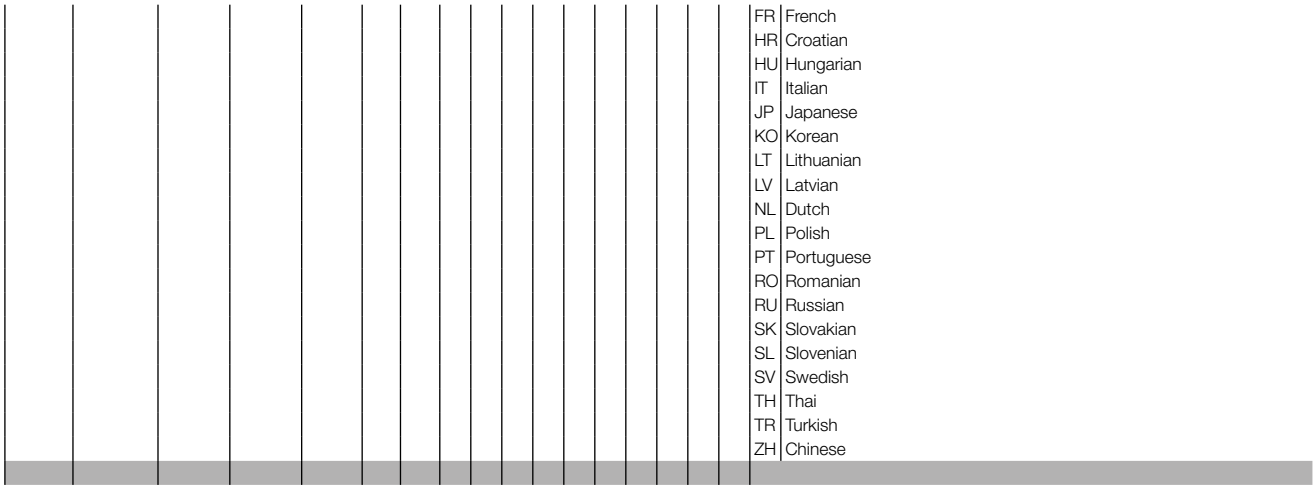
Module V1 mV/temperature + mA module (slot 1-4):

- 1 sensor input for pH or ORP sensor and temperature sensor Pt100/Pt1000
- 1 sensor input for connecting, e.g. chlorine sensors, such as CBR or pH transducer pHV1

2.9.3 Identity Code Ordering System for DULCOMETER diaLog X

| | | |

2.9 Controllers for Cooling Tower Control



FR	French
HR	Croatian
HU	Hungarian
IT	Italian
JP	Japanese
KO	Korean
LT	Lithuanian
LV	Latvian
NL	Dutch
PL	Polish
PT	Portuguese
RO	Romanian
RU	Russian
SK	Slovakian
SL	Slovenian
SV	Swedish
TH	Thai
TR	Turkish
ZH	Chinese

2.9.4 Controller AEGIS II

Treatment of cooling water in evaporation cooling systems - VDI 2047 and 42-compliant Federal Immission Control Ordinance (BImSchV)-compliant

Controller AEGIS II continuously measures and controls the conductivity and biocide concentration to keep pipework and heat exchangers clean.



The AEGIS II records all the necessary measuring parameters for cooling water treatment and controls the functions necessary for smooth operation:

- Measures the electrolytic conductivity – controls bleeding
- Biocide metering – time-dependent or as measurement and control, VDI 2047 and 42-compliant. Federal Immission Control Ordinance (BImSchV)-compliant (e.g. chlorine)
- Corrosion measurement – determines whether enough corrosion inhibitor is being metered
- pH measurement – measures and controls the pH value

Your Benefits

- Control of biocide metering over 1, 7 or 28 days, real-time clock
- If desired, the biocide concentration can be measured and controlled online
- Measurement of conductivity, temperature and flow control with the CTFS type digital sensor
- Serial web interface for unit configuration and remote maintenance with e-mail alarms (the controller must be connected to the Internet for e-mail alarms). WiFi as an option
- Forced bleeding: performs bleeding before biocide metering, based on time or measured values
- Bleed lock: blocks bleeding after biocide metering has taken place
- Operating status displayed by 10 status LEDs
- Blockage of relays between one another to prevent the metering of incompatible chemicals
- Locking of relays by digital control inputs
- Connection to the DULCONNEX IIoT solution, developed by ProMinent.

Technical Details

- 8 digital inputs for contact water meter, flow detector and control signals
- 10 status LEDs display the operating status
- 9 flexible relay outputs: for setpoint-dependent flow volume-proportional or time-based control of actuators
- Measured variables: conductivity, pH, ORP, chlorine, bromine, chlorine dioxide and more

Field of Application

- Control of bleeding in evaporation cooling systems
- Volume-proportional control or regulation of the metering of corrosion inhibitors, de-foamers and dispersants
- Measurement and control of the inhibitor concentration through the use of a fluorescence sensor
- Measurement and optionally control of the pH value and ORP voltage
- Metering of biocides, based on time or measured values

Technical Data

Measuring range	**Conductivity:** with the digital sensor CTFS via serial module D1: 0.1 - 10 mS/cm via conductivity module L3 depending on the sensor used (LMP, LFT): 50 µS/cm - 20 mS/cm via mA module AA with the inductive conductivity sensor ICT 8: up to 2 mS/cm, 20 mS/cm, 200 mS/cm **Connection type mV:** pH: 0.00 ... 14.00 ORP voltage: -1,500 ... +1,500 mV **Connection type mA (amperometric variables, measuring ranges according to the sensors):** Chlorine Chlorine dioxide Bromine **Temperature:** via Pt 100/Pt 1000, measuring range 0 ... 150 °C
Resolution	pH: 0.01 ORP voltage: 1 mV temperature: 0.1 °C amperometric analysis (chlorine etc.): 0.001/0.01 ppm, 0.01 vol.%, 0.1 vol.%
Inputs and outputs	3 plug-in module slots for 2-channel plug-in modules according to identity code 1 input for any analogue signals 5 output relays acting as changeover contacts, of which 3 are potential-free and 2 are AC/DC 4 pulse frequency outputs for controlling metering pumps 2 serial sensor inputs for CFTS conductivity sensors and CRS corrosion sensors 8 digital control inputs for contact water meter, flow switch and pause for locking
Accuracy	0.3% based on the full-scale reading
Temperature compensation	Pt 100/Pt 1000 for pH
Control characteristic	P/PID control
Electrical Connection	90 – 253 V, 50/60 Hz, 25 VA, 24 V DC
Field bus connection	Modbus RTU, additional field buses via gateway
Ambient temperature	0 ... 50 °C (for use indoors or with a protective enclosure)
Enclosure rating	Wall-mounted: IP 67
Tests and approvals	CE, MET (corresponding to UL as per IEC 61010)
Housing material	PPE with flame-proof finish
Dimensions H x W x D	240 x 360 x 110 mm

Description of modules

Module AA mA/mA sensor input (slot 1-3):

- 2 sensor inputs for connector of e.g. chlorine sensors, e.g. CBR or pH converter pHV1

Module V2 mV/mV temperature sensor input (slot 2-3):

- 2 sensor inputs for connector of pH and ORP Sensors and temperature sensors Pt100/ Pt1000, e.g. of type PHER, RHER, PHEI, RHEIC, Pt100

Module H1 mA/mA output (slot 1-3):

- 2 galvanically isolated analogue outputs 0/4-20 mA for the output of measured values or control variables

Module D1 Serial sensor module monitoring (slot 1-3):

- Module 2 digital sensor inputs, for connector of CTFS or CRS corrosion sensors

Module V1 mV/temperature + mA module (slot 2-3):

- 1 sensor input for pH or ORP Sensors and temperature sensor Pt100/Pt1000
- 1 sensor input for connector of e.g. chlorine sensors, e.g. CBR or pH converter pHV1

Module CM Modbus RTU + 2 mA outputs (slot 3):

- 1 Modbus RTU slave, for connecting to a PLC or gateway
- 1 Modbus RTU master, for connecting a Pyxis fluorometer sensor
- 2 electrically isolated 0/4-20 mA analogue outputs for the output of measured values or control variables

Module CA Modbus RTU + 2 mA outputs + 2 mA inputs (slot 3):

- 1 Modbus RTU slave, for connecting to a PLC or gateway
- 1 Modbus RTU master, for connecting a Pyxis fluorometer sensor
- 2 electrically isolated 0/4-20 mA analogue outputs for the output of measured values or control variables
- 2 sensor inputs for connecting, e.g. chlorine sensors, such as CBR or pH transducer pHV1

2.9 Controllers for Cooling Tower Control

2.9.5 Identity code ordering system for AEGIS II

| | | |

LV	Latvian
NL	Dutch
PL	Polish
PT	Portuguese
RO	Romanian
SK	Slovakian
SR	Serbian
SL	Slovenian
SV	Swedish
RU	Russian
TH	Thai
TR	Turkish
ZH	Chinese

Retrofit modules for AEGIS II, DULCOMETER diaLog X and SlimFLEX 5a

It is possible at all times to retrofit modules.

	Information	Order no.
Module 2x mA output	AEGIS II, diaLog X, SlimFLEX 5a	1092565
Module 2x conductive conductivity temperature sensor input	AEGIS II, diaLog X, SlimFLEX 5a	1081809
Module 2x mA sensor input	AEGIS II, diaLog X, SlimFLEX 5a	1081806
Module 2x mV sensor input	AEGIS II, diaLog X, SlimFLEX 5a	1081807
Module 2x serial sensor inputs	AEGIS II, diaLog X	1092566
Modules mA/mV + temperature sensor inputs	AEGIS II, diaLog X	1081808
Module Modbus RTU + 2 mA outputs	AEGIS II	1094377
Module Modbus RTU + 2 mA outputs + 2 mA inputs	AEGIS II	1094350
Wi-Fi module	AEGIS II, diaLog X, SlimFLEX 5a	734211

2.9 Controllers for Cooling Tower Control

2.9.6 Controller SlimFLEX 5a

Controller SlimFLEX 5a, the entry-level class for cooling water treatment, VDI 2047 Sheet 2 and BIM-SchV 42-compliant, the innovative and flexible controller.

The SlimFLEX 5a cooling tower controller continuously measures and regulates electrical conductivity and controls the dosing of biocides. This keeps the pipework clean and prevents legionella infestation.



The SlimFLEX5a records all the important measuring parameters for cooling water treatment and controls functions necessary for smooth operation:

- Time-dependent biocide metering (boost metering). Checks can be undertaken by measuring the ORP voltage in the cooling water.
- Measurement of electrolytic conductivity – controls bleeding.
- pH measurement with integrated PID controller.

Your Benefits

- A web interface for device configuration and remote maintenance is standard, Wi-Fi is available as an option
- Forced bleeding: performs bleeding before biocide metering
- Bleed lock: blocks bleeding after biocide metering has taken place
- Operating status displayed by 6 status LEDs
- Connection to the DULCONNEX IIoT solution, developed by ProMinent.

Technical Details

- 6 digital inputs for contact water meter, flow detector and control signals
- 6 status LEDs display the operating status
- 5 flexible relay outputs: for setpoint-dependent flow volume-proportional or time-based control of actuators
- Measured variables: Conductivity, pH, ORP

Field of Application

- Control of bleeding in smaller evaporation cooling systems
- Volume-proportional control or regulation of the metering of corrosion inhibitors, de-foamers and dispersants
- Measurement and if necessary control of pH
- Time-dependent metering of up to 2 biocides

Technical Data

Measuring range	Conductivity: 10 ... 10,000 µS/cm pH: 0.00 ... 14.00 Redox potential: -1500 ... +1500 mV
Resolution	Conductivity: 1 µS/cm pH: 0.01 Redox potential: 1 mV Temperature: 0.1 °C
Inputs and outputs	2 plug-in module slots: Plug-in modules for 2-channel modules: mA outputs, pH/ORP inputs 5 output relays used as a changeover contact, 3 of which are potential-free and 2 are AC/DC 1 serial sensor input for CTFS sensor 6 digital status inputs
Accuracy	0.3% based on the full-scale reading
Measurement input	pH/ORP (input resistance > 0.5 x 10^{12} Ω)
Temperature compensation	Pt 100/Pt 1000 for pH
Correction range temp.	0 … 100 °C
Control characteristic	P/PID control
Electrical Connection	100 – 230 V, 50/60 Hz, 25 VA
Ambient temperature	0 ... 50 °C (for use indoors or with a protective enclosure)
Enclosure rating	Wall-mounted: IP 65
Tests and approvals	CE, MET (corresponding to UL as per IEC 61010)
Housing material	PPE with flame-proof finish
Dimensions H x W x D	220 x 250 x 122 mm
Climate	Permissible relative humidity: 95 %, non-condensing DIN IEC 60068 –2-30

SlimFlex SF5a with LAN (including cable) and Wi-Fi. Conductive conductivity with CTFS sensor

	Control input	Order no.
SF5A006W0XXXXXXXXXXXX00000001	Conductivity (CTFS sensor)	1095464
SF5A006W0XXXXXXH1XXXX00000001	Conductivity (CTFS sensor), 2 mA outputs	1095443
SF5A006W0XXXXXXXXV2XX00000001	Conductivity (CTFS sensor), pH/ORP	1095465
SF5A006W0XXXXXXH1V2XX00000001	Conductivity (CTFS sensor), pH / ORP, 2 mA outputs	1095466

Please order sensors separately.

2.9 Controllers for Cooling Tower Control

2.9.7 Controller AEGIS S

Smart and powerful for your cooling system: Controller AEGIS S

AEGIS S is an easy-to-use water treatment controller for evaporative cooling systems. It is designed to keep the cooling process running reliably. AEGIS S measures conductivity and controls dosing of biocides and corrosion inhibitor, thus preventing biological growth and keeping pipelines and heat exchangers clean.



AEGIS S is an easy-to-use water treatment controller for evaporative cooling systems. With AEGIS S, users can easily monitor and control their process parameters with accuracy and reliability, helping to ensure an optimal cooling process.

Thanks to time- or measurement-based biocide metering and monitoring of electrolytic conductivity, AEGIS S prevents biological growth, keeping pipelines and heat exchangers clean.

The controller's features include an intuitive user interface with touch display and live view of the animated cooling circuit with measured values and display of the process status.

AEGIS S enables economical operation through timers for winter/summer and weekdays, automatic reporting as well as other user-supporting functions, such as an integrated maintenance calendar. Its flexible communication options facilitate efficient and reliable data exchange.

Your Benefits

- Simple installation, commissioning and operation via 5" touchscreen display
- Excellent process reliability thanks to live view of the animated cooling circuit with measured values, status of bleed valve, tank level and indication of process status
- Cost-effective operation thanks to timers for winter/summer and days of the week
- Time is saved thanks to automatic reporting, integrated maintenance calendar and other functions designed to assist users
- Flexible communication options through integration into process management systems
- Convenient transfer of configurations and USB port for data exports via Modbus RTU and Modbus TCP and web interface via LAN and Wi-Fi

Technical Details

- 5 digital inputs for which parameters can be set
- 2 mA outputs for which parameters can be set
- 6 relay outputs: 5 relays for pump control, 1 relay for control of bleed valve
- Measured variables: conductivity, pH, ORP, chlorine, bromine

Field of Application

- Control of bleeding in evaporation cooling systems
- Volume-proportional control or regulation of the metering of corrosion inhibitors, de-foamers and dispersants
- Measurement and control of inhibitor concentration
- Measurement and if necessary control of the pH value and redox potential
- Metering of biocides dependent on time or measured value

Technical Data

Measuring range	**Conductivity:** with the digital sensor CTFS: 0.1 - 10 mS/cm Via conductivity input depending on sensor used (LMP, LFT): 50 µS cm - 20 mS/cm Via mA inlet with the inductive conductivity sensor ICT: 8 to 2 mS/cm, 20 mS/cm, 200 mS/cm **Amperometric sensors (measuring ranges according to the sensors):** Chlorine 0 … 10 ppm Bromine 0 … 10 ppm Chlorine dioxide 0 … 10 ppm **Potentiometric sensors** pH: 0… 14 ORP potential: -1500 … +1500 mV **Temperature:** via Pt 100/Pt 1000, measuring range 0 … 150 °C
Inputs and outputs	**Inputs** 1 x conductive conductivity 1 x Pt 100/Pt 1000 Temperature 1 x CTFS sensor 2 x 0/4 … 20 mA **Outputs** 1 x relay output 3 A, 240 V AC 4 x ON/OFF relay outputs 3 A, 48 V AC 1 x relay output 50 mA, 48 V AC 2 x 0/4 … 20 mA, max. 12 V DC, max. load 500 Ω 1 x 24 V power output
Accuracy	±5 %
Communication	Modbus RTU (RS 485) (as standard) Modbus TCP (as standard) LAN and Wi-Fi (as standard) For LAN and Modbus TCP, the connecting cable, order no. 1132290, DULCOPOOL Pro LAN cable, contained in the scope of delivery, is also included
Temperature compensation	Pt 100/Pt 1000 for pH and conductivity
Electrical Connection	100 – 240 V, 50/60 Hz
Ambient temperature	-5… 45 at max. 90% relative air humidity (non-condensing)
Tests and approvals	CE, MET registered, UK CA
Housing material	PPE with flame-proof finish
Dimensions	240 x 360 x 110 mm (H x W x D)
Enclosure rating	Wall-mounted: IP 65

	Order no.
Controller AEGIS S with operating instructions in EN, DE, FR	1119853
Controller AEGIS S with operating instructions in EN, ES, PT	1128435
Controller AEGIS S with operating instructions in EN, IT, NL	1128436

In the scope of delivery

	Order no.
LAN cable for DULCOPOOL Pro / AEGIS S	1132290

2.9 Controllers for Cooling Tower Control

2.9.8 DULCOTEST Sensor for Conductivity, Type CTFS

Multi-parameter sensor for electrolytic conductivity, temperature and flow control for use in cooling water treatment. Installation in bypass fitting BAMa DGMa and in DN 20 pipework. For operation on the AEGIS II, SlimFLEX 5a and AEGIS S cooling tower controller.



Your Benefits

- 3 measured variables in one sensor: electrolytic conductivity, temperature and flow control
- Auto-ranging within the measuring range for electrolytic conductivity 100...10,000 µS/cm

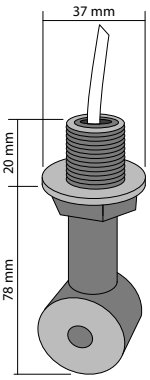
Min. measurement range	0.1 mS/cm
Max. measurement range	10 mS/cm
Cell constant	10.00 cm^{-1} ±5 %
Temperature measurement	Semiconductor temperature sensor
Medium temperature	0 … 50 °C
Max. pressure	7.0 bar (at 35 °C)
Sensors	Graphite, epoxy
Sensor shaft	PP
Seal material	FKM A
Thread	see Installation
Installation length	see Installation
Process integration	Installation without separate rotary adapter: in BAMa DGMa, 25 mm module: adapter CTFS/DGMA M25-NPT ¾" PVDF, order no. 1080293.
Enclosure rating	IP 65
Typical applications	Cooling water.
Resistance to	Ingredients in the water of the target application, taking into account the compatibility of the material
Controllers	diaLog X, AEGIS II, SlimFLEX 5a, AEGIS S
Measuring principle, technology	Conductive. Integrated temperature measurement and thermal flow detector

	Order no.
CTFS sensor conductivity/temperature/flow complete	1081727

Note the general information on page → 105 (Overview table for conductivity sensors)

2.9.9 Conductivity Sensor ICT 8-mA

Inductive sensor for the measurement of electrolytic conductivity. Suitable for contaminated water. With integrated temperature correction and factory-calibrated 4...20 mA output signal.



Your Benefits

- Measured variable: electrolytic conductivity up to 200 mS/cm without polarisation effect
- The inductive (non-contact) measuring principle permits applications in water with solids content and in film-forming media
- Fail-safe 4-20 mA output signal for flexible connection to measuring equipment with standard 4...20 mA input
- Integrated temperature correction replaces separate temperature sensor and sensor fitting

Technical Data

Measuring range	three configurable measuring ranges 0.2...2.0 mS/cm / 0.5...20 mS/cm / 1...200 mS/cm
Temperature correction	integrated in the sensor electronics, temperature co-efficient: 1.7%/K
Medium temperature	max. 50 °C at 1 bar
Sensor material	PP
Seals	EPDM
Installation length	75 mm
Electrical Connection	Fixed cable, 6-wire (6x0.25 mm^2). The cable length is 2 m between the sensor and 4-20 mA cable transmitter and 10 m between the cable transmitter and monitor.
Typical applications	Desalination control in cooling towers, contaminated wastewater, control of electroplating and rinsing baths, salt water desalination, adjustment of the salt content in swimming pool water
Resistance to	Water ingredients in the target application, taking into account compatibility to PP/EPDM and combating film-forming media
Process integration	1/2" male thread (BSP) for mounting using flange, installation in PVC pipes, DN 50 by means of installation adapter ICT8, DN 50, PVC, order no. 1106570, immersion using immersion pipe, 1 m, order no. 1105964
Controllers	diaLog C, diaLog X, diaLog DACb, D1Cb/D1Cc, DULCOMARIN 3, AEGIS II
Measuring principle, technology	Inductive, 2 coils. Integrated temperature measurement, integrated 4...20 mA transducer

	Order no.
ICT 8 -mA-200 mS/cm	1098530

2.10 DULCOMETER Transmitters

2.10.1 Transmitter DULCOMETER 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

- Measured variables: pH, ORP, chlorine, temperature and conductivity
- Precision: 0.5 % of the measuring range limit value
- Correction variable: Temperature via Pt 100/Pt 1000 (pH, chlorine, conductivity)
- Communication interface: PROFIBUS DP (wall-mounted only)
- Degree of protection: IP 65 (wall-mounted, pipe-mounted), IP 54 (installation in a control cabinet)
- Display: Graphic display

Field of Application

- Process engineering
- Food and beverage industry
- Pharmaceuticals
- Wastewater treatment
- Power station technology

Technical Data

Measuring range	pH - 1.00 … 15.00 -1200 … +1200 mV redox potential 0.01 … 50.0 mg/l Chlorine -20 … +150 °C 1 µS/cm … 200 mS/cm (auto-ranging), depending on the cell constant
Cell constant	0.006 … 12.0/cm for conductivity
Resolution	0.01 pH 1 mV 0.1 % of measuring range for chlorine 0.1 °C Conductivity 1/1000 of display value (min. 0.001 µS/cm)
Accuracy	0.5% from measurement range
Measurement input	mV terminal (pH, ORP); input resistance > 5 x 10^{11} Ω Chlorine terminal (DMT chlorine sensors) Pt 100/1000 terminal Conductivity terminal (2 or 4-line connection)
Correction variable	Temperature via Pt 100/1000 (pH, chlorine, conductivity)
Correction range temp.	Chlorine: 5 … 45 °C, pH: 0 … 100 °C, conductivity: 0 … 100 °C
Min. current loop	4 mA
Max. current loop	20 mA
Fault current	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)
Min. ambient temperature	0 °C
Max. ambient temperature	55 °C
Climate	Relative humidity up to 95% (non-condensing)
Enclosure rating	IP 65 (wall-mounted, pipe-mounted) IP 54 (installation in a control cabinet)
Display	graphical display
Housing material	PPE
Dim. H	135 mm
Dim. B	125 mm
D dimension	75 mm
Weight	0.45 kg

A complete measuring station comprises:

- Transmitter DMTa (see identity code)
- Fitting: BAMa, DGMa, DLG III
- Chlorine sensor (depending on identity code)
- Mounting kit for chlorine sensor
- pH sensor (depending on identity code)
- ORP sensor (depending on identity code)
- Temperature sensor Pt 100/Pt 1000 (depending on identity code)
- Conductivity sensor
- Sensor cable
- PROFIBUS DP connection accessories

For more information: Immersion fittings, see page 150; sensors for chlorine, see page 14; pH sensors with SN6 plug-in head or VARIO Pin, see page60; ORP sensors with fixed cable, see page97; DULCOTEST temperature sensors, see page 99; conductivity sensors, see page 101; sensor accessories, see page 135; metering monitor, control cable see volume 1 Chapter 1.6.6.1.

2.10 DULCOMETER Transmitters

2.10.2 Identity Code Ordering System Measuring Transducer DMTa

DMTa	Type of mounting										
	W	Wall mounted, pillar assembly too									
	S	Control panel installation[1]									
		Version									
		0	With ProMinent logo								
			Operating voltage								
			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)							
				Communication interfaces							
				0	None						
				4	PROFIBUS DP, only for mounting type W						
					Measured variable 1						
					P	pH					
					R	ORP					
					T	Temperature					
					C	Chlorine					
					L	Conductivity					
						Measured variable 2 (Correction variable)					
						1	Temperature Pt 1000/Pt 100				
						0	None (in the case of measured variable T)				
							Enclosure rating				
							0	Standard			
								Language			
								D	German		
								E	English		
								F	French		
								S	Spanish		
								I	Italian		
									Presetting A, probe		
									0	Standard ProMinent buffer solution pH 7 and 4	
									D	Reference buffer DIN 19266 pH 7 and 4	
									V	Variable buffer recognition	
										Presetting B, probe	
										0	Autom. temperature measurement (standard)
										1	Manual temperature measurement
										2	Autom./manual temperature measurement
										9	No temperature measurement
											Presetting C, output
											0 Proportional 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 digits of the identity code indicate the default software settings, e.g. cell constants for conductivity, temperature compensation etc.

0 = default settings

The transmitters can be preset ex-factory. The presettings can be changed with ease in the operating menu.

Note:

[1]There is no rear housing section in the control panel installation variant.

2.10.3 Application Example: Measurement of Free Chlorine with Connection to a PLC

Tasks and applications

In the treatment of potable water in a waterworks 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

Qty	Name	Order no.
1	Transmitter DMTa	DMTaW090C00D000
1	Sensor for free chlorine CLE 3-DMT-5 ppm	1005511
1	Universal cable, 5-pin round plug	1001300
1	Bypass fitting BAMa with one G 1" module and sensor adapter	BAMAEU21X1XX001X000000EN

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

2.11.1 DULCOMETER AirGuard - Measurement of trichloramine in the air in the swimming pool hall

Real-time monitoring for clean and safe air in indoor swimming pools

Measurement of trichloramine in the range of: 0.00 to 2.00 mg/m³

The DULCOMETER AirGuard measuring system continuously monitors the concentration of trichloramine in the air in real time. It is ideally suited for public indoor swimming pools. In the event of increased concentrations, the innovative system reacts immediately and triggers the adjustment of the fresh air supply.



DULCOMETER AirGuard is the only measuring system on the market to continuously detect trichloramine in the air in real time. The measured value provides valuable information about the air quality and possible dangers to swimmers and staff. Information is then transferred from the measuring system, via Modbus RTU, a relay switching output, and a measured value output to higher-level systems, which then regulate the supply of fresh air.

DULCOMETER AirGuard is capable of detecting and adjusting the chlorine content when used in conjunction with other ProMinent products, such as the DULCOMARIN 3 and DULCOPOOL Pro controllers. ProMinent's UV System DULCODES MP eliminates combined chlorine already in the water. The values of the combined chlorine are thus also lowered before it can convert to the gas phase.

Your Benefits

- Virtually continuous measurement of trichloramine in the indoor pool air
- Fast response in the form of a supply of fresh air is possible by real-time measurements
- Safety for swimmers and staff
- Autonomous analysis system
- No laboratory work, no handling of chemicals and no manual intervention needed

Technical Details

- Continuous measurement of trichloramine in indoor swimming pool air in the range of 0.00 to 2.00 mg/m³
- Stand-alone analysis system: no manual intervention needed
- Designed as a permanently installed or portable measuring station
- Touchscreen displays the trichloramine value in the air in mg/m³ in real time and diagrammatically over a period of 8 hours
- Option to calculate the Occupational Exposure Limit (OEL) over different time periods
- 4…20 mA output (measured value transmission)
- Modbus RTU, RS485 interface
- Potential-free alarm contact
- Wi-Fi connection via internal modem
- USB connector behind the front panel to download data logger files and for software updates

	Order no.
DULCOMETER AirGuard	1141436

Necessary Accessories

	Order no.
AirGuard power supply, 115-230 V AC, 12 V 5A DC	1143444
AirGuard ESSENTIAL LIQUID, 1,000 ml	1143447

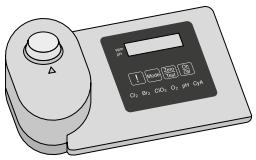
Optional Accessories

	Order no.
PTFE hose 6x4 mm, admissible operating pressure 15 bar, sold in metres	37426
Non-return valve for hose assembly design, PVDF connector 6/4 for PE/ PTFE line	1030463

Notes: The length of the PTFE hose must not exceed 100 m. The spring and ball must be removed from the non-return valve in order for it to function as a hose coupling.

2.11.2 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.

The photometers DT1B, DT3B and DT4B are used, among other things, as a reference method for calibrating the electrochemical sensors for chlorine, chlorine dioxide, chlorite, H_2O_2, bromine and ozone. They have been adapted to today's technical 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, chlorite, H_2O_2, bromine, ozone, pH and trichloro-isocyanuric 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 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 x AA/LR6

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

	Order no.
Photometer DT1B	1039315
Photometer DT3B	1039317
Photometer DT4B	1039318

The scope of delivery of the photometer includes a transport case, accessories, cuvettes and reagents.

Consumable Items

	Order no.
DPD1 tablets, 100 tablets	1115981
DPD3 tablets, 100 tablets	1115982
DPD3 tablets, 100 items (like DPD3 tablets, but not hazardous material)	1124079
Glycine tablets, 20 pieces	1115983
Phenol red tablets 100 pieces	1116004
Cyanuric acid tablets, 100 tablets	1039744
Calibration standard fluoride 1 mg/l, for calibration of the photometer during fluoride determination	1010382
3 pieces replacement cuvettes; round cuvettes with lid for DPD, phenol red and cyanuric acid detection (DT1, DT1B, DT4, DT4B)	1007566
Chlorine dioxide tablets No. 1, 250 no.	1039732
Chlorine dioxide tablets No. 2, 250 no.	1039733
Chlorine HR tablets, 100 pieces	1075056
Acidifying tablets, 100 pieces	1075057

Spare Parts

Chlorite Photometer

	Order no.
Stirrer for purging of chlorine dioxide (DT4)	1022754
3 pieces replacement cuvettes; round cuvettes with lid for DPD, phenol red and cyanuric acid detection (DT1, DT1B, DT4, DT4B)	1007566

H_2O_2 measurement

	Order no.
Reagent for H_2O_2 (DT3), 15 ml	1023636
Replacement cuvettes, 5 pieces, for H_2O_2 (DT3)	1024072

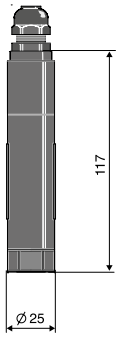
2.12.1 Transmitter 4 ... 20 mA (two-wire system)

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

Measuring range	pH 0…14
Measuring error	< 0.1 pH (typical ±0.07 pH)
Socket	SN6
Input resistance	> 5 x 10^{11} Ω
Signal output	4 … 20 mA ≈ -500 … +500 mV ≈ pH 15.45 … -1.45 uncalibrated; not electrically isolated
Supply voltage	18…24 V DC
Ambient temperature	-5 … 50 °C, non-condensing
Enclosure rating	IP 65
Dimensions	141 mm (length), 25 mm (diameter)

	Order no.
pH measuring transducer 4 ... 20 mA type pH V1	809126

ORP measuring transducer 4 ... 20 mA type RH V1

Measuring range	0…1.000 mV
Measuring error	< ±5 mV (typical ±3 mV)
Socket	SN6
Input resistance	> 5 x 10^{11} Ω
Signal output	4 ... 20 mA ≈ -1,000 ... +1,000 mV uncalibrated; no electroplating
Supply voltage	18…24 V DC
Ambient temperature	-5 … 50 °C, non-condensing
Enclosure rating	IP 65
Dimensions	141 mm (length), 25 mm (diameter)

	Order no.
ORP measuring transducer 4 ... 20 mA type RH V1	809127

Temperature measuring transducer 4 ... 20 mA type Pt100 V1

Measuring range	0…100 °C
Measuring error	< ±0,5 °C (typical ±0,3 °C)
Socket	SN6
Input resistance	~ 0 Ω
Signal output	4 … 20 mA ≈ 0 … +100 °C not electrically isolated
Supply voltage	18…24 V DC
Ambient temperature	-5 … 50 °C, non-condensing
Enclosure rating	IP 65
Dimensions	141 mm (length), 25 mm (diameter)

	Order no.
Temperature measuring transducer 4 ... 20 mA type Pt 100 V1	809128

PEROX transducer

The PEROX transducer in µ processor technology serves to control and activate the PEROX sensor as well as to evaluate the sensor signal. It is screwed directly onto the sensor's head. The H_2O_2 transducer can be connected directly to the D1C control unit by means of a 3-wire signal lead.

The PEROX transducer has a length of approx. 205 mm and a diameter of 32 mm.

PEROX transducer for the H_2O_2 measurement:

Inside, it features a switch-over for three measuring ranges:

1 … 20, 10 … 200 and 100 … 2,000 mg/l H_2O_2

	Order no.
PEROX Transducer V2	1047979

PEROX transducer V1 for D1Ca on request.

Accessories

	Order no.
Two-wire measuring line 2 x 0.25 mm² Sold by the meter, 4 mm diameter	725122

3.1 Overview of Ordering System for Measuring and Control Points DULCOTROL DWCa

3.1.1 Selection Guide

DULCOTROL DWCa_P Potable water/F&B

Treatment of potable water, water similar to potable water and treatment of rinsing water, process water in the food and beverage industry

- Disinfection
- Cleaning In Place (CIP)
- pH value adjustment
- Monitoring

DULCOTROL DWCa_W Wastewater

Treatment of industrial and municipal wastewater

- pH neutralisation
- Disinfection
- Detoxification
- Desalination of process water
- Control of dissolved oxygen
- Monitoring

3.1 Overview of Ordering System for Measuring and Control Points DULCOTROL DWCa

3.1.2 Description of the Identity Code Specifications in the DULCOTROL DWCa Ordering System

The measuring and control systems can be configured using the respective identity code ordering system. With the 'panel-mounted' design, all the components except the sensors are mounted on a polypropylene panel. 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 serious technical understanding. One or two measured variables can be configured in each product range. The DACb controller is now used instead of the DACa controller for all measured variables. The Compact controller DCCa is also configured for inductive conductivity. This means that a third measured variable can be configured on-site providing the fitting size permits this. An additional DGMa module is provided as standard. All communication interfaces of the DACb and also the connection to DULCONNEX can also be selected as part of the ordering system. 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', 'wastewater') in which the measuring and control system 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, wastewater). 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'

These are used to determine the measured variable to be measured or controlled (e.g. pH or chlorine). Up to two measured variables can be selected at the same time 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 DACb controller for all measured variables apart from 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: 'Measurement and control'

This determines whether only the measuring function or the complete two-way control function for the selected measured variable is shown on the controller.

Specification: 'Communication interface'

This specification defines which communication interface the controller has.

Specification: 'Data logger'

A data logger is pre-installed as standard.

Specification: 'Hardware upgrade'

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 as standard (see chapter 3.1.3: Technical description of the scope of delivery) cannot be used (for example: Inapplicable measuring range) or if the measuring plates are to be stored.

Specification: 'Design'

This specification defines customer-specific designs e.g. the label etc.

Specification: 'Sample water preparation'

This specification defines whether a filter is fitted.

Specification: 'Certification'

This specification defines the approvals and certificates.

Specification: 'Documentation'

This specification defines the operating language of the controller and the operating instructions.

3.2 Measuring and Control Points DULCOTROL DWCa_P Potable Water/F&B

3.2.1 Overview of DULCOTROL DWCa_Potable Water/F&B

The compact measuring and control system for the reliable monitoring and treatment of water of a similar quality to drinking water

Monitoring and treatment of potable and similar types of water with DULCOTROL Potable water/F&B – the compact measuring and control system specially designed for water treatment in waterworks and in the food and beverage industry.

Measuring and control systems DULCOTROL for the potable water/F&B application are specially tailored to the potable water sector and the 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. The measuring and control systems can be configured using the relevant identity code ordering system. With the 'panel-mounted' version, all of the components except the sensors are mounted on a polypropylene plate. The DULCOTROL ordering system works with user-based selection criteria so that you can select the most appropriate measuring and control system, largely without technical knowledge. One or two measured variables can be configured in each product range.

Your Benefits

- A third measured variable can be retrofitted on site if the size of the configured bypass fitting permits this.
- All communication interfaces of the DACb controller and connection to DULCONNEX are possible.
- Availability of all key chemical measuring parameters for water treatment
- Application-optimised configuration of the components using user-based order criteria
- Configuration of 1 or 2 measured variables on a panel
- The controller equipment can be selected
- Flexible adaptation to special applications and measuring ranges by designing the measuring and control points without sensors and ordering the sensor type and measuring range separately
- Ready-to-connect plug & play measuring and control points for quick, easy installation and commissioning
- Extensive optional accessories (pressure reducers, filters, heat exchangers, sample water pump)

Technical Details

- Installation in the bypass of the main water line through which the medium flows
- Max. pressure, depending on design: 1 bar/3 bar/6 bar
- Flow, depending on design: 15...40 l/h/ 40...65 l/h/
- Max. medium temperature: primarily up to 45 °C, the versions for the identity code specification: Water to be measured H (hot water) up to 65 °C (max. 2 bar)
- Ambient temperature: +5...50 °C
- Degree of protection: IP65
- Power supply: 90-240 V, 50/60 Hz

Field of Application

- Treatment of drinking water and product water (e.g. disinfection) in waterworks and domestic water installations
- Treatment of product water in the food and beverage industry
- Treatment of rinsing and process water for the food and beverage industry, e.g. cleaning and disinfection of pipework, vessels and machinery (cleaning in place)
- Monitoring for drinking water distribution

3.2 Measuring and Control Points DULCOTROL DWCa_P Potable Water/F&B

3.2.2 Permissible Measured Variable Combinations for DULCOTROL DWCa_P Potable Water/F&B

Sample water 1: Drinking water, product water															
Measured variable 1		Measured variable 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	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				x					
Dissolved oxygen	X0	x				x									

Sample water 2: Rinsing water, process water															
Measured variable 1		Measured variable 2													
		00	C0	C1	G0	P0	R0	D0	I0	L0	Z0	F0	H0	A0	X0
Free chlorine > pH 8	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					

Sample water H: Potable and product water, 45 °C...65 °C															
Measured variable 1		Measured variable 2													
		00	C0	C1	G0	P0	R0	D0	I0	L0	Z0	F0	H0	A0	X0
Free chlorine	C0	x				x									
pH	C1	x				x									
ORP	P0	x				x									
Conductivity	R0	x				x	x								

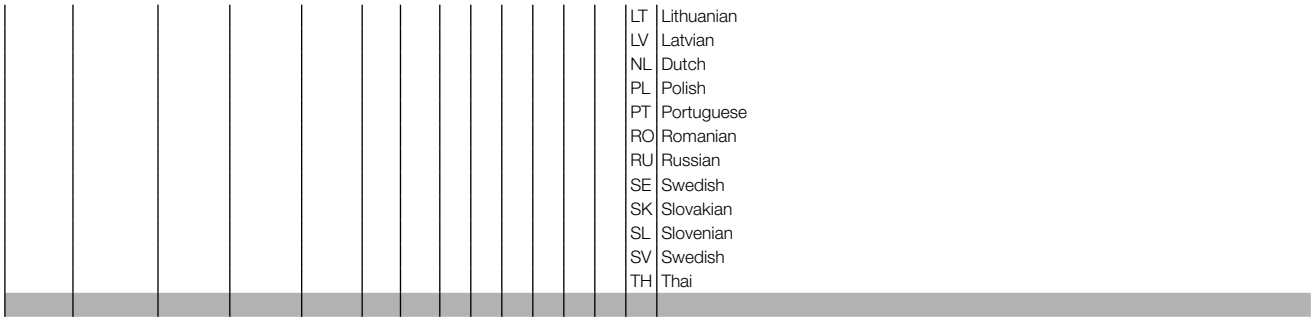
When ordering, state the identity code in the above order of measured variable 1/measured variable 2, e.g. DWCa P... C0_P0... and not DWCa P... P0_C0...

Other measured variable combinations on request.

3.2.3 Identity Code Ordering System, DULCODOS DWCa_P Potable Water/ F&B

DWCa	Application												
	P	Potable water											
		Water to be measured											
		1	Potable water/product water										
		2	Rinsing water/industrial water/process water										
		H	Hot water to max. 65 °C, at max. 2 bar (measured variables C1, P0, R0, L0 only)										
			Measured variable 1										
			C0	Free chlorine < pH 8									
			C1	Free chlorine									
			G0	Total chlorine (free+combined chlorine)									
			P0	pH									
			R0	ORP									
			D0	Chlorine dioxide									
			I0	Chlorite									
			L0	Conductivity									
			Z0	Ozone									
			F0	Fluoride									
			H0	Hydrogen peroxide									
			A0	Peracetic acid									
			X0	Dissolved oxygen									
				Measured variable 2 (optional)									
				00	None								
				C0	Free chlorine < pH 8								
				C1	Free chlorine								
				G0	Total chlorine (free+combined chlorine)								
				P0	pH								
				R0	ORP								
				D0	Chlorine dioxide								
				I0	Chlorite								
				L0	Conductivity								
				Z0	Ozone								
				F0	Fluoride								
				H0	Hydrogen peroxide								
				A0	Peracetic acid								
				X0	Dissolved oxygen								
					Measuring - Controlling								
					9	All measured variables two-way controllable							
						Communication interface							
						0	None						
						A	Modbus RTU, terminal						
						B	PROFIBUS® DPV1, terminal						
						E	LAN with web server, connection via M12 C coded						
						G	Profinet (2xM12)						
						D	DULCONNEX (appears in the scope of delivery as a separate unit)						
							Data logger						
							1	Data logger with measured value display on SD card					
								Hardware expansion					
								1	Protective RC circuit for output relay				
									Sensor equipment				
									0	With sensors			
									1	Without sensors			
										Version			
										0	Panel-mounted with ProMinent Logo		
											Sample water treatments		
											0	None	
											1	With filter, Not for measured variable D0, Z0	
												Approvals	
												01	CE (Standard)
													Documentation language
													DE German
													EN English
													ES Spanish
													IT Italian
													FR French
													FI Finnish
													BG Bulgarian
													CN Chinese
													CZ Czech
													DK Danish
													EE Estonian
													GR Greek
													HU Hungarian
													JP Japanese
													KR Korean

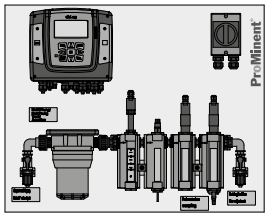
3.2 Measuring and Control Points DULCOTROL DWCa_P Potable Water/F&B



Third measured variable can always be retrofitted on-site with the DGMa (additional module is provided). With the DLGIII : an amperometric measured variable and up to two measured variables with PG13.5 connector are available

Permissible measured variable combinations for DULCOTROL DWCa_P Potable water/F&B, see page→ 256

3.2.4 Examples of DULCOTROL DWCa_P Potable Water/F&B



Similar figure

Example 1: DWCa_P_1_D0_I0_9_G_1_0_0_0_0_01_EN

Application in potable water/F&B:

Measurement of chlorine dioxide and chlorite in potable water/product water with an upstream filter (10µm). Controller with integrated data logger and Profinet® communication interface.

Controller

- DACBW006VA4000G11010EN

Fitting

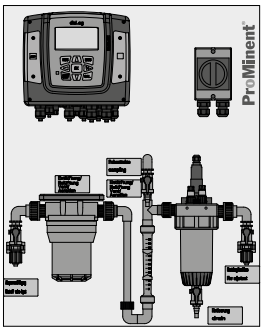
- DGM_A_3_2_0_T_0_0_2:
  - 1 measuring module: Chlorine dioxide sensor
  - 1 measuring module: Chlorite sensor
  - 1 flow control module

Sensors

- CDE-2-mA 0.5 ppm
- CLT1-mA-0.5 ppm

Panel-mounted water treatment system

- Filter



Similar figure

Example 2: DWCa_P_2_P0_C0_9_0_1_1_0_0_1_01_EN

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 an RC circuit to protect the relays and a data logger.

Controller

- DACBW006VA4000011010EN

Fitting

- DLG III for pH and chlorine monitoring + flow control

Sensors

- CBR1-mA 2ppm
- PHER 112-SE

Panel-mounted water treatment system

- Filter

3.3 Measuring and Control Points DULCOTROL DWCa_W Wastewater

3.3.1 Overview of DULCOTROL DWCa_W Wastewater

The compact measuring and control system for the reliable monitoring and treatment of wastewater

Monitoring and treatment of wastewater with DULCOTROL Wastewater – the compact measuring and control system specially designed for applications in municipal and industrial wastewater treatment.

The DULCOTROL measuring and control systems for the wastewater application are used in all industry sectors where wastewater is treated. All the necessary components are mounted on a polypropylene plate and are ready to connect. The choice of components is matched to the application. The measuring and control systems can be configured using the relevant identity code ordering system. With the 'panel-mounted' version, all of the components except the sensors are mounted on a polypropylene plate. The DULCOTROL ordering system works with user-based selection criteria so that you can select the most appropriate measuring and control system, largely without technical knowledge. One or two measured variables can be configured in each product range.

Your Benefits

- A third measuring point can be retrofitted on-site if the size of the bypass fitting permits this.
- All communication interfaces of the DACb controller and connection to DULCONNEX are possible.
- Availability of all key chemical measuring parameters for water treatment
- Application-optimised configuration of the components using user-based order criteria
- Configuration of 1 or 2 complete measuring and control systems on a panel
- The controller equipment can be selected.
- Flexible adaptation to special applications and measuring ranges by designing the measuring and control points without sensors and ordering the sensor type and measuring range separately
- Ready-to-connect plug & play measuring and control points for quick, easy installation and commissioning
- Extensive optional accessories (pressure reducers, filters, heat exchangers, sample water pump)

Technical Details

- Installation in the bypass of the main water line through which the medium flows
- Max. pressure, depending on design: 1 bar/3 bar/6 bar
- Flow, depending on design: 15...40 l/h/ 40...65 l/h/ 300...500 l/h
- Max. medium temperature: primarily up to 45 °C, the versions for the identity code specification: 'Water to be measured' 'H' (hot water) up to 65 °C (max. 2 bar)
- Ambient temperature: +5...50 °C
- Degree of protection: IP65
- Power supply: 90-240 V, 50/60 Hz

Field of Application

- Treatment of industrial and municipal wastewater
- pH neutralisation
- Disinfection
- Detoxification
- Desalination of process water
- Control of dissolved oxygen
- Monitoring

3.3.2 Permissible Measured Variable Combinations for DULCOTROL DWCa_W Wastewater

Sample water 4,5,7: clear and turbid wastewater containing fluoride															
Measured variable 1		Measured variable 2													
		00	C0	C1	G0	P0	R0	D0	I0	L0	Z0	F0	H0	A0	X0
Free chlorine > pH 8	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					

Sample water H: clear and turbid wastewater containing fluoride 45 °C...65 °C															
Measured variable 1		Measured variable 2													
		00	C0	C1	G0	P0	R0	D0	I0	L0	Z0	F0	H0	A0	X0
Free chlorine	C1	x				x									
pH	P0	x				x									
ORP	R0	x				x									

When ordering, state the identity code in the above order of measured variable 1/measured variable 2 i.e. DWCa W... C0_P0... and not DWCa W... P0_C0...

Other measured variable combinations on request.

3.3 Measuring and Control Points DULCOTROL DWCa_W Wastewater

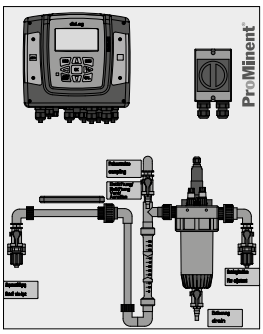
3.3.3 Identity Code Ordering System, DULCOTROL DWCA_W Wastewater

DWCa	Application												
	W	Wastewater											
		Water to be measured											
		H	Hot water to max. 65 °C, at max. 2 bar (measured variables C1, P0, R0, L0 only)										
		4	Clear wastewater										
		5	Wastewater with solid particle fraction, turbid										
		7	Wastewater, clear or turbid with fluoride content and pH < 7										
			Measured variable 1										
			C1	Free chlorine									
			G0	Total chlorine (free+combined chlorine)									
			P0	pH									
			R0	ORP									
			D0	Chlorine dioxide									
			I0	Chlorite									
			L0	Conductivity									
			Z0	Ozone									
			F0	Fluoride									
			H0	Hydrogen peroxide									
			A0	Peracetic acid									
			X0	Dissolved oxygen									
				Measured variable 2 (optional)									
				00	None								
				C1	Free chlorine								
				G0	Total chlorine (free+combined chlorine)								
				P0	pH								
				R0	ORP								
				D0	Chlorine dioxide								
				I0	Chlorite								
				L0	Conductivity								
				Z0	Ozone								
				F0	Fluoride								
				H0	Hydrogen peroxide								
				A0	Peracetic acid								
				X0	Dissolved oxygen								
					Measuring - Controlling								
					9	All measured variables two-way controllable							
						Communication interface							
						0	None						
						A	Modbus RTU, terminal						
						E	LAN with web server, connection via M12 C coded						
						G	Profinet (2xM12)						
						D	DULCONNEX (appears in the scope of delivery as a separate unit)						
							Data logger						
							1	Data logger with measured value display on SD card					
								Hardware expansion					
								1	Protective RC circuit for output relay				
									Sensor equipment				
									0	With sensors			
									1	Without sensors			
										Version			
										0	Panel-mounted with ProMinent Logo		
											Sample water treatments		
											0	None	
											1	With filter, Not for measured variable D0, Z0	
												Approvals	
												01	CE (Standard)
													Documentation language
													DE German
													EN English
													ES Spanish
													IT Italian
													FR French
													FI Finnish
													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
SL	Slovenian
SV	Swedish
TH	Thai

Third measured variable can be retrofitted on site: a total of one amperometric measured variable and up to two measured variables are possible with a PG13.5 connector. Permissible measured variable combinations for DULCOTROL DWCa_W Wastewater see page → 261

3.3.4 Examples of DULCOTROL DWCa_W Wastewater



Similar figure

Example 3: DWCa_W_5_H0_00_9_A_1_1_0_0_1_01_EN

Wastewater application:

Two-way control of the hydrogen peroxide in turbid waste water. The controller contains an RC circuit to protect the relays, a data logger and a Modbus RTU communication interface.

Controller

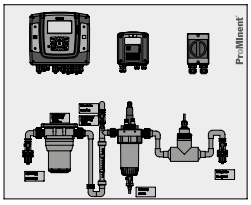
- DACBW006VA4000A11010EN

Fitting

- DLG III for hydrogen peroxide + flow control

Sensors

- H_2O_2 sensor PEROX H-3E-200ppm
- Pt100 temperature sensor



Similar figure

Example 4: DWCa_W_5_L0_P0_9_D_1_1_0_0_0_01_EN

Wastewater application:

Two-way control of pH and measurement of conductivity in turbid wastewater. The controller includes an RC circuit to protect the relays, a data logger and a DULCONNEX communication interface (appears in the scope of delivery as a separate unit).

Controller

- For pH: DACBW006L34000D11010EN
- For conductivity: Compact controller

Fitting

- Piping + flow control

Sensors

- ICT 5
- PHER 112 SE

3.4 Techn. Description of the Scope of Delivery of Measuring and Control Systems DULCOTROL DWCa

3.4.1 Technical Description of Controllers

(for more detailed information, see measuring and control technology chapter)

The DULCOMETER diaLog DACb controller is used to measure all measured variables with the exception of conductivity. The Compact controller is configured for conductivity measurement.

The DULCOMETER diaLog DACb controller used with the DULCOTROL DWCb can be selected as a single or two-channel controller. The third measuring channel can be configured on-site, as required, providing the selected sensor fitting allows this. The following versions of the device can be separately selected using the DULCOTROL identity code ordering system:

- Specification: **Communication interface**

This specification defines the type of communication interface on the controller.

- Specification: **Data logger**

All controller versions include a data logger as standard.

- Specification: **Hardware upgrade**

This specification defines whether a protective RC circuit should be available to protect relays subject to high loading.

Hardware version and identity code of diaLog DACb controllers:

	Identity code
Package 4, three measured variables by 2 no. mV/mA modules, without communication	DACBW006VA4000011010EN
Package 4, three measured variables by 1 no. mV/mA module and 2 no. conductive conductivity/temperature modules, without communication	DACBW006L34000011010EN
Package 4, three measured variables by 2 no. mV/mA modules, with Modbus RTU	DACBW006VA4000A11010EN
Package 4, three measured variables by 1 no. mV/mA module and 2 no. conductive conductivity/temperature modules, with Modbus RTU	DACBW006L34000A11010EN
Package 4, three measured variables by 2 no. mV/mA modules, with Profibus DPV1	DACBW006VA4000B11010EN
Package 4, three measured variables by 1 no. mV/mA module and 2 no. conductive conductivity/temperature modules, with Profibus	DACBW006L34000B11010EN
Package 4, three measured variables by 2 no. mV/mA modules, with LAN web server	DACBW006VA4000E11010EN
Package 4, three measured variables by 1 no. mV/mA module and 2 no. conductive conductivity/temperature modules, with LAN web server	DACBW006L34000E11010EN
Package 4, three measured variables by 2 no. mV/mA modules, with Profinet	DACBW006VA4000G11010EN
Package 4, three measured variables by 1 no. mV/mA module and 2 no. conductive conductivity/temperature modules, with Profinet	DACBW006L34000G11010EN

	Water to be measured	Identity code
Compact controller for conductive conductivity	1	DCCAW006L30010XX
Compact controller for inductive conductivity	2, 4, 5, 7	DCCAW006L60010XX

3.4 Techn. Description of the Scope of Delivery of Measuring and Control Systems DULCOTROL DWCa

3.4.2 Technical Description of Sensors

(for more detailed information, see sensor technology DULCOTEST chapter)

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 'measured variable' and 'water to be measured' specifications for the potable water ('P') application

Measured variable		Water to be measured	Sensor type	Order no.
Free chlorine with a pH value < 8	C0	1	CLE 3-mA-0,5 ppm	792927
Free chlorine	C1	1	CBR 1-mA-0,5 ppm	1038016
free chlorine, free bromine, combined bromine, DBDMH (1,3-dibrom-5,5-dimethyl-hydantoin)	C1	2	CBR 1-mA-2 ppm	1038015
Free chlorine	C1	H	CLO 4-mA-2 ppm	1131644
Total chlorine	G0	1	CTE 2-mA-0,5 ppm	1136433
Total available bromine	G0	2	BCR 1-mA-2 ppm	1040115
pH	P0	1	PHEP 112 SE	150041
pH	P0	2	PHER 112 SE	1001586
ORP	R0	1	RHEP-Pt-SE	150094
ORP	R0	2	RHER-Pt-SE	1002534
ORP combined with ozone: R0 Z0	Z0	1/2	RHEP-Au-SE	1003875
Chlorine dioxide (ClO_2)	D0	1	CDE 2-mA-0,5 ppm	792930
Chlorine dioxide (temperature-corrected)	D0	2	CDR 1-mA-2 ppm	1033393
Chlorite anion (ClO_2^-)	I0	1/2	CLT 1-mA-0,5 ppm	1021596
Conductivity, conductive	L0	1	LFTK 1 DE	1002822
Conductivity, inductive	L0	2	ICT 5	1095248
Ozone (O_3)	Z0	1/2	OZE 3-mA-2 ppm	792957
Fluoride (temp.corr.)	F0	1/2	FLEP 010-SE / FLEP 0100-SE	1028279
Fluoride (temp.corr.)	-	-	Measuring transducer 4-20 mA FPV1	1028280
Hydrogen peroxide	H0	1	H_2O_2 sensor PEROX-H2.10 P	792976
-	-	-	PEROX Transducer V2	1047979
Hydrogen peroxide	H0	2	PER 1-mA-2000 ppm	1022510
Peracetic acid	A0	1	PAA 1-mA-200 ppm	1022506
Peracetic acid	A0	2	PAA 1-mA-2000 ppm	1022507
Dissolved oxygen	X0	1/2	DO 3-mA-20 ppm	1094609
ORP	R0	-	RHEX-Pt-SE	305097
pH	P0	-	PHEF 012 SE	1010511
pH	P0	-	PHEX 112 SE	305096
-	-	-	Measuring transducer 4-20 mA FP 100 V1	1031331

3.4 Techn. Description of the Scope of Delivery of Measuring and Control Systems DULCOTROL DWCa

Sensor types for the defined 'measured variable' and 'water to be measured' specifications for the wastewater ('W') application

Measured variable		Water to be measured	Sensor type	Order no.
pH	P0	4	PHEP 112 SE	150041
pH	P0	5	PHER 112 SE	1001586
pH	P0	6	PHEX 112 SE	305096
pH	P0	7	PHEF 012 SE	1010511
ORP	R0	4	RHEP-Pt-SE	150094
ORP	R0	5	RHER-Pt-SE	1002534
ORP	R0	6	RHEX-Pt-SE	305097
ORP combined with ozone: R0 Z0	Z0	1/2	RHEP-Au-SE	1003875
Fluoride (temp.corr.)	F0	4/5/7	FLEP 010-SE / FLEP 0100-SE	1028279
-	-	-	Measuring transducer 4-20 mA FP 100 V1	1031331
-	-	-	Reference electrode REFP-SE	1018458
Conductivity, inductive	L0	4/5/6/7	ICT 5	1095248
Total available bromine	G0	4/5	BCR 1-mA-2 ppm	1040115
free chlorine, free bromine, combined bromine, DBDMH (1,3-dibrom-5,5-dimethyl-hydantoin)	C1	4/5	CBR 1-mA-2 ppm	1038015
Free chlorine	C1	H	CLO 4-mA-2 ppm	1131644
Hydrogen peroxide	H0	4/5	PEROX H-3E-200 ppm	1105778
Temperature	-	-	Pt 100 SE temperature sensor	305063
Dissolved oxygen	X0	4/5	DO 3-mA-20 ppm	1094609
Ozone (O_3)	Z0	4/5	OZR 1-mA-2 ppm	1051647
Chlorine dioxide (temperature-corrected)	D0	4/5	CDR 1-mA-2 ppm	1033393
Peracetic acid	A0	4/5	PAA 2-3E-mA-2 ppm	1120263

3.4 Techn. Description of the Scope of Delivery of Measuring and Control Systems DULCOTROL DWCa

3.4.3 Technical Description of Sensor Fittings

(for more detailed information, see sensor technology DULCOTEST chapter)

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.

Sensor fittings in DULCOTROL DWCa_P Potable water/F&B

Fitting type DGMa is used in the DULCOTROL DWCa_P Potable water/F&B for all clear types of water similar to potable water. Fitting type DLG III is used for rinsing/process water with a turbid appearance in application 'P'.

Measured variable (sensor type)	Water to be measured	Fitting
Free chlorine	1	DGMa
Total chlorine	1	DGMa
pH	1	DGMa
ORP	1	DGMa
Chlorine dioxide (CDE 2)	1	DGMa
Chlorite	1	DGMa
Conductivity (conductive)	1	DGMa
Ozone	1	DGMa
Hydrogen peroxide	1	DGMa
Peracetic acid	1	DGMa
Dissolved oxygen	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
Inductive conductivity	2	ICT 5 in T-piece
Fluoride (temp.corr.)	1/2	DLGIV
Dissolved oxygen (DO3)	2	DLGIII

Sensor fittings in DULCOTROL DWCa_W Wastewater

Fitting type DLGIII is used in the DULCOTROL DWCa_W Wastewater for all clear water or water with a minimal solid fraction.

Measured variable (sensor type)	Water to be measured	Fitting
Chlorine dioxide (CDE 2)	4/5	DLGIII
Fluoride (temp.corr.)	4/7	DLG IV (PVC) + magnetic stirrer
Dissolved oxygen (DO3)	4/5	DLGIII
Total chlorine	4/5	DLGIII
Conductivity, inductive (ICT 5)	6/5/4	Adapter for PVC pipe- DN 40 (bypass on plate)
Ozone	4/5	DLGIII
ORP	4/5	DLGIII
Temperature	4/5	DLGIII
Hydrogen peroxide	4/5	DLGIII
pH	7/5/4	DLGIII

3.4 Techn. Description of the Scope of Delivery of Measuring and Control Systems DULCOTROL DWCa

3.4.4 Technical Description of the Hydraulic Connector/Pipework

An 8x5 mm hose connector is used as the sample water hydraulic connection for the 'water to be measured' 1, 2, 4, 5, 7. 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.

3.4.5 Technical Description of Optional Accessories

	Description	Water to be measured	Order no.
Adapter M34/PG13.5	For retrofitting pH/ORP sensor in free DGMa module	1, 2, 4, 5, 7	1050866
Filter housing		1, 2, 4, 5, 7	1045244
Filter element	100 µm	2, 4, 5, 7	1031211
Filter element	10 µm	1	1031210
Pressure reducer V 82	0.5 – 10 bar	2	1031212
Pressure reducer DO 6F 1/2"	0.5 – 10 bar	1	302104
Sample water pump von Taine 0502 PP/FPM	Max. flow 1800 l/h Max. delivery height 4.5 m	1, 2, 4, 5, 7	1023089

3.5.1 Measuring and control point for low turbidity DULCOTROL LT

Ideal for applications up to 100 NTU

Smart sensor technology for clear results - the new DULCOEYE LT optical sensor from ProMinent

NEW

The new DULCOEYE Turbidity Sensor from ProMinent is a high-precision solution for the optical measurement of low turbidity. With state-of-the-art technology and intelligent design, this sensor simplifies liquid analysis.



The user-friendly DULCOEYE LT sensor impresses with its intelligent design and immediate, uncomplicated commissioning. Thanks to factory calibration, it is immediately ready for use and can be optimally combined with the DULCOMETER diaLog C Controllers from ProMinent.

The sophisticated construction enables particularly easy handling and ensures a reliable installation with high operational safety. The long-term stable light source delivers high-precision measurement results in laboratory quality - permanently and reliably.

The sensor's compact flow cell reduces water consumption and guarantees fast response times. The continuous flow ensures gentle, hydrodynamic self-cleaning.

A separately available, sealable calibration vessel with holder is available for safe and efficient calibration. The calibration can be checked as required using the available solid-state verification vessel.

Your Benefits

- **Precise measurement results in laboratory quality**
  The long-term stable light source and optimized signal processing ensure maximum precision. An intelligent algorithm automatically detects and compensates for air bubbles - for reliable measurement results without interference.
- **Low maintenance and reliable**
  The hydrodynamic self-cleaning system and high-quality components reduce maintenance requirements and increase operational reliability.
- **Resource-saving and efficient**
  The small-volume flow cell and calibration vessel reduce water consumption and enable fast response times.
- **Flexible calibration and verification options**
  Compatible with formazine and solid-state verification.
- **Ready for immediate use**
  Thanks to factory calibration and plug-and-play function, the sensor is ready for immediate use - without any additional effort.
- **Simple and safe operation**
  The user-friendly design and practical accessories enable intuitive operation - without any training.

Technical Details

- Gentle, hydrodynamic self-cleaning principle
- Available individually or as a panel
- Automatic compensation of light source ageing and light source temperature drift
- Automatic flush valve selectable for programmable remote flushing

Field of Application

- Fresh water
- Well and raw water
- Surface water from lakes, rivers, etc.
- Drinking water treatment
- Treated waste water (e.g. 4th purification stage clarification plant|sewage plant)
- Distribution networks
- Industrial process water
- Pool water, swimming pool water
- Service water treatment
- Filter control and filter backwashing
- Cleaning fruit and vegetables

Technical Data

Measuring range	0…100 NTU
Measuring principle, technology	nephelometric (90° light scattering according to DIN EN ISO 7027-1)
Unit of measurement	NTU, FNU, FTU
Light source	860 nm infrared LED
Accuracy	2 % ± 0.02 NTU whichever is greater
Repeatability	< 0,5 %
Resolution	0.001 NTU
Response time sensor t_{90}	5 s
Supply voltage	11...30 V DC
Calibration	1-point or 2-point calibration
Operating temperature	0…45 °C
Storage temperature	-10…50 °C
Ambient conditions	Indoor installation (no direct sunlight), maximum 90 % relative air humidity (non-condensing)
Digital output	RS-485
Housing material	316 L stainless steel
Enclosure rating	IP 65
Weight	ca. 1.000 g + Kabel
Operating pressure	1 – 3 bar
Flow	20…30 l/h
Controllers	diaLog C

3.5 DULCOTROL measuring and control points

3.5.2 Identity code ordering system, DULCOTROL LT measuring and control point for low turbidity

EPCa	Design												
	00	with ProMinent logo											
		Mounting type											
		B	Wall mounting										
			Measured variable										
			TU1	low turbidity, infrared									
				Accessories - Flow cell									
				TM	Flow cell with solenoid valve								
				TK	Flow cell with ball valve								
					Accessories - Fittings and hoses								
					00	without							
					01	Fittings							
					02	Fittings and hoses							
						Accessories - Calibration vessel							
						00	without						
						A1	Vessel holder						
						A2	Calibration vessel						
						A3	Vessel holder + calibration vessel						
							Accessories - Solid state verification						
							0	without					
							5	with solid-state verification					
								Operating voltage					
								0	230 V, 50/60 Hz				
									Communication interface 1				
									0	without			
										Communication interface 2			
										0	without		
											Data logger		
											0	without data logger	
											1	with data logger	
												Software extensions	
												0	none
													Approvals / Certificates
													99	no certificate
														Documentation language
														DE	Englisch
														EN	English
														JP	Japanese
														KO	Korean
														TH	Thai
														ZH	Chinese

4.1 DULCOZERO monitoring systems

4.1.1 DULCOZERO FCL monitoring system for the absence of free chlorine

Reliable monitoring for the absence of free chlorine – with the DULCOZERO measuring system

Reliably measure the absence of free chlorine with the innovative monitoring system DULCOZERO FCL: Accurate measured values and a high degree of monitoring and process reliability are guaranteed.



Reliable monitoring for the absence of free chlorine is indispensable in many water treatment processes. During diaphragm processes, e.g. for desalination (reverse osmosis), free chlorine often has to be used initially for disinfection, but then has to be eliminated again to protect the diaphragms. Even the lowest concentrations of free chlorine breaking through may irreversibly destroy the diaphragms and cause huge amounts of damage. Even after long periods when free chlorine is not present, the chlorine monitoring system DULCOZERO FCL reliably issues alarms to indicate a sudden chlorine breakthrough in < 3 min using an alarm threshold for free chlorine of 0.02 mg/l or more. The following contribute to high levels of process reliability: the innovative amperometric sensor, which is tolerant to the absence of free chlorine, an algorithm for smartly interpreting the sensor signal and logical analysis of the pH and ORP auxiliary measured variables. A convenient, fully integrated calibration and monitoring system guarantees functionality, even during long periods when chlorine is not present.

Providing all the benefits of an amperometric chlorine sensor, DULCOZERO FCL can also be used in applications where the free chlorine is not metered continuously, e.g. in drinking water treatment (needs-based disinfection, emergency disinfection) or during the disinfection intervals, which are often used during the treatment of cooling water.

Your Benefits

- Excellent process reliability thanks to the rapid and reliable issuing of alarms in the event of chlorine breakthrough, after long periods when free chlorine is not present, at concentrations of > 0.02 ppm, in less than 3 min and with great accuracy
- Reliable measurement and control mode without affecting the amperometric sensor even during long periods when chlorine is not present in applications with (discontinuous) disinfection processes
- Low operating costs: within a calibration interval lasting several months, the sensor does not have to be activated by metering chemicals
- The alarm system is protected by smart interpretation of the chlorine sensor signal (based on an algorithm) and logical linking with the pH and ORP auxiliary measured variables
- Convenient, fully integrated calibration and monitoring system guarantees functionality, even during long periods when chlorine is not present. Menu-based calibration process via the DACb measuring device.
- Amperometric measuring principle means no interference caused by turbidity or discolouration
- DULCONNEX-Ready: makes various additional benefits possible thanks to integration in the ProMinent IoT platform DULCONNEX

Field of Application

- Monitoring for the absence of free chlorine, e.g. diaphragm process (reverse osmosis) in drinking water, process water, waste water
- In discontinuous disinfection processes with long measurement pauses in designs for drinking water, cooling water, waste water and pool & wellness

4.1 DULCOZERO monitoring systems

Technical Data

Measured variable	Free chlorine, auxiliary measured variables: pH, ORP
Measuring principle, technology	Free chlorine: Sensor type CLZ: amperometric, 3 electrodes, no diaphragm, hydrodynamic cleaning; pH, ORP: potentiometric sensor types PHER-DJ-112-SE, RHER-DJ-Pt-SE
Reference method	DPD1
Selectivity	Free chlorine as against combined chlorine
pH-range	5.0…9.0
Electrolytic conductivity	200 µS/cm - 70 mS/cm (seawater)
Temperature, sample water	5…45 °C
Max. pressure	1.5 bar
Flow	Sensor bypass fitting BAMa: 40 l/h, only this fitting with this flow adjustment meets the full scope of services
Supply voltage	115 VAC / 60 Hz, versions with order no. 1138498, 1138499 230 VAC / 50 Hz, versions with order no. 1137028, 1138500
Disinfection process	Chlorine gas, hypochlorite, electrolysis with diaphragm, inline electrolysis (tubular cell electrolysis)
Process integration	Bypass: open sample water outlet
Controllers	DACb-DULCOZERO, only this DACB characteristic meets the full scope of services
Dimensions	745 x 595 x 14 mm (H x W x D)
Weight	11 kg

Designs

	Order no.
DULCOZERO FCL, 230 VAC / 50 Hz, complete with sensors	1137028
DULCOZERO FCL, 115 VAC / 60 Hz, complete with sensors	1138498

Scope of delivery with sensors, which are fitted by the customer

	Order no.
DULCOZERO FCL, 230 VAC / 50 Hz, without sensors	1138500
DULCOZERO FCL, 115 VAC / 60 Hz, without sensors	1138499

Can be fitted at a later date with sensors for pH and ORP adapted to the application

Technical description of the measuring system DULCOZERO FCL

The scope of delivery of **DULCOZERO FCL with sensors** includes the standard sensors. For **DULCOZERO FCL without sensors,** the standard sensors can be ordered at a later date, or in the case of pH and ORP, other sensor types adapted to the application can be ordered.

Other than the sensors, all DULCOZERO variants are fully mounted on the plate. The sensors are installed by the customer during installation.

The measuring systems contain the components listed in the table below:

	Order no.
Controller DACBWZF6VA3000E1101000	1137555
Bypass fitting BAMAEU2221XD0C1X000000EN, including ball cleaning	1137556
Flow limiter, 54 litres, complete, f/f PVC	1117493
Sensor for free chlorine CLZ 1-mA-0.5 ppm *	1137065
Measuring line (external cable), 2-core, 5-pin plug **	707702
Two-wire measuring line 2 x 0.25 mm² Sold by the meter, 4 mm diameter ***	725122
PHER-DJ 112 SE *	1108991
RHER-DJ-Pt-SE *	1112882
Cable combination, coaxial, Ø 5 mm 0.8 m - SN6 - pre-assembled ****	1024105
Peristaltic pump, 230 VAC, DF2A0204P00A10W0	1137554
Peristaltic pump, 115 VAC, DF2A0204PZ0B40W0	1140549
Metering bottle DULCOZERO	1137012
Metering bottle holder DULCOZERO	1137027
Hose coupling, plug	1137026
Hose coupling, socket	1137013
Calibration reagent DULCOZERO	1137024

* For the version “with sensors”
** Chlorine sensor signal cable
*** Control cable for reed switch DACb, length 0.5 m
**** One signal cable each for pH and ORP sensors

Spare parts, consumables

Sensors

	Capacity ml	Order no.
Sensor for free chlorine CLZ 1-mA-0.5 ppm	-	1137065
Electrolyte for chlorine sensor CLZ	100	1137064
Sensor cap for chlorine sensor CLZ	-	1137029
Spare parts kit for chlorine sensor CLZ	-	1137069
RHER-DJ-Pt-SE	-	1112882
PHER-DJ 112 SE	-	1108991

Sensor cleaning for CLZ sensor

	Order no.
Cleaning set CLO/BAMa for CLO / CLZ sensors in conjunction with sensor bypass armature BAMa	1113881
Flow nozzle CLO / CLZ	1104264
Cleaning balls (approx. 100)	1104267

Sensor bypass fitting BAMa

	Order no.
Sensor module CLO / CLZ (with ball funnel)	1125044
Sensor module, complete	1113795
Reed switch PVC, for flow module	1118867
Flow limiter, 54 litres, complete, f/f PVC	1117493

Chlorine metering

	Order no.
Metering spare parts kit contains bottle, holder, hose coupling, hoses	1137025
Peristaltic pump, 230 VAC, DF2A0204P00A10W0	1137554
Peristaltic pump, 115 VAC, DF2A0204PZ0B40W0	1140549
Calibration reagent DULCOZERO	1137024

4.1 DULCOZERO monitoring systems

Accessories

	Capacity ml	Order no.
Potential equalisation/earthing, complete	-	1113409
Vent valve (lip valve) G 1/4 - 6x4, PVC	-	1113427
Thermal flow control (SA 4300)	-	1122791
Photometer DT1B	-	1039315
DPD1 tablets, 100 tablets	-	1115981
pH 7.0 buffer - green colour	50	506253
pH 4.0 buffer - red colour	50	506251
ORP buffer 465 mV	50	506240
Cleaning fluid Pepsin	250	791443
Filter housing	-	1045244
Filter element 100 µm	-	1031211
Pressure reducer DO 6F 1/2", priming pressure max. 16 bar, back pressure 1.5 – 9 bar	-	302104
Pressure reducer V 82 0.5 – 10 bar	-	1031212
von Taine 0502 PP/FKM	-	1023089

5.1 Measuring and Control System for Cooling Water Treatment

5.1.1 Measuring and Control System DULCODOS Cooling Water

The compact measuring and control system for the reliable monitoring and treatment of cooling water in evaporation cooling systems.

Monitoring and treatment of cooling water with DULCODOS Cooling Water – the compact measuring and control system specially designed for the treatment of cooling water in evaporation cooling systems and wet separators.



The DULCODOS Cooling Water measuring and control systems with the AEGIS II controller are compact units for reliable monitoring and treatment of cooling water. They are available with various sensor configurations according to the statutory requirements applicable (e.g. in Germany the 42nd Federal Immission Control Ordinance (BImSchV)).

Measuring all the necessary measuring parameters, such as conductivity, pH value, ORP voltage and the selective measurement of oxidative biocides, such as chlorine, chlorine dioxide or bromine concentration, enables optimum cooling water treatment. Optimum cooling water treatment is guaranteed by the volume-proportional addition of auxiliary chemicals, such as corrosion inhibitors or dispersants, the direct measurement of the corrosion properties of various metals and the indirect measurement of corrosion inhibitors by means of fluorescence sensors.

The device can be configured using the LAN and Wi-Fi function of the AEGIS II. The configuration process and result are displayed clearly using PCs, smartphones and tablets. A Modbus RTU interface and gateways to other fieldbuses enable connection to superordinate controllers and process control systems.

Your Benefits

- Ready-to-connect plug & play measuring and control point for quick, easy installation and commissioning
- Reduces cooling water consumption
- Protects the complete system against corrosion, deposits and biological growth
- Produces automatic reports in line with applicable directives and e-mails them out
- Connection to the DULCONNEX IIoT solution, developed by ProMinent.

Technical Details

- Installation in the bypass of the circulating water line through which the medium flows
- Max. pressure, depending on design: 1 bar up to 6 bar
- Sample water flow, depending on design: 15...40 l/h (with selective measurement of biocides) / 15...500 l/h
- Max. medium temperature: 45 °C
- Ambient temperature: +5...50 °C
- Degree of protection: IP 65
- Power supply: 90-240 V, 50/60 Hz

Field of Application

- Monitoring and treatment of cooling water from industrial plants, air conditioning systems
- Wet separator
- Similar applications

5.1 Measuring and Control System for Cooling Water Treatment

The measuring and control plate with the AEGIS II controller is a compact unit for the reliable monitoring and treatment of cooling water. Optimum cooling water treatment is guaranteed by measuring all the necessary measuring parameters, including conductivity, pH value, ORP value and oxidative biocides, such as chlorine, chlorine dioxide or bromine concentration as well as the volume-proportional addition of auxiliary chemicals, such as inhibitors or dispersants.

The AEGIS II uses a data logger to document the consumption of chemicals as well as the volume of additional water fed in and the bleed frequency. The reports based on these data can be sent daily by e-mail to up to 5 addressees. Furthermore, the AEGIS II can also e-mail alerts in the event of faults. This might include the maximum bleeding duration or the maximum metering volume being exceeded.

The Wi-Fi function of the AEGIS II allows the device to be configured and displayed clearly on a smartphone and tablet.

	PM-1, Order no. 1093705	PM-2, Order no. 1093706	PM-3, Order no. 1093707	PM-5, Order no. 1097168	PM-6, Order no. 1097170	PM-7, Order no. 1103171
Conductivity	+	+	+	+	+	+
pH measurement	+	+	+	+	+	+
ORP measurement	+	+	+	+	+	+
Flow switch	+	+	+	+	+	+
Corrosion measurement, copper		+	+		+	
Corrosion measurement, construction steel		+	+		+	
Fluorescence sensor			+			
Chlorine measurement				+	+	
Pressure reduction				optional	optional	
DULCONNEX						+

Components

The measuring and control plate PM AEGIS II EU - type PM-1 comprising:

- AEGIS II controller, type AGIB006W0T1CTXXXXV2XXW0022001. Input for conductivity sensors (including temperature and flow), pH and ORP. Including Wi-Fi function and data logger. Control of a cooling tower with control of metering pumps.
- CTFS sensor for conductivity/temperature/flow, fully assembled, for measuring conductivity, temperature and flow.
- pH sensor PHEI-112-SE for the pH value measurement in industrial water containing solids.
- ORP sensor RHEIC-Pt-SE for the ORP value measurement in industrial water containing solids.
- Manometer for pressure display (also for flow control).
- 2 PVC ball valves for shutting off the feed and discharge line.
- Shut-off valve for draining the sample medium (no sample valve as not flammable).
- Filter insert 0.5 mm acting as a filter in the feed.
- Complete PVC pipework including brackets etc. and screw adapters for the sensors contained in the scope of delivery.

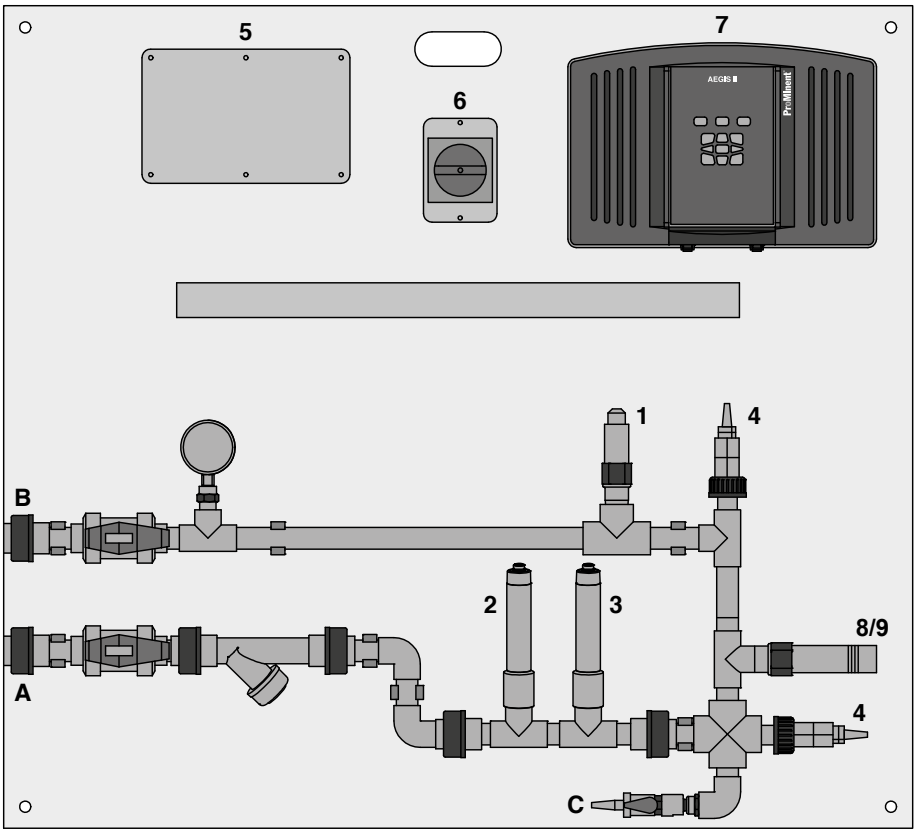
The measuring plate is supplied fully assembled and electrically wired. The measuring plate features an emergency stop switch and also has CE certification.

Dimensions of the measuring plate: 950 x 1,050 mm (HxW)

	Order no.
Measuring plate PM AEGIS 2 EU - type PM-1	1093705
Measuring plate PM AEGIS 2 EU - type PM-2	1093706
Measuring plate PM AEGIS 2 EU - type PM-3	1093707
Measuring plate PM AEGIS 2 EU - type PM-5	1097168
Measuring plate PM AEGIS 2 EU - type PM-6	1097170
Measuring plate PM AEGIS 2 EU - type PM-7	1103171

5.1 Measuring and Control System for Cooling Water Treatment

1 CTFS sensor for conductivity/temperature/flow, fully assembled (order no. 1081727)
2 pH sensor PHEI 112 SE (order no. 1076610)
3 ORP sensor RHEI C (order no. 1082281)
4 Mounting points for corrosion sensor
6 Master switch
7 AEGIS® II cooling tower controller
8/9 Fluorosensor or chlorine sensor
A Sample water feed, DN 20
B Sample water drain, DN 20
C Sampling



Measuring plate PM AEGIS 2 EU - type PM-1, basic version equipment, order no. 1093705

Item	Quantity		Order no.
7	1	AGIBEU006W0T1CTXXXXV2XXW0022001	1093713
1	1	CTFS sensor conductivity/temperature/flow complete	1081727
2	1	PHEI 112 SE	1076610
3	1	RHEIC-Pt-SE	1082281

Measuring plate PM AEGIS 2 EU - type PM-2, equipment additional to basic version, order no. 1093706

Item	Quantity		Order no.
7	1	AGIBEU006W0T1CTXXXXV2XXW0022001	1093713
4	2	Corrosion sensor basic CRS LPR	1092242
4	1	CRS-CS construction steel corrosion tip set	1092276
4	1	CRS-CU copper corrosion tip set	1092277

Measuring plate PM AEGIS 2 EU - type PM-3, equipment additional to basic version, order no. 1093707

Item	Quantity		Order no.
7	1	AGIBEU006W0T1CTXXXXV2XXW0022001	1093713
-	-	Little Dipper Fluorescence sensor® (tracer sensor)	1059104

5.1 Measuring and Control System for Cooling Water Treatment

Measuring plate PM AEGIS 2 EU - type PM-5, equipment additional to basic version, order no. 1097168

Item	Quantity		Order no.
7	1	AGIBEU006W0T1CTXXD1V2AAW0022001	1093712
4	2	Corrosion sensor basic CRS LPR	1092242
4	1	CRS-CS construction steel corrosion tip set	1092276
4	1	CRS-CU copper corrosion tip set	1092277
9	1	CBR 1-mA-2 ppm	1038015

Important: The pressure reducing unit Order No. 1095885 is needed with pressures of more than 1 bar!

Measuring plate PM AEGIS 2 EU - type PM-6, equipment additional to basic version, order no. 1097170

Item	Quantity		Order no.
7	1	AGIBEU006W0T1CTXXXXV2XXW0022001	1093713
4	2	Corrosion sensor basic CRS LPR	1092242
4	1	CRS-CS construction steel corrosion tip set	1092276
4	1	CRS-CU copper corrosion tip set	1092277
9	1	CBR 1-mA-2 ppm	1038015

Important: The pressure reducing unit (order no. 1095885) is needed with pressures of more than 1 bar!

Measuring plate PM AEGIS 2 EU - type PM-7 with DULCONNEX, equipment additional to basic version, order no. 1097171

Item	Quantity		Order no.
7	1	AGIBEU006W0T1CTXXXXV2XXW0022001	1093713
1	1	CTFS sensor conductivity/temperature/flow complete	1081727
2	1	PHEI 112 SE	1076610
3	1	RHEIC-Pt-SE	1082281
5	1	DULCONNEX Gateway AGIb	1098723

Pressure reducing unit

Pressure reduction with system pressures of > 1 bar and chlorine sensors
Ready mounted on a PP plate, pre-piped in PVC DN 20, shut-off ball valves at the inlet and outlet side, dimensions: H x W = 200 mm x 600 mm, consisting of the following main components:

	Quantity	Unit	Order no.
Manometer NG 63 0-0006 bar 233.30.	1	EA	1040999
Pressure reducing valve DMV755 DN20 PVC-U FPM	1	EA	1095887

Corrosion sensors



The corrosion sensors work on the so-called LPR principle: linear polarisation resistance. A sensor consists of the corrosion sensor basic LPR. This is fitted with the metal (corrosion tip set) used in the application. The corresponding alloy factor needs to be set in the monitor. If there is corrosion on the metal then the sensor can measure this electrochemically and the monitor (AEGIS II) can display the value. The measurement is not an absolute measurement, rather it measures a trend. The advantage over gravimetric measurement is that the LPR measurement takes place without any time delay. The value is displayed by the monitor in the unit of measure MPY (mils per year). One mil corresponds to a thousandth of an inch, in metric terms 0.0254 mm.

	Order no.
Corrosion sensor basic CRS LPR	1092242
CRS-AM Admiralty brass corrosion tip set	1092274
CRS-CN Cu/Ni corrosion tip set	1092275
CRS-CS construction steel corrosion tip set	1092276
CRS-CU copper corrosion tip set	1092277
CRS-SS 1.4301/304 SS corrosion tip set	1092278
CRS-ZN zinc corrosion tip set	1092279

Fluorescence sensor

The Turner Designs Little Dipper® is a single-channel fluorescence sensor for measuring the concentration of PSTA fluorophore in process water. The metered chemical needs to contain PTSA for this. The sensor delivers a 4 - 20 mA output signal proportional to the concentration of the PTSA fluorophore in the process water.

Measuring principle: A light source irradiates the process water and stimulates the fluorophore in the solution, which emits light of a different wavelength. The intensity of the emitted light is proportional to the concentration of the PTSA fluorophore in the process water.

	Order no.
Little Dipper Fluorescence sensor® (tracer sensor)	1059104

Retrofit module

	Order no.
Module 2x mA output	1092565
Module 2x conductive conductivity temperature sensor input	1081809
Module 2x mA sensor input	1081806
Module 2x mV sensor input	1081807
Module 2x serial sensor inputs	1092566
Modules mA/mV + temperature sensor inputs	1081808
Module Modbus RTU + 2 mA outputs	1094377
Module Modbus RTU + 2 mA outputs + 2 mA inputs	1094350
Wi-Fi module	734211

6.1 DULCODOS Pool Swimming Pool Metering Systems

6.1.1 Overview

New: The swimming pool metering systems DULCODOS Pool are now equipped with the new sensor bypass armature Modular BAMa.

The metering systems DULCODOS Pool ensure the best water quality. The systems come in four different designs. It's 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. 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 with the controller DULCOPOOL Pro 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 with the controller DULCOPOOL regulates the pH and chlorine content using the ORP. 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 with the controller DULCOPOOL Pro uses highly specific chlorine sensors to regulate the chlorine content. The concentration of chlorine in the water can be determined and set with accuracy. With numerous features to enhance operating convenience, such as display of the measured and calibration values via the in-built data logger or remote control through the integrated WEB server via LAN and WLAN. Modbus RTU and Modbus TCP are available as standard for connecting to a SmartHome system.

- **Professional**

DULCODOS Pool Professional comes in three designs:

DULCOMARIN 3 Compact Unit

A DULCOMARIN 3 comprises a DULCOMARIN 3 with 7" touch display and Compact Unit and is intended for controlling a filtration circuit. It can measure and regulate the pH, ORP, free chlorine, combined chlorine, total available chlorine and temperature measured variables.

DULCOMARIN 3 Multipool Global Unit

A DULCOMARIN 3 Multipool system consists of a Global Unit with a 7" touch display. It could be described as the central control unit via which all controllers of all pools, the Local Units, can be operated in full. There needs to be one Global Unit installed in each system yet there may only be one.

DULCOMARIN 3 Multipool Local Unit

A DULCOMARIN 3 Multipool system can control up to 16 filtration circuits, i.e. 16 Local Units with a 7" touch display are needed. The controller can be used to operate the local pool.

Every Local Unit controls one filtration circuit. They are connected to the Global Unit via cNet.

- **Choice of pumps**

6.1 DULCODOS Pool Swimming Pool Metering Systems

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 DULCOFLEX** are suited to applications requiring few chemicals, such as small pools or those used infrequently. Bubbles of gas formed during periods of non-use are reliably eliminated by the pump. 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 output and longer maintenance intervals. Like peristaltic pumps, they are silent.
- **Solenoid metering pumps beta** are not controlled by switching them on and off, like DULCOFLEX or alpha, instead, their metering frequency is adjusted continuously, enabling the pump to provide a very precise control action.
- Pumps with a **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.
- The flocculant metering pump is no longer part of the identity code. Please order a corresponding metering set to match your requirements.

Accessories

Whether you are looking for collection pans for chemical tanks or portable test devices for measurement parameters – or even software for digital control: the 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.

6.1.2 Metering System DULCODOS Pool Soft

Convincing - chlorine-free water treatment with active oxygen in private swimming pools.

Swimming pools with a circulation performance of up to 100 m³/h

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. Alternatively, sensor-based control is also possible.

Peristaltic pumps of the product range DULCOFLEX, alpha type motor-driven metering pumps or beta type solenoid metering pumps are used, depending on demand and the circulation volume.

When selecting the metering pump and pump capacity, please consider the concentration of the hydrogen peroxide used. The concentration of the commercial product has been reduced in Germany by the legislature from wi = 32.8% to wi = 11.8%. The metering time and metering pump size need to be selected correspondingly to be able to meter volumes larger by a factor of 2.8. Depending on the product used, the metering volume is approx. 1.5 l per 10 m³.

Sensors, controllers and metering pumps form a unit with the chemical tanks, which can get to work without a lot of installation effort on your part.

The control device offers many convenient functions, such as the recording of measured values (transfer via USB stick) or remote access via Wi-Fi and LAN interface and Modbus RTU and Modbus TCP interfaces as standard for connecting to SmartHome systems and programmable logic controllers.

Your Benefits

- Simple, quick assembly
- Simple menu-based operation with colour touch display
- Chlorine-free
- Constantly good water quality
- Versatile monitoring functions
- With scope for connecting to DULCONNEX, ProMinent's cloud-based IIoT solution, as standard

Technical Details

- DULCOPOOL Pro with measurement/control of pH value and metering of active oxygen via integrated timer function, mounted on wall plate ready for connection.
- Flow sensor with sample water monitoring, sample water filter and pH value sensor
- Monitoring of the chemical supply
- Metering monitoring to protect against overdosing
- Data logger with USB interface
- Embedded WEB server with WiFi and LAN interface
- Modbus RTU and Modbus TCP interfaces as standard for connection to SmartHome systems and programmable logic controllers
- 4 analogue outputs, 0/4 - 20 mA as recorder outputs or control outputs, e.g. for reducing the circulation rate
- Metering pumps alpha, DULCOFLEX or beta for regulating the pH value and active oxygen content.
- Sensors used pH sensor PHES 112 SE (150702)
- Metering point connection: Metering valves with 1/2" screw-in thread
- Connections for metering pumps / metering points: PVC hose 10 x 4 mm or 12 x 6 mm, depending on metering pump size
- Sample water connection: PVC hose 12 x 6 mm
- Digital pause input
- Alarm relay output
- Electrical connection: 230 VAC, 50/60 Hz
- Dimensions with metering pumps, DULCOFLEX DF2a, alpha or beta:
  - 595 x 745 x 350 mm (W x H x D) Mounting plate for measuring equipment
- Weight: Approx. 10 kg or 6 kg (without pumps)

DULCONNEX

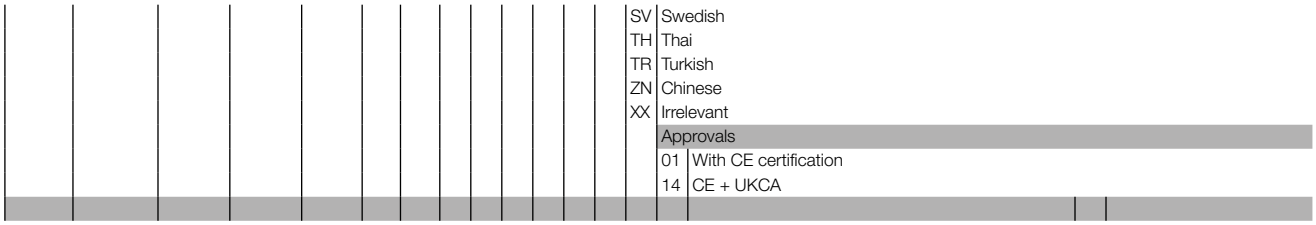
Field of Application

- Private swimming pool

6.1.3 Identity Code Ordering System for DULCODOS Pool Soft

| | | |

6.1 DULCODOS Pool Swimming Pool Metering Systems



* HB = indoor pool / FB = outdoor pool (please note the metering information provided by the manufacturer of the chemicals)

DSPb	EU	PM	D1	1	X	1	X	X	1	A	1	1	DE	01	Identity code as a representative example

DULCODOS Pool Soft - disinfectants and measured variables

Measured variable 1 | 2 | 3 | variable new DSPb	Measured variable predecessor DSPa	Disinfectant	Measured variables
1 | X | X | X	DO2	Active oxygen	pH
1 | X | X | Q	DO4	Active oxygen	pH + active oxygen

6.1.4 Metering System DULCODOS Pool Basic

Simple and controlled – for private pools.

For swimming pools with a circulation capacity of up to 100 m³/h

The chlorine metering system DULCODOS Pool Basic is a complete solution for private 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 redox potential measured variable) in swimming pool water. Depending on demand and the circulating volume, peristaltic pumps of the DULCOFLEX product range are used. Sensors, controllers and metering pumps form a single perfectly coordinated unit with the chemical tanks, which can reliably get to work without a lot of installation effort on your part.

New: With Wi-Fi stick as standard, via which the controller can be configured and operated in conjunction with a smartphone app (iOS and Android).

Your Benefits

- Simple, quick assembly
- Simple menu-based operation with colour touch display
- Constantly good water quality
- Versatile monitoring functions

Technical Details

- 2-channel swimming pool controller DULCOPOOL 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 probes for pH value and redox potential, fitted on a wall panel.
- 2 metering pumps DULCOFLEX
- Monitoring of the chemical supply
- Operation and configuration via app for iOS and Android.
- Metering monitor to protect against over-metering
- Sensors used: pH sensor PHES 112 SE (150702), ORP sensor RHES-Pt -SE (150703)
- Connectors for points of injection: Injection valves with 1/2" screw-in thread
- Connectors for metering pumps/points of injection: PVC hose 10x4 mm
- Sample water connector: PVC hose 12x6 mm
- Digital pause input
- Wi-Fi and Modbus RTU (RS 485) as standard
- Alarm relay output
- Electrical connection: 230 V AC, 50/60 Hz, max. 850 W, 3.5 A
- Dimensions: 595 x 745 x 150 mm (W x H x D)
- Weight: approx. 10 kg

Field of Application

- Private swimming pool

6.1 DULCODOS Pool Swimming Pool Metering Systems

6.1.5 Identity Code Ordering System for DULCODOS Pool Basic

DSPb	Regional design														
	EU	Europe													
	US	USA													
		Version													
		PM	ProMinent, with sensor bypass armature BAMa												
			Controller configuration												
			B2	pH/ORP (DULCOPOOL)											
				Measured variable 1, pH											
				0	Measured variable pH, without sensors										
				1	PHES 112 SE, order no. 150702										
					Measured variable 2, ORP										
					0	Measured variable ORP, without sensors									
					A	RHES-Pt-SE, order no. 150703									
						Measured variable 3, chlorine									
						X	No measured variable chlorine								
							Measured variable, variable								
							X	No measured variable, variable							
								Auxiliary functions							
								X	None						
									Communication interface						
									X	Standard, with Modbus RTU and Wi-Fi					
										Electrical Connection					
										A	230V, 50/60 Hz standard Schuko CEE 7/7				
										B	230V 50/60 Hz Switzerland type 12/13				
										C	230V, 50/60 Hz standard Schuko UK BS 1363				
											Metering pumps for acids/alkalis				
											1	0.8 l/h (DULCOFLEX DF2a 0208)			
											2	1.6 l/h (DULCOFLEX DF2a 0216)			
											3	2.4 l/h (DULCOFLEX DF2a 0224)			
												Metering pumps for disinfection			
												1	0.8 l/h DULCOFLEX DF2a for up to 45/10 m³/h circulation HB/FB*		
												2	1.6 l/h DULCOFLEX DF2a for up to 90/20 m³/h circulation HB/FB*		
												3	2.4 l/h DULCOFLEX DF2a for up to 140/30 m³/h circulation HB/FB*		
													Language (operating instructions)		
													DE	German	
													EN	English	
													BG	Bulgarian	
													CS	Czech	
													DA	Danish	
													EL	Greek	
													ES	Spanish	
													ET	Estonian	
													FI	Finnish	
													FR	French	
													HR	Croatian	
													HU	Hungarian	
													IT	Italian	
													JA	Japanese	
													KO	Korean	
													LT	Lithuanian	
													LV	Latvian	
													NL	Dutch	
													PL	Polish	
													PT	Portuguese	
													RO	Romanian	
													RU	Russian	
													SK	Slovakian	
													SL	Slovenian	
													SR	Serbian	
													SV	Swedish	
													TH	Thai	
													TR	Turkish	
													ZN	Chinese	
													XX	Irrelevant	
														Approvals	
														01	With CE certification
														14	CE + UKCA

* HB = indoor pool / FB = outdoor pool (please note the metering information provided by the manufacturer of the chemicals)

DSPb	EU	PM	B2	1	A	X	X	X	X	A	1	1	DE	01	Identity code as a representative example

DULCODOS Pool Basic - disinfectants and measured variables

Measured variable 1 | 2 | 3 | variable new DSPb	Measured variable predecessor DSPa	Disinfectant	Measured variables
1 | A | X | X	PR2	Sodium hypochlorite, calcium hypochlorite	pH + ORP

6.1.6 Metering System DULCODOS Pool Comfort

Simple and efficient – smart water management for every size of pool.

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 pool water with liquid chlorine products. Remote access to the in-built web server via Wi-Fi and LAN.



Complete system DULCODOS Pool Comfort with DULCOPOOL Pro controller for pH adjustment and disinfection with liquid chlorine products. Peristaltic pumps of the product range DULCOFLEX, alpha type motor-driven metering pumps or beta type solenoid metering pumps are used, depending on demand and the circulation volume.

Sensors, controllers and metering pumps form a unit with the chemical tanks, which can get to work without a lot of installation effort on your part.

The control device offers many convenient functions, such as the recording of measured values or remote access via Wi-Fi and LAN interface and Modbus RTU and Modbus TCP interfaces as standard for connecting to SmartHome systems and programmable logic controllers.

Your Benefits

- Simple, quick assembly
- Simple, menu-based operation
- Outstanding water quality
- Versatile monitoring functions
- With chlorine gas control as standard
- With scope for connecting to DULCONNEX, ProMinent's cloud-based IIoT solution, as standard

Technical Details

- 1 channel controller (pH) and timer for active oxygen, 2 channel controller (pH and PEROX sensor for active oxygen), 2 channel controller (pH/redox or pH/chlorine), 3 channel controller (pH/redox/chlorine), 4 channel controller (pH/redox/free chlorine/total chlorine) DULCOPOOL Pro with measuring, control and metering functions for pH value and chlorine concentration, mounted on wall plate ready for connection
- BAMa bypass fitting with sample water monitoring, sample water filter and measurement sensors for pH value and chlorine content
- Monitoring of the chemical supply
- Metering monitoring to protect against overdosing
- Data logger with USB interface
- Embedded WEB server with WiFi and LAN interface
- Modbus RTU and Modbus TCP interfaces as standard for connection to SmartHome systems and programmable logic controllers
- 4 analogue outputs, 0/4 - 20 mA as recorder outputs or control outputs, e.g. for reducing the circulation rate
- Metering pumps alpha, DULCOFLEX or beta for regulating the pH value and chlorine content, DULCOFLEX for flocculant metering (option).
- Metering point connection: Metering valves with 1/2" screw-in thread
- Connections for metering pumps / metering points: PVC hose 10 x 4 mm or 12 x 6 mm, depending on metering pump size
- Sample water connection: PVC hose 12 x 6 mm
- Digital pause input
- Alarm relay output
- 6 relays for controlling metering pumps and attractions, circulation, filter backwashing, timer with 8 switching points per relay
- Electrical connection: 230 VAC, 50/60 Hz
- Dimensions with metering pumps alpha or beta, or with "flocculant metering" option:
  - 595 x 745 x 320 mm (W x H x D) Mounting plate for measuring equipment
- Dimensions with DULCOFLEX metering pumps: 595 x 745 x 150 mm (W x H x D)
- Weight: Approx. 10 kg or 6 kg (without pumps)

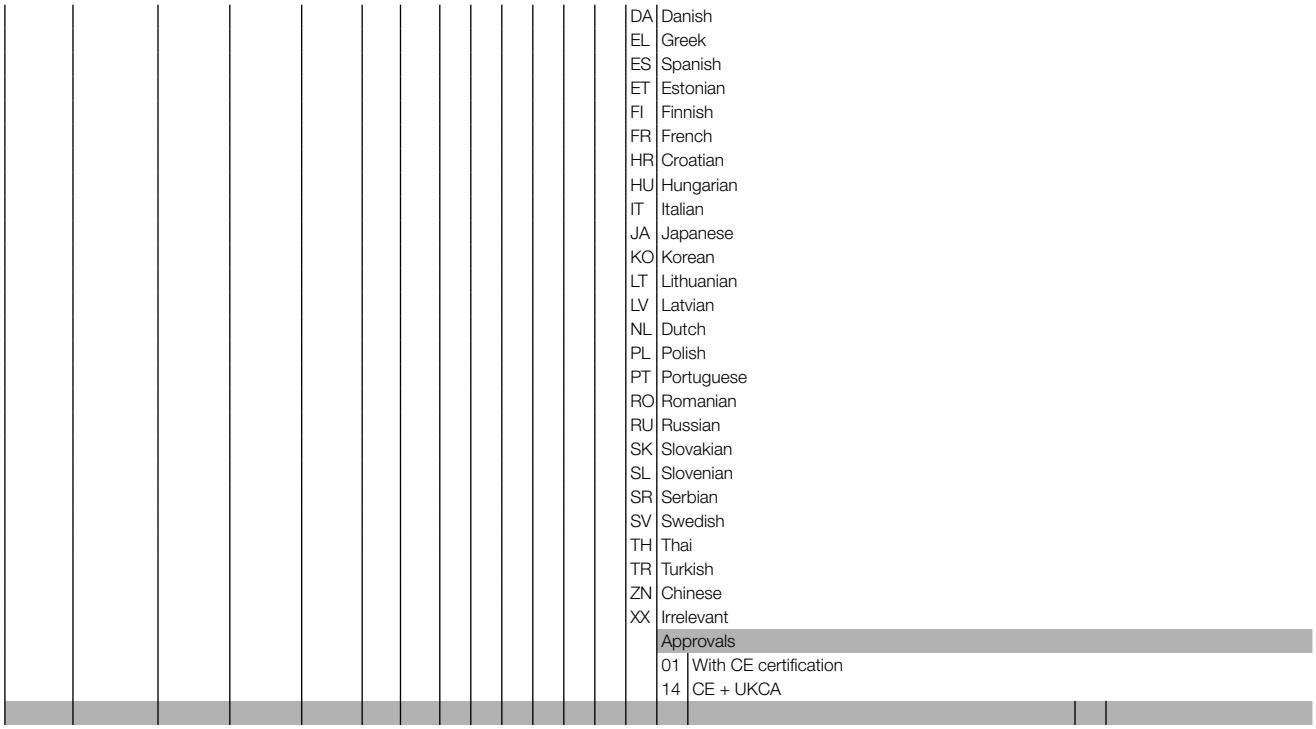
Field of Application

- High-quality private pool, hotel pool, public swimming pools

6.1.7 Identity Code Ordering System for DULCODOS Pool Comfort

| | | |

6.1 DULCODOS Pool Swimming Pool Metering Systems



DA	Danish
EL	Greek
ES	Spanish
ET	Estonian
FI	Finnish
FR	French
HR	Croatian
HU	Hungarian
IT	Italian
JA	Japanese
KO	Korean
LT	Lithuanian
LV	Latvian
NL	Dutch
PL	Polish
PT	Portuguese
RO	Romanian
RU	Russian
SK	Slovakian
SL	Slovenian
SR	Serbian
SV	Swedish
TH	Thai
TR	Turkish
ZN	Chinese
XX	Irrelevant

Approvals

01	With CE certification
14	CE + UKCA

* HB = indoor pool / FB = outdoor pool (please note the metering information provided by the manufacturer of the chemicals)

DSPb	EU	PM	C1	1	A	1	A	X	6	A	1	1	DE	01	Identity code as a representative example

DULCODOS Pool Comfort - disinfectants and measured variables

Measured variable 1 | 2 | 3 | variable new DSPb	Measured variable Predecessor DSPa	Disinfectant	Measured variables
1 | A | X | X	DR2	Sodium hypochlorite, chlorine gas, calcium hypochlorite, membrane electrolysis	pH + ORP (platinum)
1 | C | X | X	DR3	Sodium hypochlorite, chlorine gas, calcium hypochlorite, membrane electrolysis, Inline electrolysis	pH + ORP (gold)
1 | X | 1 | X	DC2	Sodium hypochlorite, chlorine gas, calcium hypochlorite, membrane electrolysis	pH + free chlorine
1 | X | 5 | X	DC4	Sodium hypochlorite, chlorine gas, calcium hypochlorite, membrane electrolysis, Inline electrolysis	pH + total available chlorine
1 | A | 1 | X	DC5	Sodium hypochlorite, chlorine gas, calcium hypochlorite, membrane electrolysis	pH + ORP + free chlorine
1 | A | 1 | X	DC6	Sodium hypochlorite, chlorine gas, calcium hypochlorite, membrane electrolysis, Inline electrolysis	pH + ORP + free chlorine
1 | X | 1 | A	DC7	Trichloroisocyanuric acid, sodium hypochlorite, chlorine gas, calcium hypochlorite, membrane electrolysis	pH + free chlorine + combined chlorine
1 | X | X | X	DO2	Active oxygen	pH + timer control for active oxygen
1 | X | X | Q	DO4	Active oxygen	pH + sensor PEROX H-3E-mA for active oxygen

6.1.8 Metering System DULCODOS Pool Professional

Professional and superior - crystal-clear water in public swimming pools.

For swimming pools with a circulation capacity of up to 350 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.



Complete system DULCODOS Pool Professional for individual adjustment and monitoring of all common hygiene-relevant parameters in public pools, such as pH, redox potential and free and combined chlorine. Peristaltic pumps of the product range DULCOFLEX, alpha type motor-driven metering pumps or beta type solenoid metering pumps are used, depending on demand and the circulation volume.

Control of the entire water circuit, a counterflow system and LED spotlight via DMX.

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 system can be easily integrated into a PLC or building control system thanks to the standard Modbus RTU interface. It can be easily operated by VNC server via LAN and optional Wi-Fi.

Sensors, controllers, metering pumps and the process chemical tanks form a single unit with the other peripheral swimming pool technology used, which gets to work without a lot of installation effort on your part.

Your Benefits

- Energy- and cost-efficient control of your swimming pool
- The DULCOMARIN 3 can be accessed from any Internet-compatible device (web browser and VNC app needed)
- Simple calibration of the sensors with video support
- Status messages and alarms issued by e-mail
- View and assess the time-based curve of the measured values of all pools on the integrated screen plotter
- Simple, unrestricted LAN and Wi-Fi connection – like in your home network
- Scope for upgrading at a later date by means of the ProMinent internal cNet bus system
- Intelligent chlorine sensors: save the sensor data and are always in the optimum measuring range thanks to auto-ranging
- Intelligent metering pumps: provide information on operating parameters, such as chemical level statuses and pump capacity, within the range of 0.7 l/h to 1000 l/h
- A wealth of communication options by means of
  - Modbus RTU
  - OPC UA
  - BACnet IP
  - Web interface
  - VNC server
  - A gateway to Profinet is available as an option
- View historical measured data directly on the controller: thanks to the integral screen plotter with data logger via USB
- Now with optional conductive conductivity measurement. Compatible with all ProMinent conductivity sensors, e.g. LFTK 1 DE
- Optional 2-channel mA input, e.g. to measure turbidity
- In combination with up to 2 F-modules: control the entire water circuit, attractions, circulation, filter backwashing, water temperature, raw water tank level
- Simple, quick assembly
- Outstanding water quality
- Eco!Mode helps cut operating costs
- Versatile communication interfaces
- Central control of peripheral devices and functions too

6.1 DULCODOS Pool Swimming Pool Metering Systems

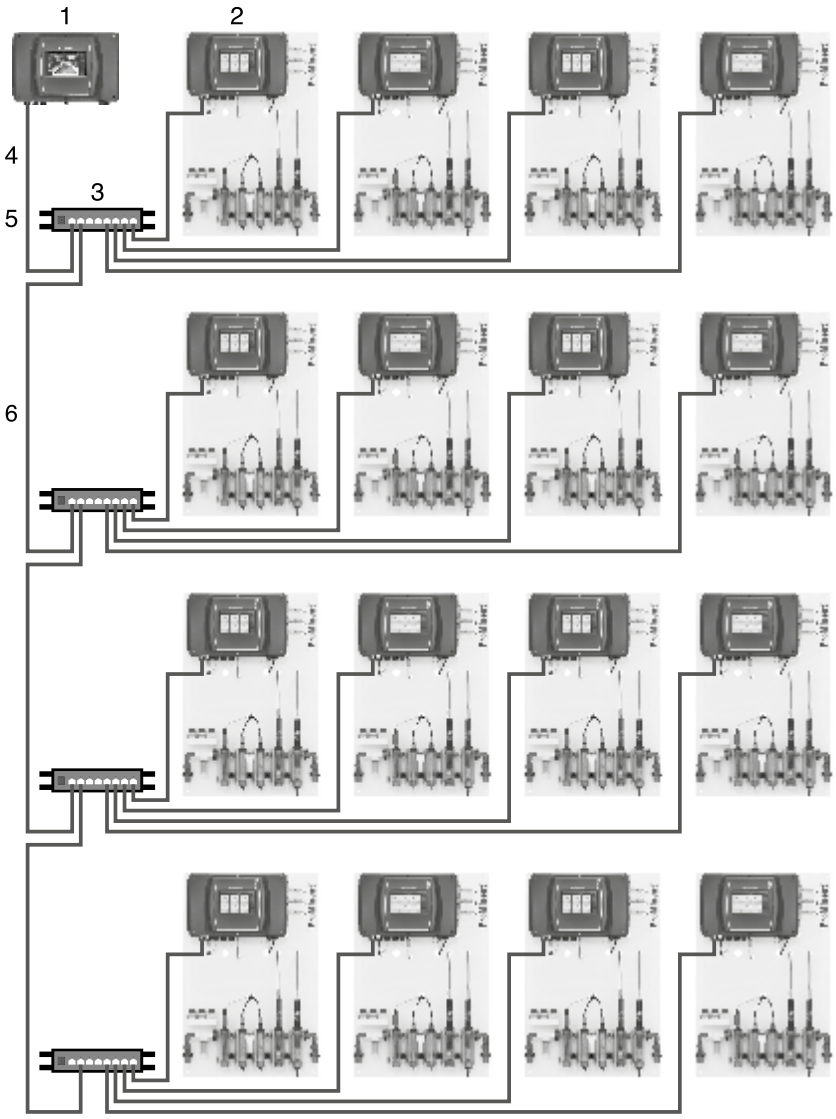
Technical Details

- Multi-channel, multi-parameter controller DULCOMETER DULCOMARIN 3 with measuring, control and metering functions for pH value, redox potential, free and combined chlorine in various combinations depending on the type, mounted on a wall panel ready for use
- Bypass fitting BAMa with sample water monitoring, sample water filter and all sensors
- Monitoring of the chemical supply with pre-alarm
- Metering monitor to protect against over-metering
- Screen plotter for graphic mapping of measured values, data logger with USB port
- Standard LAN interface with optional WLAN/Wi-Fi interface for operation of the device by VNC app
- Modbus RTU for integration into building management systems, alarm function by text or e-mail (optional)
- Metering pumps alpha, DULCOFLEX or beta to control the pH and chlorine content
- Connector for point of injection: Injection valves with 1/2" screw-in thread
- Connectors for metering pumps/points of injection: 10x4 mm or 12x6 mm PVC hose depending on size of metering pumps
- Sample water connector: PVC hose 12x6 mm
- Digital pause input
- 8 digital control inputs, for pause control, sample water errors and connecting chemical level switches
- CAN bus for connecting chlorine measuring cells and metering pumps beta and DULCOFLEX DF4a
- Temperature measuring input Pt 100/Pt 1000
- 6 output relay outputs, freely configurable
- 4 x 0/4-20 mA analogue outputs, freely configurable
- Up to 4 x 0/4-20 mA analogue inputs for processing signals from e.g. turbidity measuring devices, can be retrofitted
- Electrical connection: 230 V AC, 50/60 Hz.
- Dimensions of mounting plate for measuring technology without metering pumps and with metering pumps DULCOFLEX DF2a, the DF2a are also mounted on the mounting plate:
  - 595 x 745 x 150 mm (W x H x D)
- Dimensions of mounting plate for measuring technology without metering pumps and with metering pumps alpha, beta or DULCOFLEX:
  - 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
- Weight: approx. 12 kg or 7 kg (without pumps)

Field of Application

- High-end private pool
- Public swimming pool
- Therapy pool

Configuration example: Multipool system



1 Global unit
2 Up to 16 local units
3 LAN switch, e.g. TP-link 8 port switch
4 Connecting cable LAN M12 - RJ45 5.0 m
5 LAN coupling IP68
6 Customer's LAN cable, up to 100 m in length

6.1 DULCODOS Pool Swimming Pool Metering Systems

6.1.9 Identity Code Ordering System for DULCODOS Pool Professional

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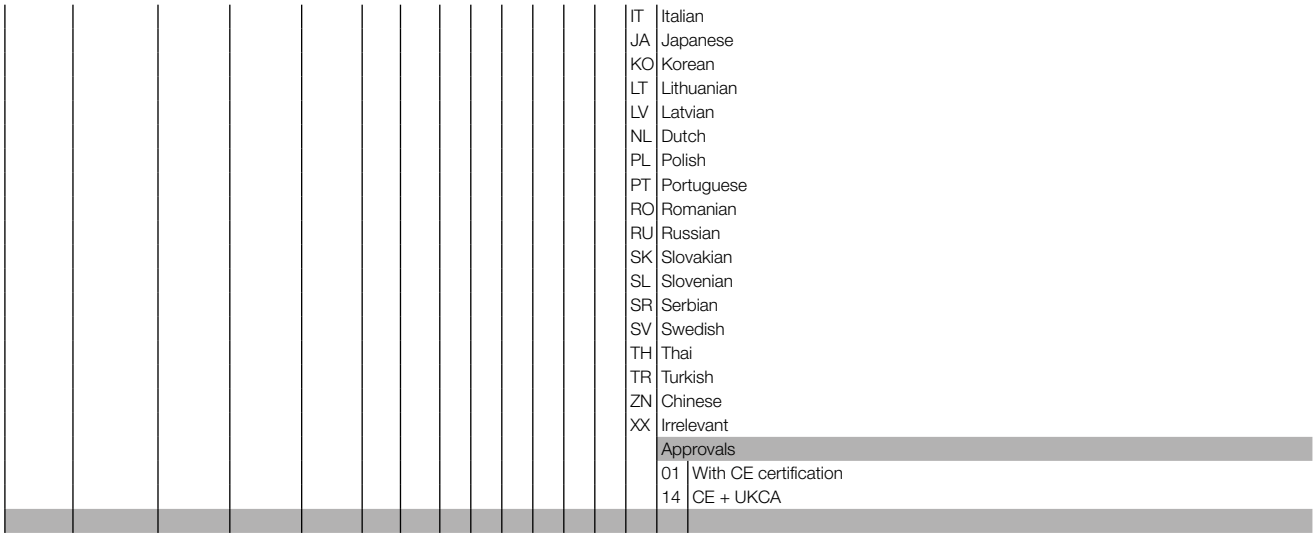


IT	Italian
JA	Japanese
KO	Korean
LT	Lithuanian
LV	Latvian
NL	Dutch
PL	Polish
PT	Portuguese
RO	Romanian
RU	Russian
SK	Slovakian
SL	Slovenian
SR	Serbian
SV	Swedish
TH	Thai
TR	Turkish
ZN	Chinese
XX	Irrelevant
Approvals	
01	With CE certification
14	CE + UKCA

* HB = indoor pool / FB = outdoor pool (please note the metering information provided by the manufacturer of the chemicals)

DSPb	EU	PM	PC	1	A	C	C	1	X	A	1	1	DE	01	Identity code as a representative example

We recommend the use of ORP sensors with gold electrodes, RHES-Au-SE, order no. 1044544 when using tubular cells or inline electrolysis systems.

DULCODOS Pool Professional - disinfectants and measured variables

Measured variable 1 | 2 | 3 | variable new DSPb	Measured variable predecessor DSPa	Disinfectant	Measured variables
1 | A | X | X	PD5	Sodium hypochlorite, chlorine gas, calcium hypochlorite, membrane electrolysis	pH + ORP
1 | X | D | X	PD6	Sodium hypochlorite, chlorine gas, calcium hypochlorite, membrane electrolysis	pH + chlorine
1 | A | D | X	PD7	Sodium hypochlorite, chlorine gas, calcium hypochlorite, membrane electrolysis	pH + free chlorine
1 | A | C | C	PD8	Sodium hypochlorite, chlorine gas, calcium hypochlorite, membrane electrolysis	pH + free chlorine + combined chlorine
1 | X | C | X	PD9	Trichloro-isocyanuric acid, sodium hypochlorite, chlorine gas, calcium hypochlorite, membrane electrolysis	pH + free chlorine
1 | A | C | X	PDA	Trichloro-isocyanuric acid, sodium hypochlorite, chlorine gas, calcium hypochlorite, membrane electrolysis	pH + ORP + free chlorine
1 | A | F | 0	PDO	Sodium hypochlorite, chlorine gas, calcium hypochlorite, membrane electrolysis	pH + ORP + free chlorine

Retrofitting of up to 4 analogue inputs for any sensors, e.g. turbidity measurement.

6.2 Maintenance Kits

The following are needed for maintenance of a measuring, control and metering system DULCODOS Pool:

- 2 maintenance kits for the metering pumps

6.2.1 Maintenance Kits for Metering Pumps

The following table shows the assignment of the maintenance kits to the types of metering pumps used.

	Series	Type	Order no.
Hose 4.8 x 8.0 PharMed	DF2a	0208, 0216, 0224	1009480
Hose 1.6 x 4.8 PharMed	DF4a	04015	1030722
Hose 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

6.2.2 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 220 mV, 50 ml	ORP	506244

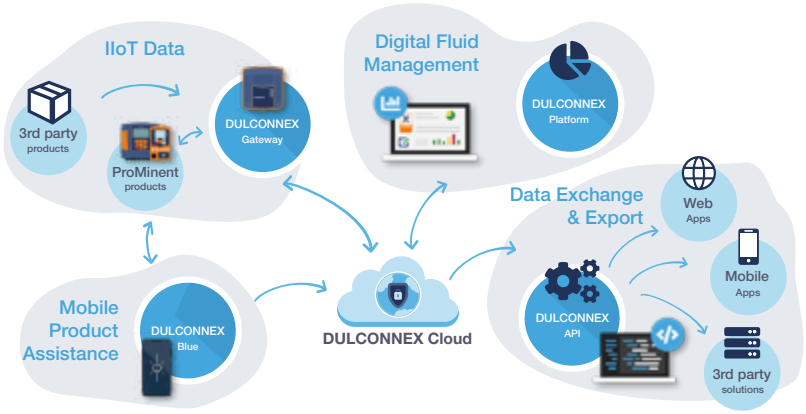
7.1 DULCONNEX: IIoT Solution for Digital Fluid Management

7.1.1 Smart Process Monitoring – Any time, Anywhere

Improved process safety, reliability and transparency due to real-time monitoring, individual alarms and automated reports.

ProMinent's DULCONNEX is the cloud-based IIoT solution for digitally networking your system components. The solution consists of individual solution modules, which can be combined specifically to meet customer requirements:

	Pricing logic	Order no.
DULCONNEX Gateway AGIb	One-time price	1098723
DULCONNEX Gateway DACb	One-time price	1098756
DULCONNEX Gateway pumps and I/O modules	One-time price	1105889
DULCONNEX Gateway UVCb, CDLb	One-time price	1098757
DULCONNEX API	One-time price	1136479
CAN connection kit UVCb	One-time price	1107357
DULCONNEX Blue	Free app (Google Play Store / Apple App Store)	-
DULCONNEX Platform	Monthly fee per connected device	1093138
DULCONNEX Inventory Management	Monthly fee per connected Inventory Management-enabled device	DX000004
DULCONNEX API	Monthly fee per connected device	1110567



The DULCONNEX Cloud lies at the heart of the DULCONNEX solution. It meets stringent safety standards, receives data from connected devices and makes this data available to target applications, such as the DULCONNEX Platform. A DULCONNEX Gateway is needed to integrate both ProMinent products as well as third-party products into the cloud.

Using the DULCONNEX Blue app, our digital wizard, ProMinent products can also be connected to the user's mobile via a Bluetooth connection without connecting to the cloud, greatly simplifying user interactions.

On the basis of data available in the cloud, external services can be fed data via API.

Location-independent system monitoring in real time

With DULCONNEX, you always have access to all the key data and measured values for your pump installations. Monitor the status of your system in real time and benefit from continuous documentation. Check your device data safely and reliably when you're out and about. Simply use the terminal device of your choice: smartphone, tablet or PC. Configurable alarms and notifications inform you of relevant events 24/7.

Be in a position to act promptly at all times with DULCONNEX. No matter whether you work with industrial and process water, cooling water, potable water or swimming pool water – DULCONNEX supports you in ensuring the reliable treatment of your fluids.

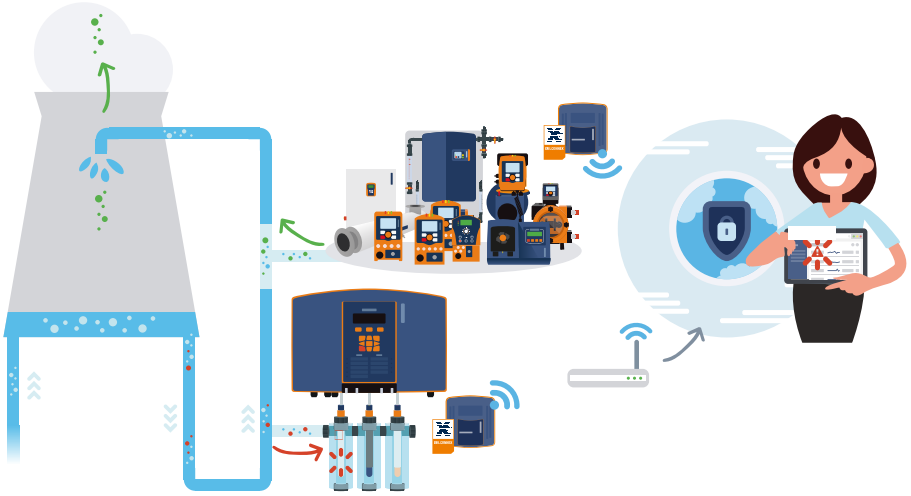
7.1 DULCONNEX: IIoT Solution for Digital Fluid Management

7.1.2 Reference Cooling Tower

In cooling water treatment, the AEGIS II cooling tower controller processes the most diverse parameters (e.g., pH, ORP, chlorine, conductivity, temperature and water flow) and controls the metering of biocides, inhibitors, stabilisers and dispersants, among others.

Apart from individually adaptable alarm conditions, connecting your cooling tower to DULCONNEX above all offers automatic and continuous documentation of the process data recorded by the AEGIS II and the connected metering pumps, enabling you to log the hygiene-compliant operation conforming to the relevant regulations without the risk of tampering.

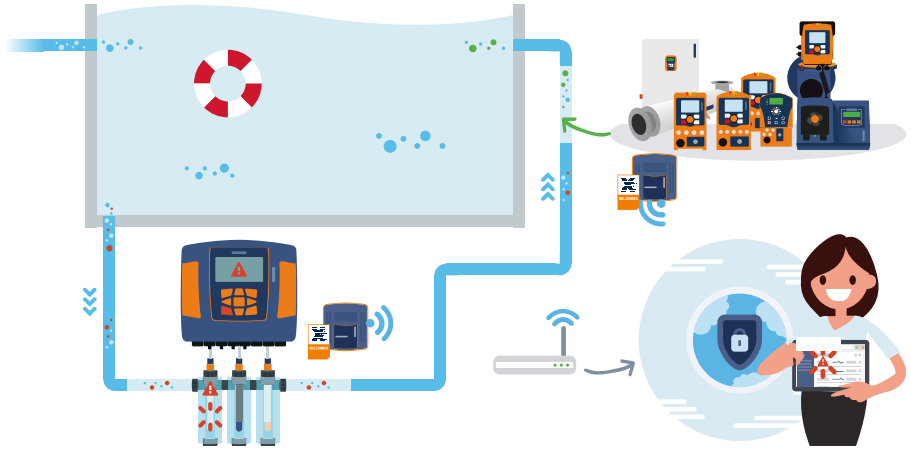
Whether you wish to record the metering of chemicals or the water parameters affected by them, DULCONNEX provides you with access to value diagrams and summarised reports anywhere and at any time. By connecting liquid level measuring devices, you can also avoid shortages when metering.



7.1.3 Reference Swimming Pool

DULCONNEX helps you to avoid downtimes, saving you the need to check on the individual controllers, pumps and UV systems in your pools. You can control the pH, chlorine and temperature values of controllers irrespective of your location, and also access the status of other connected components. Whether you wish to monitor the correct metering of chemicals or the status of disinfection systems, DULCONNEX immediately informs you by e-mail about every fault or limit violation, thanks to individually configurable alarms.

DULCONNEX continuously logs the water values of your swimming pool installations, making them available to you in the form of value diagrams and summarised reports. That way you can always ensure a smooth and carefree swimming pool operation.



7.1 DULCONNEX: IIoT Solution for Digital Fluid Management

7.1.4 Your Benefits of Digital Fluid Management



- **Complete overview of all your devices and installations** – any time and from anywhere.
- **Reliable saving of your complete value history** including alarms and warnings that occur.
- **Individual alarms by e-mail** – Keep up to date at all times.
- **Continuous logging and automatic reports** – Documentation and evidence of correct operation.
- **Clear visualisation** – Graphic display of value and parameter combinations.
- **Access via the web** – Simply use any of your smart devices with an installed browser. You do not need an additional app nor a permanent link to the connected device.

The DULCONNEX Platform can be accessed at
for free access to try out the solution and send us your questions.

Privacy and data security



The architecture of DULCONNEX is already designed to achieve maximum safety and reliably protect your data. For example, there is a systematic separation of user-specific data and measured values. In addition, all measured values are anonymised internally and the entire system is regularly inspected by professional IT safety service providers for possible safety gaps.

Examples of relevant safety measures:

- Encryption in accordance with the latest state of the art
- Multiple redundant data memories
- Systematic control of the equipment ownership

Constantly growing portfolio of supported products

- **Pumps**
  - gamma/ X
  - gamma/ XL
  - DULCOFLEX DFXa
  - DULCOFLEX DFYa
  - sigma/ X
  - DULCOFLEX DF4a
- **Controllers**
  - DULCOMETER diaLog X
  - DULCOMETER diaLog DACb
  - DULCOPOOL Pro
  - AEGIS II
  - SlimFLEX 5a
  - AEGIS S
- **Radar sensor** DULCOLEVEL
- **Water treatment and disinfection systems**
  - UV systems DULCODES MP, LP/LP certified/LP F&B/LP-PE
  - Chlorine dioxide systems Bello Zon CDLb, CDKd and CDVd
  - Electrolysis system CHLORINSITU IIa 60–2500 g/h
- **Industrial standard signals via dedicated I/O modules**
  - Digital inputs (relays, with counters too)
  - Analogue inputs (4…20 mA)

7.1 DULCONNEX: IIoT Solution for Digital Fluid Management

7.1.5 DULCONNEX Gateway

Secure and reliable provision of IIoT data

The DULCONNEX Gateway safely and reliably transfers the data of all products supported as standard to the DULCONNEX Cloud



Our DULCONNEX Gateway enables all smart products to be connected to our web-based fluid management platform.

Using a gateway matched to the relevant product guarantees smooth and reliable operation. The customer must provide a WiFi access point with an internet connection in order to communicate with the DULCONNEX Platform.

	Suitable for system types	Order no.
DULCONNEX Gateway AGIb	AEGIS II	1098723
DULCONNEX Gateway DACb	DULCOMETER diaLog DACb	1098756
DULCONNEX Gateway pumps and I/O modules	gamma/ X, gamma/ XL, delta, DULCOFLEX DF4a, DULCOFLEX DFXa, DULCOFLEX DFYa, I- and M-modules (DULCOMARIN II), Frenzel+Berg modules (CIO50, CIO57, CIO58, CIO60, CIO300), Sigma X	1105889
DULCONNEX Gateway UVCb, CDLb	DULCODES LP/MP, chlorine dioxide systems Bello Zon CDLb	1098757
DULCONNEX API	DULCOLEVEL	1136479

7.1 DULCONNEX: IIoT Solution for Digital Fluid Management

7.1.6 DULCONNEX Blue

Efficient and safe operation of pumps by smartphone

Mobile app for Android and iOS

The next generation of mobile product assistance from ProMinent – DULCONNEX Blue. The smart app enables intelligent pumps to be conveniently controlled by Bluetooth.



Your Benefits

- Easy operation and configuration of gamma/ X pumps in installation environments that are hard to access
- Live monitoring of device status and performance data from a safe distance
- Reliable remote control of supported ProMinent products
- User-friendly operation by means of intuitive interface and multilingual displays
- Efficient commissioning by simply copying of the configuration from one pump to other pumps
- Obtain professional support quickly in an emergency case – generate error logs at the press of a button and share them directly with service personnel

Technical Details

Important functions

- **Safe communication** - Easy authentication and pairing with supported devices for secure data exchange via Bluetooth interface.
- **Reliable remote control** - Easily operate ProMinent devices in hard-to-reach installation environments from a safe distance.
- **Intuitive design** - Thanks to the modern and multilingual user interface, pumps can now be operated even more conveniently.
- **Always up to date** - The clear dashboard provides the most important information on all devices at a glance. Information on current device status and performance data, as well as firmware updates, is available at all times.
- **Simple pump configuration** - Once saved, device configurations can be restored at any time and quickly copied from one pump to another.
- **Complete documentation** - The automatic logging of important operating data in the log book and the integrated commissioning report help to fulfill regulatory documentation requirements.
- **Direct access to product documentation** - Permanent access to the latest version of product-specific documents or relevant files.

Technical requirements

- Supported device model with the latest firmware version
- Integrated Bluetooth module (Bluetooth Classic or Bluetooth Low Energy)
- Mobile device with supported operating system (Android from version 9.0 (“Pie”) and iOS from version 12)

Supported devices

- Solenoid-Driven Metering Pump beta/ X, gamma/ X and gamma/ XL
  with Bluetooth Classic module from firmware version: 02.05.06.02
  with Bluetooth Low Energy module from firmware version: 02.06.01.01
- Radar liquid level sensor DULCOLEVEL

Further models will follow continuously in the future.

Supported languages

- English (DE)
- English (EN)
- French (FR)
- Spanish (ES)
- Polish (PL)

Availability

- Apple App Store for mobile devices with iOS (iPhone/iPad)
- Google Play Store for Android devices

7.1 DULCONNEX: IIoT Solution for Digital Fluid Management

Field of Application

- **Enhanced safety for personnel and processes** – Adapt the settings of connected devices directly or control the pump capacity and metering volume from a safe distance without having to put on protective equipment in advance. The opportunity to simply save device configurations and reset them to earlier statuses at any time provides for additional safety.
- **Commissioning in record time** – Significant time saved particularly when setting up multiple devices by transmitting the configuration of one pump to other pumps.
- **Everything under control** – Keep an eye on the statuses and performance data of connected pumps at all times, thanks to the clearly laid out dashboard. Access real-time operating data, including dosing rate, liquid level and system pressure, and make changes immediately if you need to.
- **Minimise downtimes** – The device automatically generates a logbook with all errors, warnings and events that have occurred. Detailed error logs can be generated at the press of a button, which can be shared quickly and easily with local service personnel. This guarantees the fastest possible help in an emergency to avoid long downtimes.
- **Provision of evidence** – The built-in commissioning report provides straightforward evidence of the set-up and commissioning of systems. Automatic recording of key operating data, including the current feed rate or number of strokes, simplifies compliance with regulatory documentation obligations.

7.1 DULCONNEX: IIoT Solution for Digital Fluid Management

7.1.7 DULCONNEX Platform

Location-independent monitoring and documentation of system and process data

Web-based IIoT platform for digital fluid management

DULCONNEX Platform is a web-based IIoT platform for digital fluid management. The web application offers simple and location-independent access to all relevant system and process data and thus increases system availability. By continuously monitoring important parameters, the process quality can be optimized and the safety of employees increased. Comprehensive logging and automated generation of reports facilitate the fulfilment of documentation obligations.



Your Benefits

- **Always one step ahead of events** - keep an eye on the status and functionality of systems at all times and react early thanks to configurable alarms with email notification function. Easily create and share documentation in the event of an emergency in order to receive competent assistance as quickly as possible.
- **Greater transparency and safety** - gain knowledge of the exact process and system status on site before entering potentially dangerous environments. The complete history of all measured values and system data and their reliable storage in the cloud also offer additional protection against manipulation and data loss. Different user authorizations and one-time passwords can be used to limit functions and prevent unintentional or unauthorized changes.
- **Plan service calls more efficiently and prepare more effectively** - With the help of location-independent access to condition and performance data, trips for pure inspection and documentation purposes can be minimized. Knowing the exact condition of the system before arriving on site also allows service activities to be optimally prepared.
- **Increased system availability and optimized process quality** - The visualization of freely combinable parameters in diagrams allows detailed analyses of processes and supports the identification of optimization potential.
- **Easier compliance with regulatory documentation requirements** - Thanks to continuous logging, automated report generation and the simple export function, the manual effort required to provide proof of proper operation is significantly reduced.

Technical Details

The responsive design and intuitive user interface of the web application ensure that users can quickly and easily benefit from the numerous functions of the IIoT platform:

- **Dashboards** - Customizable dashboards show the most important information of different systems or process sections at a glance
- **Alarms** - Freely configurable alarm messages by email provide information about exceeding or falling below individually configurable limit values and other important events
- **Log book** - The continuous logging of all system data and events creates increased transparency and additional safety
- **Data history** - A complete history of operating data and measured values supports operators in fulfilling regulatory documentation obligations and forms the basis for comprehensive analyses
- **Visualization** - Both current and historical measured values can be freely combined and displayed in diagrams, facilitating detailed analyses of system performance and process quality. It also supports the operator in fulfilling regulatory documentation obligations
- **Reports** - With the help of automated report generation and the simple creation of individual documentation in exportable file formats, proof of proper operation can be provided with minimal effort

7.1 DULCONNEX: IIoT Solution for Digital Fluid Management

Field of Application

- **Increase transparency** - Whether pumps, controllers, sensors or systems, the current status and performance data is retrieved from all installation locations in real time and stored securely in the DULCONNEX Cloud. With the help of the DULCONNEX Platform, operators have access to the complete history of their process data at any time and from anywhere and can easily keep an eye on critical measured values such as dosing rate, liquid level or system pressure at all times.
- **Ensure system availability** - The comprehensive logging of the device status, including all errors, Warnings and events that occur, is particularly useful in time-critical situations. Detailed documentation can be generated at the touch of a button and shared quickly and easily with local service contacts. This guarantees the fastest possible assistance in an emergency and minimizes the risk of longer downtimes.
- **Optimize processes** - Current liquid levels can be clearly displayed on the customizable dashboards and reliably monitored with the help of configurable alarms. If desired, automated notifications can inform responsible employees or chemical suppliers when critical limit values are reached so that they can ensure replenishment in good time. Process-critical chemicals can thus be delivered and stocked with pinpoint accuracy.
- **Protect employees** - The DULCOnneX Platform gives operators, employees or service technicians knowledge of the exact process and system status on site before entering potentially dangerous environments. This means that every operation can be optimally prepared and safety increased.
- **Prove compliance** - The continuous logging of all relevant operating data facilitates the fulfillment of regulatory documentation requirements. Customized, automatically generated reports significantly reduce manual effort and the proper operation of systems can be easily verified at any time.
- **Increase responsiveness** - Adjustments to changing conditions can be viewed from anywhere and conveniently changed remotely.

	Pricing logic	Order no.
DULCONNEX Platform	Monthly fee per connected device	1093138

7.1.8 DULCONNEX Inventory Management

The ideal DULCONNEX extension for your tank level application

The DULCONNEX Inventory Management add-on is an extension to the DULCONNEX Platform. It can be used to monitor tank levels and inventory levels of chemicals at various sites regardless of your location. Tank level monitoring is based on the data of the DULCOLEVEL radar level sensor.



The DULCONNEX Inventory Management add-on is an extension to the DULCONNEX Platform. It can be used to monitor tank levels and inventory levels of chemicals at various sites regardless of your location.

It also provides specific dashboards, reports and views to allow you to use your tank level application as efficiently as possible.

- Simple integration of existing or new tank level applications
- Detailed overview of all elements of the application, such as tank levels with warning levels, inventory levels, chemicals and locations
- Geographic overview of all systems with colour visualisation of tank levels and inventory levels
- Specific reports for tank level applications such as a detailed usage certificate for compliance with specifications

	Pricing logic	Order no.
DULCONNEX Inventory Management	Monthly fee per connected Inventory Management-enabled device	DX000004

7.1 DULCONNEX: IIoT Solution for Digital Fluid Management

7.1.9 DULCONNEX API

Integrate the raw data from your application into any system of your choice

With DULCONNEX API, you can access your data on request from the DULCONNEX Cloud. Use this for integration into existing process control systems, SCADA, mobile or online apps as well as MES or share data with other digital solutions.



Your Benefits

- Simple integration of existing or new tank level applications
- Detailed overview of all elements of the application, such as tank levels with warning levels, inventory levels, chemicals and locations
- Geographic overview of all systems with colour visualisation of tank levels and inventory levels
- Specific reports for tank level applications such as a detailed usage certificate for compliance with specifications

Technical Details

The responsive design and intuitive user interface of the web application ensure that users quickly and easily benefit from the numerous functions of the Inventory Management module in the IIoT platform:

Dashboard – The Inventory Management dashboard helps to provide a clear view of all key information, such as designation, location, current liquid level, critical classification of the liquid level, remaining tank range, chemicals as well as associated inventory levels for all tank level applications.

List view – The list view allows all tank level applications to be displayed grouped in one complete overview or by location. Inventory levels, tanks, locations and complete tank level applications can be managed within these views. In addition, detailed filters can be used to align the view to the user's needs.

Map – The overview map features colour indicators and so can be used to quickly and easily view all liquid and inventory levels. More detailed information can be displayed by selecting a location.

Inventory report – All inventory movements of the chemicals can be provided in PDF or Excel format for the desired time period, allowing transparency to be improved and documentation to be simplified.

Consumption report – All consumption of chemicals for each location and the total consumption of a chemical is documented in PDF or Excel format when using this report. The data is provided accurate to the day, ensuring a high level of traceability.

Compliance report – When using certain chemicals, this report helps you to comply with regulations as it generates a usage certificate per device.

	Pricing logic	Order no.
DULCONNEX API	Monthly fee per connected device	1110567

Resistance of Materials Used in Liquid Ends to the Chemicals Most Frequently Used

This data applies to standard conditions (20 °C, 1,013 mbar).

s	saturated solution in water
+	resistant
+/o	practically resistant
o	conditionally resistant
-	not resistant
n	resistance not known
=>	see under
*	The resistance of the adhesive (e.g. Tangit) should be taken into account for bonded connections. (We would not recommend materials rated as 'o' and '-' !)
**	Does not apply to fibre glass-reinforced material

Concentrations are stated as weight percentages with reference to aqueous solutions. If the level of resistance is provided with a percentage figure, it only applies up to this concentration.

NOTE:

The **CSM (Hypalon®)** and **IIR (butyl rubber)** elastomers used as the diaphragm materials in bladder dampers have similar characteristics to **EPDM**.

PTFE is resistant to all the chemicals in this list.

However, **PTFE filled with carbon** is attacked by aggressive oxidants such as bromine (anhydrous) or concentrated acids (nitric acid, sulfuric acid, chromic acid).

The resistance of PVC-U connections bonded with Tangit deviates from the list below for the following chemicals:

Medium	Concentration range
Chromo-sulfuric acid	≥ 70 % H_2SO_4 + 5 % $K_2Cr_2O_7$/$Na_2Cr_2O_7$
Chromic acid	≥ 10 % CrO_3
Hydrochloric acid	≥ 25 % HCl
Hydrogen peroxide	≥ 5 % H_2O_2
Hydrofluoric acid	≥ 0 % HF

Abbreviations used in the column designations:

Acrylic:	Resistance of poly(methyl methacrylate) (clear acrylic)
PVC:	Resistance of polyvinyl chloride, hard (PVC-U)
PP:	Resistance of polypropylene
PVDF:	Resistance of polyvinylidene fluoride (PVDF)
1.4404:	Resistance of stainless steel 1.4404, 1.4571 and 1.4435
FKM:	Resistance of fluorine rubber (e. g. Viton® A and B)
EPDM:	Resistance of ethylene propylene diene monomer
PharMed®:	Resistance of PharMed®
PE:	Resistance of polyethene
2.4819:	Resistance of Hastelloy C-276
WGK:	Water hazard class

Viton® is a registered trademark of DuPont Dow Elastomers

Water Hazard Classes (WGK):

1	Low hazard to waters
2	Hazard to waters
3	Severe hazard to waters
(X)	Not classified. Classified through conclusion by analogy. To be used with reservations.

Safety data sheets

Safety data sheets for our products can be found on our website and are available in versions for

ProMinent Chemical Resistance List

The data has been taken from relevant manufacturers' literature and supplemented by our own tests and experience. As the resistance of materials also depends on other factors (operating conditions, state of surface 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 feed chemicals 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.

[1] Chlorine dioxide is capable of penetrating PVDF without destroying it. This can lead to damage to PVDF-coated parts.

[2] Nitric acid is a highly diffusive acid and tends to permeate depending on temperature and concentration. For potential limitations on its use in piston diaphragm valves, please contact ProMinent.

The statements made in this list do not necessarily apply to components, such as valves, even if they are made from the same materials.

Corrosive agent	Formula	Concentration in %	Acryl	PVC	PP	PVDF	1.4404	FKM	EPDM	PharMed®	PE	HastelloyC	WGK
1,2-Dichloroethene	$C_2H_2Cl_2$	100	-	-	o	+	+	o	-	o	-	+	2
1-Hexanol	$C_6H_{13}OH$	100	-	-	+	+	+	n	+	o	+	+	1
1-Octanol	$C_8H_{17}OH$	100	-	-	+	+	+	+	+	-	+	+	1
1-Pentanol	$C_5H_{11}OH$	100	+	+	+	+	+	-	+	-	+	+	1
2-Chloroethanol	$ClCH_2CH_2OH$	100	-	-	+	o	+	-	o	+	+	+	3
2-Ethylhexanol	$C_8H_{16}O$	100	n	+/o	+	+	+	+	+	-	+	+	2
4-Methylcatechol	$C_6H_3(OH)_2CH_3$	s	+	+	+	+	+	+	-	+/o	+	+	1
Acetaldehyde	CH_3CHO	100	-	-	o	-	+	-	+/o	-	+	+	2
Acetamide	CH_3CONH_2	s	+	+	+	+	+	o	+	+/o	+	+	1
Acetic acid	CH_3COOH	100	-	50%	+	+	+	-	o	60%	70%	+	1
Acetic acid anhydride	$(CH_3CO)_2O$	100	-	-	o	-	+	-	+/o	+	o	+	1
Acetic anhydride	$(CH_3CO)_2O$	100	-	-	o	-	+	-	+/o	+	o	+	1
Acetic ester	$CH_3COOC_2H_5$	100	-	-	35%	+	+	-	+/o	+/o	+	+	1
Acetone	CH_3COCH_3	100	-	-	+	-	+	-	+	-	+	+	1
Acetophenone	$C_6H_5COCH_3$	100	-	n	+	-	+	-	+	n	+	+	-
Acetyl chloride	CH_3COCl	100	-	+	n	-	o	+	-	o	n	+	1
Acetyl chloride	CH_3COCl	100	-	+	n	-	o	+	-	o	n	+	1
Acetylacetone	$CH_3COCH_2COCH_3$	100	-	-	+	-	+	-	+	n	+	+	1
Acetylene tetrachloride	$C_2H_2Cl_4$	100	-	-	o	+	+	o	-	o	o	+	3
Acrylonitrile	CH_2=CH-CN	100	-	-	+	+	+	-	-	-	+	+	3
Adipic acid	$HOOC(CH_2)_4COOH$	s	+	+	+	+	+	+	+	+/o	+	+	1
Allyl alcohol	CH_2CHCH_2OH	96	-	o	+	+	+	-	+	o	+	+/o	2
Aluminium acetate	$Al(CH_3COO)_3$	s	+	+	+	+	+	+	+	+	+	+/o	1
Aluminium bromide	$AlBr_3$	s	+	+	+	+	n	+	+	+	+	+	2
Aluminium chloride	$AlCl_3$	s	+	+	+	+	-	+	+	+	+	+	1
Aluminium fluoride	AlF_3	10	+	+	+	+	-	+	+	+	+	+/o	1
Aluminium hydroxide	$Al(OH)_3$	s	+	+	+	o	+	+	+	+	+	+	1
Aluminium nitrate	$Al(NO_3)_3$	s	+	+	+	+	+	+	+	+	+	+	1
Aluminium phosphate	$AlPO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Aluminium sulfate	$Al_2(SO_4)_3$	s	+	+	+	+	+	+	+	+	+	+	1
Ammonia	"NH_4OH"	30	+	+	+	+ (25 °C)	+	-	+	+	+	+	2
Ammonia solution	"NH_4OH"	30	+	+	+	+ (25 °C)	+	-	+	+	+	+	2
Ammonium acetate	CH_3COONH_4	s	+	+/o	+	+	+	+	+	+	+	+	1
Ammonium aluminium sulfate	$NH_4Al(SO_4)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Ammonium bicarbonate	NH_4HCO_3	s	+	+	+	+	+	+	+	+	+	+	1
Ammonium carbonate	$(NH_4)_2CO_3$	40	+	+	+	+	+	+	+	+	+	+	1
Ammonium carbonate	$(NH_4)_2CO_3$	40	+	+	+	+	+	+	+	+	+	+	1
Ammonium chloride	NH_4Cl	s	+	+	+	+	-	+	+	+	+	+/o	1
Ammonium fluoride	NH_4F	s	+	o	+	+	o	+	+	+	+	+	1
Ammonium hydroxide	"NH_4OH"	30	+	+	+	+ (25 °C)	+	-	+	+	+	+	2
Ammonium nitrate	NH_4NO_3	s	+	+	+	+	+	+	+	+	+	+	1
Ammonium nitrate	NH_4NO_3	s	+	+	+	+	+	+	+	+	+	+	1
Ammonium oxalate	$(COONH_4)_2 * H_2O$	s	+	+	+	+	+	+	+	+	+	+	1
Ammonium perchlorate	NH_4ClO_4	10	+	+	+	+	+	+	+	+	+	+	1
Ammonium peroxodisulfate	$(NH_4)_2S_2O_8$	s	+	+	+	+	5%	+	+	+	+	5%	2
Ammonium phosphate	$(NH_4)_3PO_4$	s	+	+	+	+	10%	+	+	+	+	10%	1
Ammonium sulfate	$(NH_4)_2SO_4$	s	+	+	+	+	10%	+	+	+	+	10%	1
Ammonium sulfide	$(NH_4)_2S$	s	+	+	+	+	n	+	+	n	+	n	2
Amyl alcohol	$C_5H_{11}OH$	100	+	+	+	+	+	-	+	-	+	+	1
Aniline	$C_6H_5NH_2$	100	-	-	+	+	+	-	+/o	o	+	+	2
Anilinium chloride	$C_6H_5NH_2 * HCl$	s	n	+	+	+	-	+/o	+/o	o	+	+	2
Antimony trichloride	$SbCl_3$	s	+	+	+	+	-	+	+	+	+	n	2
Aqua regia	3 HCl + HNO_3	100	-	+	-	+[2]	-	-	o	-	-	-	2
Arsenic acid	H_3AsO_4	s	+	+	+	+	+	+	+	o	+	+	3
Askarels	$C_6H_{10}O$	100	-	-	+	-	+	-	+/o	-	+	+	1
Barium carbonate	$BaCO_3$	s	+	+	+	+	+	+	+	+	+	+	1
Barium chloride	$BaCl_2$	s	+	+	+	+	-	+	+	+	+	+	1

ProMinent Chemical Resistance List

Corrosive agent	Formula	Concentration in %	Acryl	PVC	PP	PVDF	1.4404	FKM	EPDM	Pharmed®	PE	Hastelloy C	WGK
Barium hydroxide	$Ba(OH)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Barium hydroxide	$Ba(OH)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Barium nitrate	$Ba(NO_3)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Barium sulfate	$BaSO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Barium sulfide	BaS	s	+	+	+	+	+	+	+	+	+	+	1
Battery acid	H_2SO_4	98%	30%	50%	85%	+	20%	+	80%	30%	80%	+	1
Benzaldehyde	C_6H_5CHO	100	-	-	+	-	+	+	+	-	o	+	1
Benzene	C_6H_6	100	-	-	o	+	+	o	-	-	o	+	3
Benzenesulfonic acid	$C_6H_5SO_3H$	10	n	n	+	+	+	+	-	-	n	+	2
Benzine	-	100	-	-	+	+	+	+	-	-	+	+	2
Benzoic acid	C_6H_5COOH	s	+	+	+	+	+	+	+	+/o	+	+	1
Benzoyl chloride	C_6H_5COCl	100	-	n	o	n	o	+	+	n	o	+	2
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
Bleaching lye	NaOCl + NaCl	12%	+	+	o	+	-	o	+	+	o	> 10%	2
Borax	$Na_2B_4O_7 * {}_{10H2}O$	s	+	+	+	+	+	+	+	+	+	+	1
Borax	$NaBO_2$	s	+	+	+	+	+	+	+	+	+	+	1
Boric acid	H_3BO_3	s	+	+	+	+	+	+	+	+	+	+	1
Bromine (dry)	Br_2	100	-	-	-	+	-	-	-	-	-	+	2
Bromine water	$Br_2 + H_2O$	s	-	+	-	+	-	-	-	n	-	n	2
Bromobenzene	C_6H_5Br	100	n	n	o	+	+	o	-	-	o	+	2
Bromochloromethane	CH_2BrCl	100	-	-	-	+	+	n	+/o	-	o	+	2
Bromochlorotrifluoroethane	$HCClBrCF_3$	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
Butanone	$CH_3COC_2H_5$	100	-	-	+	-	+	-	+	-	+	+	1
Butyl acetate	$CH_3COOC_4H_9$	100	-	-	o	+	+	-	+/o	+/o	-	+	1
Butyl acetate	$CH_3COOC_4H_9$	100	-	-	o	+	+	-	+/o	+/o	-	+	1
Butyl acrylate	$C_7H_{13}O_2$	100	-	-	+	+	+	-	-	+/o	+	+	1
Butyl alcohol	C_4H_9OH	100	-	+	+	+	+	o	+/o	-	+	+	1
Butyl benzoate	$C_6H_5COOC_4H_9$	100	-	-	o	n	+	+	+	-	o	+	2
Butyl mercaptan	C_4H_9SH	100	n	n	n	+	n	+	-	n	n	n	3
Butyl oleate	$C_{22}H_{42}O_2$	100	n	n	n	+	+	+	+/o	n	n	+	1
Butyl stearate	$C_{22}H_{44}O_2$	100	o	n	n	+	+	+	-	n	n	+	1
Butylamine	$C_4H_9NH_2$	100	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 bisulfite	$Ca(HSO_3)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Calcium bisulfite	$Ca(HSO_3)_2$	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 hydroxide	$Ca(OH)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Calcium hypochlorite	$Ca(OCl)_2$	s	+	+	o	+	-	o	+	+	+	+	2
Calcium nitrate	$Ca(NO_3)_2$	s	+	50%	50%	+	+	+	+	+	+	+	1
Calcium nitrate	$Ca(NO_3)_2$	s	+	50%	50%	+	+	+	+	+	+	+	1
Calcium phosphate	$Ca_3(PO_4)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Calcium sulfate	$CaSO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Calcium sulfide	CaS	s	+	+	+	+	n	+	+	+	+	+	2
Calcium sulfite	$CaSO_3$	s	+	+	+	+	+	+	+	+	+	+	1
Calcium thiosulfate	CaS_2O_3	s	+	+	+	+	-	+	+	+	+	+	1
Caprylic aldehyde	$C_5H_{11}CHO$	100	n	n	+	+	+	-	+/o	-	+	+	1
Carbolic acid	C_6H_5OH	100	-	-	+	+	+	+	-	+	+	+	2
Carbon disulfide	CS_2	100	-	-	o	+	+	+	-	-	o	+	2
Carbon disulfide	CS_2	100	-	-	o	+	+	+	-	-	o	+	2
Carbon tetrachloride	CCl_4	100	-	-	-	+	+	+	-	-	o	+	3
Carbonic acid	"H_2CO_3"	s	+	+	+	+	+	+	+	+	+	+	1
Caustic potash	KOH	50	+	+	+	+ (25 °C)	+	-	+	10%	+	+	1
Chile saltpeter	$NaNO_3$	s	+	+	+	+	+	+	+	+	+	+	1
Chloracetone	$ClCH_2COCH_3$	100	-	-	n	n	+	-	+	-	n	+	3
Chloral hydrate	$CCl_3CH(OH)_2$	s	-	-	o	-	+	o	o	n	+	+	2
Chloric acid	$HClO_3$	20	+	+	-	+	-	o	o	+	10%	+	2
Chlorinated lime	$Ca(OCl)_2$	s	+	+	o	+	-	o	+	+	+	+	2
Chlorine bleaching	NaOCl + NaCl	12%	+	+	o	+	-	o	+	+	o	> 10%	2
Chlorine dioxide solution	$ClO_2 + H_2O$	0.5%	o	+	o	+[1)]	-	o	-	-	o	+	-
Chlorine water	$Cl_2 + H_2O$	s	+	+	o	+	-	+	+	-	o	+	-
Chlorobenzene	C_6H_5Cl	100	-	-	+	+	+	+	-	-	o	+	2
Chloroethylbenzene	$C_6H_4ClC_2H_5$	100	-	-	o	n	+	o	-	-	o	+	2
Chloroform	$CHCl_3$	100	-	-	o	+	+	+	-	o	-	+	2
Chloroformic acid ethyl ester	$ClCO_2C_2H_5$	100	n	n	n	n	n	+	-	n	n	n	2
Chlorophenol	C_6H_4OHCl	100	-	n	+	+	+	n	-	-	+	+	2
Chloroprene	C_4H_5Cl	100	-	-	n	n	+	+	-	-	n	+	1

ProMinent Chemical Resistance List

Corrosive agent	Formula	Concentration in %	Acryl	PVC	PP	PVDF	1.4404	FKM	EPDM	Pharmed®	PE	HastelloyC	WGK
Chloroprene	C_4H_5Cl	100	-	-	n	n	+	+	-	-	n	+	1
Chlorosulfuric acid	$SO_2(OH)Cl$	100	-	o	-	+	-	-	-	-	-	o	1
Chlorotoluene	C_7H_7Cl	100	-	-	n	+	+	+	-	-	n	+	2
Chromic acid	H_2CrO_4	50	-	+	o	+	10%	+	-	o	+	10%	3
Chromium(III) potassium sulfate dodecahydrate	$KCr(SO_4)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Chromium(III) potassium sulfate dodecahydrate	$KCr(SO_4)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Chromium(III) sulfate	$Cr_2(SO_4)_3$	s	+	+	+	+	+	+	+	+	+	+	1
Chromo-sulfuric acid	$K_2CrO_4 + H_2SO_4$	s	-	+	-	+	n	n	n	-	-	n	3
Citric acid	$C_6H_8O_7$	s	+	+	+	+	+	+	+	+	+	+	1
Cobalt chloride	$CoCl_2$	s	+	+	+	+	-	+	+	+	+	+	2
Colamine	$HOC_2H_4NH_2$	100	o	n	+	-	+	-	+/o	o	+	+	1
Copper arsenite	$Cu_3(AsO_3)_2$	s	+	+	+	+	+	+	+	+	+	+	3
Copper(II) acetate	$Cu(CH_3COO)_2$	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) sulfate	$CuSO_4$	s	+	+	+	+	+	+	+	+	+	+	2
Cresol	$C_6H_4CH_3OH$	100	o	o	+	+	+	+	-	-	+	+	2
Crotonaldehyde	$CH_3C_2H_2CHO$	100	n	-	+	+	+	-	+	-	+	+	3
Cumene	$C_6H_5CH(CH_3)_2$	100	-	-	o	+	+	+	-	-	o	+	1
Cyclohexane	C_6H_{12}	100	+	-	+	+	+	+	-	-	+	o	1
Cyclohexanol	$C_6H_{11}OH$	100	o	+/o	+	+	+	+	-	-	+	+	1
Cyclohexanone	$C_6H_{10}O$	100	-	-	+	-	+	-	+/o	-	+	+	1
Cyclohexanone	$C_6H_{10}O$	100	-	-	+	-	+	-	+/o	-	+	+	1
Cyclohexyl alcohol	$C_6H_{11}OH$	100	o	+/o	+	+	+	+	-	-	+	+	1
Cyclohexylamine	$C_6H_{11}NH_2$	100	n	n	n	n	+	-	n	n	n	+	2
Decahydronaphthalene	$C_{10}H_{18}$	100	-	+/o	o	+	n	o	-	-	o	+	2
Decalin	$C_{10}H_{18}$	100	-	+/o	o	+	n	o	-	-	o	+	2
Dextrin	-	s	+	+	+	+	+	+	+	+	+	+	1
Dextrose	$C_6H_{12}O_6$	s	+	+	+	+	+	+	+	+	+	+	1
Diacetone alcohol	$C_6H_{12}O_2$	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	+	2
Dibutylamine	$(C_4H_9)_2NH$	100	n	n	+	+	+	-	-	n	+	+	1
Dichloroacetic acid	$Cl_2CHCOOH$	100	-	+	+	+	+	-	+	o	+	+	1
Dichloroacetic acid methyl ester	$Cl_2CHCOOCH_3$	100	-	-	+	n	+	-	n	-	+	+	2
Dichlorobenzene	$C_6H_4Cl_2$	100	-	-	o	+	+	+	-	-	o	+	2
Dichlorobutane	$C_4H_8Cl_2$	100	-	-	o	+	+	+	-	-	o	+	3
Dichlorobutene	$C_4H_6Cl_2$	100	-	-	o	+	+	o	-	-	o	+	3
Dichlorobutene	$C_4H_6Cl_2$	100	-	-	o	+	+	o	-	-	o	+	3
Dichloroethane	$C_2H_4Cl_2$	100	-	-	o	+	+	+	-	o	-	+	3
Dichloroethene	$C_2H_2Cl_2$	100	-	-	o	+	+	o	-	o	-	+	2
Dichloroisopropyl ether	$(C_3H_6Cl)_2O$	100	-	-	o	n	+	o	o	-	o	+	2
Dichloromethane	CH_2Cl_2	100	-	-	o	o	o	+	-	o	-	+	2
Dicyclohexylamine	$(C_6H_{12})_2NH$	100	-	-	o	n	+	-	-	-	o	+	2
Diethyl ether	$C_2H_5OC_2H_5$	100	-	-	o	+	+	-	-	o	o	+	1
Diethylene glycol	$C_4H_{10}O_3$	s	+	+	+	+	+	+	+	+	+	+	1
Diethylene glycol	$C_4H_{10}O_3$	s	+	+	+	+	+	+	+	+	+	+	1
Diethylene glycol monoethyl ether	$C_8H_{18}O_3$	100	n	n	+	+	+	n	+/o	o	+	+	1
Diglycolic acid	$C_4H_6O_5$	30	+	+	+	+	+	+	n	+/o	+	+	3
Dihexyl phthalate	$C_{20}H_{26}O_4$	100	-	-	+	+	+	-	n	+	+	+	1
Diisobutyl ketone	$C_9H_{18}O$	100	-	-	+	+	+	-	+	-	+	+	1
Diisononyl phthalate	$C_{26}H_{42}O_4$	100	-	-	+	+	+	n	n	+	+	+	1
Diisopropyl ketone	$C_7H_{14}O$	100	-	-	+	+	+	-	+	-	+	+	1
Dimethyl carbonate	$(CH_3O)_2CO$	100	n	n	+	+	+	+	-	n	+	+	1
Dimethyl ketone	CH_3COCH_3	100	-	-	+	-	+	-	+	-	+	+	1
Dimethyl phthalate	$C_{10}H_{10}O_4$	100	-	-	+	+	+	-	+/o	+	+	+	1
Dimethylformamide	$HCON(CH_3)_2$	100	-	-	+	-	+	-	+	+/o	+	+	1
Dimethylhydrazine	$H_2NN(CH_3)_2$	100	n	n	+	n	+	-	+	n	+	+	3
Dioctyl phthalate	$C_4H_4(COOC_8H_{17})_2$	100	-	-	+	+	+	-	+/o	+	+	+	1
Dioxane	$C_4H_8O_2$	100	-	-	o	-	+	-	+/o	-	+	+	1
Disodium hydrogen phosphate	Na_2HPO_4	s	+	+	+	+	+	+	+	+	+	+	1
Disulfur dichloride	S_2Cl_2	100	n	n	n	+	n	+	-	-	n	n	-
Disulfur dichloride	S_2Cl_2	100	n	n	n	+	n	+	-	-	n	n	-
Disulfur dichloride	S_2Cl_2	100	n	n	n	+	n	+	-	-	n	n	-
Disulfuric acid	$H_2SO_4 + SO_3$	s	n	-	-	-	+	+	-	+	-	+	2
DMF	$HCON(CH_3)_2$	100	-	-	+	-	+	-	+	+/o	+	+	1
DOP	$C_4H_4(COOC_8H_{17})_2$	100	-	-	+	+	+	-	+/o	+	+	+	1
Epichlorohydrin	C_3H_5OCl	100	-	n	+	-	+	+	o	+	+	+	3
Epsomite	$MgSO_4$	s	+	+	+	+	+	+	+	+	+	+/o	1

ProMinent Chemical Resistance List

Corrosive agent	Formula	Concentration in %	Acryl	PVC	PP	PVDF	1.4404	FKM	EPDM	PharMed®	PE	HastelloyC	WGK
Ethanol	C_2H_5OH	100	-	+	+	+	+	-	+	+	+	+	1
Ethanolamine	$HOC_2H_4NH_2$	100	o	n	+	-	+	-	+/o	o	+	+	1
Ether	$C_2H_5OC_2H_5$	100	-	-	o	+	+	-	-	o	o	+	1
Ethyl acetate	$CH_3COOC_2H_5$	100	-	-	35%	+	+	-	+/o	+/o	+	+	1
Ethyl acetoacetate	$C_6H_{10}O_3$	100	n	-	+	+	+	-	+/o	+/o	+	+	1
Ethyl acrylate	$C_2H_3COOC_2H_5$	100	-	-	+	o	+	-	+/o	-	+	+	2
Ethyl alcohol	C_2H_5OH	100	-	+	+	+	+	-	+	+	+	+	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
Ethylacrylic acid	C_4H_7COOH	100	n	n	+	+	+	n	+/o	n	+	+	1
Ethylbenzene	C_6H_5-C_2H_5	100	-	-	o	+	+	o	-	-	o	+	1
Ethylcyclopentane	$C_5H_4C_2H_5$	100	+	+	+	+	+	+	-	-	+	+	1
Ethylene dibromide	$C_2H_4Br_2$	100	-	-	n	+	+	+	-	-	-	+	3
Ethylene dichloride	$C_2H_4Cl_2$	100	-	-	o	+	+	+	-	o	-	+	3
Ethylene dichloride	$C_2H_4Cl_2$	100	-	-	o	+	+	+	-	o	-	+	3
Ethylene glycol	$C_2H_4(OH)_2$	100	+	+	+	+	+	+	+	+	+	+	1
Ethylene glycol ethyl ether	$HOC_2H_4OC_2H_5$	100	n	n	+	+	+	n	+/o	o	+	+	1
Ethylenediamine	$(CH_2NH_2)_2$	100	o	o	+	-	o	-	+	n	+	o	2
Fatty acids	R-COOH	100	+	+	+	+	+	+	o	o	+	+	1
Ferrous sulfate	$FeSO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Fluorobenzene	C_6H_5F	100	-	-	+	+	+	o	-	-	o	+	2
Fluoroboric acid	HBF_4	35%	+	+	+	+	o	+	+	-	+	+	1
Formaldehyde	CH_2O	40	+	+	+	+	+	-	+/o	-	+	+	2
Formalin	CH_2O	40	+	+	+	+	+	-	+/o	-	+	+	2
Formamide	$HCONH_2$	100	+	-	+	+	+	+	+	n	+	+	1
Formic acid	HCOOH	s	-	+/o	+	+	+	-	-	+/o	+	+	1
Furan	C_4H_4O	100	-	-	+	-	+	-	n	-	+	+	3
Furanaldehyde	$C_5H_3O_2$	100	n	n	n	o	+	-	+/o	-	n	n	2
Furfural	$C_5H_3O_2$	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
Glacial acetic acid	CH_3COOH	100	-	50%	+	+	+	-	o	60%	70%	+	1
Glauber's salt	Na_2SO_4	s	+	+	+	+	+	+	+	+	+	+	1
Glucose	$C_6H_{12}O_6$	s	+	+	+	+	+	+	+	+	+	+	1
Glycerol	$C_3H_5(OH)_3$	100	+	+	+	+	+	+	+	+	+	+	1
Glycerol chlorohydrin	C_3H_7OCl	100	-	n	+	-	+	+	o	+	+	+	3
Glycine	NH_2CH_2COOH	10	+	+	+	+	+	+	+	+	+	+	1
Glycine	NH_2CH_2COOH	10	+	+	+	+	+	+	+	+	+	+	1
Glycol	$C_2H_4(OH)_2$	100	+	+	+	+	+	+	+	+	+	+	1
Glycolic acid	$CH_2OHCOOH$	70%	+	37%	+	+	+	+	+	+/o	+	+	1
Green vitriol	$FeSO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Heptane	C_7H_{16}	100	+	+	+	+	+	+	-	-	+	+	1
Hexachloroplatinic acid	H_2PtCl_6	s	n	+	+	+	-	n	+	n	+	-	-
Hexafluorosilicic acid	H_2SiF_6	100	+	30%	30%	+	o	+	+	o	40%	+/o	2
Hexafluorosilicic acid	H_2SiF_6	100	+	30%	30%	+	o	+	+	o	40%	+/o	2
Hexanal	$C_5H_{11}CHO$	100	n	n	+	+	+	-	+/o	-	+	+	1
Hexane	C_6H_{14}	100	+	+	+	+	+	+	-	-	+	+	1
Hexanetriol	$C_6H_9(OH)_3$	100	n	n	+	+	+	+	+	n	+	+	1
Hexanol	$C_6H_{13}OH$	100	-	-	+	+	+	n	+	o	+	+	1
Hexene	C_6H_{12}	100	n	+	+	+	+	+	-	-	+	+	1
Hydrazin hydrate	$N_2H_4 * H_2O$	s	+	+	+	+	+	n	+	o	+	+	3
Hydrochloric acid	HCl	38%	32%	+	+	+	-	+	o	o	+	o	1
Hydrochloric acid	HCl	38%	32%	+	+	+	-	+	o	o	+	o	1
Hydrofluoric acid	HF	80%	-	40%*	40%**	+	-	+	o	-	40%	+/o	1
Hydrofluoric acid	HF	80%	-	40%*	40%**	+	-	+	o	-	40%	+/o	1
Hydrogen bromide	HBr	50	+	+	+	+	-	-	+	-	+	o	1
Hydrogen cyanide	HCN	s	+	+	+	+	+	+	+	+	+	+	3
Hydrogen peroxide	H_2O_2	90%	40%	40%*	30%	+	+	30%	30%	+	+	+	1
Hydroiodic acid	HI	s	+	+	+	+	-	-	n	-	+	n	1
Hydroquinone	$C_6H_4(OH)_2$	s	o	+	+	+	+	+	-	+/o	+	+	2
Hydroxylammonium sulfate	$(NH_2OH)_2 * H_2SO_4$	10	+	+	+	+	+	+	+	+	+	+	2
Hypochlorous acid	HOCl	s	+	+	o	+	-	+	+/o	+	o	+	1
Hypochlorous acid	HOCl	s	+	+	o	+	-	+	+/o	+	o	+	1
Iodine	I_2	s	o	-	+	+	-	+	+/o	+	o	+/o	-
Iodkalium	KI	s	+	+	+	+	+	+	+	+	+	+	1
Iron(II) chloride	$FeCl_2$	s	+	+	+	+	-	+	+	+	+	+/o	1
Iron(II) sulfate	$FeSO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Iron(III) chloride	$FeCl_3$	s	+	+	+	+	-	+	+	+	+	+/o	1
Iron(III) nitrate	$Fe(NO_3)_3$	s	+	+	+	+	+	+	+	+	+	+	1
Iron(III) phosphate	$FePO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Iron(III) sulfate	$Fe_2(SO_4)_3$	s	+	+	+	+	o	+	+	+	+	+	1
Isobutyl alcohol	$C_2H_5CH(OH)CH_3$	100	-	+	+	+	+	+	+	o	+	+	1
Isopropanol	$(CH_3)_2CHOH$	100	-	+/o	+	+	+	+	+	o	+	+	1
Isopropyl acetate	$CH_3COOCH(CH_3)_2$	100	-	-	+	+	+	-	+/o	+/o	+	+	1
Isopropyl alcohol	$(CH_3)_2CHOH$	100	-	+/o	+	+	+	+	+	o	+	+	1
Isopropyl chloride	$CH_3CHClCH_3$	80%	-	-	o	+	+	+	-	o	o	+/o	2

ProMinent Chemical Resistance List

Corrosive agent	Formula	Concentration in %	Acryl	PVC	PP	PVDF	1.4404	FKM	EPDM	PharMed®	PE	HastelloyC	WGK
Isopropylbenzene	$C_6H_5CH(CH_3)_2$	100	-	-	o	+	+	+	-	-	o	+	1
Isopropylether	$C_6H_{14}O$	100	-	-	o	+	+	-	-	o	o	+	1
Lactic acid	$C_3H_6O_3$	100	-	+	+	+	+/o	+	10%	+/o	+	+	1
Lead(II) acetate / lead(IV) acetate	$Pb(CH_3COO)_2$	s	+	+	+	+	+	+	+	+	+	+	2
Lead(II) nitrate	$Pb(NO_3)_2$	50	+	+	+	+	+	+	+	+	+	+	2
Lead(II) sulfate	$PbSO_4$	s	+	+	+	+	+	+	+	+	+	+	2
Levoxin	$N_2H_4 * H_2O$	s	+	+	+	+	+	n	+	o	+	+	3
Lime milk	$Ca(OH)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Limescale	$CaCO_3$	s	+	+	+	+	+	+	+	+	+	+	1
Lithium bromide	LiBr	s	+	+	+	+	+	+	+	+	+	+	1
Lithium chloride	LiCl	s	+	+	+	+	-	+	+	+	+	n	1
Magnesium carbonate	$MgCO_3$	s	+	+	+	+	+	+	+	+	+	+/o	1
Magnesium chloride	$MgCl_2$	s	+	+	+	+	o	+	+	+	+	+	1
Magnesium hydroxide	$Mg(OH)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Magnesium nitrate	$Mg(NO_3)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Magnesium sulfate	$MgSO_4$	s	+	+	+	+	+	+	+	+	+	+/o	1
Maleic acid	$C_4H_4O_4$	s	+	+	+	+	+	+	+	o	+	+	1
Malic acid	$C_4H_6O_5$	s	+	+	+	+	+	+	+	+	+	+	1
Manganese(II) chloride	$MnCl_2$	s	+	+	+	+	-	+	+	+	+	+	1
Manganese(II) sulfate	$MnSO_4$	s	+	+	+	+	+	+	+	+	+	+	1
MEK	$CH_3COC_2H_5$	100	-	-	+	-	+	-	+	-	+	+	1
Mercury	Hg	100	+	+	+	+	+	+	+	+	+	+	3
Mercury(II) chloride	$HgCl_2$	s	+	+	+	+	-	+	+	+	+	+	3
Mercury(II) cyanide	$Hg(CN)_2$	s	+	+	+	+	+	+	+	+	+	+	3
Mercury(II) nitrate	$Hg(NO_3)_2$	s	+	+	+	+	+	+	+	+	+	+	3
Mesityl oxide	$C_6H_{10}O$	100	-	-	n	n	+	-	+/o	-	n	+	1
Methacrylic acid	C_3H_5COOH	100	n	n	+	+	+	o	+/o	+/o	+	+	1
Methanol	CH_3OH	100	-	-	+	+	+	o	+	+/o	+	+	1
Methoxybutanol	$CH_3O(CH_2)_4OH$	100	-	-	+	+	+	+	o	o	+	+	1
Methyl acetate	CH_3COOCH_3	60%	-	-	+	+	+	-	+/o	+/o	+	+	2
Methyl acetoacetate	$C_5H_8O_3$	100	-	-	+	+	+	-	+/o	o	+	+	2
Methyl acrylate	$C_2H_3COOCH_3$	100	-	-	+	+	+	-	+/o	o	+	+	2
Methyl alcohol	CH_3OH	100	-	-	+	+	+	o	+	+/o	+	+	1
Methyl benzoate	$C_6H_5COOCH_3$	100	-	-	+	o	+	+	-	-	+	+	2
Methyl cellulose	-	s	+	+	+	+	+	+	+	+	+	+	1
Methyl chloroacetate	$ClCH_2COOCH_3$	100	-	o	+	+	+	o	-	-	+	+	2
Methyl chloroform	CCl_3CH_3	100	-	-	o	+	+	+	-	o	o	+	3
Methyl ethyl ketone	$CH_3COC_2H_5$	100	-	-	+	-	+	-	+	-	+	+	1
Methyl isobutyl ketone	$CH_3COC_4H_9$	100	-	-	+	-	+	-	o	-	+	+	1
Methyl isopropyl ketone	$CH_3COC_3H_7$	100	-	-	+	-	+	-	+/o	-	+	+	1
Methyl methacrylate	$C_3H_5COOCH_3$	100	-	-	+	+	+	-	-	-	+	+	1
Methyl oleate	$C_{17}H_{33}COOCH_3$	100	n	n	+	+	+	+	+/o	n	+	+	1
Methyl salicylate	$HOC_6H_4COOCH_3$	100	-	-	+	+	+	n	+/o	-	+	+	1
Methylamine	CH_3NH_2	32%	+	o	+	o	+	-	+	+	+	+	2
Methylcyclopentane	$C_5H_9CH_3$	100	+	+	+	+	+	+	-	-	+	+	1
Methylene chloride	CH_2Cl_2	100	-	-	o	o	o	+	-	o	-	+	2
Methylglycol	$C_3H_8O_2$	100	+	+	+	+	+	-	+/o	+	+	+	1
MIBK	$CH_3COC_4H_9$	100	-	-	+	-	+	-	o	-	+	+	1
Morpholine	C_4H_9ON	100	-	-	+	-	+	n	n	-	+	+	2
Motor oils	-	100	n	+/o	+	+	+	+	-	-	+	+	2
Natron	$NaHCO_3$	s	+	+	+	+	+	+	+	+	+	+	1
Nickel(II) acetate	$(CH_3COO)_2Ni$	s	+	+	+	+	+	-	+	+	+	+	2
Nickel(II) chloride	$NiCl_2$	s	+	+	+	+	-	+	+	+	+	+	2
Nickel(II) nitrate	$Ni(NO_3)_2$	s	+	+	+	+	+	+	+	+	+	+/o	2
Nickel(II) sulfate	$NiSO_4$	s	+	+	+	+	+	+	+	+	+	+/o	2
Nitric acid	HNO_3	99%	10%	50%	o	65%[2)]	50%	50%	10%	35%	50%	65%	1
Nitromethane	CH_3NO_2	100	-	-	+	o	+	-	+/o	-	+	+	2
Nitropropane	$(CH_3)_2CHNO_2$	100	-	-	+	n	+	-	+/o	-	+	+	2
Nitrotoluene	$C_6H_4NO_2CH_3$	100	-	-	+	+	+	o	-	-	+	+	2
Octane	C_8H_{18}	100	o	+	+	+	+	+	-	-	+	+	1
Octanol	$C_8H_{17}OH$	100	-	-	+	+	+	+	+	-	+	+	1
Octylcresol	$C_{15}H_{24}O$	100	-	-	+	+	+	o	n	-	+	+	1
Oil	-	100	n	+/o	+	+	+	+	-	-	+	+	2
Oleum	$H_2SO_4 + SO_3$	s	n	-	-	-	+	+	-	+	-	+	2
Orthophosphoric acid	H_3PO_4	85%	50%	+	+	+	+	+	+	+	+	+	1
Oxalic acid	$(COOH)_2$	s	+	+	+	+	10%	+	+	+/o	+	+/o	1
Pentane	C_5H_{12}	100	+	+	+	+	+	+	-	-	+	+	1
PER	C_2Cl_4	100	-	-	o	+	+	o	-	o	o	+	3
Perchloric acid	$HClO_4$	70%	n	10%*	10%	+	-	+	+/o	+	+	n	1
Perhydrol	H_2O_2	90%	40%	40%*	30%	+	+	30%	30%	+	+	+	1
Petroleum ether	C_nH_{2n+2}	100	+	+/o	+	+	+	+	-	-	+	+	1
Phenol	C_6H_5OH	100	-	-	+	+	+	+	-	+	+	+	2
Phenylethyl ether	$C_6H_5OC_2H_5$	100	-	-	+	n	+	-	-	-	+	+	2
Phenylhydrazine	$C_6H_5NHNH_2$	100	-	-	o	+	+	o	-	-	o	+	2
Phosphoric acid	H_3PO_4	85%	50%	+	+	+	+	+	+	+	+	+	1
Phosphorus trichloride	PCl_3	100	-	-	+	+	+	o	+	+/o	+	+	1

ProMinent Chemical Resistance List

Corrosive agent	Formula	Concentration in %	Acryl	PVC	PP	PVDF	1.4404	FKM	EPDM	PharMed®	PE	HastelloyC	WGK
Phosphoryl chloride	$POCl_3$	100	-	-	+	+	n	+	+	n	+	+	1
Phthalic acid	$C_6H_4(COOH)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Picric acid	$C_6H_2(NO_3)_3OH$	s	+	+	+	+	+	+	+	-	+	+	2
Piperidine	$C_5H_{11}N$	100	-	-	n	n	+	-	-	-	n	+	2
Plaster	$CaSO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Potassium acetate	CH_3COOK	s	+	+	+	+	+	+	+	+	+	+	1
Potassium alum	$KAl(SO_4)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Potassium aluminium sulfate	$KAl(SO_4)_2$	s	+	+	+	+	+	+	+	+	+	+	1
Potassium bicarbonate	$KHCO_3$	40	+	+	+	+	+	+	+	+	+	+/o	1
Potassium bisulfate	$KHSO_4$	5%	+	+	+	+	+	+	+	+	+	+	1
Potassium bitartrate	$KC_4H_5O_6$	s	+	+	+	+	+	+	+	+	+	+	1
Potassium bromate	$KBrO_3$	s	+	+	+	+	+	+	+	+	+	+	2
Potassium bromide	KBr	s	+	+	+	+	10%	+	+	+	+	0.1	1
Potassium bromide	KBr	s	+	+	+	+	10%	+	+	+	+	0.1	1
Potassium carbonate	K_2CO_3	s	+	+	+	+	+	+	+	55%	+	+	1
Potassium carbonate	K_2CO_3	s	+	+	+	+	+	+	+	55%	+	+	1
Potassium chlorate	$KClO_3$	s	+	+	+	+	+	+	+	+	+	+	2
Potassium chloride	KCl	s	+	+	+	+	-	+	+	+	+	+/o	1
Potassium chromate	K_2CrO_4	10	+	+	+	+	+	+	+	+	+	+	3
Potassium cyanate	KOCN	s	+	+	+	+	+	+	+	+	+	+	2
Potassium cyanide	KCN	s	+	+	+	+	5%	+	+	+	+	5%	3
Potassium cyanide	KCN	s	+	+	+	+	5%	+	+	+	+	5%	3
Potassium dichromate	$K_2Cr_2O_7$	s	+	+	+	+	25%	+	+	+	+	10%	3
Potassium dichromate	$K_2Cr_2O_7$	s	+	+	+	+	25%	+	+	+	+	10%	3
Potassium ferrocyanide	$K_4Fe(CN)_6$	s	+	+	+	+	+	+	+	+	+	+	1
Potassium ferrocyanide / potassium ferricyanide	$K_4Fe(CN)_6$	s	+	+	+	+	+	+	+	+	+	+	1
Potassium fluoride	KF	s	+	+	+	+	+	+	+	+	+	+	1
Potassium hexacyanoferrate(III)	$K_3Fe(CN)_6$	s	+	+	+	+	+	+	+	+	+	+	1
Potassium hydrogen fluoride	KHF_2	s	n	+	+	+	+	+	+	+	+	+	1
Potassium hydroxide	KOH	50	+	+	+	+ (25 °C)	+	-	+	10%	+	+	1
Potassium iodide	KI	s	+	+	+	+	+	+	+	+	+	+	1
Potassium metaborate	KBO_2	s	+	+	+	+	+	+	+	+	+	+	1
Potassium nitrate	KNO_3	s	+	+	+	+	+	+	+	+	+	+	1
Potassium perchlorate	$KClO_4$	s	+	+	+	+	n	+	+	+	+	+	1
Potassium permanganate	$KMnO_4$	s	+	+	+	+	+	+	+	6%	+	+	2
Potassium persulfate	$K_2S_2O_8$	s	+	+	+	+	+	+	+	+	+	+	1
Potassium persulfate	$K_2S_2O_8$	s	+	+	+	+	+	+	+	+	+	+	1
Potassium sulfate	K_2SO_4	s	+	+	+	+	+	+	+	+	+	+	1
Potassium sulfite	K_2SO_3	s	+	+	+	+	+	+	+	+	+	+	1
Propionic acid	C_2H_5COOH	100	o	+	+	+	+	+	+	+/o	+	+	1
Propionitrile	CH_3CH_2CN	100	n	n	+	+	+	+	-	-	+	+	2
Propyl acetate	$CH_3COOC_3H_7$	100	-	-	+	+	+	-	+/o	-	+	+	1
Propyl acetate	$CH_3COOC_3H_7$	100	-	-	+	+	+	-	+/o	-	+	+	1
Propylene glycol	$CH_3CHOHCH_2OH$	100	+	+	+	+	+	+	+	+	+	+	1
Prussic acid	HCN	s	+	+	+	+	+	+	+	+	+	+	3
Pyridine	C_5H_5N	100	-	-	o	-	+	-	-	o	+	+	2
Pyrrole	C_4H_4NH	100	n	n	+	n	+	-	-	-	+	+	2
Salicylic acid	HOC_6H_4COOH	s	+	+	+	+	+	+	+	+	+	+/o	1
Salmiac	NH_4Cl	s	+	+	+	+	-	+	+	+	+	+/o	1
Salt water	-	s	+	+/o	+	+	+/o	+	+	+	+	+	1
Saltpetre	KNO_3	s	+	+	+	+	+	+	+	+	+	+	1
Silicic acid	$SiO_2 * x H_2O$	s	+	+	+	+	+	+	+	+	+	+	1
Silver bromide	AgBr	s	+	+	+	+	+/o	+	+	+	+	+	1
Silver chloride	AgCl	s	+	+	+	+	-	+	+	+	+	+/o	1
Silver nitrate	$AgNO_3$	s	+	+	+	+	+	+	+	+	+	+/o	3
Silver nitrate	$AgNO_3$	s	+	+	+	+	+	+	+	+	+	+/o	3
Sodium acetate	$NaCH_3COO$	s	+	+	+	+	+	+	+	+	+	+	1
Sodium benzoate	C_6H_5COONa	s	+	+	+	+	+	+	+	+	+	+	1
Sodium bicarbonate	$NaHCO_3$	s	+	+	+	+	+	+	+	+	+	+	1
Sodium bisulfate	$NaHSO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Sodium bisulfite	$NaHSO_3$	s	+	+	+	+	+	+	+	+	+	+	1
Sodium bromate	$NaBrO_3$	s	+	+	+	+	+	+	+	+	+	+	3
Sodium bromide	NaBr	s	+	+	+	+	+	+	+	+	+	+	1
Sodium carbonate	Na_2CO_3	s	+	+	+	+	+/o	+	+	+	+	+	1
Sodium chlorate	$NaClO_3$	s	+	+	+	+	+	+	+	+	+	+	2
Sodium chloride	NaCl	s	+	+	+	+	-	+	+	+	+	+	1
Sodium chloride (table salt)	NaCl	s	+	+	+	+	-	+	+	+	+	+	1
Sodium chlorite	$NaClO_2$	24%	+	+	+	+	10%	+	+	+	+	10%	2
Sodium chromate	Na_2CrO_4	s	+	+	+	+	+	+	+	+	+	+	3
Sodium cyanide	NaCN	s	+	+	+	+	+	+	+	+	+	+	3
Sodium dichromate	$Na_2Cr_2O_7$	s	+	+	+	+	+	+	+	+	+	+	3
Sodium dithionite	$Na_2S_2O_4$	s	+	10%*	10%	+	+	n	n	+	10%	+/o	1
Sodium fluoride	NaF	s	+	+	+	+	10%	+	+	+	+	+	1
Sodium hydrogen sulfate	$NaHSO_4$	s	+	+	+	+	+	+	+	+	+	+	1
Sodium hydroxide	NaOH	50	+	+	+	+ (60%/25 °C)	+	-	+	30%	+	+	1

ProMinent Chemical Resistance List

Corrosive agent	Formula	Concentration in %	Acryl	PVC	PP	PVDF	1.4404	FKM	EPDM	PharMed®	PE	HastelloyC	WGK
Sodium hydroxide solution	NaOH	50	+	+	+	+ (60%/25 °C)	+	-	+	30%	+	+	1
Sodium hypochlorite	NaOCl + NaCl	12%	+	+	o	+	-	o	+	+	o	> 10%	2
Sodium iodide	NaI	s	+	+	+	+	+	+	+	+	+	+	1
Sodium metabisulfite	$Na_2S_2O_5$	s	+	+	+	+	+	n	n	+	+	+	1
Sodium metaphosphate	$(NaPO_3)_n$	s	+	+	+	+	+	+	+	+	+	+	1
Sodium nitrate	$NaNO_3$	s	+	+	+	+	+	+	+	+	+	+	1
Sodium nitrite	$NaNO_2$	s	+	+	+	+	+	+	+	+	+	+	2
Sodium oxalate	$Na_2C_2O_4$	s	+	+	+	+	+	+	+	+	+	+	1
Sodium perborate	$NaBO_2*H_2O_2$	s	+	+/o	+	+	+	+	+	+	+	+/o	1
Sodium perchlorate	$NaClO_4$	s	+	+	+	+	10%	+	+	+	+	10%	1
Sodium peroxide	Na_2O_2	s	+	+	+	+	+	+	+	n	-	+	1
Sodium peroxodisulfate	$Na_2S_2O_8$	s	n	+	+	+	+	+	+	+	+	+	1
Sodium salicylate	$C_6H_4(OH)COONa$	s	+	+/o	+	+	+	+	+	+	+	+	1
Sodium silicate	Na_2SiO_3	s	+	+	+	+	+	+	+	+	+	+	1
Sodium sulfate	Na_2SO_4	s	+	+	+	+	+	+	+	+	+	+	1
Sodium sulfide	Na_2S	s	+	+	+	+	+	+	+	+	+	+	2
Sodium sulfite	Na_2SO_3	s	+	+	+	+	50%	+	+	+	+	50%	1
Sodium tetraborate	$Na_2B_4O_7 * {}_{10H2}O$	s	+	+	+	+	+	+	+	+	+	+	1
Sodium thiosulfate	$Na_2S_2O_3$	s	+	+	+	+	25%	+	+	+	+	25%	1
Sodium thiosulfate	$Na_2S_2O_3$	s	+	+	+	+	25%	+	+	+	+	25%	1
Sodium tripolyphosphate	$Na_5P_3O_{10}$	s	+	+	+	+	+	+/o	+	+	+	+	1
Starch	$(C_6H_{10}O_5)_n$	s	+	+	+	+	+	+	n	+	+	+	1
Styrene	$C_6H_5CHCH_2$	100	-	-	o	+	+	o	-	-	o	+	2
Succinic acid	$C_4H_6O_4$	s	+	+	+	+	+	+	+	+	+	+	1
Sugar of lead	$Pb(CH_3COO)_2$	s	+	+	+	+	+	+	+	+	+	+	2
Sugar solution	-	s	+	+	+	+	+	+	+	+	+	+	1
Sulfur chloride	S_2Cl_2	100	n	n	n	+	n	+	-	-	n	n	-
Sulfuric acid	H_2SO_4	98%	30%	50%	85%	+	20%	+	80%	30%	80%	+	1
Sulfuric acid, fuming	$H_2SO_4 + SO_3$	s	n	-	-	-	+	+	-	+	-	+	2
Sulfurous acid	H_2SO_3	s	+	+	+	+	10%	+	+	+	+	+	1
Sulfuryl chloride	SO_2Cl_2	100	-	-	-	o	n	+	o	-	-	n	1
Tannin	$C_{76}H_{52}O_{46}$	50	+	+	+	+	+	+	+	+	+	+	1
Tartaric acid	$C_4H_6O_6$	s	50%	+	+	+	+	+	+/o	+	+	+	1
Tetrachloroethane	$C_2H_2Cl_4$	100	-	-	o	+	+	o	-	o	o	+	3
Tetrachloroethylene	C_2Cl_4	100	-	-	o	+	+	o	-	o	o	+	3
Tetrachloroethylene	C_2Cl_4	100	-	-	o	+	+	o	-	o	o	+	3
Tetrachloromethane	CCl_4	100	-	-	-	+	+	+	-	-	o	+	3
Tetraethyl lead	$Pb(C_2H_5)_4$	100	+	+	+	+	+	+	-	n	+	+	3
Tetraethyllead	$Pb(C_2H_5)_4$	100	+	+	+	+	+	+	-	n	+	+	3
Tetrahydrofuran	C_4H_8O	100	-	-	o	-	+	-	-	-	o	+	1
Tetralin	$C_{10}H_{12}$	100	-	-	-	+	+	+	-	-	o	+	3
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) sulfate	$SnSO_4$	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	1
Toluene	$C_6H_5CH_3$	100	-	-	o	+	+	o	-	-	o	+	2
Toluene diisocyanate	$C_7H_3(NCO)_2$	100	n	n	+	+	+	-	+/o	n	+	+	2
Triacetin	$C_3H_5(CH_3COO)_3$	100	n	n	+	+	+	-	+	n	+	+	1
Tributyl phosphate	$(C_4H_9)_3PO_4$	100	n	-	+	+	+	-	+	+	+	+	1
Trichloroacetic acid	CCl_3COOH	50	-	+	+	+	-	-	o	+/o	+	+	1
Trichloroethane	CCl_3CH_3	100	-	-	o	+	+	+	-	o	o	+	3
Trichloroethylene	C_2HCl_3	100	-	-	o	+	+/o	o	-	o	o	+	3
Tricresyl phosphate	$(C_7H_7)_3PO_4$	90%	-	-	+	n	+	o	+	+	+	+	2
Triethanolamine	$N(C_2H_4OH)_3$	100	+	o	+	n	+	-	+/o	o	+	+	1
Tripotassium phosphate	KH_2PO_4	s	+	+	+	+	+	+	+	+	+	+	1
Tris(2-ethylhexyl) phosphate	$(C_8H_{17})_3PO_4$	100	n	-	+	+	+	o	+	+	+	+	2
Trisodium phosphate	Na_3PO_4	s	+	+	+	+	+	+	+	+	+	+	1
Urea	$CO(NH_2)_2$	s	+	+/o	+	+	+	+	+	20%	+	+	1
Vinyl acetate	$CH_2=CHOOCCH_3$	100	-	-	+	+	+	n	n	+/o	+	+	2
Vitriol of copper	$CuSO_4$	s	+	+	+	+	+	+	+	+	+	+	2
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 sulfate	$ZnSO_4$	s	+	+	+	+	+	+	+	+	+	+/o	1

Overview of the Resistance of Soft PVC Hoses (Guttasyn®) to the Most Common Chemicals

This data applies to standard conditions (20 °C, 1,013 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 feed chemicals 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, aqueous	all	+
Ammonium, aqueous	saturated	-
Ammonium, aqueous	15	-
Aniline	100	-
Benzene	100	-
Bisulfite, 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 disulfide	100	-
Carbonic acid	all	+
Caustic potash	15	+
Chlorinated hydrocarbons	all	-
Chrome-alum, aqueous	all	+
Chromic acid, aqueous	50	-
Copper sulfate, 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	-
Hydrochloric acid	15	+
Hydrogen bromide	10	+
Hydrogen peroxide	up to 10	+
Hydrogen sulfide, gaseous	100	-
Ink	-	+

ProMinent Chemical Resistance List

Corrosive agent	Concentration in %	Evaluation
Magnesium salts, aqueous	all	+
Methyl alcohol	100	+
Methylene chloride	100	-
Nitric acid, aqueous	25	+
Oils	-	-
Perchloric acid	all	o
Phenol, aqueous	all	o
Phosphoric acid, aqueous	100	-
Potassium bichromate, aqueous	saturated	+
Potassium persulfate, aqueous	saturated	+
Silver nitrate	10	+
Sodium chloride, aqueous	all	+
Sodium hydroxide solution	aqueous	+
Sodium hypochlorite	15	+
Sodium salts	-	-
Sulfur dioxide, gaseous	all	+
Sulfuric acid	30	+
Tetrachloromethane	100	-
Toluene	100	-
Trichloroethylene	100	-
Urea, aqueous	all	+
Xylene	100	-
Zinc salts	all	+

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