evoqua
WATER TECHNOLOGIES

WALLACE & TIERNAN® MEASURING AND CONTROL SYSTEM
SFC
from version V:3.08

INSTRUCTION MANUAL

Please note

Original instruction manual!

Contents

1. Introduction

1.1 Documentation

1.1.1 Target groups

This instruction manual provides the information for installation, operating and maintenance personnel. It is required for operation and maintenance of the unit.

This instruction manual is intended for the operating personnel. It contains important information for safe, reliable, trouble-free and economical operation of the unit. Observance of this information helps to prevent danger, lowers repair costs, reduces down-times, and also increases the reliability and service life of the unit.

The chapters on installation and maintenance are solely provided for trained service personnel. These sections contain important information on the installation, configuration and commissioning of the unit as well as information on its repair.

All persons working with the unit must have read and understood the operating instructions, in particular, the safety instructions it contains.

Please consult the table of contents and the index to find the information you require quickly.

1.2 Conventions

Please note

This operating manual contains a number of notes with different priorities, which are marked with symbols.

Picto-gram	Note	Meaning
	*Danger!*	Immediate danger to life and limb! If the situation is not handled properly, death or serious injury may be the result.
	*Warning!*	Danger to life and limb! If the situation is not handled properly, death or serious injury may be the result.
	*Caution!*	If this warning is not observed, medium or slight injury or damage to the equipment may the result.
	*Warning!*	Electrical hazard.
	*Please note*	These notes facilitate work with the unit.

2. Safety

2.1 Intended use

The SFC is exclusively designed for measurement and control tasks required for the treatment of waste water, potable water, industrial water, and bathing water.

The operational safety of the unit is only guaranteed if it is used in accordance with its intended application. The unit may only be used for the purpose defined in the order and under the operating conditions indicated in the technical specifications.

Compliance with the intended use also includes reading this operating manual and observing all the instructions it contains. Furthermore, all inspection and maintenance work must be performed at the prescribed intervals.

The operator bears full and sole responsibility if this unit is put to any use which does not comply strictly and exclusively with this intended use.

2.2 General safety instructions

Evoqua Water Technologies GmbH attaches great importance to ensuring that work on its system is always perfectly safe. This was already taken into account in the design of the system, by the integration of safety features.

Safety instructions

The safety instructions in this documentation must always be observed. These do not affect the validity of any additional national or company safety instructions.

Safety instructions on the system

All safety instructions attached to the system itself must be observed. They must always be complete and easily legible.

Technical standard

The system or unit has been constructed in accordance with state-of-the-art technology and the accepted safety regulations. However, in the event of the system or unit being used by persons who have not been adequately instructed, risks to life and limb of such persons or third parties and damage to the system or unit itself or to other property cannot be ruled out. Work not described in this operating manual may only be performed by authorized personnel.

Personnel

The operator of the system must ensure that only authorized and qualified specialized personnel are permitted to work with and on the unit within their defined scope of authority. „Authorized specialists“ are trained technicians employed by the operator, by Evoqua, or, if applicable, the service partner. Only qualified electricians may perform work on electrical components.

Spare parts / components

Trouble-free operation of the system is only guaranteed if original spare parts and components are used in precisely the combination described in this operating manual. Failure to observe this instruction may incur the risk of malfunction or damage to the system.

Modifications and extensions

Never attempt to perform any modifications, extensions or conversions to the unit without the written approval of the manufacturer! These could have an adverse affect on safety!

Electrical power

During normal operation, the control unit must remain closed.

Before starting any assembly, inspection, maintenance, or repair work, the system must be switched OFF using the emergency stop switch and the switch must be secured against reactivation.

Connect all cables in accordance with the wiring diagram.

Waste disposal

Ensure safe and environmentally-friendly disposal of agents and replaced parts.

2.3 Warranty conditions

The following must be observed for compliance with warranty conditions:

- Installation, commissioning by Evoqua technicians or trained and authorized specialized personnel, e.g. of contracted companies
- Intended use
- Observation of the operational parameters and settings.
- The unit may only be operated by trained personnel.

- An operating log book must be kept (only in the public sector).
- Only approved calibration chemicals may be used
- The unit must not be exposed to frost.
- Maintenance work must be executed
- Use of original spare parts

If any of the above conditions are not met, the warranty is void.

2.4 Specific Operating Phases

Normal operation

Never employ any working methods which could affect safety!

Only run the unit when the housing is closed!

Inspect the unit at least once daily for externally visible damage and faults! Inform the responsible person/authority immediately of any detected changes (including any changes in the operating performance)!

In the event of malfunctions, always switch the unit off immediately! Have malfunctions remedied immediately!

Installation and maintenance work

Always perform installation or maintenance work in accordance with this operating manual or the technical documentation for installed unit components!

Secure the unit against activation during installation and maintenance work!

Always retighten released screw connections!

Never use corrosive cleaning agents!
Use only a damp cloth to clean the unit.

Ensure safe disposal of agents and replaced parts in accordance with environmental regulations!

2.5 Notes on Special Dangers

Electrical power

Only use original fuses with the prescribed current rating! In the event of a fault in the electrical power supply, switch the unit off immediately!

Only qualified electricians or trained personnel supervised by a qualified electrician are permitted to perform any work on electrical components in accordance with valid electro-technical regulations.

If stipulated, disconnect all parts of the unit from the power supply before performing any inspection, maintenance or repair work. Then first test the disconnected components to ensure they do not carry any voltage.

Inspect/check the electrical system of the unit regularly. Remedy any faults immediately!

Connect disconnected cables in accordance with the wiring diagram!

Agents and chemical substances

When handling agents and chemical substances always observe the safety regulations valid for each product!

Always remove leaked agents immediately with a suitable binder or wipe up with a cloth. Danger of slipping!

Always collect and dispose of agents or used cleaning material separately and in accordance with valid national regulations!

3. Description

3.1 Versions

There are two versions of the SFC.

They differ in the type and number of inputs and outputs that are available and in terms of functionality.

Both versions are available either as control cabinet units or wall units.

Version 1 (SFC with sensor measuring module)
This version supports all applications 1 – 3 (see 4.5 “Applications”)

- slot for 1 sensor module
- 4 relays
- 2x mA input
- 1x feedback input
- 2x digital input
- 1x temperature input PT 1000
- 1x mA output
- 1x SD memory card receptacle
- 1x CAN interface
- 1x RS485 interface
- 1x RS232 interface for Gateway
- 1x interface for firmware updates

Version 2 = SFC SC
This version only supports application 3 (see 4.5 “Applications”) without the possibility of recording measurements using the sensor measuring module.

- 2 relays
- 1 x mA input
- 1x feedback input
- 2x digital input
- 1x mA output
- 1x interface for firmware updates

3.2 Technical Data

3.2.1 Electronic module SFC

Housing

Dimensions (WxHxD)	185 x 265 x 145 mm
Weight	approx. 2.5 kg
Protection type	IP 66

Electronics

Mains connection
100 – 240 V AC ± 10%, 50 – 60 Hz, 15 W, Fuse 1A time lag 250 V Type: 5 x 20 mm
24 V DC ± 20%, 15 W, Fuse 1 A time lag 250 V Type: 5 x 20 mm

Insulation	
Overvoltage category	2
Pollution degree	2
Measuring category	I

Caution!

Do not use the device in measuring categories II, III and IV.

Operating conditions	
Ambient temperature	0 – 50 °C
Humidity	< 80 %
Environment	Indoor use No direct sunlight
max. altitude	2000 m
Atmospheric pressure	75 – 106 kPa
Storage temperature	-20 – +70 °C
Noise emission	<45 dB

Digital inputs
2x inputs for voltage-free contact (< 100 Ohm) power supply via SFC (12 V)
DI 1: Sample water monitoring / freely selectable in menu
DI 2: Freely selectable in menu

Measurement inputs
1x temperature input PT 1000 (0°C – 50°C) with sensor error display (not with Version 2)
1x feedback input positioner position feedback Potentiometer 1kOhm or 5kOhm, 0 – 1 V, 0 – 20 mA (selectable via DIP switch)
1x measured value input (electrically isolated up to 50 V to ground) for plug-in cards of the sensor measuring module (not with Version 2): • 3-electrode cell for chlorine, chlorine dioxide or potassium permanganate • Membrane sensors for total chlorine TC1/TC3, free chlorine FC1/FC2, chlorine dioxide CD7, ozone OZ7 • pH value • Redox voltage • Fluoride • Conductivity • mA/V input
1x mA input for flow rate 0 – 20 mA/4 – 20 mA In SFC units with a 24 V supply voltage this input is not electrically isolated from the 24 V DC supply voltage.
1x mA input for external setpoint or dosing factor 0 – 20 mA/4 – 20 mA (not with Version 2) In SFC units with a 24 V supply voltage this input is not electrically isolated from the 24 V DC supply voltage.

Interfaces

1x RS232 for firmware updates (not galvanically isolated)
1x RS485 (optional) (not with Version 2) for connection to: • ChemWeb-Server • OPC Server Data Access V2.0 • CMS Software 3.0 • SECO-S7 The RS485 interface is electrically isolated up to 50 V to ground.
1 x CAN interface to connect to CAN sensors
1x RS232 interface for Gateway module (not with Version 2)

Display and operating unit

1 x Operating panel with 9 keys
1 x Graphic display: • Resolution 128 x 64 pixels • white background illumination

Relay outputs

4 relay outputs (with Version 1) or 2 relay outputs (with Version 2) (each with two-way switch)	
Switching values	5 A, 250 V AC, 1250 VA max 5 A, 220 V DC, 150 W max
UL/CSA-rating	5 A, 1/6 HP 125, 250 V AC 5 A, 30 V DC, 30 W max 1 A, 30 V DC - 0.24 A, 125 V DC

mA output

1x mA output (freely configurable):

- Output 0/4 – 20 mA
- Accuracy < 0.5% FS
- Load max. 500 Ohm
- Temperature drift max. 0.2% / 10°C
- Load monitoring
- Electrically isolated up to 50 V to earth

Memory card

1x SD memory card slot for installing an SD memory card (not with Version 2)

DES measuring module 3-electrode cell

Sensor	3-electrode cell
Principle of operation	Potentiostatic amperometry
Temperature drift	max. 0.2% / 10k
Linearity error	< 0,1 %
Calibration	Pre-calibrated
Upot cell voltage	0 – +1000 mV
Upot accuracy	± 20 mV
Upot temperature drift	0.5% / 10K
Input signal	-7 – 1000 µA
Temperature input	PT 1000 (optional)
Measuring ranges	10, 70, 100, 200, 1000 µA (depending on the type of the DES module)

DES module membrane sensors

Sensor	Membrane covered 3-electrode sensor
Principle of operation	Potentiostatic amperometry
Temperature drift	max. 0.2% / 10k
Linearity error	< 0,1 %
Calibration	Pre-calibrated
Input signal	-7 – 1000 µA
Measuring ranges	70, 100, 200, 1000 µA

pH measuring module for pH value

Sensor input	pH single rod electrode
Temperature drift	max. 0.2% / 10k
Linearity error	< 0,1 %
Calibration	Pre-calibrated
Input signal	-1000 – +1000 mV
Input impedance	10^{13} Ohm

mV measuring module for Redox

Sensor input	Redox single rod electrode
Temperature drift	max. 0.2% / 10k
Linearity error	< 0,1 %
Calibration	Pre-calibrated
Input signal	-1000 – +1000 mV
Input impedance	10^{13} Ohm

mS measuring module for conductivity

Sensor input	LF325
Temperature measuring range	0 – +50 °C
Temperature drift	< 0,2 %
Calibration	Pre-calibrated
Linearity error	< 0,5 %
Measuring range	0,1 – 200 mS/cm

mA/V measuring module for analog input

Sensor input	mA signal or V signal
Temperature drift	max. 0.2% / 10k
Linearity error	< 0,1 %
Calibration	Pre-calibrated
Measuring ranges	0/4 – 20 mA (scalable) or 0 – 10 V (scalable)

F^- measuring module for fluoride

Sensor input	Fluoride single rod electrode
Calibration	Pre-calibrated
Measuring range	0.2 – 20.0 mg/l
Temperature drift	max. 0.2% / 10k
Linearity error	< 0,1 %

3.2.2 Flow block assembly DEPOLOX® 5

Housing

Dimensions (WxHxD)	215 x 375 x 155 mm
Weight	approx. 1.5 kg

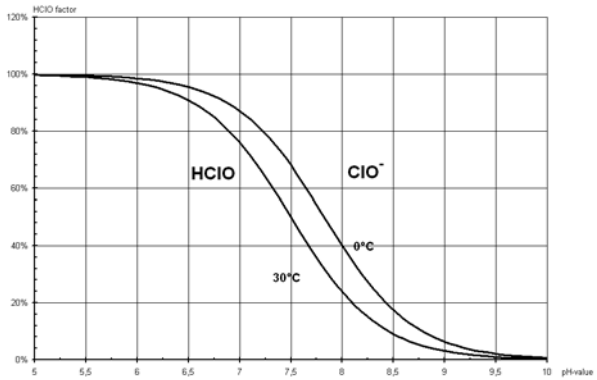
Multi sensor

Switching point	21 l/h +/- 3 l/h
Switching hysteresis	2 l/h
Temperature sensor	PT 1000

Measured variables	Free chlorine, chlorine dioxide, ozone, potassium permanganate
Measuring ranges	70, 100, 200, 1000 µA
Typical output signal	approx. 20 µA/mg/l free chlorine
Measuring system	Potentiostatic 3-electrode system
Reference electrode	Silver/Silver chloride/Potassium chloride solution
Working electrode	Platinum
Other materials	PVC, PMMA, ABS, ECTFE, PTFE, stainless steel, EPDM, FKM, NBR
Cable length	650 mm
Electrolyte	Potassium chloride solution, 3 mol
Zero point calibration	by stopping flow rate or dechlorinated sample water typ. zero current approx. 1 µA
Response time T_{90}:	< 20 sec.
Temperature compensation	0 – 50 °C
Storage temperature	-10°C – +50°C (without electrolyte)
Influence of the pH value	HOCl curve, operating range pH 5.0 – pH 8.5

Cross-sensitivity	other oxidation agent: copper-based algaecide
Water quality	swimming pool, potable, industrial and process water
Sample water temperature	max. +50 °C
Conductivity	min. 200 µS/cm
Service life	Life of the electrolytes in operation approx. 6 months Service life of electrodes in operation approx. 5 years (shortened by poor water quality, e.g. sand, dirt)

The HOCl curve describes the influence of the pH value on the DEPOLOX® 5.



Picture 1 HOCl curve

Volumetric flow control

Flow rate	approx. 33 l/h (controlled)
Control range	0.2 – 4.0 bar
Back pressure	• non-pressurized version (free drain) • pressurized version 1.5 bar

Connections

Sample water	PVC hose 6x3 mm or PE hose 6x1 mm
Thread connection	G1/2“ or NPT 1/4“

3.2.3 VariaSens flow block assembly

Housing

Dimensions (WxHxD)	215 x 375 x 155 mm
Weight	approx. 1.5 kg

Connections

Sample water	PVC hose 6 x 3 mm or PE hose 6 x 1 mm
Thread connection	G1/2“ or NPT 1/4“

Flow control valve

Flow rate	approx. 33 l/h (controlled)
Control range	0.2 – 4.0 bar
Back pressure	• non-pressurized version (free drain) • pressurized version 1.5 bar

Sample water

Water quality	swimming pool, potable, industrial and process water
Sample water temperature	max. +50 °C

Multi sensor

Switching point	21 l/h +/- 3 l/h
Switching hysteresis	2 l/h
Temperature sensor	PT 1000

3.2.4 Flow block assembly DEPOLOX® Pool

Housing

Dimensions (WxHxD)	215 x 375 x 155 mm
Weight	approx. 1.5 kg

Connections

Sample water	PVC hose 6 x 3 mm or PE hose 6 x 1 mm
Thread connection	1/2"

Flow control valve

Flow rate	approx. 33 l/h (controlled)
Control range	0.2 – 4.0 bar
Back pressure	• non-pressurized version or • pressurized version 1.5 bar

Sample water

Water quality	Swimming pool water
Sample water temperature	max. +50 °C

Multi sensor

Switching point	21 l/h +/- 3 l/h
Switching hysteresis	2 l/h
Temperature sensor	PT 1000

3.2.5 Y-style flow through assembly

Y-style flow through assembly pH/mV

Back pressure	non-pressurized/pressurized Version (max. 6 bar)
Sample water temperature	max. +50 °C

Y-style flow through assembly fluoride

Back pressure	Non-pressurized version
Sample water temperature	max. +50 °C

Y-style flow through assembly conductivity

Back pressure	pressurized version up to 6 bar
Sample water temperature	max. +50 °C

3.2.6 Electrodes and sensors

DES 3-electrode chlorine measuring cell (glass electrode) for DEPOLOX® Pool flow block assembly

Measuring system	3-electrode sensor with additional stock of electrolyte salt
Principle of operation	Potentiostatic amperometry
Temperature compensation	0 – 50 °C
Temperature drift	max. 0.2 % / 10 K
Measuring range	0,1 – max. 20 mg/l
Upot	0 – +1000 mV
Reference electrode	Silver/Silver chloride/Potassium chloride solution
Working electrode	Platinum
Other materials	Vitreous body
Storage temperature	-10 – +30 °C
Water quality	Swimming pool water

pH electrode

Max. measuring range	pH 0 – 12
Operating temperature range	-5 – +80 °C
Storage temperature range	-5 – +30 °C
Sample water conductivity	200 µS/cm – 200 mS/cm
Max. operating pressure	6 bar

ORP electrode

Max. measuring range	-1000 – +1000 mV
Operating temperature range	-10 – +80 °C
Storage temperature range	-5 – +30 °C
Sample water conductivity	200 µS/cm – 200 mS/cm
Max. operating pressure	6 bar

Fluoride electrode

Max. measuring range	0.2 – 20 mg/l
Operating temperature range	0 – +80 °C
Storage temperature range	-5 – +30 °C
Sample water conductivity	200 µS/cm – 200 mS/cm
Max. operating pressure	non-pressurized

Conductivity electrode

Measuring system	4-electrode system LF325
Principle of operation	4 conductor measurement
Operating temperature range	-5 – +100 °C
Storage temperature range	-5 – +50 °C
Cell constant	0.48 cm^{-1} ±1.5 %
Max. operating pressure	10 bar

Membrane sensor

Please note

For further technical data please refer to instruction manual „Membrane sensor for free chlorine FC2“ and „Membrane sensor for total chlorine TC3“ for each membrane sensor.

Membrane sensor for chlorine dioxide CD7

Measured variables	Chlorine dioxide, selective compared to Cl_2, Br_2, H_2O_2, cross-sensitivity compared to O_3, peracetic acid
Power supply	unipolar +12 – 15 VDC, 11 mA
Typical output signal	approx. 10 µA per 1 mg/l (ppm) ClO_2
Measuring system	membrane-covered 2-electrode system
Reference electrode	Silver / Silver halide / Potassium halide solution
Working electrode	Gold
Other materials	PVC, silicone rubber, stainless steel
External dimensions	Ø 25 mm (1"), length 175 mm (6.9")
Connector cable combination cablelength	1,2 m
Electrolyte	Diluted potassium halide solution, 100 ml bottle, store in a dark place at 15°C to 25°C, useable up to 2 years, as long as it is still uniformly clear
Measuring range	0,05 – 20 mg/l (ppm) ClO_2
Chemical analysis	DPD 1
Zero point calibration	not necessary (zero point signal at 0 mg/l ClO_2 = 0 µA)
Response time T_{90}	< 20 sec.
Influence of the pH value	No signal influence up to the ClO_2 stability limit
Temperature compensation	internal temperature compensation 5 – 45 °C
Storage temperature	-10 – +45°C (without electrolyte)
max. pressure	1.5 bar (only with suitable adapter)
Water quality	all types of water, swimming pool, potable, industrial and process water (limestone deposits may block the membranes)
Conductivity	> 1 µS/cm to max. 40 mS/cm
Flow	6 – 35 l/h, as constant as possible

Service life	Service life of the electrolytes in operation is approx. 6 months, service life of membrane cap is typically 1 year (shortened by poor water quality, e.g., sand, dirt)
Cross-sensitivity	ozone, peracetic acid
Selectivity	compared to chlorine, bromine, hydrogen peroxide

Membrane sensor for ozone OZ7

Measured variables	Ozone, selective compared to Cl_2, Br_2, H_2O_2, cross-sensitivity compared to ClO_2, peracetic acid
Power supply	unipolar +12 – 15 VDC, 11 mA
Typical output signal	approx. 10 µA per 1 mg/l (ppm) O_3
Measuring system	membrane-covered 2-electrode system
Reference electrode	Silver / Silver halide / Potassium halide solution
Working electrode	Gold
Other materials	PVC, silicone rubber, stainless steel
External dimensions	Ø 25 mm (1"), length 175 mm (6.9")
Connector cable combination	Cable length 1.2 m
Electrolyte	Diluted potassium halide solution, 100 ml bottle, store in a dark place at 15°C to 25°C, useable up to 1 years, as long as it is still uniformly clear
Measuring range	0,02 – 10 mg/l (ppm) O_3
Chemical analysis	DPD 1 + DPD 3
Zero point calibration	not necessary (zero point signal at 0 mg/l O_3 = 0 µA)
Response time T_{90}	< 50 sec.
Influence of the pH value	No signal influence up to the ozone stability limit
Temperature compensation	internal temperature compensation 5 – 45 °C
Storage temperature	-10 – +45 °C (without electrolyte)
max. pressure	1.5 bar (only with suitable adapter)
Water quality	all types of water, swimming pool, potable, industrial and process water (also tenside-laden) (limestone deposits may block the membranes)
Conductivity	> 1 µS/cm to max. 40 mS/cm
Flow	6 – 35 l/h, as constant as possible

Service life	Service life of electrolytes in operation is approx. 6 months, service life of membrane cap is typically 1 year (shortened by poor water quality, e.g., sand, dirt)
Cross-sensitivity	Chlorine dioxide, peracetic acid
Selectivity	compared to chlorine, bromine, hydrogen peroxide

3.2.7 CAN sensor modules SiDiSens

Housing

Dimensions (WxHxD)	40 x 120 x 35 mm (without cable)
Weight	about 200 – 250 g depending on the version
Protection rating	IP66

Electronics

Power supply	24 V DC ± 20%; max. 2 W

Operating conditions	
Ambient temperature	0 - 50 °C
Humidity	< 80 %
Environment	No direct sunlight
Atmospheric pressure	75 - 106 kPa
Max. altitude	2,000 m
Storage temperature	-20 - 50 °C
Noise emission	<45 dB

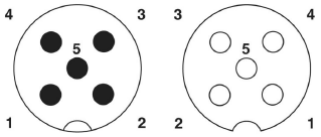
Interface

CAN bus interface (electrically isolated up to 50V to earth)

Measurement inputs

SiDiSens	pH
Sensor type	Single-rod electrode for pH
Input signal	-400…+400 mV
Temperature drift	<0.1 %/10K
Linearity error	< 0,1 %
Input impedance	10^{13} Ohm
Calibration	Pre-calibrated

Connections

Power supply + CAN bus	Connecting cable with 5-pin M12 plug and 5-pin M12 socket for CAN bus terminal plug or to connect other CAN bus components  M12 plug M12 socket Pin 1 screen 2 +24V 3 0V 4 CAN high 5 CAN low
Measurement input	Plug connector compatible with sensor

3.3 Scope of supply

Please note

You will find the order numbers under 8. “Complete Units, Retrofit Kits and Spare Parts”.

3.3.1 Standard

Depending on the individual order, the scope of supply includes the following:

- Electronic module SFC
  incl. accessories set and mounting set, comprising:

  4x screws Ø 5 mm
  4x dowels Ø 8 mm
  4x washers
  3 multiple seal inserts 2x6 mm
  3 multiple seal inserts 4x5 mm
  3 reducing sealing rings Ø 8 mm
  4 bolts for multiple seal inserts 5 mm
  2 bolts for multiple seal inserts 6 mm

3.3.2 Options

The order numbers for the flow block assembly are found in 8. “Complete Units, Retrofit Kits and Spare Parts”.

Flow block assembly

- DEPOLOX® 5 (non-pressurized or pressurized version)
- DEPOLOX® Pool (non-pressurized or pressurized version)
- VariaSens (non-pressurized or pressurized version)
- Y-style flow through assemblys (non-pressurized or pressurized version)

Please note

The order numbers for the sensor measuring modules are found in 8. “Complete Units, Retrofit Kits and Spare Parts”.

Sensor measuring module retrofit kit including accessories:

- pH
- Redox
- Conductivity
- Fluoride
- Free chlorine (FC2)
- Chlorine dioxide selective (CD7)
- Ozone selective (OZ7)
- Total chlorine (TC3)
- 3-electrode cell DEPOLOX® 5
- 3-electrode cell DEPOLOX® Pool
- 3-electrode cell DEPOLOX® 4 with PT 100
- mA/V input card
- CAN sensor measurement module SiDiSens pH
- CAN sensor measurement module SiDiSens DES

Please note

All retrofit kits or sensor measurement modules, except for the SiDiSens measurement modules, are available with or without the process control option.

3.4 Description

3.4.1 Versions

SFC

The SFC is available in two different versions (see 3.1 “Versions”), each in two voltage variations:

- 100 – 240 V AC
- 24 V DC

Depending on the application, the SFC can be operated either without a flow block assembly (no sensor measuring module) or in connection with a flow block assembly and sensor measuring module.

Flow block assembly

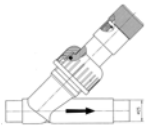
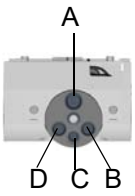
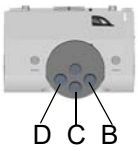
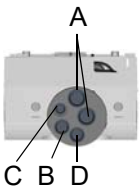
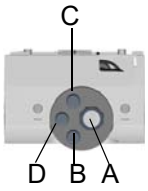
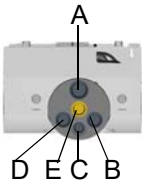
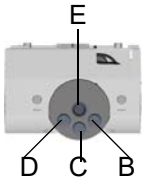
The flow block asssembly is available in different versions:

- DEPOLOX® 5 - non-pressurised version
  (Sample water drains freely)
- DEPOLOX® 5- pressurised version
  (Sample water is recycled through the system cycle)
- DEPOLOX® Pool - Non-pressurized version
- DEPOLOX® Pool - Pressurized version
- VariaSens - non-pressurized version, see “Overview” on Page 35
- VariaSens - pressurized version, see “Overview” on Page 35
- Various Y-style flow through assemblys

Please note

The selection is customised according to the type of measured values to be recorded.

Overview

Non-pressurized version DEPOLOX® 5	Pressurized version DEPOLOX®5	Non-pressurized version VariaSens	Pressurized version VariaSens	Non-pressurized version DEPOLOX® Pool	Pressurized version DEPOLOX® Pool	Y-style flow through assembly
						Example: 
						[1] W3T171332 [2] W3T159950 [3] W3T158503 [4] W3T163663
A Membrane sensor for free chlorine FC1/FC2, total chlorine TC1/TC3, chlorine dioxide CD7, ozone OZ7 *B Redox* *C Fluoride or conductivity* *D pH* *E 3-electrode sensor (single rod glass electrode)*						

		Non-pressurized version DEPOLOX® 5	Pressurized version DEPOLOX® 5	Non-pressurized version VariaSens	Pressurized version VariaSens	Non-pressurized version DEPOLOX® Pool	Pressurized version DEPOLOX® Pool	Y flow-through adapter
Free chlorine, ClO_2, $KMnO_4$, O_3	3-electrode measuring cell	X	X	--		X	X	--
Membrane sensor FC1/FC2, TC1/ TC3, CD7 or OZ7	Membrane-covered electrode	1x	--	2x	1x (only OZ7 or CD7)	1x	--	--
pH	pH 0 – 12	X	X	X	X	X	X	X [1] [2]
Redox value	-1000 – +1,000mV	X	X	X	X	X	X	X [1] [2]

		Non-pressurized version DEPOLOX® 5	Pressurized version DEPOLOX® 5	Non-pressurized version VariaSens	Pressurized version VariaSens	Non-pressurized version DEPOLOX® Pool	Pressurized version DEPOLOX® Pool	Y flow-through adapter
Fluoride	0,20 – 20,00	X	--	X	--	X	--	X [4)]
Conductivity	0,1 – 200 mS/cm	X	X	X	X	X	X	X [3)]
„Multi sensor“	Temperature (PT 1000) 0 – 50 °C	X	X	X	X	X	X	--
	Flow rate monitor (reed switch)	X	X	X	X	X	X	--
	Earthing	X	X	X	X	X	X	--
Ball valve Sample water (inlet)	G 1/2“ connection	X	X	X	X	X	X	--
Ball valve Sample water (outlet)	G 1/2“ connection	--	X	--	X	--	X	--
Preliminary filter	Recommended when using membrane-covered electrodes	X	--	X	X	X	--	--
Check valve	Glass ball	X	X	X	X	X	X	--
Volumetric flow control	free drain	X	X	X	X	X	X	--
Factory setting: 33 l/h Admission pressure: 0.2 – 4.0 bar	Max. back pressure: 1.5 bar	X	X	X	X	X	X	--
Drain/extract specimen		X	X	X	X	X	X	X [4)]
Calibration instrument bracket	Calibration aid	X	X	X	X	X	X	--

Please note

The „membrane sensor for free chlorine FC1“ has been replaced by the „membrane sensor for free chlorine FC2“ and the „membrane sensor for total chlorine TC1“ has been replaced by the „membrane sensor for total chlorine TC3“. The membrane sensors FC1 and TC1 are fully compatible with the SFC.

3.4.2 Design

Overall design

The SFC unit has a modular structure and can be equipped with various types of sensor measuring modules. Several SFC modules can be installed next to each other on a top-hat rail or using surface mounting brackets.

Picture 2 SFC Cl_2 with flow block assembly DEPOLOX® 5

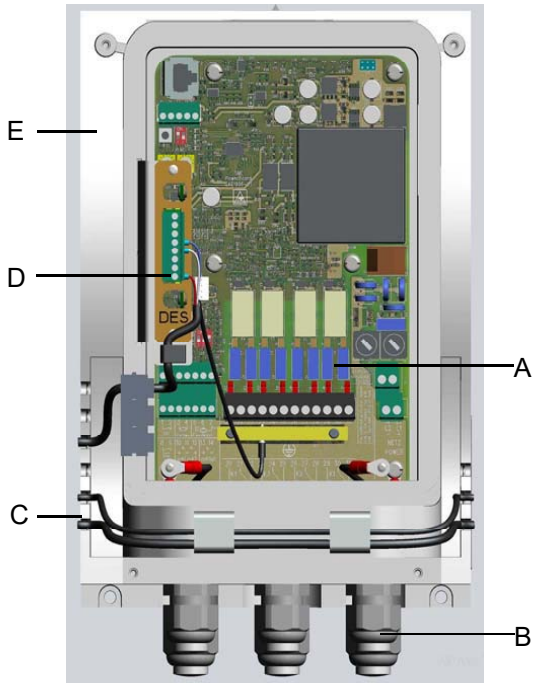
A Flow block assembly DEPOLOX® 5
B Sensors
C Electronic module SFC

Electronic module SFC

The electronic module SFC consists of a plastic housing (E) with a removable cover.

The housing contains:

- A&C board (A)
- Housing ducts for the cables of the sensor measuring modules (C)
- the cable glands (B)
- the sensor measuring module (D) (optional)

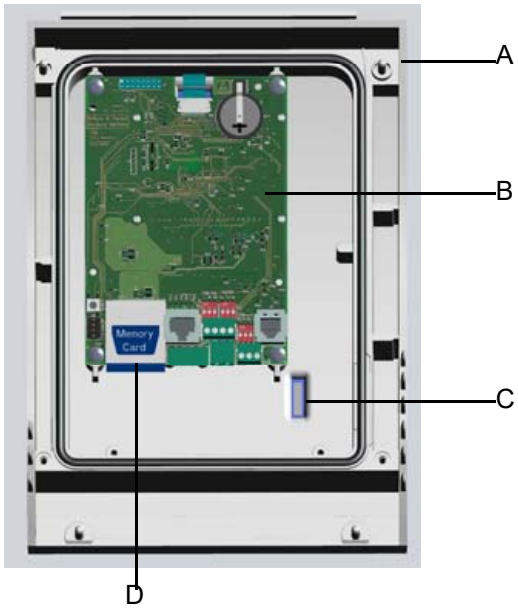


Picture 3 SFC basic with card and cable

A A&C Board
B Cable glands
C Housing ducts for the cables of the sensor measuring modules
D Slot for sensor measuring module
E Housing

The following are integrated into the cover:

- Front panel board with graphic display (B) and interface connections
- Insertable strips (C)
- SD memory card (D)



Picture 4 SFC Operating front (rear)

A Housing cover
B Front panel board
C Insertable strips
D Memory card

Flow block assembly DEPOLOX® 5 / VariaSens - non-pressurized or pressurized version -

The flow block assembly DEPOLOX® 5/VariaSens consists of a plastic housing (B) with a removable cover.

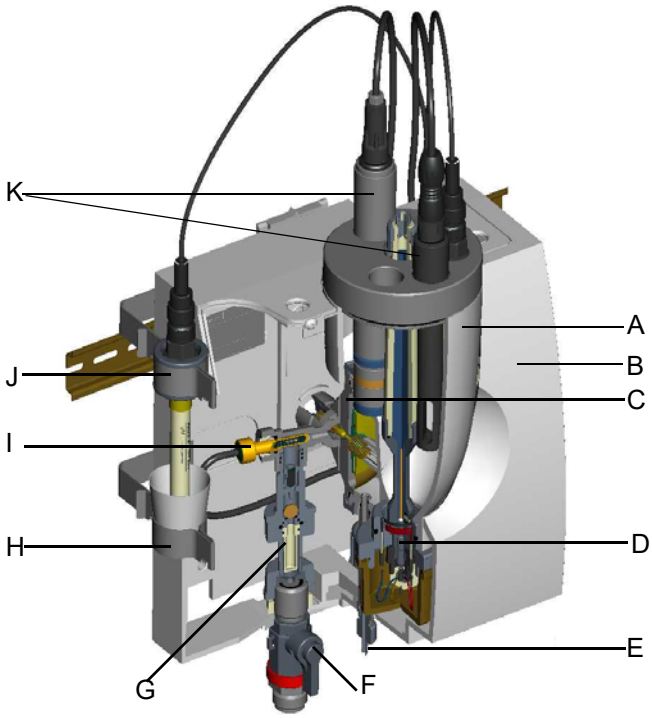
The flow block assembly contains the following:

- Cell body with cover (A)
- Flow control valve (C)
- Multi sensor (I)
- Drain (E)
- Fine filter (G) (only when membrane sensors are used)
- Sample water inlet with check valve and ball valve (F)

The DEPOLOX® 5 flow block assembly contains the

3-electrode cell for Cl_2, ClO_2, O_3 or $KMnO_4$ (D).

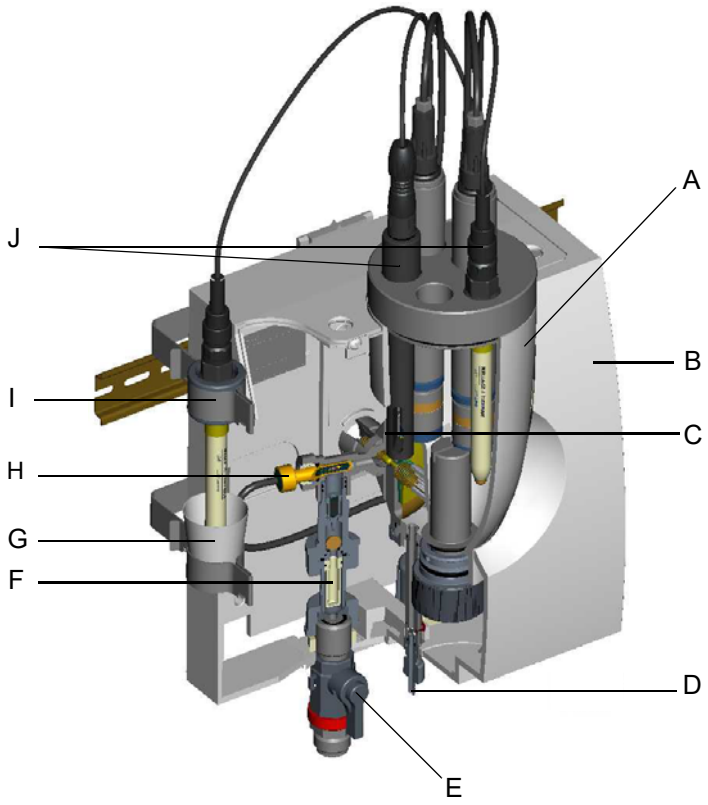
Flow block assembly DEPOLOX® 5 non-pressurized version



Picture 5 Flow block assembly DEPOLOX® 5 cutaway model

A Cell body with cover
B Plastic housing
C Flow control valve
D 3-electrode cell for Cl_2, ClO_2, O_3 or $KMnO_4$
E Drain/extract specimen
F Ball valve
G Fine filter
H Lower clip
I Multi sensor
J Upper clip (coated)
K Sensors

Flow block assembly VariaSens non-pressurized version



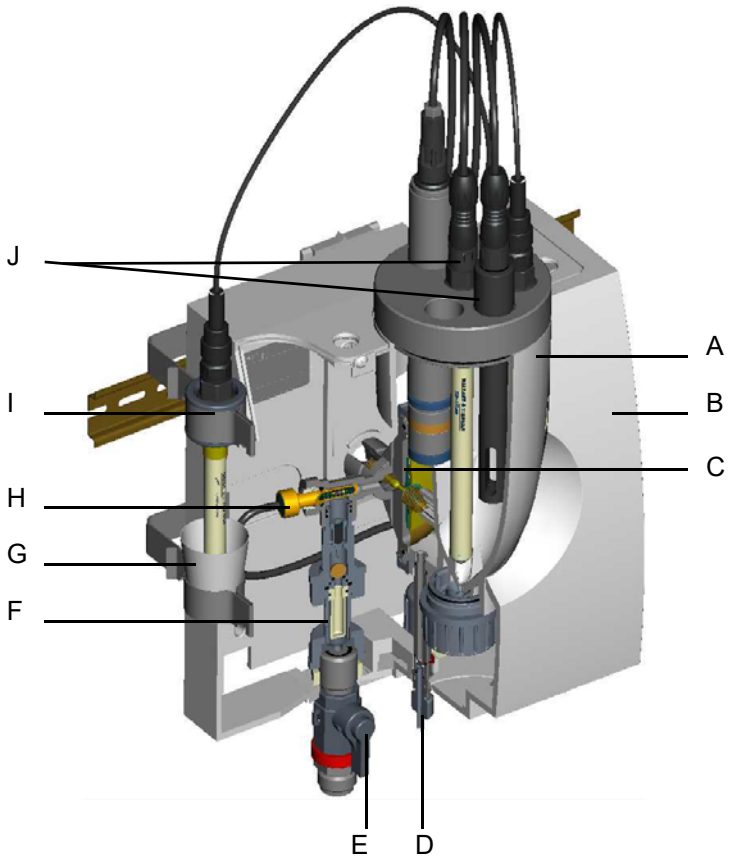
Picture 6 Flow block assembly VariaSens cutaway model

A Cell body with cover
B Plastic housing
C Flow control valve
D Drain/extract specimen
E Ball valve
F Fine filter
G Lower clip
H Multi sensor
I Upper clip (coated)
J Sensors

Two clips (H/I) are installed in the housing cover. These clips can be inserted into the rear panel of the housing.

The cell body can be equipped with up to five sensors (J) on the non-pressurized version or four sensors on the pressurized version.

Flow block assembly DEPOLOX® Pool non-pressurized version



Picture 7 Flow block assembly DEPOLOX® Pool cutaway model

A Cell body with cover
B Plastic housing
C Flow control valve
D Drain/extract specimen
E Ball valve
F Fine filter
G Lower clip
H Multi sensor
I Upper clip (coated)
J Sensors

Two clips (G/I) are installed in the housing cover. These clips can be inserted into the rear panel of the housing.

The cell body can be equipped with up to five sensors (J) on the non-pressurized version or four sensors on the pressurized version.

Sensor measuring module

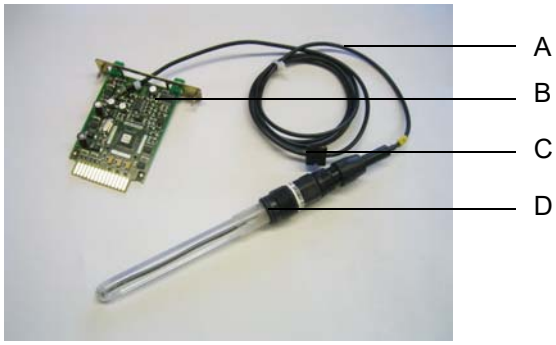
The sensor measuring module consists of:

- Sensor (not with 3-electrode cell DEPOLOX® 5, mA/V input)
- the sensor cable with water-tight housing duct (not with 3-electrode cell DEPOLOX® 5, mA/V input)
- Pre-calibrated plug-in card

Due to the modular design, simple installation and configuration of sensor measuring modules in accordance with the plug-and-play principle is possible at any time.

All sensor measuring modules and retrofit kits for Cl_2, pH, mV, F- ... can be plugged into the module slot.

This configuration determines the functionality of the SFC (see 4.2 “Measurement inputs”).



Picture 8 Example sensor measuring module pH

A Sensor cable
B Plug-in card
C Housing duct
D Sensor

4. Functions

4.1 General

The SFC is a special measuring and control device for use in the treatment of potable water, industrial process water and pool water.

Two different versions of the unit are available (see chapter 3.1), which differ in terms of their inputs and outputs.

Version 1 supports all of the applications described in chapter 3.1. Due to the restricted number of inputs and outputs, version 2 only works in application 3.

Typical applications:

- Measurement and registration of water parameters
- Flow-controlled potable water chlorination (compound loop)
- Flow-controlled fluroide dosing (compound loop)
- pH single feedback closed-loop control
- Chlorine single feedback closed-loop control
- Quantity-proportional dosing of disinfectants (single feed forward)
- Quantity-proportional dosing of disinfectants with linearization of the actuator (with positioner)

Possible process measurements (only with applications 1 and 2) are:

free chlorine, combined chlorine, total chlorine, chlorine dioxide, potassium permanganate, ozone, pH, Redox, fluoride, conductivity

As an option, two additional control signal inputs can be installed to log flow rate and external setpoint using compound loop or single feed forward.

Please note

For the simultaneous recording of process measurements (Cl_2, pH, ...) and flow-controlled dosing of chemicals (single feed forward, compound loop), it is necessary to use sensor measuring modules with the „Process Control“ option (see 4.5 “Applications”).

The integrated graphic display displays the following:

- Measured values
- Mode
- Bar graph with limit values
- Setpoint and measuring range
- Description of customized measuring points
- etc.

The menus are easy to use, displayed in plain text and are selected using softkeys.

A 30-day trend enables you to view past measured values of up to two selectable process variables (with SD memory card). Without SD memory card, the trend from 0 – 24 hrs is displayed.

With the SD memory card installed, a measured value file is saved for every month, with the available measured values and the associated time. The file is a text file and can be opened with every editor.

An mA output and an RS 485 bus interface, including a protocol, are available to connect visualization systems. Three different process applications, which reflect the variety of on-site conditions, are integrated into the SFC to simplify commissioning.

Overall Function

Possible measured values:

- Free chlorine*/Cl_2^{++}*, potassium permanganate*, chlorine dioxide*, ozone* (3-electrode cells)
- Total chlorine*/Combined chlorine* (membrane sensor)
- pH value
- Redox voltage
- Conductivity*
- Ozone* (membrane sensor)
- Chlorine dioxide* (membrane sensor)
- Free chlorine* (membrane sensor)
- Fluoride
- External mA/V inputs
- Temperature measurement
- Actuator feedback

The value of the combined chlorine is calculated from the difference between the total chlorine and the free chlorine (optional). This requires a free chlorine and total chlorine measurement in the same sample water, further information See “Combined chlorine display” on page 117.

* These measurements are automatically temperature-compensated.

The Cl_2^{++}value is a pH-compensated chlorine measurement (optional). This requires a pH-measurement in the same sample water as the 3-electrode cell. Measurement values are collected by SiDiSens pH via the CAN bus.

The graphic display shows the measured data, limit values and setpoints as numeric values, diagrams or a trend line.

Applications

The control functions available to the SFC are determined by the type of sensor measuring modules, the version of the SFC, and the application selected.

Application 1

Only measurement with limit switches.

Application 2

Process measurement with various controller functions.

- Single feedback closed loop control
- Compound loop (only with sensor measuring modules with the Process Control option)
- Single feed forward (only with sensor measuring modules with the Process Control option)

Application 3

Single feed forward with linearization of the actuator (positioner), no process measurement or measured value display such as Cl_2, pH, ...

Controller outputs

Controller outputs for positioners, dosing pumps, pulse pumps, continuous mA output as well as a dosing contact. CAN actuators are also supported.

Adaption program

The adaption program automatically determines the control parameters when commissioning the single feedback closed loop control (chlorine, chlorine dioxide, ozone and potassium permanganate modules only).

Safety functions

The following safety functions are integrated into the control if configured accordingly:

- Safety cut-off if dosing tank signals empty and also if the sample water supply fails
- Dosing time delay (D1)
- Alarms
- External controller stop with digital input
- Function "Positioner closed" in the event of power failure (only with external power supply for positioner)
- Password protection on two levels

Configuration switch-over

The SFC gives the option of either saving internally or loading all necessary operating parameters as a configuration. A maximum of two configurations are possible. These can also be copied to or loaded from the optionally installed SD memory card.

Interfaces

The SFC supports the following links:

RS485 interface

- CMS 3.0
  Visualization software for archiving and display of measured values on computers with a Windows operating system
- SECO-S7:
  SPS driver for data links to SPS, type S7-300
- OPC-Server Data Access V2.0:
  Server software for Windows operating systems for data links to visualisation system with OPC client capability
- ChemWeb-Server:
  Measured value archiving and display, remote diagnosis, remote access with standard browser with Internet and e-mail capability
- Process control systems from other manufacturers
  (refer to the manual "RS-485 Bus Interface" for description, bus system, and protocol)

CAN interface

- The SFC has an integrated CAN interface. This is used for exchanging data between CAN sensors. (See 4.12 “CAN interface” for description and bus system).

Flow block assembly DEPOLOX® 5 / VariaSens / DEPOLOX® Pool

These flow block assemblies guarantee a stable measurement signal with

- robust sensors
- Constant flow rate with the aid of the flow control valve
- Hydrodynamic grit cleaning of the 3-electrode sensor
  (only flow block assembly DEPOLOX® 5/DEPOLOX® Pool)
- optimum flow around all sensors

The multi-sensor integrated into the flow block assembly monitors the constant flow rate of sample water, registers the temperature of the sample water and ensures equipotential earthing over a large surface area (sample water earthing).

Please note

As an option, sensors may also be installed via the Yflow-through adapter, or the DEPOLOX® 4 can be combined with the SFC.

4.2 Measurement inputs

In principle, the following types of sensor measuring module or retrofit kits can be installed at the module slot: The sensor measuring modules are only supported in applications 1 and 2:

DES	-	for 3-electrode cell
DES	-	for 3-electrode cell with PT 100 temperature option
DES	-	for free chlorine (FC1/FC2), chlorine dioxide (CD7), ozone (OZ7), and total chlorine (TC1/ TC3) membrane sensors
DES	-	for Micro 2000 with PT 1000
DES	-	for DEOX 2000 with PT 1000
pH	-	pH value
mV	-	Redox value
F^-	-	Fluoride value
mS	-	Conductivity
mA/V	-	Input module

Please note

As 3-electrode cell, DEPOLOX® 5, DEPOLOX® Pool, glass electrodes or DEPOLOX® 4 can be connected. All of these sensor measuring modules are available with the „Process Control“ option (PC).

When the unit is switched on, the menus are initialized according to the installed sensor module. Even if the sensor modules are changed at a later date, the user menus are automatically initialized when the unit is switched on. If no sensor measuring module is installed in unit version 1, the message „No measurement available“ appears. When delivered from the factory, the SFC is set to application 2. Unit version 2 can only operate in application 3.

The sensor measuring module should be considered as the main measurement, and control functions such as single feed forward, single feedback closed loop control, and compound loop are supported depending on the Process Control option. No controller output is available for application 1.

4.2.1 3-electrode sensor DEPOLOX® 5 and DEPOLOX® Pool

Flow block assembly DEPOLOX® 5 3-electrode measurement for free Cl_2, ClO_2, O_3 or $KMnO_4$

Potable, industrial and swimming pool water are disinfected almost exclusively by adding chlorine, chlorine dioxide, ozone or potassium permanganate.

With the flow block assembly DEPOLOX® 5 with integrated 3-electrode cell, the contents of this disinfectant can be continuously recorded.

A sensor module ("DES" for 3-electrode cells) and terminal strips are used to connect the flow block assembly DEPOLOX® 5 to the SFC. Various controller functions are available depending on the application selected. The flow block assembly DEPOLOX® 5 is also used for holding other sensors, such as pH, Redox, fluoride, conductivity or membrane sensors for free chlorine, chlorine dioxide, ozone, total chlorine, or combined chlorine.

A pressurized and non-pressurized version with flow rate control is available as a flow block assembly with integrated 3-electrode cells (see "Overall Function" page 31).

Mode of operation of the 3-electrode sensor in the flow block assembly DEPOLOX® 5

The measuring cell in the flow block assembly DEPOLOX® 5 is a 3-electrode cell with external potentiostatic control circuit. Working and counter electrodes are designed as half-ring electrodes and consist of a special platinum alloy.
The reference electrode is a silver/silver chloride electrode, which is connected to the sample water via two diaphragms (membranes). The reference electrode with PVC support is immersed into an electrolyte solution.
The electrolyte supply can be replenished during operation if necessary (see7.2 “Maintenance of flow block assembly DEPOLOX® 5”).

By connecting the 3-electrode cell to the SFC (DES sensor module for 3-electrode cell), a variable Upot cell voltage can be output between the working electrode (red) and reference electrode (white) via the potentiostatic control circuit. A measuring cell current (µA signal), which is evaluated using the SFC, sets itself proportional to the disinfectant concentration in the sample water.

A special cleaning sand is filled into the flow block assembly, which is circulated by the sample water current and continuously cleans the platinum electrodes.

A multi-sensor is integrated into the flow block assembly DEPOLOX® 5 to measure the temperature and monitor the flow rate. This is made of a stainless steel housing and is used simultaneously as the sample water grounding (for connection to SFC, see 9. “Wiring Diagrams”).

Single-rod 3-electrode sensor (single-rod glass electrode)

Single-rod 3-electrode sensor for the DEPOLOX® Pool for measuring free chlorine

The disinfection of pool water is carried out almost exclusively through the addition of chlorine. The contents of this disinfectant can be continuously recorded using the 3-electrode single-rod electrode. The single-rod electrode can only be installed in the flow block assembly DEPOLOX® Pool, in order to guarantee a stable measurement signal. For connecting to the SFC,a sensor measuring module DES for 3-electrode cells must be installed in the SFC.

Mode of operation of the single-rod 3-electrode sensor

The 3-electrode sensor is maintenance-free and has a service life of approx. 2 years. A special cleaning grit, which is filled into the flow block assembly DEPOLOX® Pool, continuously cleans the electrodes, by swirling constantly around the electrodes. The grit should be changed regularly (see 7. “Maintenance”).

A multi-sensor is integrated into the flow block assembly DEPOLOX® Pool to measure the temperature and monitor the flow rate. This is made of a stainless steel housing and is used simultaneously as the sample water grounding.

Adjusting the measurement signal input

The µA-signal input of the flow block assembly DEPOLOX® 5 is adjusted on the sensor measuring module as follows:

The measuring cell current of the flow block assembly DEPOLOX® 5 (µA current signal) is directly proportional to the disinfectant concentration in the sample water. Depending on how the flow block assembly DEPOLOX® 5 is used, the µA measuring range on the sensor input must be adjusted according to the operating conditions.

Please note

The setting for the µA measuring range depends on the cell, the disinfectant concentration and the type of disinfectant.

Setting guideline

The difference between the µA cell current at 0% disinfectant (or sample water stop) and the maximum measured value must be within the following µA measuring ranges:

- 0 – 70 µA
- 0 – 100 µA (factory setting)
- 0 – 200 µA
- 0 – 1000 µA

Please note

Select a higher µA measuring range for a correspondingly high concentration of disinfectant. With the DEPOLOX® 5, a µA value of approx. 30 µA per 1 mg/l chlorine should be taken as a guide value. With the single-rod glass electrode, a guide value of approx. 8 µA per 1 mg/l chlorine should be taken.

The "µA Meas. Range" parameter can be modified in the "Meas. Range" menu of the respective module.

Setting the Upot potential voltage

A variable potential voltage is output between the working electrode and the reference electrode. If a disinfectant other than Cl_2 is used, the potential voltage must be adjusted:

- Chlorine — 250 mV (factory setting)
- Chlorine dioxide, ozone, potassium permanganate — 300 mV

The "Upot" parameter can be set in the "Meas. Range" menu of the respective module.

Installation notes

Ambient conditions

The following must be taken into account when installing the 3-electrode measurement:

- Select the sample water extraction point that guarantees a proper mixture of disinfectant and a bubble-free sample water flow.
- Keep the sample water extraction line as short as possible.

Please note

No water carrying lines made of copper piping may be installed. These would distort the measurements.

- If the flow block assembly is not installed right next to the SFC, the measuring cell cable can be lengthened up to no more than 50 m with a three-core, shielded cable. Ready-made extension cables are available for this (see 8. “Complete Units, Retrofit Kits and Spare Parts”).
- Because the multi sensor is also integrated to measure the temperature and monitor the flow rate in the flow block assembly DEPOLOX® 5, it must also be installed with an equal extension. Graded, ready-made cable lengths up to 50 m are also available (see 8. “Complete Units, Retrofit Kits and Spare Parts”).
- In the SFC, terminal strips must be used with a right-hand direction of connection. Information on connecting the sensor to the sensor module can be found under 9. “Wiring Diagrams”.
- The sensor can be calibrated for the first time after approx. two to three hours running-in time.

Please note

The calibration must be checked after one day.

4.2.2 pH measurement

The pH value is a measured variable in the field of water treatment. It is a measure of the level of acidity or basicity of a water sample. A glass single-rod measuring sequence is used as sensor.

Picture 1 Sensor measuring module

The pH measuring system consists of:

- pH module with a solidlysoldered connecting cable
- pH glass electrode

The pH module must be installed in the module slot of the SFC. Various controller functions are available depending on the application selected.

The electrode can be installed in the flow block assembly DEPOLOX® 5/DEPOLOX® Pool/VariaSens or in a separate Y-style flow through assembly.

Installation notes

Ambient conditions

The following must be taken into account when installing the pH measurement:

- Select the sample water extraction point that guarantees a proper mixture of correction medium and a bubble-free sample water flow.
- This does not require a certain flow rate.
- The electrode must be immersed at least 2 cm deep into the sample water.
- If the pH electrode is not installed right next to the SFC, extension cables with plug connectors are available (see 8. “Complete Units, Retrofit Kits and Spare Parts”).
- If an extension cable is used (max. 50 m), an impedance converter (see 8. “Complete Units, Retrofit Kits and Spare Parts”) must be used on the electrode in order to guarantee a stable measuring signal.

Installing the pH sensor in the flow block assembly

1 Install the pH sensor in the corresponding opening on the flow block assembly in the Y-style flow through assembly.

2 Screw the sensor cable marked "pH" into place.

3 The pH sensor can be calibrated for the first time after approx. two to three hours running-in time.

Please note

The calibration must be checked after one day.

4.2.3 Redox Measurement

The Redox voltage is a measured variable in the field of water treatment. The electrical potential present during the Redox reaction is described as Redox voltage and represents the oxidation strength of a system. The Redox electrode is a single-rod electrode including silver/silver chloride reference system, which is very robust and low-maintenance.

Picture 2 Sensor measuring module

The Redox measuring system consists of:

- mV module with a solidly soldered connecting cable
- Redox electrode

The mV-module must be installed in the module slot of the SFC. Various controller functions are available depending on the application selected.

The electrode can be installed in the flow block assemblies DEPOLOX® 5/DEPOLOX® Pool/VariaSens or in a separate Y-style flow through assembly.

Installation notes

Ambient conditions

The following must be taken into account when installing the Redox measurement:

- Select the sample water extraction point that guarantees a proper mixture of disinfectant and a bubble-free sample water flow.
- This does not require a certain flow rate.
- The electrode must be immersed at least 2 cm deep into the sample water.

Please note

No water carrying lines made of copper piping may be installed. These would distort the measurements.

- If the Redox electrode is not installed right next to the SFC, extension cables with plug connectors are available (see 8. “Complete Units, Retrofit Kits and Spare Parts”).
- If an extension cable is used (max. 50 m), an impedance converter (see 8. “Complete Units, Retrofit Kits and Spare Parts”) must be used on the electrode in order to guarantee a stable measuring signal.

Installing the mV sensor in the flow block assembly

1 Install the mV sensor in the corresponding opening on the flow block assembly in theY-style flow through assembly.

2 Screw the sensor cable marked "mV" into place.

3 The mV sensor can be calibrated for the first time after approx. two to three hours running-in time.

Please note

The calibration must be checked after one day.

4.2.4 Fluoride Measurement

The fluoride measurement with fluoride ionic-sensitive electrodes is used to continuously determine the fluorides in solutions. The measurement of the fluoride ions concentration is selective, i. e. the remaining electrodes do not disturb even at a high surplus. The measurement medium's pH value must be between pH 4 and pH 8.5, in order to obtain a correct result.

Picture 3 Sensor measuring module

Caution!

Quick and repetitive changes in temperature cause the potential to change continuously, which can lead to electrode malfunction.

Please note

The reference system is filled with electrolyte. The integrated storage tank must be replenished routinely with the solution.

The fluoride measuring system consists of:

- Fluoride module with a solidly soldered connecting cable
- Fluoride single-rod electrode

The fluoride module must be installed in the module slot of the SFC. Various controller functions are available depending on the application selected.

The electrode can be installed in the flow block assemblies DEPOLOX® 5/DEPOLOX® Pool/VariaSens or in a separate Y-style flow through assembly.

Installation notes

Ambient conditions

The following must be taken into account when installing the fluoride measurement:

- Select the sample water extraction point that guarantees a proper mixture of disinfectant and a bubble-free sample water flow.
- This does not require a certain flow rate.
- The electrode must be immersed at least 2 cm deep into the sample water.

Please note

No water carrying lines made of copper piping may be installed. These would distort the measurements.

- If the fluoride electrode is not installed right next to the SFC, extension cables with plug connectors are available (see 8. “Complete Units, Retrofit Kits and Spare Parts”).
- If an extension cable is used (max. 50 m), a impedance converter (see 8. “Complete Units, Retrofit Kits and Spare Parts”) must be used on the electrode in order to guarantee a stable measuring signal.
- Because the fluoride electrode has a connecting cable, the impedance converter must be installed between the electrode extension cable and the connecting cable.

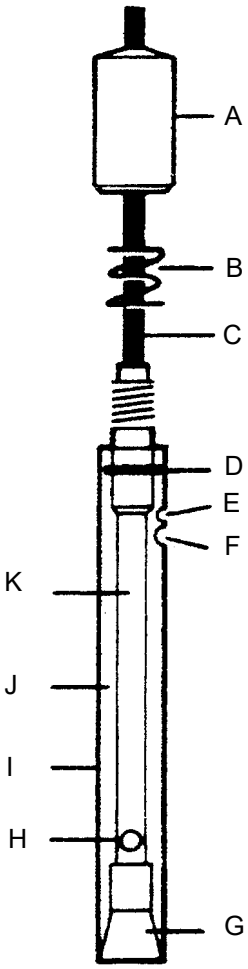
Commissioning

Please note

The fluoride-sensitive membrane of the electrode is protected by a rubber cap. The rubber cap must be removed before the electrode is immersed in the sample water.

To prevent damages, do not touch the membrane.

Preparing the electrodes



1 Screw the injection cap on the bottle with the fill solution.

2 Pour a little fill solution into the filling hole. Then rinse the electrode to wet the electrode body O-ring.

3 Press on the electrode cap until the electrode body is loosened slightly from the epoxy cover so that the cone is also wet.

4 Release the cap.
If the protective cover does not immediately return to its original position, check whether the O-ring is wet enough and repeat steps 2 and 3 until the protective cover returns.

5 The electrode must be filled with electrolyte up to the filling hole.

6 Before use, the electrode should be placed in a 100 mg/l fluoride solution at pH 7 for approx. 24 hours (e.g. calibration solution).

A cap
B spring
C cable
D O-ring
E vent
F filling hole
G cone
H reference element
I protective cover
J chamber for fill solution
K electrode body

Please note

The filling hole or vent must remain open. The solution in the electrode may not be contaminated by other liquids.

Installing the fluoride sensor in the flow block assembly

1 Install the fluoride sensor in the corresponding opening on the flow block assembly in the Y-style flow through assembly.

2 Connect the sensor to the sensor cable marked „F⁻“.

3 The fluoride sensor can be calibrated for the first time after approx. two to three hours running-in time.

Please note

The calibration must be checked after one day.

4.2.5 Conductivity Measurement

The conductivity measurement represents a composite parameter for the total mineralization of water. This measurement depends heavily on the temperature, therefore a temperature sensor is integrated directly into the conductivity sensor. The measured value is always indicated in relation to a certain temperature value. The international reference temperatures are 20°C or 25°C.

Picture 4 Sensor measuring module

The conductivity measuring system consists of:

- Conductivity module with terminal strip
- Conductivity sensor
- Electrode support for pressurized/non-pressurized assembly

The LF325 conductivity measuring cell consists of a 4-electrode system with integrated temperature sensor. The electrodes are made of graphite and are therefore very robust and abrasion-resistant. The cell constant is 0.48 cm^{-1}.

The conductivity module must be installed in the module slot of the SFC. Various controller functions are available depending on the application. The electrode can be installed in the flow block assemblies DEPOLOX® 5/DEPOLOX® Pool/DEPOLOX® 4 or in a separate Y-style flow through assembly. The electrode support must also be used if installing the pressurized version in the flow block assembly.

Installation notes

Ambient conditions

The following must be taken into account when installing the conductivity measurement:

- Select the sample water extraction point that guarantees bubble-free sample water flow.
- This does not require a certain flow rate.
- The electrode must be immersed at least 4 cm deep into the sample water.
- If the conductivity electrode is not installed right next to the SFC, the measuring cell cable can be lengthened up to no more than 50 m using a connecting box and a six-core, shielded cable (see 8. “Complete Units, Retrofit Kits and Spare Parts”).
- The terminal strips must be used with a right-hand direction of connection. Information on connecting the sensor to the conductivity module can be found in the wiring diagrams in 9. “Wiring Diagrams”.

Installing the conductivity sensor in the flow block assembly

1 Install the conductivity sensor in the corresponding opening on the flow block assembly in the Y-style flow through assembly.

2 Use the appropriate accessories if installing the pressurized version.

3 Plug in the corresponding sensor cable.

4 Then calibrate immediately.

4.2.6 Membrane sensors

Membrane sensors

The following alarm messages are configurable:

- Free chlorine - FC2
- Chlorine dioxide - CD7
- Ozone - OZ7
- Total chlorine - TC3

The membrane measuring system consists of the sensor module ("DES" for membrane sensors) including terminal strips and the sensors. The module must be installed in the module slot of the SFC. Various controller functions are available depending on the slot and application selected.

All membrane systems are equipped with an integrated temperature sensor and therefore deliver a temperature-compensated output signal.

Picture 5 Membrane sensor

Please note

For a better overview, the commissioning, maintenance, trouble-shooting, de-bugging and storage is listed here for each sensor.

For further information and the start-up please refer to instruction manual „membrane sensor for free chlorine FC2“ and „membrane sensor for total chlorine TC3“ for each membrane sensor.

Installation notes

Ambient conditions

The following must be taken into account when installing the membrane sensors:

- Select the sample water extraction point that guarantees a proper mixture of disinfectant and a bubble-free sample water flow.
- Keep the sample water extraction line as short as possible.

Please note

No water carrying lines made of copper piping may be installed. These would distort the measurements.

- The membrane sensors can only be used in the DEPOLOX® 5, DEPOLOX® Pool or VariaSens flow block assembly, which maintains the constant sample water flow.
  Because not all membrane sensors are designed for pressurized operation, the operating conditions and the sensor technical data must be reviewed and coordinated before the sensors are installed in pressurized flow block assemblies!
- If the membrane sensor is not installed right next to the SFC, the measuring cell cable can be lengthened up to no more than 50m with a three-core, shielded cable. Ready- made extension cables up to 15 m are available for this (see 8. “Complete Units, Retrofit Kits and Spare Parts”).

The terminal strips with a right-hand direction of connection must be used. Information on connecting the sensor to the sensor module can be found in the wiring diagrams (see 9. “Wiring Diagrams”).

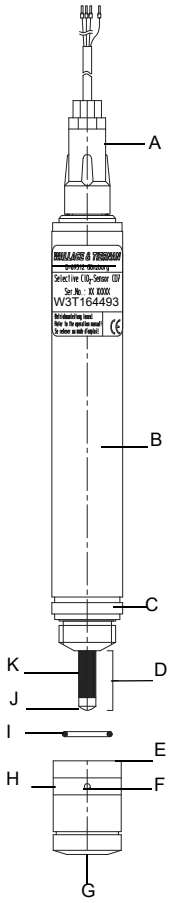
Membrane sensor for chlorine dioxide CD7

The CD7 membrane sensor enables the chlorine dioxide content in all types of water to be determined selectively, also in high-purity water (LF > 1µS/cm), without cross-sensitivity to chlorine, bromine and hydrogen peroxide, but with cross-sensitivity to ozone and peracetic acid. The sensor demonstrates no pH value dependency (see „Technical data“) and is therefore very suitable for water with various pH values.

Commissioning

Caution!

The electrode fingers (D) and membranes (G) are extremely sensitive! Do not touch, soil or damage! Before unscrewing the filled membrane cap (E), push the elastomer seal (H) to one side to permit the inflow of air through the vent (F) underneath it (at the cap label)! Otherwise, the membrane (G) may be damaged due to the development of underpressure. Do not remove the light yellowish-gray deposit of the reference electrode (K) or wipe it in the direction of the gold working electrode (J)!
Flush eyes and skin immediately with water after contact. Rinse away spilled electrolyte with water.



1. Screw off the membrane cap (E) from the electrode shaft (B) and fill with the included gel electrolyte up to the top brim.
2. Rub gold working electrode (J) with the included lapping paper (special emery). To do this, lay the lapping paper on a paper towel, take hold of a corner, and using the tip of the vertically-held electrode shaft (B), slide it once or twice over the rough side of the lapping paper.
3. Check whether the elastomer seal (H) completely closes the valve opening (F).
4. Then screw the filled membrane cap (E) slowly (by hand) back onto the the electrode shaft (B).

Please note

As the excess electrolyte escapes through the valve opening (F) under the elastomer seal (H), do not clamp it shut and do not press it onto the elastomer seal (H).

5 Rinse off the escaped electrolyte with water.

Please note

The membrane cap (E) must be completely screwed (hand-tight) onto the electrode shaft (B), so that no gap remains between the two! After a run-in period of about one hour, the membrane sensor is sufficiently run-in for an initial calibration to take place. Calibration should be repeated after one day.

Inserting into the flow-through adapter

1 Insert the membrane sensor through the cover into the flow-through adapter until it is resting mechanically on the inflow mating connector and therefore receives a good flow. It may be necessary to turn the flow-through adapter cover to set it in the right position relative to the inflow mating connector.

Please note

Remove air bubbles from the membrane by lifting the membrane sensor. They interfere with the measurement!

2 Connect the measuring signal cable to the measuring device.

Please note

If the measuring sensor is installed this way, it will function reliably for approx. three to six months.

Storing the membrane sensor

1 Lift elastomer seal (H) and only then screw off the membrane cap (E).

2 Wash the membrane cap (E) and electrode finger (D) with clean (distilled) water.

3 Carefully dry the electrode finger (D) with absorbent paper.

4 Leave the membrane cap (E) to dry in a dust-free place.

5 Screw the dry membrane cap (E) loosely onto the electrode shaft (B).

Please note

The membrane (G) may not touch the gold working electrode (J).

Restarting

See „Commissioning“.

Trouble-shooting and debugging when the measuring signal is too low or irregular

1 Remove air bubbles on the membrane (G) by lifting the membrane sensor; air bubbles prevent the chlorine dioxide from diffusing through the membrane (G) and distort the measurement!

Please note

Air bubbles on the electrode shaft (B) and the membrane cap (E) are normal following the initial startup and subsequent startups and they disappear by themselves after one or two days.

2 Replenish electrolyte. Open membrane sensor. To do this, push the elastomer seal (H) to the side so that air can flow in through the valve opening (F), and only then screw off the membrane cap (E). Pour out the electrolyte. Wash the electrode finger (D) and the membrane cap (E) with clean (distilled) water and dry with a clean paper towel.

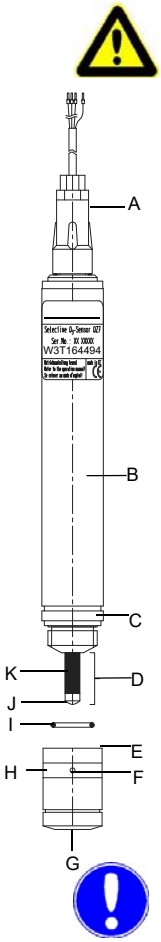
Please note

For further procedures, see “Commissioning“. If the membrane sensor's measuring signal is still too low or irregular, a new membrane cap (E) must be used. The membrane sensor then requires a run-in time of approx. one hour, before a calibration can be carried out.

Membrane sensor for ozone OZ7

The OZ7 membrane sensor enables the ozone content in all types of water to be determined selectively, also in high-purity water (LF > 1µS/cm), without cross-sensitivity to chlorine, bromine and hydrogen peroxide, but with cross-sensitivity to chlorine dioxide and peracetic acid. The sensor demonstrates no pH value dependency (see „Technical data“) and is therefore very suitable for water with various pH values.

Commissioning



Caution!

The electrode fingers (D) and membranes (G) are extremely sensitive! Do not touch, soil or damage! Before unscrewing the filled membrane cap (E), push the elastomer seal (H) to one side to permit the inflow of air through the vent (F) underneath it (at the cap label)! Otherwise, the membrane (G) may be damaged due to the development of underpressure. Do not remove the light yellowish-gray deposit of the reference electrode (K) or wipe it in the direction of the gold working electrode (J)!
Flush eyes and skin immediately with water after contact. Rinse away spilled electrolyte with water.

1. Screw off the membrane cap (E) from the electrode shaft (B) and fill with the included gel electrolyte up to the top brim.
2. Rub gold working electrode (J) with the included lapping paper (special emery). To do this, lay the lapping paper on a paper towel, take hold of a corner, and using the tip of the vertically-held electrode shaft (B), slide it once or twice over the rough side of the lapping paper.
3. Check whether the elastomer seal (H) completely closes the valve opening (F).
4. Then screw the filled membrane cap (E) slowly (by hand) back onto the electrode shaft (B).

Please note

As the excess electrolyte escapes through the valve opening (F) under the elastomer seal (H), do not clamp it shut and do not press it onto the elastomer seal (H).

5 Rinse off the escaped electrolyte with water.

Please note

The membrane cap (E) must be completely screwed (hand-tight) onto the electrode shaft (B), so that no gap remains between the two! When the sensors are first commissioned, it is necessary to operate the sensors for two or three hours in water with an ozone content of >0.2 mg/l. The sensor needs this time to activate itself. Following a run-in time of approx. three hours, a first calibration can take place. Calibration should be repeated after one day.

Inserting into the flow-through adapter

1 Insert the membrane sensor through the cover into the flow-through adapter until it is resting mechanically on the inflow mating connector and therefore receives a good flow. It may be necessary to turn the flow-through adapter cover to set it in the right position relative to the inflow mating connector.

Please note

Remove air bubbles from the membrane by lifting the membrane sensor. They interfere with the measurement!

2 Connect the measuring signal cable to the measuring device.

Please note

If the measuring sensor is installed this way, it will function reliably for approx. three to six months.

Storing the membrane sensor

1 Lift elastomer seal (H) and only then screw off the membrane cap (E).

2 Wash the membrane cap (E) and electrode finger (D) with clean (distilled) water.

3 Carefully dry the electrode finger (D) with absorbent paper.

4 Leave the membrane cap (E) to dry in a dust-free place.

5 Screw the dry membrane cap (E) loosely onto the electrode shaft (B).

Please note

The membrane (G) may not touch the gold working electrode (J).

Restarting

See chapter „Commissioning“.

Trouble-shooting and debugging when the measuring signal is too low or irregular

1 Remove air bubbles on the membrane (G) by lifting the membrane sensor; air bubbles prevent the ozone from diffusing through the membrane (G) and distort the measurement!

Please note

Air bubbles on the electrode shaft (B) and the membrane cap (E) are normal following the initial startup and subsequent startups and they disappear by themselves after one or two days.

2 Replenish electrolyte. Open membrane sensor. To do this, push the elastomer seal (H) to the side so that air can flow in through the valve opening (F), and only then screw off the membrane cap (E). Pour out the electrolyte. Wash the electrode finger (D) and the membrane cap (E) with clean (distilled) water and dry with a clean paper towel.

Please note

For further procedures, see “Commissioning“. If the membrane sensor's measuring signal is still too low or irregular, a new membrane cap (E) must be used. The membrane sensor then requires a run-in time of approx. one hour, before a calibration can be carried out.

4.2.7 mA/V input module

The mA/V input module is used for connecting sensors or external measurements with mA or voltage output signal. 0/4 – 20 mA signal or 0 – 10 V input voltage are possible.

Various controller functions are available depending on the application selected. If the mA/V module is used with the „Process Control“ option (PC), compound loop and single feed forward are also available.

As measured value display, the unit and display format can be freely selected in the menu.

4.2.8 Temperature measurement

The A&C board of SFC has a temperature measurement for connecting a PT1000 sensor (multi-sensor). This temperature measurement is used for temperature compensation of the „DES“ module and pH measurement. The temperature is shown on the main display and can be calibrated if necessary. The measuring range is 0 – 50°C. The unit may be adjusted to °F.

4.2.9 mA inputs of the A&C boards

The A&C board integrates two mA inputs (mA 1 and mA 2) for recording process parameters.

mA input 1 Used for recording the flow rate signal as 0 – 20 mA or 4 – 20 mA signal.

mA input 2 Used for recording an external setpoint value or dosing factor as 0 – 20 mA signal

Both input signals can be freely scaled in the menu (see Inputs/ Outputs menu).

Special Function When measuring the combined chlorine, it is also possible to record the measured value „free chlorine“, which is required for combined chlorine measurement, via mA input instead of CAN bus. However, single feed forward and compound loop, with recording of the flow rate, will then no longer be supported by SFC.

4.2.10 CAN sensor measurement module SiDiSens

SiDiSens is an external CAN bus component which can be used to add a measurement input to the SFC.

Using the integrated connecting cable the module is directly plugged into SFC. The M12 socket in the SiDiSens housing is provided for the bus terminal plug included in the scope of delivery.

The relevant sensor is attached to the SiDiSens and the measurement data is transmitted to the SFC via the CAN bus.

If a SiDiSens is connected to the SFC, the associated measurement is automatically detected upon start-up of the device and the necessary menus for parameterisation are enabled. Assignment to mA output and entry of limit values is possible. The measurement values are presented as a line diagram and stored on the SD memory card.

The status LED in the SiDiSens housing provides information on the current status.
While the connection is being established the LED either flashes red/green quickly or green slowly. As soon as communication is established with the SFC it lights up a continuous green.
A CAN bus fault is indicated by a red illuminated LED.

The SiDiSens is designed as a wall mounting module. Using an optionally available assembly set it can also be fixed to a top-hat rail.

The following version is available:

- SiDiSens pH for measuring and compensating the pH value for a Cl_2++ measurement

Please note

The SiDiSens is only suitable for connecting to a SFC with firmware version 3.0 and above.

Only one SiDiSens may be connected to the SFC.

The SiDiSens is provided for the following applications:

- Cl_2++ measurement

Cl_2++ measurement

The pH dependency of the chlorine measurement is compensated if the pH value fluctuates within the range of pH 6.00 - pH 8.75. This function is only guaranteed to a max. 10 mg/l free chlorine.

If free chlorine measurement is enabled in SFC, a measurement cell DEPOLOX® 5 is available and a SiDiSens pH is connected via the CAN interface, the Cl_2++ measurement is automatically activated on system start-up. In the "measuring range - sensor type" menu there is also the option of selecting the normal Cl_2 measurement.

Please note

The SiDiSens measurement value displayed in the SFC is only used to compensate the pH value of the chlorine measurement. No controller function is available for the pH measurement.

4.3 Outputs

4.3.1 mA output

The mA output of the SFC is electrically isolated and can be parameterized to 0 – 5 mA, 0 – 10 mA, 0 – 20 mA or 4 – 20 mA in the menu. Any measured value, actuator output Y_{out} or temperature can be assigned to the mA output.

4.3.2 Relay outputs

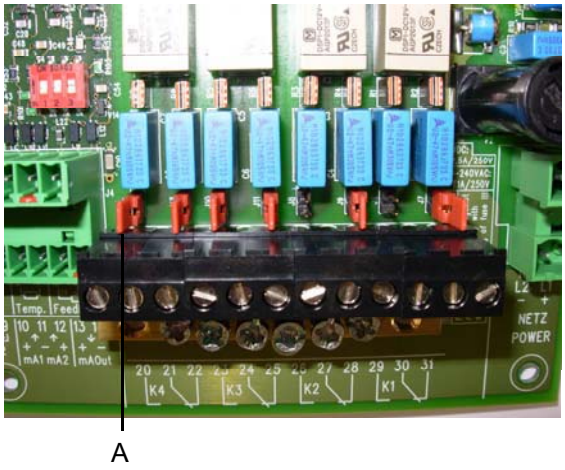
The SFC has a maximum of four relays, each with a two-way switch. These switches are assigned various switching tasks depending on the selected application (see 4.5 “Applications”). The corresponding diagrams for the three applications are in the appendix under 9. “Wiring Diagrams”. In order to switch larger inductive load, we recommend installing an additional contact such as a contactor or load relay, in order to guarantee the contacts have a longer service life.

Protection of the relay contacts of alarm and control outputs is provided at the factory using RC circuits. These provide radio interference suppression for inductive loads such as pumps, motors, etc.

Connection of small loads

When connecting small loads to the mains voltage, e.g. contactors or positioners with low power consumption (e.g. V10K), the closed-circuit current via the RC circuits can suffice to activate the loads (humming of the positioner, contactor is not deactivated, etc.). In this case, the plug-in jumpers of the relevant contacts should be removed to deactivate the RC circuits.

K1 J6/J7
K2 J8/J9
K3 J10/J11
K4 J12/J13



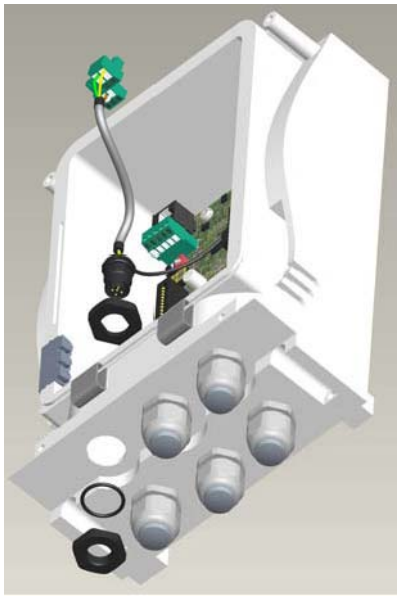
Picture 6 Connection diagram

A Plug-in jumpers

4.4 SFC CAN retrofit kit

A retrofit kit with CAN bus socket (M12, 5-pin) and connecting cable is available as an accessory to directly connect the CAN sensor measurement module SiDiSens to the SFC electronics module.

Integration is described in the supplied conversion instructions.



Picture 7 SFC CAN retrofit kit

4.5 Applications

The configuration of the system is determined by:

- Version of the SFC
- The required measurement and control parameters
- The installed components
- the selection of the suitable application
- the type of sensor module installed

The SFC provides the option to customize the system to the various on-site systems using three integrated applications.

- Factor setting of version 1 = application 2
- Factor setting of version 2 = application 3

The connections are determined by selecting the applications 1, 2 or 3. Factory settings are always set for the respective application. However, these can be customized to the respective system.

Caution!

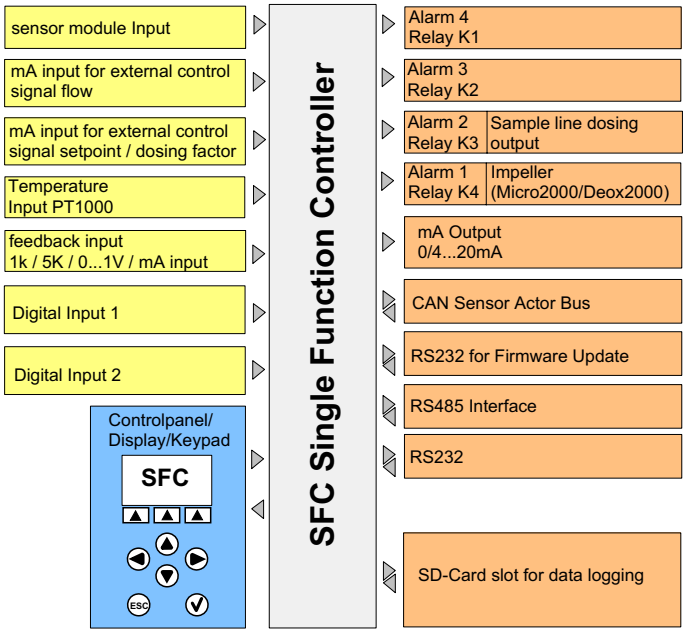
The defined application 1, 2, 3, 4 or 5 must be entered the first time the device is switched on (see 5.3.9 “Switching the device on”.

It is then not possible to change this for the defined configuration, otherwise the incorrect controller outputs are activated.

The three available applications 1, 2 and 3 are described below.

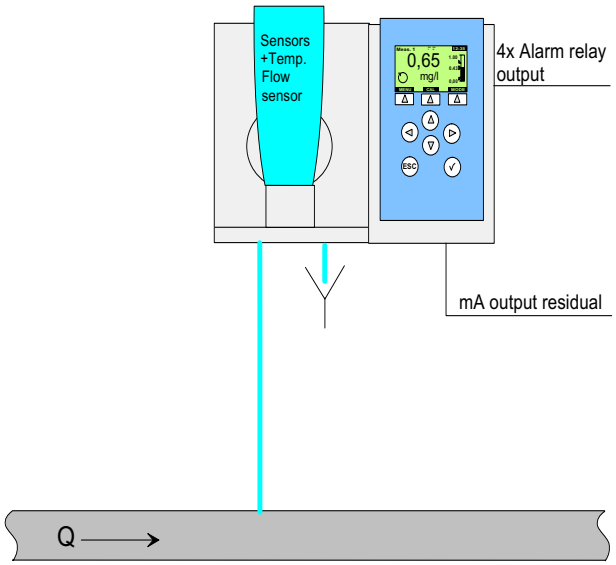
4.5.1 Application 1 - Process measurement

With application 1, the SFC operates exclusively as a measuring device. A maximum of four freely configurable alarm relays are available. The type of measurement is determined by the type of the sensor measuring module. Controller outputs are not supported in this application.
Picture 8 gives an overview of the available inputs and outputs of the SFC.



Picture 8 Application 1

Picture 9 shows a sample implementation of application 1 as individual process measurement. The measured value can be forwarded via mA signal or CAN bus to a higher-level controller.

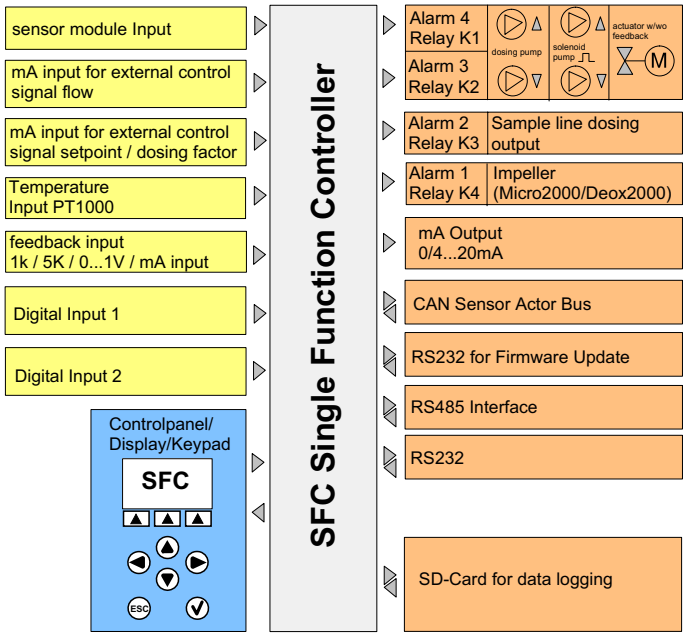


Picture 9 Process measurement

4.5.2 Application 2

In application 2, the SFC works as a measuring device and as a control device. Various controller modes can be selected depending on the installed sensor measuring module:

- Sensor measuring module without „Process Control“ option (PC)
  -> Single feedback closed loop control
- Sensor measuring module with „Process Control“ option (PC)
  -> Single feedback closed loop control
  -> Compound loop
  -> Single feed forward



Picture 10 Application 2

Controller functions in Application 2

The following integrated control modes are available for selection:

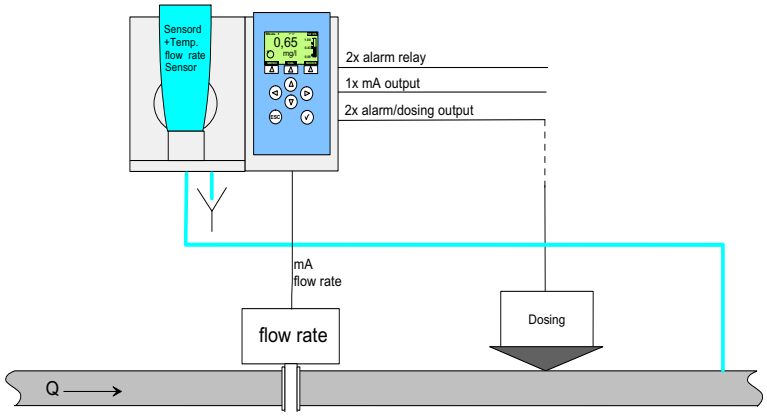
- Single feed forward (with Process Control option)
- Single feedback closed loop control
- Compound loop (with Process Control option)
- Single feed forward with linearization of the positioner output, with actuators with feedback output, (max. 11 calibration points) (with Process Control option)

Online measurements can be transmitted direct from the SFC by means of a sensor measuring module and from external measuring systems via mA input signal. External control signals, such as flow rate and external setpoint, are recorded by two integrated mA inputs. The SFC system can record a main measurement and two external control signals. In addition, measuring inputs for temperature, actuator feedback and two digital inputs are available.

4.5.2.1 Single feed forward with process measurement

This operating mode controls the quantity-proportional dosing of disinfectants. The single feed forward with process measurement is only supported with sensor measuring modules with the Process Control option.

A typical application is simple flow-controlled potable water chlorination, as shown in the following figure.



Picture 11 Process measurement with single feed forward.

Required module configuration:

- MOD1 - To record the measured value

Input signals:

- Module 1 measured value recording
- Flow rate measurement (0/4 – 20mA) scalable
- second control variable is possible via sensor measuring module
- internal or external dosing factor (0/4 – 20 mA)

The following controller outputs are possible:

- Dosing pump
- Pulse pump
- Positioner with feedback 1kOhm/5kOhm/0 –1 V/mA signal
- mA analog output

How the ratio control works

The flow rate is recorded and the dosing capacity adjusted proportionally to the flow rate using the flow rate sensor with linear mA/V output signal.

On the settings for the flow rate signal see menu „Inputs/Outputs“ - “Flow Wq“.

Please note

If the measuring range end value of the flow meter is not identical with the actual maximum flow rate, a factor for adjusting the flow rate signal should be input in the menu „Inputs/Outputs“ - „Flow Wq“.
For example:
Measuring range flow meter = 5000 l/h / max. flow rate = 2500 l/h => factor = 5000: 2500 = 2,0

The ratio between control variable and dosing output is determined by the internal dosing factor (control „Dos.Fact.Source“ = internal), or it can also be set by an external mA/V input signal (Dos.Fact.Source = external).

You can switch between internal and external dosing factor (DF) via the digital input ("Dos.Fact.Source" = "external with DI2" or "internal with DI2").

It is possible that a second control variable „Measured Value X“ (measured value from module 1) will have a proportional or inverse proportional influence on the single feed forward ("X-direction" = direct / inverse variable).

The second control variable X is activated, if the parameter “Control Variable2“ is set to "Measured Value X" (second control variable deactivated by the „Off“ setting (factory setting).

The amplification factor for this parameter is defined by the X-factor input parameter.

The controller output is calculated in this operating mode as follows:

Yout = Wq x DF x (X-measured value x X-factor) x Yout-factor

Wq	*Control variable 1 flow rate in %*
DF	*set dosing factor in %*
X-measured value	*Control variable 2 measured value sensor measuring module 1 in %*
X factor	*Amplification factor for X measured value*
Yout	*Determined controller output value %*
Yout factor	*This factor gives the option of increasing the dosing output by a dosing factor DF of 100 % when the setpoint value is not reached, increase the dosing output.* *Setting range: 1.0– 4.0* *Factory setting: 1.0*

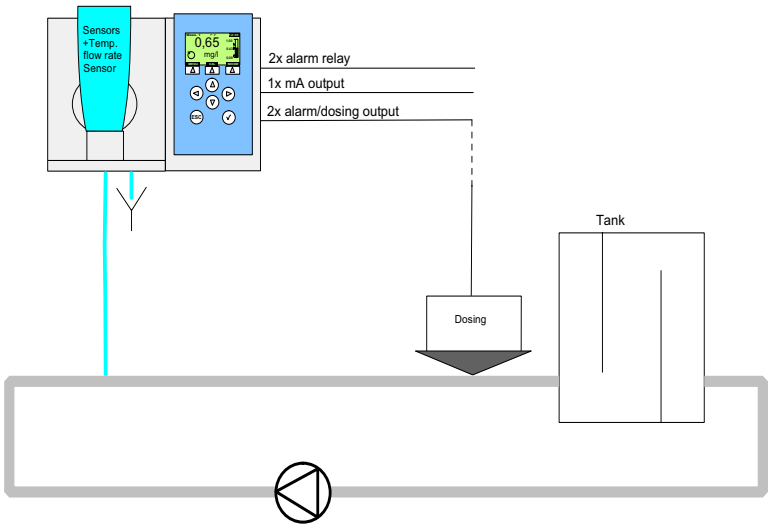
Please note

If this factor is increased, there is a danger that the setpoint value will also not be reached with a higher flow rate value, because the Yout value takes the value 100 % prematurely.

4.5.2.2 Single feedback closed loop control with process measurement

This operating mode controls the desired measured variable according to the the provided setpoint. Single feedback closed loop control is supported with all sensor measuring modules (with and without the Process Control option).

The following figure shows a typical application of a chlorine single feedback closed loop control for tanks which are circulated in cycles.



Picture 12 Process measurement with single feedback closed loop control

Please note

This controller mode is only available when application 2 is selected.

Required module configuration:

- Sensor measuring module for measured value recording

Input signals:

- Measured value recording module
- internal or external setpoint value

The following controller outputs are possible:

- Dosing pump
- Pulse pump
- Positioners with/without feedback (1kOhm/5kOhm/0 – 1 V/mA signal)
- Continuous
- CAN actuator

How the single feedback closed-loop control works

A PI controller is used to control the measured variables of the sensor measuring module continuously and without control deviation from the desired setpoint. It continuously determines the required dosing output.

The setpoint can be set within the measuring range (at "Setpoint Source" = internal).

Xp and Tn are control parameters to be set. They can also be automatically determined via the integrated adaption during a chlorine control.

An external setpoint from 0 – 100 % can be provided via the mA/V input signal ("Setpoint Source" = external). You can switch between internal and external setpoint via the digital input ("Setpoint Source" = "external with DI3" or "internal with DI3").

The control direction can be selected with the parameter "Control Direction" = direct or inverse (e.g. direct = chlorination, inverse = dechlorination).

The controller output is calculated in this operating mode as follows:

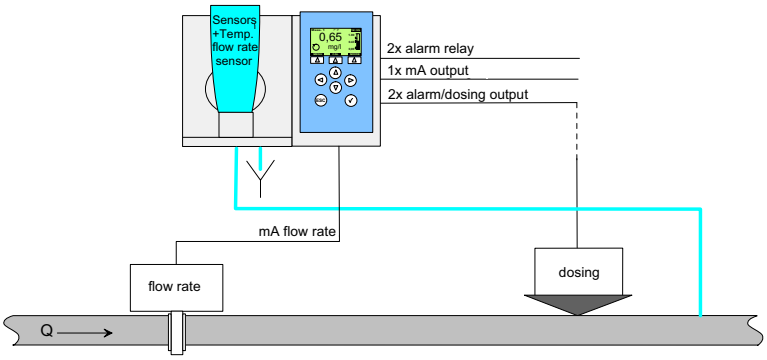
Yout = Ypi = ek x Kp x (1 + t/tn)

t	*Controller cycle time*
tn	*Integral action time*
Kp	*Control amplification 100 / Xp*
ek	*Setpoint-actual value control deviation*
Ypi	*PI controller output variable*
Yout	*Determined controller output value %*

4.5.2.3 Compound loop with process measurement

The compound loop is a combination of the single feed forward with additional single feedback closed-loop control to correct control deviations. The compound loop is only supported with sensor measuring modules with the Process Control option.

The following figure shows a typical chlorine compound loop as implemented in the treatment of potable water.



Picture 13 Process measurement with compound loop

Required module configuration:

- Sensor measuring module for measured value recording

Input signals:

- Flow rate measurement (0/4 – 20mA) scalable
- Measured value recording module
- internal or external setpoint value

Output parameter:

- Dosing pump
- Pulse pump
- Positioner with feedback (1kOhm/5kOhm)
- Continuous
- CAN actuator

How the combi-control works

The compound loop outputs a dosing capacity proportional to the flow rate, which does not have a fixed dosing factor proportional to the flow rate as in the single feed forward, but varies depending on demand.

To detect control deviations, the sensor measuring module records the control variable and a setpoint is specified, which are compared with the integrated single feedback closed-loop control.

The internal setpoint can be set within the measuring range. "Setpoint Source" must be set to "internal". An external setpoint from 0 – 100 % can be provided via the mA/V input signal. This requires that „Setpoint Source“ = "external". You can switch between internal and external setpoint via the digital input. The "Setpoint Source" must be set to "external with DI3" or "internal with DI3".

The Xp and Tn control parameters of this higher-level single feedback closed-loop control are automatically determined by the integrated fuzzy logic Tconst and Tvar process times to be entered at 100 % flow rate. Because the Tvar process time changes, Tvar, Xp and Tn are continuously updated by the integrated fuzzy logic.

The SFC operates internally with a dosing factor table for 0 – 105 % flow rate. In 5 % intervals, the device determines the required dosing factors automatically during operation based on the corresponding flow rate.. The single feedback closed-loop control corrections are transferred into the dosing factor table during this process. Non-linearities in the control loop are learned this way. This quickly activates the setpoint if flow rate changes occur.

The dosing factor table can be checked in the „Diagnosis“ menu. It is possible to delete the dosing factor table and to initialize it with a particular dosing factor (factory setting: 50%), for example, in order to prevent too high dosing factors during commissioning. To do this, the required dosing factor must be entered in the menu “System“-“Reset“-“Dosing Factors“.

The control operating mode can be switched between single feed forward and single feedback closed-loop control via digital input.

The control direction can be selected with the parameter "Control Direction" = direct or inverse (e.g. direct = chlorination, inverse = dechlorination)

Behavior in operation

Operation after a flow rate change:

The single feedback closed-loop control remains switched off (Ypi stop function) during the disturbance variables (flow rate change, positioner running time, dead time from line lengths). This maintains a stable control, which means the control operates with the dosing factor from the dosing factor table applicable for the new flow rate.
The time the single feedback closed-loop control is switched off is determined by the fuzzy module and is therefore variable („PI“ display in seconds). The parameter "PI shutdown“ can be used to define the effect of the disturbance variables or the degree of the flow rate change caused by the YPI stop function.

A larger change in the setpoint deletes all learning meters, in order to reinitialize the dosing rate curve when the setpoint is reached. However, the learned dosing factors remain initially unchanged. Inactivated flow rate values are automatically preassigned a dosing factor.
The single feedback closed-loop control is always active.

Control deviations that occur are quickly offset by the PI single feedback closed-loop control during continuous flow.

A positive jump in the flow rate causes a brief drop below the setpoint due to the running time of the positioner and the dosing delay. Therefore, the PI controller freezes for a brief period ("PI" display in seconds).

A negative jump in the flow rate causes the setpoint to be briefly exceeded due to the running time of the positioner and the dosing delay. Therefore, the PI controller freezes for a brief period ("PI" display in seconds).

The PI controller is not deactivated when the flow rate is continuously rising or falling, so long as the dosing capacity can quickly adjust to these changes. This is true of fast positioner running times and loops without dosing delay.

Special Functions

- The control direction can be switched.
- Automatic determination of the control parameter using the integrated fuzzy module. The fuzzy module determines the control parameter from the embedded Tconst and Tvar process times.
- The setpoint can be switched between internal and external
- Ypi stop function during a change in control variable
- Control variable Wq available optionally as proportional or indirect proportional as well as factor adjustment
- Smooth switch from compound loop to single feed forward or single feedback closed-loop control via digital input 1, 2 or 3 available

$$\mathbf{Yout = Wq \times (DF_{Wq}}_{\text{Ratio}} \mathbf{+ ek \times Kp \times (1 + t/tn)) \times Yout\ factor}_{\text{Feedback control}}$$

t	*Internal controller cycle time*
tn	*Integral action time*
Kp	*Control amplification 100 / Xp*
ek	*Setpoint-actual value*
DF_{Wq}	*Learned dosing factor for the current flow rate*
Wq	*Flow rate signal in %*
Yout	*Determined controller output value %*
Yout factor	*This factor gives the option of increasing the dosing output by a dosing factor DF of 100% when the setpoint value is not reached increase the dosing output.* *Setting range: 1.0– 4.0* *Factory setting: 1.0*

Please note

If the Yout factor is increased to >1, there is a danger that the setpoint value will also not be reached with a higher flow rate value, because the Yout value takes the value 100 % prematurely.

Determining the compound loop process times

To adjust the control for compound loop, the Tconst and Tvar process times must bet entered in the parameter menu path. These times refer to control loop dead times,which on the one hand are independent of the control variables, and on the other hand depend proportionally on the control variables.

The constant dead time< Tconst > (independent of control variable) consists of the control variable measurement dead time (measuring dead time) and possible dosing delays.

The variable dead time< Tvar > depends on the current control variable and is entered in the menu at a control variable of 100%.

The following calculation examples apply to the use of the SFC for flow-controlled chlorine dosing with chlorine overfeed correction (potable water control loop).

Determining the controlvariable independent dead time Tconst

The control variable independent dead time Tconst consists of the measuring dead time and the dosing dead time.

Calculating the measuring dead time

Calculation 1:

The sample water is extracted right after the mixture loop and fed to the measuring cell.

The sample water dead time depends on the nominal diameter and length of the sample water line and the flow rate to the measuring cell. With the DEPOLOX® 5 measuring cell, a flow rate of 36 l/h is assumed.

The following equation applies to the DEPOLOX® 5:

$t_{mw(}$DEPOLOX® 5$_{)}$ = (d_{mw} x d_{mw} x l_{mw}) : 7,65 (result in min)

In general, this equation applies:

t_{mw} = (4.71 x d_{mw} x d_{mw} x l_{mw}) : Q_{mw}(result in min)

d_{mw} = Internal diameter of the sample water line in cm
l_{mw} = Length of the sample water line in meter
Q_{mw} = Flow rate to the measuring cell in l/h

Example

As a DN6, the sample water line is 10 m long and connected to a DEPOLOX® 5 chlorine measuring cell.

t_{mW} = (0.6 x 0.6 x 10) : 7.65 min = 0.47 min, (i.e. approx. 28 sec.)

Calculation 2:

The sample water is extracted using an additional sample water pump (bypass line).

Sample water dead time depends on the flow rate of the sample water pump, nominal diameter of the bypass line and its length up to the sample water branch pipe to the measuring cell.

T_{by} = (4.71 x d_{by} x d_{by} x l_{by}) : Q_{by}

d_{by} = Internal diameter of the bypass line in cm
l_{by} = Length of the bypass line from the sample water extraction point
to the sample water branch pipe to the cell in m
Q_{by} = Flow rate to the bypass pump in l/h
(result in min)

Check whether the length of the sample water line to the measuring cell can be neglected. If so, establish the sum from calculation 1 and 2.

Calculation 3:

The sample water distraction is carried out as in calculation 1 and/ or 2. To increase the exposure time, the sample water is also sent through a delay tank.

The exposure time in the delay tank must be added to the calculated time.

Determining the dosing dead time (dosing delay)

Dosing dead times arise from long dosing lines and positioner running times.

Calculation 1:

Determining the dead time based on dosing line length

The dosing dead time can be determined as follows:

t_{dos} = (4.71 x d_{dos} x d_{dos} x l_{dos}) : Q_{dos}(result in min)

d_{dos} = Internal diameter of the dosing line in cm
l_{dos} = Length of the dosing line in m
Q_{dos} = Dosing line flow rate in l/h

Calculation 2:

If rapid control variable changes are expected in the system, which the dosing equipment cannot adjust to (e.g. positioner running times, dosing pump cycle times), the dosing delay time should be assumed under all circumstances to be half of the positioner running time ty or the cycle time tp.

At a positioner running time of 80 seconds, a value of approx. 40 s should be assumed as the constant dosing delay.

The sum of the measured dead time and the dosing delay is displayed in the< Tconst > menu in minutes.

Determining the control variable dependent Tvar dead time

The control variable dependent Tvar dead time depends on the nominal flow rate, the internal diameter of the line and the distance between where the chlorine is added and the sample water extracted.

t_{var} = (d_{pipe} x d_{pipe} x l_{pipe}) : (212,3 x Q_{nom}) (result in min)

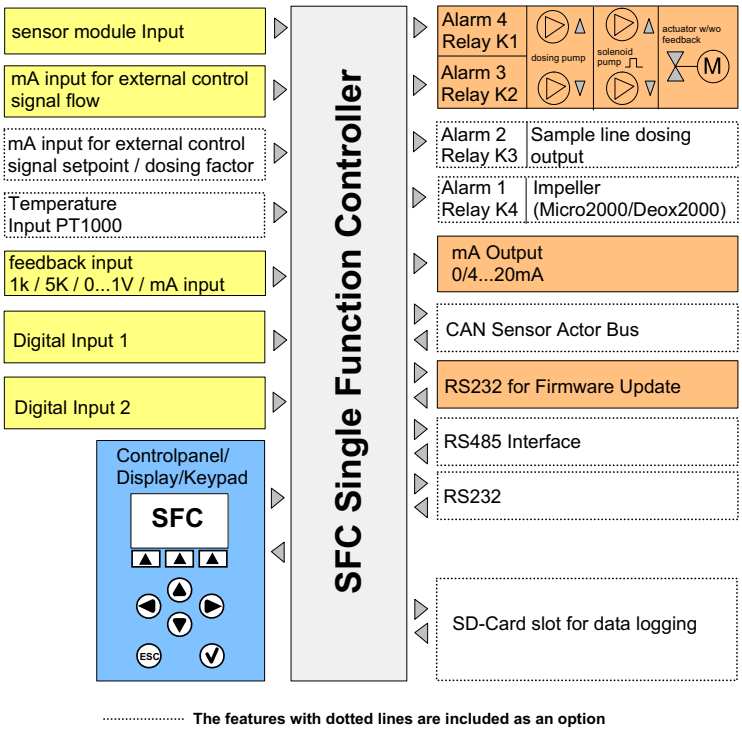
d_{pipe} = Internal diameter of the pipeline in cm
l_{pipe} = Distance between where chlorine is added and sample water extracted in m
Q_{nom} = Nominal flow rate in m³/h (reflects the flow rate, which is preset for the controller as 100% flow signal)

If there are special reaction tanks in the system, they must be treated separately.

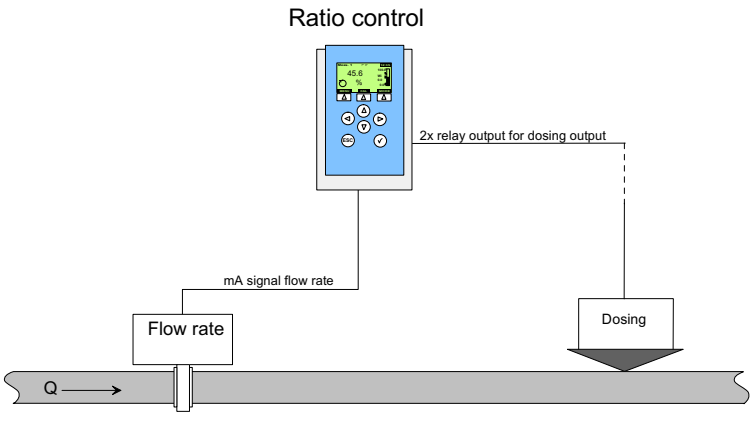
4.5.3 Application 3
Single feed forward without process measurement

In application 3, the SFC operates exclusively as a single feed forward. The installation of a sensor measuring module is not supported in this application.

The dosing capacity of the connected device is controlled automatically, depending on a measuring signal (external flow rate control signal) and a settable dosing factor. When actuators with feedback are involved, it is possible to adjust the non-linearity using a maximum of 11 calibration points.



Picture 14 Application 3



Picture 15 Sample application of SFC as single feed forward

Required module configuration:

Sensor measuring modules for measured value recording, e.g., of Cl_2, pH, etc., are not supported or evaluated in this application.

Input signals:

- Flow rate measurement (0/4 – 20mA) scalable

The following dosing outputs are possible:

- Dosing pump
- Pulse pump
- Positioner with feedback 1kOhm/5kOhm/0 –1 V/mA signal
- mA analog output

How the ratio control works

The flow rate is recorded and the dosing capacity adjusted proportionally to the flow rate using the flow rate sensor with linear mA output signal.

On the settings for the flow rate signal see menu „Inputs/Outputs“ - “Flow Wq“.

Please note

If the measuring range end value of the flow meter is not identical with the actual maximum flow rate, a factor for adjusting the flow rate signal should be input in the menu „Inputs/Outputs“ - „Flow Wq“.
For example:
Measuring range flow meter = 5000 l/h / max. flow rate = 2500 l/h => factor = 5000: 2500 = 2,0

The relationship between control variable and dosing output is determined by the internal dosing factor.

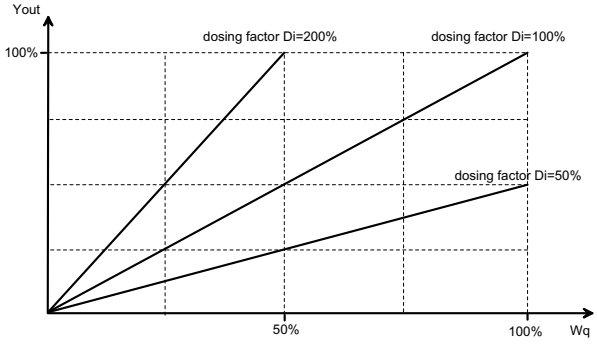
If a positioner with feedback is used as the dosing output, it can be linearized using several support points. At least two points are required (0/100 %). It possible to define 2, 3, 6 or 11 support points with definite steps. In the menu „Dosing“ - „Ym Calib. Points“ the number can be defined. The support points then have to be set in menu „Dosing“ - „Ym Calib. Manual“(see5.3.12 “Positioner calibration with SFC (application 3) or single feed forward (application 2)”).

The controller output is calculated in this operating mode as follows:

Yout = Wq x DF

Wq *control variable 1 flow rate in %*
DF *set dosing factor in %*

The figure below shows the output dosing capacity depending on the flow rate Wq and the set dosing factor.



Picture 16 Dosing factor

4.6 Controller outputs

Controller types

Controller for	Type	Parameter description	Action
Positioner with feedback	3-point	Positioner with Ym	Dosing ↑ or ↓
Positioner without feedback	3-point	Positioner without Ym	Dosing ↑ or ↓
Motor dosing pump (pulse duration controller)	2-point	Dosing pump 2p	Dosing ↑ or ↓
2 Motor dosing pumps (pulse duration controller)	3-point	Dosing pump 3p	Dosing ↑ and ↓
Pulse pump (pulse frequency controller)	2-point	Pulse pump 2p	Dosing ↑ or ↓
2 pulse pumps (pulse frequency controller)	3-point	Pulse pump 3p	Dosing ↑ and ↓
Dosing pump with mA-input	2-point	Analog output 2p	Dosing ↑ or ↓
2 dosing pumps with mA-input	3-point	analog output 3p	Dosing ↑ and ↓
Dosing contact	2-point	Enable contact	Dosing ↑

Positioner (with and without feedback)

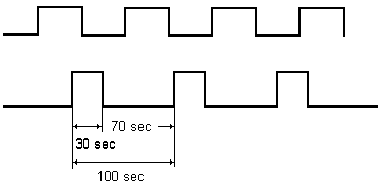
With the selection of the integrated controller for "positioner", for example, it is possible to use chlorineoverfeed control in connection with a positioner as dosing equipment in a chlorinator.

If positioner feedback is available, it must be calibrated during commissioning. Potentiometer 1 KOhm/5 KOhm or 0 – 1 V or 0/ 4 – 20 mA signals can be connected as positioner feedback (see section 4.15 “Actuator feedback”).

The positioner feedback can either be calibrated automatically or by manually setting the positioner to the 0 and 100% positions. If ratio control is used, up to 11 calibrationpoints are available. These points can only be calibrated manually.

2-point pulse duration controller for dosing pumps

The dosing pump is switched on for the calculated time within an adjustable cycle period TP (relay contact). The cycle period is mainly determined by the reaction time of the connected system and entered as the cycle period TP.



Example:	Cycle period TP	=	100 s
	Output value Yout	=	30 %
	Duty cycle		30 s
	Off duty cycle		70 s

2-point pulse frequency controller for pulse pumps

Pulse pumps are controlled with 0 to max. pulse rate per minute, depending on the specification of the connected pump. The SFC supports pumps with 100, 120, 140, 160 and 180 pulses per minute.

The duty cycle during each dosing is 0.3 s. The break time is calculated to be between 0.2 and 60 s, depending on the dosing rate.

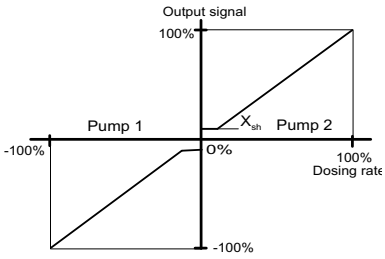
Example for a pulse pump with 120 pulses/min:

Yout in %	100...	84...	72...	56	50...	33...	25...	10...	5...	10
Pulses/min	120...	96...	85...	75	60...	40...	30...	12...	6...	10

3-point pulse-duration controller for dosing pump and 3-point pulse-frequency controller for pulse pump

Pump 1 decreases the control value.
Pump 2 increases the control value.

The control range is between -100 % (pump 1) and +100 % (pump 2); this range can also be set in manual mode.



If the setpoint = actual value, no pump is activated (neutral zone Xsh).

Output signals as for 2-point pulse-duration controller and 2-point pulse-frequency controller.

Dosing factor e.g. for electrolysis systems

A special controller is required for controlling electrolysis units to prevent excessive on/off switching (on account of the response times of the electrolysis unit).

This controller output, therefore, uses a minimum duty cycle as well as a switching hysteresis to minimize the switching cycles.

If the value falls below the specified Cl_2setpoint minus hysteresis (e.g. setpoint 0.50mg/l - hysteresis 0.05 = 0.45mg/l), the controller output switches on.
The controller output remains active for at least the set minimum duty cycle. If the setpoint is exceeded and the minimum duty cycle has expired, the contact switches off.

The minimum duty cycle is ignored in manual mode.

Controller with mA output

The SFC has an analog mA output. This can optionally be assigned as a registration output or controller output.

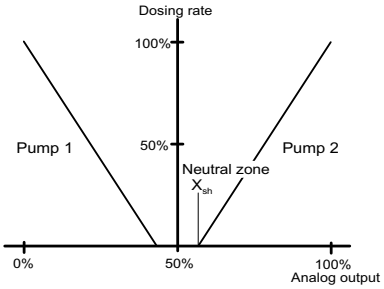
If pH dosing "analog output.2P" or „analog output.3P“ is selected the output is permanently assigned.

Analog output controller 2-point

With a controller output of 0 %, the output current is 0 or 4 mA; with a higher controller output, the output current reaches up to 20 mA. Pumps with current input, thyristor controllers with DC or 3-phase pumps or analog control valves can be used as dosing equipment.

Analog output controller 3-point

Pump 1 decreases the control value.
Pump 2 increases the control value.



Output behavior is similar to "analog output controller (2-point)", but with 50 % offset. This means that with a control deviation of 0 % (setpoint = actual value) a current of 10 or 12 mA is output (pump is idle).

Setting	Signal	Pump	Signal	Pump
0...20 mA	0..0.10 mA	Pump 1	10...20 mA	Pump 2
4...20 mA	4..0.12 mA	Pump 1	12...20 mA	Pump 2

Therefore, 2 suitable pumps can be controlled with one mA current loop.

4.7 Control parameters

Control parameters are input variables that determine the control functions of a controller. Different parameters apply to each type of controller.

Please note

The control parameters are listed alphabetically.

Flow rate source

This parameter is only available during single feed forward in application 2.

This parameter switches off the flow input (off) and activates the flow rate signal for the single feed forward (factory setting = flow measurement) as control variable.

For quantity-proportional dosing, the parameter must be set to „Flow Measurement“.

Flow rate direction

This parameter determines the direction of the flow rate signal directly proportional to the actuator output:

direct	=	Flow rate input signal directly proportional to the positioner output (factory setting)
inverse	=	1 flow rate input signal

Example: 0 – 100 % flow rate = 0 – 20 mA (direct)
0 – 100 % flow rate = 20 – 0 mA (inverse)

Max. pulses/min

Meaning:
Maximum number of pulses

Explanation:
The pulses max./min parameter only applies to pulse pumps.

This parameter is used to set the maximum number of pulses per minute in accordance with the employed pump.

Setting range:
The parameter max. pulses/min. can be set to 100, 120, 140, 160 or 180 pulses.

Max.lin.Corr

This parameter monitors changes to already learned dosing factors.
If new dosing factor changes are learned, which are larger than the max. linearity correction, this dosing factor is used for all values in the dosing curve = > initialization of the curve.

Special case:

Max.lin.Corr. = 0: The curve function is turned off, only one dosing factor is valid for all flow rates and the higher-level single feedback closed loop control remains active.

Example:

Max.lin.Corr. = 50 % (based on dosing factor):

Previous dosing factor:	30 %
Newly learned dosing factor:	48 %
max. permissible correction range:	30 ± (50 % von 30 %) = 30 % ± 15 %
Change in this case:	48 % - 30 % = +18 %

=> The new dosing factor is assumed for the entire curve, because the new dosing factor (+ 48%) is greater than the max.lin.Correction (+18%).

Control factor Setting the ratio of control range and measuring range, in order to adjust the control amplification Xp to the process.

Control factor=
(End of measuring range - start of measuring range): Control range

Example:

Start of measuring range:	pH 4
End of measuring range:	pH 9
Max. process control range:	± 1 pH (=> 2 pH increments)=> Control factor = (9 - 4) : 2 = 2,5

PI shutdown Defines a range for flow rate changes triggered by the YPI stop function when the limit is exceeded. Factory setting = 5%, i.e. if the change in flow rate is greater than 5% the PI controller is frozen for a specific length of time. Adjustment range 5 to 100 %.

Control direction

Meaning:
Direction of the control

Display:
Direct/inverse (e.g. for pH)

Explanation:
Defines which medium is used to perform the correction.

Example:

pH:	Control direction "inverse": Lowering pH-value by adding acid
pH:	Control direction "direct": Adding alkaline to raise the pH value

Setpoint

Specified value at which the control variable can be maintained by the controller. The setting range corresponds to the respective measuring range.

Control variable 2

This parameter activates and deactivates a second control variable during the single feed forward (only with application 2). If „Control Variable 2“ = measured value X is selected, this influences the actuator output. The „Off“ setting indicates that this control variable is inactive (factory setting) (see 4.5.2.1 “Single feed forward with process measurement”).

T

Sampling time T is the time after which a change controlvariable or setpoint is responded to. This value must be adjusted in the case of delayed feedback signals.

Tconst

Defines the constant dead time in the compound loop. Consists of the sample water line dead time and the dosing delay time (for the calculation, see 4.5.2.3 “Compound loop with process measurement”).

Tn

Meaning:
Integral action time (I-element)

Display:
Minutes (min)

Explanation:
On the basis of the integral action time Tn, the dosing capacity changes constantly until the setpoint is reached. The higher the value of Tn, the longer it takes until the controller increases the dosing rate.

Tn higher: Control response becomes slower
Tn lower: Control response is faster

Setting range:
The parameter Tn can be set from 0 – 100 min (Tn = 0 means that the "I-element" is deactivated, i.e. a pure P-control response applies). It may not be possible to reach the setpoint value.

Tp

Meaning:
Cycle period

Display:
Seconds (s)

Explanation:
The parameter Tp only applies to dosing pumps.

The cycle period Tp defines a switching period, which must be coordinated with the respective pump type.

Setting range:
The parameter Tp can be set from 10 – 180 s.

Example:
Fast dosing pumps correspond to a low Tp; slow dosing pumps correspond to a high Tp.

The control parameter Tp must always be adjusted to suit the pump employed:

Dosing pump strokes/min	**up to 20**	**20-40**	**40-80**	**80-125**	**125-200**
Tp value	120	100	60	30	15

Ts

Meaning:
Loop rise time

Display:
Minutes (min)

Explanation:
Time required to reach the measuring range end value with 100% dosing chemical supply (see 4.9 “Adaption”)

Setting range:
The parameter Ts can be set from 1 s – 8 h.

Please note

If the values Tu and Ts are manually modified, the control parameters Xp and Tn are re-calculated.

Tu

Meaning:
Loop dead time

Display:
Seconds (s)

Explanation:
Time required between dosing start and clear recognition of the rise in the control variable

Setting range:
The parameter Tu can be set from 1 s – 59 min 59s.

Please note

If the values Tu and Ts are manually modified, the control parameters Xp and Tn are re-calculated.

Tvar

Defines the variable dead time in the compound loop. The time to be entered is based on 100 % flow rate (for the calculation, see 4.5.2.3 “Compound loop with process measurement”).

Ty

Meaning:
Running time of the positioner

Display:
Seconds (s)

Explanation:
The parameter Ty only applies to positioners.

Ty is the time which the positioner requires to adjust from 0 % to 100 %.

Setting range:
The parameter Ty can be set from 10 – 180 s.

X factor

This parameter is only available during single feed forward, control variable 2 = measured value X.

Determines an adjustment factor, how strongly the measured value influences the actuator output (factory setting 1.0).

Xp

Meaning:
Proportional factor

Display:
Percentage (%) with factor

Explanation:
The control amplification is determined with the proportional factor.

The lower the proportional factor Xp is selected in % , the greater the deviation from the setpoint is amplified, and the more quickly the controller attempts to control the deviation from the setpoint.

The control amplification factor is calculated using the following equation:

Factor = (1/Xp) x 100 %

Setting range:
The parameter XP can be set from 1 % (factor 100) – 1000 % (factor 0.1).

X direction

Determines the direction of the second control variable during the single feed forward.

direct	=	Measured value directly proportional to the actuator output
inverse	=	Actuator output indirectly proportional to the measured value (factory setting = direct)

Xsh

Meaning:
Neutral zone

Display:
Percentage (%)

Explanation:
The parameter Xsh only applies to 3-point controllers.

No control output occurs in the neutral zone.

Setting range:
The parameter Xsh can be set from 1 – 5 % (depending on the measuring range).
The neutral zone is the defined range of setpoint + X_{sh} to setpoint X_{sh}.

Ym calibration

This parameter is only possible for dosing output positioner with feedback.

Adjust the positioner feedback signal to 0 % and 100 % dosing capacity. When automatic Ym calibration is started, the positioner moves to positions 0 % and 100 % and calibrates both positions with the SFC.

With manual calibration of the up-to-11 positions, all positions must be shifted to manually and saved in the menu using the Enter key.

Ymax

Meaning:
Dosing rate limitation
(single feedback control-loop control only)

Display:
Percentage (%)

Explanation:
The parameter Ymax only applies to:

- Positioner with feedback
- Dosing pumps
- Solenoid pump
- Controller with mA output

Ymax defines the maximum control output to the actuator

The control parameter corresponds to electronic dosing limitation of the actuator.

Setting range:
The parameter Ymax can be set from 0 – 100 %.

Ymin

Meaning:
Dosing rate basic load
(single feedback control-loop control only)

Display:
Percentage (%)

Explanation:
The parameter Yminonly applies to:

- Positioner with feedback
- Dosing pumps 2p
- Solenoid pumps 2p
- Controllers with mA output 2p

A basic dosing rate is output to the actuators with Ymin.

Setting range:
The parameter Ymincan be set from 0 – 100 %.

Please note

Ymin and Ymax is only available for the single feedback closed-loop control.
The control range is limited by the parameters Ymax and Ymin.
Do not select a Ymax value lower than Ymin.
At Ymin> 0 overdosing can occur.

Yout-factor

Meaning:
Multiplication factor for dosing output

Setting range:
The parameter Yout factor can be set from 1.0 – 4.0.

Explanation:
If the dosing factor 100 % is not sufficient, the parameter Yout factor is used to increase the dosing output. The parameter is available with compound loop and single feed forward.

4.8 Alarms

The output of the alarms takes place by means of relay contacts and alarm indicators on the display. The number of the max. four alarms is determined in the application or by the version of SFC.

Each alarm can be assigned the following functions:

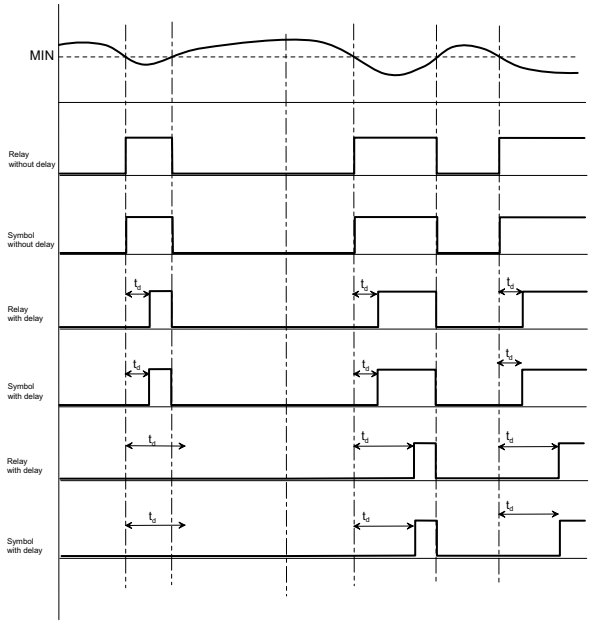
- Limit value = Min — All measured values can be selected individually Cl_2, pH, mV, Cl-N, conductivity, etc.
- Limit value = Max — All measured values can be selected individually Cl_2, pH, mV, Cl-N, conductivity, etc.
- Digital inputs — 1 – 2 can be individually selected
- Error
- Flow rate min/max
- ext. Setpoint/DF min, max
- Yout min/max
- Manual mode
- Ypi min/max

The type of alarm can be selected in the "Alarms" menu in the "Alarm ... – Functions" displays. There are three alarm types.

In all alarm types the response can be influenced by entering a delay (td) (refer to the diagrams in this chapter).

Unlatched alarm without acknowledgement option (N.O. unlatched, N.C. unlatched)

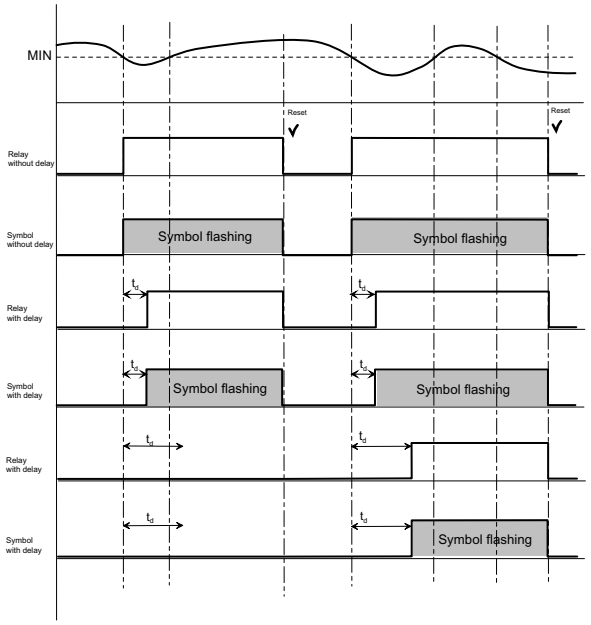
The alarm symbol on the display is on when an alarm is triggered and goes out automatically when the alarm condition is removed. The same applies to the contact.



Picture 17 Example MIN alarm

Latched alarm with reset acknowledgement option (N.O.latched. reset, N.C.latched.reset)

In the event of an alarm, the alarm symbol on the display flashes until the alarm is acknowledged. The LED also goes out even if the alarm conditions still apply when the alarm is acknowledged.

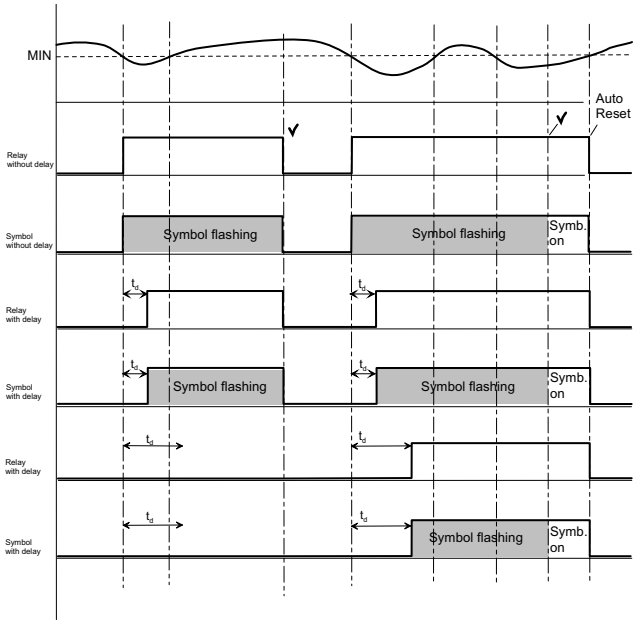


Picture 18 Example MIN alarm

Latched alarm with confirmation (N.O. latched. ack N.C. latched. ack)

In the event of an alarm, the alarm symbol on the display flashes until the alarm is acknowledged.

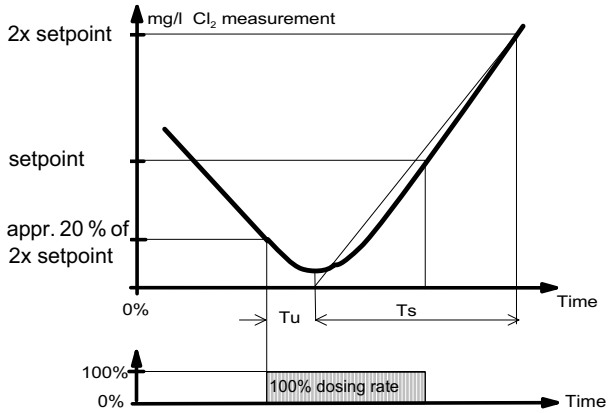
- If the alarm condition is no longer present when the alarm is acknowledged, the symbol disappears.
- If the alarm condition is still present when the alarm is acknowledged, the symbol is reset from flashing to a permanent state. The symbol or the contact is active until the alarm condition has been removed (auto-reset).



Picture 19 Example MIN alarm

4.9 Adaption

This only applies with Cl_2 single feedback closed loop control.



Application

The adaption is used for automatic ascertainment of the reaction times of the control loop (loop dead time Tu and loop rise time Ts) or the resulting control parameters Xp and Tn.

Please note

The control parameters Xp and T ascertained by the adaption must be considered as a recommendation for the first commissioning! The control parameters Xp and T can be manually optimized to ensure maximum control quality.

Requirements

- Positioner set to automatic (manual wheel engaged)
  Dosing pump to automatic
- Calibrated Cl_2 measuring (zero point and DPD value)
- Loop dead time < 60 min
- Loop rise time < 480 min (8 h) for measuring range 0 – 100 %
- Decomposition time < 480 min (8 h) of the current value to 20 % of 2x setpoint
- Correct menu setting of the end value, control direction (direct or inverse), actuator (e.g. positioner), positioner running time (Ty)

Adaption may not be started:

- If a large volume of fresh water is being added
- If the measuring cell has not been run in
- During cleaning work
- During filter backwashing
- While the circulation changes
- If there are flow rate fluctuations

Starting adaption

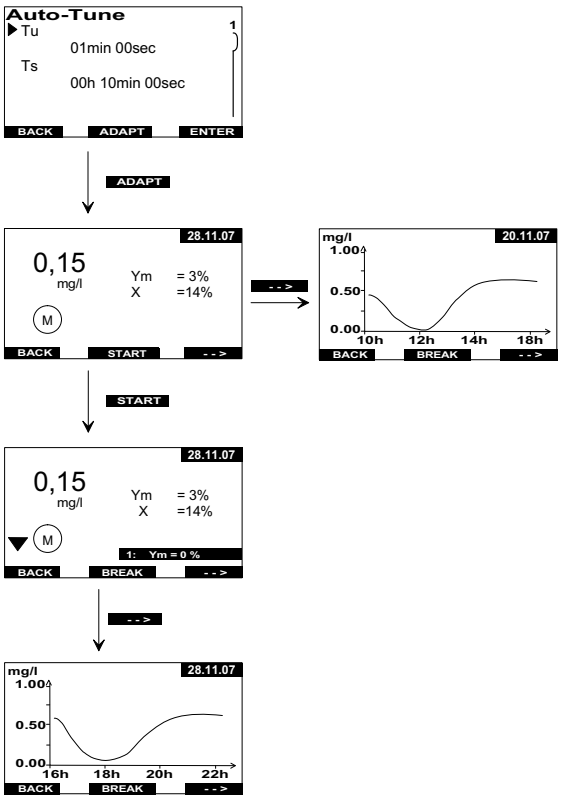
1 Starting from the basic display, select "Adaption" from the "Cl_2free ( )" menu.
The Tu and Ts loop parameters are displayed.

2 In the "Adaption" menu, select the "ADAPT softkey.

3 The display shows the current chlorine value, the actuator output Ym/Y and the control variable in %. The diagram of the previous adaption is shown when the key [->] is pressed.

4 Press "START" to start the adaption.
Adaption starts.

5 Adaption can be cancelled using the „Cancel“ softkey.



Picture 20 Adaption displays

Displays

The diagram shows the chlorine value curve during the adaption phases.
The current phase of adaption (total of 13) is shown in the bottom line.

Successful adaption is confirmed by the message "ADAPTION OK".

Press the "BACK" softkey to return to the basic display.

If adaption is not successful, the error message "ADAPTION?" is displayed.

Adaption sequence

Each adaption phase is then displayed with a status message:

Display text	Explanation
"0: Init“	Start
"1: Ym = 0 %“	Chlorinator to 0 % or dosing pump off
"2: X = 20 %“	Delay until actual value < 0.2 x 2x setpoint
"3: Ym = 100 %“	Chlorinator to 100 % or dosing pump on
"4: Ym = 100 %“	Wait until the chlorinator reaches 100 %
"5: Tu! "	Start dead time measurement
"6: Tu! "	Measurement of the loop dead time Tu
"7: Tu Check“	Plausibility enquiry dead time
"8: Init Ts“	Start of rise time measurement
"9: Ts "	Measurement of the loop rise time Ts
"10: TS "	Calculate control parameters
"11: Y = 0 %“	Chlorinator to 0 % or dosing pump off
"12: Y = 0 %“	Wait until the chlorinator reaches 0 %
"13: Adaption OK“	End

Various status messages can be output, depending on the selection of the actuator. Different status messages also have different execution times. It is possible that some status messages are only displayed briefly or not at all if the execution time is very short.

Caution!

Adaption can take up to 13 hours, depending on the control loop. During this time no errors should occur on the control loop (e.g. filter backwashing, changes in the circulation or widely fluctuating number of visitors).

Please note

The adaption procedure can be terminated at any time with "STOP". The previously set parameters remain unchanged.

Completing adaption without errors

When the loop times (dead time Tu and rise time Ts) have been completed without error, calculation of the control parameters Xp and Tn commences. This is indicated by the message "Adaption OK". The calculated parameters are entered in the menus. When adaption has been concluded, the measuring amplifier adjusts with the newly calculated control parameters and continues in the selected operating mode (e.g. automatic).

To monitor the determined loop times they are entered into the "Tu" and "Ts" menus .

If errors occur in the control loop during adaption, incorrect loop times and therefore incorrect control parameters can be determined.

Caution!

The remaining control parameters Ymin, Ymax and Tp are not influenced when adaption is performed. The control parameters Xp and Tn are determined for Ymin = 0 % (no basic load) and Ymax = 100 % (no dosing rate limitation). If there is a system-specific requirement for a basic load Ymin or a dosing rate limitation Ymax, it must be taken into account that the control loop is restricted as a result. There is then the risk of excessive chlorination (Ymin too high) or inadequate chlorination (Ymax limits excessively).

Completing adaption with error

If errors occur in the control loop during adaption (e.g. filter backwashing, changes in the circulation or widely fluctuating number of visitors to the pool) or if the reaction times of the control loop are too long, adaption is interrupted.

Possible error conditions:

Initial value not reached (Display: "T = >8h")
When adaption has started and the dosing system has closed or the dosing pump has switched off, the measuring amplifier waits until the actual value has dropped below the initial value (0.2 x the measurement range value). This delay is indicated by the message "2: X = 20 %" and the maximum permissible time is 8 hours.

Loop dead time too high (Display: "Tu = > 1h")
The value determined by the time measurement between starting up the dosing, switching on the dosing pumps and the rise of the actual value may only take a maximum of 1 hour. This measured time is displayed by "6: Tu!".

Loop rise time too great (display: "Ts = > 8h")
The time is determined by a measurement, which the control loop requires at a 100 % dosing rate of the dosing system or the dosing pump, to increase the actual value to 50 % of the measuring range. This measurement is indicated with "9: Ts!" and may take a maximum of 4 hours.

If any of the error conditions described above occur, adaption is interrupted. The measuring amplifier displays a fault message. The "old" parameters Xp and Tn are not changed.

Determination of the control parameters with known Tu and Ts times

If the loop times Tu and Ts are already known or if these cannot be determined automatically due to specific system conditions, the loop times can be entered into the "Tu" and "Ts" menus. When Tu or Ts are saved, the control parameters Xp and Tn are also calculated and entered in the menus.

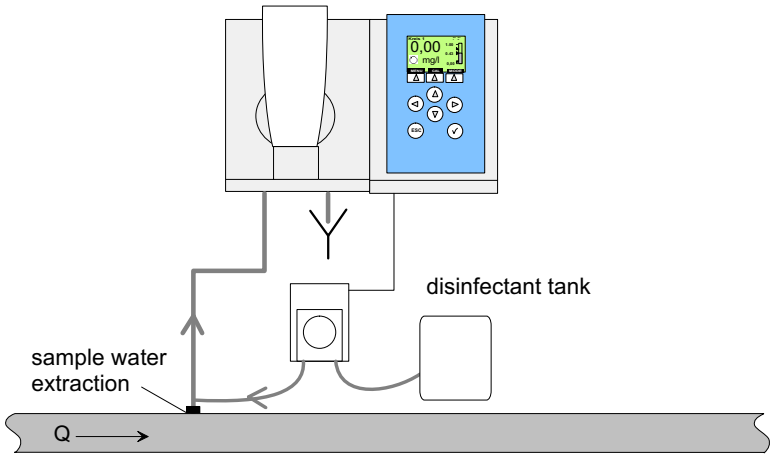
4.10 Sample water inlet disinfection

For certain applications it is necessary to disinfect the sample water inlet and the measuring cells occasionally using disinfectant such as chlorine solution, for example for measuring the zero chlorine point or for dechlorination. Because there should ideally be no disinfectant in the sample water, you may find that the sample water inlet and the measuring cell become contaminated with bacteria, resulting in an incorrect reading.

Please note

This function is only available with DES modules.

To avoid this, switch on the SFC's "Sample Line Dos" function. This adds disinfectant to the water at one or more specific times (range start) for a certain length of time (dosing time). The system has a relay output for this function, for example to control a dosing pump (Alarm 2/Relay 3). The figure below shows a typical application for monitoring drinking water to ensure it is free of disinfectant. Such systems may be installed upstream of ion exchange columns, for example, to protect the system against chlorine.



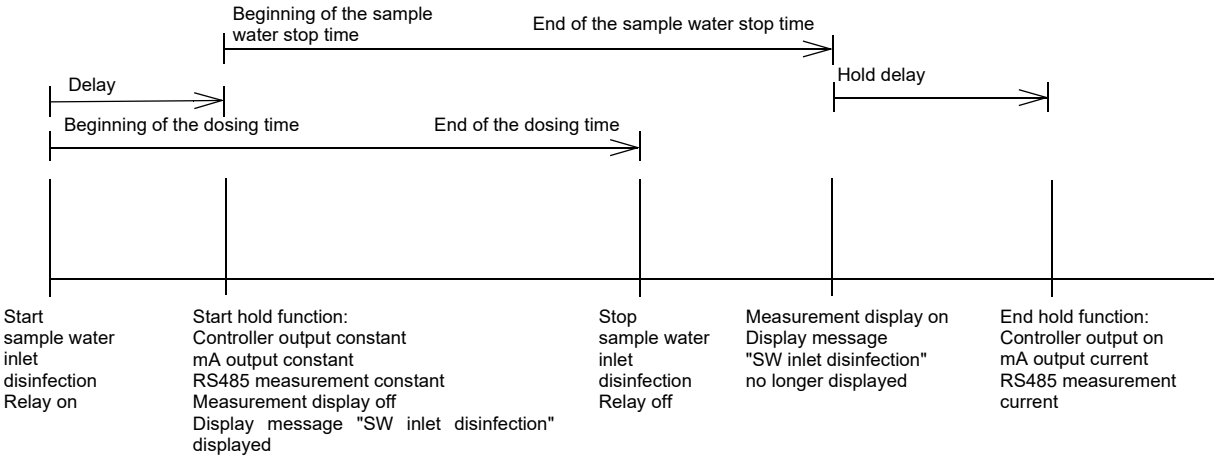
This function can be found on the main "Extern. functions" menu and contains the following options:

Sample Line Dos	OFF	OFF - ON
Range-Start	1: 00:00 ----	9 start times, can be programmed by day of the week or the same start time can be used for several days, e.g. 1:06:30 MON-SUN
Dosing time	00 min 30 sec	30 sec - 20 min
Delay	00 min 00 sec	0 ... 30 min
SW stop time	01 min 30 sec	1 min 30 sec - 59 min 59 sec (always at least dosing time + 1 min)
Hold delay	15 min 00 sec	0 - 20 min

Please note

If this function is activated, alarm relay 2 is no longer available!

The disinfection process is shown schematically below:



The function starts at the times and on the days programmed automatically, whether the system is in manual or automatic mode. The process is shown below (see also the schematic diagram on the previous page):

- Relay 3 switches on to start the dosing pump
  The "Dosing time" starts running
  At the same time, the "Delay" (the dead time between the dosing point and the measurement) starts as well

- As soon as the "Delay" has finished, the "Sample water stop time" starts
  The message "SW inlet disinfection" is displayed instead of the measurement
  The measurement cannot be changed via the ports (e.g. RS485) any more (constant)
  The controller output cannot be changed any more (constant)
  The mA output cannot be changed any more (constant)
- Once the dosing time has finished, relay 3 switches the dosing pump off
- Once the "Sample water stop time" has finished the measurement is displayed again (and the message disappears)
- After the hold delay has elapsed:
  all of the measurements are current again
  The controller output is current again
  The mA output is current again

Caution!

This function always starts as programmed, irrespective of whether the system is in manual or automatic mode and irrespective of whether the sample water flow rate. This function needs to be deactivated if maintenance work is being carried out or if the system is shut down for any length of time, otherwise it will feed disinfectant unchecked and the disinfectant may leak!

4.11 Serial interfaces

Various interfaces are available for external connections to the SFC.

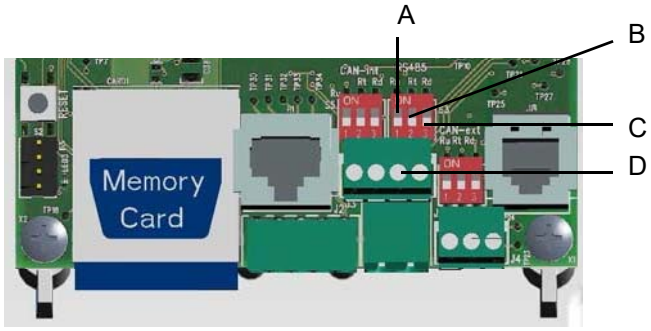
RS232 The RS232 interface serves to connect:

- A laptop or PC for firmware updates (download the latest firmware version together with an update program and update instructions from the homepage www.evoqua.com. Matching RS232 connection cable: part no. W3T164902).

RS485 The RS485 interface provides connectivity to:

- Web technology via the ChemWeb-Server
- Higher level visualization systems through OPC Server Data Access V2.0
- SECO S7 - Serial data link to SIMATIC S7-300
- external gateways

The RS485 interface of the SFC is electrically isolated. For connecting to a bus system, four terminals, a terminating resistor Rt and the balancing resistors R_u and R_d are integrated in the SFC (see front panel board in the cover).



Picture 21 Front panel board

A Ru
B Rt
C Rd
D Terminal strips RS485 interface

Please note

The instruction manual of RS485 interface can be requested from your contractual partner or can be downloaded from the homepage www.evoqua.com.

4.12 CAN interface

The CAN interface is used as a CAN sensor bus and serves to connect:

- CAN sensor measurement modules such as SiDiSens pH

The CAN interface of the SFC is electrically isolated. For the purpose of connecting the CAN bus components, a standardised plug connector (M12, 5-pin) is integrated in the SFC to supply the CAN sensor with voltage.

For wiring, preassembled 4-wire cables of up to 10 m, a T-piece and a plug with terminating resistance are available.
For longer cables the CAN bus cable 2 x 2 x 0.22 mm² and ready to assemble plug connectors can be used (see spare parts).
The maximum cable length must not exceed 1000 m. Stub cables should be avoided and are only permitted up to a total length of 5 metres.

The SFC operates as a master in the bus system. CAN slaves are the attached sensors.

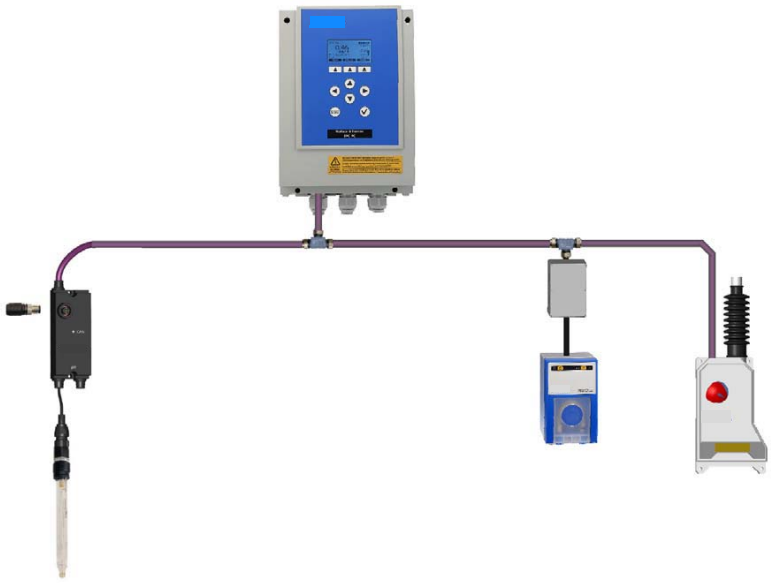
Please note

There can only be one master in the CAN bus system.
For this reason do not connect two SFCs together for data exchange via the CAN interface.

Only the CAN sensor measurement module SiDiSens pH can be used for the Cl_2++ measurement (pH compensated Cl_2 measurement).

The combined chlorine in the SFC total chlorine can be measured using CAN and a SiDiSens DES or via mA input 1 and a SFC for the measurement of the free chlorine (see 4.2.9"mA inputs of the A&C boards").

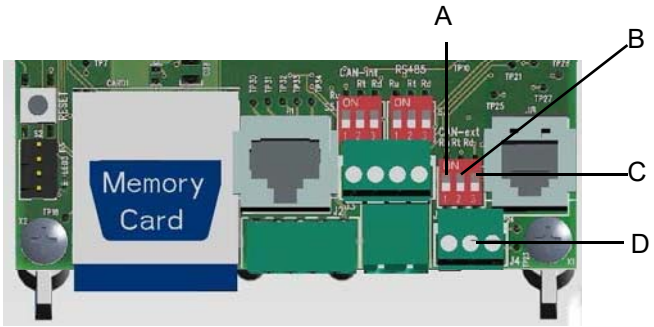
CAN bus setup



Picture 22 CAN bus setup

In each case on the first and last device on the bus a bus terminator (bus end Rt) must be installed.

In the SFC using the DIP switch Rt, the terminal resistance can be switched on or off (see front panel board in the SFC cover).



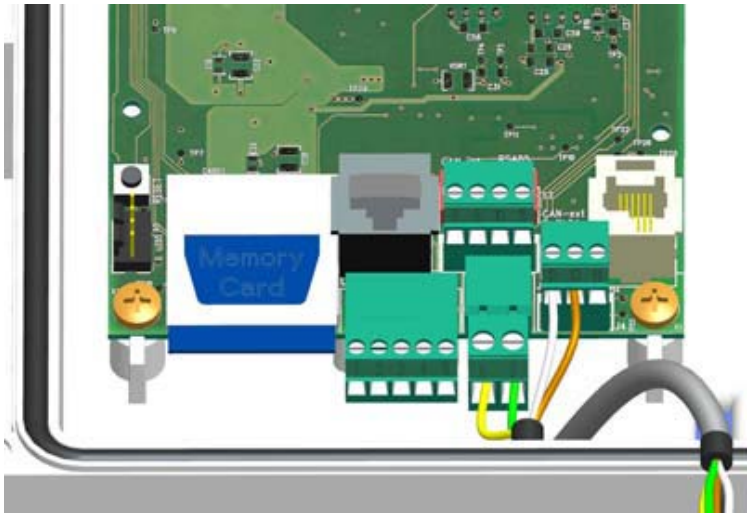
Picture 23 Front panel board

A Ru
B Rt
C Rd
D CAN external terminal strips

Please note

The DIP switches Ru and Rd must always be switched off.

The SiDiSens is supplied with a special plug for the bus termination which can be plugged directly into the free connection socket for termination.



Please note

The CAN interface is not compatible with CANopen or CAN component groups of other manufacturers.

4.13 Fieldbus

The SFC can be connected to various fieldbus systems. A number of different retrofit kits, in the form of additional circuit boards that can be installed in the SFC, are available. The fieldbus module is auto-detected and can be configured using the system menus. The corresponding menus are only displayed once a fieldbus module has been auto-detected. Different settings menus are displayed, depending on the fieldbus module installed. The process data transmission is bidirectional. In other words, data can be received as well as sent. Three SFC fieldbus module retrofit kits (types of fieldbus) are available.

Fieldbus type	Part No.	Designation
Profibus DP	W3T166498	Fieldbus module retrofit set SFC Profibus DP with terminal connections
Profinet	W3T166499	Fieldbus module retrofit set SFC Profinet with terminal connections
Modbus TCP	W3T166500	Fieldbus module retrofit set SFC Modbus TCP with terminal connections

Please note

The installation and start-up instructions for the fieldbus retrofit kits are available from your contractual partner or can be downloaded from the homepage www.evoqua.com.

4.14 Firmware update

Caution!

A firmware-update can cause a „Init“ to factory default values! Please note all relevant menu settings before update!

The SFC offers two different ways to perform a firmware update.

Serial firmware update

Via the serial interface of a laptop/PC, it is possible to update the firmware of the SFC. A special download software and the latest firmware including a description can be downloaded from the homepage at www.evoqua.com. A special update cable is available for the firmware update under part no. W3T164902.

Update using a SD memory card (not for SFC-SC)

The SFC (front panel board) is able to perform a software update with the existing SD memory card slot starting with software version 1.02. The latest software can be downloaded from the download area of the Internet homepage at www.evoqua.com.

Following files are needed for the update:

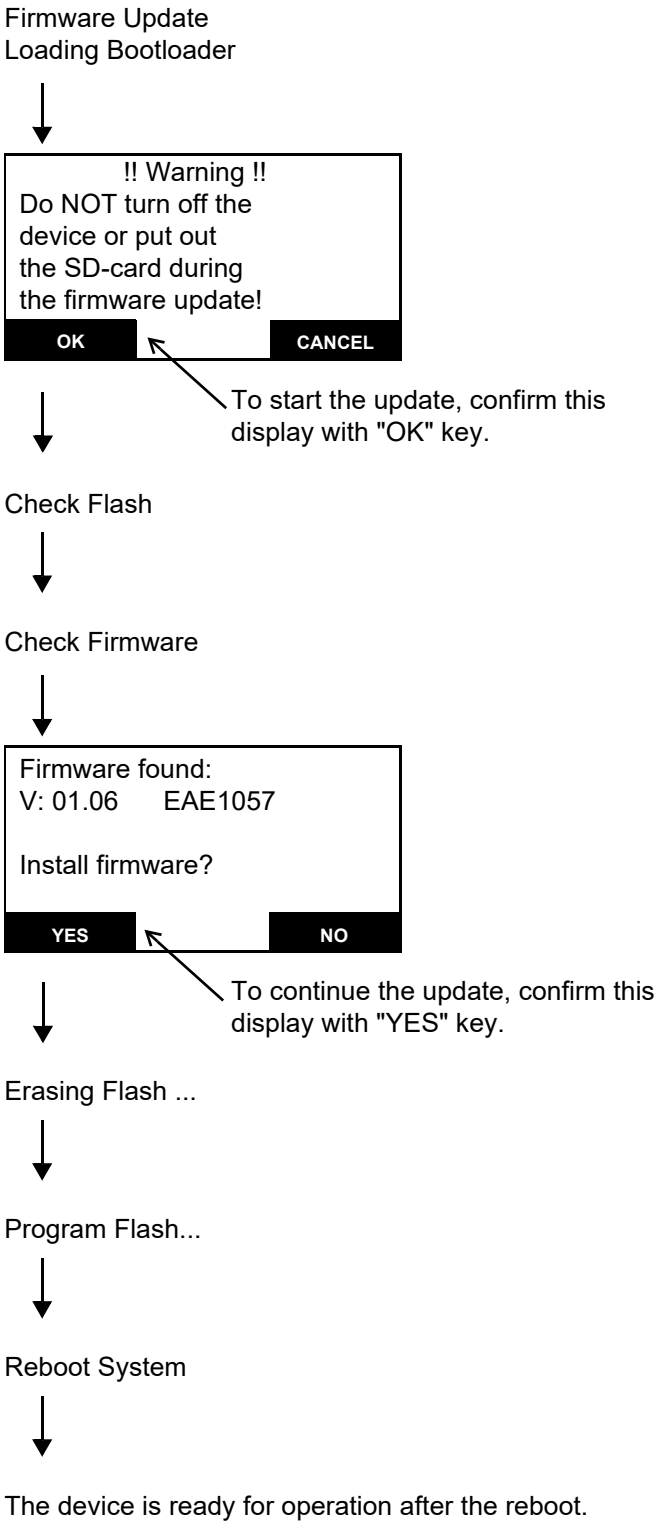
- SFC_LOAD.BTL (bootloader)
- SFC_V300.mhx (firmware of the SFC front panel board)
- BTL.DAT

These files must then be copied to the SD memory card (no subfolder).

Please note

The SFC only supports SD memory cards with a maximum capacity of 2 GB.

Select "Start" in the "System Firmware Update - SD Card" menu and confirm with "Enter" key. Various messages are depicted on the display.


Firmware Update
Loading Bootloader
!! Warning !!
Do NOT turn off the
device or put out
the SD-card during
the firmware update!
OK
CANCEL
To start the update, confirm this
display with "OK" key.
Check Flash
Check Firmware
Firmware found:
V: 01.06 EAE1057
Install firmware?
YES
NO
To continue the update, confirm this
display with "YES" key.
Erasing Flash ...
Program Flash...
Reboot System
The device is ready for operation after the reboot.

4.15 Actuator feedback

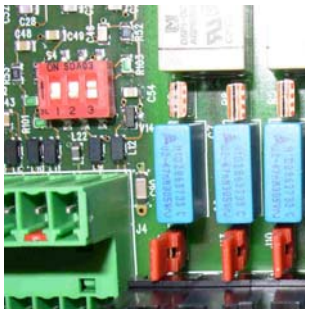
The actuator feedback of the SFC is set at the factory to potentiometer with 1 kOhm. For other feedback signals the device must be reset using the DIP switch S4 (see A&C board).

Possible signals are:

- Potentiometer 1 KOhm
- Potentiometer 5 KOhm
- 0/4 – 20 mA signal
- 0 – 1 V signal

Switch settings of DIP switch S4:

	S4-A 1	S4-B 2	S4-C 3
Potentiometer 1K	OFF	OFF	ON
Potentiometer 5K	OFF	OFF	OFF
0/4 – 20mA*	OFF	ON	ON
0 – 1 V*	OFF	OFF	ON



Picture 24 DIP switch

* Additional a 1 kOhm resistance must be installed between terminal 5 and 7 at the feedback input.

4.16 Digital inputs

Two digital inputs are integrated in the A&C board of the SFC. These are provided for connecting voltage-free contacts (< 100 Ohm) and are supplied internally with 12 V.

Warning!

No voltage may be applied to the digital input terminals!

4.17 SD memory card

Warning!

Only insert/remove the SD memory card when the power supply to the system is off!

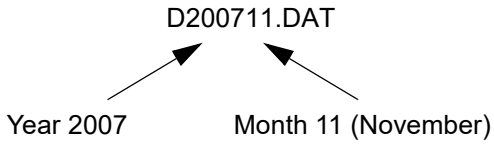
The SFC can be equipped with an SD memory card for saving or copying unit configurations (see 4.18 “Unit configuration”) and for recording measured data. Every minute, all measured values, such as the main measurement (e.g. Cl_2, pH, etc.), flow rate, external setpoint or dosing factor, actuating variable Yout and temperature, along with the date and time, are saved on this card. The data are stored in files every month and have the following format:

Please note

The SFC only supports SD memory cards with a maximum capacity of 2 GB.

The SD memory card is installed inside the SFC. In order to remove or replace the SD memory card, the cover of the SFC must be opened.

Example



The data can be further processed using any text editor or table processing program, such as EXCEL. The SD memory cards can be read-out and the data copied by any standard card reading device or PC.

Example of a file section

Date		MW-mg/l	Wq	Wext./DF	Yout	Temperature
2008-01-01	00:01	0.21	20.1	0.0	10.1	19.1
2008-01-01	00:02	0.21	20.1	0.0	10.1	19.1
2008-01-01	00:03	0.22	20.0	0.0	10.1	19.1
...						
...						
...						

Picture 25 shows the installed SD memory card

A SD memory card

Please note

Files ending with "*.Bin" can not be evaluated. They are only used as data storage for the SFC and must not be altered.

4.18 Unit configuration

The SFC gives the option of saving all unit settings as a configuration. Unit settings include all parameters that can be set in the menu, such as the controller mode, setpoint, limit values, etc.). A maximum of two configurations can be saved in the internal memory SFC (see Menu-System-Configuration-Save-Job 1, Job 2).

If configurations are saved in the internal memory as Job 1 and Job 2, they can be restored when required as the current unit settings. The previous unit settings are deleted in the process. It is possible to switch between Job 1 and Job 2 via digital input 1 or 2 (see Menu-Inputs/Outputs-Digital input-DI (1), DI (2)).

When „Job 2“ is selected, a signal on the digital input causes configuration 2 to be loaded, and the SFC continues to operate with the unit settings of Job 2. If the signal on the digital input is deactivated, then configuration 1 is loaded again and the SFC continues to operate with the unit settings of Job 1.

Please note

For the changes to the configuration to take effect the digital input must be set to config. 2 in both configurations.

Unit configuration of SD memory card

For data backup purposes, internally saved configurations can be copied to the SD memory card (see Menu-System-Configuration-Copy-Job 1 -> SD, Job 2 -> SD).

The Job file copied to the SD memory card (directory „JOB“-JOB1.Bin, JOB2.Bin) can be copied with any laptop/PC with a card reader, and can be transferred to other SFC systems via SD memory card (see Menu-System-Configuration-Copy Job 1 to SD, SD-Job 2 to act., SD-Job 1 to act., act. to SD-Job 2, act. to SD-Job 1, SD to Job 2, SD to Job 1, Job 2 to SD.*).

* act. refers to the current unit setting

4.19 Special Features

Temperature measurement

If there is no temperature measurement integrated into the sensor measuring module (DES), the PT 1000 temperature measurement is automatically used from the A&C board for temperature compensation. This can also be switched off in the „Temperature“ calibration menu. The PT 1000 temperature compensation is thereby generally turned off.

If a temperature measurement is integrated into a sensor measuring module for chlorine, it is automatically used for compensation.

In the menu, it is possible to chose or switch between the temperature measurements of the sensor measuring module and the A&C board.

In the calibration menu for pH, you can select between a manual, permanently set temperature value or the temperature measurement with PT 1000 provided by the A&C board for compensation. If the PT 1000 measurement of the mother board is switched off, only a manual value may be set for compensation.

Combined chlorine display

If a total chlorine measurement as well as free chlorine measurement is installed via mA signal, it is possible to display the combined chlorine value. To do this, set the display to "Cl-comb" in the total chlorine measurement "measurement range - sensor type" menu.

If the free chlorine measurement is transmitted via an mA signal, the mA input signal can be defined in the "measurement range" menu. The mA signal of the free chlorine measurement is also connected to mA input 1.

Please note

If mA input 1 is used to record the free chlorine, the operating mode combi-control or ratio control is not available.
In this case the controller function is assigned to the total chlorine measurement.

5. Installation

5.1 Transport and storage

Transport

The unit is supplied in standard packaging. During transport the packaged unit must be handled carefully and should not be exposed to wet weather or moisture.

Check that the transport packaging is undamaged.
In the event of damage please inform the transport company immediately, as your rights to compensation will otherwise be lost.

If the device is damaged, please contact the respective contractual partner immediately.

Keep the packaging until the unit has been correctly installed and taken into operation.

Storage

Store the unit and the sensors in a dry condition without any residual water in a dry place that is not exposed to the weather. Storage temperature, see 3.2 “Technical Data”.

5.2 Installation

Installation site

The unit must be protected against rain, frost and direct sunlight and may therefore not be installed outdoors.

It must be mounted horizontally on a flat wall in a frost-free room with an ambient temperature of 0 to 50 °C.

The air in the room should be non-condensing.

Installation

The device is not suitable for an electrical connection with permanently installed cable conduits.
If the cable glands do not meet local installation rules and regulations, these glands must be replaced with suitable ones.

Opening the housing

1 Remove the housing cover of the flow block assembly. To this purpose, lightly press the two buttons on the top of the housing (optional).

2 Release the four screws on the cover of the electronic module.

Caution!

There are connection cables between the cover and basic housing.

3 Carefully remove the cover of the electronic module and leave to hang on the strain relief.

Installation with mounting rails

1 Fasten the mounting rail to the wall with two screws (diameter 5 mm) and two dowels (diameter 8 mm).

2 Hook the electronic module onto the mounting rail so that it is flush at the right and fasten to the wall with two screws (diameter 5 mm) and a dowel (diameter 8 mm).

3 Hook the flow block assembly onto the mounting rail on the left next to the SFC and fasten to the wall with two screws (diameter 5 mm) and two dowels (diameter 8 mm).

Refer to “Top-hat rail assembly” on page 121 and Page 123.

Please note

If the flow block assembly is not mounted directly next to the electronic module, it can also be mounted without the mounting rail (see next page).

Installation without mounting rails

If the electronic module and the flow block assembly are to be mounted in different places, the modules can be hooked onto suitable tallow-drop screws by the top holding fixtures instead of onto the mounting rail. Proceed with the installation as described above.

Please note

If the electronic module and the flow block assembly are mounted at separate locations, the sensor cable extensions with a maximum length of 50 m must be used. An impedance converter for the Redox, fluoride and pH sensors is also required (see 8. “Complete Units, Retrofit Kits and Spare Parts”).

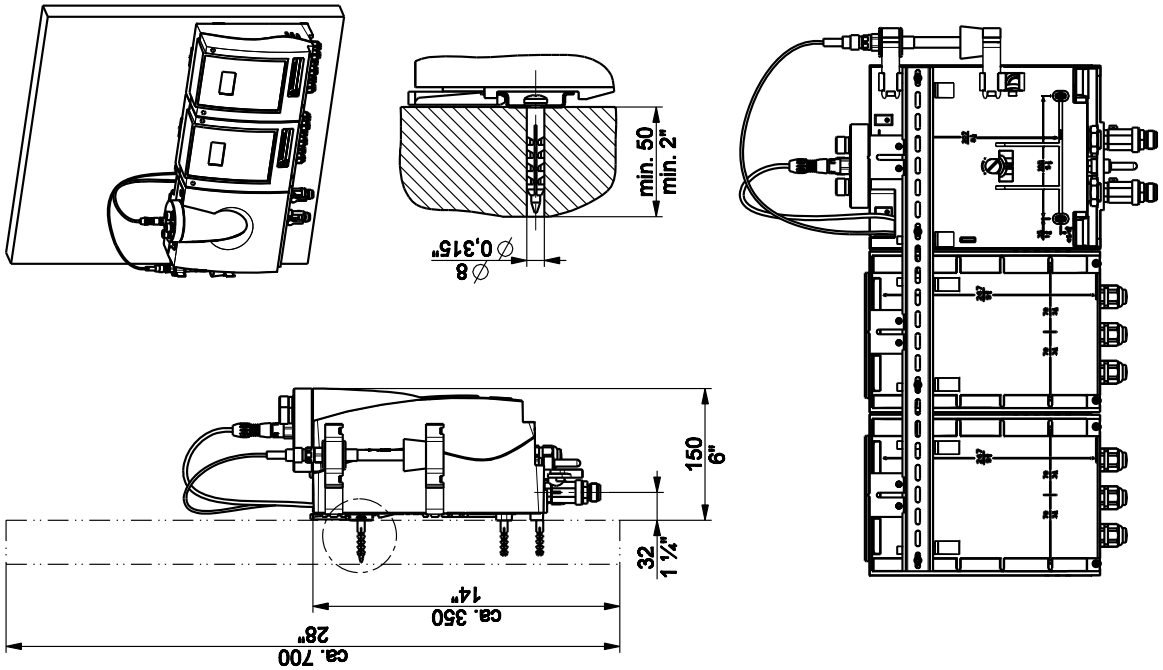
Refer to “Wall mounting assembly” on page 122 and Page 124.

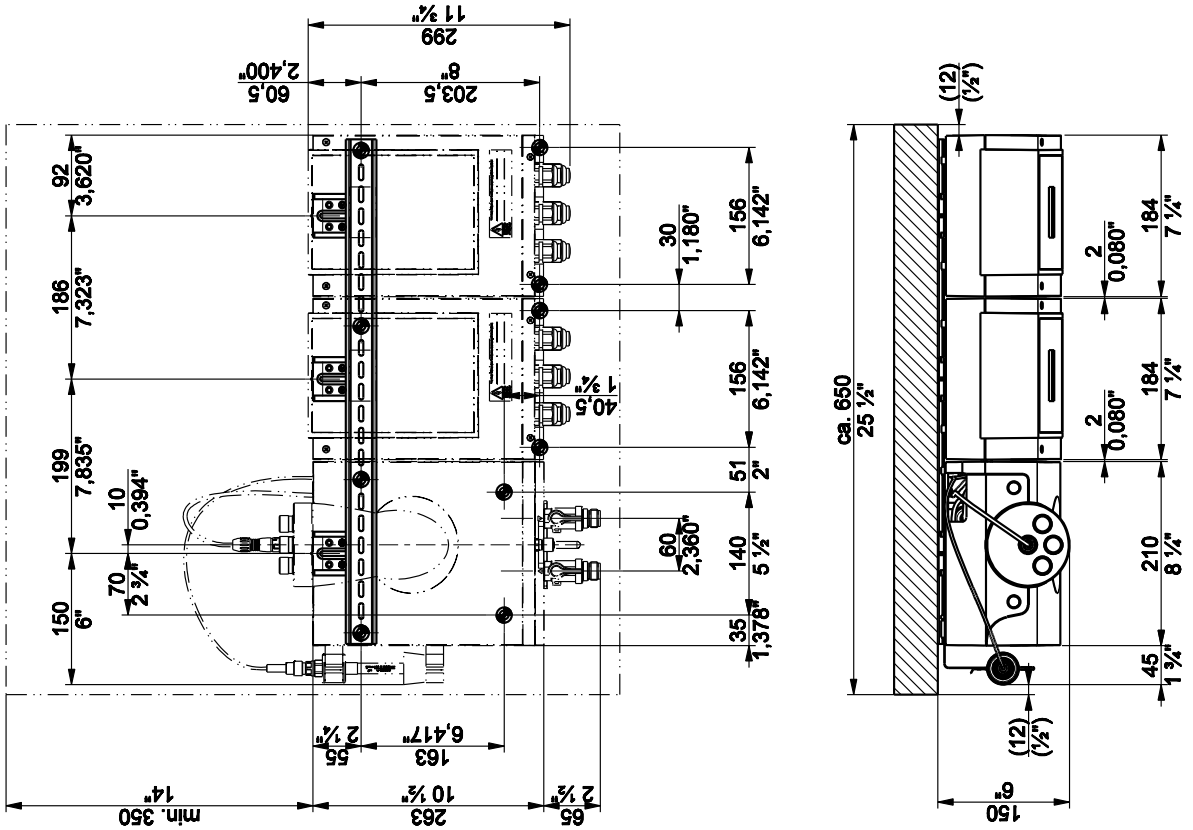
Control cabinet installation

A special version is available for control cabinet installation. The base unit (basic electronics) of this version is attached to the mounting plate using a top-hat rail. The front control panel is fitted in accordance with the “Control cabinet installation” assembly drawing using the 3 m connecting cable provided (part no. W3T161012).

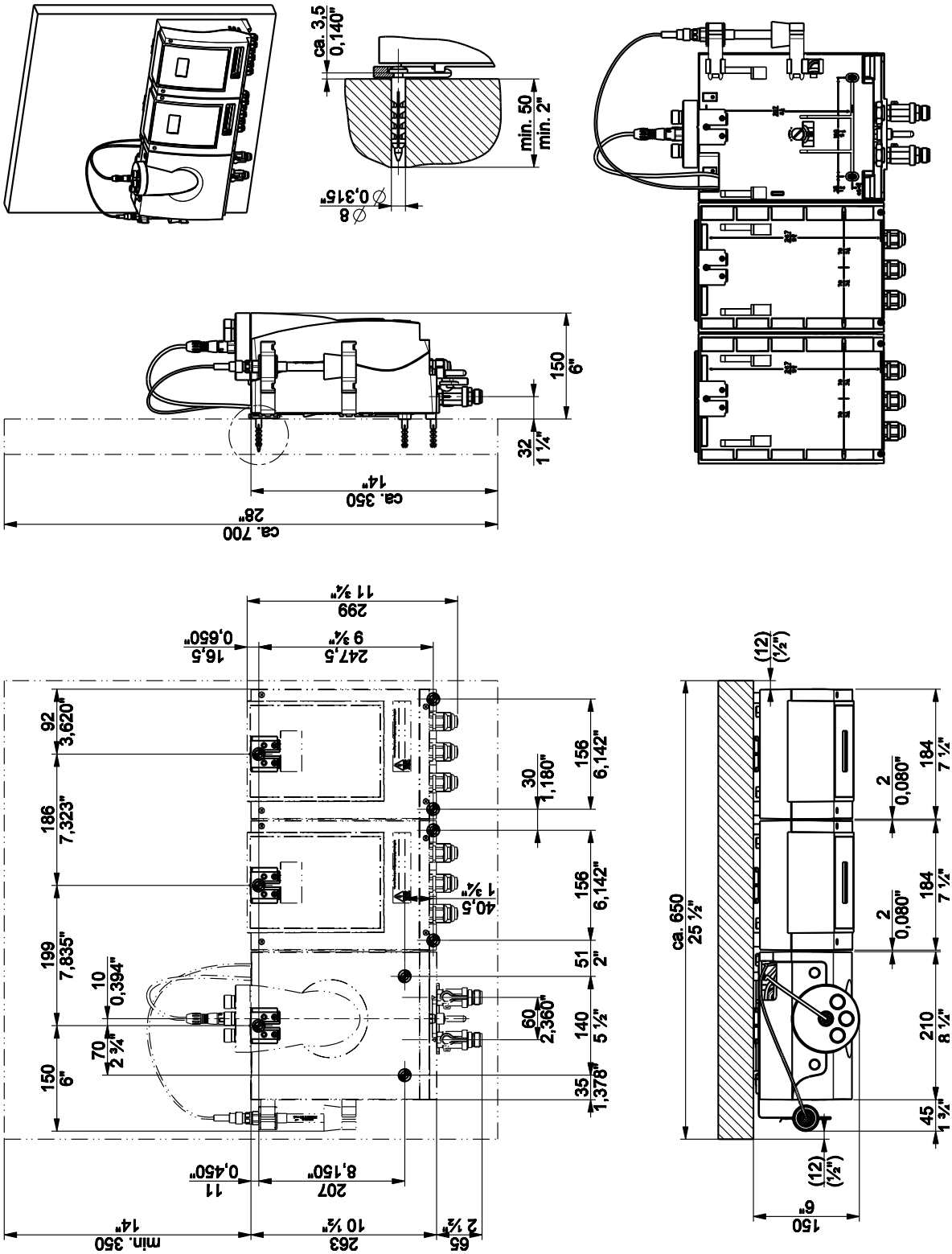
Refer to “Control cabinet installation assembly” on page 125 and Page 126.

Top-hat rail assembly

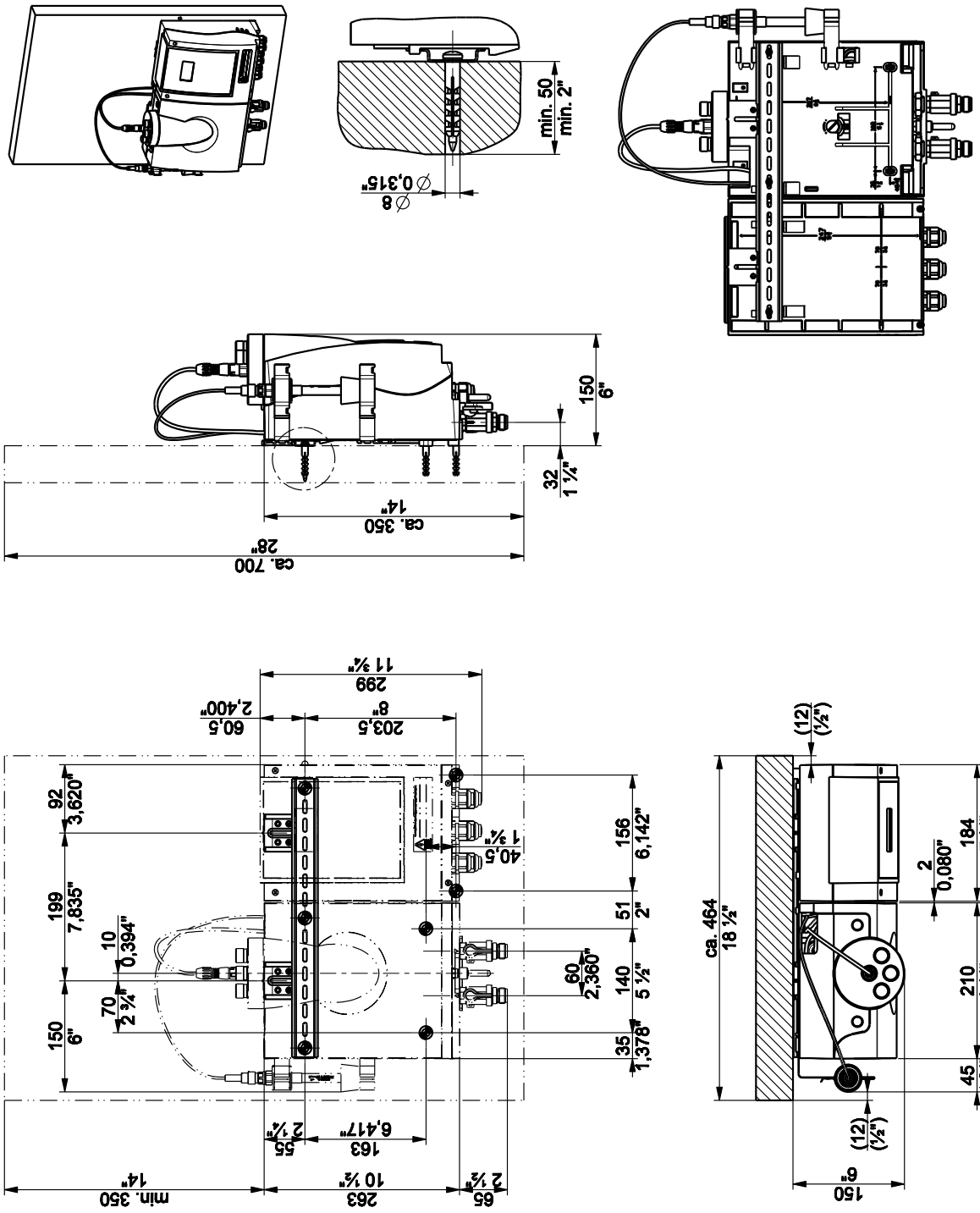




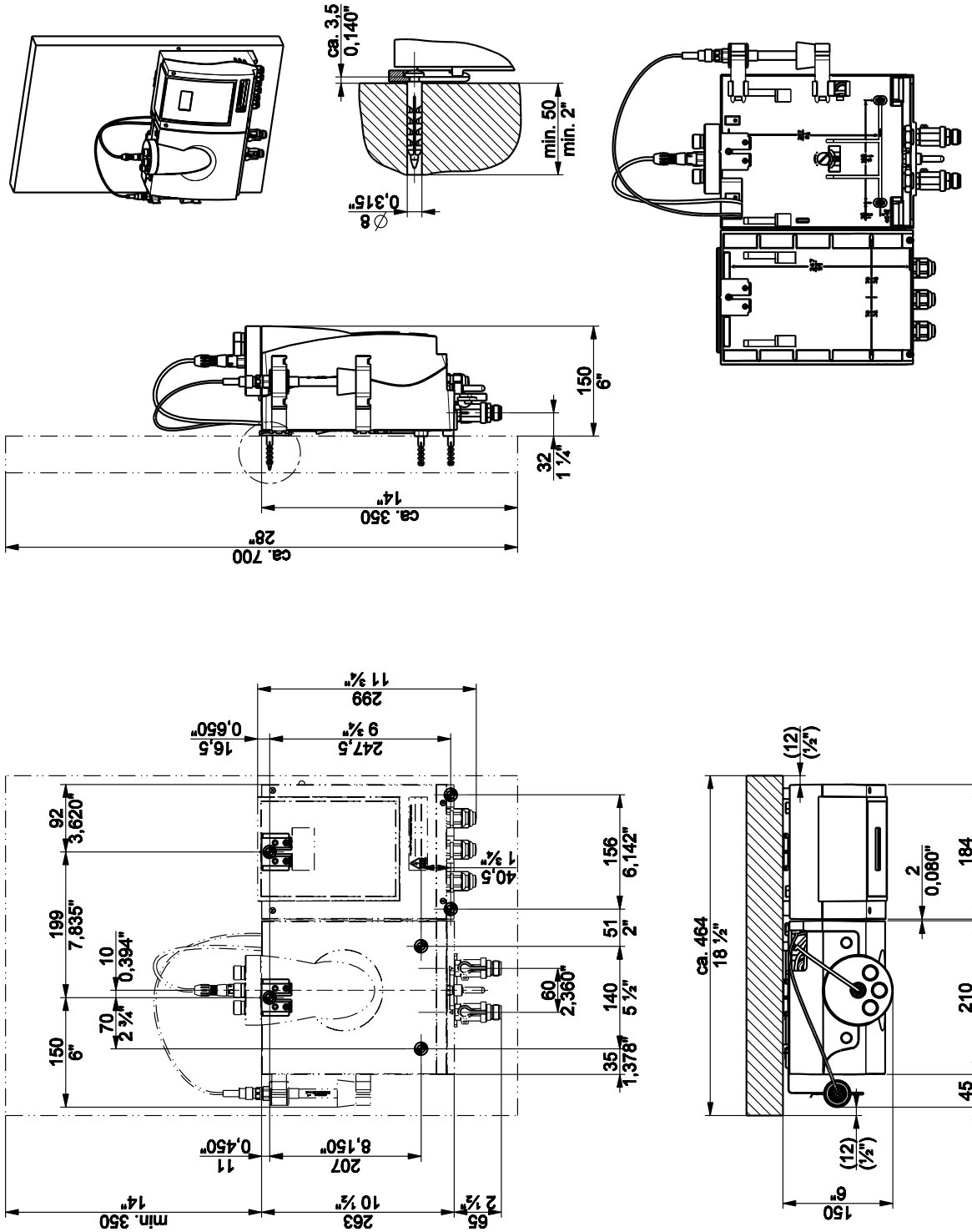
Wall mounting assembly



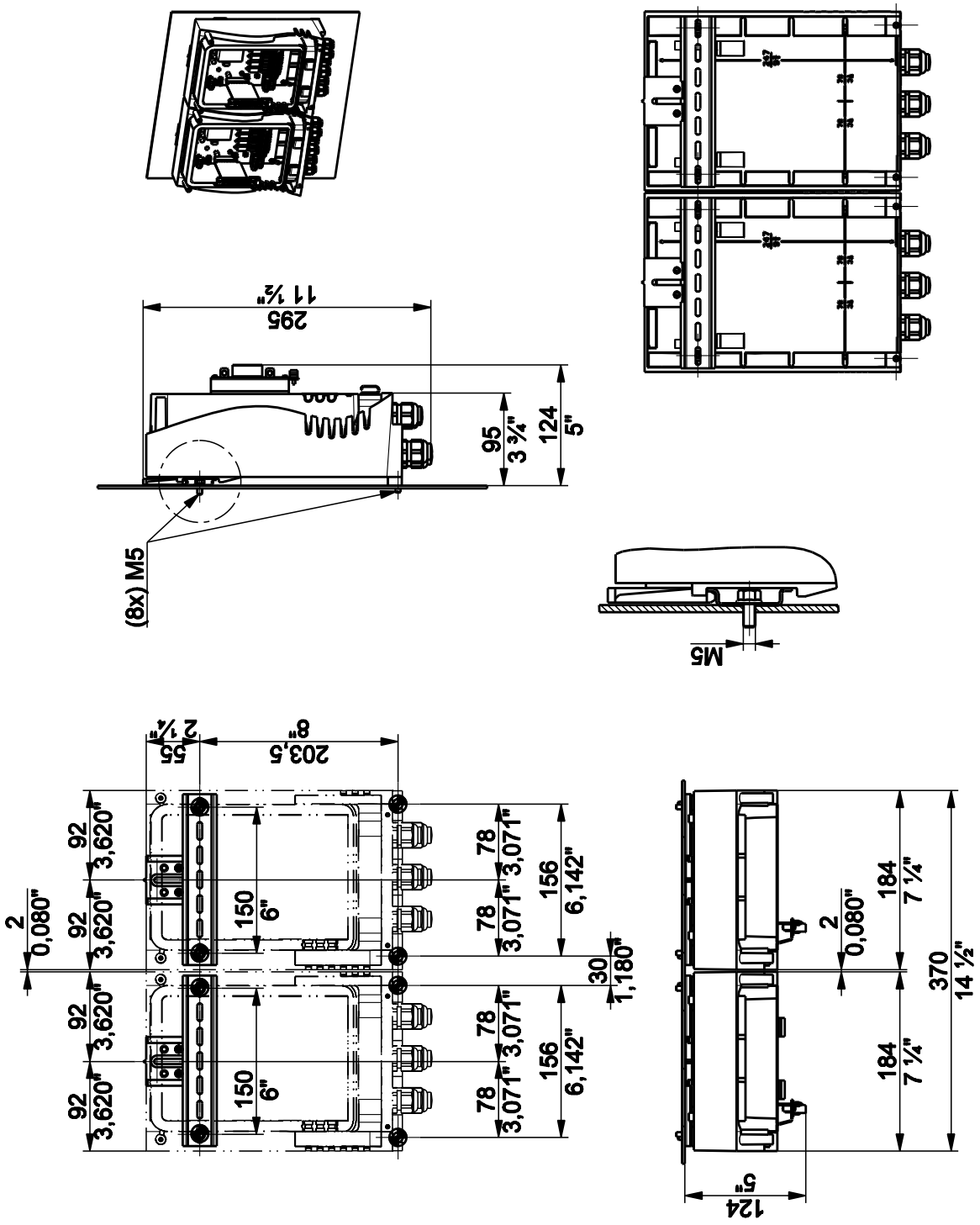
Top-hat rail assembly



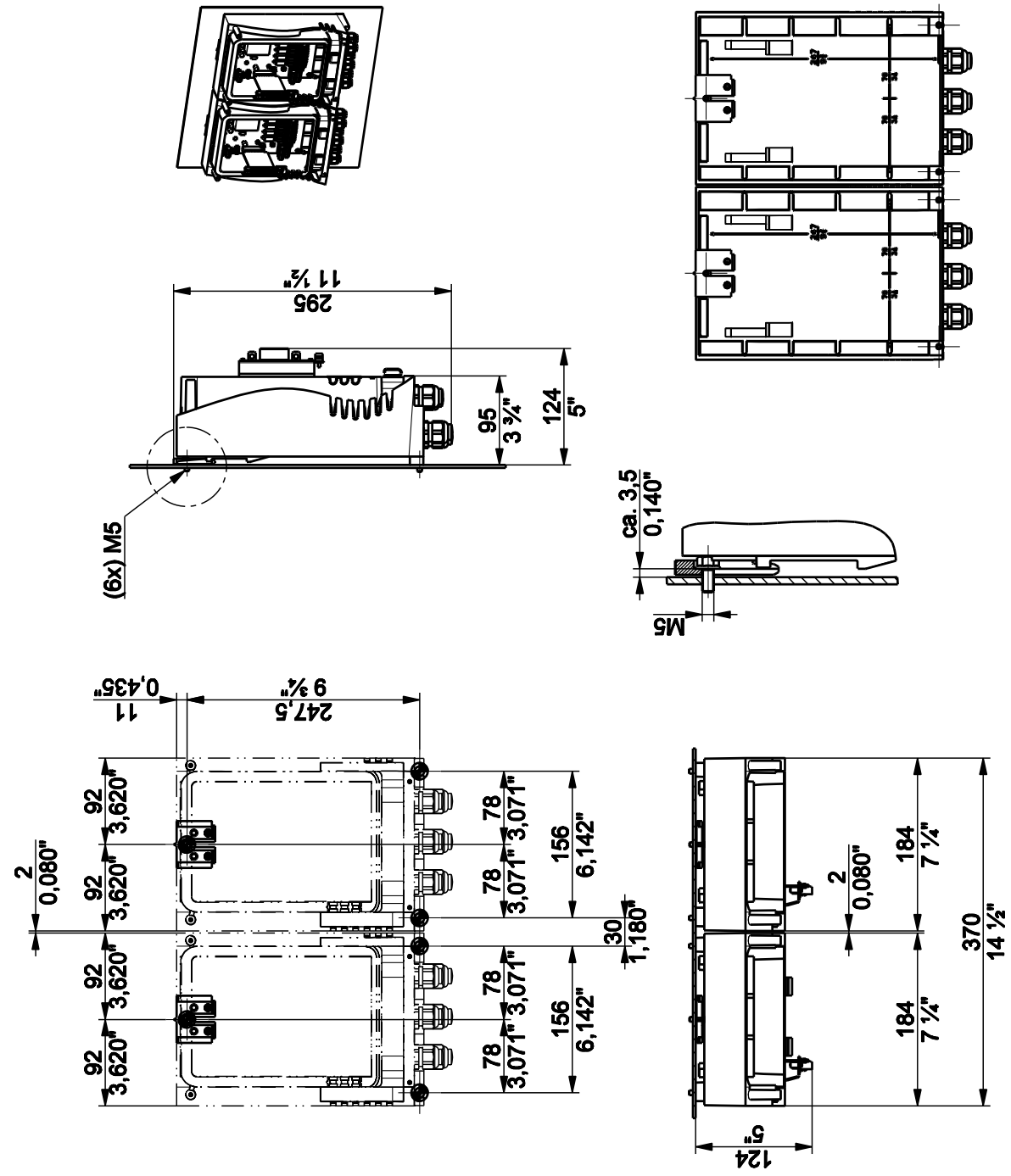
Wall mounting assembly



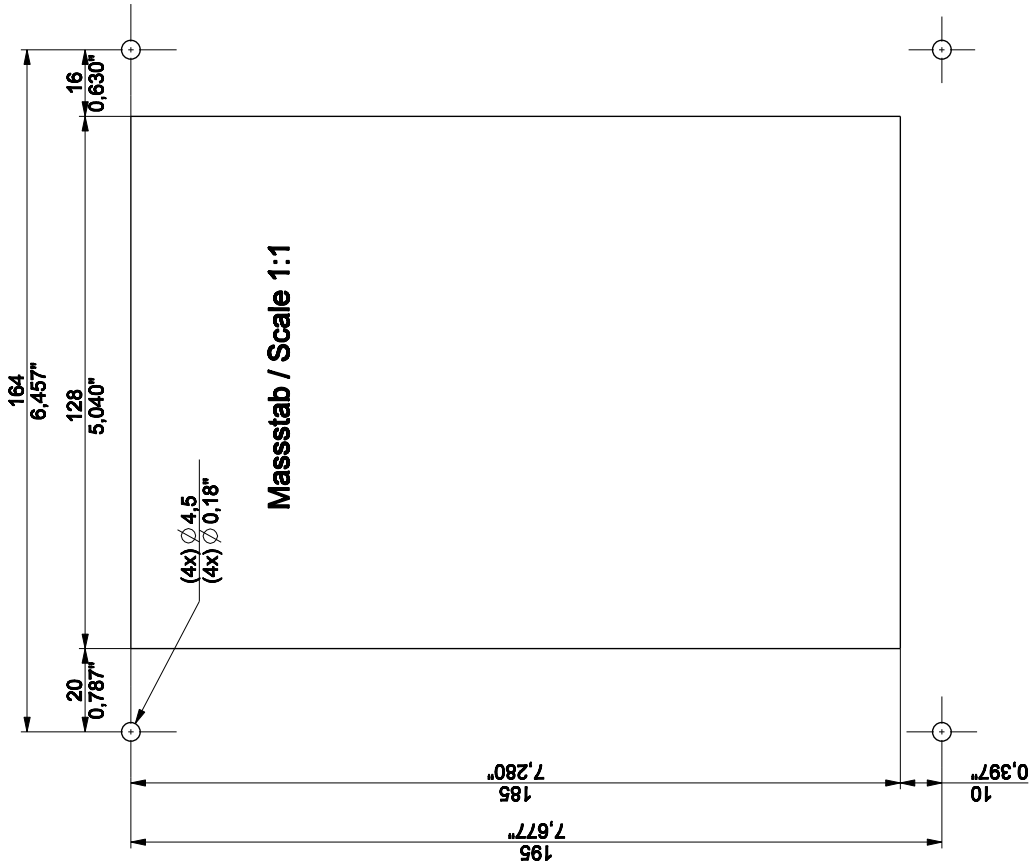
Control cabinet installation assembly

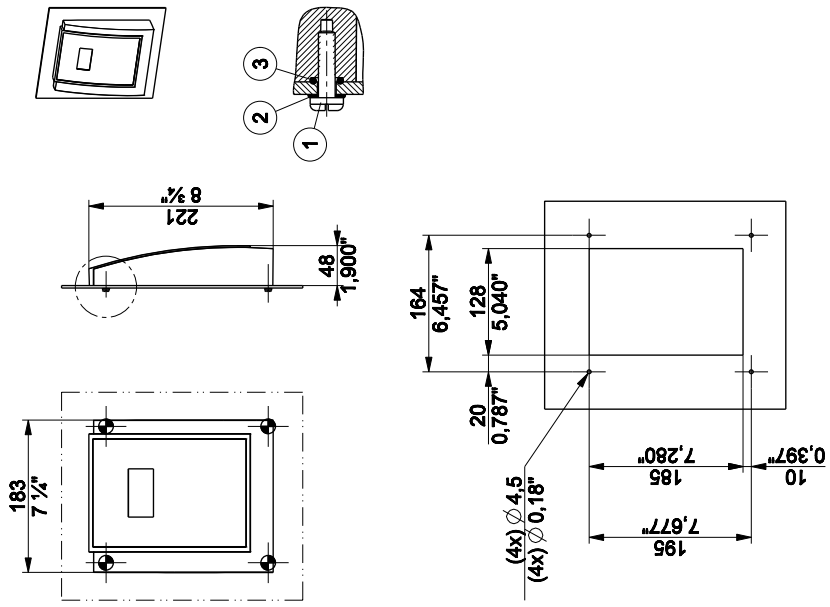


Control cabinet installation assembly

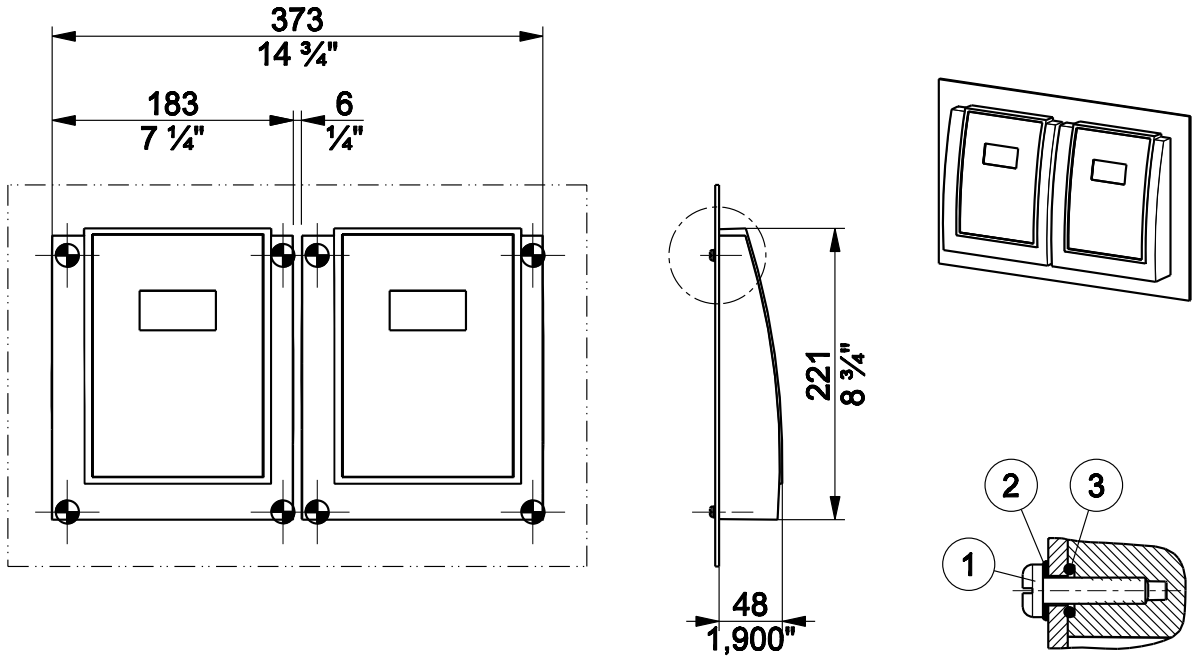


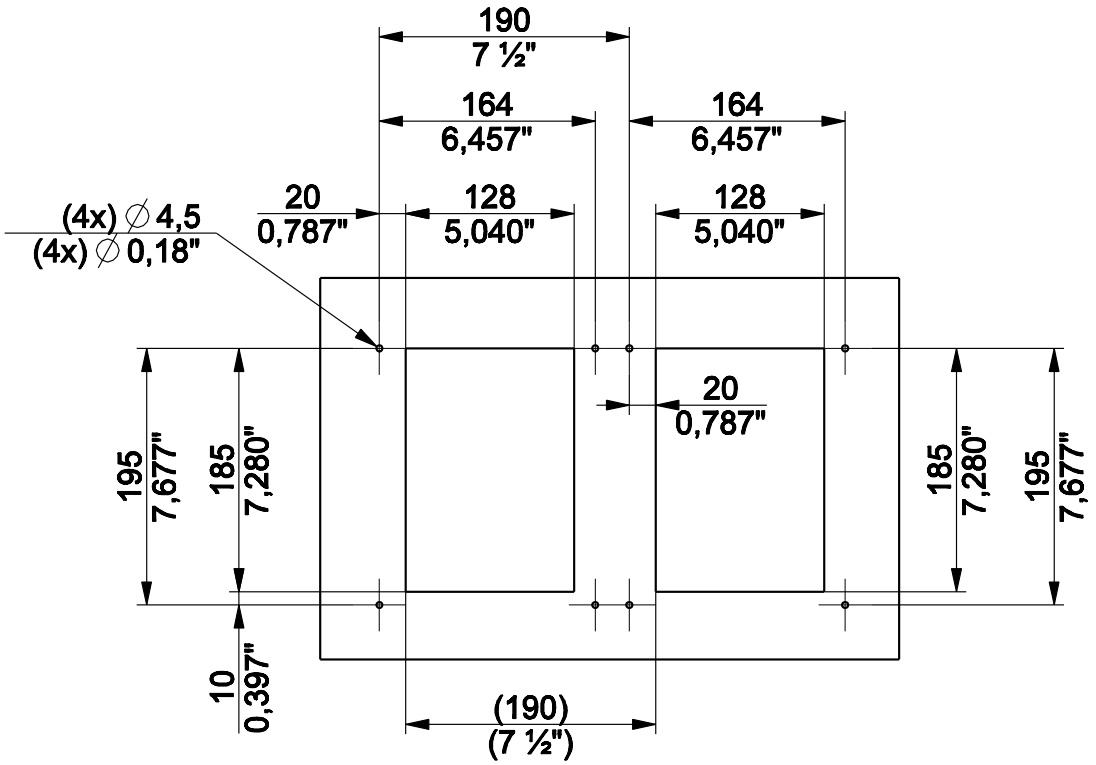
Installation of the front panel on the control cabinet





Installation of the front panel on the control cabinet





5.3 Commissioning

5.3.1 Installation guide

Commissioning procedure

When the unit has been mounted, the sensor measuring module can be equipped (not applicable to unit version 2). The electrical connections can then be setup in accordance with the required application.

To set applications, refer to 5.3.10 “Setting the applications”.

The following table contains the individual commissioning steps in their correct sequence.

More detailed information is contained in the chapters listed in the "Chapter and page reference" column.

Completion of each task can be confirmed in the "Completed" column.

Please note

If this installation sequence cannot be complied with, please contact your contractual partner.

Commissioning using the example of application 2

Seq. no.	Task	Chapter and page reference	Com-pleted
1	Setup electrical connection in accordance with the application.	5.3.6 Page 148 9. Page 267	☐
2	Install sensor measurement module and, if applicable, connect SiDiSens		☐
3	Insert the sensors and connect	5.3.3 Page 135	☐
4	Pour in the cell sand (only with DEPOLOX® 5/ DEPOLOX® Pool)	5.3.2 Page 134	☐
5	Insert fine filter, if membrane sensors are used (only with DEPOLOX® 5/DEPOLOX® Pool/ VariaSens)	5.3.5 Page 147	☐
6	Insert the labeling field in the housing cover	5.3.7 Page 149	☐
7	Close the housing cover	5.3.8 Page 149	☐
8	Switch the unit on	5.3.9 Page 150	☐
9	Set the language	5.3.9 Page 150	☐
10	Set the application	5.3.10 Page 151	☐
11	If another operating mode is activated, switch to „MANUAL“	Page 184	☐
12	Set the time	Page 184	☐
13	Set the date	Page 184	☐
14	Enter system name (e.g. Control 1)	Page 184	☐
15	Set the trend graphs assignment	Page 184	☐
16	Set module descriptions	Page 184	☐

Seq. no.	Task	Chapter and page reference	Com-pleted
17	Select control mode	Page 184	☐
18	Set dosing output, and adjust positioner running time, Tp, and max. pulses if necessary	Page 184	☐
19	On positioner with feedback calibrate„Ym”. With feedback signals, such as mA signal, 0 – 1V, 5kOhm, the DIP switch S4 must be adjusted on the A&C board. Factory setting: 1kOhm potentiometer	Page 184	☐
20	Check setpoint and dosing factor, adjust if necessary	Page 184	☐
21	Check setpoint and dosing source, adjust if necessary	Page 184	☐
22	Check flow rate source, adjust if necessary	Page 184	☐
23	Check flow rate direction, adjust if necessary	Page 184	☐
24	Check control variable 2, adjust if necessary (single feed forward only)	Page 184	☐
25	Check X direction, adjust if necessary (single feed forward only)	Page 184	☐
26	Check X factor, adjust if necessary (single feed forward only)	Page 184	☐
27	Adjust values for Xp and Tn on control loop (single feedback closed-loop control only)  *Please note* These values may be optimized later by adaption or manually.	Page 184	☐

Seq. no.	Task	Chapter and page reference	Compl eted
28	Adjust values for Tconst and Tvar on control (compound loop only)	Page 184	☐
29	Check max. Lin. corr., adjust if necessary (compound loop only)	Page 184	☐
30	Check control factor, adjust if necessary (compound loop only)	Page 184	☐
31	Check Yout factor, adjust if necessary	Page 184	☐
32	Check measuring range, adjust if necessary	Page 184	☐
33	Check limit values, adjust if necessary	Page 184	☐
	Input and output settings:		
34	Check flow rate signal settings such as signal, unit, factor, format, measuring range start and end value, adjust if necessary	Page 179	☐
35	Check flow rate limit values, adjust if necessary	Page 179	☐
36	Check external set point/dosing factor setting such as signal and factor, adjust if necessary (only if using an external setpoint/dosing factor)	Page 179	☐
37	Check limit values for external set point/dosing factor, adjust if necessary (only if using an external setpoint/dosing factor)	Page 179	☐
38	Check mA signal, adjust if necessary (only if mA output is used)	Page 179	☐
39	Check mA allocation, adjust if necessary (only if mA output is used)	Page 179	☐

Seq. no.	Task	Chapter and page reference	Com-pleted
40	Check settings for digital inputs 1 - 2, adjust if necessary	Page 179	☐
41	Configure RS485 interface as required	Page 179	☐
42	Check function of alarms 1 - 4, adjust if necessary	Page 179	☐
43	Configure alarm 1 - 4 assignment as required	Page 179	☐
44	Via Mode - Man.Dos., check that all connected actuators and dosing pumps are working properly	Page 179	☐
45	Calibrate the fitted sensors after approx. 1 hour running-in time	Page 179	☐
46	Switch to operating mode „AUTO“	Page 198	☐
47	Repeat calibration after 24 hours running time		☐

5.3.2 Pour in the cell sand (only with DEPOLOX® 5 and DEPOLOX® Pool)

Caution!

Before opening the cover on the pressurized version always first release the pressure in the cell body with the drain screw.

1. Close the ball valve on the sample water inlet and outlet (pressurized version).
2. On the non-pressurized version, remove the protection plugs on the cell body cover of the 3-electrode cells.

   On the pressurized version, unscrew the protection plugs on the cell body cover of the 3-electrode cells.
3. Fill half a cap from the plastic bottle with cell sand and pour it into the cell body (approx. 1/2 cm³ cell sand).
4. On the non-pressurized version, replace the protection plugs on the cell body cover of the 3-electrode cells.

   On the pressurized version, screw the protection plugs on the cell body cover of the 3-electrode cells.

Please note

Make sure that the opening (especially the threads in the pressurized version) is clean; rinse with water, if necessary.

5. Reopen the ball valve on the sample water inlet and outlet (pressurized version).

Please note

The system must be recalibrated approx. 4 hours after each time the cell sand is replaced.

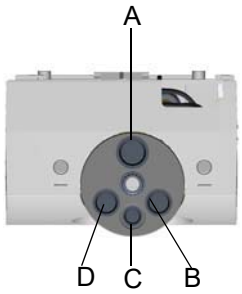
The calibration must be checked after one day.

5.3.3 Inserting and Connecting Sensors

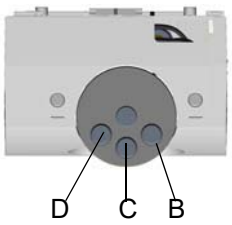
Please note

Observe the max. back pressure (pressurized version).
Please consult the membrane sensor data sheet for this figure.
See chapter 4.2.6 Page 56.

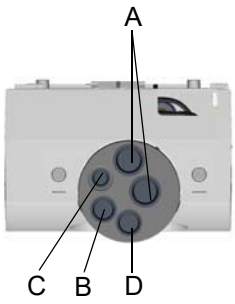
Arrangement of the sensors



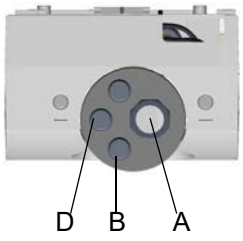
Picture 1 DEPOLOX® 5 Non-pressurized version



Picture 2 DEPOLOX® 5 Pressurized version

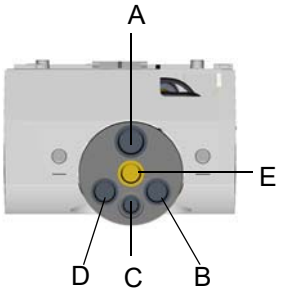


Picture 3 VariaSens non-pressurized version

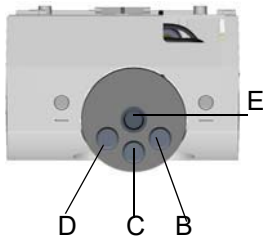


Picture 4 VariaSens pressurized version

A Membrane sensor: FC1/FC2, CD7, OZ7, TC1/TC3
B Redox
C Fluoride or conductivity
D pH



Picture 5 DEPOLOX® Pool Non-pressurized version



Picture 6 DEPOLOX® Pool Pressurized version

A Membrane sensor: FC1/FC2, CD7, OZ7, TC1/TC3
B Redox
C Conductivity
D pH
E 3-electrode sensor (single rod glass electrode)

1 Remove the protection caps from the sensors.

2 Install sensors (see figure above) in the cell body cover.

The sensors are marked as follows:

FC1/FC2, CD7, OZ7, TC1/TC3 Membrane sensor for free chlorine, chlorine dioxide, ozone and total chlorine (A) (only possible with non-pressurized version)

mV: Sensor for Redox, marked "mV" (B)

pH: Sensor for the pH value, marked "pH" (D)

µS: Sensor for conductivity, marked "LF325" (C)

Des: Sensor for free chlorine „DES“ (E)

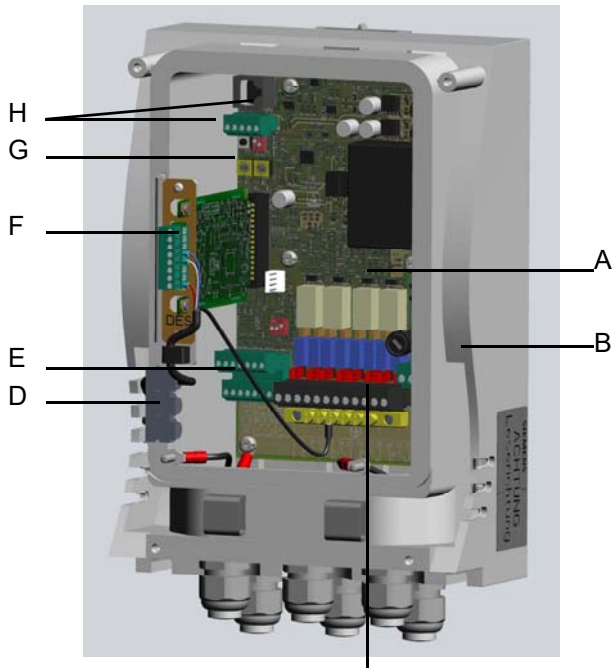
Please note

Keep the dust protection caps and watering caps of the sensors for subsequent use.

Please note

Cable extension:
The sensor cable for chlorine, conductivity and total chlorine may be extended to a max. of 50 m.
If the pH, Redox or fluoride sensor cables must be extended (max. 50 m), an impedance converter must be attached to the sensor. The impedance converter converts the very high-resistance sensor signal into a low-resistance signal. Power is supplied to the impedance converter by an installed battery. The life of the battery is approx. 5 years; the impedance converter should be sent to us for battery replacement.

Arrangement of the plug-in cards and cables



Picture 7 Electronic module cutaway model

A A&C Board
B Housing
C Relay terminal
D Sensor cable duct
E Terminal signal inputs/outputs
F Sensor measuring module
G Coding switch A&C board
H Connecting plug or terminal at the front panel board

Connecting the sensor cables

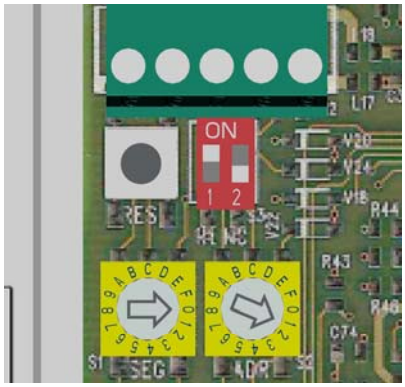
1 Place the sensor cables with the attached bushes into the cable ducts of the housing.

2 Depending on the sensor design, either plug or screw the cable in place.

3 Insert the supplied bushes into ducts that are not in use in order to seal the housing.

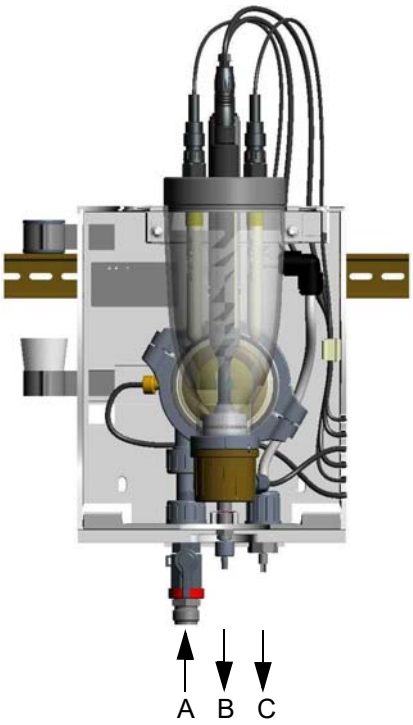
Please note

The coding switch of the A&C board may not be changed, as otherwise the functioning of the SFC can no longer be guaranteed. The settings must remain as shown on the following figure.



Picture 8 Settings view

5.3.4 Connecting the sample water and starting up, taking DEPOLOX® 5 as an example



Picture 9 Flow block assembly cross-section

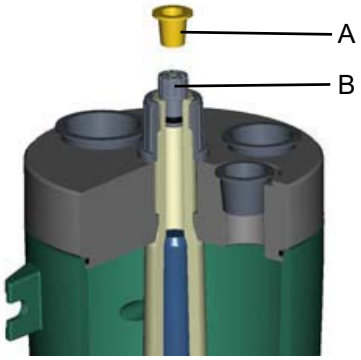
A Sample water inlet with ball valve
B Drain on the drain screw
C Sample water outlet (on pressurized version with ball valve only)

Please note

Before starting the DEPOLOX 5 perform following steps.

Non-pressurized version

1 Remove the transport plug (yellow) from the electrolyte storage tank and replace with the stopper.

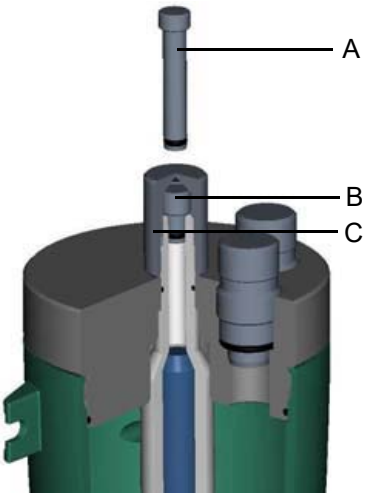


A Transport plug (yellow)
B Stopper (with white venting rod)

Pressurized version

Caution!

The cap must always be in place when the unit is running.



1 Remove the transport plugs (long) from the electrolyte storage tank and replace with the short stopper.
Then put the cap in place.

A Transport plug (long)
B Stopper (short)
C Cap

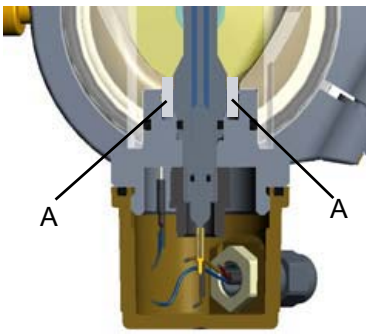
Remove felt ring

Please note

To keep the diaphragm moist and prevent crystallization in the filled electrodes there is a damp felt ring in the gap between the membrane and the electrodes when the unit is in storage.

Caution!

The felt ring must be removed before initial startup!



2 Remove the felt ring between the electrodes and the diaphragm.

A felt ring

Connecting the sample water inlet

Please note

Never use copper tubing.

1 The pressure in the sample water inlet must always be within a range of min. 0.2 to max. 4 bar. At the same time, the pressure in the sample water inlet must generally be 0.2 bar higher than in the sample water outlet.

- If the admission pressure is below 0.2 bar, a booster pump must be used (see„examples for sample water extraction with booster pump“ Page 144 and Page 145).
- If the admission pressure exceeds 4 bar, a pressure reducing valve must be used.

2 To prevent long loop lag times, ensure that the lines in the sample water inlet are as short as possible.

3 An external strainer with a mesh width of 0.5 mm is provided for the sample water inlet.

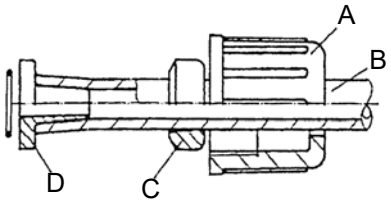
With hose connection

Please note

The water-tightness of the hose screw connection is only guaranteed if the following installation instructions are followed!

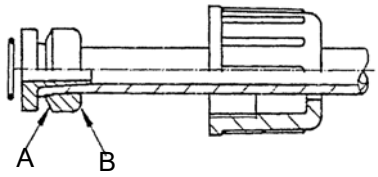
1 Release the union nut (A) on the hose screw connection.

2 Insert the hose (B) until it hits the hose bushing (D).



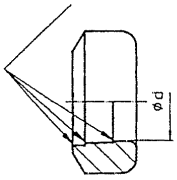
A Union nut
B Hose
C Locking ring
D Hose bushing

3 Push the locking ring out until the union nut engages the connecting threads.

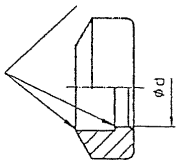


A 30° pitch on this side
B Rounding on this side

Locking ring for PE hose with 3 clamping points



Locking ring for PVC hose with 2 clamping points



With rigid pipework

1 Connect the sample water pipework to the ball valve connection threads.

2 Ensure that the sample water pipework is installed so that it is free of mechanical stress.

Connecting the sample water outlet

Please note

Never use copper tubing.

1 On the non-pressurized version, no back-pressure is permitted in the cell body. The sample water outlet must be open.

2 On the non-pressurized version, the sample water outlet must be installed so that no siphon effect can occur.

Please note

Recommendation: Position the outlet above a funnel.

3 On the pressurized version, a maximum back-pressure of 1.5 bar is permitted on the sample water outlet.

With hose connection

See installation instructions Page 141.

With rigid pipework

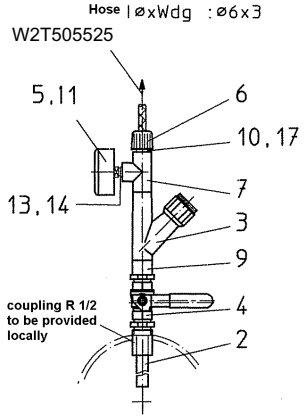
1 Connect the sample water pipework to the connection nozzle.

2 Ensure that the sample water pipework is installed so that it is free of mechanical stress.

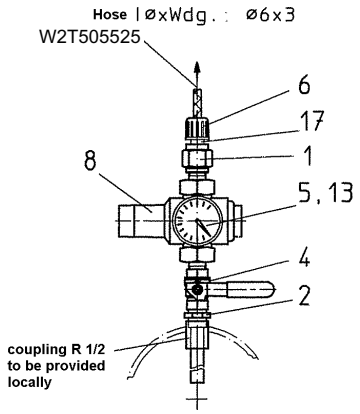
Connecting the drain

3 Ensure that the drain screw is always closed.

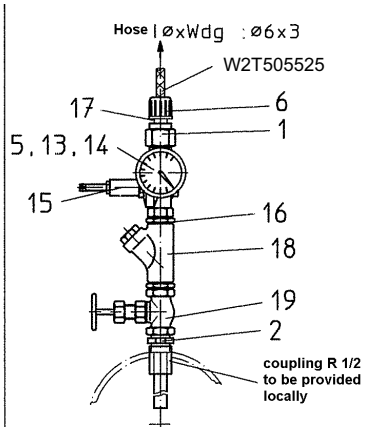
Examples of sample water extraction systems



W3T167656: 0.1 – 1 bar
W3T167628: 0.15 – 4 bar



W3T167645: 4 – 16 bar

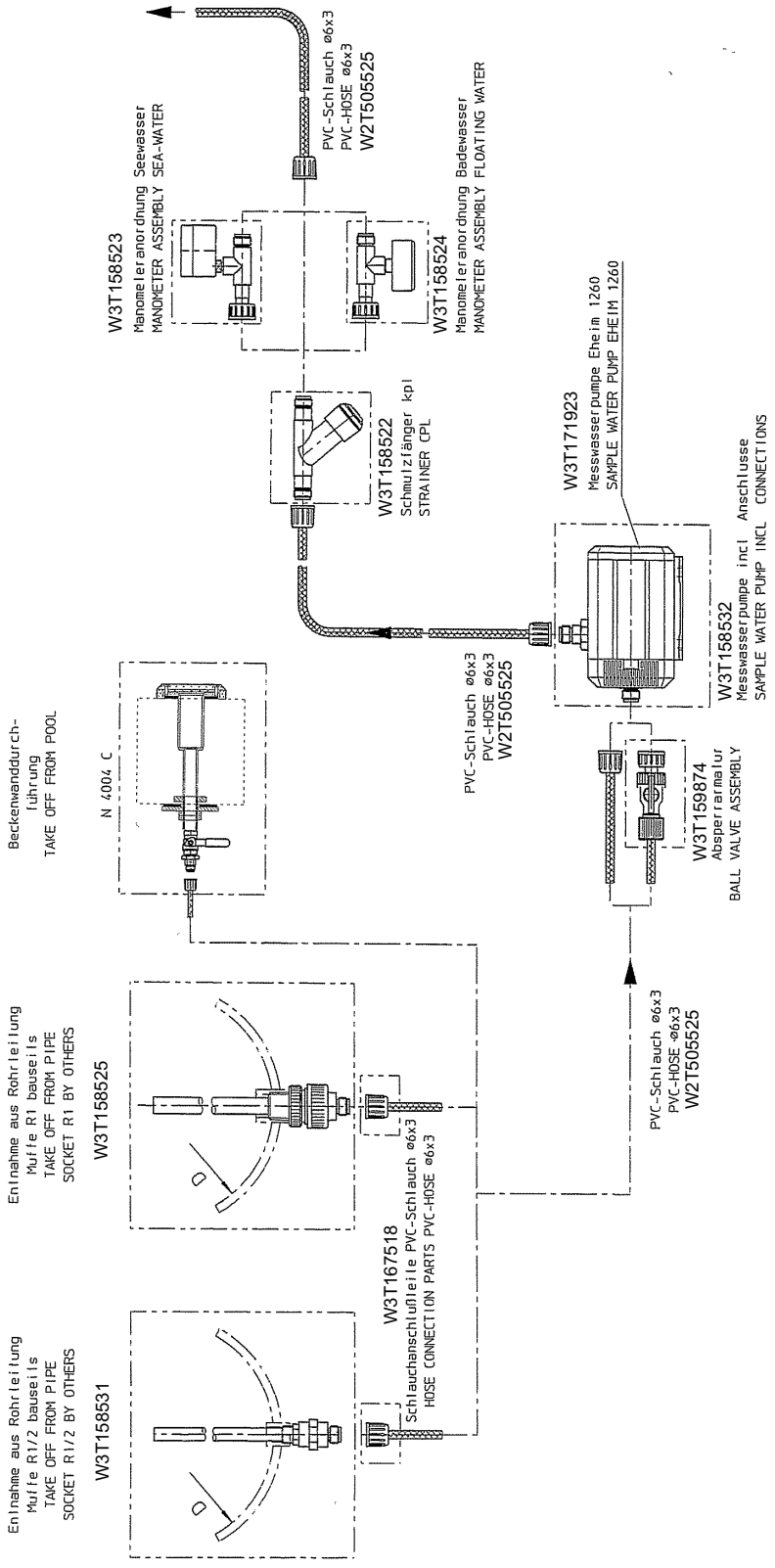


W3T167421 : 16 – 40 bar

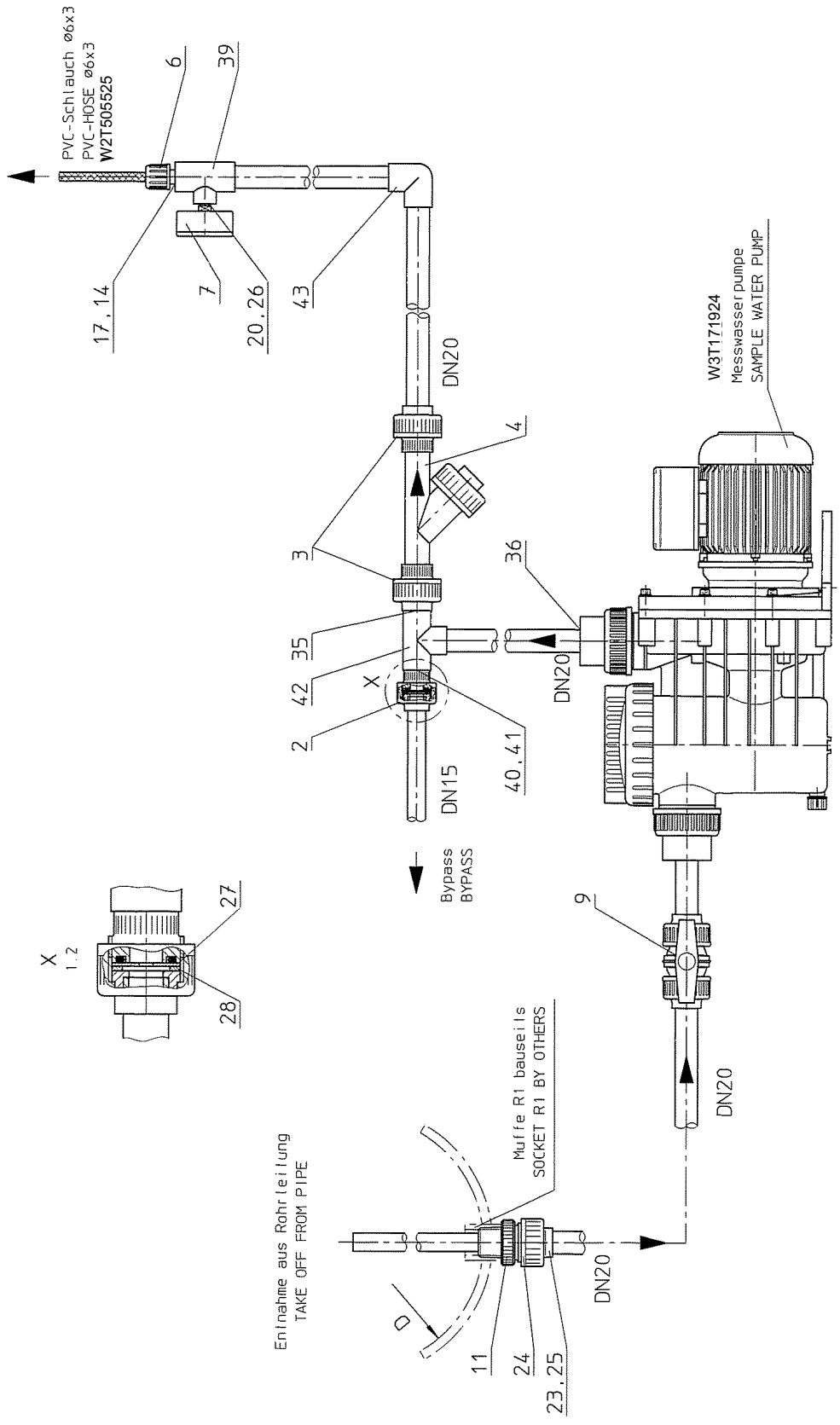
Item	Part No.	Description
1	W2T506486	Pressure gauge bushing
2	W3T167416	Sample pipe
3	W3T171391	Strainer DN15
4	W3T161902	Ball valve R 1/2
5	W3T173160	Pressure gauge 0 – 4 bar
6	W3T167518	Hose connection
7	W2T507524	T junction DN15
8	W3T165583	Pressure reducing valve R 1/2“
9	W2T505339	Male/female union
10	W2T506780	Reduction
11	W3T173138	Pressure gauge 0 – 1 bar
13	W3T161254	Flat gasket
14	W3T163500	Reduction nipple
15	W3T169418	Pressure reducing valve
16	W3T163535	Dual nipple R 1/2
17	W3T172948	Threaded part
18	W3T173148	Strainer
19	W3T165546	Needle valve

Examples for sample water extraction with booster pump

Example 1



Example 2



Only operate with sample water inlet!

parts list Sample water extraction for fresh water part no. W3T158528
Sample water extraction for salt water part no. W3T158529

Seq. no.	Quantity	Part No.	Description
2	1	W2T505181	Screw connection
3	2	W2T505182	Screw connection
4	1	W3T171416	Strainer complete
6	1	W3T167518	Hose connection parts
7	1	W3T173160 W3T173198	Pressure gauge (fresh water) Pressure gauge (salt water)
9	1	W2T505945	Ball valve
11	1	W3T163670	Sample pipe
14	1	W3T172948	Threaded part
17	1	W2T505600	Reduction
20	1	W3T163500	Reduction nipple
23	1	W2T507288	Insert
24	1	W2T506934	Union nut
25	1	W3T172720	O-ring
26	1	W3T161254	Flat gasket
27	1	W3T171146	Nozzle washer
28	1	W3T172727	Flat gasket
35	1	W3T166090	Pipe segment
36	2	W2T506782	Reducing bush, short
39	1	W2T506527	T-piece
40	1	W3T166089	Pipe segment
41	1	W2T506778	Reducing bush, short
42	1	W2T507525	T-piece
43	1	W2T507535	Elbow ben

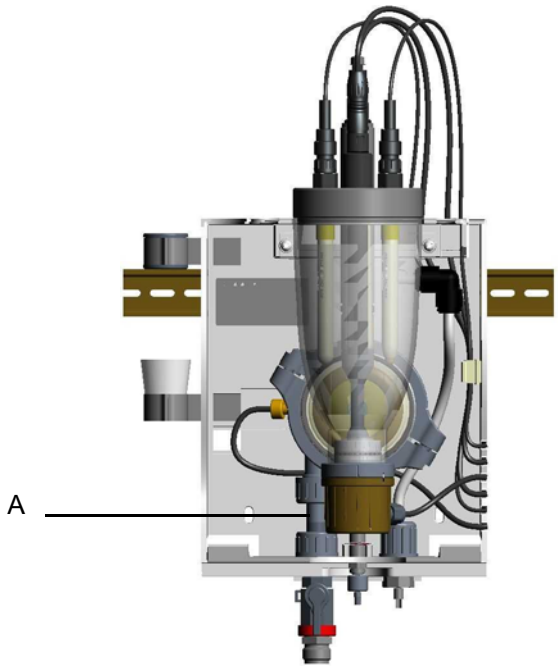
5.3.5 Fitting the fine filter

Insert fine filter with the flow through adapters DEPOLOX® 5, VariaSens and DEPOLOX® Pool.

Please note

A fine filter must only be installed when membrane sensors are employed.

The fine filter is contained in the enclosed accessory set.



Picture 10

A Filter unit (interior)

1 Release both knurled nuts.

2 Remove complete filter unit.

3 Place the fine filter into the filter unit. Ensure that the O-ring is fitted correctly (insert as far as possible).

4 Fit the filter unit. Ensure that it is fitted in the correct position.

5 Retighten both knurled nuts.

5.3.6 Connect the device to the power supply

Warning!

Only authorized and qualified electricians are permitted to install the device and open the housing. The unit may only be put into operation when the housing is closed, and must be connected to protection earth. Modifications to the device which go beyond those described in this manual are not permissible.

Warning!

The device is not equipped with a mains switch and is in operation as soon as the supply voltage is applied. An external switch or circuit breaker is therefore necessary.
Provide a mains fuse locally (6 A). The conductor cross section of the mains cable must be at least 0.75 mm (AWG 18).
When connecting system components (e.g. devices, motors, pumps) as well as when entering operating data, the system components must be switched off in order to prevent uncontrolled activation or any incorrect function.

Caution!

To ensure safe and correct commissioning, knowledge of the operation, connected electrical load, measurement signals, cable assignment and fuse protection of the connected devices and machines and the relevant safety regulations is required. Commissioning of the device may therefore only be performed by qualified and authorized electricians. Incorrectly connected devices can be damaged, possibly irreparably, or cause faults in other equipment when they are switched on or in operation. Ensure that the measuring and control cables are not confused or make contact with one another. Never connect or disconnect any cables to which voltage is applied!

Please note

A line-side fuse (max. 16A) in the main supply line is necessary when connecting to 230 V or 115 V.

Recommendation: Provide an on/off facility for the unit at the installation site. 6A is recommended for the line fuse.

Observe local installation regulations!

Connect system components in accordance with the application-relevant wiring diagrams (Chapter 9).

5.3.7 Attaching the labeling field

1. Select the required labeling field depending on what module is loaded.
2. Insert labeling field in the housing cover.

5.3.8 Mounting the housing covers

1. Ensure that the cable bushes are fitted correctly.
2. Carefully fit the housing cover of the electronic module and secure with the four housing screws.
3. Carefully place the housing cover onto the flow block assembly and snap into place.

Please note

Tighten the housing screws to a maximum torque of 0.7 Nm (± 0.15 Nm).

5.3.9 Switching the device on

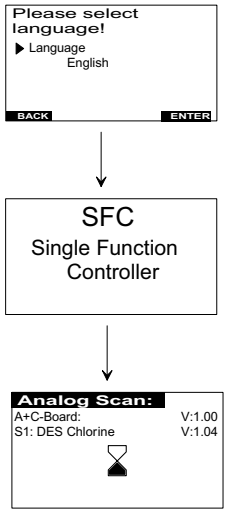
Warning!

The device is not equipped with a mains switch and is in operation as soon as the supply voltage is applied. When entering operating data it must be taken into account that these could directly influence the connected system components.

Activate the power supply to the device.

The following appear in succession on the graphic display:

During the first commissioning, the language setup menu always appears first. Open the menu with the „Enter“ key and set the required language using the up and down arrow keys. Then press „Enter“ to confirm the selection. When the country language is set, this screen is no longer shown.

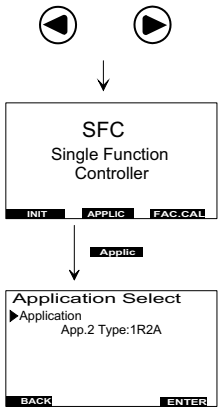


Picture 11 Display is switched on

5.3.10 Setting the applications

1 Starting from the basic display, restart the system„by selecting "Reset" under the "System" menu, and then pressing "System Restart" "Yes".
"SFC Single Function Controller" is displayed.

When this appears, press the "left" and "right" arrow keys simultaneously for at least two seconds, in order to obtain the display of the softkey„Applic“.



Picture 12 Application selection

2 Press the APPLIC softkey.
The "Application Select" menu then appears.

3 Confirm the selection with the "ENTER" softkey.

4 Another application can be chosen using the "up" and "down" arrow keys (see 4.5 “Applications”).

5 Select "ENTER" to program the set application. Select "BACK" to return to the basic display.

5.3.11 Positioner calibration with compound-loop-control and single feed back control

When connecting a feedback signal, always calibrate the 0 and 100 % positions in order to enable automatic positioning. Calibration can be performed automatically or manually.

Only possible with selection of "El.Pos.w.Ym".

Automatic calibration

1. Ensure that the feedback signal is correctly set on the A&C board (factory setting 1kOhm potentiometer) see 4.15 “Actuator feedback”.
2. Starting with the basic display in the main menu, open the "Actuator" window from the „Module Type“ menu.
3. Select the parameter "Ym Calibration Auto" and confirm the selection.
4. Select the "Auto" function and confirm the selection.

   Feedback signal alignment starts automatically.

   The motor moves to the end positions Ym = 100 % and Ym = 0 %. The end of the alignment is indicated by the message „Ym calibration was complete“. If an error occurs during automatic setting, an error is indicated and the setting is terminated.
5. Press the "OK" softkey to apply the calibration.

   The runtime determined for the positioner from 0 % to 100 % is automatically entered in the "Dosing" menu under Ty.

Please note

If automatic alignment is not successful, perform alignment manually.

Manual calibration

1 Starting with the basic display, open the „Actuator“ window from the „Module Type“ menu.

2 Select and confirm the parameter „Ym Calibration Manual“.

3 Open the „000%“ menu with the Enter key and close the positioner using the arrow-down key until the limit switch turns off.

4 Save with the Enter key.

5 Open the „100%“ menu with the Enter key and open the positioner using the arrow-up key until the limit switch turns off.

6 Save with the Enter key.

Please note

There must be a distance of at least 60 % of the total path between the set 0 % position and the 100 % position.

7 Check the position in a second operation:

Select the "MANUAL" operating mode.

Move to various positions via the „MAN.DOS“ key and check dosing capacity.

Repeat calibration at 0 % and 100 %, if necessary.

8 Determine the running time of the positioner from 0 % to 100 %.

9 Enter the determined running time in the "Dosing" menu under Ty.

5.3.12 Positioner calibration with SFC (application 3) or single feed forward (application 2)

In these applications the linearization of the control output is possible, such as for example with a gas feeder which has positioner feedback. Here, for example, 30 % control (opening) does not equal 30 % dosing capacity. Calibration of the positioner feedback allows up to eleven dosing capacity points to be aligned, in order to obtain dosing that is as linear as possible.

For this purpose, the number of support points to be calibrated can be selected in the menu „Control“ => „Actuator“ => „Ym Calib.Points“. It is possible to calibrate 2, 3, 6 or 11 support points. The more support points are selected, the more accurate is the dosing.

- Starting from the basic display, select the „Control“ => „Actuator“ menu.
- In the „Ym Calib.Points“ menu, select the number of calibration support points.
- Select the „Ym Calibration.Man“ menu and confirm with the Enter key.
- The dosing outputs to be calibrated are shown on the display (max. 11).

000%	0.0	(calibration point 0 % dosing)
020%	20.0	(calibration point 20 % dosing)
040%	40.0	(calibration point 40 % dosing)
060%	60.0	(calibration point 60 % dosing)
080%	80.0	(calibration point 80 % dosing)
100%	100.0	(calibration point 100 % dosing)

- The calibration points can be selected using the up/down arrow keys. Press Enter to calibrate the support points, and use the up/down arrow keys to open/close the positioner until the actual dosing shown on the dosing capacity indicator (e.g. gas feed inspection glass) agrees with the calibration point (e.g. 20%). Save the value by pressing the Enter key.
- Select the next calibration point and align the actuator position as described.

Please note

All calibration points must be aligned or checked in order to obtain linear dosing output.

5.4 System shut down

Caution!

Risk of uncontrolled dosing of chlorine or pH-correction medium! Shut down dosing system, close positioner!
If the installation site of the flow block assembly is not frost-free, the system must be shut down in due time!

1 Switch off the power supply.

2 Drain the sample water supply line and drainage line (hold container underneath)

3 Empty cell bodies and remove cleaning sand (see Page 223).

4 Dismantle the filter housing and the check valve housing.

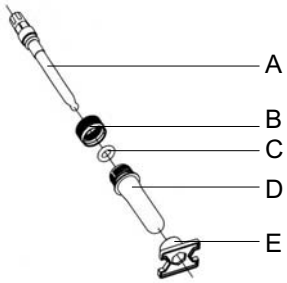
5 When the remaining water has drained from the flow control valve, refit the filter housing and the check valve housing.

6 Remove the sensors from the cell body cover and disconnect from the cable.

7 Apply a KCI solution to the protection caps of the pH and Redox electrodes and fit onto the electrodes.

Please note

A "KCI tank to store the sensors" may be used instead of the protection cap for pH and Redox electrodes (see 8. “Complete Units, Retrofit Kits and Spare Parts”).



A Sensor
B Sealing cap
C O-ring
D Tank
E Stand

The fluoride electrodes can be stored wet in the short term in a 100 mg/l fluoride solution at pH 7. Fill the electrodes in the tank with 100 mg/l fluoride solution and mount on the electrodes. However, the electrodes should be kept in a dry condition if they are to be stored for several months. In this case, drain the fill solution from the electrode chamber and wash the membrane and chamber with distilled water.

Picture 13 Senor components

8 Store the sensors in a frost-free place.

Please note

The water must be drained if frost occurs.
Insert electrode in a beaker with water and store in a frost-free place.

9 Procedure for membrane sensors, see 4.2.6 “Membrane sensors”.

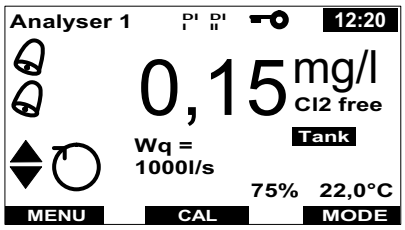
6. Operation

6.1 Display and operator controls

Graphic display and operating panel

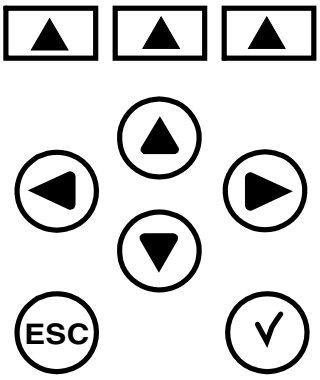
All information is shown on the graphic display with backlight.

The backlight of the display becomes brighter at the touch of a key. Five minutes after the last keyboard entry the brightness reduces to save energy consumption and ensure a longer backlight life.



Picture 1 Graphic display

The SFC is operated using nine keys. The software function is controlled with the top three keys (softkeys).



Picture 2 Operating panel

The exact depiction of individual parameters by the graphic display is described in chapter 6.3 “Menu structure”.

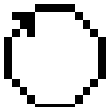
Indicators

CONTROL 1 System name (Enter in menu „System“ - „Common“ - „System name“)

DI I DI II Digital inputs 1, 2 active
The symbols indicate that a function has been selected for the digital signal and that a signal is pending (= digital input open).


Password active
The defined password must be entered to permit modification of parameters and for calibrating the device.

12.35 Time


Operating mode "AUTO" is active
The control unit is running in automatic mode.
Dosing is carried out automatically.


Positioner is started, dosing pump on
Positioner stopped, dosing pump on

15

Pulse pump on, 15 pulses/min in the example


Operating mode "MANUAL" is active
Dosing can be set manually.


Alarm on
upper alarm symbol corresponds to Alarm 1, beneath it are alarms 2, ...4

"System stopped" operating mode
Dosing is switched off.

"Adaption" operating mode active during "Automatic" operation
Automatic determination of the control parameters for the single feedback closed-loop controller is active.

"Adaption" operating mode active during "Manual" operation
Automatic determination of the control parameters for the single feedback closed-loop controller is active.

Bar graph
This serves to indicate a measured value, the measuring range (column height), the limit values (◣ or ◤) and the setpoint (▶), Wi (internal setpoint), We (external setpoint), Di (internal dosing factor), De (external dosing faktor).

Softkeys Current softkey assignments.

BREAK Stop the adaption procedure.

SELECT Select one or more options from the list provided.

CHANGE Change the operating mode.

ENTER Confirm selection/Save input.

CAL Select the "Calibration" menu.

LOCK Activate password protection.

MENU Select a menu.

MODE Select the "Mode" menu.

UNLOCK Start deactivation of password protection.

BACK Jump back one menu level.

---> Open next diagnosis display.

START Starts adaption.

13s
The time until dosing resumes after interruption.

ADAPT Opens the display for adaption

100% If the display blinks, the positioner is in manual mode and cannot be activated.

28.4°C Sample water temperature

mA? **1/5** Error indication active (display bottom right)
The system has detected an error. The error can be identified using the table in chapter 6.5 “Errors and remedies”. The number combination states the series number of the error message and the total number of error messages (in this example: 1. first error of a total of five).

PI 85 s YPI stop time display. The time it takes after a spike in the flow rate for the single feedback closed loop control in the compound loop to reactivate.

Scroll bar
This is used to indicate the actual menu position of the menu arrow. If the selection mark is at the top, the menu arrow is on parameter 1 (see example). A maximum of eight parameters per display is possible.

TANK

The SFC provides the option to assign a customer-specific name or designation to each measurement. In the menu „System - Module designation“, a text of up to six characters can be defined, e.g. „Inlet“, „Main“, „Tank“ etc. This name is displayed in the main display under the associated measurement. If blanks (default setting) are entered as a module name, it is deactivated and does not appear in the main displays.

General messages

Adaption is currently running!
This message appears if an attempt is made during adaption to automatically calibrate the positioner.

This function is possible in the MANUAL mode only!
This message appears, for example, if an attempt is made to calibrate the positioner during automatic operation. Acknowledge by pressing ENTER or the ESC key.

A module has been removed!
Do you wish to adopt the new configuration?
This message appears when the unit is switched on, after a module has been removed. Confirm with the yes/no key.

New hardware component found!
This message appears when the device is switched on after addition of a module.

No data available!
This message appears when there is no configuration saved on the SD memory card and an attempt is made to load a configuration from the SD memory card.

No measurement available!
This message appears when the SFC is operated in application 1 or 2 and no senor measuring module has been loaded.

Data are not compatible!
This message appears when a configuration is loaded from an SD memory card and may be caused by the following:

- Sensor measuring module different from the current measuring module
- The software version of the front panel board is different from the current version

No SD memory card available!
An attempt was made to save a configuration on an SD memory card, but no SD memory card was loaded or the SD memory card is faulty.

Function is not possible!
It is not possible to calibrate the positioner feedback at the CAN actuator.

Please note

Information about what plug-in card is contained in the device is displayed in the "Analog scan" when the device is switched on or can be viewed statically in the "Diagnosis" menu under "Software Versions" (Display “Diagnosis“).

Operator Controls

Softkey

- Activate the function shown on the graphic display over the keys.

Up

- Move up one level.
- Display the previous option.
- Increase value.

Down

- Move down one level.
- Display the next option.
- Decrease value.

Left/right

- Change the column in the menu.
- Change the position in the displayed value (cursor menu).
- Move forwards or backwards by 6 hours in the trend graph.

Escape

- Cancel input without saving new value.
- Move up one menu level.

Acknowledgement

- Acknowledge alarm message.
- Set the running delays to zero.
- Delete adaption error.
- Acknowledge max. dosing time to reactivate dosing.

6.2 Notes on operation

During operation observe the following points:

- Check your entries and modifications before exiting the menu.
- Only press the keys with your fingers, never with hard or pointed objects such as pencils, etc. This could damage the sealed keypad.

Password

The system runs with up to two passwords to prevent unauthorized access or inadvertent incorrect operation:

- The system password permits full access to all setting options.
- The calibration password only permits access to the calibration menu and the display of the menus.

Each password comprises a four-digit number combination.

Please note

The password is not set at the works (four zeros).

A calibration password can only be allocated if a system password has been allocated.

If the password protection was not activated with the "LOCK" softkey after entry/calibration, the system activates an automatic lock one hour later.

The password can be changed after correct entry of the existing password.

Operation

You have the following options starting from the basic display (the basic display is opened by pressing the „ESC“ key in the menu four times):

Switch between the basic displays and trend graphs	• Press the up or down key
Select menu	• Press the "MENU" softkey to select the menu • Press the "CAL" softkey to calibrate • Press the "MODE" softkey to set the operating mode
Select a menu item in the menu display	• Select the menu item with the arrow keys (arrow in front of menu item) • Confirm the selection with “ENTER"
Change/enter displayed parameters	• Select the parameter with the arrow keys (arrow in front of parameter) • Confirm the selection with "ENTER" • Change or enter the input values using the arrow keys • Save the input with "ENTER"
Cancel entry	• Press the "ESC" key to exit the menu item. Entries which have not been confirmed are reset to their original settings.
Reactivate password protection	This function is only active when a password has been programmed. • Change/enter displayed parameters • Block the system entry with the "LOCK" softkey in the menu display
Exit the menu item	• Press the "ESC" key or • Press the "BACK" softkey

6.3 Menu structure

The SFC has various manus:

- Main menu
- Module type, e.g. Cl_2 free 1
- Extern. Functions
- Inputs/Outputs
- Alarms
- System
- Diagnosis
- Calibration
- Mode

These depend on the number of sensor measuring modules installed.

The "Calibration" and "Mode" menus are opened with the corresponding keys directly from the basic display. All other menus can be accessed with the "MENU" softkey.

The following pages show the eight individual menus.
The displays contain the settings made at the works.

Please note

The actual displays on your unit may vary from those illustrated. The displays and menus depend on the number of sensor measuring modules installed and the selected settings.

Main menu

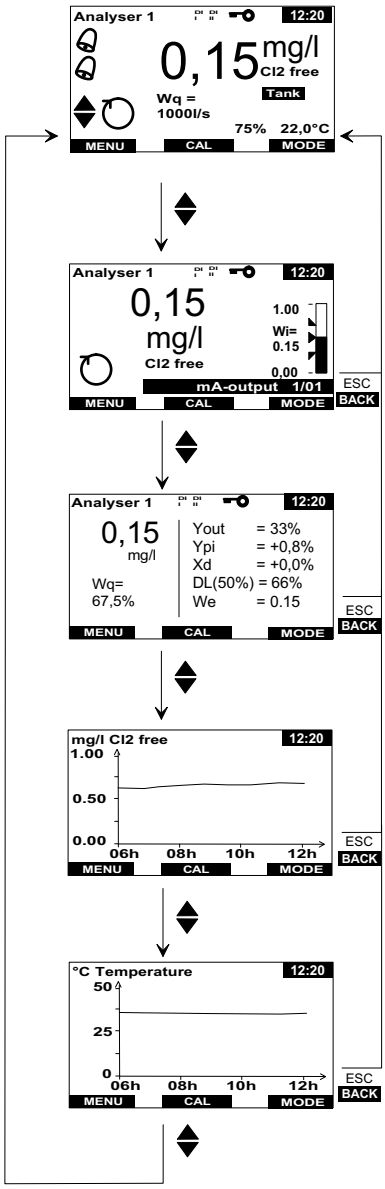
Basic display 1

Basic display 2

Basic display 3

Trend Graph 1

Trend Graph 2



Main menu

Basic display 1

Top status line

- System name
- Digital inputs activated
- Password protection activated
- Time

Centre display range

- Mode
- Measured value, e.g. free chlorine (mg/l) as a digital display with module designation (optional)
- Flow rate display Wq
- Alarm relay display
- Control output
- Feed delay (s), e.g., following sample water stop or change of mode from manual to automatic.
- Fault message (instead of positioner feedback, temperature and feed delay)
  In the case of several fault messages the display alternates.
- Sample water temperature (°C)

Bottom status line

- Softkey display

Basic display 2

Top status line

See basic display 1

Centre display range

- Mode
- Measured value display with bar graph display

Bottom status line

See basic display 1

Basic display 3

Top status line

See basic display 1

Centre display range

- Measured value display
- Flow rate display
- Controller-specific input/output variables, such as Yout, Ypi, Xd, dosing capacity DL depending on Wq, setpoint value Wi/ We

Bottom status line

See basic display 1

Line diagrams (2 max.)

Top status line

- Unit and type of the selected measurement parameter
- Date of the displayed diagram

Centre display range

- Six hours line graph (scroll back up to 30 days with option SD memory card)

Bottom line

- Softkey display

Menu - Module type Display based on a free chlorine measurement example

Basic display

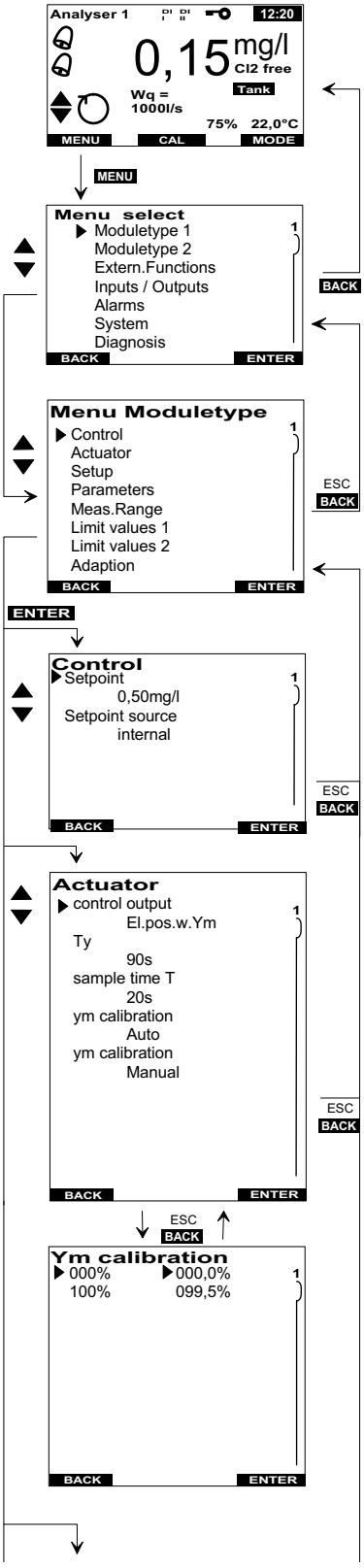
Menu select

Module type menu

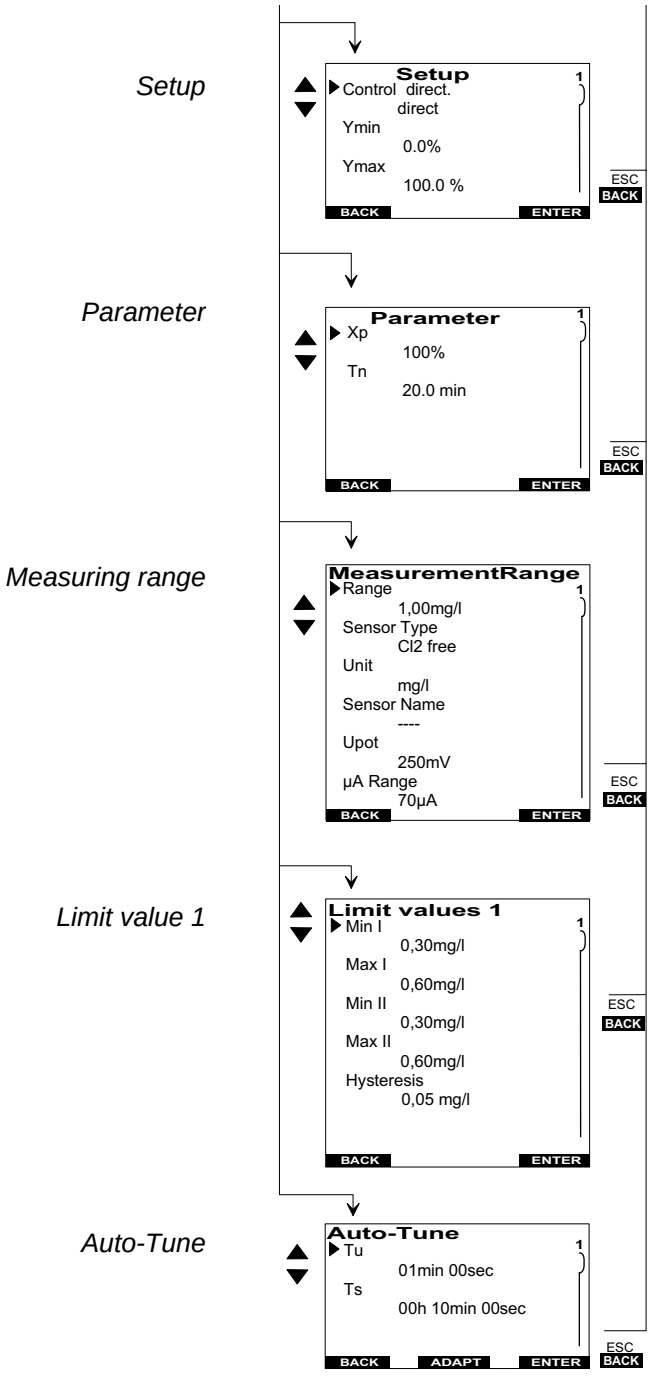
Control

Actuator

Ym calibration



Menu - Module type Display based on a free chlorine measurement example



Setup

Parameter

Measuring range

Limit value 1

Auto-Tune

Menu - Module type

Please note

The displayed menus and selection parameters depend on the number of sensor measuring modules installed and the selected application. All the parameters illustrated here are not displayed at the same time.

Basic display Refer to main menu

Menu select Display of all available menus

Module type (1) menu Display of all available settings for module type 1

Control

Control mode	Combined/single feed forw/single feed back (combined and single feed forw only available with modules with PC option)
Setpoint	Measuring range
Setpoint source	internal/external/internal if DI 2/external if DI 2
Dosing factor	0 – 100 %
Dos. fact source	internal/external/internal if DI 2/external if DI 2
Yout-factor	1.0 – 4.0

Actuator

Control output	El.Pos.w.Ym
	Electr.Pos.wo.Ym
	Dosing pump 2P.
	Dosing pump 3P.
	Solenoid pump 2P.
	Solenoid pump 3P.
	Analog output 2P.
	Analog output 3P.
	Dosing contact
Tp	10 s – 180 s (60 s)
Ty	10 s – 180 s (90 s)
Sample time T	1 – 20 s

Ym calibration	Auto
Ym calibration	Manual
Ym calib. points	2, 3, 6, 11
max. Pulse/min	100/120/140/160/180
Hysteresis	Depending on measuring range 0.01 – 0.50 / 00.1 – 5.0 / 1 – 50
min. ON	1min00s – 59min59s

Setup

Flow source	Off/flow measurement
Flow direct ion	direct/inverse
Control Input 2	Off/measurement X
Input direction	direct/inverse
Control direct	direct/inverse
X factor	0,1 – 4,0
Ymin	0 – 100 %
Ymax	0 – 100 %

Parameter

Xsh	0,0 – 5,0 %
Tkonst	30 s – 10 min
Tvar	30 s – 5 min
Max. lin. correction	0 – 100 %
Control factor	0,1 – 50
Xp	1 – 1000 %
Tn	0,0 – 100.0 min
PI shutdown	5 – 100 %

Measuring range

Range start | | | pH | mV | | | mA/V |

Adjustment of measuring range initial value:

pH	0.00 – 5.00
mV	-1000 – +900 (min 100 mV to end value)
mA/V	Freely definable

Range end | | | pH | mV | | | mA/V |

Adjustment of the measuring range end value:

pH	9.00 – 14.00
mV	-900 – +1000
mA/V	Freely definable

Measuring range | Cl2 | Mem | | | F^- | LF | |

Adjustment of the measuring range:

Cl_2	100 / 200 / 500 µg/l 1.00 / 2.00 / 5.00 / 10.0 / 20.0 / 50.0 / 100 / 200 mg/l
Mem	100 / 200 / 500 µg/l 1.00 / 2.00 / 5.00 / 10.0 / 20.0 / 50.0 / 100 / 200 mg/l
F^-	2.00 / 5.00 / 20.00 mg/l
LF	2500 µS/cm / 10.00 mS/cm / 20.0 mS/cm / 50.0 mS/cm / 100.0 mS/cm / 200 mS/cm 500 µS/cm
Cl_2/Micro 2000	100 / 200 / 500 µg/l 1.00 / 2.00 / 5.00 / 10.0 / 20.0 / 50.0 / 100 / 200 mg/l 20.0 / 10.0 / 5.00 / 2.50 / 2.00 / 1.00 g/l

Sensor type

Cl2	Mem					

Definition of the sensor with 3-electrode cells:
free $Cl_2Cl_2^{++}$, ClO_2, O_3, $KMnO_4$

A readily programmable sensor type is also available. This can initially be selected under "_ _ _ _". In the "sensor name" menu the name of the sensor can be set.

Definition of the sensor with membrane cells:
Cl-N total, Cl-N combined, ClO_2sel., O_3sel., Cl_2free (M)

Unit

Cl2	Mem					mA/V

Cl_2	mg/l, µg/l, ppb, ppm
Mem	mg/l, µg/l, ppb, ppm
mA/V	max. 5 free definable characters

Sensor name

Cl2						

Setting of a customer-specific sensor name, for example, "$KMNO_4$" with a maximum of seven definable characters.

Format

						mA/V

Selection of the displayed number format for mA/V sensor modules:
000.0 / 00.00 / 0000

Upot

Cl2						

Adjustment of the potential voltage with 3-electrode cells:
0 – 1000 mV

µA measuring range

Cl2	Mem					

Select the µA signal measuring range for 3-electrode cells and membrane sensors:
70 µA, 100 µA, 200 µA, 1000 µA
for Micro 2000 and Deox 2000: 10 µA, 100 µA, 1000 µA

Signal Cl_2 free

	Mem					

Allocation of the signal used for reading the free Cl_2 value, either CAN external or analog (mA input 1).
Only applicable is using a Cl-N-sensor.

Signal

						mA/V

Setting the connected measurement signal:
0 – 20 mA, 4 – 20 mA, 0 – 10 V, CAN external
power supply should be arranged in accordance with this setting (see 9. “Wiring Diagrams”)

Factor

						mA/V

Factor for adapting an external input signal:
0.1 – 4.0

Reference temp.

					LF	

Adjustment of the reference temperature for the conductivity measurement:
20°C / 25°C

Salt displ.

					LF	

Display => NaCl in g/l / NaCl in % / TDS in g/l / off
TDS factor =>0.4 – 1.0 (if TDS display is active)

TDS:
Total Dissolved Solids = filtrate dried solid matter content in g/l
The TDS factor depends on the composition of the sample water and must be determined for each water type.

Limit value 1

Min I	within measuring range
Max I	within measuring range
Min II	within measuring range
Max II	within measuring range
Hysteresis	Depending on measuring range 0.01 – 0.25 / 00.1 – 05.0 / 1 – 50

Limit value 2

Min You/Ym	0 – 100.0 % (not with single feedback closed loop control)
Max Yout/Ym	0 – 100.0 % (not with single feedback closed loop control) Ym is only output when positioner feedback is available, otherwise the controller output Yout
Hysteresis	0.1 – 5.0 %
Min Ypi	0 – 100 % (only with compound loop)
Max Ypi	0 – 100 % (only with compound loop)
Hysteresis	0.1 – 5.0 % (only with compound loop)

Adaption Adaption is only available for single feedback closed loop control „DES“ modules.

Tu	1 – 3600 s (60 s)
Ts	0,1 – 480.0 min (10 min)

Menu - Module type

Please note

The displayed menus and selection parameters depend on the number of sensor measuring modules installed and the selected application. All the parameters illustrated here are not displayed at the same time.

Basic display Refer to main menu

Menu select Display of all available menus

Module type (2) menu Display of all available settings for module type 2

Control

Control output	OFF
	Dosing contact
Hysteresis	Depending on measuring range 0.01 – 0.50 / 00.1 – 5.0 / 1 – 50
min. ON	1min00s – 59min59s

Setup

Control direct	direct/inverse

Measuring range

Range start | | | pH | | | | |

Adjustment of measuring range initial value:

pH	0.00 – 5.00

Range end | | | pH | | | | |

Adjustment of the measuring range end value:

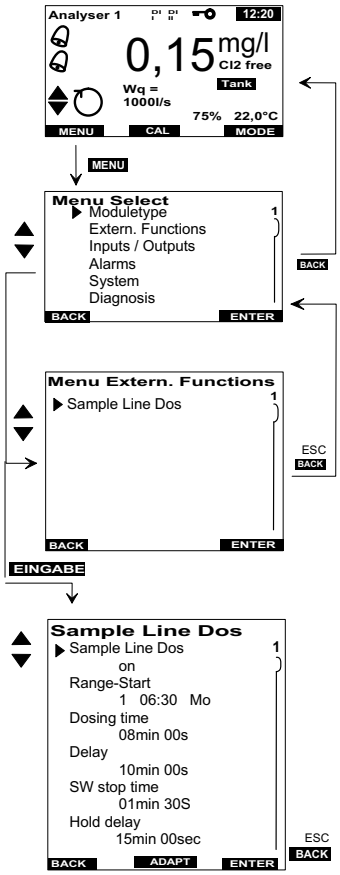
pH	9.00 – 14.00

Limit value

Min	within measuring range
Max	within measuring range
Hysteresis	Depending on measuring range 0.01 – 0.25 / 00.1 – 05.0 / 1 – 50

Menu - Extern. Functions (This function is only available with DES modules.)

Basic display



Menu select

Menu Extern. Functions

Sample Line Dos

Basic display Refer to main menu

Menu select Display of all available menus

Menu Extern. Functions Display of all available input/output settings

Sample Line Dos

Sample Line Dos	OFF	OFF - ON
Range-Start	1: 00:00 ----	9 start times, can be programmed by day of the week or the same start time can be used for several days, e.g. 1:06:30 MON-SUN
Dosing time	00 min 30 sec	30 sec - 20 min
Delay	00 min 00 sec	0 ... 30 min
SW stop time	01 min 30 sec	1 min 30 sec - 59 min 59 sec (always at least dosing time + 1 min)
Hold delay	15 min 00 sec	0 - 20 min

Menu - Inputs/Outputs

Basic display

Menu select

Menu Inputs/Outputs

Flow rate

Flow limit values

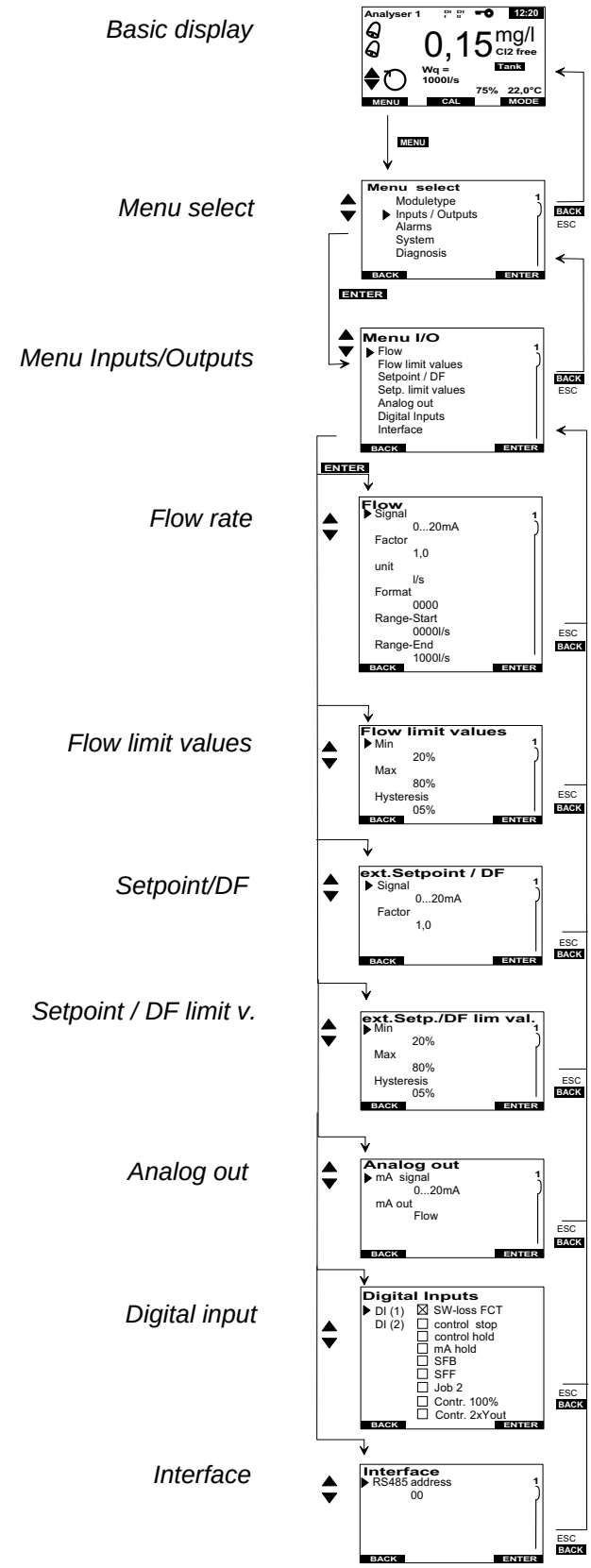
Setpoint/DF

Setpoint / DF limit v.

Analog out

Digital input

Interface



Menu - Inputs/Outputs

Basic display Refer to main menu

Menu select Display of all available menus

Menu Inputs/Outputs Display of all available input/output settings

Flow rate

Signal	0 – 20 mA, 4 – 20 mA
Factor	0,1 – 4,0
Format	Measurement display 000.0 / 00.00 / 0000
Unit	Max. 5 digits (any combination)
Range-Start	Freely definable
Range-End	Freely definable

Flow limit values

Min	Min limit value within measuring range
Max	Max limit value within measuring range
Hysteresis	0,1 – 5,0 %

Setpoint/DF

Signal	0 – 20 mA, 4 – 20 mA, Off
Factor	0,1 – 4,0

Setpoint / DF limit v.

Min	Min. limit value of the external signal input 0 – 100.0 %
Max	Max. limit value of the external signal input 0 – 100.0 %
Hysteresis	1 – 25 %

Analog out

mA signal	0 – 5 mA, 0 – 20 mA, 4 – 20 mA, 0 – 10 mA, off
mA	Measured value sensor module, flow, ext. setpoint/DF, Yout/Ym, Ypi Measurement value SiDiSens (if available)

Digital input

DI (1), DI (2)	Every digital input can be assigned a function.
SW-LOSS FCT (only with DI (1))	Yout = 0 %, dosing, mA continuous = 0 % if DI is activated, the feed stops after the preset sample water delay. If DI is deactivated, the feed starts after the preset feed delay. See Menu - System - Safety
CONTROL.STOP	Yout = 0%, dosing, mA continuous = 0%
CONTROL.HOLD	Yout remains constant, i.e., the control signals are kept constant.
MA HOLD	All mA outputs remain unchanged, while DI is active.
SFF	If the DI is active, the control mode switches to single feed forward.
SFB	If the DI is active, the control mode switches to single feedback closed loop control.
JOB 2	If the DI is active, the device switches to the settings of configuration 2.
CONTR. 100 %	If the DI is active, the controller output switches to Yout = 100 %.
CONTR. 2x Yout	If the DI is active, the controller output Yout is doubled.

Interface

RS485 address	Bus addresses 00 – 31 (0)

Menu - Alarm

Basic display

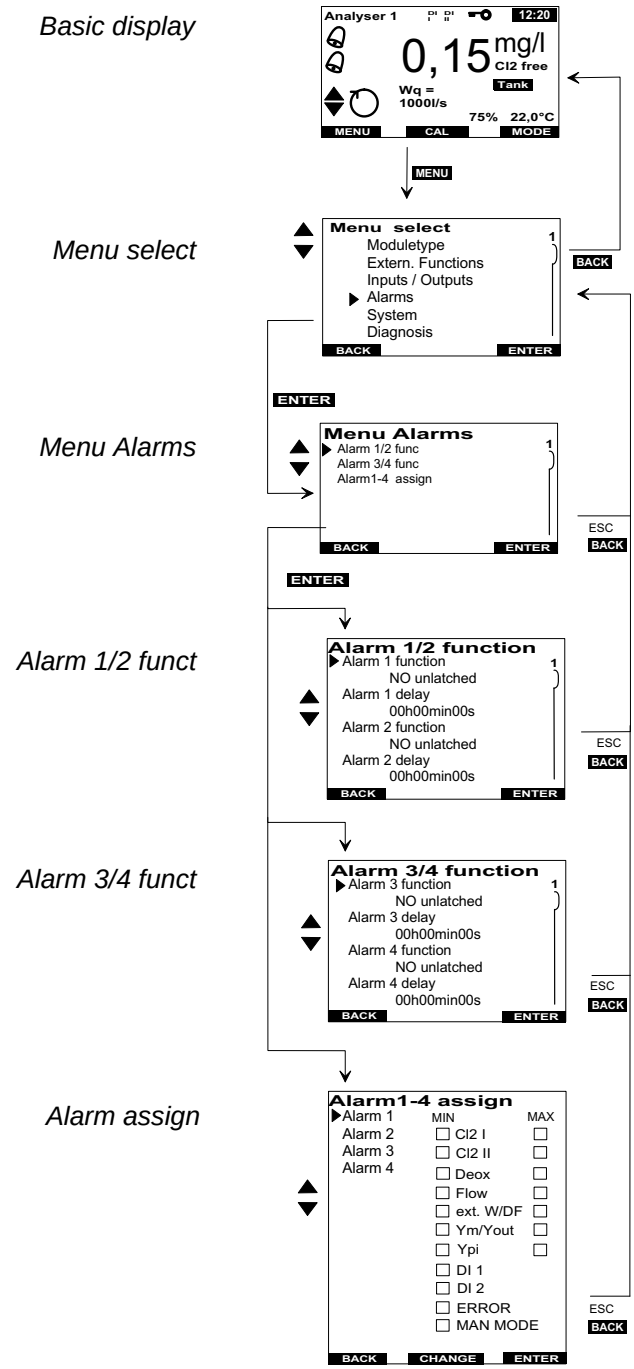
Menu select

Menu Alarms

Alarm 1/2 funct

Alarm 3/4 funct

Alarm assign



Menu - Alarms

Basic display Refer to main menu

Menu select Display of all available menus

Menu Alarms Display of all available settings

Alarm 1/2 funct

Alarm 1 function	Defines the contact condition of the alarm relay, if the alarm is not active. N.O. unlatched N.C. unlatched N.O. latched res N.C. latched res N.O. latched ack N.C. latched ack
Alarm 1 delay	00:00 – 10:00 h ON delay
Alarm 2 function	See description of alarm 1
Alarm 2 delay	See description of alarm 1

Alarm 3/4 funct

Alarm 3 function	See description of alarm 1
Alarm 3 delay	See description of alarm 1
Alarm 4 function	See description of alarm 1
Alarm 4 delay	See description of alarm 1

Alarm assign. 1/2/3/4 This parameter gives the option of defining the switching conditions for the alarms:

Min I and Max I of the measurement of the sensor module
Min II and Max II of the measurement of the sensor module
Min and max of the SiDiSens (if available)
Min and Max of the SO_2measurement with Deox application
Min and Max of the flow
Min and Max of the external setpoint/dosing factor
Min and Max of the controller output Yout or Ym
Min and Max of the controller output Ypi
DI (1)
DI (2)
ERROR
MAN MODE

Menu - System

Basic display

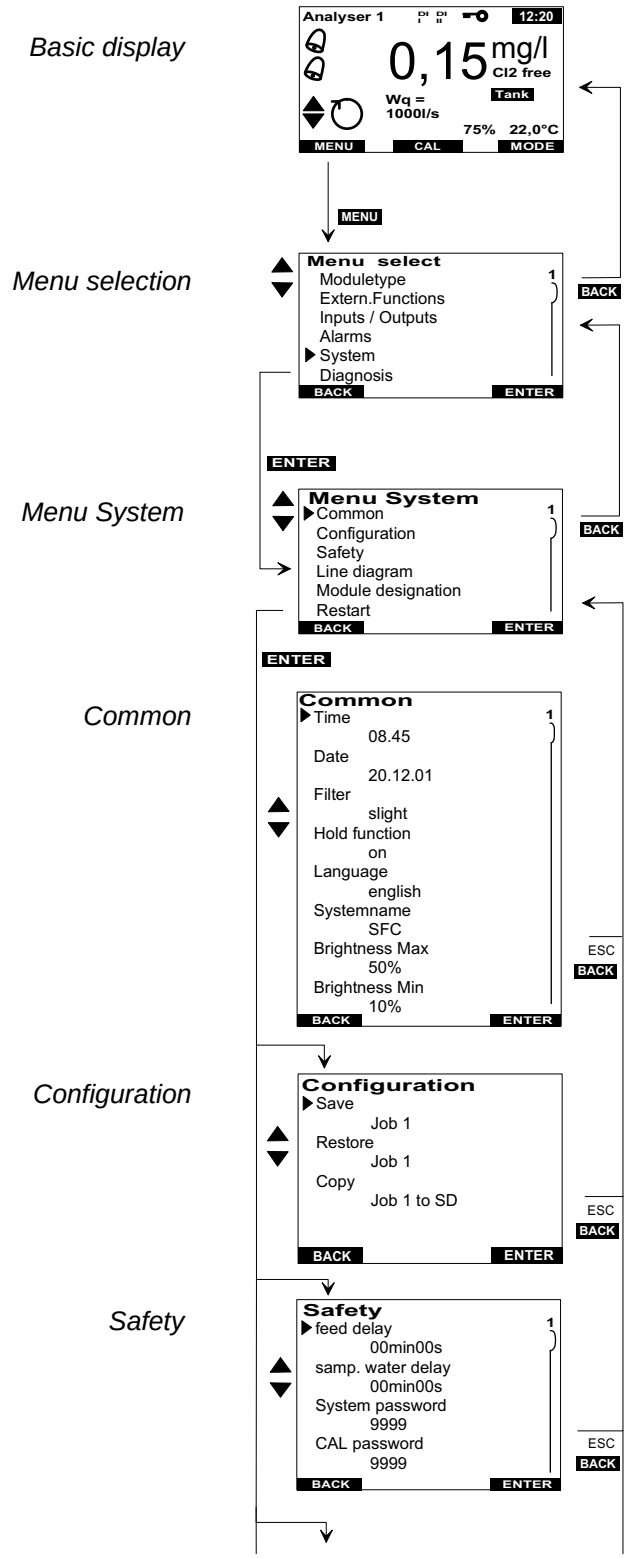
Menu selection

Menu System

Common

Configuration

Safety



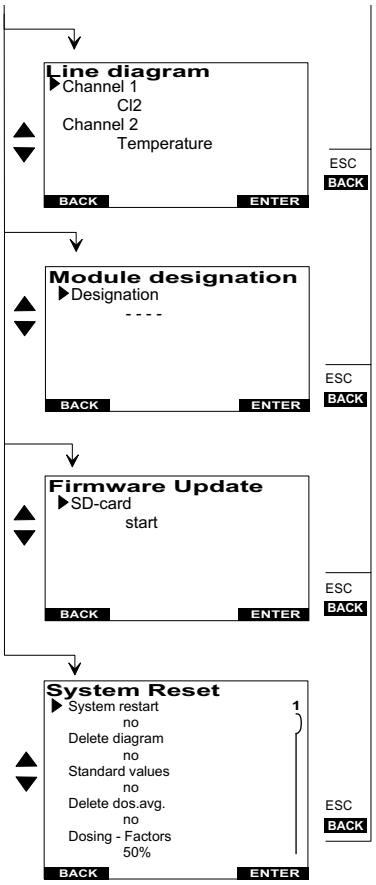
Menu - System

Line diagram

Module designation

Firmware Update

System Reset



Menu - System

Basic display Refer to main menu

Menu selection Display of all available menus

Menu System Display of all available system settings

General

Time (hh:mm)	Current time
Date (dd.mm.yy)	Current date
Measure. filter[1)]	Off / low / high
Hold function	Off/On (Keeps the measured value constant during calibration)
Language	German, English, French, Dutch, Polish
System name	12 characters; each with character set A-Z and digits 1-9 incl. special characters
Brightness max	Setting the backlight brightness for operation 10% (min) ... 100% (default 50%)
Brightness min	Setting the backlight brightness for idle period 10% ... Max (default 10%)

Please note

At increasing lifespan the backlight brightness drops. The backlight brightness can be adapted to the respective ambient conditions or to other systems.

Automatic reduction of the backlight of the display.

To avoid reducing the lifespan of the backlight unnecessarily, automatic reduction of the backlight is activated by default. In this way five minutes after the last keyboard entry the brightness of the backlight is reduced from max. brightness to min. brightness. To deactivate this function, both brightness values can be set to the same percentage (not recommended).

Configuration

Save	Gives the option of saving all device settings, including the application, as Job 1 or Job 2
Restore	Gives the option of restoring saved or stored configurations. The current menu settings are overwritten in the process. Job 1 or Job 2
Copy	If an SD memory card is installed, the configurations Job 1 and Job 2 can be copied to and from the SD memory card. The current operating configuration (act.) can also be copied. Job 1 to SD Job 2 to SD SD to Job 1 SD to Job 2 act. to SD-Job 1 act. to SD-Job 2 SD-Job 1 to act. SD-Job 2 to act.

Safety

feed delay[2])	00:00 – 10:00 (03min : 00s)
Samp. water delay[3)]	00:00 – 10:00 (01min : 00s) (sample water delay)
System password	four-digit numeric code (activate with softkey "LOCK" in the "Menu Select" window)
Calib password*	four-digit numeric code (activate with softkey "LOCK" in the "Menu Select" window)

* only if system password is set

Trend Graph

channel 1 channel 2	Assignment of a measured value to the trend graph. The selected measured value is plotted in the trend graph (can be traced back up to 30 days if the SD memory card is installed, without the SD memory card from 0 to 24 hours). The measurement value of the sensor measurement module, measurement value of the SiDiSens (if available), flow rate Wq, external set point/dosing factor, temperature, Yout control signals, can be entered. If the setting „Off“ is selected, the relevant channel is not logged.

Please note

If Ym is available, the Ym value is displayed instead of Yout.

Module designation

Module	Max. 7 characters, customer-specific input If blanks are entered, the module designation is switched off. The designation is shown on the main display beneath the unit.

System reset

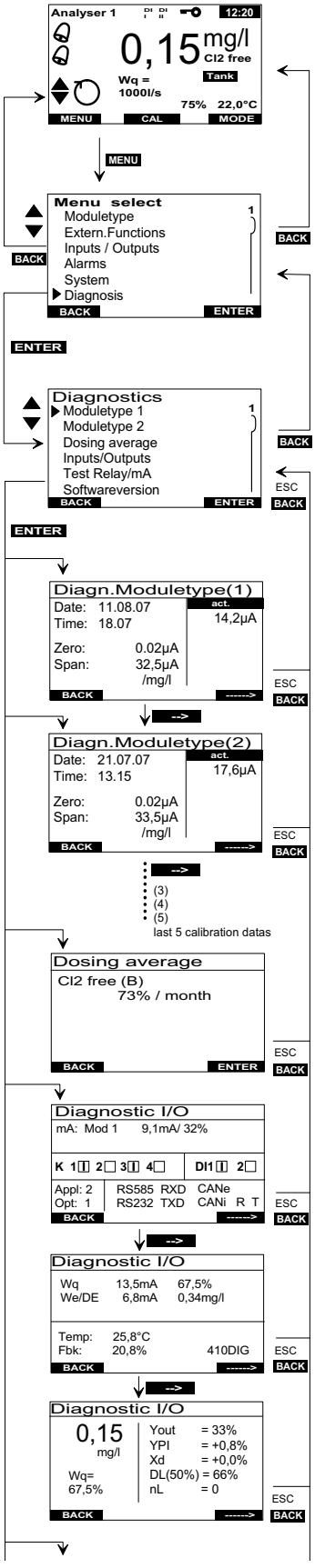
System Restart[4)]	yes/no
Delete graph[5)]	yes/no
Standard values[6)]	yes/no
Delete dos.avg[7)]	yes/no
Dosing Factors[8)]	0 – 100 %

Please note

The system settings marked with 1) to 8) are explained below.

	Explanation of system settings
[1] *Measure. filter*	The measurement filter serves to compensate measurement value fluctuations in the event of irregular measurement value signals.
[2] *Feed delay*	The feed delay delays the start of dosing when the unit is switched on and when the operating mode has been changed. The selected delay time can be cancelled by pressing the "Acknowledge" key.
[3] *Samp.water delay*	The sample water delay (DI 1) determines the time after which dosing is deactivated, e.g., in the event of a sample water stop. DI 1 flashes while the delay time is running.
[4] *System restart*	When the applications are changed, the device must be restarted using System restart.
[5] *Delete graph*	The stored measured values of the trend graph are deleted.
[6] *Standard values*	Deletes customer settings (except for the selected application), resets system to factory settings. The sensors must be recalibrated.
[7] *Delete dos.avg*	The dosing average is set to zero.
[8] *Delete DL diagram*	Resets the dosing factor table to the set value and all training meters to zero.

Menu - Diagnosis



Menü - Diagnose

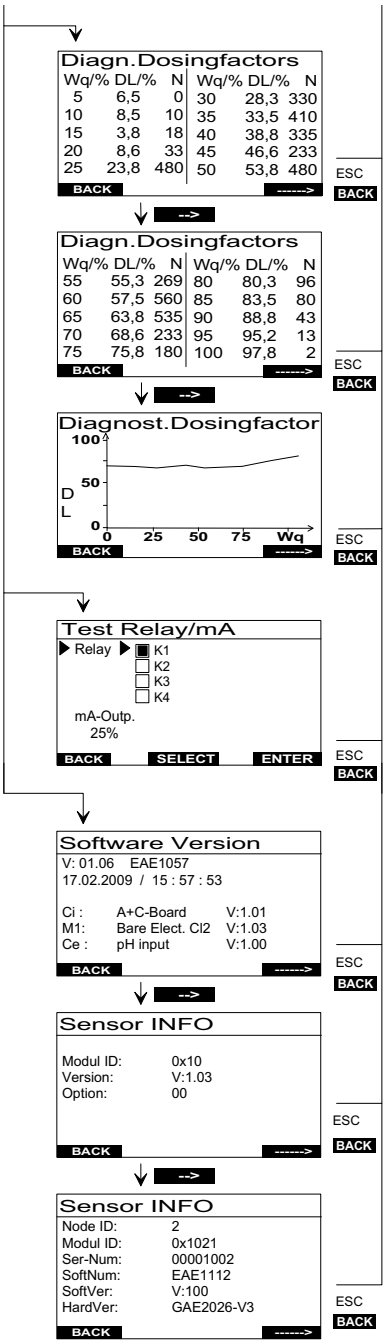
Diagn. Dosing factors

Diagn. Dosing factors

Diagnosis Dosing factor

Test Relay/mA

Software Versionen



Menu - Diagnosis

Basic display Refer to main menu

Menu selection Display of all available menus

Diagnosis Display of all available diagnosis displays

Diagnose module type (1-5) For example Cl_2 Scroll with softkey „-->“

Calibration data of 3-electrodesensor for Cl_2, $KMnO_4$, O_3, ClO_2, Cl_2++ Calibration data with date and time of the last 5 calibrations (1-5)

zero	Zero point signal of the measuring cell
span	µA-signal based on 1 mg/l
act.	current µ A-sensor signal

pH calibration data Date and time of the last 5 calibrations

pH7	Signal offset with pH 7 in mV
Span/pH	mV-signal of the pH sensors based on 1 pH step
Offs	Manual offset in pH (menu 2.1.2 - Offset pH)
act.	current mV sensor signal

Redox calibration data Date and time of the last 5 calibrations

Offset	Signal offset of the mV sensor in mV
act.	current mV sensor signal

Membrane sensor calibration data Cl tot, O_3 sel, ClO_2 sel, Cl comb, Cl_2 free Date and time of the last 5 calibrations

zero	Zero point signal of the membrane sensor (only with 2-point calibration mode, not with Cl_2 tot)
span	µA-signal based on 1 mg/l
act.	current µ A-sensor signal

F^- calibration data

Date and time of the last 5 calibrations

Zero	Established zero point signal of the sensor
Decade	mV signal of the sensor based on 1 decade (log)
act.	current mV signal of the sensor

Conductivity calibration data

Date and time of the last 5 calibrations

Span	Calibration factor of the conductivity measuring cell
act.	Displays the current sensor power in mA Displays the current sensor voltage in mV Displays the current temperature of the conductivity sensor

Diagnosis dosing average

Displays the dosing average of the previous hour, day, week, month

Inputs/Output diagnosis

Information on

- Assignment of the mA output
- The current mA output in mA and %
- The current circuit states of the relay ☐ Relay off ▮ Relay on
- The selected application
- Display the option (Opt = 1 -> with process control, Opt = 0 -> without process control)
- The send/receive state of the interfaces RS485, RS232, CAN external and CAN internal
- The current circuit states of digital inputs 1 and 2

Second display - Inputs/Outputs

- The current input signal of the flow rate measurement (Wq)
- The current input signal of the external setpoint (We) or external dosing factor (ext. DF) DF
- Temperature display
- Feedback signal display

Third display - Inputs/Outputs

Information on

- Measured value module
- compound loop Yout in %
- Ypi-share of Yout in %
- Control deviation Xd in %
- Dosing capacity (DL) in % acc. to the current flow rate from the dosing factor table
- nL delay until new DL value is accepted in the dosing factor table (entry at 120)

Diagnost.Dosingfactor

Displays the learned DL dosing factors for the compound loop output depending on Wq (display in 5 % increments). N describes the training meter, how often a dosing factor was learned for this Wq value. This table can be displayed as a diagram (toggle with the ---> key).

Test relay/mA

This menu enables the manual switching on and off of the relay outputs and also manual simulation of the mA output signals from 0...100% (0/4 ... 20mA) for test purposes. Exiting this menu clears the manual settings again.

Software versions

Displays the software versions of the front panel boards of the sensor measurement module and the A&C boards

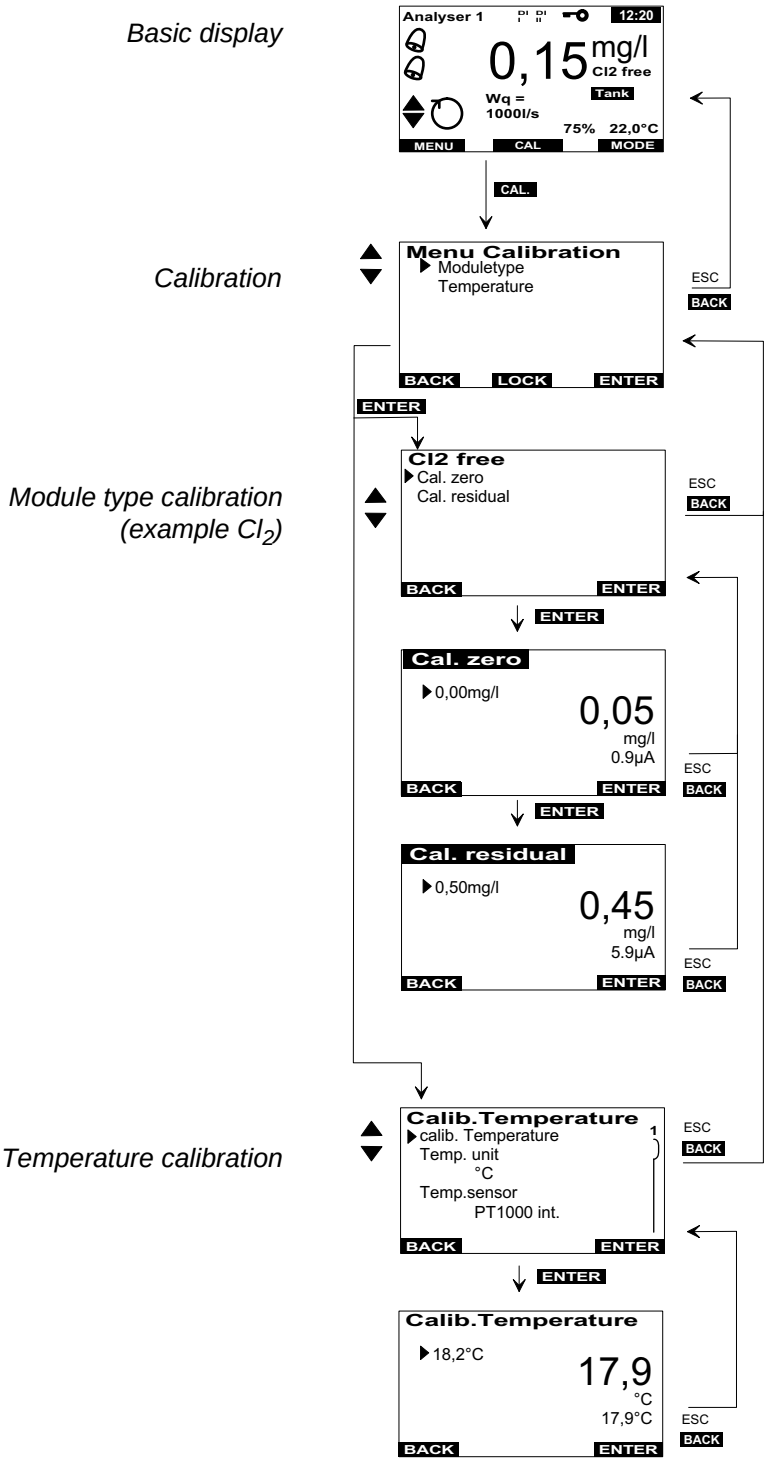
Menu - Calibration

Basic display

Calibration

Module type calibration (example Cl_2)

Temperature calibration



Menu - Calibration Refer to 6.4 “Calibration”.

Basic display Refer to main menu

Calibration Display of all available calibration options

Module type calibration Cl_2 free, Cl_2++, ClO_2, O_3, $KMnO_4$

Cal. zero	with softkey "ENTER" the display is set to „0.00 mg/l"
Cal. residual	within measuring range

Module type pH calibration

Calibrate pH7	6.85 – 7.15 pH
pH calibration	within measuring range
Corr. pH	-1,00 – +1.00 pH (0pH)
Cal. at temp.	0 – 50°C
Man. temp. comp.	0 – 50°C

Module type mV calibration

Cal. ORP	within measuring range

Fluoride calibration

Cal. low value	within measuring range
Cal. high value	within measuring range

Module type calibration Conductivity

Calib	0 – 200 mS/cm
Calib. temperature	0 – 50 °C

Module type calibration Membrane sensors ClO_2, O_3 sel, Cl_2 free

Zero span/DPD	within measuring range
Calib. span	within measuring range
Calibration mode	1-point/2-point

Membrane sensor calibration Cl tot

Calib. total	within measuring range

Membrane sensor calibration Cl comb.

Calib. total	within measuring range
Calib. combined	within measuring range

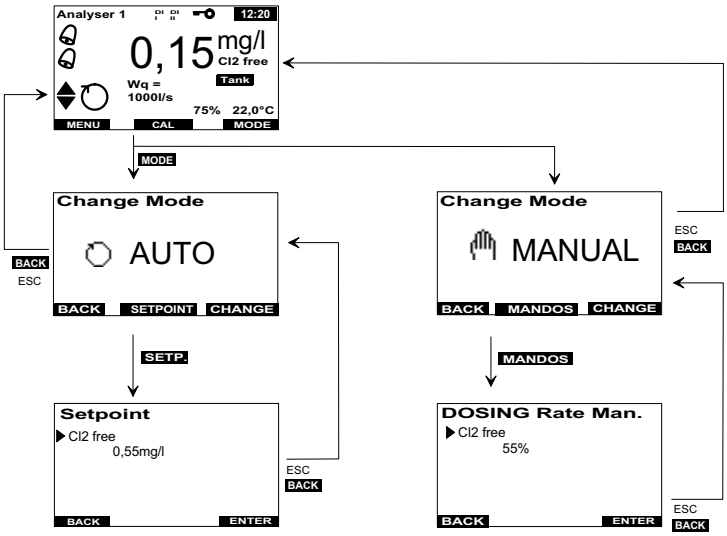
mA/V input calibration

Cal. zero	within measuring range
Cal. span	within measuring range

Temperature calibration

Calib. temperature	0 – 50°C
Temp. Unit	°C/°F
Temp. sensor	Switching automatic temperature compensation on or off, selection of the internal temperature sensor (temperature input A&C board), or sensor measuring module (temperature input sensor measuring module option). With the PT1000 switched off, a manual temperature value can be entered in the calibration menu when a pH measurement is taken.

Menu - Operating mode Display with the example of a chlorine measurement



Basic display Refer to main menu

Manual / Automatic AUTO / MANUAL
toggle using the "CHANGE" softkey

Setpoint Setting the setpoint or dosing factor (depending on the sensor measuring module and application)

Dosing Rate MANUAL Setting the dosing capacity for manual operation

Smooth switching between operating modes

Switching from automatic to manual or from manual to automatic mode

To switch smoothly from automatic to manual mode or from manual to automatic mode while maintaining the same dosing capacity:

AUTO -> MANUAL

1 Press and hold the **CHANGE** softkey for approx. 2 - 3 seconds to apply the current dosing capacity in manual mode. The display switches to "Dosing capacity MANUAL".

2 The dosing capacity can now be set manually.

MANUAL -> AUTO

1 Press and hold the **CHANGE** softkey for approx. 2 - 3 seconds to apply the current dosing capacity in automatic mode.
The prompt "Do you wish to use the current dosing capacity?" is displayed.

2 Press "Yes" to confirm and leave the current dosing capacity unchanged.
Press "No" to change the dosing capacity.

Description of the operating modes

MANUAL

Dosing is not automatically controlled in the MANUAL mode. The values must be continuously monitored.

The MANUAL mode is used:

- In the event of any possible system faults
- during maintenance/cleaning work or while checking the system

Please note

The MANUAL mode leads to:

The pumps are off, the positioner remains in its current position, if necessary unlock the positioner and close either by hand or with the Man.dos. menu.

AUTOMATIC

Automatically controls the measured variables acc. to the selected application

STOP

STOP mode is automatically activated:

- When the sample water flow is faulty
- When a stop signal is received via the digital inputs

After activation:

- Pumps off, positioner closed, mA analog output 0 %
  If the stop conditions are no longer active, the system automatically switches to automatic mode.

ADAPTION

ADAPTION mode is activated, if the adaption is started for the Cl_2 single feedback closed-loop control.

For more details concerning adaption, refer to 4.9 “Adaption”.

6.4 Calibration

Sensor measuring module calibration

Caution!

With the pressurized version, when calibrating the sensor modules

- pH value
- Redox voltage
- Conductivity
- Fluoride
- membrane sensors for free chlorine, chlorine dioxide, ozone and
- Total chlorine

the following tasks must also be completed:

Before calibration:
Close the ball valves on the inlet and outlet.
Depressurize the unit. To do this, briefly open and close the drain.

After calibration:
Open the inlet and outlet.

Caution!

The electrode fingers or membranes on the sensors are extremely sensitive! Do not touch, soil or damage them.

Caution!

Note the safety data sheets for buffer solutions.

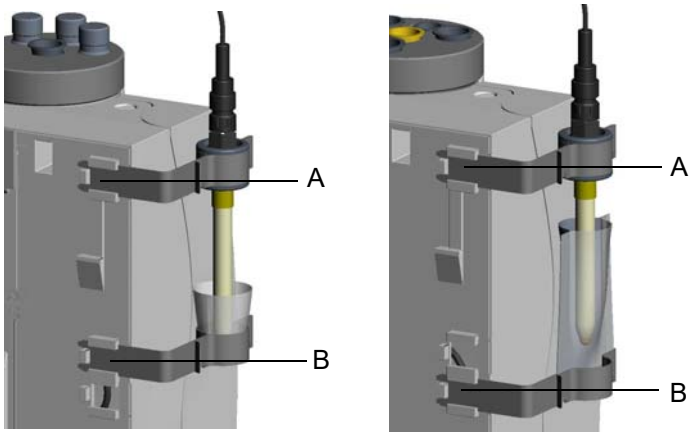
Please note

To prevent the output of incorrect control signals during calibration, the "Hold function" in the system menu should be set to "On". mA outputs and the controller output then remain constant, as long as a calibration menu is open.

To find out how often you must calibrate, refer to7.1 “Maintenance Schedules”.

Calibration aids of the flow rate module DEPOLOX® 5, DEPOLOX® Pool, VariaSens

Two clips are installed in the housing cover. These clips can be inserted into the rear panel of the housing.
The clip (A) for the sensor will be inserted into the upper catch. When the electrodes are calibrated in the beaker with the calibration solution, the second clip (B) will be inserted into the middle catch (left figure). The lower clip position is provided for calibrating with the calibration solution bag (right figure).



Picture 3 Fastening clips

A Upper clip
B Lower clip

6.4.1 Temperature calibration

1 Starting from the basic display in the main menu select the "Calibration" menu.

2 Select the "Temperature" menu item

The window "Calib. temperature" appear on the graphic display.

3 Select the "Cal. temperature" parameter.

4 Perform comparative temperature measurement.

5 Open the menu with the „Enter“ key and enter the ascertained value with the arrow keys.

6 Save the value by pressing the „Enter“ key.

This concludes the temperature calibration.

Please note

It is possible to select °C or °F in the „Temp. unit“ menu. The required temperature input can be selected or switched off in the „Temp. sensor“ menu.

6.4.2 3-electrode cell (DEPOLOX® 5 and DEPOLOX® Pool) calibration

Calibration of the 3-electrode cell for Cl_2, $KMnO_4$, O_3, ClO_2 and Cl_2++ (pH-compensated).

Before Cl_2++ calibration, it must be ensured that the pH measurement is calibrated correctly.

During calibration of the 3-electrode cell, perform a zero point calibration and a measurement value calibration (DPD).
The calibration process is nearly the same for chlorine, chlorine dioxide, ozone and potassium permanganate.
The difference lies in the fact that some of the reagents are measured with a photometer and others with a colour meter.

Zero point calibration

1. Starting from the basic display in the main menu select the "Calibration" menu.
2. Select the measurement to be calibrated from the menu, e.g. Cl_2 free.
3. Select the "Cal. zero" parameter.
4. Close the ball valve on the sample water inlet.

Please note

When the sample water supply has been stopped, the display first drops rapidly, and after approximately one minute slowly approaches zero. During commissioning it is essential to wait for 5 minutes, even if the display is already blinking or stands at "0.00" after a few seconds.

5. Wait until the displayed value or the µA-sensor signal no longer changes for at least one minute.
6. Press the "ENTER" softkey to set the display to zero and press „Enter“ again to save the value.
7. Press the softkey „Back“.

Zero point calibration with disinfectant-free water

8. If disinfectant-free water (e.g. by switching off the dosing system) is available, zero point calibration can be performed with it. To do this, switch off the dosing system and perform steps 1, 2, 3, 5 and 6. The delay times for sample water extraction and dosing must be observed here (waiting time)!
9. Open the ball valve on the sample water inlet.

Measurement value calibration (DPD)

10 After zero point calibration, wait at least 2 minutes.

11 Select the parameter "Cal. Span" and confirm with "Enter".

12 Open the input menu by pressing "Enter". The actual measured sensor value is thereby cached and can be used for later calibration. This is absolutely essential for fluctuating measurement values.

13 Immediately after this extract specimen of sample water.

14 Determine the free chlorine, ozone, chlorine dioxide or potassium permanganate content, for example, with a photometer.

15 Use the arrow keys to enter the determined value. Finally save by pressing "Enter". Should the measured sensor value (µA) according to step 12 have changed, the measured value displays another value immediately after calibration than that which was entered in the calibration menu. This is based on the change in the measured value during the calibration process between step 12 and 15.

16 Press the soft key "back" several times until the main display is shown. This concludes the calibration.

Please note

In the DPD calibration of the Cl_2++ measurement the calibration value should be greater or equal to 25 % of the measuring range.

6.4.3 Membrane sensors calibration

Calibration is nearly identical for all membrane sensors. The difference lies in the fact that some of the chemicals are measured manually with a photometer and others with a colour meter.
A 1-point calibration is available to calibrate the total chlorine measurement and the combined chlorine measurement.
Either the total chlorine or the combined chlorine must be calibrated.

For the selective ozone, chlorine dioxide and free chlorine measurements, 1-point or 2-point can be selected in the calibration menu of the „Calibration mode“.
2-point calibration provides the option to compensate for possible measuring cell zero point offsets.

Total chlorine

In the calibration of the total chlorine measurement, the free chlorine value is also essential. For this reason, prior to calibration, the current free chlorine value must be entered in the menu calibration-Cl-total "Enter free Cl2". Only then shall the total chlorine calibration be carried out as follows:

1 Using the soft key "calib", select the menu item "Cl-total" and press "Enter" to confirm.

2 Select the parameter "calib. total" and press "Enter" to confirm.

3 Open the input menu by pressing "Enter". The actual measured sensor value is thereby cached and can be used for later calibration. This is essential for fluctuating measurement values.

4 Immediately after this extract specimen of sample water and determine the total chlorine content using a comparative device.

5 Use the arrow keys to enter the determined value.

6 Save the value by pressing "ENTER".

Combined chlorine (optional)

The calibration of the combined chlorine measurement also takes into account the free chlorine value. It must therefore be ensured that the free chlorine value (from external measurement system) is correctly calibrated. Calibration can then take place as follows:

1 Using the soft key "calib", select the menu item "Cl-comb" and press "Enter" to confirm.

2 Select the parameters "calib. comb" or "calib total" and press "Enter" to confirm. It does not matter which value is entered.

3 Open the input menu by pressing "Enter". The actual measured sensor value is thereby cached and can be used for later calibration. This is essential with fluctuating measurement values.

4 Immediately after this extract specimen of sample water and determine the combined or total chlorine content using a comparative device.

5 Confirm the selection by pressing "ENTER" and enter the value measured using with the arrow keys.

6 Confirm by pressing "ENTER". This concludes the combined chlorine calibration.

Zero point calibration for ozone, chloride dioxide, Cl_2 free (M)

Zero point calibration using 2-point calibration

Please note

Instead of the zero point, a DPD value can also be calibrated.

1 Starting from the basic display, select the „Calibration“ menu.

2 Select the measurement to be calibrated from the menu, e.g. Cl_2 free (M) and confirm with „Enter“.

3 Select the parameter „Zero span“ and confirm with „Enter“.

4 Run disinfectant-free or disinfectant-reduced water through the flow-through adapter (e.g. by switching off or reducing the dosing system).

5 Allow for the process delay by waiting until the measured value on the display no longer changes.
In disinfectant-reduced water, extract a specimen of the sample water and run a comparative measurement.

6 Press the „Enter“ key to open the setup menu.

7 To enter the calibration value, the zero point or an ascertained DPD value can be entered using the arrow keys (e.g. with reduced dosing).

8 Save the value by pressing the „Enter“ key.

DPD calibration using 1-point and 2-point calibration for O_3, ClO_2 and Cl_2

1 Extract specimen of sample water.

2 Determine the disinfectant content with a comparative device (e.g. photometer).

3 Starting from the basic display, from the main menu, select the „Calibration“ menu.

4 Select the measurement to be calibrated from the menu and confirm with „Enter“.

5 Select the parameter „Calib. span“ and confirm with „Enter“.

6 Confirm the selection with „Enter“ and enter the ascertained value with the arrow keys.

7 Save the value by pressing the „Enter“ key. This concludes the calibration for O_3, ClO_2 or Cl_2 free.

6.4.4 pH calibration

Please note

During pH calibration the buffer solution and the sample water should have the same temperature. If there is a difference in temperature of > 5 °C, first enter the temperature of the buffer solution in the menu "Calibration" - “pH“ under "Cal. at temp.".

pH-7 alignment

1 Starting from the basic display in the main menu select the "Calibration" menu.

2 Select the menu item.
The "pH" widow appears on the display.

3 Select the parameter "Cal. pH7" and confirm the selection.

4 Place one of the supplied beakers into the bottom clip and fill with the buffer solution pH 7.00, or clamp a bag with buffer solution pH 7.00 into the bottom fastening clip.

5 Pull or unscrew the pH sensor from the lid of the cell body.

6 Dip the pH sensor through the top clip at least 2 cm into the buffer solution and move slightly until the indicated pH value remains constant.

7 Confirm the selection with the „Enter“ key and, using the four arrow keys, enter the pH value that corresponds to the buffer temperature, or leave pH 7.00.

8 Save the value by pressing the „Enter“ key.

9 Leave the menu by pressing „Back“.

Slope alignment

10 Remove the buffer solution pH 7.00 from the bottom fastening clip.

11 Wash the sensor in distilled water to prevent carry-over of the buffer solution.

12 Select the parameter "Cal. pH" and confirm the selection.

13 Place an empty beaker into the bottom clip and fill with the buffer solution pH 4.65, or clamp a bag with buffer solution pH 4.65 into the bottom fastening clip.

Please note

If buffer solutions other than those stated are used, the pH value of the buffer solution must be lower than pH 6 or higher than pH 8.

14 Dip the pH sensor at least 2 cm deep into the buffer solution until the indicated pH value remains constant.

15 Confirm the selection with „Enter“ and save the ascertained value with the arrow keys.

16 Save the value by pressing the „Enter“ key.

17 Take the pH sensor out of the upper fastening clip and wash with distilled water.

18 Insert or screw the pH sensor into the lid of the cell body. The pH measurement is then calibrated.

pH calibration

If external influences result in a constant difference between the displayed pH value and a pH value measured manually, this difference can be compensated:

1 Starting from the basic display in the main menu select the "Calibration" menu.

2 Select menu item "pH".

3 Select the parameter "Offset“ and confirm the selection.

4 Confirm the selection with „Enter“ and using the four arrow keys enter the difference between the comparative value and the displayed value (comparative value minus the displayed value).

5 Save the value by pressing the „Enter“ key. This concludes the pH offset.

Please note

The offset is deleted each time a new pH-7 alignment or span alignment is performed.

6.4.5 Redox calibration (mV)

Please note

Redox sensors have long running-in times. After calibration with a buffer solution, it can therefore take several hours until the value has stabilized.

1. Starting from the basic display in the main menu select the "Calibration" menu.
2. Select menu item "ORP" and conform with the Enter key.
3. Confirm the menu „Calibrate mV“ with the „Enter“ key.
4. Place one of the supplied beakers into the bottom clip and fill with the buffer solution or clamp a bag with buffer solution into the bottom clip.
5. Pull or unscrew the Redox sensor from the lid of the cell body.
6. Dip the Redox sensor through the top clip at least 2 cm deep into the buffer solution until the indicated pH value remains constant.
7. Confirm the selection with „Enter“ and enter the ascertained value with the arrow keys.
8. Save the value by pressing the „Enter“ key.
9. Remove the Redox sensor from the top clip.
10. Insert or screw the Redox sensor into the lid of the cell body. Redox calibration is then concluded.

6.4.6 Conductivity calibration

Please note

The conductivity sensor has an integrated temperature sensor and therefore an automatic temperature compensation feature.

In the conductivity calibration menu, the temperature of the temperature sensor in the conductivity sensor can be adapted with the parameter "Cal. temperature" to a comparative measurement.

1 Starting from the basic display in the main menu select the "Calibration" menu.

2 Select menu item "Conductivity" and confirm selection.

3 Select parameter "Calib. conductivity“ and confirm with the „Enter“ key.

4 Place one of the supplied beakers into the bottom clip and fill with approx. 25 ml calibration solution * or clamp a bag with calibration solution* into the bottom clip.

5 Pull or unscrew the conductivity sensor from the lid of the cell body.

6 Dip the conductivity sensor through the top clip into the calibration solution to the bottom of the beaker.

7 Pull out the conductivity sensor and rinse off with distilled water.

8 Repeat the dipping and rinsing procedure several times.

9 Replace the calibration solution in the bottom beaker with a new solution.

10 Repeat measurement. Move the conductivity sensor slightly until the displayed value remains constant.

11 Confirm the selection with „Enter“ and enter the ascertained value with the arrow keys.

12 Save the value by pressing the „Enter“ key.

13 Insert or screw the conductivity sensor into the lid of the cell body.
Conductivity calibration is then concluded.

* Depending on the measuring range:
600 µS/cm calibration solution for a measuring range of 2500 µS/cm
60 mS/cm calibration solution for all mS/cm measuring ranges

6.4.7 Fluoride calibration

The fluoride measurement is calibrated at 2 points, which should be as far from each other as possible, but within the measurement range. The lower value must be calibrated with a lower fluoride concentration than the upper value, e.g. lower value 0.20 mg/l and upper value 2.00 mg/l.
Calibration solutions for 0.20 mg/l, 2.00 mg/l and 100 mg/l are available.

Please note

Before use, the electrode must be placed in a 100 mg/l fluoride solution at pH 7 for approx. 24 hours. This is necessary to guarantee that the electrode functions properly.

1 Starting from the basic display, from the main menu, select the „Calibration“ menu.

2 Select menu item „Fluoride“ and confirm with „Enter“.

3 10 – Fill 20 ml of the lower concentrated standard solution in one of the supplied beakers and place in the bottom clip. Dip the electrode at least 2 cm.

4 Select „Cal. lower value“ in the menu, and press „Enter“.

5 Confirm the selection with „Enter“ and enter the value of the calibration solution using the arrow keys. Wait until the displayed measured value no longer changes.

6 Save the value by pressing the „Enter“ key.

7 Press „Back“ and select the menu „Cal. upper value“. Confirm by pressing „Enter“.

8 Wash electrode with distilled water and fill 10 – 20 ml of the higher concentrated standard solution into one of the supplied beakers. Dip electrode.

9 Confirm the selection with „Enter“ and enter the value of the calibration solution using with the arrow keys and wait until the displayed measured value no longer changes.

10 Save the value by pressing the „Enter“ key.

11 Place the sensor in the flow-through adapter again.

This concludes the fluoride calibration.

Fluoride correction

If external influences result in a constant difference between the displayed value and a fluoride value measured manually, this difference can be compensated:

1. Starting from the basic display, from the main menu, select the „Calibration“ menu.
2. Select menu item „Fluor“.
3. Select the parameter „Offset“ and confirm the selection.
4. Confirm the selection with „Enter“ and using the four arrow keys enter the difference between the comparative value and the displayed value (comparative value minus the displayed value).
5. Save the value by pressing the „Enter“ key.

This concludes the fluoride correction.

Please note

The offset correction is deleted at every new fluoride calibration or slope alignment.

6.5 Errors and remedies

Error messages

The following table shows and explains all possible error messages which can be displayed. If several errors occur at the same time, the corresponding messages appear alternately in succession. When the error has been remedied, the error message is automatically deleted.

If you are unable to remedy the error yourself, please contact your contractual partner.

Error message	Cause	Remedy
Measured value display flashes	Measured value is outside the measuring range	Check measuring range and change, if necessary. Check dosing or controller settings
Positioner feedback flashes	Positioner in manual mode	Press the adjusting knob on the positioner
DI I flashes	Sample water flow recently insufficient (delay running), signal at the signal input DI I	Check the sample water flow rate (approx. 33 l/h)
DI I Permanent display	Sample water flow insufficient for some time (delay elapsed)	Clean or replace the preliminary filter Multi-sensor incorrectly connected or defective
DI II	Signal at the signal input DI II	Check connection and setting
Zero ?	In 3-electrode cells Sensor has zero current > +5 µA or < -5 µA	Upot potential voltage set incorrectly; change, if necessary Electrodes in the 3-electrode cell are soiled; clean and service, if necessary Sample water is not turned off or check valve leaks; turn off sample water, if necessary
	In membrane sensors Sensor has zero current > +5 µA or < -5 µA	Disinfectant in water; calibrate with disinfectant-free water, if necessary Check sensors and replace or service, if necessary

Error message	Cause	Remedy
Calibration?	In 3-electrode cells and membrane sensors Slope error - the sensor current based on 1 mg/l has fallen below the required minimum In measuring range: 10µ : min. 0.04 µA/mg/l 70 µA: min. 0.2 µA/mg/l 100 µA: min. 0.4 µA/mg/l 200 µA: min. 2 µA/mg/l 1000 µA: min. 4 µA/mg/l	Check whether there are air bubbles on the membrane sensor and remove, if necessary Service membrane sensors - replace electrolyte/membrane cap Clean 3-electrode cells, replace cell sand
	With pH with pH 7 calibration, the sensor signal is outside -100 – +100 mV or the sensor delivers a signal outside 46 – 70 mV per pH step the distance of the calibration point is less than 1 pH step	Checks electrode, Check buffer solution, Replace if necessary
	With mV the correction offset of the mV electrode is outside -50 – +50 mV	Check electrodes, Check buffer solution, Replace if necessary
	Conductivity measurement spread is smaller than 0.8 or larger than 1.2	Clean sensor, check, change sensor if necessary
	Fluoride The rate of change of the sensor curve is too small or the calibration limits have been exceeded 0,2 mg/l: 40 – 160 mV 2.0 mg/l: -10 – 100 mV 20 mg/l: -60 – 40 mV The lower cal. value sensor voltage must be 20 mV higher than the upper cal. value	Check electrode, cable and standard solution, use fresh standard solution, replace electrodes
mA output?	Load error The mA output cannot drive its mA output current through the connected current loop (500 Ohm at 20 mA max.).	Check whether the mA signal is required at all (e.g. for plotter). If not, in the "INPUTS/OUTPUTS" menu, „analog output“, switch off the output signal. Check the mA signal cable for interruption
Temperature ?	Interruption in the temperaturesensor or multi-sensor cable	Check multi-sensor and cable

Error message	Cause	Remedy
Setpoint?	Due to modification of the measuring range the setpoint of the controller is outside the measuring range.	Reset the controller setpoint or adjust the measuring range
Sensor temp?	Error in the temperature measurement of the sensor measurement module/SiDiSens Interruption in the temperature sensor or cable	Check the temperature sensor and cable of the measurement module
Cl_2 comb?	Free Cl_2 measurement via CAN bus is not available	Check SiDiSens DES, check setup of CAN bus
Cl_2++?	pH<6 or pH>8,75 pH measurement via CAN bus is not available	Check pH measurement, check SiDiSens DES, check setup of CAN bus
Cell ?	In 3-electrode cells Chlorine sensor not screwed in. No grit cleaning. Sensor, sensor cable or sensor module defective. Sensor measuring module µA measuring range exceeded With pH, F^- and mV modules Sensor, sensor cable or sensor module defective In membrane sensors Sensor, sensor cable or sensor module defective Sensor measuring module µA measuring range exceeded In conductivity modules Sensor, sensor cable or sensor module defective	Screw in sensor correctly. Check grit cleaning. Check sensor, sensor cable or sensor module, replace if necessary. Select higher µA measuring range Check the sensor, sensor cable and sensor module, replace if necessary Check the sensor, sensor cable and sensor module, replace if necessary Check the sensor, sensor cable or sensor module, replace if necessary; clean sensor

Error message	Cause	Remedy
Position. Ym?	Ym range too narrow Position of positioning motor is calibrated wrong	Check the distance between the calibration points.
	Positioner selected, but not connected	Check setting: Positioner with Ym
	Feedback signal incorrect	Check DIP switch for feedback
	Positioner feedback incorrectly connected or defective	Check (refer to 9. “Wiring Diagrams”)
Module?	Sensor module has been removed Sensor module defective	Refit or replace the sensor module
Adaption?	Adaption terminated with error	Refer to 4.9 “Adaption”.
Range?	Min. or max. limit value is outside the measuring range	Check the min/max limit values and change, if necessary
mA-Input 1 ? mA-Input 2 ?	mA-Input signal has been exceeded or fallen short of	Check mA connection or signal
Ym calibration?	Positioner calibration incorrect	Check calibration of the positioner
CAN measurement?	No CAN bus station present	Check CAN bus, configure CAN station
CAN-actuator?	No CAN bus actuator present	Check CAN bus, configure CAN station
Ym display blinking	Positioner disconnected	Switch positioner to automatic
Sample Line Dos	Automatic sample water inlet disinfection	Time-controlled function is ended automatically, as soon as the process is complete

Error The following table shows and explains possible errors which can occur. If you are unable to remedy the error yourself, please contact your contractual partner.

Error	Cause	Remedy
No indication on device	No power supply	External switch or fuse on
	Device fuse defective	Check the power supply and replace fuse (Electrician)
	Housing cover is fitted incorrectly	Check and, if necessary, fit the housing cover correctly (cable possibly trapped)
Displayed/output value incorrect	Change on sensor or in the sample water	Calibrating
Low controller quality (controller swings, setpoint not reached)	Incorrect control parameters	Check, adjust controller parameters; perform automatic adaption on single feedback closed-loop control
	Dosing chemical tank empty	Fill, replace
	Incorrect actuator selected	Check, correct actuator
	Positioner or pump defective	Check, replace positioner/pump
Measured value display not available, although the appropriate measuring module is installed	Measuring module defective or fitted incorrectly	Check, replace measuring module (Electrician)
Positioner/pump does not work	Positioner in manual mode	Engage manual knob
	Dosing device selected incorrectly	Select correct dosing device
	Positioner/pump incorrectly connected	Connect the positioner/pump correctly (Electrician)
	Relay defective	Check, (Electrician)
	Incorrect application	Check (refer to 4.9 “Adaption” or 9. “Wiring Diagrams”)
Positioner runs in wrong direction	Positioner incorrectly connected	Correct connections (Electrician)
Positioner closes	Positioner feedback interrupted	Correct connections (Electrician)
Digital outputs without function	Digital inputs not activated	Activate digital inputs

7. Maintenance

7.1 Maintenance Schedules

Please note

The liability for defects is only valid if maintenance work is performed as specified.
Adhere to the appropriate standards, regulations and locally applicable guidelines.

Activity	Period/Interval	Page
Flow block assembly DEPOLOX® 5/DEPOLOX® Pool/VariaSens		
Check for leakages	Daily	Page 221
Comparative measurement, calibrate if necessary	daily/acc. to guidelines	Page 201
Check electrolyte level (DEPOLOX® 5 only)	Weekly	Page 223
Check cell sand (DEPOLOX® 5 and DEPOLOX® Pool only)	Weekly	Page 221
Clean fine filter if membrane cells are used	every 2 months (depending on amount of dirt)	Page 226
Change cell sand (DEPOLOX® 5 and DEPOLOX® Pool only)	Every six months	Page 222
Change electrolyte (DEPOLOX® 5 only)	Every six months	Page 224
Diaphragm (DEPOLOX® 5 only)	every six months (depending on amount of dirt)	Page 224
Membrane sensors OZ7, CD7		
Comparative measurement, calibrate if necessary	Daily	Page 227
Replace electrolyte	Every six months	Page 224
Replace membrane cap	Annual	Page 227

Activity	Period/Interval	Page
Membrane sensor FC2, TC3		
Check measuring signal	min. 1x per week	refer to separate instruction manual
Replace electrolyte	every 3 months	refer to separate instruction manual
Replace membrane cap	1x per year (depending on water quality)	refer to separate instruction manual
pH measurement		
Comparative pH measurement, calibrate if necessary	weekly/ acc. to guidelines	Page 228
mV measurement		
Check redox of buffer solution	every 4 to 6 weeks	Page 227
Conductivity		
Check conductivity	every 4 to 6 weeks	Page 229
Fluoride Measurement		
Comparative measurement F^-, calibrate if necessary	daily/acc. to guidelines	
SFC Electronics	Change buffer battery after 5 years	Page 231

Checking for tightness (daily)

Check the entire measuring device including all screw connections for leakage. Repair any leakage points immediately!

Please note

Air bubbles in the sample water influence the measuring accuracy. The cause must be determined and remedied.

Checking the cell sand (weekly)

Check that there is sufficient sand in the cell body.
The cell sand must be swirled around in the bottom section of the cell body.
The cell sand is necessary for cleaning the chlorine sensor electrodes and must be replenished or replaced when required. (Refer to 5.3.2 “Pour in the cell sand (only with DEPOLOX® 5 and DEPOLOX® Pool)” and “Changing sell sand with the 3-electrode cell DEPOLOX® 5, DEPOLOX® Pool”).

Please note

When fresh sand is replenished, the electrode current may increase slightly for approximately 3 hours. Do not calibrate during this time.

You must calibrate each time the cell sand is replaced.

The calibration must be checked after one day.

7.2 Maintenance of flow block assembly DEPOLOX® 5

Changing sell sand with the 3-electrode cell DEPOLOX® 5, DEPOLOX® Pool

The cell sand required for constant cleaning of the electrodes grinds itself down over time until it is very fine. It must therefore be replaced regularly. Cell sand is delivered in a plastic bottle:

1 Remove cover of flow block assembly DEPOLOX® 5.

2 Close the ball valve on the sample water inlet and on the outlet (pressurized version).

3 Open the drain valve and drain the cell body (hold container underneath).

4 Close the drain valve when the cell body is empty.

5 Remove the sensors. Remove sensor cable from the sensors.

6 Loosen the lower cap on the 3-electrode cell (DEPOLOX® 5 only).

7 Remove the signal cable (DEPOLOX® 5 only).

8 Unscrew the upper knurled nut on the electrolyte container (DEPOLOX® 5 only).

9 Using the electrode mount, push the electrolyte tank downwards out of the cell body (DEPOLOX® 5 only) or remove the flow distributor cap (DEPOLOX® Pool).

10 Wash the cell sand out of the electrode mount or flow distributor cap.

11 Using the electrolyte container, insert the electrode mount back into the cell body or screw the flow distributor cap back on.

Please note

The cell body's dowel pin must be locked into place in the appropriate hole in the electrode mount (DEPOLOX® 5 only).

12 Screw the upper knurled nut back on the electrolyte container (DEPOLOX® 5 only).

13 Reconnect the signal cable acc. to color (DEPOLOX® 5 only).

CNT	Counter electrode	Blue point	Blue cable
WRK	Working electrode	Red point	Pink cable
Ref	Reference electrode (middle)		White cable

14 Screw the cap back on (DEPOLOX® 5 only).

15 Fill half a cap from the plastic bottle with cell sand and pour it into the cell body (approx. 1/2 cm³ cell sand) (see 5.3.2 “Pour in the cell sand (only with DEPOLOX® 5 and DEPOLOX® Pool)”).

16 Reinsert electrodes.

17 Reopen the check valve on the sample water inlet and outlet (pressurized version).

18 Perform the zero-point calibration after approximately three hours running-in time.

Please note

You must calibrate each time the cell sand is replaced.

The calibration must be checked after one day.

Please note

We recommend checking and, if necessary, replacing the electrodes and diaphragms when replacing the cell sand (see “Replacing electrolyte, reference electrode and diaphragms (DEPOLOX® 5)”).

Check electrolyte level of the 3-electrode cell DEPOLOX® 5

1 Check whether the potassium electrolyte is filled approx. 3 cm over the water level (narrowing of the KCL container) and replenish, if necessary.
To do this, remove the plug in the upper part of the electrolyte tank and inject the electrolyte (use the syringe in the accessory set).

2 The diaphragms in the electrolyte tank form the connection between the reference electrolytes and the sample water. If the sample water quality is poor (e.g. high iron content), both diaphragms in the electrolyte housing should be replaced. The diaphragms should be white (any coloration is an indication that the diaphragms are clogged and should be replaced).

3 Calibrate after approximately three hours.

Please note

The calibration must be checked after one day.

Replacing electrolyte, reference electrode and diaphragms (DEPOLOX® 5)

1 Remove cover of flow block assembly DEPOLOX® 5.

2 Close the ball valve on the sample water inlet and on the outlet (pressurized version).

3 Open the drain valve and drain the cell body (hold container underneath).

4 Close the drain valve when the cell body is empty.

5 Remove the sensors. Loosen the cable union (hold the cable while doing this as it may not be allowed to rotate).

6 Loosen the lower cap on the 3 electrode cell.

7 Remove the signal cable.

Replacing electrolyte (DEPOLOX® 5)

8 Unscrew the upper knurled nut on the electrolyte container.

9 Remove the electrolyte tank out of the cell body from below using the electrode mount.

Please note

Wash the cell sand out of the electrode mount “Changing sell sand with the 3-electrode cell DEPOLOX® 5, DEPOLOX® Pool”.

10 Remove the electrolyte container from the electrode mount. To do this, unscrew the knurled nut in the electrode mount.

11 Pull the electrolyte container upwards out of the electrode mount.

12 Remove the drain plug from the electrolyte container.

13 Turn the electrolyte container upside down and drainthe KCl electrolytes by lightly shaking it.

Replacing reference electrode (DEPOLOX® 5)

14 If necessary, replace the reference electrode.
The reference electrode can be unscrewed from the electrolyte container. Lightly wet the O-ring before installinga new reference electrode.

Replacing diaphragms (DEPOLOX® 5)

Please note

The diaphragms, which form the contact between the reference electrodes and sample water, cannot be cleaned. If the water quality is very good, the diaphragms can remain installed for up to three years; they should be replaced thereafter (no exceptions). If the sample water quality is poor, the diaphragms may be soiled. This influences the measuring accuracy.

15 Remove both diaphragms from the electrolyte container using a suitable tool (e.g. tweezers).

16 Push new diaphragms into the electrolyte container. Lightly wet the O-rings.

17 Insert the electrolyte container back into the electrode mount. Lightly wet the O-ring here as well.

Filling electrolyte (DEPOLOX® 5)

18 Fill the container with fresh electrolyte (approx. 3 cm above the water level or narrowing of the KCl container).

19 Insert the drain plug into the electrolyte container.

20 Insert the electrode mount back into the cell body using the electrolyte container.

Please note

The cell body's dowel pin must be locked into place in the appropriate hole in the electrode mount.

21 Screw the upper knurled nut back onto the electrolyte container.

22 Reconnect the signal cable acc. to color.

CNT	Counter electrode	Blue point	Blue cable
WRK	Working electrode	Red point	Pink cable
Ref	Reference electrode (middle)		White cable

23 Screw the cap back on.

24 Fill half a cap from the plastic bottle with cell sand and pour it into the cell body (approx. 1/2 cm³ cell sand) (see 5.3.2 “Pour in the cell sand (only with DEPOLOX® 5 and DEPOLOX® Pool)”).

25 Reinsert electrodes.

26 Reopen the check valve on the sample water inlet and outlet (pressurized version).

27 Perform the zero-point calibration after approximately three hours running-in time.

Please note

Perform a zero-point calibration after one hour running-in timeand, if required, after 24 hours.
You must calibrate each time the cell sand is replaced.
The calibration must be checked after one day.

Please note

Note the electrolyte's expiration date.

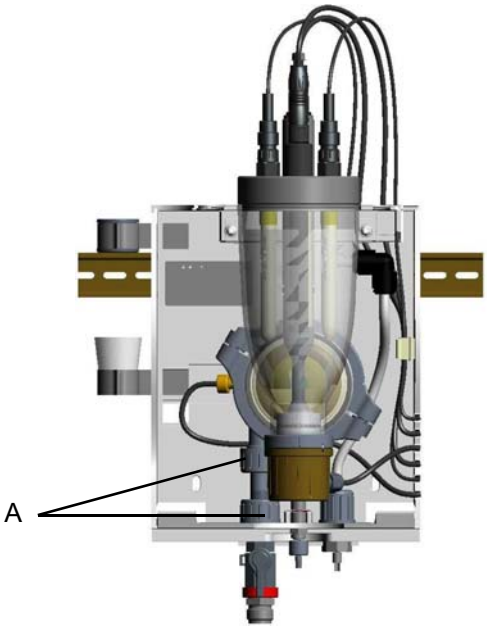
Cleaning/replacing the fine filter (DEPOLOX® 5, DEPOLOX® Pool, VariaSens)

Please note

A fine filter must only be installed when membrane sensors are employed.

Please note

The fine filter must be cleaned or replaced in order to protect the membrane sensor's delicate membrane against soiling or damage.



Picture 1 Flow block assembly cutaway model

A Fine filter

1 Release both knurled nuts.

2 Remove complete filter unit.

3 Remove the fine filter.

To do this, screw the M6 screw slightly into the fine filter and pull the fine filter out of the filter unit
or
press the fine filter with a suitable tool (not pointed) out of the filter unit.

4 Rinse the fine filter with water, replace if necessary.

5 Place the fine filter into the filter unit.
Ensure that the O-ring is fitted correctly (insert as far as possible).

6 Fit the filter unit. Ensure that it is fitted in the correct position.

7 Tighten both knurled nuts (A).

7.3 Maintaining membrane sensors

For the membrane sensor maintenance procedure, see 4.2.6 “Membrane sensors”.

Please refer to instruction manual „membrane sensor for free chlorine FC2“ and „membrane sensor for total chlorine TC3“.

7.4 Maintaining Redox electrode

Depending on how dirty the sample water is, the Redox electrode must be cleaned at certain intervals. Unclean water causes the measurement to be very slow. At the same time, the Redox voltage is frequently indicated as too low. The surface of the platinum disc is usually soiled. This may be to some extent in the form of an invisible coating. In particular, the ceramic electrode diaphragm may also be soiled or coated with lime deposits.

To clean the soiled metal disc, the Redox electrode is removed from the flow-through adapter and cleaned with a paper towel; use diluted hydrochloric acid (up to 10 %), if necessary. Scouring cleaner may not be used because it may clog the diaphragm. Then rinse well with water. Do not touch the platinum electrode after rinsing in order to keep oil from fingers off them. To remove lime deposits, immerse the electrodes just past the diaphragms into hydrochloric acid (10 %); allow several minutes for this to react and rinse with clear water.

Please note

Do not use any other chemicals than those described here. These could damage the electrode.

7.5 Maintaining pH electrode

Clean and calibrate if there are fluctuations in the measured values. A routine schedule cannot be given here because the cleaning schedule depends heavily on the general condition of the sample water. In general, calibrate approx. every 4 weeks. Remove dirt on the glass membrane and diaphragm to prevent measuring errors.

In particular, the ceramic electrode diaphragm may also be soiled or coated with lime deposits.

Remove contaminants deposited on the surface of the membrane glass; use diluted hydrochloric acid (up to 10 %), if necessary.

The electrodes should not be cleaned in a dry state because this is more likely to smear the layer of dirt over the surface rather than removing it. Under no circumstances may the membrane be treated with abrasive cleaning agents.

The electrode must be rinsed subsequently with nothing other than water.

Remove lime deposits on the glass membrane and the diaphragm by immersing the electrode into hydrochloric acid (up to 10 %). Rinse thoroughly with water or distilled water here as well; pH electrodes age. This is often the cause for a slow display of the pH value or a drop in the span. pH electrodes typically last 1 to 2 years. However, routine maintenance of the electrodes recommended.

7.6 Maintaining fluoride electrode

Routinely check the electrolyte level in the electrode (at least once per week). The fill level should always be just under the filling hole, approx. 25 mm above the sample water. Replenish the electrolyte, if necessary.

Routinely calibrate the measuring system to guarantee safe operation and accuracy.

The electrode shaft can be cleaned using a moist cloth.

Do not touch the glass surfaces with the cloth.

7.7 Maintaining conductivity electrode

The electrode does not contain any maintenance parts. However, depending on how dirty the sample water is, the electrode can be cleaned at certain intervals. A routine schedule cannot be given here because the cleaning schedule depends heavily on the general condition of the sample water. In general, calibrate approx. every 4 weeks.

If wiping with a soft, damp paper towel is not sufficient, use one of the following chemical cleaning methods depending on how the electrode is soiled:

Soiling	Cleaning agent	Time needed at room temperature
Water soluble substances	Distilled water	Any
Grease and oil	Warm water and household washing liquid	Any
Lime and hydroxide deposits	Hydrochloric acid (0.1 n)	Any

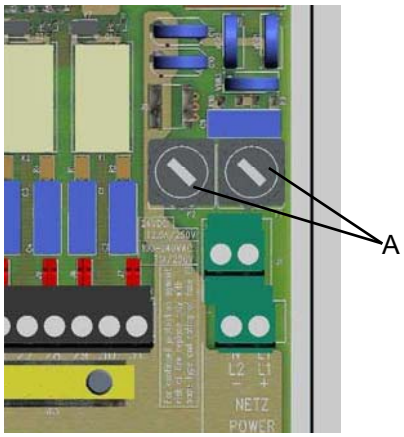
7.8 Changing the fuse on the A&C board

Warning!

Only authorized and qualified electricians are permitted to open the housing.

The device is not equipped with a mains switch.

1. Disconnect the unit from the power supply.
2. Remove the cover of the electronic module.
3. Remove screw-in fuse holder.
4. Change the defective fuse.
5. Screw the screw-in fuse holder back in.
6. Reassemble the unit.



Picture 2 Cutaway model of fuses

A Screw-in fuse holder

7.9 Replacing the battery

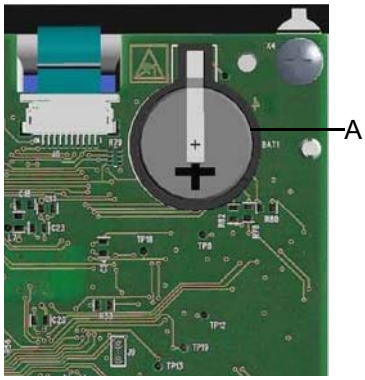
Warning!

Only authorized and qualified electricians are permitted to open the housing.

The device is not equipped with a mains switch.

The buffer battery is required for the real time clock in case of a power failure. If the time is not correct or if time controlled functions show faulty behavior, the battery must be changed. After five years at the latest.

1 Disconnect the unit from the power supply.



Picture 3 Housing cover with battery

A Backup battery

2 Remove the cover of the electronic module.

3 Take out the old buffer battery and dispose of in accordance with the regulations.

4 Insert the new battery type CR2032.

5 Replace the housing cover.

6 Switch on mains voltage.

7 Setting the date and time.

8. Complete Units, Retrofit Kits and Spare Parts

Warning!

For reasons of safety, only use original spare parts.
Please contact our customer service department if you need any spare parts.

Part No.	Complete unit	
W3T158815	SFC Electronic module for wall installation	100 – 240 V, 4x relays, 1x mA output, 1x feedback input, 2x mA input, 2x DI, temperature input, SD memory card 128MB - 2 GB, RS485, CAN, 1x module slot for sensor measuring module
W3T158816		24 V DC, 4x relays, 1x mA output, 1xfeedback input, 2x mA input, 2x DI, temperature input, SD memory card 128MB - 2 GB, RS485, CAN, 1x module slot for sensor measuring module
W3T158817	SFC PC electronic module for wall installation with mA/V measuring module	100 – 240 V, 4x relays, 1x mA output, 1x feedback input, 2x mA input, 2x DI, temperature input, SD memory card 128MB - 2 GB, RS485, CAN, 1x sensor measuring module for mA/V signal installed for process control
W3T158818		24 V DC, 4x relays, 1x mA output, 1x feedback input, 2x mA input, 2x DI, temperature input, SD memory card 128MB - 2 GB, RS485, CAN, 1x sensor measuring module for mA/V signal installed for process control
W3T158819	SFC SC electronic module for wall installation	100 – 240 V, 2x relay, 1x mA input, 1x feedback input, 2x DI, 1x mA output
W3T158820		24 V DC, 2x relay, 1x mA input, 1xfeedback input, 2x DI, 1x mA output
W3T162663	SFC electronic module for control cabinet installation	100 – 240 V, 4x relays, 1x mA output, 1x feedback input, 2x mA input, 2x DI, temperature input, SD memory card 128MB - 2 GB, RS485, CAN, 1x module slot for sensor measuring module
W3T162664		24 V DC, 4x relays, 1x mA output, 1xfeedback input, 2x mA input, 2x DI, temperature input, SD memory card 128MB - 2 GB, RS485, CAN, 1x module slot for sensor measuring module

Part No.	Complete unit	
W3T162665	SFC PC electronic module for control cabinet installation with mA/V measuring module	100 – 240 V, 4x relays, 1x mA output, 1x feedback input, 2x mA input, 2x DI, temperature input, SD memory card 128MB - 2 GB, RS485, CAN, 1x slot for process control
W3T162666		24 V DC, 4x relays, 1x mA output, 1xfeedback input, 2x mA input, 2x DI, temperature input, SD memory card 128MB - 2 GB, RS485, CAN, 1x sensor measuring module
W3T162667	SFC SC electronic module for control cabinet installation	100 – 240 V, 2x relay, 1x mA input, 1x feedback input, 2x DI, 1x mA output
W3T162668		24 V DC, 2x relay, 1x mA output, 1xfeedback input, 2x DI, 1x mA output
W3T168777	Operating Manual SFC	
W3T163001	Operating instructions RS485 bus interface of the SFC	

Sensor measuring modules

pH	Redox	Conductivity potable water	Conductivity pool water	Fluoride
incl. calibration solution, sensor, cable, plug-in card W3T166292 with optional Process Control W3T170350	incl. calibration solution, sensor, cable, plug-in card W3T166165 with optional Process Control W3T170351	incl. 600 µS calibration solution, sensor, cable, plug-in card W3T158763 with optional Process Control W3T170354	incl. 60 mS calibration solution, sensor, cable, plug-in card W3T166166 with optional Process Control W3T170353	incl. sensor, cable, plug-in card and calibration solution W3T166293 with optional Process Control W3T170352

Sensor measuring module for membrane sensors

Free chlorine FC2	Chlorine dioxide selective CD7	Ozone selective OZ7	Total chlorine TC3
incl. sensor, cable, plug-in card, electrolyte W3T170343 with optional Process Control W3T170344	incl. sensor, cable, plug-in card, electrolyte W3T170345 with optional Process Control W3T170346	incl. sensor, cable, plug-in card, electrolyte W3T170347 with optional Process Control W3T170348	incl. sensor, cable, plug-in card, electrolyte W3T170339 with optional Process Control W3T170340

Seal set for membrane electrodes

Seal kit W3T158755 for pressure-tight installation of the membrane sensors

Sensor measuring module for 3-electrode cell DEPOLOX® Pool

Plug-in card with terminals, glass electrode, cleaning grit, power cable W3T170333

Sensor measuring modules for DEPOLOX® 5 three-electrode cell

Cl_2-DEPOLOX® 5 non-pressurized	Plug-in card with terminals, cleaning grit, connection cable DEPOLOX® 5 non-pressurized W3T162670
Cl_2-DEPOLOX® 5 non-pressurized with option process control	Plug-in card with terminals, cleaning grit, connection cable DEPOLOX® 5 non-pressurized W3T162671
Cl_2-DEPOLOX® 5 pressurized	Plug-in card with terminals, cleaning grit, connection cable DEPOLOX® 5 pressurized W3T162672
Cl_2-DEPOLOX® 5 pressurized with option process control	Plug-in card with terminals, cleaning grit, connection cable DEPOLOX® 5 pressurized W3T162673

Retrofit sets

3-electrode cell DEPOLOX® 5	3-electrode cell DEPOLOX® 4 with PT100	3-electrode cell Micro 2000 with PT1000	3-electrode cell DEOX 2000 with PT1000	mA/V input card
Plug-in card with terminals W3T170334 with optional Process Control W3T170335	Plug-in card with terminals W3T170337 with optional Process Control W3T170338	Plug-in card with terminals W3T158828 with optional Process Control W3T158830	Plug-in card with terminals W3T158829 with optional Process Control W3T158831	Plug-in card with terminals W3T166161 with optional Process Control W3T170349

Retrofit set fieldbus module

Three SFC fieldbus module retrofit kits (types of fieldbus) are available:

Part No.	Fieldbus type	Designation
W3T166498	Profibus DP	Fieldbus module retrofit set SFC Profibus DP with terminal connections
W3T166499	Profinet	Fieldbus module retrofit set SFC Profinet with terminal connections
W3T166500	Modbus TCP	Fieldbus module retrofit set SFC Modbus TCP with terminal connections

SiDiSens retrofit kit / Accessories

Part No.	*SiDiSens*	Description
W3T212541	SiDiSens pH	Retrofit kit with SiDiSens pH incl. pH electrode, calibration solution and terminal resistor
W3T180808	Top-hat rail mounting set for SiDiSens	Mounting bracket to fix the SiDiSens

CAN bus component

Part No.	Description
W2T504979 W2T504980 W2T504981 W2T504982 W2T504850	CAN bus extension cable (assembled) 0.3 m 1 m 2 m 5 m 10 m
W3T183695	CAN T-piece
W3T183696	CAN terminal resistance M12 plug
W3T212650	CAN bus installation cable 2 x 2 x 0.22m² by the metre
W3T212807	Cable connector M12 5-pin (ready to assemble)
W3T212808	Cable box M12 5-pin (ready to assemble)
W3T204814	Retrofit kit SFC CAN with CAN bus socket (M12) and connector cable to connect to the CAN sensor measurement module SiDiSens

Spare parts and consumables

DEPOLOX® 5	pH	Redox	Conductivity	Fluoride	DEPOLOX® 4	DEPOLOX® Pool
Electrode cleaning grit W3T158743	Sensor W3T169297	Sensor W3T169298	Sensor W3T172052	Sensor W3T169303	Plug-in card without Process Control W3T158832	Glass electrode W3T172052
Electrolyte W3T165565	Calibration solution pH 7.00 250 ml W3T165076	Calibration solution 478 mV 250 ml W3T165048	Cable W3T172050	Calibration solution 0.20 mg/l W3T161789 500 ml	Plug-in card with Process Control W3T158833	Sensor cable W3T172012
Multi sensor W3T172029	Calibration solution pH 4.65 250 ml W3T165084	Calibration solution 478 mV 12 ml Bag W3T161182	Calibration solution 60 mS/cm 1000 ml W3T161187	Calibration solution 2.00 mg/l 500 ml W3T161845		Plug-in card with Process Control W3T158824
Measuring cup 5 pcs W3T158600	Calibration solution pH 7.00 12 ml bag W3T161181	Plug-in card without Process Control W3T170232 Plug-in card with Process Control W3T158838	Calibration solution 600 µS/cm 1000 ml W3T161179	Calibration solution 100 mg/l 500 ml W3T161884		Plug-in card without Process Control W3T158823
Cable W3T160702	Calibration solution pH 4.65 12 ml Bag W3T161189	Impedance converter W3T165563	Plug-in card without Process Control W3T170235 Plug-in card with Process Control W3T158841	Electrolyte set W3T161173 5 x 60 ml		Electrode cleaning grit W3T171317
Plug-in card with Process Control W3T158824 Plug-in card without Process Control W3T158823	Plug-in card without Process Control W3T170233 Plug-in card with Process Control W3T158839			Plug-in card without Process Control W3T170234 Plug-in card with Process Control W3T158840		
	Impedance converter W3T165563			Impedance converter W3T165563		
	KCL tank to store the sensors 5 ml KCL-3 mol. W3T164482					

Membrane sensors

Membrane sensors	Free chlorine FC2	ClO_2, selective CD7	Ozone, selective OZ7	Total chlorine TC3
Sensor compl. with electrolyte, lapping paper	W3T365498	W3T164493	W3T164494	W3T391561
Membrane cap incl. lapping paper	W3T365500	W3T168103	W3T168106	W3T365500
Membrane cap, plastic incl. lapping paper*				W3T391564*
Electrolyte	W3T168101	W3T168102	W3T168105	W3T171793
Spare part set Consists of lapping paper, elastomer seal and O-ring	W3T164339	W3T168104	W3T168107	W3T164339
Maintenance set Consists of electrolyte, membrane cap and spare part set	W3T365601	W3T168242	W3T168243	W3T391565
Plug-in card without Process Control	W3T158825			
Plug-in card with Process Control	W3T158826			
Connector cable combination 0.9 m	W3T172017			

Please note

Please use at increased salt concentration (optional)!

Cable extensions for sensors

Extension cable/ connector-cable combination	DEPOLOX® 5	pH Redox Fluoride (with 2 connectors)	Conductivity (with 1 connector)	Multi sensor with cable	Membrane sensors (with 1 connector)	DEPOLOX® Pool glass electrode (with 1 connector)
5 m	W3T160703	W3T164517	W3T164529	W3T164557	W3T164519	W3T164515
10 m	W3T160704	W3T164518	W3T164553	W3T164558	W3T164520	W3T164516
15 m	W3T160705	W3T164544	W3T164554	W3T164559	W3T164538	W3T164547
25 m	W3T160706	W3T164545	W3T164555	W3T164560	W3T164539	W3T164548
50 m	W3T160707	W3T164546	W3T164556	W3T164561	W3T164540	W3T164549
Impedance converter	--	W3T165563	--	--	--	--

SFC spare parts

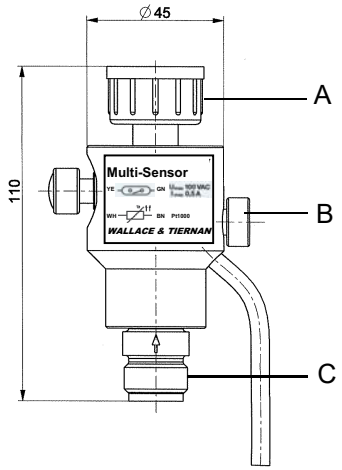
Part No.	Description
W3T166455	Spare circuit board A&C board SFC 100 – 240 V AC
W3T166456	Spare circuit board A&C board SFC 24 V DC
W3T166457	Spare circuit board A&C board SFCSC 100 – 240 V AC
W3T166458	Spare circuit board A&C board SFCSC 24 V DC
W3T162628	Front cover panel SFC wall mounting
W3T162629	Front cover panel SFCSC wall mounting
W3T170285	Front cover panel SFC control cabinet installation
W3T170286	Front cover panel SFCSC control cabinet installation
W3T158811	Basic electronics SFC 100 – 240 V wall mounting/control cabinet installation
W3T158812	Basic electronics SFC 24 V DC wall mounting/control cabinet installation
W3T158813	Basic electronics SFCSC 100 – 240 V wall mounting/control cabinet installation
W3T158814	Basic electronics SFCSC 24 V DC wall mounting/control cabinet installation
W3T168569	SD memory card 128 MB - 2GB
W3T172413	Connection cable A&C board front panel board approx. 0.5 m
W3T161012	Connection cable A&C board front panel board for control cabinet installation approx. 3 m long
W2T506812	A&C board fuse for 24 V DC and 100 – 240 V AC (1A time-lag)
W3T172625	Varta battery CR2032
W3T164902	Update cable for SFC with 9-pin RS232-DSUB plug
W3T158822	Accessory set, comprising: screws, dowels, multiple seal inserts, bolts, reducing sealing ring
W2T504443 W2T504444 W2T504456	V2A mounting rails for installation of the SFC on a top-hat rail 575 mm (length 2 x SFC+ DEPOLOX® 5 / DEPOLOX® pool) 375 mm (length 2 x SFC+ DEPOLOX® 5 / DEPOLOX® pool) 175 mm (length 1 x SFC)

Flow rate monitoring with temperature sensor PT1000

Part No.: W3T166494 pressurized version up to 4 bar

Caution!

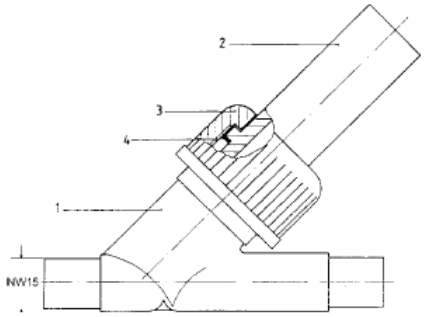
Vertical installation!



A Drain: G1/2“ union nut
B Sample tap
C Inlet: G1/2“ outside thread

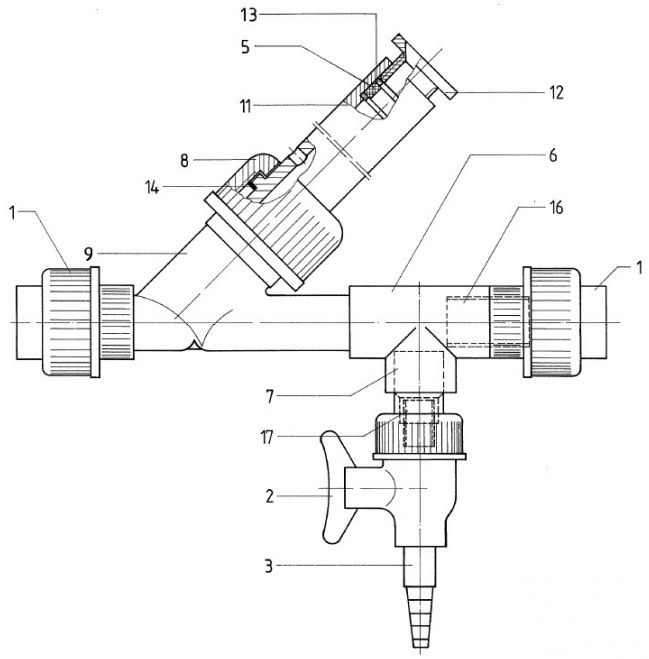
Flow-through adapter pH/mV

Part No.: W3T171332 non-pressurized version
W3T159950 pressurized version up to 6 bar



Item	Part No.	Description
1	W3T172856	Housing
2	W3T170970 (non-pressurized) W3T159595 (pressurized)	Electrode mount
3	W3T170971	Hexagon cap nut
4	W3T168861	O-ring

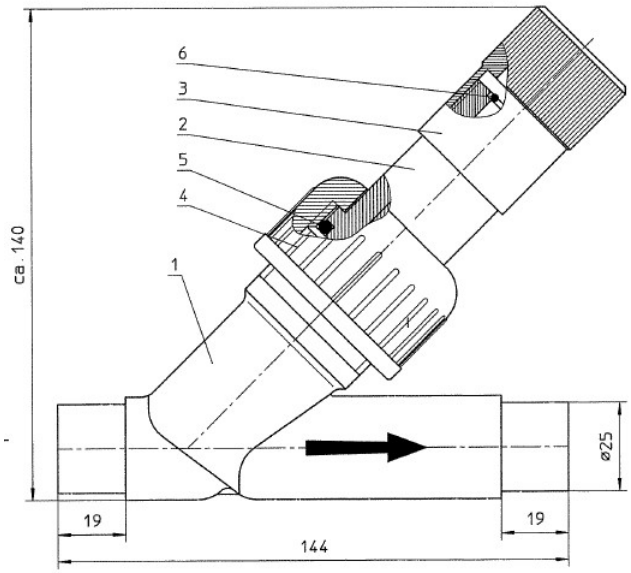
Flow-through adapter fluoride Part No.: W3T163663 non-pressurized version



Item	Qty	Part No.	Description
1	2	W2T505181	PVC screw connection, DN15/d20, with O-ring
2	1	W2T507048	Ball valve
3		W2T506240	Hose bushing
5	1	W3T168889	Seal
6	1	W2T507524	T-piece
7	1	W2T505438	Reduction
8	1	W3T170971	Hexagon cap nut
9	1	W3T172856	Housing
11	1	W3T159710	Electrode mount
12	1	W3T167218	Tightening nut
13	2	W3T167237	Washer
14	1	W3T168861	O-ring
16	37 mm	W2T506051	Pipe
17	29 mm	W2T506626	Pipe

Flow-through adapter conductivity

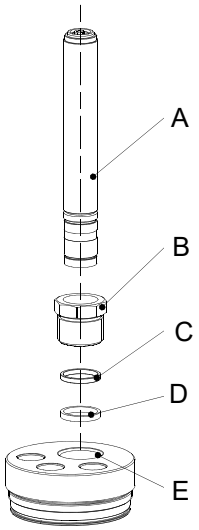
Part No.: W3T158503 pressurized version up to 6 bar



Item	Qty	Part No.	Description
1	1	W3T161463	Strainer housing
2	1	W3T158502	Electrode mount
3	1	W3T158501	Electrode tightening nut
4	1	W3T163440	Hexagon cap nut
5	1	W3T172720	O-ring
6	1	W3T172556	O-ring

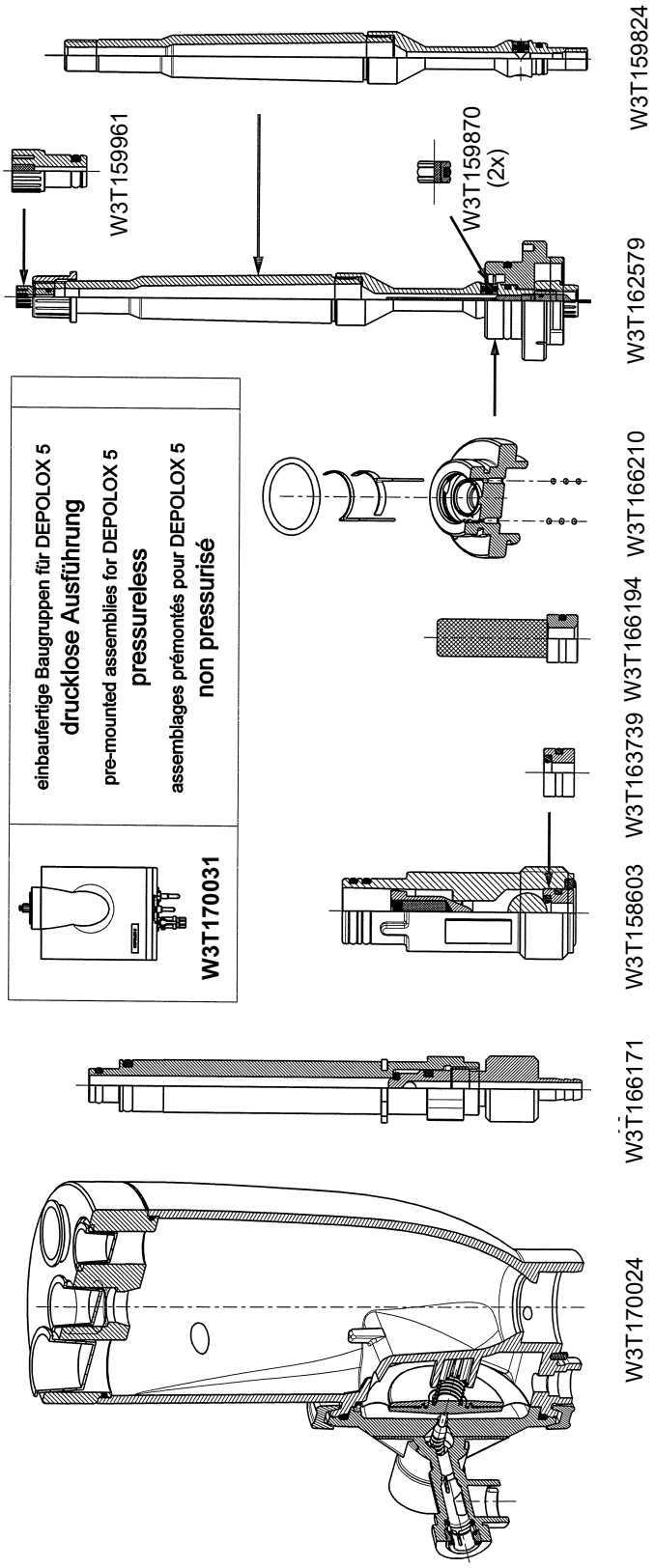
Seal set for membrane electrodes

Part No.: W3T158755 pressure-tight version



A Membrane electrode, type TC1/TC3, FC1/FC2, CD7, OZ7...
B Union bush G1“ W3T171788
C Locking ring W3T171789
D Gasket W3T164773
E Cell body cover W3T158754

DEPOLOX® 5 retrofit set (non-pressurized version) W3T170031

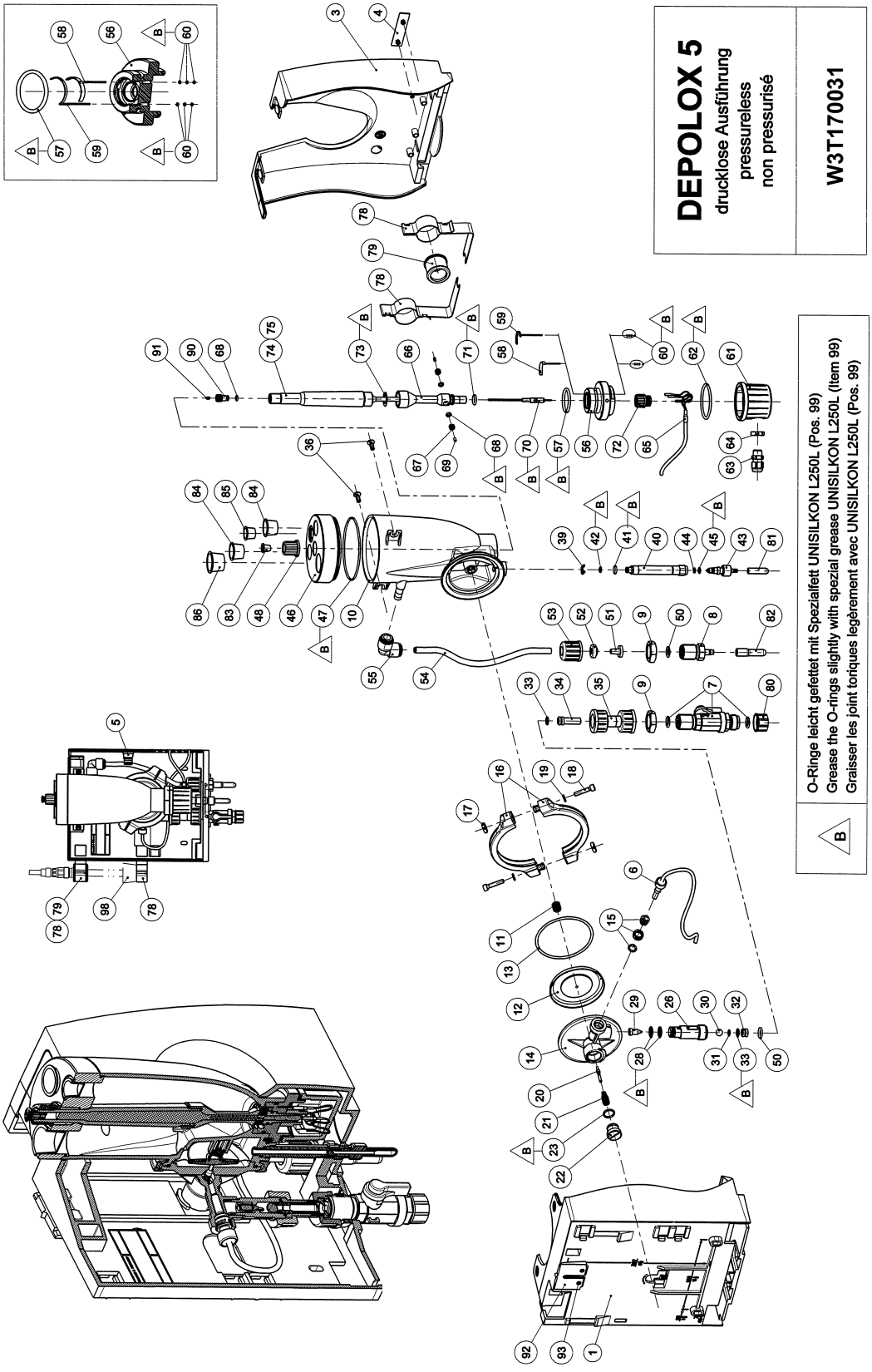


Parts list for DEPOLOX® 5 non-pressurized version W3T170031

Part No.	Designation
W3T170031	Flow cell module, non-pressurized
W3T170024	Cell body D5-DL, complete
W3T166171	Drainage unit
W3T158603	Non-return valve
W3T163739	Valve seat complete
W3T166194	Fine filter
W3T166210	Electrode holder complete
W3T162579	Electrode cell, complete, without electrolyte
W3T159961	Plug, complete, non-pressurized
W3T159870	Diaphragm complete
W3T159824	Electrode housing, non-pressurized

Part No.	Designation
W3T170063	Accessories set D5-DL
W3T170065	Maintenance part set, annual maintenance
W3T170071	Maintenance part set, every 4 years
W3T158882	Set of spare parts for volumetric flow control

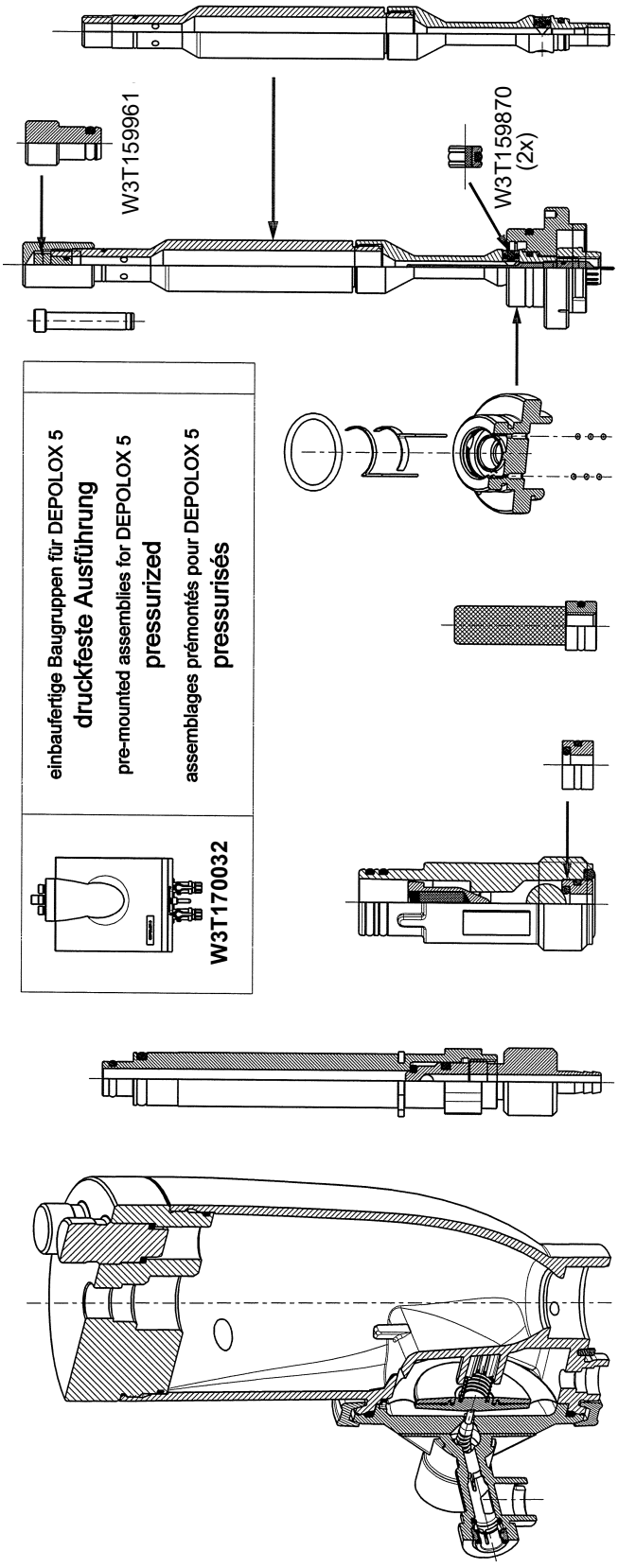
Drawing of DEPOLOX® 5 non-pressurized version W3T170031



Parts list for DEPOLOX® 5 non-pressurized version W3T170031

Item	Part No.	Designation
1	W3T160628	Basic housing
1,92,93	W3T164571	Basic housing, pre-assembled
3	W3T160629	Housing cover
4	W3T172042	Product label
5	W2T506143	Cable clamp
6	W3T172029	Multi sensor
7	W3T166170	Shut-off valve
8	W3T158593	Discharge nozzle
9	W2T507615	Flat nut
10	W3T158561	Cell body
11	W3T164226	Compression spring
12	W3T158569	Membrane unit
13	W3T160654	O-ring
14	W3T158595	Control valve body
15	W2T504209	Plastic cartridge
16	W3T160649	V profile clamp
17	W3T158567	Square nut
18	W2T504659	Cylinder screw
19	W2T506019	Washer
20	W3T158572	Valve pin
21	W3T172795	Compression spring
22	W3T158573	Adjusting screw
23	W3T160357	O-ring
26	W3T160648	Check valve housing
28	W3T161396	O-ring
29	W3T169827	Float with magnet
30	W3T172946	Ball
31	W3T172949	O-ring
32	W3T159707	Insert
33	W3T172975	O-ring
34	W3T168189	Fine filter
33,34	W3T166194	Fine filter, complete
35	W3T158602	Filter housing
36	W2T505463	Plastic self-tapping screw
39	W3T172041	Securing ring
40	W3T158576	Outlet drain pipe
41	W3T172997	O-ring
42	W3T164597	O-ring
43	W3T158575	Drain screw
44	W3T166160	EPDM Flat gasket
45	W3T172556	O-ring
46	W3T158565	Cell body cover
47	W3T160657	O-ring
48	W3T165266	Knurled nut
50	W3T172861	O-ring
51	W3T161501	Hose bushing
52	W3T169815	Locking ring
53	W3T161502	Union nut
50-53	W3T171453	Hose connection parts
54	W3T158601	Hose
55	W2T505093	Angle-reducing connector
56	W3T166209	Electrode mount
57	W3T168875	O-ring
58	W3T163795	Working electrode
59	W3T167461	Counter electrode
60	W3T168904	O-ring
61	W3T158562	Hinged cover
62	W3T168868	O-ring
63	W2T504177	Cable union
64	W3T160549	Hexagonal nut
65	W3T160702	Connector cable combination
66	W3T159653	Electrode housing
67-69	W3T159870	Diaphragm complete
70	W3T169295	Reference electrode
71	W3T161424	O-ring
72	W3T165267	Knurled nut
73	W3T161464	Flat gasket
74	W3T165565	KCL electrolyte set, 100ml
75	W3T172885	Container, non-pressurized version
76	W3T161396	O-ring
78	W3T166169	Fastening clip, coated
79	W3T172045	Electrode mount
80	W3T161561	Screw cap
81	W3T168162	Protective cap
82	W3T164588	Protective cap
83	W3T161537	Protection plug
84	W3T169029	Protection plug
85	W3T169044	Protection plug
86	W3T164573	Protection plug
68,90,91	W3T159961	Plug complete
92	W3T160627	Wall brackets
93	W2T504752	Sheet metal screw
98	W3T158600	Measuring beaker, 5 items
Accessories	W3T161452	Felt ring, transit support
Accessories	W3T171453	Hose connection parts ID6xWdg1
Accessories	W3T167518	Hose connection parts ID6xWdg3
Accessories	W3T158743	Electrode cleaning grit "QK"
Accessories	W3T173182	Fastening kit

Retrofit set for DEPOLOX® 5 (pressurized version) W3T170032

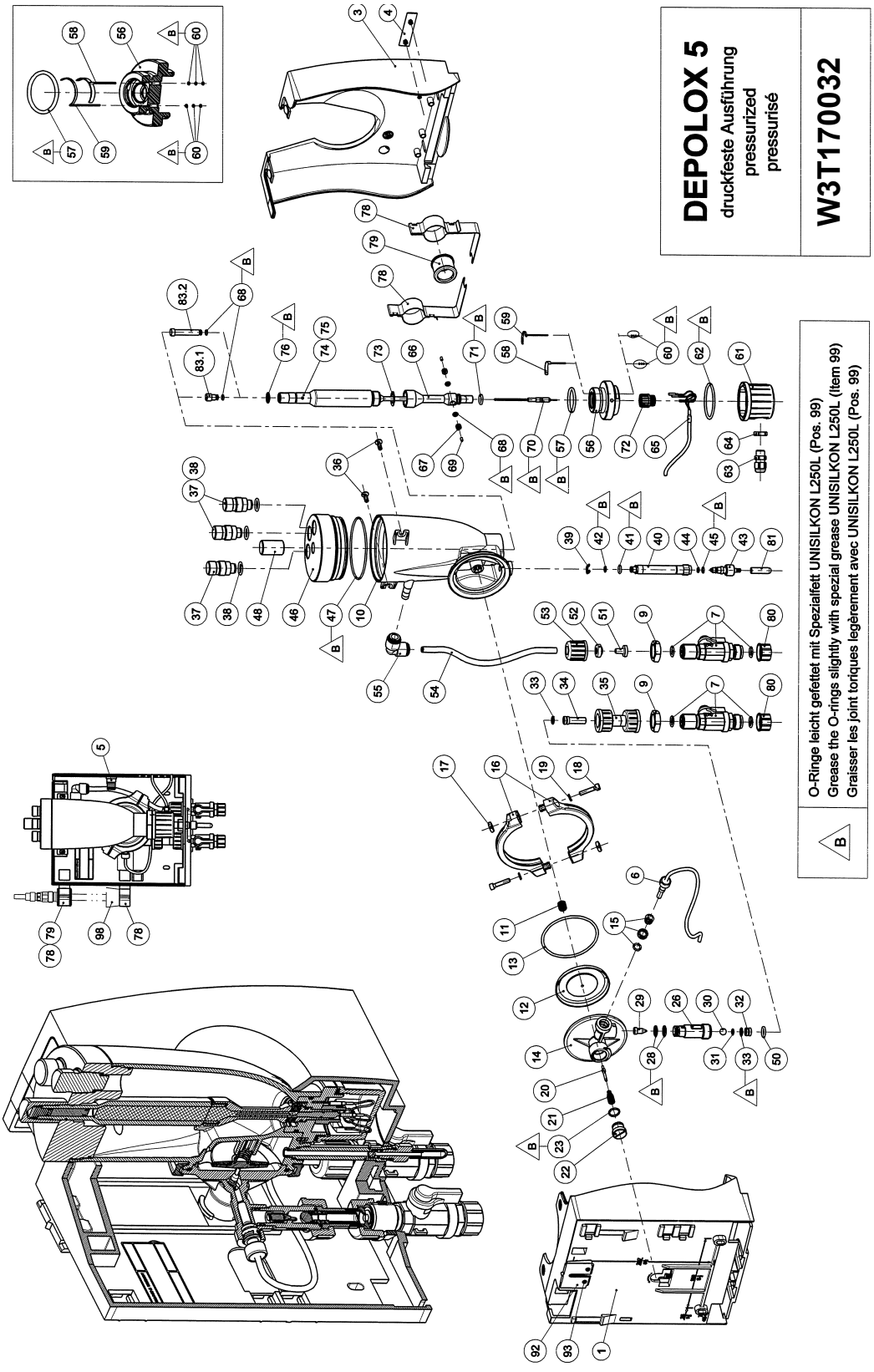


Parts list for DEPOLOX® 5 (pressurized version) W3T170032

Part No.	Designation
W3T170032	Flow block assembly, pressurized
W3T170025	Cell body D5-DF, complete
W3T166171	Drainage unit
W3T158603	Non-return valve
W3T163739	Valve seat complete
W3T166194	Fine filter
W3T166210	Electrode holder complete
W3T162580	Electrode cell, complete, without electrolyte
W3T163746	Plug, complete, pressurized
W3T159870	Diaphragm complete
W3T159825	Electrode housing, pressurized

Part No.	Designation
W3T170064	Accessories set D5-DF
W3T158875	Maintenance part set, annual maintenance
W3T170072	Maintenance part set, every 4 years
W3T158882	Set of spare parts for volumetric flow control

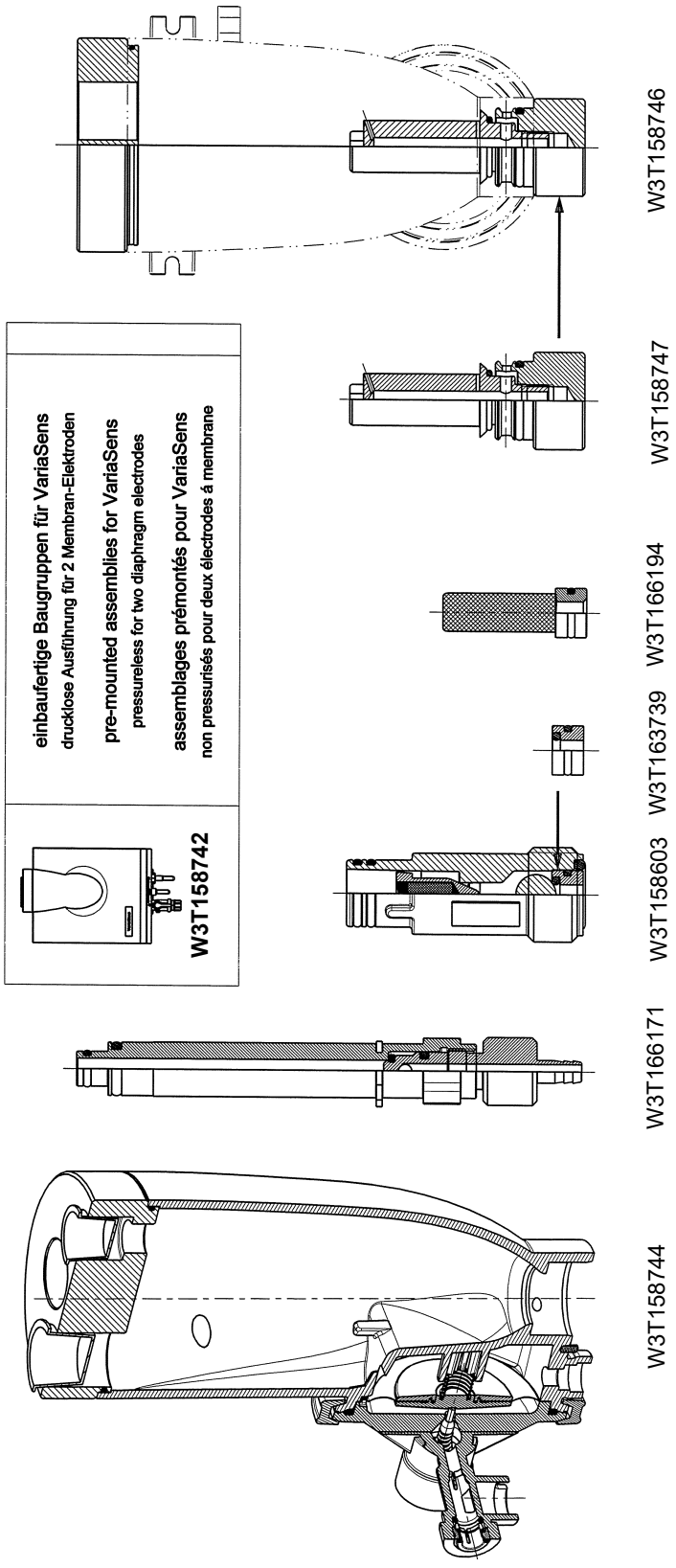
Drawing of DEPOLOX® 5 (pressurized version) W3T170032



Parts list for DEPOLOX® 5 (pressurized version) W3T170032

Item	Part No.	Designation
1	W3T160628	Basic housing
1,92,93	W3T164571	Basic housing, pre-assembled
3	W3T160629	Housing cover
4	W3T172042	Product label
5	W2T506143	Cable clamp
6	W3T172029	Multi sensor
7	W3T166170	Shut-off valve
9	W2T507615	Flat nut
10	W3T158560	Cell body
11	W3T164226	Compression spring
12	W3T158569	Membrane unit
13	W3T160654	O-ring
14	W3T158595	Control valve body
15	W2T504209	Plastic cartridge
16	W3T160649	V profile clamp
17	W3T158567	Square nut
18	W2T504659	Cylinder screw
19	W2T506019	Washer
20	W3T158572	Valve pin
21	W3T172795	Compression spring
22	W3T158573	Adjusting screw
23	W3T160357	O-ring
26	W3T160648	Check valve housing
28	W3T161396	O-ring
29	W3T169827	Float with magnet
30	W3T172946	Ball
31	W3T172949	O-ring
32	W3T159707	Insert
33	W3T172975	O-ring
34	W3T168189	Fine filter
33,34	W3T166194	Fine filter, complete
35	W3T158602	Filter housing
36	W2T505463	Plastic self-tapping screw
37	W3T161450	Plug
38	W3T168859	O-ring
39	W3T172041	Securing ring
40	W3T158576	Outlet drain pipe
41	W3T172997	O-ring
42	W3T164597	O-ring
43	W3T158575	Drain screw
44	W3T166160	EPDM Flat gasket
45	W3T172556	O-ring
46	W3T158564	Cell body cover
47	W3T160657	O-ring
48	W3T171088	Knurled nut
50	W3T172861	O-ring
51	W3T161501	Hose bushing
52	W3T169815	Locking ring
53	W3T161502	Union nut
50-53	W3T171453	Hose connection parts
54	W3T158601	Hose
55	W2T505093	Angle-reducing connector
56	W3T166209	Electrode mount
57	W3T168875	O-ring
58	W3T163795	Working electrode
59	W3T167461	Counter electrode
60	W3T168904	O-ring
61	W3T158562	Hinged cover
62	W3T168868	O-ring
63	W2T504177	Cable union
64	W3T160549	Hexagonal nut
65	W3T160702	Connector cable combination
66	W3T159653	Electrode housing
67-69	W3T159870	Diaphragm complete
70	W3T169295	Reference electrode
71	W3T161424	O-ring
72	W3T165267	Knurled nut
73	W3T161464	Flat gasket
74	W3T165565	KCL electrolyte set, 100ml
75	W3T171171	Container, pressurized version
76	W3T161396	O-ring
78	W3T166169	Fastening clip, coated
79	W3T172045	Electrode mount
80	W3T161561	Screw cap
81	W3T168162	Protective cap
83.1, 68	W3T163746	Plug, complete, for operation
83.1	W3T159726	Plug, for operation
83.2, 68	W3T159992	Plug, complete, transit support
83.2	W3T159757	Plug, transit support
92	W3T160627	Wall brackets
93	W2T504752	Sheet metal screw
98	W3T158600	Measuring beaker, 5 items
Accessories	W3T161452	Felt ring, transit support
Accessories	W3T171453	Hose connection parts ID6xWdg1
Accessories	W3T167518	Hose connection parts ID6xWdg3
Accessories	W3T158743	Electrode cleaning grit "QK"
Accessories	W3T173182	Fastening kit

VariaSens retrofit set (non-pressurized version) W3T158742

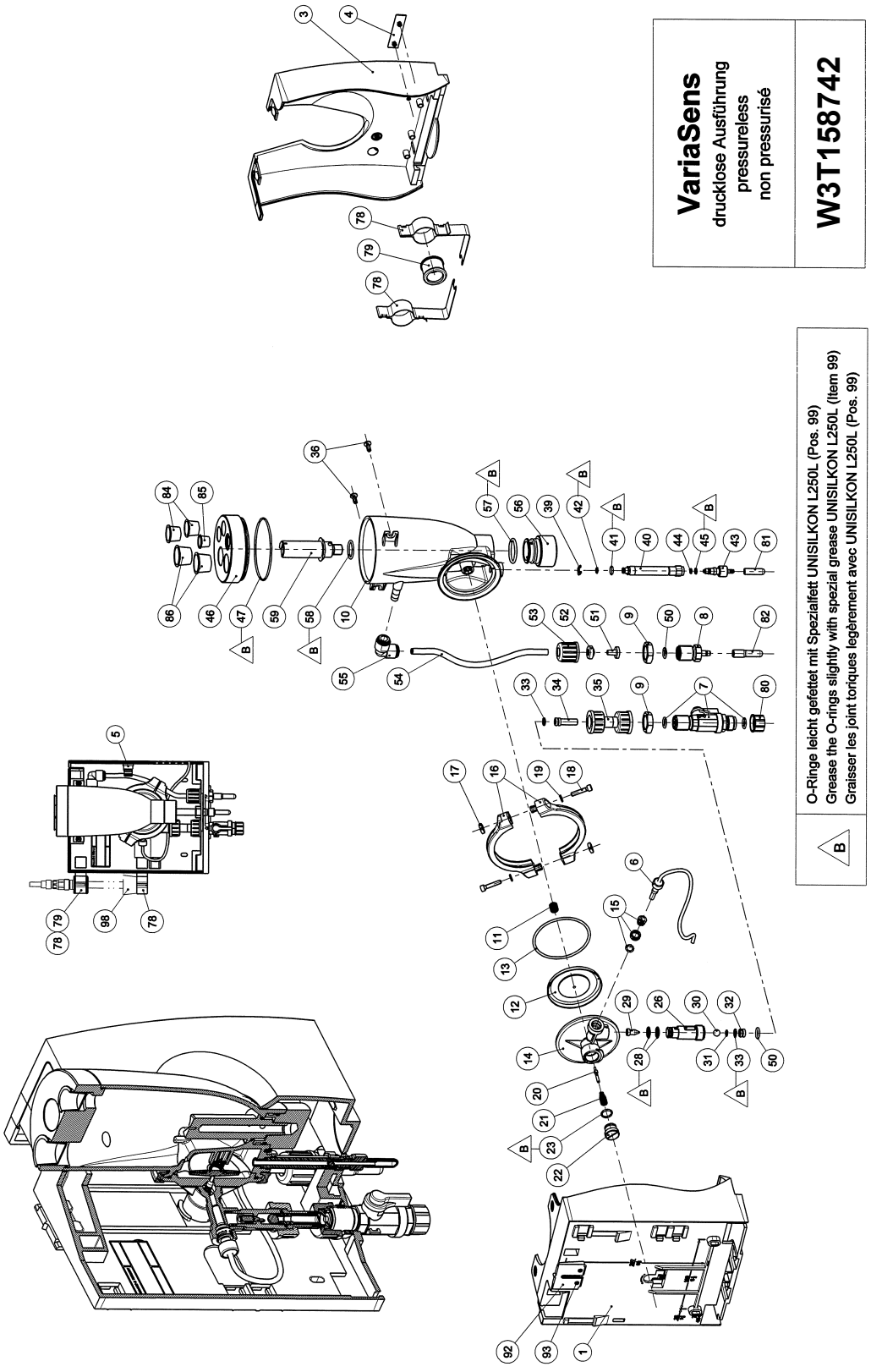


VariaSens parts list (non-pressurized version) W3T158742

Part No.	Designation
W3T158742	Flow cell module, non-pressurized
W3T158744	Cell body VS-DL, complete
W3T166171	Drainage unit
W3T158603	Non-return valve
W3T163739	Valve seat complete
W3T166194	Fine filter
W3T158747	Flow body complete
W3T158746	Conversion kit D5-DL/VS-DL

Part No.	Designation
W3T158745	Accessories set VS-DL
W3T158876	Maintenance part set, annual maintenance
W3T158750	Maintenance part set, every 4 years
W3T158882	Set of spare parts for volumetric flow control

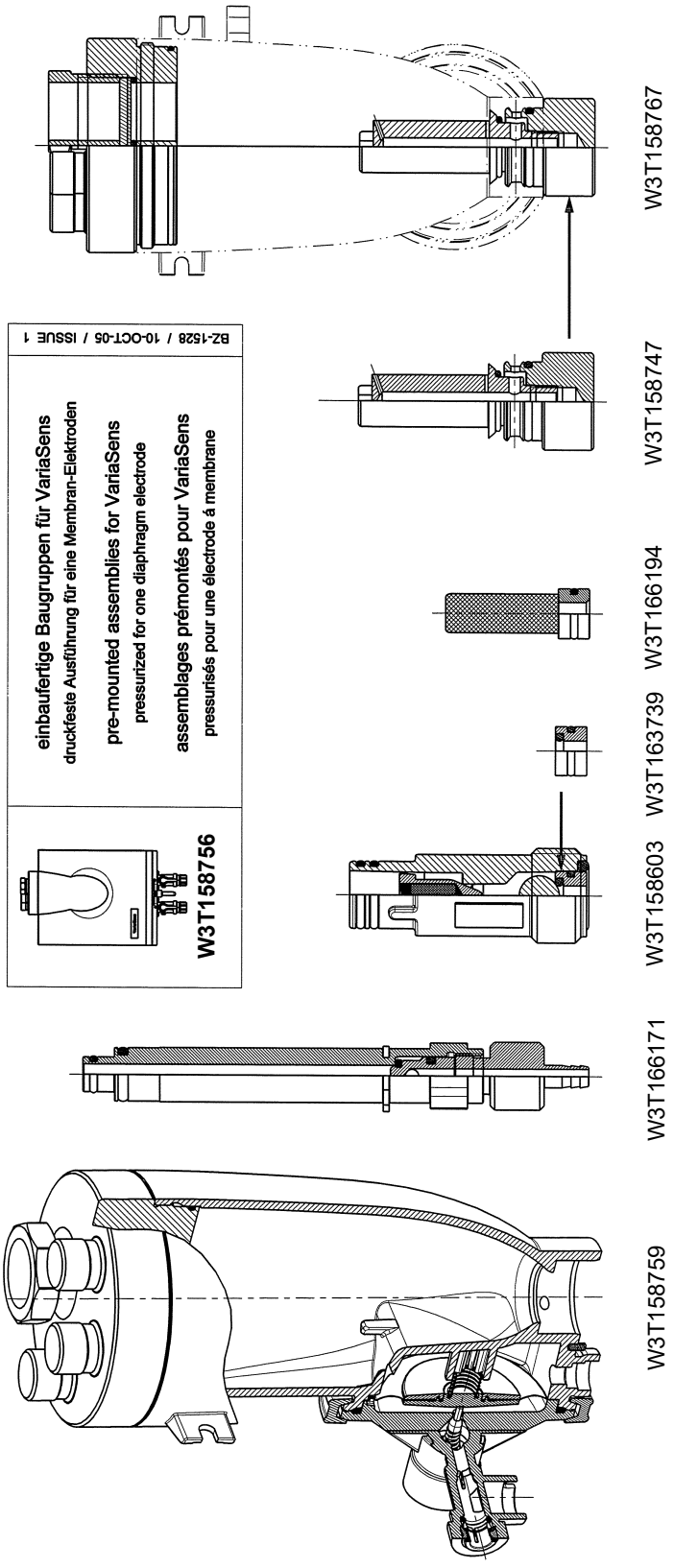
VariaSens drawing (non-pressurized version) W3T158742



VariaSens parts list (non-pressurized version) W3T158742

Item	Part No.	Designation
1	W3T160628	Basic housing
1,92,93	W3T164571	Basic housing, pre-assembled
3	W3T160629	Housing cover
4	W3T160908	Product label
5	W2T506143	Cable clamp
6	W3T172029	Multi sensor
7	W3T166170	Shut-off valve
8	W3T158593	Discharge nozzle
9	W2T507615	Flat nut
10	W3T158561	Cell body
11	W3T164226	Compression spring
12	W3T158569	Membrane unit
13	W3T160654	O-ring
14	W3T158595	Control valve body
15	W2T504209	Plastic cartridge
16	W3T160649	V profile clamp
17	W3T158567	Square nut
18	W2T504659	Cylinder screw
19	W2T506019	Washer
20	W3T158572	Valve pin
21	W3T172795	Compression spring
22	W3T158573	Adjusting screw
23	W3T160357	O-ring
26	W3T160648	Check valve housing
28	W3T161396	O-ring
29	W3T169827	Float with magnet
30	W3T172946	Ball
31	W3T172949	O-ring
32	W3T159707	Insert
33	W3T172975	O-ring
34	W3T168189	Fine filter
33,34	W3T166194	Fine filter, complete
35	W3T158602	Filter housing
36	W2T505463	Plastic self-tapping screw
39	W3T172041	Securing ring
40	W3T158576	Outlet drain pipe
41	W3T172997	O-ring
42	W3T164597	O-ring
43	W3T158575	Drain screw
44	W3T166160	EPDM Flat gasket
45	W3T172556	O-ring
46	W3T158738	Cell body cover
47	W3T160657	O-ring
50	W3T172861	O-ring
51	W3T161501	Hose bushing
52	W3T169815	Locking ring
53	W3T161502	Union nut
50-53	W3T171453	Hose connection parts
54	W3T158601	Hose
55	W2T505093	Angle-reducing connector
56	W3T158740	Drain plug
57	W3T168875	O-ring
58	W3T167941	O-ring
59	W3T158739	Flow body
78	W3T166169	Fastening clip, coated
79	W3T172045	Electrode mount
80	W3T161561	Screw cap
81	W3T168162	Protective cap
82	W3T164588	Protective cap
84	W3T169029	Protection plug
85	W3T169044	Protection plug
86	W3T164574	Protection plug
92	W3T160627	Wall brackets
93	W2T504752	Sheet metal screw
98	W3T158600	Measuring beaker, 5 items
Accessories	W3T1714531	Hose connection parts ID6xWdg1
Accessories	W3T167518	Hose connection parts ID6xWdg3
Accessories	W3T173182	Fastening kit

VariaSens retrofit set (pressurized version) W3T158756

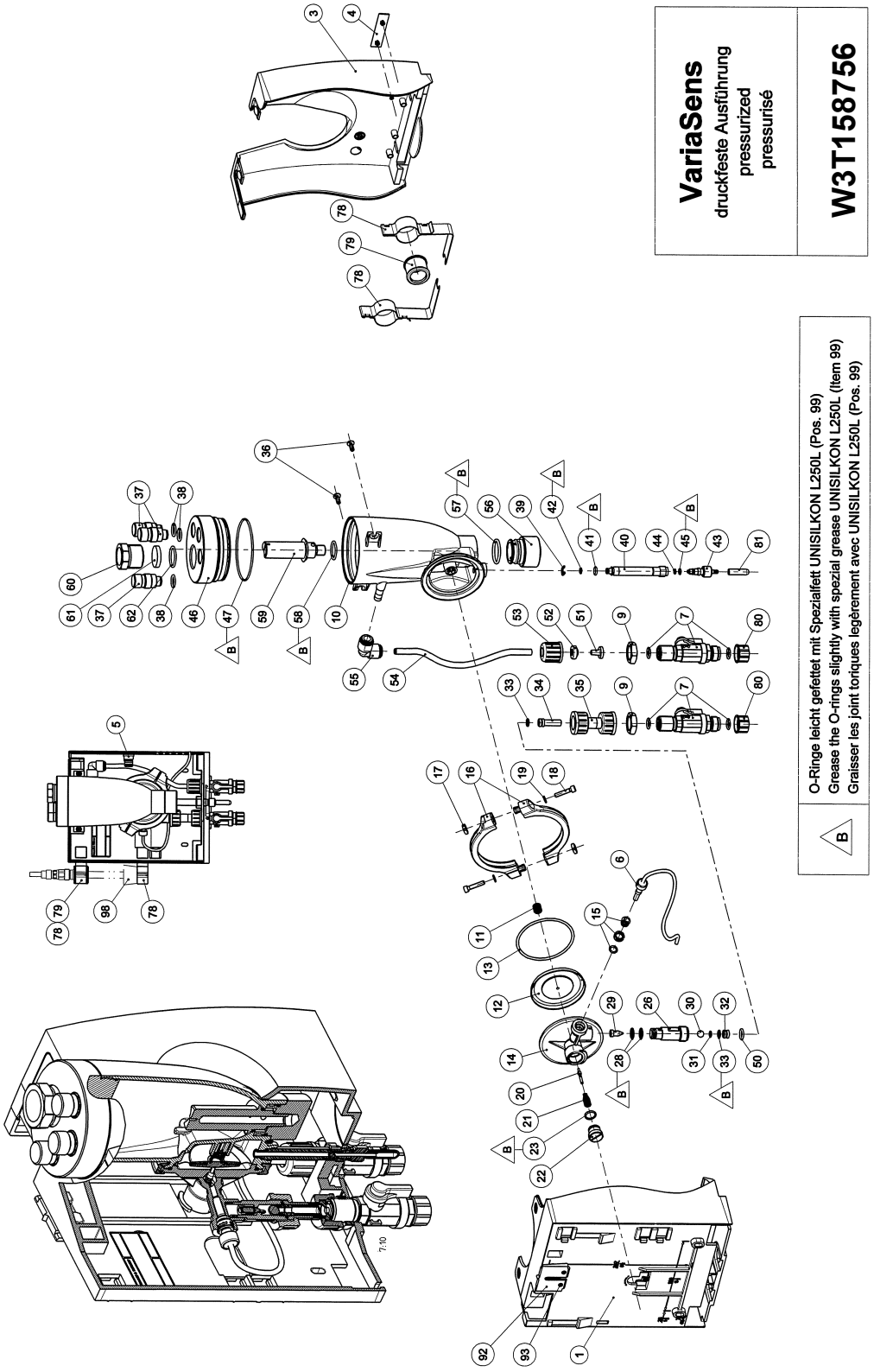


VariaSens parts list (pressurized version) W3T158756

Part No.	Designation
W3T158756	Flow block assembly, pressurized
W3T158759	Cell body VS-DF, complete
W3T166171	Drainage unit
W3T158603	Non-return valve
W3T163739	Valve seat complete
W3T166194	Fine filter
W3T158747	Flow body complete
W3T158767	Conversion kit D5-DF/VS-DF

Part No.	Designation
W3T158758	Accessories set VS-DF
W3T158877	Maintenance part set, annual maintenance
W3T158879	Maintenance part set, every 4 years
W3T158882	Set of spare parts for volumetric flow control

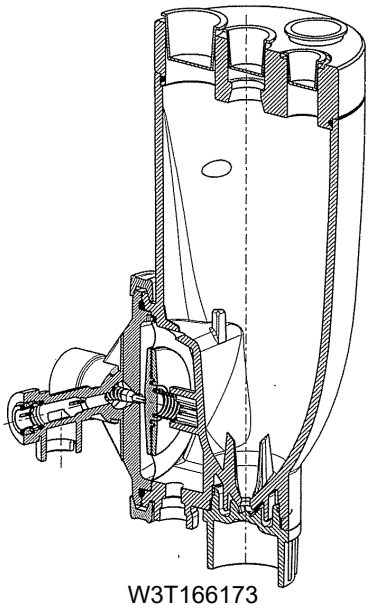
VariaSens drawing (pressurized version) W3T158756



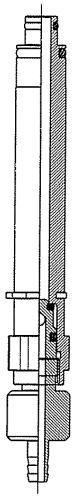
VariaSens parts list (pressurized version) W3T158756

Item	Part No.	Designation
1	W3T160628	Basic housing
1,92,93	W3T164571	Basic housing, pre-assembled
3	W3T160629	Housing cover
4	W3T160908	Product label
5	W2T506143	Cable clamp
6	W3T172029	Multi sensor
7	W3T166170	Shut-off valve
9	W2T507615	Flat nut
10	W3T158560	Cell body
11	W3T164226	Compression spring
12	W3T158569	Membrane unit
13	W3T160654	O-ring
14	W3T158595	Control valve body
15	W2T504209	Plastic cartridge
16	W3T160649	V profile clamp
17	W3T158567	Square nut
18	W2T504659	Cylinder screw
19	W2T506019	Washer
20	W3T158572	Valve pin
21	W3T172795	Compression spring
22	W3T158573	Adjusting screw
23	W3T160357	O-ring
26	W3T160648	Check valve housing
28	W3T161396	O-ring
29	W3T169827	Float with magnet
30	W3T172946	Ball
31	W3T172949	O-ring
32	W3T159707	Insert
33	W3T172975	O-ring
34	W3T168189	Fine filter
33,34	W3T166194	Fine filter, complete
35	W3T158602	Filter housing
36	W2T505463	Plastic self-tapping screw
37	W3T161450	Plug
38	W3T168859	O-ring
39	W3T172041	Securing ring
40	W3T158576	Outlet drain pipe
41	W3T172997	O-ring
42	W3T164597	O-ring
43	W3T158575	Drain screw
44	W3T166160	EPDM Flat gasket
45	W3T172556	O-ring
46	W3T158754	Cell body cover
47	W3T160657	O-ring
50	W3T172861	O-ring
51	W3T161501	Hose bushing
52	W3T169815	Locking ring
53	W3T161502	Union nut
50-53	W3T171453	Hose connection parts
54	W3T158601	Hose
55	W2T505093	Angle-reducing connector
56	W3T158740	Drain plug
57	W3T168875	O-ring
58	W3T167941	O-ring
59	W3T158739	Flow body
60	W3T171788	Screw-in part G1"
61	W3T163376	Washer
62	W3T168861	O-ring
78	W3T166169	Fastening clip, coated
79	W3T172045	Electrode mount
80	W3T161561	Screw cap
81	W3T168162	Protective cap
82	W3T164588	Protective cap
92	W3T160627	Wall brackets
93	W2T504752	Sheet metal screw
98	W3T158600	Measuring beaker, 5 items
Accessories	W3T171453	Hose connection parts ID6xWdg1
Accessories	W3T167518	Hose connection parts ID6xWdg3
Accessories	W3T173182	Fastening kit

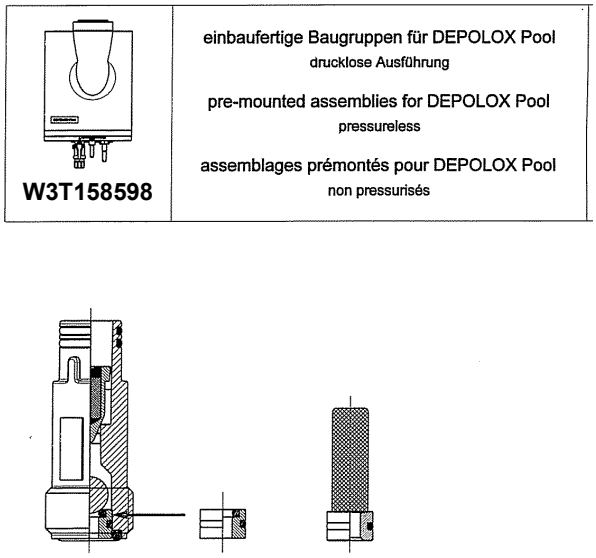
Ready-to-install assembly for DEPOLOX® Pool



W3T166173



W3T166171



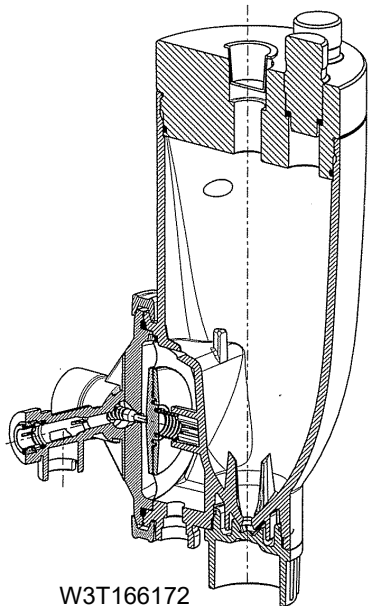
W3T158598

einbaufertige Baugruppen für DEPOLOX Pool
drucklose Ausführung

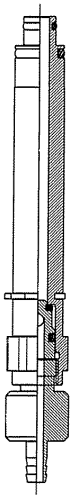
pre-mounted assemblies for DEPOLOX Pool
pressureless

assemblages prémontés pour DEPOLOX Pool
non pressurisés

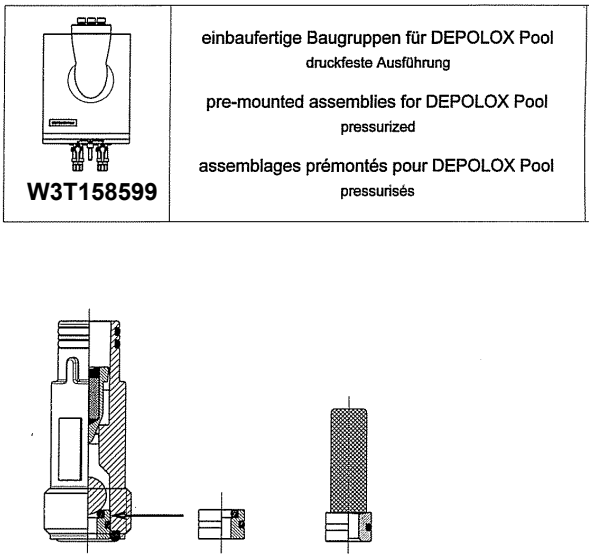
W3T158603 W3T163739 W3T166194



W3T166172



W3T166171



W3T158599

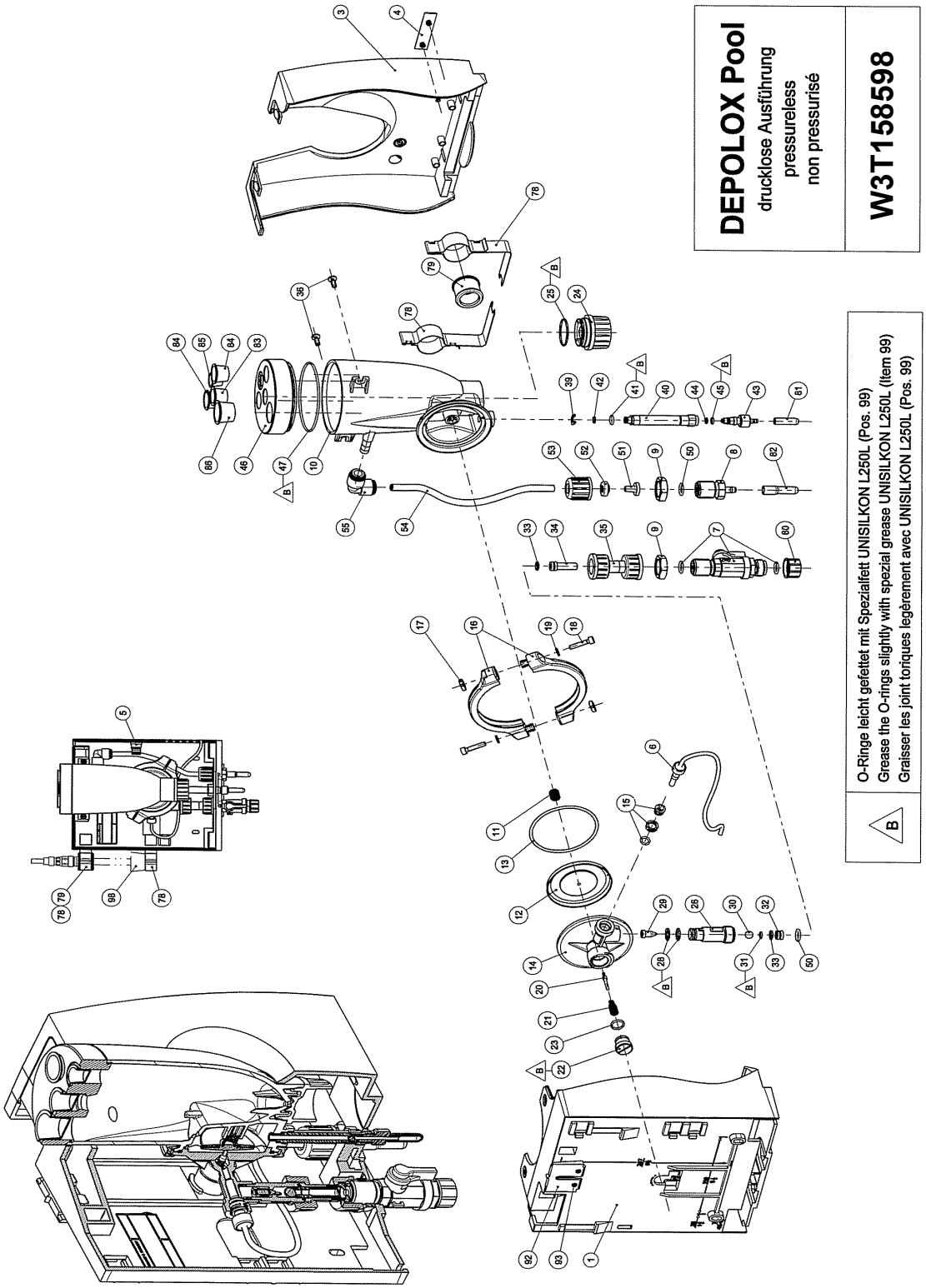
einbaufertige Baugruppen für DEPOLOX Pool
druckfeste Ausführung

pre-mounted assemblies for DEPOLOX Pool
pressurized

assemblages prémontés pour DEPOLOX Pool
pressurisés

W3T158603 W3T163739 W3T166194

Drawing DEPOLOX® Pool non-pressurized version W3T158598



Parts list DEPOLOX® Pool non-pressurized version
Part No. W3T158598 REF: WAE4161

Item	Part No.	Designation
1	W3T164571	Basic housing, pre-assembled
2	W2T507548	Type plate
3	W3T160629	Housing cover
4	W3T172038	Product label
5	W2T506143	Cable clamp
6	W3T172029	Multi sensor
7	W3T166170	Shut-off valve
8	W3T158593	Discharge nozzle
9	W2T507615	Flat nut
10	W3T158594	Cell body
11	W3T164226	Compression spring
12	W3T158569	Membrane unit
13	W3T160654	O-ring
14	W3T158595	Control valve body
15	W2T504209	Plastic cartridge
16	W3T160649	V profile clamp
17	W3T158567	Square nut
18	W2T504659	Cylinder screw
19	W2T506019	Washer
20	W3T158572	Valve pin
21	W3T172795	Compression spring
22	W3T158573	Adjusting screw
23	W3T160357	O-ring
24	W3T160650	Flow distributor cap
25	W3T160655	O-ring
26	W3T160648	Check valve housing
28	W3T161396	O-ring
29	W3T169827	Cone
30	W3T172946	Ball
31	W3T172949	O-ring
32	W3T159707	Insert
33	W3T172975	O-ring
34	W3T168189	Fine filter
35	W3T158602	Filter unit
36	W2T505463	Cross recessed head screw
39	W3T172041	Securing ring
40	W3T158576	Outlet drain pipe
41	W3T172997	O-ring
42	W3T164597	O-ring
43	W3T158575	Drain screw
44	W3T166160	EPDM flat gasket
45	W3T172556	O-ring
46	W3T158565	Cell body cover
47	W3T160657	O-ring
50	W3T172861	O-ring
51	W3T161501	Hose bushing
52	W3T169815	Locking ring
53	W3T161502	Union nut
54	W3T158601	Hose
55	W2T505093	Angle-reducing connector
78	W3T166169	Fastening clip
79	W3T172045	Electrode mount
80	W3T161561	Screw cap
81	W3T168162	Protective cap
82	W3T164588	Protective cap
83	W3T161453	Protection plug
84	W3T169029	Protection plug
85	W3T169044	Protection plug
86	W3T164574	Protection plug
98	W3T158600	Beaker

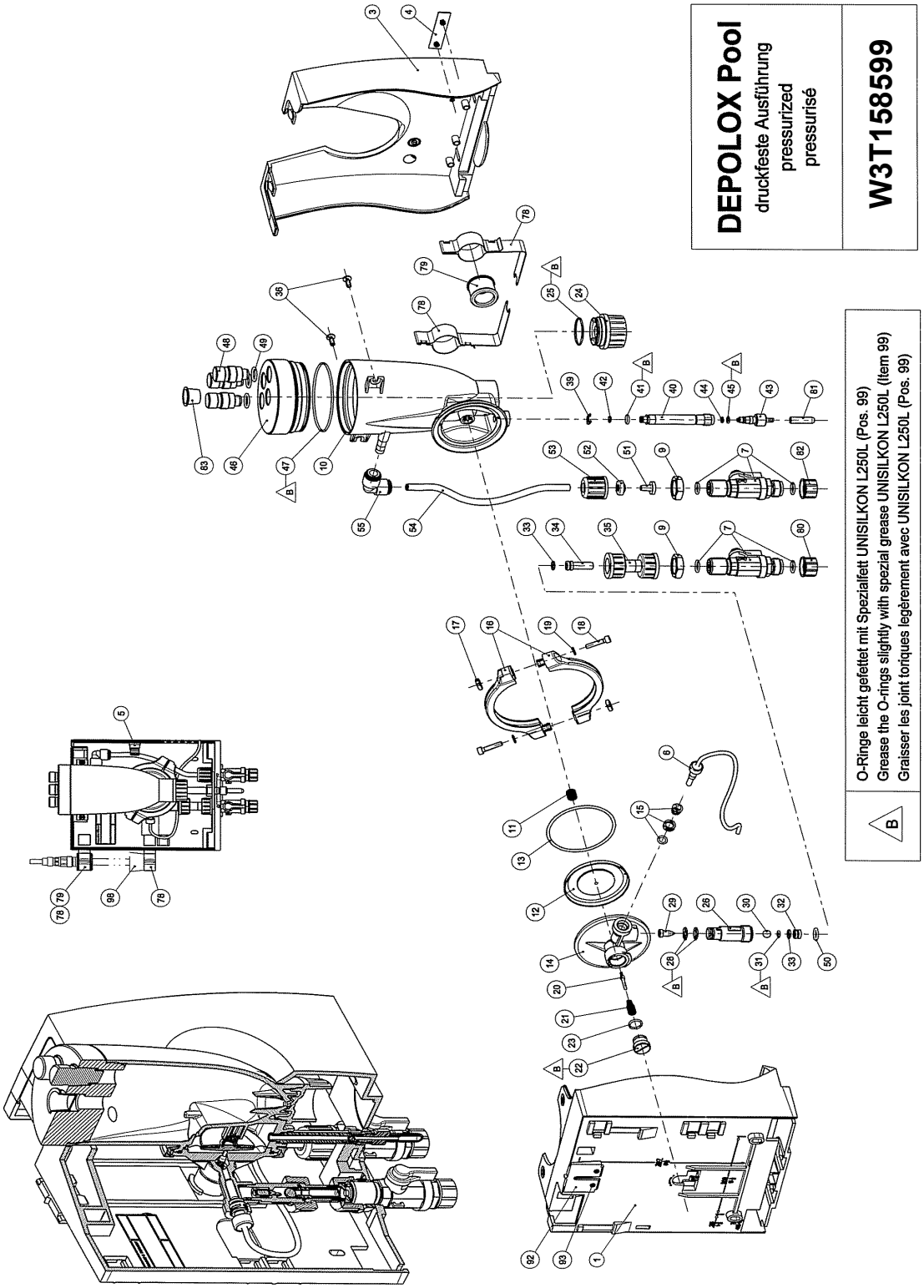
Pre-assembled component groups

Item	Part No.	Designation
W3T166173	Cell body, complete	consisting of: Items 10-25, 46-47, 83-86
W3T158603	Non-return valve	consisting of: Items 26, 28-33, 50, 80
W3T166171	Drainage unit	consisting of: Items 39-45, 81
W3T166194	Fine filter	consisting of: Items 33-34
W3T163739	Valve seat complete	consisting of: Items 31-33

Spare parts sets

Item	Part No.	Designation
W3T166192	Accessories set DP-DL	
W3T166181	Maintenance part set, annual maintenance	consisting of: Pos. 1, 32, 44, 45, 95, 98, 99, 100 special gease UNISILKON (tube, W2T504248)
W3T170073	Maintenance part set, every 4 years	consisting of: Pos. 1, 7, 25, 28, 32, 41, 42, 44, 45, 47, 50, 95, 98, 99, 100
W3T158882	Set of spare parts for volumetric flow control	

Drawing of DEPOLOX® Pool pressurized version W3T158599



Parts list DEPOLOX® Pool non-pressurized version
Part No. W3T158599 REF: WAE4162

Item	Part No.	Designation
1	W3T164571	Basic housing, pre-assembled
2	W2T507548	Type plate
3	W3T160629	Housing cover
4	W3T172038	Product label
5	W2T506143	Cable clamp
6	W3T172029	Multi sensor
7	W3T166170	Shut-off valve
9	W2T507615	Flat nut
10	W3T158559	Cell body
11	W3T164226	Compression spring
12	W3T158569	Membrane unit
13	W3T160654	O-ring
14	W3T158595	Control valve body
15	W2T504209	Plastic cartridge
16	W3T160649	V profile clamp
17	W3T158567	Square nut
18	W2T504659	Cylinder screw
19	W2T506019	Washer
20	W3T158572	Valve pin
21	W3T172795	Compression spring
22	W3T158573	Adjusting screw
23	W3T160357	O-ring
24	W3T160650	Flow distributor cap
25	W3T160655	O-ring
26	W3T160648	Check valve housing
28	W3T161396	O-ring
29	W3T169827	Cone
30	W3T172946	Ball
31	W3T172949	O-ring
32	W3T159707	Insert
33	W3T172975	O-ring
34	W3T168189	Fine filter
35	W3T158602	Filter unit
36	W2T505463	Cross recessed head screw
39	W3T172041	Securing ring
40	W3T158576	Outlet drain pipe
41	W3T172997	O-ring
42	W3T164597	O-ring
43	W3T158575	Drain screw
44	W3T166160	EPDM flat gasket
45	W3T172556	O-ring
46	W3T158563	Cell body cover
47	W3T160657	O-ring
48	W3T161450	Plug
49	W3T168859	O-ring
50	W3T172861	O-ring
51	W3T161501	Hose bushing
52	W3T169815	Locking ring
53	W3T161502	Union nut
54	W3T158601	Hose
55	W2T505093	Angle-reducing connector
78	W3T166169	Fastening clip
79	W3T172045	Electrode mount
80	W3T161561	Screw cap
81	W3T168162	Protective cap
83	W3T161453	Protection plug
98	W3T158600	Beaker

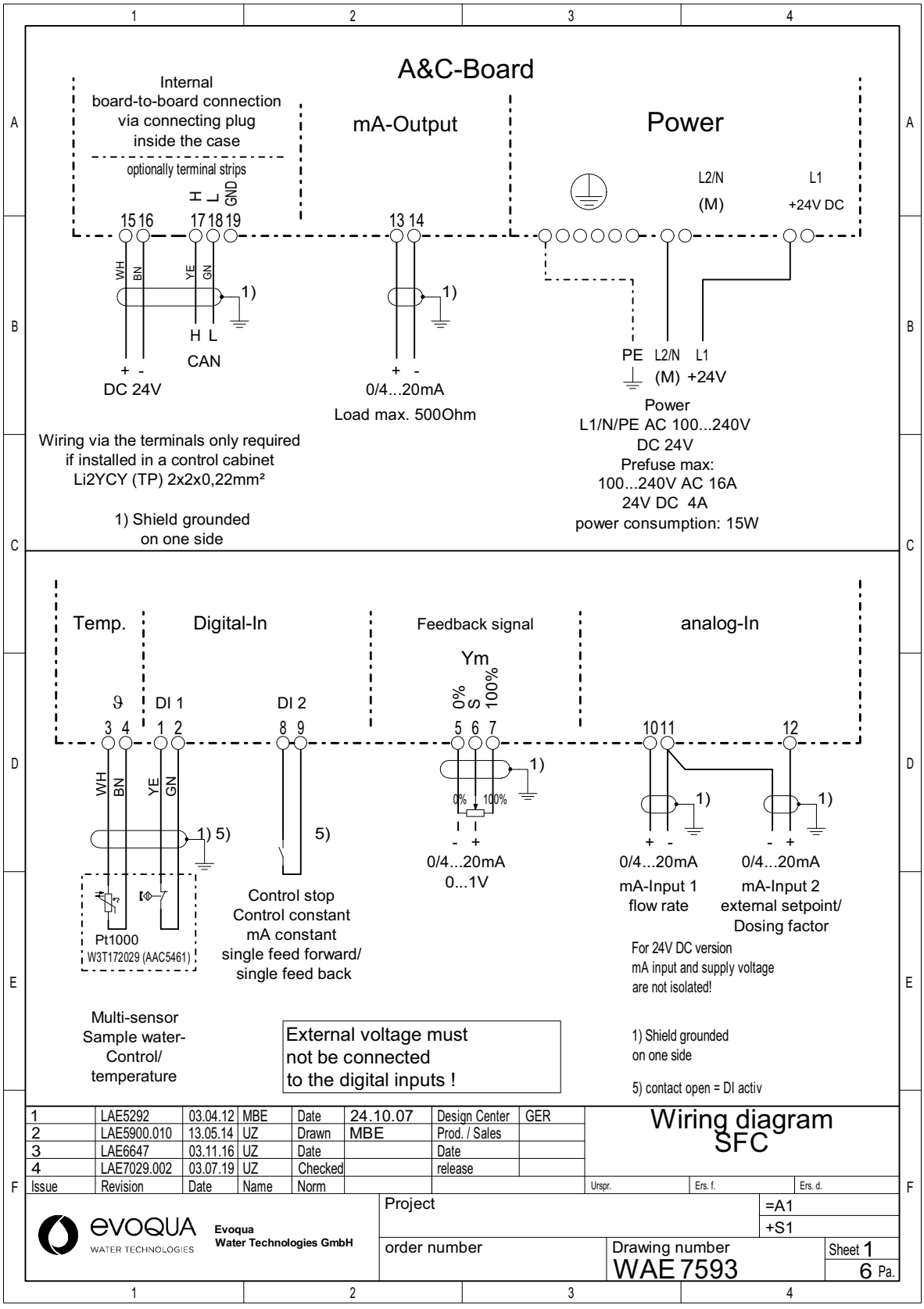
Pre-assembled component groups

Item	Part No.	Designation
W3T166172	Cell body, complete	consisting of: Items 10-25, 46-49, 55, 83
W3T158603	Non-return valve	consisting of: Items 26, 28-33, 50, 80
W3T166171	Drainage unit	consisting of: Items 39-45, 81
W3T166194	Fine filter	consisting of: Items 33-34
W3T163739	Valve seat complete	consisting of: Items 31-33

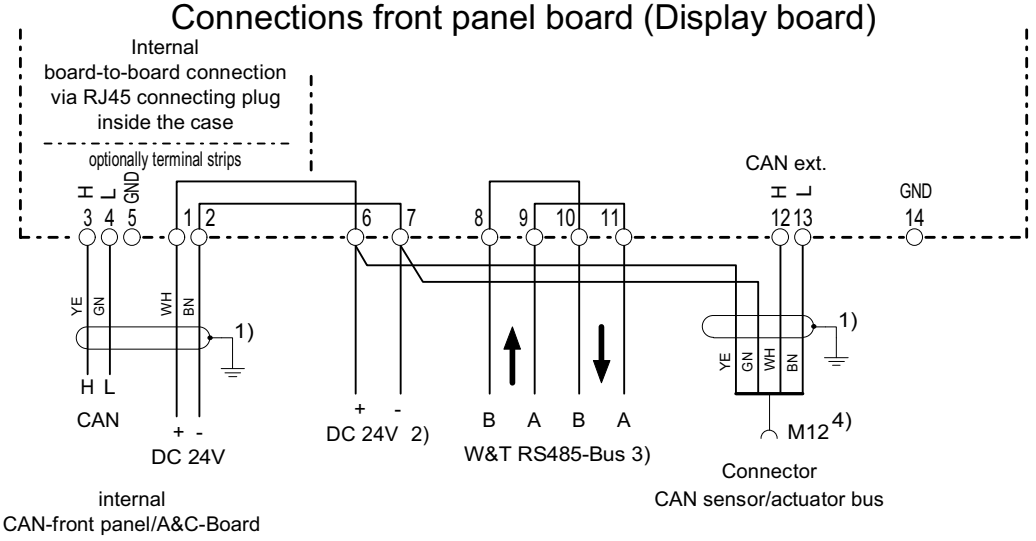
Spare parts sets

Item	Part No.	Designation
W3T166193	Accessories set DP-DF	
W3T158874	Maintenance part set, annualy maintenance	consisting of: Pos. 1, 32, 44, 45, 95, 98, 100 special gease UNISILKON (tube, W2T504248)
W3T158878	Maintenance part set, every 4 years	consisting of: Pos. 1, 7, 25, 28, 32, 41, 42, 44, 45, 47, 50, 95, 98, 100
W3T166180	Seal set (for conductivity sensor)	
W3T158882	Set of spare parts for volumetric flow control	

9. Wiring Diagrams



Connections front panel board (Display board)



(Only requires wiring if installed in a control cabinet,
max. length 30 m, otherwise use preassembled plug cable W3T172413 (AAD8065))

Connector M12		
1	shield	BK
2	+24V	YE
3	0V	GN
4	CAN H	WH
5	CAN L	BN

1) Shield grounded
on one side

2) Only use if not using terminals 1 + 2 or preassembled plug cable

3) For shielding concept or RS485 bus design,
please refer to the RS485 instructions provided with the SFC unit.

4) CAN connector as accessories available

1	LAE5292	03.04.12	MBE	Date	24.10.07	Design Center	GER	Wiring diagram SFC
2	LAE5900.010	13.05.14	UZ	Drawn	MBE	Prod. / Sales		
3	LAE6647	03.11.16	UZ	Date		Date		
4	LAE7029.002	03.07.19	UZ	Checked		release		
Issue	Revision	Date	Name	Norm			Urspr. / Ers. f. / Ers. d.	

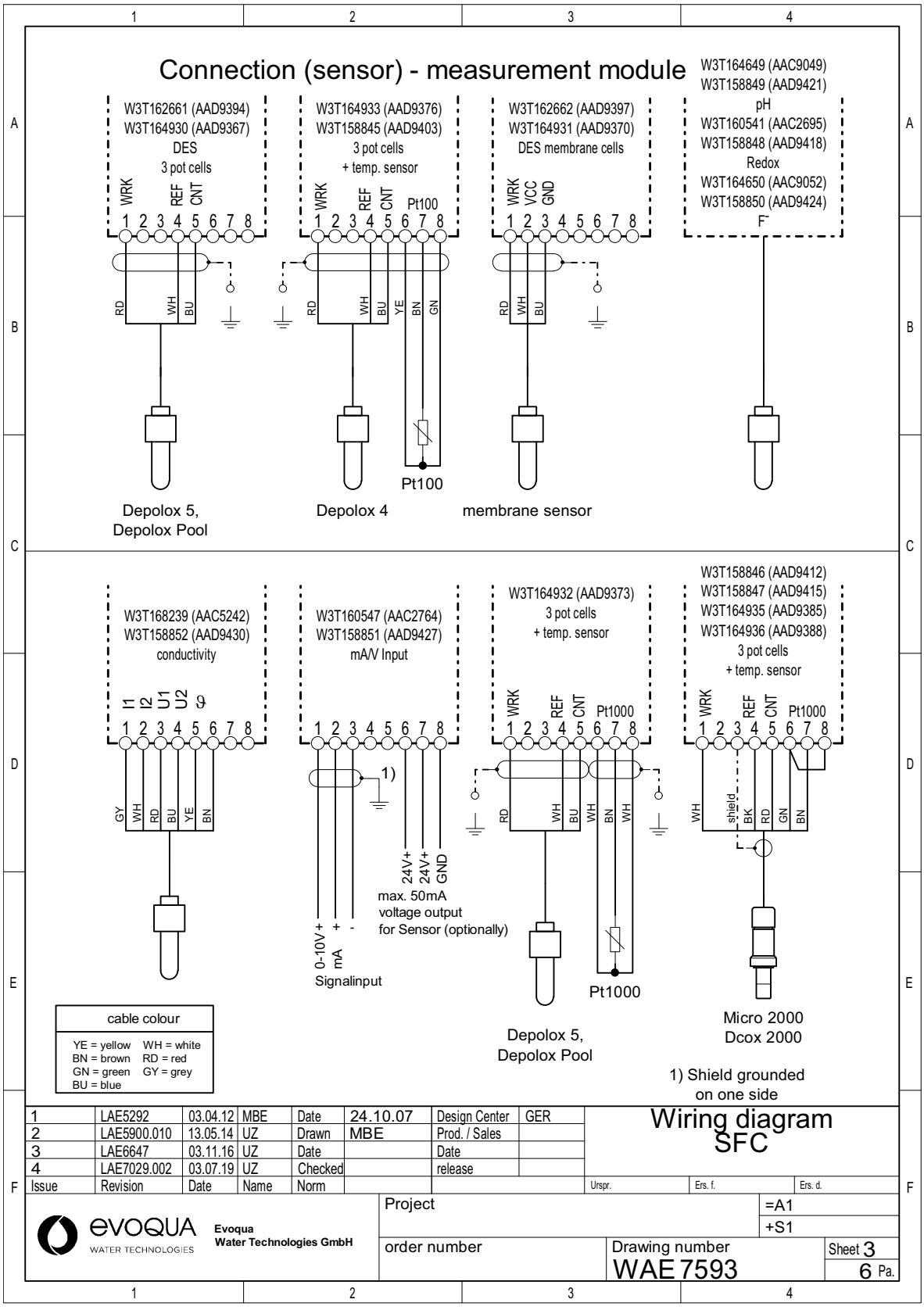
EVOQUA WATER TECHNOLOGIES — Evoqua Water Technologies GmbH

Project: =A1 +S1

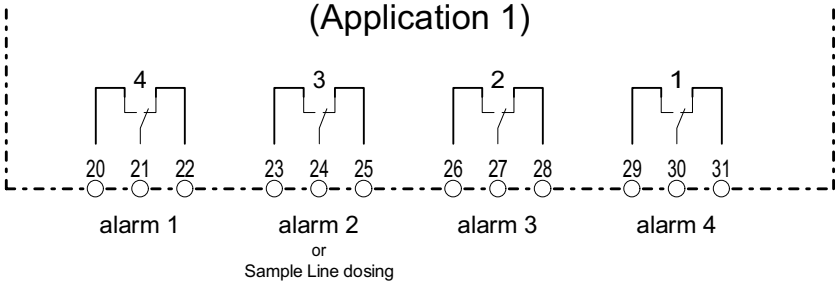
order number

Drawing number: WAE 7593

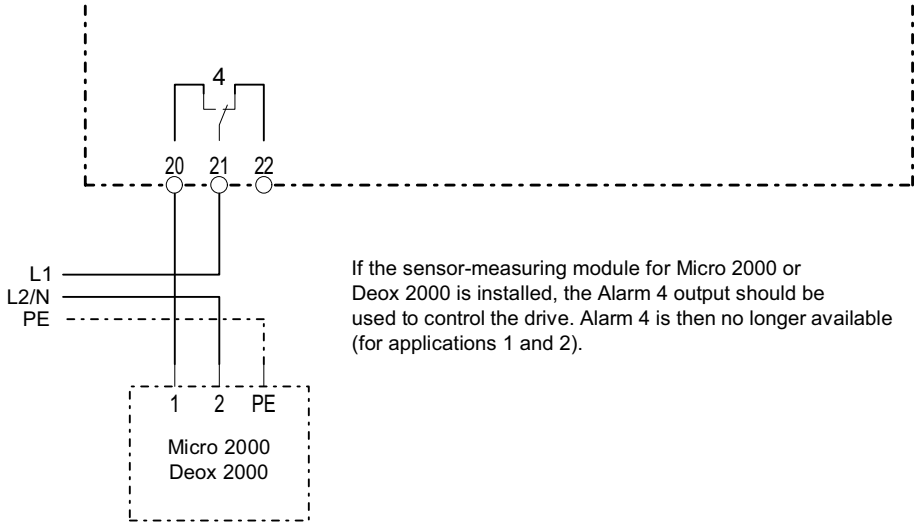
Sheet 2 / 6 Pa.


Connection (sensor) - measurement module
W3T162661 (AAD9394)
W3T164930 (AAD9367)
DES
3 pot cells
WRK REF CNT
1 2 3 4 5 6 7 8
RD WH BU
Depolox 5,
Depolox Pool
W3T164933 (AAD9376)
W3T158845 (AAD9403)
3 pot cells
+ temp. sensor
WRK REF CNT Pt100
1 2 3 4 5 6 7 8
RD WH BU YE BN GN
Pt100
Depolox 4
W3T162662 (AAD9397)
W3T164931 (AAD9370)
DES membrane cells
WRK VCC GND
1 2 3 4 5 6 7 8
RD WH BU
membrane sensor
W3T164649 (AAC9049)
W3T158849 (AAD9421)
pH
W3T160541 (AAC2695)
W3T158848 (AAD9418)
Redox
W3T164650 (AAC9052)
W3T158850 (AAD9424)
F-
W3T168239 (AAC5242)
W3T158852 (AAD9430)
conductivity
I1 I2 U1 U2 ϑ
1 2 3 4 5 6 7 8
GY WH RD BU YE BN
W3T160547 (AAC2764)
W3T158851 (AAD9427)
mA/V Input
1 2 3 4 5 6 7 8
1)
24V+ 24V+ GND
max. 50mA
voltage output
for Sensor (optionally)
0-10V+ + -
mA
Signalinput
W3T164932 (AAD9373)
3 pot cells
+ temp. sensor
WRK REF CNT Pt1000
1 2 3 4 5 6 7 8
RD WH BU WH BN WH
Pt1000
Depolox 5,
Depolox Pool
W3T158846 (AAD9412)
W3T158847 (AAD9415)
W3T164935 (AAD9385)
W3T164936 (AAD9388)
3 pot cells
+ temp. sensor
WRK REF CNT Pt1000
1 2 3 4 5 6 7 8
WH shield BK RD GN BN
Micro 2000
Dcox 2000
cable colour
YE = yellow WH = white
BN = brown RD = red
GN = green GY = grey
BU = blue
1) Shield grounded
on one side
1 LAE5292 03.04.12 MBE Date 24.10.07 Design Center GER
2 LAE5900.010 13.05.14 UZ Drawn MBE Prod. / Sales
3 LAE6647 03.11.16 UZ Date Date
4 LAE7029.002 03.07.19 UZ Checked release
Issue Revision Date Name Norm
Wiring diagram
SFC
Urspr. Ers. f. Ers. d.
Evoqua
Water Technologies GmbH
Project
=A1
+S1
order number
Drawing number
WAE 7593
Sheet 3
6 Pa.

Relay-outputs A&C-Board (mother board) (Application 1)



Connection from Micro 2000 / Deox 2000 Drive



If the sensor-measuring module for Micro 2000 or Deox 2000 is installed, the Alarm 4 output should be used to control the drive. Alarm 4 is then no longer available (for applications 1 and 2).

External voltage may still be connected even when the main switch is set to OFF !

Issue	Revision	Date	Name	Norm				Urspr.	Ers. f.	Ers. d.
1	LAE5292	03.04.12	MBE	Date	24.10.07	Design Center	GER			
2	LAE5900.010	13.05.14	UZ	Drawn	MBE	Prod. / Sales				
3	LAE6647	03.11.16	UZ	Date		Date				
4	LAE7029.002	03.07.19	UZ	Checked		release				

Wiring diagram SFC

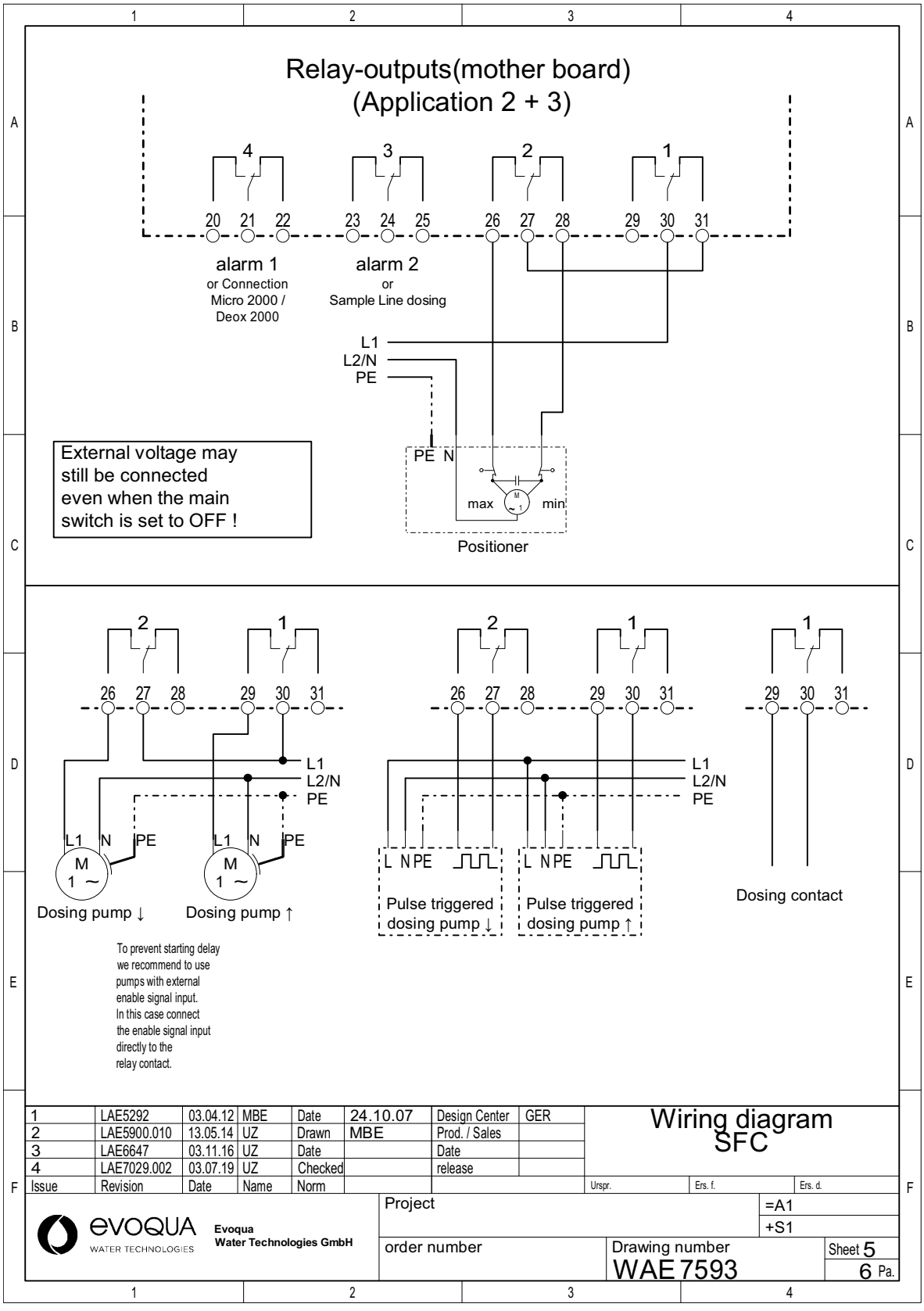
Evoqua Water Technologies GmbH

Project =A1 +S1

order number

Drawing number WAE 7593

Sheet 4 6 Pa.



1	LAE5292	03.04.12	MBE	Date	24.10.07	Design Center	GER
2	LAE5900.010	13.05.14	UZ	Drawn	MBE	Prod. / Sales	
3	LAE6647	03.11.16	UZ	Date		Date	
4	LAE7029.002	03.07.19	UZ	Checked		release	
Issue	Revision	Date	Name	Norm			

Wiring diagram
SFC

Urspr. | Ers. f. | Ers. d.

Evoqua
Water Technologies GmbH

Project: =A1 +S1

order number

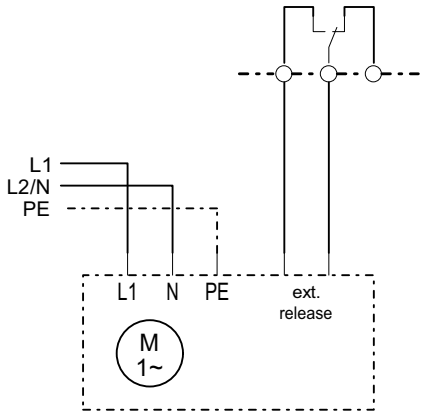
Drawing number: WAE 7593

Sheet 5
6 Pa.

Connection of a dosing pump with external enable signal input contact

Note:

To prevent starting delay we recommend to use pumps with external enable signal input. In this case connect the enable signal input directly to the relay contact.



Dosing pump

wiring diagramm DE: WAE7592
wiring diagramm EN: WAE7593
wiring diagramm FR: WAE7594

1	LAE5292	03.04.12	MBE	Date	24.10.07	Design Center	GER
2	LAE5900.010	13.05.14	UZ	Drawn	MBE	Prod. / Sales	
3	LAE6647	03.11.16	UZ	Date		Date	
4	LAE7029.002	03.07.19	UZ	Checked		release	
Issue	Revision	Date	Name	Norm			

Wiring diagram
SFC

Urspr. | Ers. f. | Ers. d.

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Water Technologies GmbH

Project: =A1 +S1

order number

Drawing number: WAE 7593

Sheet 6
6 Pa.

10.Declarations and certificates

10.1 Declaration of Conformity

EVOQUA WATER TECHNOLOGIES

EG-Konformitätserklärung
EC Declaration of Conformity
Déclaration CE de conformité

No. MAE1272

Ausgabe/*issue*/**édition** 05

Hersteller/*Manufacturer*/**Constructeur:**	Evoqua Water Technologies GmbH
Anschrift/*Address*/**Adresse:**	Auf der Weide 10, D-89312 Günzburg
Produktbezeichnung: *Product description:* **Description du produit:**	Serie SFC *Series SFC* **Séries SFC**

Das bezeichnete Produkt stimmt in der von uns in Verkehr gebrachten Ausführung mit den Vorschriften folgender europäischer Richtlinien überein:
The product described above in the form as delivered is in conformity with the provisions of the following European Directives:
Le produit désigné est conforme, dans la version que nous avons mise en circulation, avec les prescriptions des directives européennes suivantes :

2014/30/EU Richtlinie des Europäischen Parlaments und des Rates vom 26. Februar 2014 zur Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit.
Directive of the European Parliament and of the Council of 26 February 2014 on the approximation of the laws of the Member States relating to electromagnetic compatibility.
Directive du Parlement européen et du Conseil du 26 février 2014 relative au rapprochement des législations des Etats membres concernant la compatibilité électromagnétique.

2014/35/EU Richtlinie des Europäischen Parlaments und des Rates vom 26. Februar 2014 zur Harmonisierung der Rechtsvorschriften der Mitgliedstaaten betreffend elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen.
Directive of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.
Directive du Parlement européen et du Conseil du 26 février 2014 concernant le rapprochement des législations des Etats membres relatives au matériel électrique destiné à être employé dans certaines limites de tension.
CE-Kennzeichnung / *CE marking* / **Marquage CE**: 2016

Evoqua Water Technologies GmbH
Auf der Weide 10
89312 Günzburg
Deutschland

Tel.: +49 (8221) 904-0
Fax: +49 (8221) 904-203
www.evoqua.com

Die Konformität mit den Richtlinien wird nachgewiesen durch die Einhaltung der in der Nachweisdokumentation aufgelisteten Normen.
Evidence of conformity to the Directives is assured through the application of the standards listed in the relevant documentation.
La conformité avec les directives est assurée par le respect des normes listés dans la documentation téchnique correspondante.

Benannte Person für technische Unterlagen:
Authorized person for the technical file:
Personne désignée pour la documentation technique:

Name / *name* / **nom:** Evoqua Water Technologies GmbH

Adresse / *address* / **adresse:** Auf der Weide 10, D-89312 Günzburg

Günzburg, den / *the* 2016-04-19

Evoqua Water Technologies GmbH

i.V. .....

Klaus Andre
Technischer Leiter / *Director Engineering*
Unterschrift
signature / **signature**

i.V. .....

Helmut Fischer
Leiter QM / *Quality Manager*
Unterschrift
signature / **signature**

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Beschaffenheits- oder Haltbarkeitsgarantie nach §443 BGB. Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.
This declaration certifies the conformity to the specified directives but does not imply any warranty for properties. The safety documentation accompanying the product shall be considered in detail..
La présente déclaration atteste de la concordance avec les directives citées, elle n'offre cependant pas de garantie quant à la nature ou la durabilité selon l'article 443 du code civil allemand. Les consignes de sécurité de la documentation du produit fournie sont à respecter.

10.2 Certificate of Compliance

CSA Group

Certificate of Compliance

Certificate: 2008605 **Master Contract:** 226676

Project: 70006009 **Date Issued:** May 29, 2014

Issued to: **Evoqua Water Technologies GmbH**

Auf der Weide 10
Gunzburg, 89312
Germany
Attention: Wolfgang Kleiber

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US or with adjacent indicator 'US' for US only or without either indicator for Canada only.

C US

Anne Drouin

Issued by: Anne Drouin

PRODUCTS

CLASS 3631 05 - ELECTRICAL MEASUREMENT AND TEST EQUIPMENT
CLASS 3631 85 - ELECTRICAL EQUIPMENT FOR MEASUREMENT USE - Certified to US Standards

Water analysers**, Models: SFC, SFC-PC* and SFC-SC*, permanently connected, permanently installed, Rated: 100-240Vac, 50/60Hz, 15W or 24Vdc, 15W; IPX0.

Notes:

The above model is Equipment Class 1 (for 100-240Vac rated units) and Class III (for 24Vdc rated units), Pollution Degree II and Measurement Category 2.

*: PC stands for Process Control and SC stand for Signal Conditioning.

**: Can be used with the following flow block modules:

DP-XX Flow block module “Depolox Pool” for application in the pool market

DQD 507 Rev. 2012-05-22 Page: 1

CSA Group

Certificate: 2008605 **Master Contract:** 226676

Project: 70006009 **Date Issued:** May 29, 2014

D5-XX Flow block module "Depolox 5" for application in the potable water market

VS-XX Flow block module "VariaSens" for application in the potable water market

These Flow blocks are available in two versions for pressure less or pressurized application. XX stands for DL (*Drucklos*: Pressure less) or DF (*Druckfest*: pressurized).

XXX: stands for the type of sensor used in the unit: TC1 (total chlorine), FC1 (free chlorine), CD7 (chlorine dioxide) or OZ7 (ozone).

APPLICABLE REQUIREMENTS

CAN/CSA-C22.2 No. 61010-1-04 - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements

UL Std. No. 61010-1 (2nd Edition) - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements

DQD 507 Rev. 2012-05-22 Page: 2

11.Settings Table

Please note

This settings table shows all of the settings available in SFC. Depending on the application selected and the sensor measuring modules fitted, various menu items, menu parameters and setting parameters may be hidden. Cross out any that are not applicable. Make a note of your settings here.
Please refer to the settings table inside the control cabinet too (optional).

Selected application	Factory settings: 2	Commissioning:

Menu	Menu parameters	Setting parameters (factory setting)	Commissioning
Module type 1			
Control	Control mode		
	Setpoint		
	Setpoint source	internal	
	Dosing factor	100 %	
	Dos. fact source	internal	
	Yout-factor	1.0	
Actuator	Control output	Dosing pump 2P	
	Tp	60 s	
	Ty	90 s	
	Sample time T	20 s	
	Ym calibration	Auto	
	Ym calibration	Manual	
	Ym calib. points	2	
	max. Pulse/min	100	
	Hysteresis		
	min. ON	10min00s	

Menu	Menu parameters	Setting parameters (factory setting)	Commissioning
Setup	Flow source	Flow measurement	
	Flow dirtect ion	direct	
	Control Input 2	Off	
	Input direction	direct	
	Control direct	direct	
	X factor	1,0	
	Ymin	0 %	
	Ymax	100 %	
Parameter	Xsh	1,0 %	
	Tkonst	1min00s	
	Tvar	00min30s	
	Max. lin. correction	50 %	
	Control factor	1,0	
	Xp	100 %	
	Tn	20 min	
	PI shutdown	5 %	
Measuring range	Range start		
	pH	4.00	
	mV	400 mV	
	mA/V	0 %	
	Range end		
	pH	9.00	
	mV	900 mV	
	mA/V	100 %	
	Measuring range		
	Cl_2	1,00 mg/l	
	Mem	1,0 mg/l	
	F^-	2,00 mg/l	
	LF	10,00 mS/cm	
	Sensor type	Definition of the senosr with 3-electrode cells: free Cl_2	
		Definition of the senosr with membrane cells: Cl-N total	
	Unit		
	Cl_2	mg/l	
	Mem	mg/l	

Menu	Menu parameters	Setting parameters (factory setting)	Commissioning
	mA/V	%	
	Sensor name	"_ _ _ _"	
	Format	000.0	
	Upot	250 mV	
	µA measuring range	Select the µA signal measuring range for 3-electrode cells and membrane sensors: 100 µA for Micro 2000 and Deox 2000: 100 µA	
	Signal Cl_2 free	CAN external	
	Signal	0 – 20 mA	
	Factor		
	Reference temp.	20°C / 25°C	
	Salt displ.	NaCl in g/l	
Limit value 1	Min I		
	Max I		
	Min II		
	Max II		
	Hysteresis		
Limit value 2	Min Yout/Ym	20 %	
	Max Yout/Ym	80 %	
	Hysteresis	5 %	
	Min Ypi	20 %	
	Max Ypi	80 %	
	Hysterese	5,0 %	
Adaption	Tu	1min00s	
	Ts	00h10min00s	

Menu	Menu parameters	Setting parameters (factory setting)	Commissioning
Module type 2			
Actuator	Control output	Dosing pump 2P	
	Hysteresis		
	min. ON	10min00s	
Setup	Control direction	direct	
Measuring range	Range start		
	pH	4.00	
	Range end		
	pH	9.00	
Limit value	Min		
	Max		
	Hysteresis		

Menu	Menu parameters	Setting parameters (factory setting)	Commissioning
External Functions	Sample Line Dos	Off	
	Range start	1: 00:00 --	
	Dosing time	00min30s	
	Delay	00min30s	
	SW stop time	01min30s	
	Hold delay	15min00s	

Menu	Menu parameters	Setting parameters (factory setting)	Commissioning
Input/Output			
Flow rateWq	Signal	0 – 20 mA	
	Factor	1,1	
	Format	0000	
	Unit	%	
	Range start	000.0 %	
	Range end	100.0 %	
Flow limit values	Min	20 %	
	Max	80 %	
	Hysteresis	0.5 %	
ext. setpoint / DF	Signal	0 – 20 mA,	
	Factor	1,0	
Setpoint / DF limit values	Min	20 %	
	Max	80 %	
	Hysteresis	05 %	
Analog out	mA Signal	Off	
	mA	Measured value	
Digital input	DI (1)	MW-STOP FCT	
	DI (2)	--	
Interface	RS485 Adress	01	

Menu	Menu parameters	Setting parameters (factory setting)	Commissioning
Alarm			
	Alarm 1 function	N.O. unlatched	
	Alarm 1 delay	00h00min00s	
	Alarm 2 function	N.O. unlatched	
	Alarm 2 delay	00h00min00s	
	Alarm 3 function	N.O. unlatched	
	Alarm 3 delay	00h00min00s	
	Alarm 4 function	N.O. unlatched	
	Alarm 4 delay	00h00min00s	
Alarm assign Alarm 1			
Alarm assign Alarm 2			
Alarm assign Alarm 3			
Alarm assign Alarm 4			

Menu	Menu parameters	Setting parameters (factory setting)	Commissioning
System			
General	Time (hh:mm)	current time	
	Date (tt.mm.jj)	current date	
	Measure. filter	Off	
	Hold Function	Off	
	Language	English	
	System name	SFC-PC	
	Brightness Max	50 %	
	Brightness Min	10 %	
Configuration	Save	Config 1	
	Restore	Config 1	
	Copy	Config 1 -> SD	
Safety	Feed delay	3min00s	
	Samp. water delay	1min00s	
	System password	0000	
	Calib password	--	
Trend Graph	Channel 1	Measured value	
	Channel 2	Temperature	
Module designation	Module	----	
System reset	System restart	no	
	Delete graph	no	
	Standard values	no	
	Delete dos. avg.	no	
	Dosing factors	50 %	

Settings changed from: _____

Settings changed on: _____

12.Index

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WATER TECHNOLOGIES

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