October 2015

E N G L I S H

Please carefully read this operating instructions completely before commissioning the probe!

Do not discard!

The operator shall be liable for any damage caused by installation or operating errors!

For types:

Chlorine dioxide	CD7 (analog-out/analog)	analog signal output Dual power supply ±5 - ±15 VDC Single power supply 10 – 30 VDC analog signal processing no galvanical isolation
Peracetic acid	PES7 (analog-out/analog)	
Ozone	OZ7 (analog-out/analog)	
Hydrogen peroxide	WP7 (analog-out/analog)	

Chlorine dioxide	CD7 4-20mA (analog-out/analog)	analog signal output Current supply 4…20 mA analog signal processing no galvanical isolation
Peracetic acid	PES7 4-20mA (analog-out/analog)	
Ozone	OZ7 4-20mA (analog-out/analog)	
Hydrogen peroxide	WP7 4-20mA (analog-out/analog)	

Content

Page

1 General information

These sensors can be applied in nearly all water qualities. These sensors are partially resistant to chemicals and surfactants as they are equipped with a special membrane system.

This sensor is not suitable to check the absence of chlorine dioxide /peracetic acid /ozone / hydrogen peroxide.

A complete measuring and/or control system normally consists of the following components:

- sensor
- electrical leads and connectors
- flow chambers and connections
- measuring and control device
- dosing equipment
- analysing instrumentation

This operating instructions primarily refers to the sensor. Please pay attention to the corresponding operating instructions of the peripheral devices!

Warning: *Do not touch the electrode finger and keep it clean!*

Do not remove the layer on the electrode finger!

1.1 Chlorine dioxide sensor CD7

The chlorine dioxide sensor is insensitive to chlorine. Ozone is measured with a sensitivity 25 times higher than chlorine dioxide. The sensor can be used in the pH range from >pH 1 in alkaline fluids up to the chlorine dioxide stability limit is reached. Precipitations (e. g. lime) may block the membrane!

1.2 Peracetic acid sensor PES7

The sensor can be used in the pH range from >pH 1 up to pH 6. At a pH >6 the peracetic anion is present which cannot be measured by the sensor.
(Lime may block the membrane!)

1.3 Ozone sensor OZ7

The ozone probe is insensitive to chlorine. Chlorine dioxide increases the measuring value about 6%. The probe can be used within the pH range of pH 2 to pH 12 (lime may block the membrane!).

1.4 Hydrogen peroxide sensor WP7

The probe can be used in the pH range from >pH 2 up to pH 11 (lime may block the membrane)!

2 Function

The sensor is a membrane covered amperometric 2-electrode system. The measuring electrode is membrane covered and is in the electrolyte area together with the reference electrode. This electrolyte area contains a special electrolyte and is separated from the measuring water.

In this measuring method the disinfectant, e. g. chlorine dioxide diffuses out of the measuring water, through the membrane and causes in compound with the electrolyte an electrical signal at the measuring electrode. The electrical signal at the measuring electrode is proportional to the concentration of the disinfectant and is amplified by the electronics of the sensor. The measuring signal is independent from the temperature of the measuring water due to an integrated temperature compensation. Surfactants (e. g. tensides) are partially tolerated.

3 Intended use

The sensor has to be inserted in the flow chambers FLC-1 or FLC-3 according to this operating instructions (see section 6). The use of the sensor in other flow chambers has to be released by the manufacturer of the sensor. Otherwise the liability for a proper function of the sensors and personal injury and damage to equipment resulting from that is disclaimed.

The maximum allowed operating pressure of the sensor is 1.0 bar / 10 mwc. The allowed temperature operating range of the sensor is 0 up to <50 °C or <45 °C for the hydrogen peroxide sensors of the type WP7 and peracetic acid sensors PES7. Further operating guidelines see items 13 + 14. The sensors are to be used only for the measurement and control of the concentration of chlorine dioxide / peracetic acid / ozone / hydrogen peroxide.

Only trained and authorised staff should operate the sensor.

Each application beyond this is a not intended use so the warranty becomes void and the liability is disclaimed.

We do not accept liability for injury to persons or damage to property if the operating instructions in this manual have not been followed, or the original state of the sensor has been changed, or the sensor has been used under conditions other than those specified.

If installing the sensor outside Germany, please comply with the corresponding local regulations.

4 Scope of supply

Keep the packaging for the sensor completely. In case of repair or warranty return the sensor in this package.

Check that the delivery is intact. In case of damage please contact your supplier.

Check that the delivery is complete by comparing with the below mentioned scope of supply.

4.1 Sensor with voltage supply (analog-out/analog) – 4-20mA with 5-pole M12

	1 sensor with membrane cap M7N / M7D or M7N O3 / M7D O3 1 btl. 100 ml electrolyte ECD4/W-ECD7/W / EPS7/W / EPS7L/W / EOZ7/W 1 piece of abrasive paper S2 1 manual

4.2 Sensor with 4-20 mA output (analog-out/analog) with 2-pole terminal

1 sensor with membrane cap M7N / M7D or M7N O3 / M7D O3

1 mA-cap with o-ring 20 x 1.5

1 btl. 100 ml electrolyte ECD4/W-ECD7/W / EPS7/W / EPS7L/W / EOZ7/W

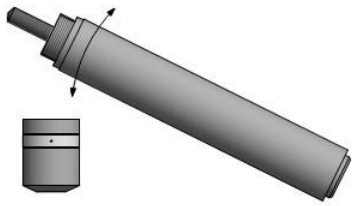
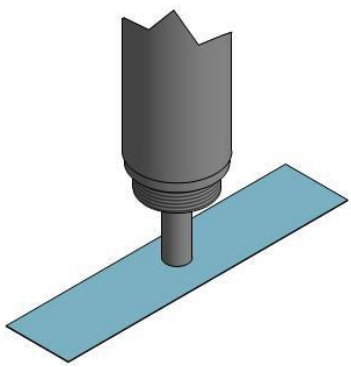
1 piece of abrasive paper S2

1 manual

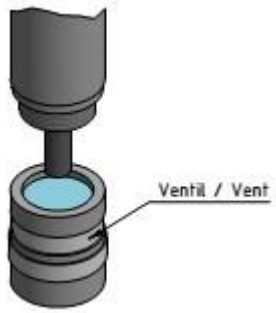
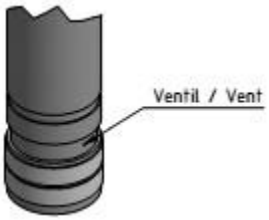
5 Preparation of the sensor for start up

Safety hint: *Some electrolytes contain diluted acids. Please heed the warnings on the electrolyte bottle.*

Do not swallow the electrolyte. Avoid contact of the electrolyte with skin and eyes. Otherwise wash with a lot of water. In case of eye inflammation, contact a doctor.

	Filling the membrane cap Open the box with the membrane cap, empty out the liquid and take the membrane cap. Make sure that only one hose-ring is situated in the groove and closes the vent (see arrow). Then fill the empty membrane cap up to the edge with the electrolyte supplied. If there are air entrapments in the area of the membrane (visible with transmitted light), please perform the “knock method“ described below.
	If necessary: “knock method” to remove air entrapments in the membrane area Hereby potentially existing air entrapments on the inner side of the membrane can be removed. An air entrapment may interfere the measuring function: Knock on the filled membrane cap with the electrode shaft until no more air bubbles appear (see picture). This procedure removes air entrapments that may have built up on the inside of the membrane. Then add electrolyte if necessary.
	Cleaning of the working electrode Remove the black protection tube from the electrode finger. Use the special abrasive paper supplied to clean just the **tip** of the dry electrode finger (= working electrode). Firmly hold the soft pad with the special abrasive paper and rub the electrode tip of the slightly inclined probe over the abrasive paper. Then turn the probe a bit around its axis and rub again over the abrasive paper. Repeat this procedure several times.

Assembling of the sensor

	Hold the electrode shaft upright and place it onto filled membrane cap. Turn it anticlockwise until the thread engages, then screw the electrode shaft clockwise (by hand) slowly onto the membrane cap. Excess electrolyte will escape through a valve (located above the type marking) in the membrane cap. Do not close this vent (see arrow)! **Caution:** The electrolyte may spurt from the vent. Excess electrolyte or electrolyte which gets on your skin or in your eye wash up with water. Some electrolytes contain diluted acids. Please heed the warnings on the electrolyte bottle. Make sure that the membrane cap is tightly fastened to the electrode shaft! Wash up the excess electrolyte with water.
	**Important:** Check whether the membrane cap is completely screwed in up to the stop. The first screw-in resistance comes from the O-ring seal; however the screwing procedure of the cap must be continued until it hits the electrode shaft! When the membrane cap has been screwed on, the membrane is curved to the outside and must not be thumped any more, as this will damage the membrane and thus make it unusable. **Caution:** When the filled membrane cap is completely screwed onto the electrode shaft it is not allowed to touch or to adjoin the membrane!
	Then also push the second hose-ring into the deepening over the first one. Make sure that the hose-rings do not pucker!
	Unscrewing the membrane cap **Important:** When unscrewing the filled membrane cap, the two hose-rings must be pushed to the side above the type marking to allow air to stream into the electrolyte chamber; otherwise the membrane will be destroyed!

6 Insertion of the sensor in the flow chambers FLC

Depressurise the system before inserting the sensor into the flow chamber. Close the stop valves before and after the flow chamber.

Insertion of the sensor into the flow chamber should be carried out slowly.

The sensor is not allowed to be pushed against the bottom of the flow chamber!

Warning: A sudden failure of the sensor may lead to a very dangerous overdosing of the disinfectant – please provide preventative measures. In case of a very high overdose, the titration may be imprecise as the titration volume gets too large or the DPD-measuring may remain colourless, as the colorant will be bleached by the disinfectant respectively.

Recommendations: e. g. dosage volume monitoring, dosage time monitoring, limit value monitoring.

Safety hint: Please make sure that the sensor is tightly fastened in place!

Otherwise it may be pressed out of the flow chamber when it is under pressure.

Operating mode	**Flow chamber**	**Operating pressure** **max.**	**Operating temperature** **max.**	**Flow rate** **l/h**
IMPORTANT:	**!! Heed and comply with the max. allowed operating pressure / operating temperature of the sensor !!**			
Operation of the sensor **without** retaining ring	FLC-1	0.5 bar (5 mWS)	45 °C	15 (45)
	FLC-3		70 °C	45 (15)
Operation of the sensor **with** retaining ring	FLC-1	4.0 bar (40 mWS)	45 °C	15 (45)
	FLC-3	8.0 bar (80 mWS)	70 °C	45 (15)

6.1 Mounting with retaining ring

For the installation of the sensor in the flow chamber the sensor can be equipped with retaining ring, slide-ring and O-ring by the manufacturer (see fig. 1). For installation of the sensor in the flow chamber unscrew the 1 ¼” screw-connection from the flow chamber. Prepare the sensor according section 5. Make sure that retaining ring, slide-ring and O-ring are properly fixed according fig. 1.

Fig. 1:

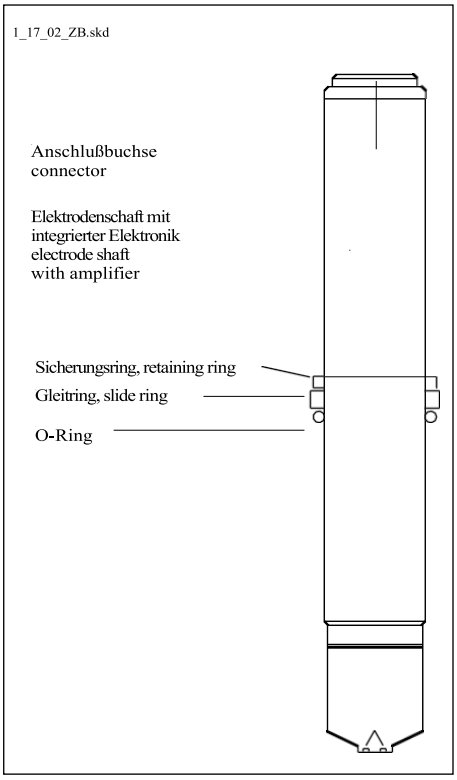
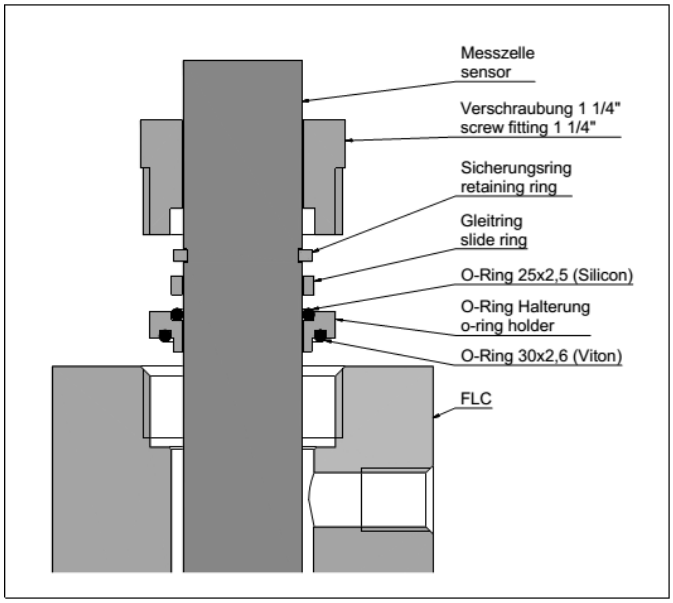


Fig. 2:



Insert the sensor according fig. 2 into the flow chamber. Push the earlier unscrewed 1 ¼” screw-connection carefully over the inserted sensor and fasten it tightly, otherwise leaks may occur.

First open the measuring water outlet. Then open slowly the measuring water supply.

Avoid installations that allow air bubbles to enter the measuring water.

6.2 Mounting without retaining ring

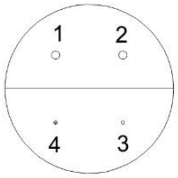
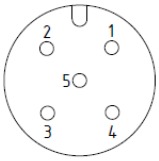
If the sensor is not equipped with retaining ring, slide-ring and o-ring it can also be installed in the flow chamber by using an o-ring and 2 slide rings. The second slide ring has to be used instead of the retaining ring. Loosen the 1 ¼” screw-connection of the flow chamber. Insert the sensor (after preparation according section 5) into the flow chamber until the distance between the membrane and the inflow-opening is approx. 2 cm. Fasten the 1 ¼” screw-connection tightly. Please make sure that the sensor is tightly fastened in place, otherwise it may be pressed out of the flow chamber when it is under pressure and / or leaks may occur.

First open the measuring water outlet. Then open slowly the measuring water supply.

Avoid installations that allow air bubbles to enter the measuring water.

7 Startup of the sensor

Connect the sensor with the measuring device.

Connection of sensors with 0…+/-2000 mV signal output	4 pole connector, reverse polarity protection, symmetrical or unipolar power supply pin configuration: 1 (socket) +U 2 (socket) -U or voltage GND 3 (PIN) GND or Signal GND 4 (PIN) signal output 
Connection of mA-sensors with 2-pole terminal	2-pole terminal clamp Push the sensor cable through the black cable gland of the cap. Then fasten the wires in the terminals of the sensor electronics. By hand, screw the cap only now onto the sensor body/shaft until the o-ring seals. Now tighten the black cable gland (fixing the cable). For disconnection untighten the black cable gland first to release the cable. Recommended cable: diameter approx. 4 mm, 2 x 0.25 mm².
Connection of mA-sensors with 5-pole M12 plug-on flange	5 pole screw-connector, M12, reverse polarity protection pin configuration: PIN 2: +U PIN 3: -U 

As a rule the sensor is run in after about 3 hours so that a first adjustment can be made. The run-in period of the OZ7 can take up to 5 hours or longer. The adjustment has to be repeated after approx. one day. If there is some disinfectant in the measuring water it benefits the run-in period.
For proper function of the sensor the slope adjustment has to be repeated in regular intervals.

8 Control of the sensor / Analytics

A balance or checking of the probe using DPD-method or sulphuric titration with potassium permanganate and if necessary sodium thiosulfate respectively, is recommended. This should be performed regularly depending on utilization.

Recommendation: weekly check, if necessary more frequently.

The titrated value is adjusted by means of slope calibration function of the controller (see Operation Manual of the Controller).

We recommend to replace the electrolyte every 3 - 6 month.

8.1 Analytics chlorine dioxide

Provided that there are no other oxidants present in the measuring water, e. g. chlorine and ozone, chlorine dioxide can be determined in the same way as “free chlorine” (DPD-1). The result of this determination has to be multiplied by the factor 1.9, which shows the concentration in mg/l of chlorine dioxide.

8.2 Analytics peracetic acid

The determination of the peracetic acid concentration should be performed by using sulphuric titration with potassium permanganate and sodium thiosulfate.

8.3 Analytics ozone

Provided that there are no other oxidants in the measuring water, e. g. chlorine and chlorine dioxide, ozone can be determined by DPD-method. For this, a DPD total chlorine determination has to be done (DPD-4 or DPD-1 + DPD-3). The measuring value obtained has to be multiplied by a factor of 0.68, which shows the ozone concentration in mg/l. This method can be used for ozone concentrations up to 1 mg/l.

8.4 Analytics hydrogen peroxide

The determination of the hydrogen peroxide concentration should be performed by using one-level sulphuric titration with potassium permanganate.

8.5 Sensors with 2-pole terminal + CE-mark (4-20mA)

Factory provided the potentiometer sideways to the 2-pole-connector is adjusted on the measuring range which is specified on the label. This adjustment is secured by a sealing wax. The setting of the potentiometer should not be changed.

9 Disassembling of the sensor

Switch of secondary measuring and/or control systems or switch them to manual operation before dismantling the sensor. A disassembled sensor results in an incorrect measuring value, which may cause an uncontrolled dosing within a control system.

Lock the measuring water supply at first and after that the outlet. Disconnect the sensor from the device.

Disconnection of sensors with 2-pole terminal: First untighten the PG screw-connection so that the cable is released. Unscrew the cap from the sensor. Then disconnect the wires from the 2-pole-terminal.

Untighten the screw-connection and pull out the sensor carefully.

10 Maintenance of the sensor

***Caution**: The brown coating of the electrode finger must not be emeried!!*

Do not unscrew the metallic membrane holder from the cap as this will damage the membrane.

Check the sensor regularly for dirt, algae and bubbles. As far as possible avoid contamination of the membrane with solid particles, deposits etc. Bubbles on the outside of the membrane can be eliminated by increasing the flow rate temporary.

A slope adjustment has to be made after a change of the membrane cap or the electrolyte.

10.1 Change of electrolyte

Recommendation: Change the electrolyte every 3 – 6 months. And also, if an adjustment is impossible due to unstable or too low values displayed.

Lift the two hose rings on the membrane cap above the type marking sealing the vent sideways so that the opening is free (see fig. 3). The membrane cap is unscrewed and then air streams into the uncovered vent. The electrode finger is cleaned with a clean, dry paper towel. With the special abrasive paper supplied just the tip of the dry electrode finger (= working electrode) is cleaned. Place the special abrasive paper on paper towel, hold it at one corner and rub the electrode tip of slightly inclined probe two or three times across the abrasive paper (see fig. 4). Replace one hose ring in the deepening and prepare the sensor according item 5 for installation: fill with electrolyte, if necessary knock with the sensor shaft onto the membrane cap to remove air entrapments on the inner side of the membrane that might have built up (see fig. 5 “knock-method”), add electrolyte if necessary, screw on the membrane cap, replace the second hose ring into the deepening.

If the sensor still displays unstable or too low values, a new membrane cap must be used.

10.2 Change of membrane cap

Recommendation: Change of the membrane cap once a year. And also, if an adjustment is impossible due to unstable or too low values displayed.

Lift the two hose rings on the membrane cap above the type marking sealing the vent sideways so that the opening is free (see fig. 3). The membrane cap is unscrewed and then air streams into the uncovered vent. The electrode finger is cleaned with a clean, dry paper towel. With the special abrasive paper supplied just the tip of the dry electrode finger (= working electrode) is cleaned. Place the special abrasive paper on paper towel, hold it at one corner and rub the electrode tip of slightly inclined probe two or three times across the abrasive paper (see fig. 4). Take a new membrane cap and fill with electrolyte, if necessary knock with the sensor shaft onto the membrane cap to remove air entrapments on the inner side of the membrane that might have built up (see fig. 5 “knock-method”).

If the sensor still displays unstable or too low values, a check / reconditioning by the manufacturer has to be done.

Note: When starting up a new membrane cap with an ozone sensor (M7N O3, M7D O3) the run-in period may take up to 24 hours until 100% of the measuring signal is reached.

Fig. 3:

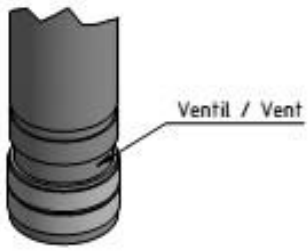


Fig. 4:

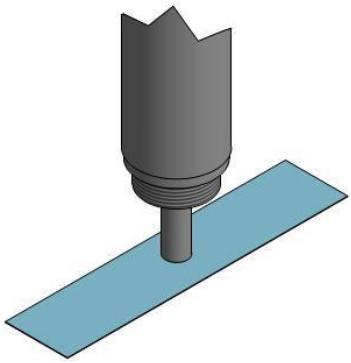
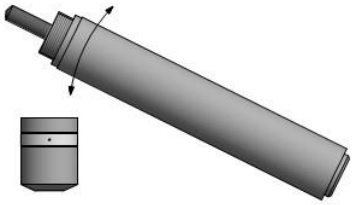


Fig. 5:



11 Storage

To store the sensor the membrane cap is unscrewed and the G-Holder removed with the tweezers. Membrane cap and electrode finger are rinsed in clean water and dried in a place free of dust. The dry membrane cap is then loosely screwed onto the electrode shaft to protect the electrode finger. The membrane must not rest against the measuring electrode.

When putting the sensor back into use after storage, the electrode tip must be cleaned with the special abrasive paper and a new membrane cap with new G-Holder must be used (see item 5).

Used membrane caps which have been in operation for at least 1 day cannot be stored and reused.

12 Electrical specifications

The sensors have to be operated potentialfree. A current flow between the sensors and the measuring water is not allowed. Therefore the measuring and control devices must be supplied with a galvanical isolation. When a 4-20 mA current loop is present a galvanical isolation can be achieved by using a isolating amplifier.

The sensors are only allowed to be operated with the specified voltage supply.

Ensure that the supply voltage of the measuring and/or control device is stable. Too low a voltage supply can cause incorrect measuring values, which may result in dangerous overdosing within a control system.

NOTE: A potential-free electrical connection is necessary as the sensor electronic is not equipped with a galvanical isolation.

12.1 Chlorine dioxide sensor CD7 / Ozone sensor OZ7

Type	N / H / L	Up / HUp	MA-x
CE	EMC-Testing DIN EN 61326-1 RoHS compliant		
Voltage supply	±5 … ±15 V DC	+10 …+30 V DC	12 V DC (load resistor: max. 50Ω) Up to 30 V DC (load resistor: 50Ω until 900Ω)
Power consumption	approx. 10 mA		approx. 4 mA (max. current by overloading: approx. 30 mA)
Signal transmission	Analog signal output (mV per mg/l) **N:** appr. -100 **H:** appr. -1000 **L:** appr. -10	Analog signal output (mV per mg/l) **Up:** appr. +100 **HUp:** appr. +1000	Analog signal output 4 – 20 mA (uncalibrated) (16 mA/measuring range in ppm = nominal slope in mA/ppm)
Internal signal processing	analog		
Measuring range (mg/L)	**N:** 0.05… appr. 20.00 **H:** 0.005…appr. 2.000 **L:** 0.5… appr. 200.0	**Up:** 0.05… appr. 20.00 **HUp:** 0.005… appr. 2.000	x = Measuring range in mg/L (e. g. OZ7MA2: Measuring range up to 2 mg/L ozone)
Connection information	– 4-pole screw connector – Ground power supply and ground signal are the same – connections are protected against polarity reversal	– 4-pole screw connector – power supply is gal vanically isolated – connections are protected against polarity reversal	– 2-pole terminal or 5-pole M12 plug-on flange – connection is pro tected against polarity reversal – the 4-20 mA connection to the device also supplies the sensor with current – slope adjustment at the device necessary

(Subject to technical changes!)

12.2 Peracetic acid sensor PES7 / Hydrogen peroxide sensor WP7

Type	N / H / L	Up / HUp	MA-x
CE	EMC-Testing DIN EN 61326-1 RoHS compliant		
Voltage supply	±5 … ±15 V DC	+10 …+30 V DC	12 V DC (load resistor: max. 50Ω) Up to 30 V DC (load resistor: 50Ω until 900Ω)
Power consumption	approx. 10 mA		approx. 4 mA (max. current by overloading: approx. 30 mA)
Signal transmission	Analog signal output (mV per ppm) **N:** appr. -1 **H:** appr. -10 **L:** appr. -0,1	Analog signal output (mV per ppm) **Up:** appr. +1 **HUp:** appr. +10	Analog signal output 4 – 20 mA (uncalibrated) (16 mA/measuring range in ppm = nominal slope in mA/ppm)
Internal signal processing	analog		
Measuring range (ppm)	**N:** 0.05… appr. 2000 **H:** 0.005…appr. 20 **L:** 0.5… appr. 2 %	**Up:** 0.05… appr. 2000 **HUp:** 0.005… appr. 200	x = Measuring range in mg/L (e. g. PES7MA-CC: Measuring range up to 200 mg/L peracetic acid)
Connection information	– 4-pole screw connector – Ground power supply and ground signal are the same – connections are protected against polarity reversal	– 4-pole screw connector – power supply is galvanically isolated – connections are protected against polarity reversal	– 2-pole terminal or 5-pole M12 plug-on flange – connection is protected against polarity reversal – the 4-20 mA connection to the device also supplies the sensor with current – slope adjustment at the device necessary

(Subject to technical changes!)

13 Technical Data

Data sheets are available for each type of sensor.

13.1 Chlorine dioxide sensor CD7

Application	All kinds of water treatment, also sea water (e. g. bottle washing machine, CIP-plants)
Measuring system	Membrane covered, amperometric 2-electrode system
Electronic	Analog version: - voltage output - not galvanically isolated electronics - analog internal data processing - output signal: analog (analog-out/analog) mA-version: - current output analog - not galvanically isolated electronics - output signal: analog (analog-out/analog) - only valid for sensors with 2-pole-terminal & CE-mark: poti for (restricted) adjustment of measuring range
Information about the measuring range of sensors with 4-20 mA	Slope of a sensor can vary production-related or application-related between 65% and 150% of the nominal slope -> Recommendation to determine the suitable measuring range or the suitable sensor: Concentration to be measured x factor 1.5 = measuring range of the sensor Example: Concentration to be measured 1.6 ppm x 1.5 = 2.4 -> recommended sensor with a measuring range of 5 ppm
indicator	Chlorine dioxide
Working temperature	0 – <50 °C (no ice crystals in the measuring water)
Temperature compensation	Automatically, by an integrated temperature sensor Temperature changes <5 °C
Max. allowed working pressure	1,0 bar, no pressure impulses and/or vibrations
Flow rate	approx. 30L/h, small flow rate dependence is given
pH-range	pH 1 – pH 11
Run-in time	First start-up approx. 1 h
Response time	T_{90}: approx. 1,5 min.
Zero point adjustment	Not necessary
Slope calibration	At the device, by analytical determination
interferences	Cl_2: does not disturb O_3: is measured with a sensitivity 25-times higher than ClO_2
Connection	analog-out/analog version: 4-pole plug adapter 4-20 mA version: 2-pole terminal (2 x 1 mm²) or 5-pole M12, plug-on flange (PIN2: +U, PIN3: -U)
material	PVC-U, stainless steel 1.4571

Size	diameter: approx. 25 mm Length: analog-out/analog version approx. 175 mm 4-20 mA version approx. 220 mm (2-pole-terminal) approx. 190 mm (5-pole-M12)
storage	Probe: Frost-protected, dry and without electrolyte no limit at >5 - <40 °C Membrane cap: Used membrane caps cannot be stored! Electrolyte: in original bottle protected from sunlight min. 1 year at >10 - <35 °C
maintenance	Regularly control of the measuring signal, min. once a week The following specifications depend on the water quality: Change of the membrane cap: once a year Change of the electrolyte: every 3 - 6 months

13.2 Peracetic acid sensor PES7

Application	All kinds of water treatment, also sea water Conductivity acids are tolerated, water must not contain any surfactants (tensides) (e. g. bottle washing machine, CIP-plants)
Measuring system	Membrane covered, amperometric 2-electrode system
Electronic	Analog version: - voltage output - not galvanically isolated electronics - analog internal data processing - output signal: analog (analog-out/analog) mA-version: - current output analog - not galvanically isolated electronics - output signal: analog (analog-out/analog) - only valid for sensors with 2-pole-terminal & CE-mark: poti for (restricted) adjustment of measuring range
Information about the measuring range of sensors with 4-20 mA	Slope of a sensor can vary production-related or application-related between 65% and 150% of the nominal slope -> Recommendation to determine the suitable measuring range or the suitable sensor: Concentration to be measured x factor 1.5 = measuring range of the sensor Example: Concentration to be measured 1.6 ppm x 1.5 = 2.4 -> recommended sensor with a measuring range of 5 ppm
indicator	Peracetic acid
Working temperature	0 – 45 °C (no ice crystals in the measuring water)
Temperature compensation	Automatically, by an integrated temperature sensor Temperature changes <5 °C
Max. allowed working pressure	1,0 bar, no pressure impulses and/or vibrations
Flow rate	approx. 30L/h, small flow rate dependence is given
pH-range	pH 1 – pH 6
Run-in time	First start-up approx. 1 h
Response time	T_{90}: approx. 3 min.
Zero point adjustment	Not necessary
Slope calibration	At the device, by analytical determination

interferences	O_3: is measured with a factor of 2.500 of its measuring value ClO_2: is measured with a factor of 1 of its measuring value H_2O_2: is measured with a factor of 0,005 of its measuring value
Connection	analog-out/analog version: 4-pole plug adapter 4-20 mA version: 2-pole terminal (2 x 1 mm²) or 5-pole M12, plug-on flange (PIN2: +U, PIN3: -U)
influence of conductivity acids	1 % sulfuric acid or 1 % nitric acid in the water have no influence on the sensor or the measuring behaviour respectively.
material	PVC-U, stainless steel 1.4571
Size	diameter: approx. 25 mm Length: analog-out/analog version approx. 175 mm 4-20 mA version approx. 220 mm (2-pole-terminal) approx. 190 mm (5-pole-M12)
storage	Probe: Frost-protected, dry and without electrolyte no limit at >5 - <40 °C Membrane cap: Used membrane caps cannot be stored! Electrolyte: in original bottle protected from sunlight min. 1 year at >10 - <35 °C
maintenance	Regularly control of the measuring signal, min. once a week The following specifications depend on the water quality: Change of the membrane cap: once a year Change of the electrolyte: every 3 - 6 months

13.3 Ozone sensor OZ7

Application	All kinds of water treatment, also sea water Tensides are tolerated. (e. g. bottle washing machine, CIP-plants)
Measuring system	Membrane covered, amperometric 2-electrode system
Electronic	Analog version: - voltage output - not galvanically isolated electronics - analog internal data processing - output signal: analog (analog-out/analog) mA-version: - current output analog - not galvanically isolated electronics - output signal: analog (analog-out/analog) - only valid for sensors with 2-pole-terminal & CE-mark: poti for (restricted) adjustment of measuring range
Information about the measuring range of sensors with 4-20 mA	Slope of a sensor can vary production-related or application-related between 65% and 150% of the nominal slope -> Recommendation to determine the suitable measuring range or the suitable sensor: Concentration to be measured x factor 1.5 = measuring range of the sensor Example: Concentration to be measured 1.6 ppm x 1.5 = 2.4 -> recommended sensor with a measuring range of 5 ppm
indicator	ozone
Working temperature	0 – <50 °C (no ice crystals in the measuring water)

Temperature compensation	Automatically, by an integrated temperature sensor Temperature changes <5 °C per hour
Max. allowed working pressure	1,0 bar, no pressure impulses and/or vibrations
Flow rate	approx. 30L/h, small flow rate dependence is given
pH-range	pH 2 – pH 11
Run-in time	First start-up approx. 1 h
Response time	T_{90}: approx. 50 sec.
Zero point adjustment	Not necessary
Slope calibration	At the device, by analytical determination
interferences	Cl_2: OZ7H: increases the measuring value about 1,5 % OZ7N: negligible ClO_2: OZ7N: increases the measuring value about 6 %
Connection	analog-out/analog version: 4-pole plug adapter 4-20 mA version: 2-pole terminal (2 x 1 mm²) or 5-pole M12, plug-on flange (PIN2: +U, PIN3: -U)
material	PVC-U, stainless steel 1.4571
Size	diameter: approx. 25 mm Length: analog-out/analog version approx. 175 mm 4-20 mA version approx. 220 mm (2-pole-terminal) approx. 190 mm (5-pole-M12)
storage	Probe: Frost-protected, dry and without electrolyte no limit at >5 - <40 °C Membrane cap: Used membrane caps cannot be stored! Electrolyte: in original bottle protected from sunlight min. 1 year at >10 - <35 °C
maintenance	Regularly control of the measuring signal, min. once a week The following specifications depend on the water quality: Change of the membrane cap: once a year Change of the electrolyte: every 3 - 6 months

13.4 Hydrogen peroxide sensor WP7

Application	All kinds of water treatment, also sea water (e. g. bottle washing machine, CIP-plants)
Measuring system	Membrane covered, amperometric 2-electrode system
Electronic	Analog version: - voltage output - not galvanically isolated electronics - analog internal data processing - output signal: analog (analog-out/analog) mA-version: - current output analog - not galvanically isolated electronics - output signal: analog (analog-out/analog) - only valid for sensors with 2-pole-terminal & CE-mark: poti for (restricted) adjustment of measuring range

Information about the measuring range of sensors with 4-20 mA	Slope of a sensor can vary production-related or application-related between 65% and 150% of the nominal slope -> Recommendation to determine the suitable measuring range or the suitable sensor: Concentration to be measured x factor 1.5 = measuring range of the sensor Example: Concentration to be measured 1.6 ppm x 1.5 = 2.4 -> recommended sensor with a measuring range of 5 ppm
indicator	Hydrogen peroxide
Working temperature	0 – <45 °C (no ice crystals in the measuring water)
Temperature compensation	Automatically, by an integrated temperature sensor Temperature changes <5 °C
Max. allowed working pressure	1,0 bar, no pressure impulses and/or vibrations
Flow rate	approx. 30L/h, small flow rate dependence is given
pH-range	pH 2 – pH 11
Run-in time	First start-up approx. 3 h
Response time	T_{90}: approx. 5 min. …10 min.
Zero point adjustment	Not necessary
Slope calibration	At the device, by analytical determination
interferences	Cl_2: must not be present PAA: must not be present O_3: must not be present Sulfides: contaminate the measuring system Phenol: aqueous solution >3 % phenol, destroys the membrane system
Connection	analog-out/analog version: 4-pole plug adapter 4-20 mA version: 2-pole terminal (2 x 1 mm²) or 5-pole M12, plug-on flange (PIN2: +U, PIN3: -U)
material	PVC-U, stainless steel 1.4571
Size	diameter: approx. 25 mm Length: analog-out/analog version approx. 175 mm 4-20 mA version approx. 220 mm (2-pole-terminal) approx. 190 mm (5-pole-M12)
storage	Probe: Frost-protected, dry and without electrolyte no limit at >5 - <40 °C Membrane cap: Used membrane caps cannot be stored! Electrolyte: in original bottle protected from sunlight min. 1 year at >10 - <35 °C
maintenance	Regularly control of the measuring signal, min. once a week The following specifications depend on the water quality: Change of the membrane cap: once a year Change of the electrolyte: every 3 - 6 months

14 General operating guidelines

- The sensor has to be operated in an upright position, so that the incoming flow comes from the bottom up to the membrane.
- During unpressurised operation with free outflow of the measuring water air bubbles have no disturbing effect unless they cover the membrane. Air bubbles at the membrane obstruct the inflow of the disinfectant, which leads to incorrect measuring signals.
- The flow rate must be constant.
- The membrane life is typically one year, but can vary considerably depending on the water quality. Heavy contamination of the membrane should be avoided.
- Each sensor has been tested and the results are documented.
- During interval operation of the measuring system / plant the sensor is not allowed to be disconnected from the power supply. The sensor must be connected to the power supply all the time. The sensor must not be allowed to stand dry.
- The sensor is not allowed to be operated in water that is free of disinfectant for a longer period (>1 day). Danger: build-up of sediments/contaminations (e. g. biological) on the membrane. This can interfere or block a later measurement of the disinfectant.
  After any operation without disinfectant, run-in periods must be reckoned with. If required, switch on metering unit time-delayed.
  If no disinfectant is dosed for a longer period of time, the sensor must be disconnected from the device, disassembled and stored dry (see section 11).
- The presence of reducing-, oxidising reagents and corrosion inhibitors may interfere with the measurement.

15 Spare Parts

Membrane caps	Electrolyte
M7N (Art. No. 11014)	
PES7H, PES7N, PES7Up, PES7Un, PES7MAx (x=D, M, MM)	EPS7/W (Art. No. 11020)
CD7H, CD7N, CD7Up, CD7HUp, CD7HUn, CD7MAx (x=0.5 / 2 / 5 / 10)	ECD4/W - ECD7/W (Art. No. 11030)
WP7HUn, WP7Un, WP7Up, WP7HUp, WP7MAx (x=CC, D, MM)	EWP7/W (Art. No. 11201)
M7D (Art. No. 11015)	
WP7MA-XM	EWP7/W (Art. No. 11201)
M7L (Art. No. 11010)	
PES7L, PES7Up5000, PES7MA-XM	EPS7L/W (Art. No. 11022)
WP7LUn, WP7Up-CM, WP7CUn, WP7MA-x (x=XXM, LM, CM)	EWP7/W (Art. No. 11201)

M7N O3 (Art. No. 11018)	
OZ7H, OZ7MA0.2, OZ7MA0.5	EOZ7/W (Art. No. 11102)
M7D O3 (Art. No. 11017)	
OZ7N, OZ7Up, OZ7MA2, OZ7MA5, OZ7MA10	EOZ7/W (Art. No. 11102)

16 Trouble Shooting

Trouble shooting must take account of the whole measuring circuit system from the extraction point to drain. In general, the measuring system consists of:

- sensor
- electrical leads and its connectors
- measuring and control device
- flow chambers with hose connections / pipe connections

16.1 General Troubleshooting

Fault	Possible Cause	Action
Sensor cannot be calibrated / deviation of the measuring value from titration result	Run-in time too short	See item 5, repeat calibration after several hours
	Membrane cracked	Replace membrane cap, see item 10.2
	Membrane cap damaged	Replace membrane cap, see item 10.2
	Interfering substances in the measuring water	Examine the measuring water for interfering substances and remedy, if necessary consult supplier
	Short-circuit / damage in the signal lead	Locate and eliminate short-circuit / defect, if necessary change the measuring cable
	Distance between working electrode and membrane is too great	Screw the membrane cap tightly onto the shaft until it hits the shaft

	DPD-/titration chemicals spent	Use new DPD-/titration chemicals, repeat calibration
	<u>Only valid for peracetic acid:</u>	
	Improper method of titration	Repeat titration with an appropriate method (with a minimal titration volume)
	Deposits on the membrane	With a soft brush (e. g. toothbrush) and scoring agent remove deposits carefully Otherwise replace membrane cap, see item 10.2
	Air bubbles on the outside of the membrane	Increase the flow rate temporary, if necessary check installation and revise it
	Air entrapments on the inner side of the membrane	Knock with the electrode shaft on the membrane cap until no air bubbles bubble up anymore (see paragraph 5 “knock method”)
	Sensor defective	Return the sensor to the manufacturer for check/reconditioning
	No electrolyte in the membrane cap	Fill membrane cap with electrolyte and follow the instructions of item 5
	concentration of the disinfectant exceeds the upper limit of the measuring range	Check the whole system, remedy fault, repeat calibration
Measuring signal is not stable	Membrane cracked	Replace membrane cap, see item 10.2
	Air Bubbles in the electrolyte	Empty out the membrane cap and refill it carefully with new electrolyte without bubbles, see item 10.1

	Air bubbles on the outside of the membrane	Increase the flow rate temporary, if necessary check installation and revise it
	Air entrapments on the inner side of the membrane	Knock with the electrode shaft on the membrane cap until no air bubbles bubble up anymore (see paragraph 5 "knock method")
	Pressure fluctuations in the measuring water	Check installation, if necessary revise it
	Reference electrode exhausted and/or contaminated	Return sensor for reconditioning to the manufacturer
Only for MA-sensors: Output signal is 0	Sensor is connected to the measuring and/or control device with wrong polarity	Correctly connect the sensor to the measuring and/or control device
	Signal lead is broken	Replace signal lead
	Sensor defective	Return the sensor to the manufacturer for check/reconditioning
	Measuring and/or control device defective	Check the measuring and/or control device

16.2 Special troubleshooting for sensor

When the electrode finger turns shiny silver or white the sensor must be reconditioned by the manufacturer.

Tightness check of membrane cap	Membrane cap M7N / M7N O3, M7D / M7D O3, M7L 1. Thoroughly dry the outside of the membrane cap to be checked 2. Prepare membrane cap according to instruction manual and fill with electrolyte or clean water 3. Dry the outside of the membrane cap again if necessary 4. Slowly and carefully screw membrane cap on sensor according to the instruction manual 5. When screwing the membrane cap on, check if liquid leaks through the membrane

	CAUTION: Thoroughly check if liquid leaks through the membrane or exits at the designated points. If necessary, repeat tightness check. -> If dripping can be observed at the membrane, the membrane is damaged and a new membrane cap must be used. -> Check if the reference electrode was damaged by the exchange from measuring water to electrolyte. If it is not intact anymore, the sensor must be send back to the manufacturer for testing.
Check of the electronic system (dry test)	1. Unscrew membrane cap 2. Thoroughly rinse off electrode finger and dry carefully using clean cloth 3. Connect sensor to measurement/control device and wait for approx. 5 min. 4. Take readings of original sensor signal from measurement/control device or measure using a digital multimeter A) Sensor (mV): approx. +/- 0 mV B) Sensor (mA): approx. 4 mA C) Sensor (µA): approx. 0 µA -> If the sensor signal approximately corresponds to the above mentioned values, the electronic system is likely to be ok. -> If the measured value significantly deviates from the above mentioned values, the sensor must be send back to the manufacturer for testing.
Zero point check	<u>After the check of the electronic system</u> 1. Prepare sensor for start-up according to section 5 of the instruction manual 2. Connect sensor to measurement/control device 3. Place sensor carefully into a beaker filled with clean tab water (free from disinfectant!) 4. Stir for approx. 30 sec. using sensor in beaker (without causing air bubbles) 5. Then leave the sensor in the beaker and wait until the run-in time has passed (at least for 1 hour) 6. Take readings of original sensor signal from measurement/control device or measure using a digital multimeter 7. The sensor signal should approach zero. -> If the sensor signal approaches zero, the zero point is likely to be ok. -> If the measured value deviates significantly from zero, maintenance must be carried out on the sensor according to section 10 of the instruction manual and the zeropoint check must be repeated. It has to be taken into account that a freshly cleaned working electrode (measuring electrode) has a relatively high zero point. The sensor needs a few days to reach its lowest zero point again. -> If the measured value does not approach zero even after maintenance was carried out, the sensor must be send back to the manufacturer for testing.

	Note: For sensors with very limited measurement ranges or high sensitivity, the zero points are always slightly above those of sensors with larger measurement ranges or low sensitivity.
Signal check	<u>After zero point check</u> 1. Add some disinfectant to the beaker filled with clean tab water from section “zero point check“ 2. Stir as steadily as possible using the sensor connected to the measurement device for at least 5 min. 3. During this time, you should observe an increase of the measuring signal -> If the sensor signal increases, the sensor is likely to be ok. If the sensor does not react to the disinfectant, maintenance must be carried out on the sensor according to section 10 of the operating instructions and the “signal check” must be repeated. -> If the sensor still does not react to the disinfectant, the sensor must be send back to the manufacturer for testing.
Periphery check	e. g. 1. Check flow 2. Check measuring cable 3. Check measurement/control device 4. Check proper calibration 5. Check dosing unit 6. Check concentration of disinfectant in the dosing tank 7. Check suitability of sensor for measuring the dosed disinfectant 8. Check concentration of disinfectant in the measuring water (analytics) 9. Check pH value of the measuring water 10. Check temperature of measuring water 11. Check pressure in the flow fittings 12. Check analytics

17 Warranty

We grant a manufacturer’s warranty of two years on the electrode body including the electronics subject to appropriate application. The warranty does not apply to the membrane cap (wearing part), electrolyte (consumable material) and service work to be performed.

(Cleaning of the parts in contact with the electrolyte, renewing the silver chloride coating of the electrode finger and cleaning of the electrode tip with special abrasive paper). Should there be mechanical damage or should the serial number be illegible, the warranty becomes void.

Return of a sensor for check/reconditioning: Only shipments are accepted that are returned with carriage paid. Otherwise they will be returned to the sender.

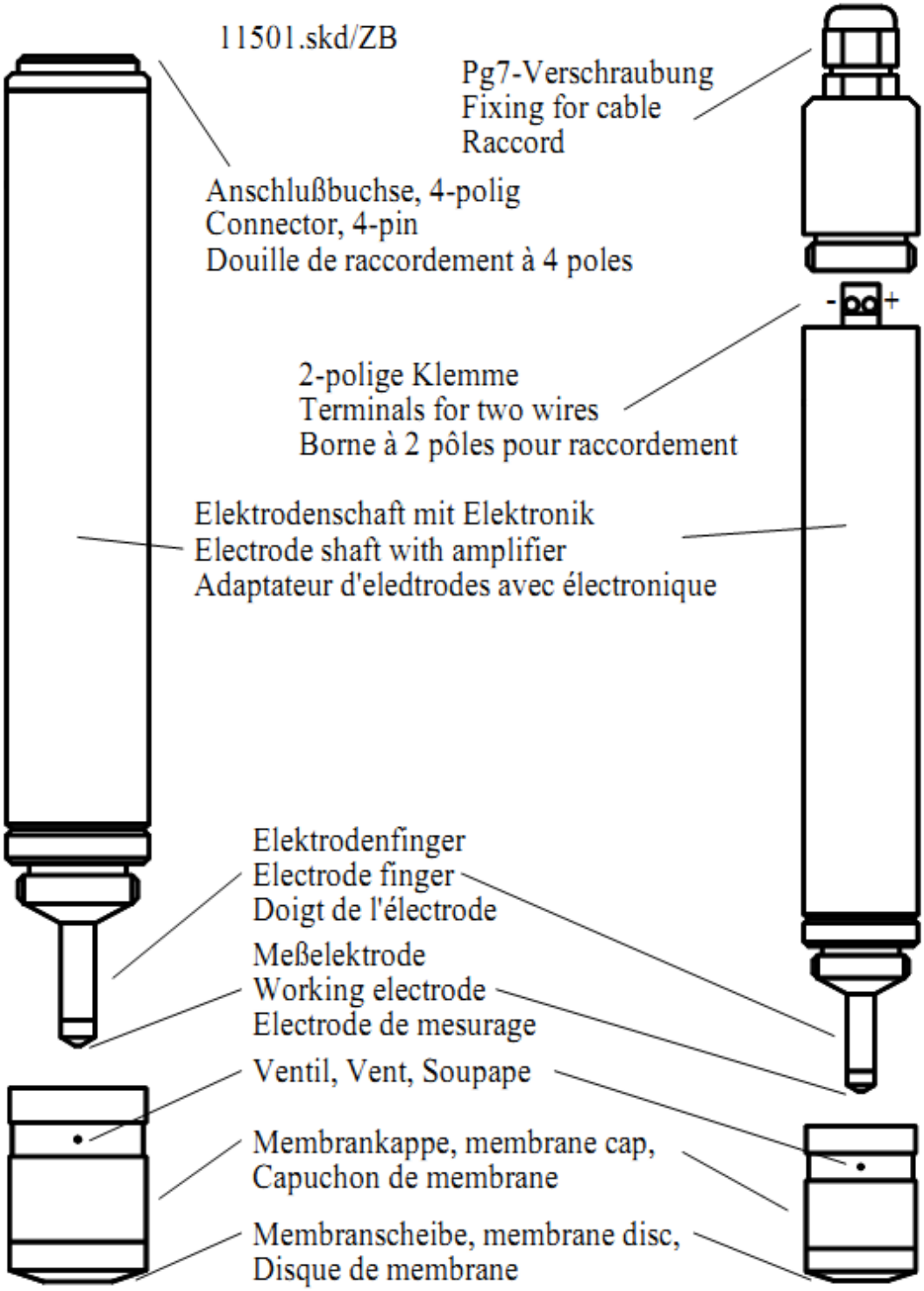
On checked/reconditioned sensors we grant a warranty of one year on the electrode body including the electronics subject to appropriate application from the date of check/reconditioning. Should there be mechanical damage or should the serial number be illegible, this warranty becomes void.

18 Liability disclaimer

The sensors are manufactured with the greatest care and is subjected to a documented function test.

Should any malfunctions occur in the sensor despite this, no liability claims may be lodged against the manufacturer in case of damage resulting from this malfunction.

Subject to technical changes!


11501.skd/ZB
Pg7-Verschraubung
Fixing for cable
Raccord
Anschlußbuchse, 4-polig
Connector, 4-pin
Douille de raccordement à 4 poles
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2-polige Klemme
Terminals for two wires
Borne à 2 pôles pour raccordement
Elektrodenschaft mit Elektronik
Electrode shaft with amplifier
Adaptateur d'eledtrodes avec électronique
Elektrodenfinger
Electrode finger
Doigt de l'électrode
Meßelektrode
Working electrode
Electrode de mesurage
Ventil, Vent, Soupape
Membrankappe, membrane cap,
Capuchon de membrane
Membranscheibe, membrane disc,
Disque de membrane