

DurOx[®] 325



Dissolved Oxygen Sensor

**Accuracy when
going to press**

The use of advanced technology and the high quality standard of our instruments are the result of continuous development. Consequently, this may result in some differences between this operating manual and your instrument. Also, we cannot guarantee that there are absolutely no errors in this manual. Therefore, we are sure you will understand that we cannot accept any legal claims resulting from the data, figures or descriptions.

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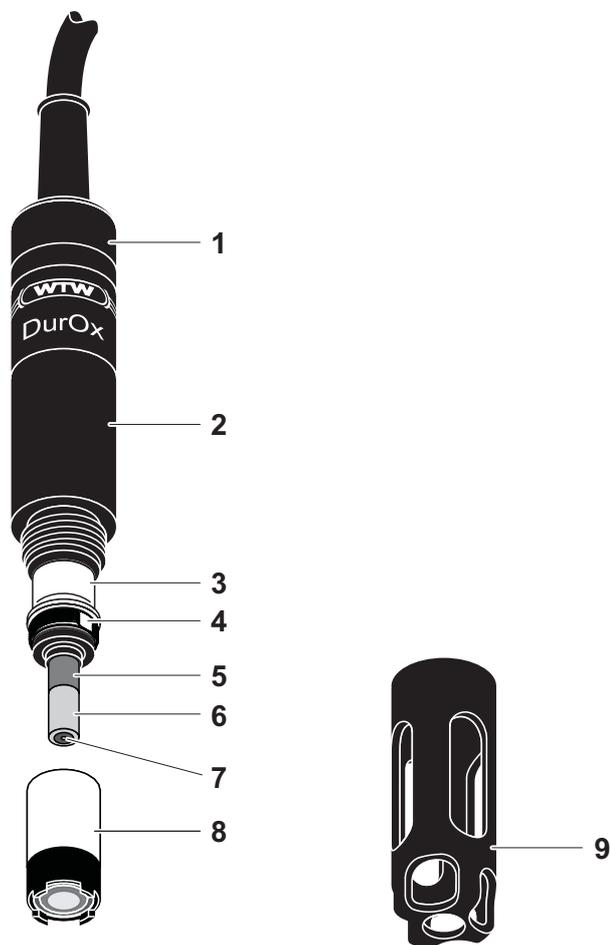
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1 Overview

Structure



1	Connection head
2	Shaft housing
3	Temperature sensor and auxiliary electrode
4	Ventilation area
5	Lead counter electrode (anode)
6	Insulator
7	Gold working electrode (cathode)
8	WP-D membrane cap (filled with electrolyte solution)
9	Protective hood

Recommended fields of application

On site measurements in rivers, lakes and wastewater

2 Safety instructions

This operating manual contains special instructions that must be followed during the operation of the D.O. sensor.

Always keep this operating manual in the vicinity of the sensor.

Special user qualifications

The membrane cap of the D.O. sensor is filled with a small amount of an alkaline electrolyte solution. All maintenance work that requires dealing with the electrolyte solution must only be carried out by persons who know how to safely deal with chemicals.

General safety instructions

The individual chapters of this operating manual use safety labels like the one below to indicate danger:



CAUTION

indicates instructions that must be followed precisely in order to avoid slight injuries or damage to the instrument or the environment.

3 Commissioning

Scope of delivery

- D.O. sensor DurOx® 325, filled with electrolyte solution and ready to operate
- Calibration and storage vessel, OxiCal®-D
- 1 exchange membrane cap, WP-D
- Electrolyte solution, ELY/G
- Cleaning solution, RL/G
- Polishing strip, SF 300
- Operating manual



Note

The membrane cap that is mounted on the sensor for delivery serves mainly as a transport protection. Depending on the duration of the transport and storage period, it may have a shortened operational lifetime. If the measuring system cannot be calibrated (error message of the instrument), please proceed according to section REPLACING THE ELECTROLYTE SOLUTION AND MEMBRANE CAP.

Preparing the sensor for measurement

Connect the sensor to the measuring instrument. The sensor is immediately ready to measure. It is not necessary to polarize the sensor.

4 Measuring / Operation

4.1 Calibration



Note

For calibration, please refer to the operating manual of the measuring instrument.

4.2 Measuring

Note the required minimum depth of immersion and minimum approach flow (see chapter 7 TECHNICAL DATA).

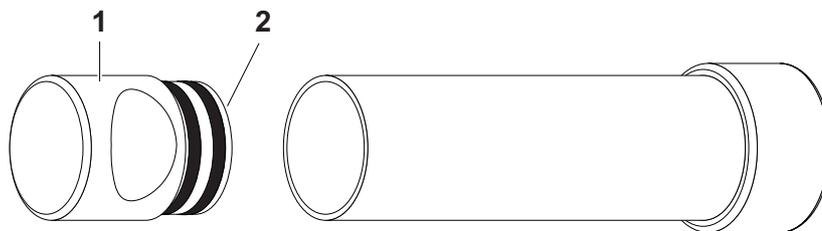
The minimum flow can be provided in different ways, e. g.:

- The flow of the water to be measured is sufficient (aeration tank, water pipe, stream)
- Slowly pull the sensor through the water by hand (lake, container), or
- Use a flow aid, e.g. stirrer.

4.3 Storage

Always store the sensor in the calibration and storage vessel at a temperature in the range 0 ... +50 °C (32 ... 122 °F). Make sure that the sponge in the calibration and storage vessel is always moist.

Calibration and
storage vessel,
OxiCal®-D



Moisten the sponge:

- Pull out the insert (1).
- Take out the sponge (2), wet it, then slightly squeeze it out.
- Put in the sponge and install the insert in the calibration and storage vessel again.

5 Maintenance, cleaning, replacement

5.1 General maintenance notes

For your safety

Note the following safety instructions when handling electrolyte and cleaning solutions:



CAUTION

The ELY/G electrolyte solution and RL-G cleaning solution irritate the eyes and skin. Note the following points when dealing with these solutions:

- During working activities, always wear suitable protective gloves and protective goggles/face shield.
- If it comes into contact with the skin, rinse thoroughly with water and immediately change contaminated clothing.
- If it comes into contact with the eyes, rinse thoroughly with water and consult a doctor.
- Note the safety datasheets.



CAUTION

Before all maintenance activities, disconnect the sensor from the instrument.



Note

Information on how to order wear parts and maintenance equipment can be found in chapter 8 WEAR PARTS AND ACCESSORIES.

5.2 Outside cleaning

Cleaning agents

Contamination	Cleaning procedure
Lime sediments	Immerse in acetic acid for 1 minute (volume share = 10 %)
Fat/oil	Clean with warm water that contains washing-up liquid

After cleaning, thoroughly rinse with deionized water and recalibrate if necessary.

5.3 Changing the electrolyte and membrane cap



General information

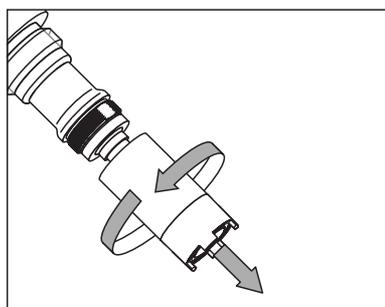
CAUTION

Before starting to work with the sensor, please note the **GENERAL MAINTENANCE INSTRUCTIONS** on page 23.

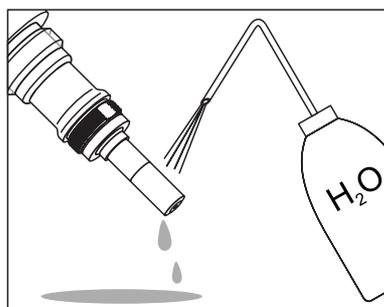
WTW delivers the sensor ready to operate (see section 3). The electrolyte solution and membrane cap must only be replaced if:

- a calibration error occurs and the membrane is heavily contaminated
- the membrane is damaged
- the electrolyte solution is exhausted.
- in case of a leak message by the measuring instrument

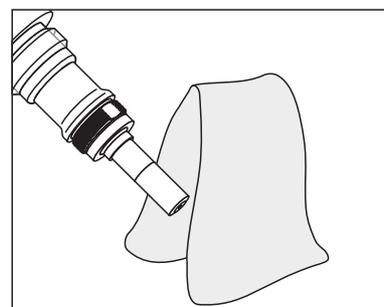
Changing the electrolyte and membrane cap



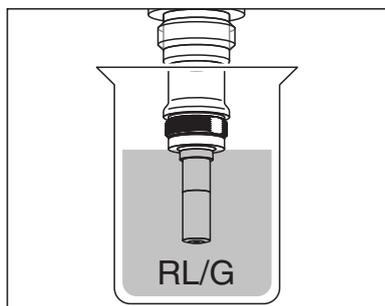
Unscrew the membrane cap.
Caution: Electrolyte solution!
For disposal of the membrane head and electrolyte solution, see section 5.6.



Rinse the sensor head with deionized water.

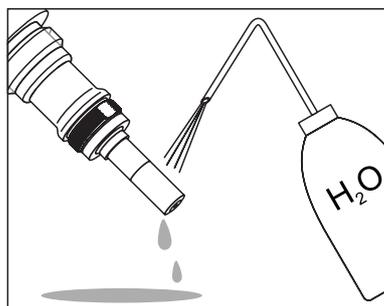


Carefully rub and dry the counter electrode with a lint-free paper towel.

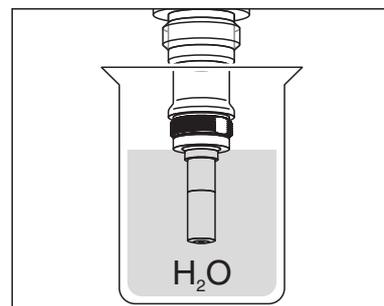


Immerse the sensor head including the counter electrode in RL/G cleaning solution.

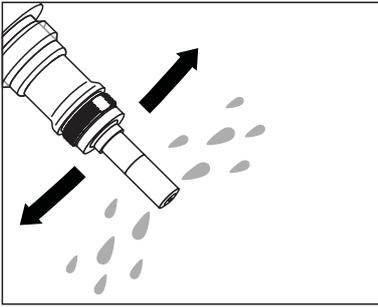
Allow to react for 1 to 3 minutes.



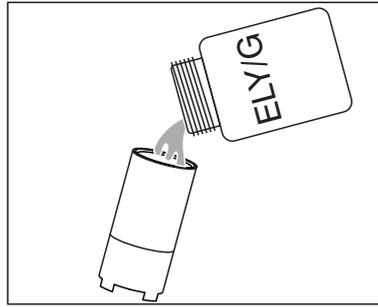
Thoroughly rinse the sensor head with deionized water.



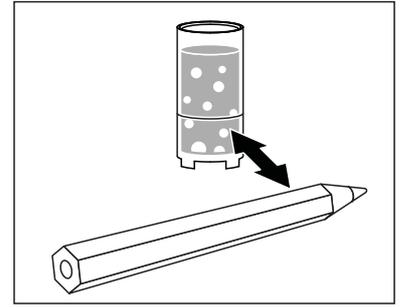
Water the counter electrode in deionized water for at least 10 minutes.



Carefully shake off the drops of water.



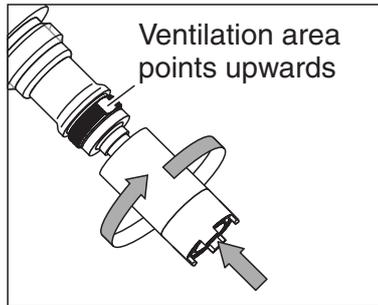
Fill a new membrane cap with ELY/G electrolyte solution.



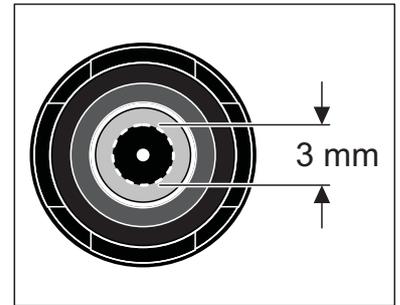
Remove any air bubbles by carefully tapping the membrane head. Additionally, you can prevent air bubbles by throwing the first filling away and refilling the membrane cap.



Thoroughly rinse the sensor head with electrolyte solution.



Hold the sensor inclined and screw on the membrane head fingertight using a paper towel. Excess electrolyte solution is forced out of the ventilation area.



Check the filling: Inspect the face surface. No air bubbles may be present within the dashed circle. Air bubbles outside this area do not interfere.



Readiness to measure

Note

For measurements under high pressure the filling must be completely free of air bubbles.

After approx. 30 to 50 minutes, the sensor is ready for operation. Subsequently calibrate the sensor.



Note

If you want to measure very low oxygen concentrations (< 0.5 % saturation), we recommend to let the sensor rest overnight and then calibrate it.

5.4 Cleaning the electrodes



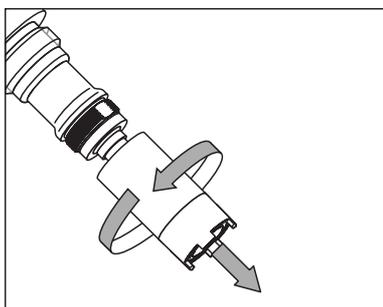
General information

CAUTION

Before starting to work with the sensor, please note the **GENERAL MAINTENANCE INSTRUCTIONS** on page 23.

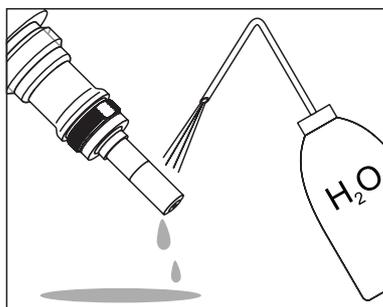
Cleaning is only required in cases of slopes too low or too high (sensor cannot be calibrated) that cannot be resolved by changing the membrane head and electrolyte solution.

Cleaning the electrodes

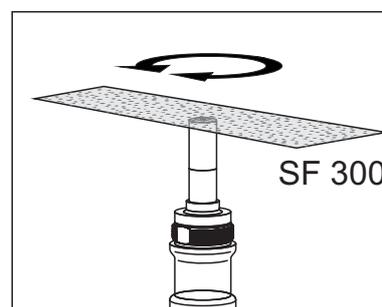


Unscrew the membrane cap.

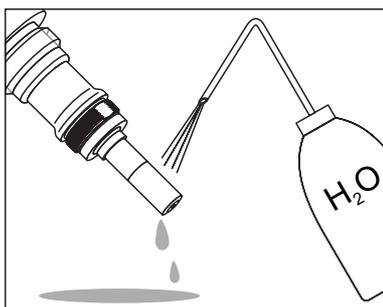
Caution: Electrolyte solution!
For disposal of the membrane head and electrolyte solution, see section 5.6.



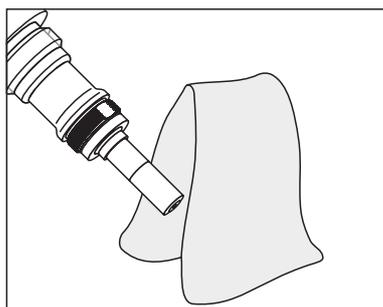
Rinse the sensor head with deionized water.



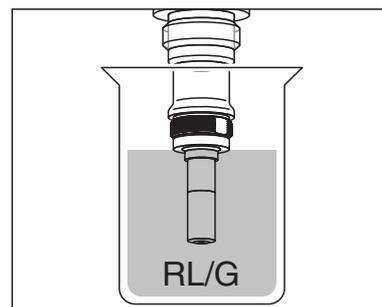
Using the rough side of the **wet SF 300** polishing strip, polish off any contamination from the gold working electrode using light pressure.
Caution: Do not use any conventional sandpaper or glass-fiber brushes.



Rinse the sensor head with deionized water.



Wipe the counter electrode with a lint-free paper towel and carefully remove any loose white deposits.

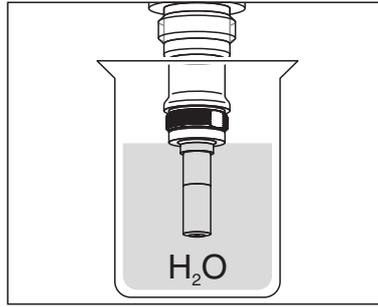


Immerse the sensor head including the counter electrode in RL/G cleaning solution.

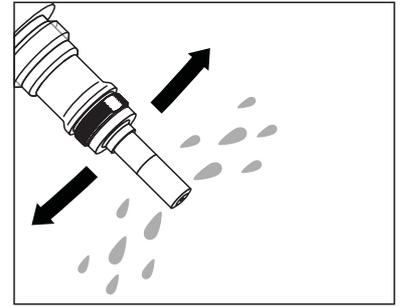
Allow to react for 1 to 3 minutes.



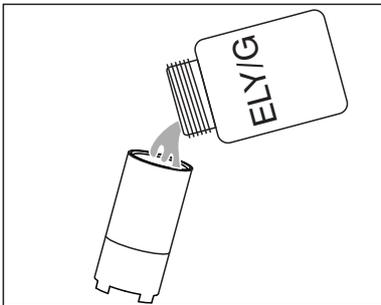
Thoroughly rinse the sensor head with deionized water.



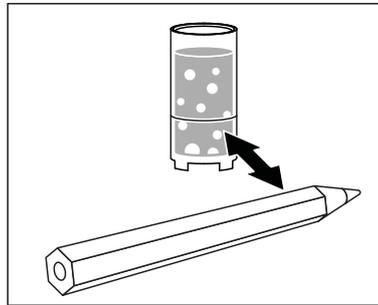
Water the counter electrode in deionized water for at least 10 minutes.



Carefully shake off the drops of water.



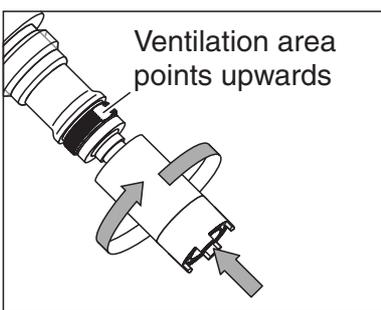
Fill a new membrane cap with ELY/G electrolyte solution.



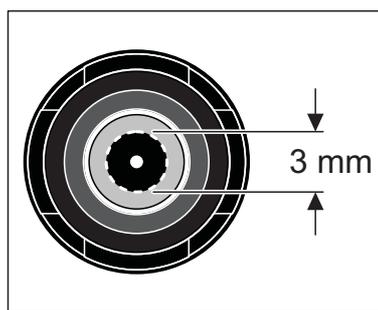
Remove any air bubbles by carefully tapping the membrane head. Additionally, you can prevent air bubbles by throwing the first filling away and refilling the membrane cap.



Rinse the sensor head with electrolyte solution.



Hold the sensor inclined and screw on the membrane head fingertight using a paper towel. Excess electrolyte solution is forced out of the ventilation area.



Check the filling: Inspect the face surface. No air bubbles may be present within the dashed circle. Air bubbles outside this area do not interfere.

**Note**

For measurements under high pressure the filling must be completely free of air bubbles.

Readiness to measure

After approx. 30 to 50 minutes, the sensor is ready for operation. Subsequently calibrate the sensor.

**Note**

If you want to measure very low oxygen concentrations (< 0.5 % saturation), we recommend to let the sensor rest overnight and then calibrate it.

5.5 Checking the sensor for freedom from zero-current

The sensor is zero-current free. Checking the module for freedom from zero-current is only necessary in the case of malfunctions that cannot be remedied by exchanging the electrolyte solution and membrane cap or by cleaning the electrodes.

There are 2 possibilities to check the sensor for freedom from zero-current:

- Measurement in a nitrogen atmosphere (recommended method)
- Measurement in a sodium sulfite solution according to DIN EN 25814/ISO 5814.

**CAUTION**

If you check the sensor according to DIN EN 25814/ISO 5814, do not leave the sensor in the sodium sulfite solution for more than 2 minutes. Danger of sensor poisoning!

Test criterion

The sensor is OK if the measuring instrument displays < 1 % D.O. saturation after 2 minutes.

5.6 Disposal

**CAUTION**

The ELY/G electrolyte solution irritates the eyes and skin. When dealing with the ELY/G electrolyte solution, observe the following points:

- **During working activities, always wear suitable protective gloves and protective goggles/face shield.**
- **If it comes into contact with the skin, rinse thoroughly with water and immediately change contaminated clothing.**
- **If it comes into contact with the eyes, rinse thoroughly with water and consult a doctor.**
- **Follow the safety datasheet.**

Sensor and membrane cap

For disposal, unscrew the membrane head and rinse the sensor and membrane head with water. We recommend disposing of the sensor without the membrane cap as electronic refuse. The membrane head may be disposed of with the household refuse.

Electrolyte solution

Disposal according to the safety data sheet.

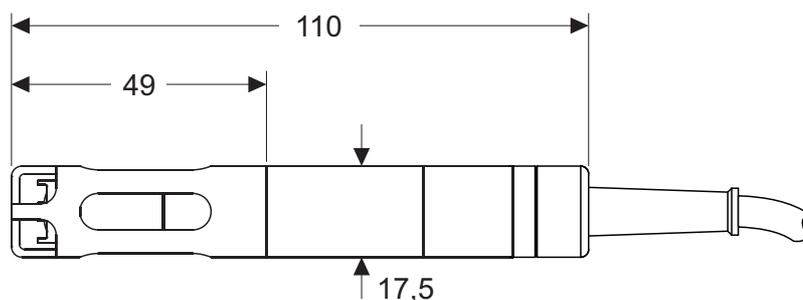
6 What to do if ...

Error symptom	Cause	Remedy
The sensor is in the air and the display shows 0.0 mg/l or 0 % O ₂	<ul style="list-style-type: none"> – No connection between measuring instrument and sensor – No electrolyte in the membrane head – Cable defective 	<ul style="list-style-type: none"> – Check connection between measuring instrument and sensor – Replace and refill the membrane cap (see section 5.3) – Return the sensor
The sensor cannot be calibrated	<ul style="list-style-type: none"> – Contaminated membrane head – Electrolyte depleted – Hole in the membrane – Membrane cap not screwed on tight enough 	<ul style="list-style-type: none"> – Replace and refill the membrane cap (see section 5.3) Subsequently, wait for 30 to 50 min and recalibrate. – Screw membrane head tighter
The sensor still cannot be calibrated after changing the electrolyte and membrane head	<ul style="list-style-type: none"> – Contaminated electrodes or sensor toxification 	<ul style="list-style-type: none"> – Clean the electrodes (see section 5.4)
Leak display appears	<ul style="list-style-type: none"> – Membrane cap not screwed on tight enough – Hole in the membrane 	<ul style="list-style-type: none"> – Screw membrane head tighter – Replace and refill the membrane cap (see section 5.3)
Incorrect temperature display	<ul style="list-style-type: none"> – Temperature sensor defective 	<ul style="list-style-type: none"> – Return the sensor
Mechanical damage to the sensor		<ul style="list-style-type: none"> – Return the sensor
Meter displays <i>OFL</i> (display range exceeded)	<ul style="list-style-type: none"> – Short-circuit between working electrode and counter electrode 	<ul style="list-style-type: none"> – Clean the electrodes (see section 5.4). If the meter still displays <i>OFL</i>, return the sensor.

7 Technical data

General features	Measuring principle	Membrane covered galvanic sensor
	Temperature compensation	IMT compensation (calculated by the meter)
	Temperature sensor	Integrated NTC 30 (30 kΩ at 25 °C / 77 °F)

Dimensions (in mm)



Weight 310 g (with 2 m cable)

Materials	Working electrode	Gold
	Counter electrode	Lead
	– Shaft housing	POM
	– Connection head	
	– Membrane head	
	– Cable screw joint	
	Membrane	FEP
	Sensor head	Epoxy, PEEK
	Insulator	PEEK
	Thermistor housing	VA steel 1.4571
Seals	FPM (Viton)	

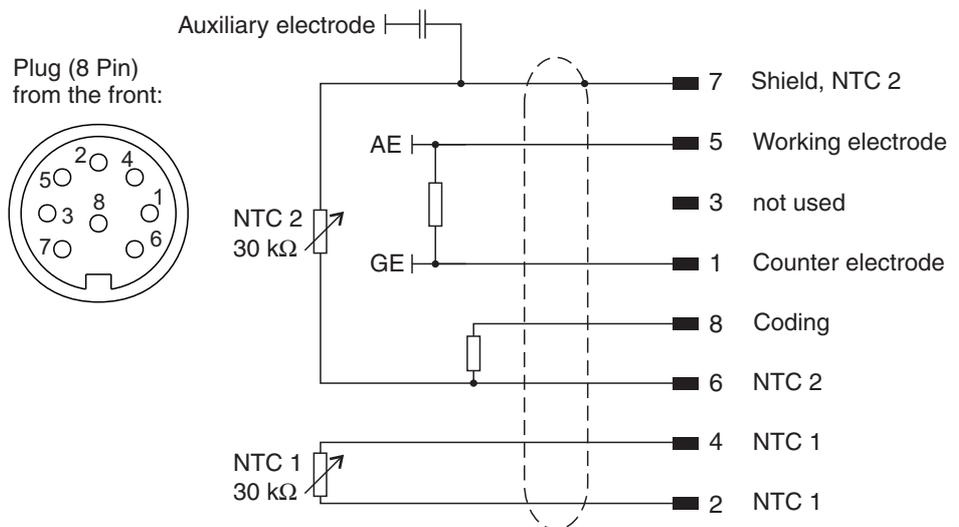
Connection cable	Lengths	3 or 6 m
	Diameter	6 mm
	Smallest allowed bend radius	Fixed installation: 50 mm Flexible use: 80 mm
	Plug type	Socket, 8 pins

Pressure resistance	Sensor	IP 68 (6 bar)
	Sensor cable	IP 68 (2 bar)
	Plug	IP 67 (when plugged in)

The DurOx® 325 meets the requirements according to article 3(3) of the 97/23/EC directive ("Pressure equipment directive").

Measurement conditions	Measuring ranges at 20 °C (68 °F)	0 ... 50 mg/l D.O. 0 ... 600 % D.O. saturation 0 ... 1250 mbar D.O. partial pressure
	Temperature range	0 ... 40 °C (32 ... 104 °F)
	Depth of immersion	min. 4 cm max. 6 m (depending on the cable length)
	Operating position	Any
	Approach flow	> 2,5 cm/s with 10 % measurement accuracy 5 cm/s with 5 % measurement accuracy
Storage conditions	Recommended storing method	in the calibration and storage vessel, OxiCal®-ST (moist)
	Storage temperature	0 ... 40 °C (32 ... 104 °F)
Characteristics when delivered	Zero signal	< 1 % of the saturation value
	Response time of D.O. measurement at 20 °C (68 °F)	t ₉₀ (90 % of the final value display after) < 25 s t ₉₅ (95 % of the final value display after) < 40 s t ₉₉ (99 % of the final value display after) < 125 s
	Own consumption of oxygen at 20 °C (68 °F)	0.006 µg·h ⁻¹ (mg/l) ⁻¹
	Drift	Approx. 3 % per month in the operating condition
	Response time of temperature measurement	t ₉₉ (99 % of the final value display after) < 60 s
	Precision of temperature measurement	± 0.2 K
	Working life	min. 6 months with one electrolyte filling

Pin assignment



8 Wear parts and accessories

Wear parts and maintenance equipment

Description	Model	Order no.
Set of exchange membrane caps (3 pieces)	WP3-D	202 740
Electrolyte solution	ELY/G	205 217
Cleaning solution for lead counter electrode	RL/G	205 204
Polishing strip	SF 300	203 680
Accessory kit, comprising: – 3 exchange membrane caps, WP-D – Electrolyte solution ELY/G – Cleaning solution, RL/G – Polishing strip, SF 300	ZBK-D	201 578

Accessories

Description	Model	Order no.
Calibration and storage vessel	OxiCal®-D	201 579
Protective hood	SK-D	201 575



Note

For further accessories, refer to the WTW catalog or the Internet.