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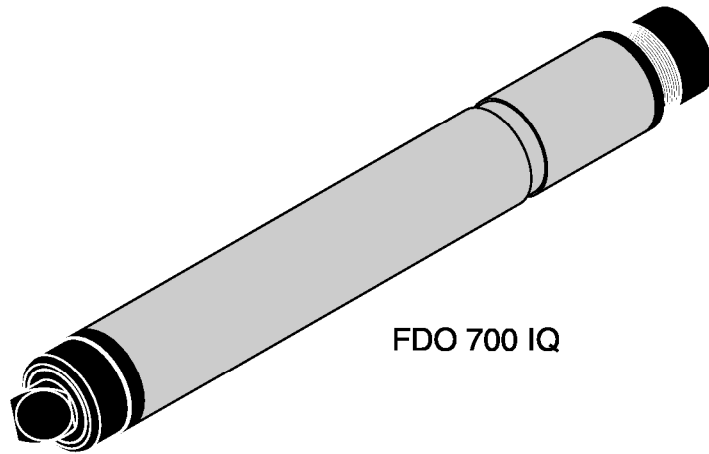
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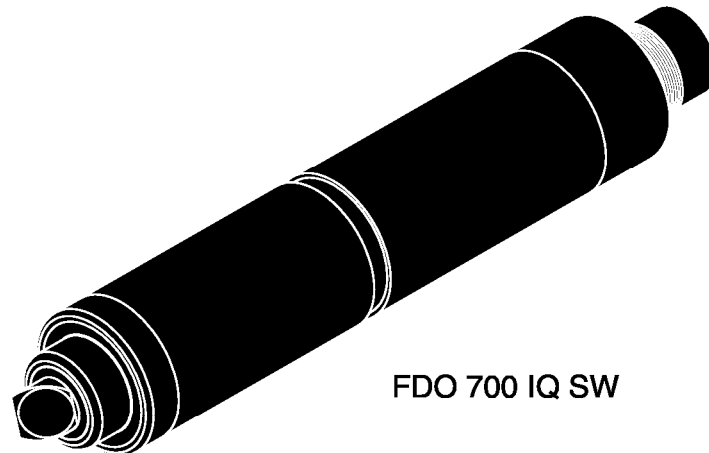
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Operating manual

**FDO 700 IQ
FDO 700 IQ SW**



FDO 700 IQ



FDO 700 IQ SW

Optical IQ SENSOR NET D. O. sensor

**Accuracy when going to
press**

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Note

The latest version of the present operating manual can be found on the Internet under www.WTW.com.

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1 Overview

1.1 How to use this component operating manual

Structure of the IQ SENSOR NET operating manual

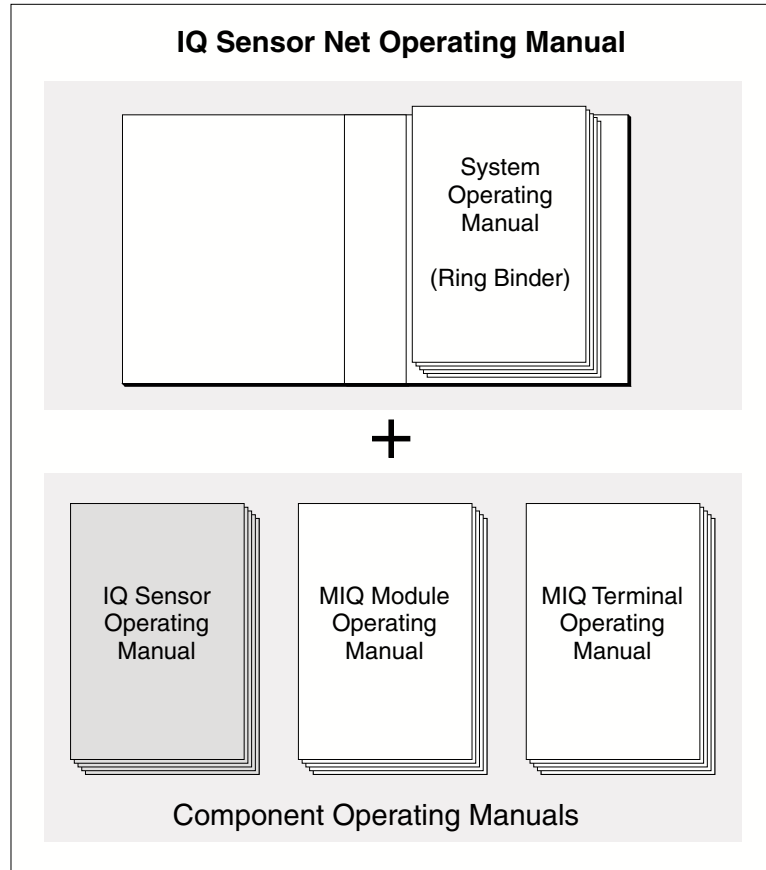


figure 1-1 Structure of the IQ SENSOR NET operating manual

The IQ SENSOR NET operating manual has a modular structure like the IQ SENSOR NET system itself. It consists of a system operating manual and the operating manuals of all the components used.

Please file this component operating manual into the ring binder of the system operating manual.

1.2 Structure of the FDO 700 IQ (SW)

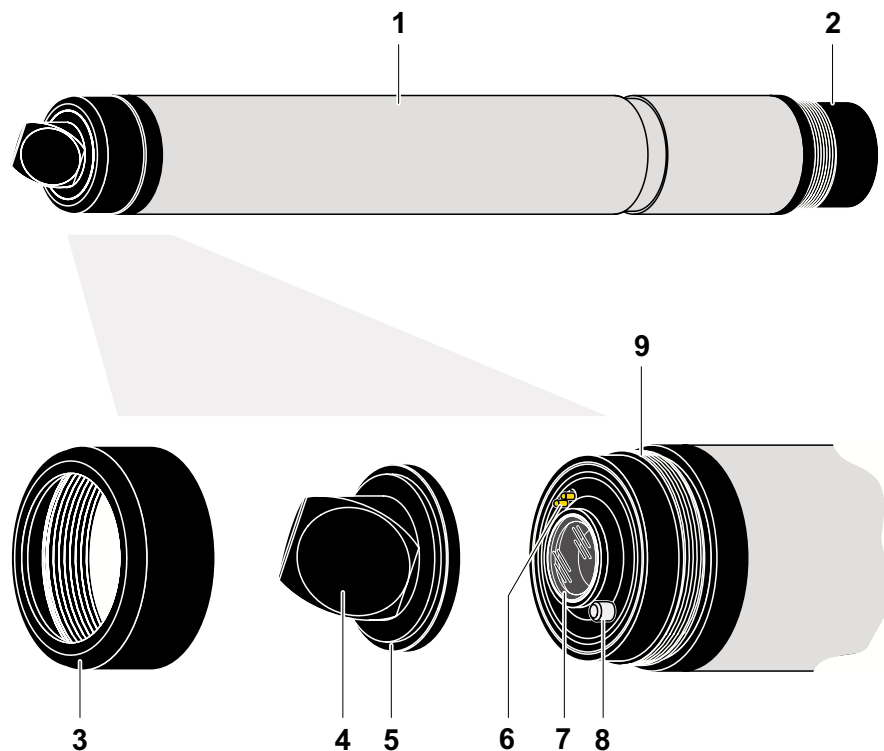


figure 1-2 Structure of the D. O. sensor (example: FDO 700 IQ)

1	Shaft
2	Plug head connector
3	Fixation ring
4	Sensor membrane
5	Sensor cap with memory chip
6	Gold plated contact pins for memory chip
7	Measurement window
8	Temperature sensor and arrest
9	Sensor head

Sensor cap with memory chip

A memory chip is integrated in the sensor cap, on which the following data can be stored:

- Type designation of the sensor cap
- Serial number
- Data of the factory calibration

**Intelligent Membran
(IQMC Technology)**

For each membrane the individual calibration values are determined by a factory calibration process and stored on the memory chip of the sensor cap, ensuring maximum accuracy over the whole lifetime of the sensor.

1.3 Recommended fields of application**FDO 700 IQ**

Stationary measurements in water/wastewater applications.

FDO 700 IQ SW

Stationary measurements in seawater, aquaculture.

2 Safety instructions

This component operating manual contains special instructions that must be followed during the operation of the FDO 700 IQ (SW) D.O. sensor. Thus, it is essential to read this component operating manual before carrying out any work using this sensor. In addition to this manual, the SAFETY chapter of the IQ SENSOR NET system operating manual must be followed.

Always keep this component operating manual together with the system operating manual and any other component operating manuals in the vicinity of the IQ SENSOR NET system.

General safety instructions

Safety instructions in this operating manual are indicated by the warning symbol (triangle) in the left column. The signal word (e.g. "Caution") indicates the danger level:



Warning

indicates instructions that must be followed precisely in order to prevent serious dangers to personnel.



Caution

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

Other labels



Note

indicates notes that draw your attention to special features.



Note

indicates cross-references to other documents, e.g. operating manuals.

2.1 Authorized use

The authorized use of the FDO 700 IQ (SW) comprises its use as an oxygen sensor in the IQ SENSOR NET. The technical specifications according to chapter 7 TECHNICAL DATA must be observed. Only operation according to the instructions in this operating manual is authorized.

Any other use is considered to be **unauthorized**. Unauthorized use invalidates any claims with regard to the guarantee.



Caution

Only connect and operate the sensor together with IQ SENSOR NET accessories.

Function and operational safety

2.2 General safety instructions

The sensor left the factory in a safe and secure technical condition.

The failure-free function and operational safety of the sensor is only guaranteed if the generally applicable safety measures and the special safety instructions in this operating manual are followed during its use.

The failure-free function and operational safety of the sensor is only guaranteed under the environmental conditions that are specified in chapter 7 TECHNICAL DATA.

The specified temperature (chapter 7 TECHNICAL DATA) must be maintained during the operation and transport of the sensor. Protect the sensor, particularly against frost or overheating.



Caution

The sensor may only be opened by specialists authorized by WTW. The only exceptions to this are the activities described in chapter 5 MAINTENANCE, CLEANING, DISPOSAL, AND REPLACEMENT.

Safe operation

If safe operation is no longer possible, the sensor must be taken out of operation and secured against inadvertent operation.

Safe operation is no longer possible if the sensor:

- has been damaged in transport
- has been stored under adverse conditions for a lengthy period of time
- is visibly damaged
- no longer operates as described in this manual.

If you are in any doubt, contact the supplier of your sensor.

Obligations of the operator

The operator of the sensor must ensure that the following rules and regulations are followed when dealing with hazardous substances:

- EEC directives for protective labor legislation
- National protective labor legislation
- Safety regulations
- Safety data sheets of the chemical manufacturer.

Are the plug connections dry?

Before connecting the sensor and sensor connection cable, please make sure that the plug connections are dry. If moisture gets into the plug connections, first dry the plug connections (dab them dry or blow them dry using compressed air).



Note

Do not suspend the sensor on the sensor connection cable. Use a sensor holder or an armature. Information on this and other IQ SENSOR NET accessories is given in the WTW catalog and on the Internet.

Connecting the sensor to the sensor connection cable

1	Take the protective caps off the plug connections of the sensor and the SACIQ (SW) sensor connection cable and keep them safe.
2	Plug the jack of the SACIQ (SW) sensor connection cable onto the plug head connector of the sensor. At the same time, rotate the socket so that the pin in the plug head connector (1) clicks into one of the two holes in the socket.
3	Then screw the coupling ring (2) of the sensor connection cable onto the sensor up to the stop.

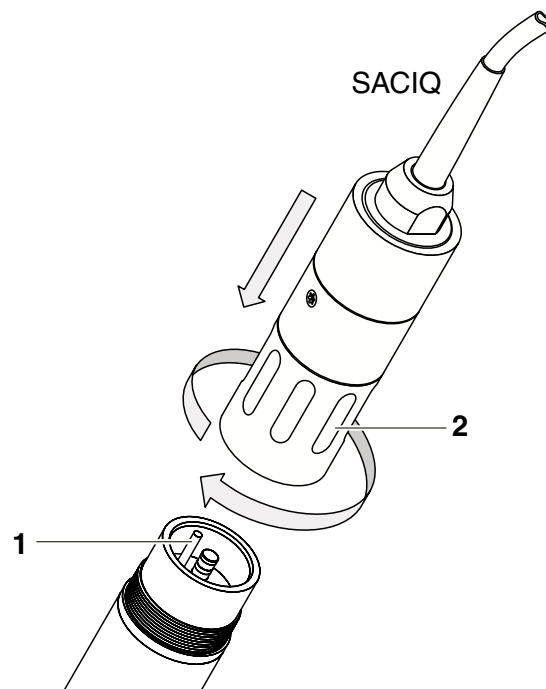


figure 3-1 Connect the sensor

3.3 Commissioning / Getting the instrument ready for measuring

Identification in the IQ SENSOR NET

For a successful registration in the IQ SENSOR NET system the sensor has to be equipped with the sensor cap. The ready-to-operate sensor is displayed in the list of the sensors as follows:

- Type designation of the sensor cap ("SC FDO 700")
- Serial number of the sensors FDO 700 IQ or FDO 700 IQ SW resp.

Commissioning steps

1	Pull the protective cap off the sensor.
2	If required, assign a user-defined name to the sensor (see relevant IQ SENSOR NET system operating manual).
3	When using IQ SENSOR NET systems without automatic air pressure compensation the mean air pressure value or the location altitude has to be entered (for detailed informations, see particular IQ SENSOR NET system operating manual).
4	Set the sensor (see section 3.4).

3.4 FDO 700 IQ (SW) setting table


Setting	Selection/values	Explanation
<i>Measuring mode</i>	<ul style="list-style-type: none"> ● <i>Concentration</i> ● <i>Saturation</i> 	Unit of the measured value on the measured value display.
<i>Measuring range Concentration</i>	<ul style="list-style-type: none"> ● <i>0 ... 20.00 mg/l</i> ● <i>0 ... 20.00 ppm</i> 	These measuring ranges are available for selection.
<i>Measuring range Saturation</i>	<ul style="list-style-type: none"> ● <i>0 ... 200.0 %</i> 	The measuring range is set permanently.
<i>Response time t90</i>	<i>30 ... 300 s</i>	Response time of the signal filters. Depending on the sample matrix the measuring values can fluctuate more or less. A signal filter in the sensor decreases the fluctuation margin of the measuring value. The signal filter is characterised by the <i>Response time t90</i> , which is the time after which 90 % of a signal change is displayed.

Setting	Selection/values	Explanation
<i>Calibration</i>	<ul style="list-style-type: none"> ● <i>Factory calibration</i> ● <i>User calibration</i> ● <i>active</i> ● <i>abort</i> 	<p>Determines, which calibration data are used for the calculation of the measuring values. The active calibration is displayed in the calibration history.</p> <p>The selection <i>User calibration</i> is only displayed, when valid calibration data of a <i>User calibration</i> are stored in the sensor.</p> <p><i>active</i> indicates that a sensor gets calibrated at the moment.</p> <p>With the selection <i>abort</i> the active calibration gets cancelled with <i>Save and quit</i> when the setting table is quit the next time.</p>
<i>Temperature mode</i>	<ul style="list-style-type: none"> ● °C ● °F 	Unit of the measured temperature value (Celsius, Fahrenheit).
<i>Temp. adjustment</i>	-1.5 K ... +1.5 K	<p>The temperature compensation enables the displayed temperature value to be balanced (shifting of the zero point by ±1.5 K).</p> <p>Notes:</p> <ul style="list-style-type: none"> ● Due to the thermal capacity of the sensor, it is necessary to place it in a container with at least 2 liters of water. ● Leave the sensor in this container for at least 15 minutes while stirring occasionally until the balancing can be performed. <p>With temperature differences between the water and sensor > 10 °C, leave the sensor for at least 1 hour in this container while stirring occasionally until the balancing can be performed.</p>
<i>Salinity</i>	<ul style="list-style-type: none"> ● <i>On</i> ● <i>Off</i> 	Determines whether the entered salinity should be taken into account.

Setting	Selection/values	Explanation
<i>Calibration</i>	<ul style="list-style-type: none"> ● <i>Factory calibration</i> ● <i>User calibration</i> ● <i>active</i> ● <i>abort</i> 	<p>Determines, which calibration data are used for the calculation of the measuring values. The active calibration is displayed in the calibration history.</p> <p>The selection <i>User calibration</i> is only displayed, when valid calibration data of a <i>User calibration</i> are stored in the sensor.</p> <p><i>active</i> indicates that a sensor gets calibrated at the moment.</p> <p>With the selection <i>abort</i> the active calibration gets cancelled with <i>Save and quit</i> when the setting table is quit the next time.</p>
<i>Temperature mode</i>	<ul style="list-style-type: none"> ● °C ● °F 	Unit of the measured temperature value (Celsius, Fahrenheit).
<i>Temp. adjustment</i>	-1.5 K ... +1.5 K	<p>The temperature compensation enables the displayed temperature value to be balanced (shifting of the zero point by ± 1.5 K).</p> <p>Notes:</p> <ul style="list-style-type: none"> ● Due to the thermal capacity of the sensor, it is necessary to place it in a container with at least 2 liters of water. ● Leave the sensor in this container for at least 15 minutes while stirring occasionally until the balancing can be performed. <p>With temperature differences between the water and sensor > 10 °C, leave the sensor for at least 1 hour in this container while stirring occasionally until the balancing can be performed.</p>
<i>Salinity</i>	<ul style="list-style-type: none"> ● <i>On</i> ● <i>Off</i> 	Determines whether the entered salinity should be taken into account.

Setting	Selection/values	Explanation
<i>Sensor cap data</i>	<ul style="list-style-type: none"> ● <i>Do not download</i> ● <i>Transmit to log book</i> 	Generates a log book message with all in the sensor cap stored data (see section 1.2) when the settings are quit with <i>Save and quit</i> . When the menu is re-opened again, the settings are reset to <i>Do not download</i> .
<i>Save and quit</i>		The system confirms the saving of the settings and the display switches to the next higher level.
<i>Quit</i>		The display switches to the next higher level without saving the new settings.

Carrying out settings

Switch to the main settings menu from the measured value display with . Then navigate to the setting menu (setting table) of the sensor. The exact procedure is described in the respective IQ SENSOR NET system operating manual.



Note

For information on oxygen measurement in solutions that contain salt, see WTW application report no. 1193118.

4 Measuring / Operation

4.1 Measuring



Warning

Contact with the sample can be dangerous for the user!

Depending on the type of sample, suitable protective measures must be taken (protective clothing, protective goggles, etc.).

Please pay attention to the given data in section 7.2 APPLICATION CONDITIONS, in particular the minimum immersion depth of the sensors (> 50 mm). The measured value is available immediately on submersing.



Note

When problems of contamination of the sensor head arise, the usage of the air pressure cleaning system with the cleaning head CH is recommended (see section 5.5 REPLACEMENT PARTS AND ACCESSORIES).

4.2 Function check and user calibration

4.2.1 General information

Factory calibration

The oxygen sensor FDO 700 IQ (SW) is factory calibrated. For the recommended fields of application (see section 1.3 RECOMMENDED FIELDS OF APPLICATION) the measuring characteristic of the sensor cap stays stable over the specified lifetime, so that a user calibration is not needed.

When is a function check/user calibration useful?

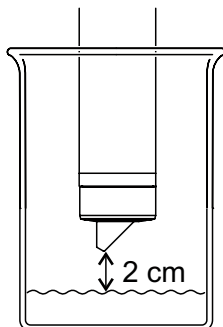
A function check or user calibration can be helpful in the below listed special cases:

- When the measuring values seem to be implausible and it is assumed that the end of the sensor cap's lifetime is reached.
- Routinely within the framework of the company quality assurance.

Function check or calibration medium

Depending on the temperature at the location of the calibration one should choose between two possible variations:

- In the case of air temperatures above 5 °C ideally calibration takes place in water vapor-saturated air. To do so, position the sensor approx. 2 cm above a water surface, for example in a narrow bucket or similar container with water. The membrane has to be clean and dry.



- In the case of air temperatures below 5 °C do not calibrate the sensor in air but in air-saturated water that has a higher temperature. You obtain air-saturated water by pouring water several times in and out of two vessels so that it sparkles.

4.2.2 Funktion check

The function check is the simplest way of letting you know whether the sensor needs to be cleaned or calibrated.

Principle

The function check can either be performed in water vapor-saturated air or in air-saturated water (see FUNCTION CHECK OR CALIBRATION MEDIUM at page 4-1).

The function check is carried out in the measuring mode *Saturation*.



Note

Be aware, that when changing to the measuring mode *Saturation* the informations of linked outputs get lost.

Steps

1	Take the sensor out of the measuring solution.
2	Immerse the sensor in the function check or calibration medium (water vapor-saturated air or air-saturated water, respectively - see section 4.2.1).
3	Open the setting table and set the measuring mode to <i>Sättigung</i> (unit %) (see section 3.4).
4	Change with M to the measured value display.
5	Wait minimum 15 minutes for the temperature adaption of the sensor and the environment. Large temperature differences can require longer adaption times.
6	Read the measured value. Rate the measured value as described below.



Evaluation

Basis of the rating is an accuracy which is demanded by the user. Together with the desired value (100 %) a valid range for the function check arises.

Is the measured value within the valid range, no cleaning or calibration is required.

Is the measured value outside the valid range, the sensor shaft and the membrane should be cleaned and afterwards the function test should be repeated (see section 5.4.1).

Example:

- demanded accuracy = ± 5 %.
- In air or in air-saturated water the desired value for the relative oxygen saturation (Saturation) 100 %.
According to that the valid range is 95 to 105 %
- The function check results in a measuring value of 97 %
⇒ no cleaning or user calibration is required, as the measurement error is within the valid range.

4.2.3 User calibration

Principle

The user calibration is performed either in water vapor-saturated air or in air-saturated water (see FUNCTION CHECK OR CALIBRATION MEDIUM page 4-1). The relative slope of the sensor is determined with the calibration procedure. The calibration is rated on the basis of the relative slope and intensity (successful <-> not successful).

The result of the calibration gets stored in the calibration record or in the calibration history and can be viewed afterwards (see respective IQ SENSOR NET system operating manual).



Note

It is emphasized, that the factory calibration of the membrane is highly precise due to the IQMC technology. However, if a user calibration is demanded, environmental influences has to be considered.

Steps

In general the user calibration on the IQ SENSOR NET has to be performed as described below. System specific details are given in the respective IQ SENSOR NET system operating manual.

1	Change with (M) to the measured value display and select the sensor FDO 700 IQ (SW).
2	Press (C) . The next step switches on the maintenance condition for the sensor. A corresponding note appears on the display.
3	Confirm the index with (OK) . The maintenance condition is active.
4	Bring the sensor in calibration position (water vapor-saturated air or air-saturated water - see above).
5	Press (OK) . The sensor detects the calibration data. The process is stopped automatically, when the measured values fulfill the criterion of the stability control. This process can last longer when there are large temperature differences between the sensor and the environment. In the end a note occurs on the display.
6	Bring the sensor back in the measuring position, when the user calibration was successful.
7	Wait until the measuring signal is stable (Temperature adaption).
8	Switch off the maintenance condition.

Termination of the user calibration

As long as the calibration process was not started (step 5), it is possible to interrupt the calibration routine with **M** or **ESC**.

The already started process of calibration (after pressing **OK** in step 5) can be quit as follows:

1	Open the the setting table (see section 3.4).
2	Choose in the menu item <i>Calibration</i> the setting <i>abort</i> and quit the setting table afterwards with <i>Save and quit</i> .

After the termination of the user calibration, the sensor resumes operation using the calibration data which have been used before the terminated calibration.

Possible results of the user calibration

The calibration data are evaluated by the system. A calibration can have the following results:

Display	Explanation
Measured value display	Sensor was successfully calibrated. The calibration data can viewed in the calibration history (section 4.2.4).
"----"	The sensor could not be calibrated. The sensor is blocked for further measurements. Informations for possible causes can be found in the log book of the sensor.

4.2.4 Calibration history

Calibration history
(available in the
IQ SENSOR NET systems
184 XT and 2020 XT
only)

MIQ/T2020	15 Dec 2006	00:13			
Calibration history of selected sensor					330
S01 SC FDO 700 03270001					
Date	Rel.slope	Intens.	Res		

Factory	1.00	+	o.k.		

15.12.2006	0.77	+	Error		
04.11.2006	0.96	+	o.k.		

Range of tolerance 0.90 .. 1.10					
Return ESC					

actual active calibration

chronological list with the last calibrations

figure 4-1 Calibration history FDO 700 IQ (SW)

The calibration history contains the following information:

Date	Date of the calibration (<i>Factory</i> = factory calibration)
Rel.slope	Relative Slope (dimensionless)
Intens.	Intensity: + : sufficient - : to low
Res	Rating of the calibration <i>o.k.</i> : Calibration was successful. The new calibration values are used for the measurements. <i>Error</i> : Calibration was not successful. Bad calibration data were rejected. The measurement is continued with the last valid calibration data.



Note

The calibration history is stored in the sensor. When a new sensor cap is mounted (with different serial number) the calibration history gets deleted and can not be recovered again.

4.2.5 Reactivation of former calibrations

The FDO 700 IQ (SW) enables you to reactivate a former user calibration or the factory calibration when needed. Thereby, it is possible to continue with measurements, when a calibration failed or it is assumed that optimal calibration conditions were not met.



Note

The reactivation of former calibration data is only a temporary solution. Please consider, that thereby possibly wrong measurement values are produced. Please check correct functioning of the sensor by performing a function check and/ or a user calibration.

Reactivate calibration data

1	Open the the setting table (see section 3.4).
2	Choose in the menu item <i>Calibration</i> the setting <i>User calibration</i> or <i>Factory calibration</i> and quit the setting table afterwards with <i>Save and quit</i> .

5 Maintenance, cleaning, disposal, and replacement

5.1 General maintenance notes



Maintenance condition

Warning

Contact with the sample can be dangerous for the user! Depending on the type of sample, suitable protective measures must be taken (protective clothing, protective goggles, etc.).

We recommend to switch on the maintenance condition each time the sensor is taken out of the measuring position. This avoids unwanted reactions of linked outputs. More information on the maintenance condition is given in the relevant IQ SENSOR NET system operating manual.



Note

We do not recommend unscrewing the sensor from the sensor connection cable for maintenance work. Otherwise, moisture and/or dirt can get into the plug connection where they can cause contact problems.

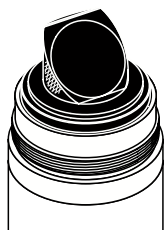
If you would like to disconnect the sensor from the sensor connection cable, please observe the following points:

- Before disconnecting the sensor from the sensor connection cable SACIQ (SW) the sensor has to be cleaned from the outside (siehe section 5.4.1).
- Unscrew the sensor from the SACIQ (SW) sensor connection cable.
- Always place a protective cap on the plug head of the sensor and on the the SACIQ (SW) sensor connection cable so that no moisture or dirt can get onto the contacting surface.
- In corrosive environments, close the socket of the sensor connection cable with the screwable SACIQ-Plug when it is dry in order to protect the electrical contacts from corrosion. The protective plug is available as an accessory (see section 5.5 REPLACEMENT PARTS AND ACCESSORIES). It is included in the standard scope of delivery of the SACIQ SW sensor connection cable.

5.2 Handling instructions for the sensor cap

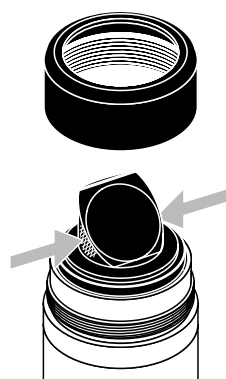
Despite of the robustness, the sensor is a high precision optical instrument. Therefore, care has to be taken for all maintenance and cleaning work done on the sensor:

- Dirt and moisture below the sensor cap can have negative influences on the function of the sensor and decrease lifetime of the sensor cap. Please pay attention to clean and dry working environment, when taking off the sensor cap.
- Please do not touch the outer sensor membrane with your fingers. Touch the sensor cap principally only at the sides (hatched area in the figure on the left).
- Avoid strong mechanical forces on the sensor membrane (pressure, scratches).
- The impact of light, particularly daylight, on the inner side of the sensor cap will have, over some time, an impact on the measuring properties and can shorten the lifetime of the sensor cap. Therefore, the inner side of the sensor cap should not be exposed particularly to direct sunlight. Principally, incidence of light should be avoided, which overexceed normal maintenance and cleaning work. Please store dismounted sensor caps only in light protected environments.



5.3 Changing of the sensor cap

Removing the sensor cap

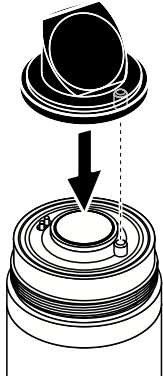


1	Pull the sensor out of the sample.
2	Cleaning of the outer sensor (siehe section 5.4.1).
3	Unscrew the sensor fixation ring by hand.
4	Clean and dry the sensor head once again.
5	Grasp the sensor cap with your fingers on the sides (arrow in figure on the left) and remove the sensor cap by pulling in a straight upward direction from the sensor.



Caution
 No tools or other sharp items should be pushed between the sealing surfaces. Thereby, the sealing surfaces get damaged.

Attaching the sensor cap



6	The sensor front has to be absolutely clean, if necessary it has to be cleaned (see section 5.4.1).
7	The tread of the fixation ring has to be cleaned carefully.
8	The new sensor cap has to be attached to the sensor, so that the temperature sensor fits into the hole on the inner side of the sensor cap (see opposite figure).
9	Screw the fixation ring by hand on the sensor head <u>until stop</u> .

5.4 Cleaning the sensor

5.4.1 Exterior cleaning

Heavy dirt on the sensor can influence the measuring properties. Biofilms, e.g., consume oxygen and can have a negative influence on the response characteristic and can cause too low values, when appearing on the sensor membrane. Therefore, we suggest regular visual inspections and exterior cleaning when needed.

Pay attention to the following points when cleaning the sensor:

- Rinse thoroughly the sensor with tap water to remove easy removable dirt.
- Rough dirt on the sensor shaft can be removed with a soft brush. Attention: Do not use a brush in the area of sensor membrane. Risk of damage!
- The sensor cap as well as the sensor membrane should be wiped off with wetted and soft cleaning cloth.
- To remove tough dirt household detergents can be added to the tap water. Attention: Do not use any alcohol for cleaning!

5.4.2 Cleaning the inner side of sensor cap and sensor head

When, e. g., by a damage of the sensor cap, moisture and dirt penetrated under the sensor cap, the sensor can be made ready to use again as follows:



Caution

Use only non abrasive, alcohol free detergents. Otherwise, the optical surfaces can be damaged.

1	Remove sensor cap (see section 5.3).
2	Clean sensor head and sensor cap: <ul style="list-style-type: none"> – Rinse all inner surfaces with tap water – Remove fat- and oily dirt with warm tap water and household detergents
3	Dry all surfaces with a clean lint-free cloth. Therefore, a lint-free cloth, e.g. for cleaning glasses is suitable.
4	Dry sensor and sensor cap at a dry place so that all moisture, even from not easy accessible location, can evaporate. Thereby, the inner part of the sensor cap should be protected from light.



Note

The sensor cap has to be replaced, when it is visually damaged.

5.5 Replacement parts and accessories

Description	Model	Order no.
Exchange sensor cap	SC FDO 700	201 654
Protective hood against Fishes	MSK FDO	205 253
Protective screw cap for sensor connection cable	SACIQ-Plug	480 065

Components for cleaning system

Description	Model	Order no.
Cleaning head	CH	900107
Active valve module (does not require a free relay output in the IQ SENSOR NET system)	MIQ/CHV PLUS	480018



Note

Information on other IQ SENSOR NET accessories is given in the WTW catalog and on the Internet.

6 What to do if...

Sensor is not displayed on the measured value display and in the list of the sensors

Cause

- Sensor cap is not mounted or defect

Remedy

- Sensor cap (see section 5.3)
- Defect sensor cap has to be exchanged

measured values too low

Cause

- Film on sensor cap

Remedy

- Clean the outside of the sensor (see section 5.4.1)

measured values too high

Causes

- Lifetime of the sensor is reached
- Dirt in the inner part of the sensor cap and sensor head.
- Fixation ring is not tightened enough.
- Sensor cap leaky or defect.

Remedy

- Check sensor
- If necessary the sensor cap has to be exchanged (see section 5.3)
- Remove sensor cap
- Clean inner part of the sensor cap and sensor head (see section 5.4.2)
- Mount sensor cap correctly and tighten fixation ring until stop (see section 5.3)
- Replace defective sensor cap if necessary

Measured value fluctuating heavily

Causes

- Film on sensor cap
- Lifetime of the sensor cap is reached
- Dirt in the inner part of the sensor cap and sensor head.
- Fixation ring is not tightened enough.
- Sensor cap leaky or defect.

Remedy

- Clean the outside of the sensor (see section 5.4.1)
- see "Measured value too high"
- see "Measured value too high"

Measured value invalid (Display "----")	Cause	Remedy
	<ul style="list-style-type: none"> - User calibration not successful. Sensor is blocked for measurements. 	<ul style="list-style-type: none"> - As temporal solution to enable measurements again: activation of factory calibration (see section 4.2.5) - For precise measurements the function of the sensor has to be checked and if necessary the user calibration has to be repeated.
Incorrect temperature display	Cause	Remedy
	<ul style="list-style-type: none"> - Temperature sensor defective 	<ul style="list-style-type: none"> - Return the sensor

7 Technical data

7.1 Measuring characteristics

Measuring principle

Optical measurement on the basis of photoluminescence.

Measuring ranges and resolutions

Oxygen partial pressure 0 ... 400 hPa

Measuring mode	Adjustable Measuring range	Resolution
D. O. concentration	0 ... 20,00 mg/l 0 ... 20,00 ppm	0.01 mg/l 0,01 ppm
D. O. saturation	0 ... 200,0 %	0.1 %

Accuracy

Range	Accuracy
< 1 mg/l (ppm)	± 0,05 mg/l (ppm)
> 1 mg/l (ppm)	± 0,1 mg/l (ppm)

Repeatability

± 0,05 mg/l (ppm) according to EN ISO 15839

Response time

t_{90} (90 % of the final value display) after < 150 s acc. to EN ISO 15839
 t_{95} (95 % of the final value display) after < 200 s acc. to EN ISO 15839

Minimum approach flow

no flow required

Cross sensibility

Insensitive against hydrogen sulfide, chlorine, and ionogenic substances

Measurement in water

After solubility function according to ISO 5814

Measurement in salt-contaminated wastewater

Salinity input from 2.0 ... 70.0;
 correspondin to 3,4 mS/cm ... 86,2 mS/cm at T_{REF} 20 °C
 (Salinity measurements according to IOT = International Oceanographic Tables)

Temperature measurement

Temperature sensor	integrated NTC
Measuring range	- 5 °C ... + 50 °C (23 ... 122 °F)
Accuracy	± 0.5 K
Resolution	0.1 K

Temperature compensation

In the range of -5 °C ... + 50 °C (23 ... 122 °F)

Calibration procedure Factory calibration using the IQMC (Intelligent Membrane Calibration) method. User calibration in water vapor-saturated air or air-saturated water possible.

7.2 Application conditions

Allowed temperature range	Measuring medium	-5 °C ... + 50 °C (23 ... 122 °F)
	Storage/transport	- 25 °C ... + 50 °C (-33 ... 122 °F)

Allowed pH range of the measuring medium 4 ... 12

Pressure resistance Sensor with connected SACIQ (SW) sensor connection cable:

Max. allowed overpressure | 10⁶ Pa (10 bar)

The sensor meets all requirements according to article 3(3) of 97/23/EC ("pressure equipment directive").

Type of protection Sensor with connected SACIQ (SW) sensor connection cable:
IP 68, 10 bar (10⁶ Pa)

Depth of immersion min. 10 cm; max. 100 m depth

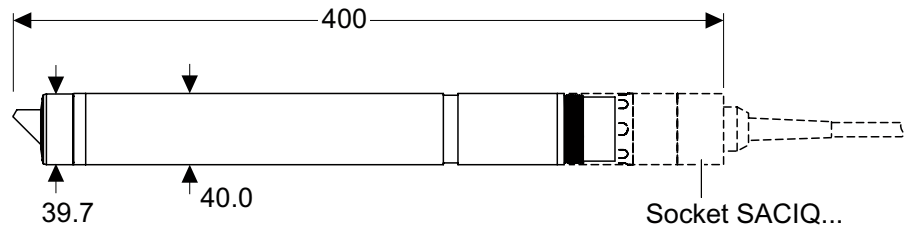
Operating position Any

Lifetime of the sensor cap 2 years guaranteed if used in the recommended fields of application

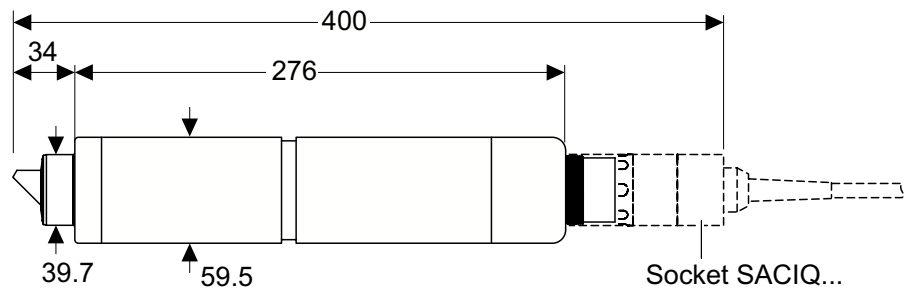
7.3 General data

Dimensions

FDO 700 IQ:



FDO 700 IQ SW:



Weight (without sensor connection cable)

FDO 700 IQ	approx. 900 g
FDO 700 IQ SW	approx. 1500 g

Connection technique

Connection via SACIQ (SW) sensor connection cable

Material

Shaft:	
– FDO 700 IQ	V4A stainless steel 1.4571
– FDO 700 IQ SW	POM
Plug head connector housing	POM
Sensor head	POM and PVC
Sensor cap	PMMA, PVC and Silicone
Plug, 3-pole	ETFE (blue) Tefzel®
Fixation ring	POM

Automatic sensor monitoring (SensCheck function) Monitoring of the mambrane function

Instrument safety Applicable norms

– EN 61010-1
– UL 3111-1
– CAN/CSA C22.2 No. 1010.1

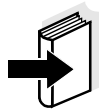
7.4 Electrical data

Nominal voltage	max. 24 VDC via the IQ SENSOR NET (details see chapter TECHNICAL DATA of the IQ SENSOR NET system operating manual)
Power consumption	0.7 W
Protective class	III

8 Indexes

8.1 Explanation of the messages

This chapter contains a list of all the message codes and related message texts that can occur in the log book of the IQ SENSOR NET system for the FDO 700 IQ (SW) sensor.



Note

Information on the contents and structure of the log book, and how to call it up, is given in the LOG BOOK chapter of the IQ SENSOR NET system operating manual.



Note

The last three digits of the message code identify the source of the message:

- 334 = SC FDO 700 (Sensor cap SC FDO 700)
- 531 = FDO700IQ (Sensor / component class, ADA adapters)

8.1.1 Error messages

Message code	Message text
EA1334	<i>Meas. range exceeded or undercut</i> * Check process * Select other meas. range
EA2334	<i>Sensor temperature too high!</i> * Check process and application
EA3334	<i>Sensor temperature too low!</i> * Check process and application
EAP334	<i>Measurement interfered</i> * SensCheck: Sensor cap is missing, leaky, depleted, or defective * Clean sensor according to operating instructions, clean space between sensor cap and sensor if necessary * Screw on sensor cap securely * Replace sensor cap
EAP531	<i>Measurement interfered</i> * SensCheck: Sensor cap is missing, leaky, depleted, or defective * Clean sensor according to operating instructions, clean space between sensor cap and sensor if necessary * Screw on sensor cap securely * Replace sensor cap

Message code	Message text
EC8334	<i>Sensor could not be calibrated, sensor blocked for measurement Cause: instable signal * Check temperature adjustment * Check calibration conditions (see operating manual) * Repeat calibration</i>
EC9334	<i>Calibration error, measurement disabled Cause: Sensor cap is missing, leaky, depleted, or defective * Clean sensor according to operating instructions, clean space between sensor cap and sensor if necessary * Screw on sensor cap securely * Replace sensor cap * Repeat calibration</i>
ES1334	<i>Component hardware defective * Contact WTW</i>

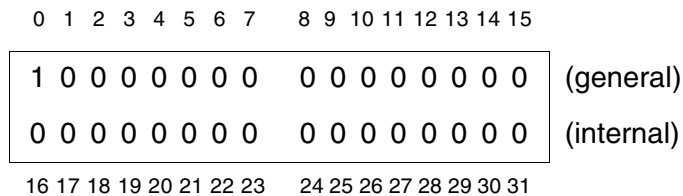
8.1.2 Info messages

Message code	Message text
IC1334	<i>Sensor has been successfully calibrated * For calibration data, see calibration history</i>
IC3334	<i>Factory calibration has been activated. Make sure the sensor operates correctly.</i>
IC4334	<i>Last valid calibration has been activated. Make sure the sensor operates correctly.</i>
IC5334	<i>Invalid user calibration has been replaced by last valid user calibration. Caution! Wrong measured values possible. Carry out a new successful calibration to make sure the sensor operates correctly.</i>
IC6334	<i>The invalid user calibration was replaced by the factory calibration. Caution! Wrong measured values possible. Check whether the sensor operates correctly or carry out a new successful calibration.</i>
IS1334	<i>This message shows all information stored in the sensor cap (see section 1.2)</i>

8.2 Status info

The status info is a piece of coded information about the current state of a sensor. Each sensor sends this status info to the controller. The status info of sensors consists of 32 bits, each of which can have the value 0 or 1.

Status info, general structure



The bits 0 - 15 are reserved for general information.
 The bits 16 - 21 are reserved for internal service information.

You obtain the status info:

- via a manual query in the menu, *Einstellungen/Settings/Service/List of all components* (see system operating manual)
- via an automated query
 - from a superordinate process control (e. g. when connected to the Profibus)
 - of the IQ Data Server (see operating manual of the IQ SENSOR NET software pack)



Note

The evaluation of the status info, e.g. in the case of an automated query, has to be made individually for each bit.

Status info FDO 700 IQ (SW)

Status bit	Explanation
Bit 0	<i>Component hardware defective</i>
Bit 1	<i>Sernsor cap is missing, leaky, exhausted or defect</i>
Bit 2-31	-



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