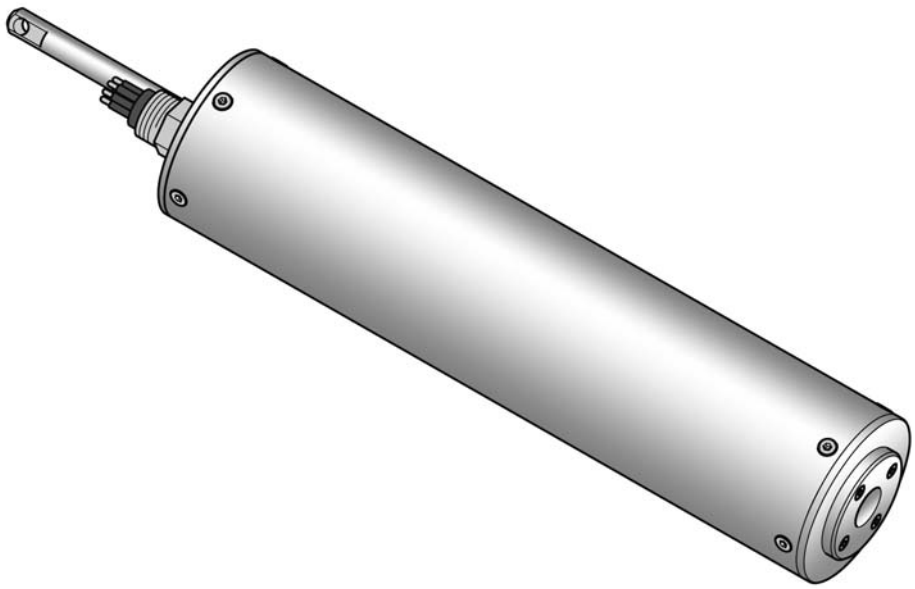
DOC023.52.90161

FP 360 sc

User Manual

01/2010, Edition 1B



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Section 1 Specifications

Specifications are subject to change without notice.

Measurement		
Measurement method		UV fluorescent measurement process for polycyclic aromatic Hydrocarbons (PAH) Excitation wavelength: 254 nm Emission (measurement) wavelength: 360 nm
Measuring range	**Low measurement range**	0 to 50 ppb and 0 to 500 ppb in relation to PAH calibration standard, corresponding to 0.1 to 1.5 ppm and 0.1 to 15 ppm of oil calibration standard
	High measurement range	0 to 500 ppb and 0 to 5000 ppb in relation to PAH calibration standard, corresponding to 0.1 to 15 ppm and 0.1 to 150 ppm of oil calibration standard
Display units		ppb, ppm, µg/L, mg/L
Reproducibility		2.5% of measurement value at a constant temperature
Measurement accuracy		5% of measurement value ±2% from measurement range limit at a constant temperature
Limit of detection		1.2 ppb (PAH)
Response time		10 s (T90)
Calibration		Factory calibration with UV fluorescence calibration standard, custom adaptation possible
Sensor software		
Software version		From 1.14
Equipment properties		
Weight	**Measurement sensor**	Stainless steel version 2.8 kg, titanium version 1.8 kg
	Flow cell	Approximately 0.6 kg, including installation board approximately 2.0 kg
Pressure range	**Sensor**	Max. 30 bar
	Flow cell	Max. 1 bar
Dimensions	**Measurement sensor (Ø × length)**	68 mm x 306 mm (2.68 in. x 12.05 in.) (without plugs or suspension pin) 68 mm x 399 mm (2.68 in. x 15.71 in.) (including suspension pin) 68 mm x 413 mm (2.68 in. x 16.26 in.) (with additional cleaning option)
	Flow cell (L × W × D)	98 mm x 98 mm x 150 mm (3.86 in. x 3.86 in. x 5.91 in.) (without fittings), installation board: 600 x 300 x 10 mm (23.62 in. x 11.81 in. x 0.39 in.)
Materials	**Measurement sensor**	Housing: stainless steel 1.4571 or titanium Optic bracket: POM Housing bolts: stainless steel 1.4571 Measurement window: synthetic quartz glass (Suprasil) Gaskets (housing): Viton Gaskets (measurement window): NBR (Nitrile Butadiene Rubber)
	Flow cell	Housing: POM Installation board: PVC Gaskets: NBR (Nitrile Butadiene Rubber) Fittings: nickel-plated brass
	Shackle	Stainless steel 1.4301

Environment considerations		
Sample temperature		1 to 40 °C (34 to 104 °F)
Ambient temperature		–5 to +45 °C (23 to 113 °F) Measurement sensor wetted by at least half from the measuring medium: –25 to +55 °C (-13 to 131 °F)
Sensor distance - wall/ground		min. 100 mm (3.94 in.) (recommended)
Miscellaneous		
Cable length		1.5 or 10 m, extension cable up to total maximum length of 40 m
Connection information	**Sensor side**	8-pin, type of protection IP68, PUR
	Controller side	M12, type of protection IP67
Inspection interval		Every 2 years; 1/year service agreement by request, with warranty extension up to 5 years
Maintenance requirements		Clean the measurement window, if necessary. Intervals are dependent on the measuring medium.
Compliance		CE
Warranty		2 years

1.1 Dimensions

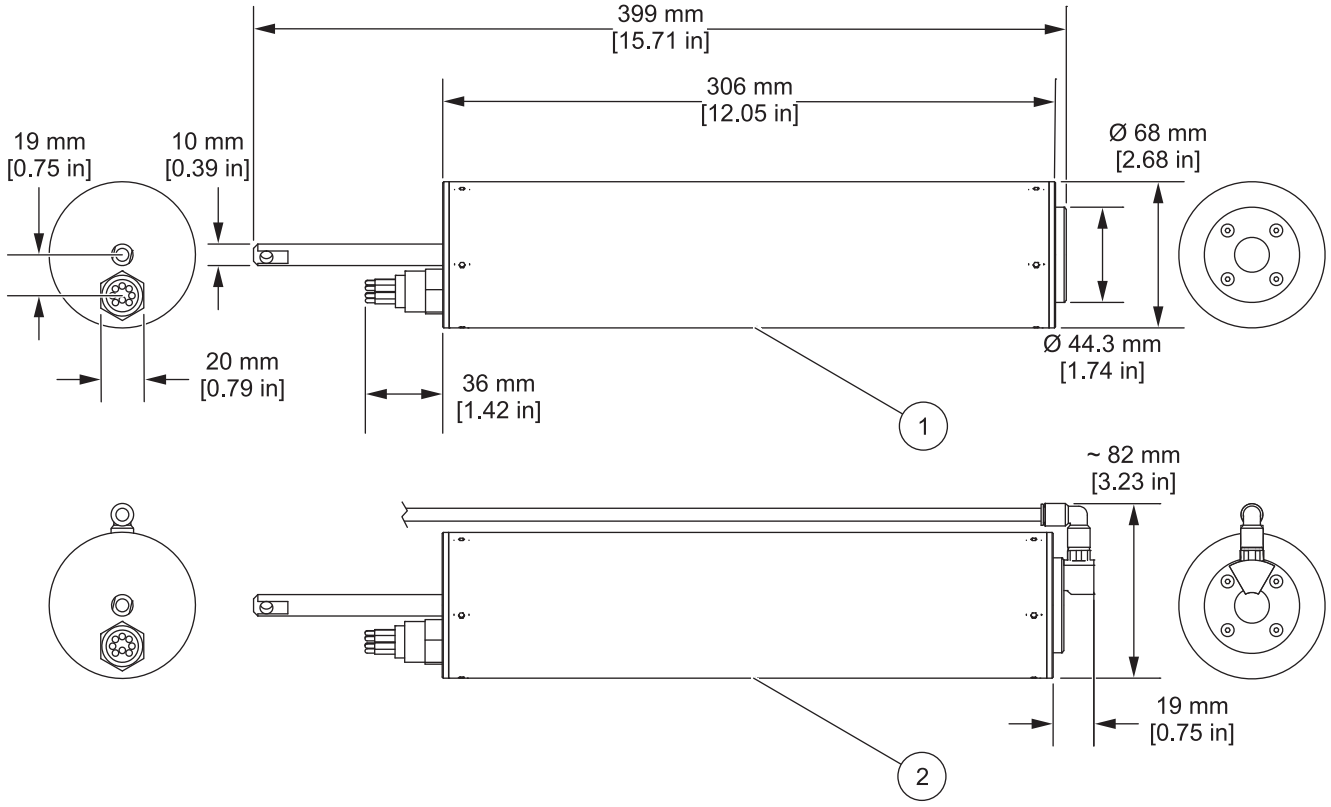

Figure 1 Sensor without and with cleaning unit

1	Sensor without cleaning unit	**2**	Sensor with cleaning unit

Section 2 General information

2.1 Safety information

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired, do not use or install this equipment in any manner other than that specified in this manual.

2.1.1 Use of hazard information

⚠DANGER

Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠WARNING

Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION

Indicates a potentially hazardous situation that may result in minor or moderate injury.

NOTICE

Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.

Note: *Information that supplements points in the main text.*

2.1.2 Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed. A symbol on the instrument is referenced in the manual with a precautionary statement.

	This is the safety alert symbol. Obey all safety messages that follow this symbol to avoid potential injury. If on the instrument, refer to the instruction manual for operation or safety information.
	This symbol indicates that a risk of electrical shock and/or electrocution exists.
	This symbol shows that a UV lamp is used in the equipment.
	Electrical equipment marked with this symbol may not be disposed of in European domestic or public disposal systems after 12 August 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of life equipment to the manufacturer for disposal at no charge to the user. ***Note:*** *For return for recycling, please contact the equipment producer or supplier for instructions on how to return end-oflife equipment, producer-supplied electrical accessories, and all auxiliary items for proper disposal.*

2.2 Product overview

⚠DANGER

This product is not suitable for use in potentially explosive atmospheres.

⚠WARNING

The UV rays from the flash bulb are harmful to eyes and skin. Do not look directly through the measurement window during operation under any circumstances. Remove the measurement sensor from operation before carrying out any maintenance or installation work.

The FP 360 sc sensor is a UV fluorimeter used to continuously measure the concentration of PAH (polycyclic aromatic hydrocarbons) in water. The measurement values can be converted to reflect the total oil content for mineral oils using lab data.

The sensor may need to be installed with additional accessories depending on its area of application.

Area of application	Installation with	Sensor variants
Open channels, shafts, tanks (solid matter max. 200 mg/L)	Chain mount kit	Sensor with or without cleaning unit
Measurement media without solid matter with continuous, low sample throughput	Flow cell	Sensor without cleaning unit

Do not apply the sensor to any hard mechanical effects.

2.3 Measuring principle

The measuring principle is based on the fluorescent properties of PAHs. After excitation caused by UV rays, PAHs emit light with longer wavelengths after a short time delay. The intensity of this light is measured. This measuring principle is considerably more sensitive than absorption and scattered light measurement. It is possible to detect even the slightest trace of PAH contamination in water. PAHs are integral parts of most mineral oil products and are a very specific indicator of oil contamination in water bodies and process water.

2.4 Product components

Each sensor is supplied with

- a connector cable with safety sleeve,
- a shackle,
- a basic user manual and
- a CD.

The sensor is available in a variety of types (refer to section 7.1 on page 27). Refer to Figure 2 to make sure that all components have been received. If any of these items are missing or damaged, contact the manufacturer or a sales representative immediately.

2.4.1 FP 360 sc sensor

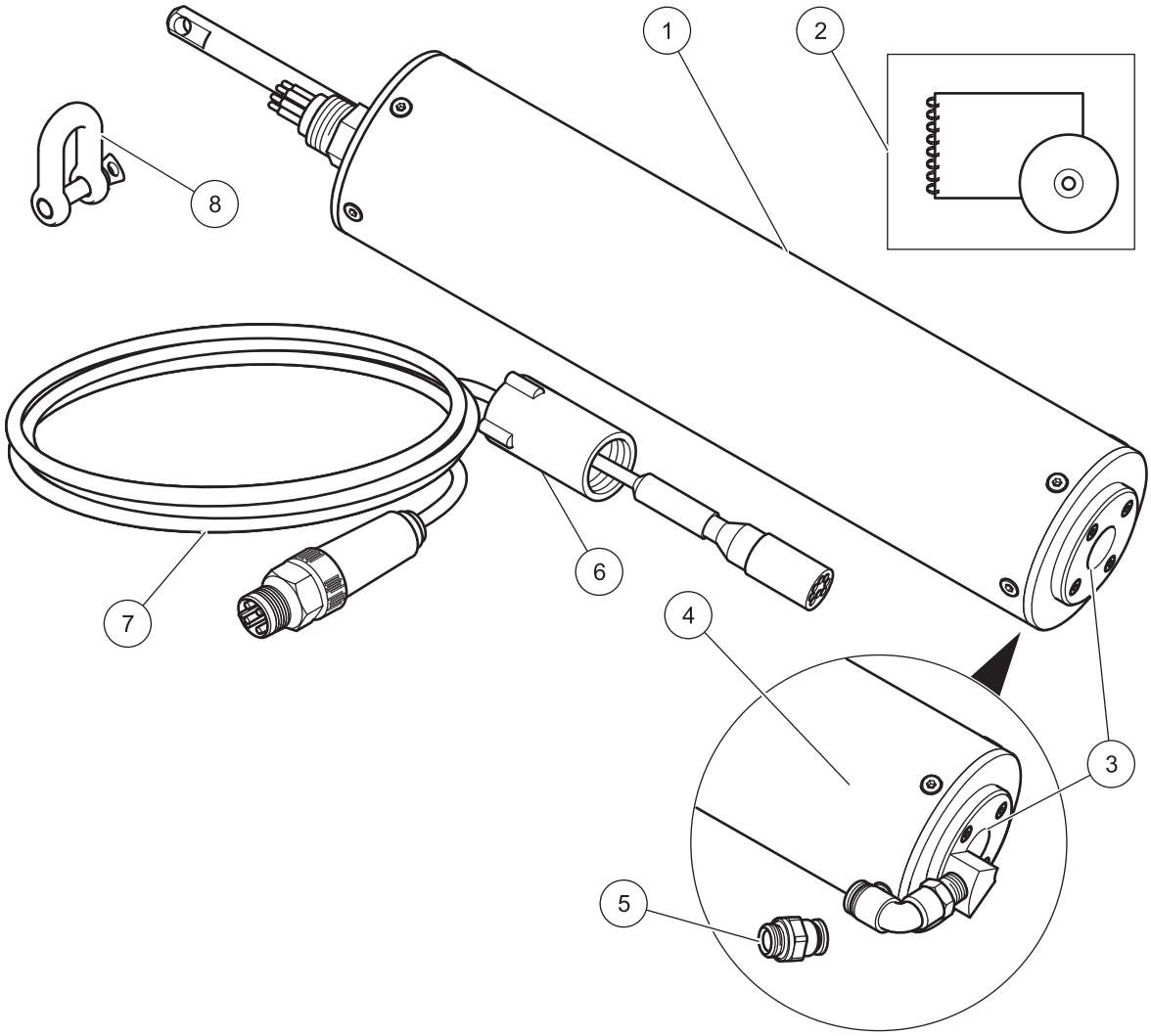

Figure 2 FP 360 sc sensor

1	FP 360 sc measurement sensor	**5**	6 mm fitting for cleaning unit (depending on model)
2	Basic user manual with CD	**6**	Safety sleeve
3	Measurement window	**7**	Connector cable
4	Sensor with cleaning unit (depending on model)	**8**	Shackle

2.5 Function test

⚠ CAUTION

Before power is applied, refer to the controller operation instructions.

After the components are removed from the package, do a function test.

1. Connect the connector cable to the sensor (8-pin polarized connector) and an appropriate sc controller (5-pin polarized connector) (refer to section 3.1 on page 11).
2. Apply power to the sc controller. The display is activated and the sensor goes to measurement mode.
   The sensor ticks quietly and regularly.

3. Cover the sensor measurement window with a sheet of white paper (do not use recycled paper).
4. Vary the distance between the measurement window and the paper.
   The measurement value on the display will change accordingly.

Note: *In air, the measurement value displayed is not exactly zero due to reflections on the window surface (refer to section 4.5.3 on page 21).*

⚠ DANGER

Personal injury hazard. Only qualified personnel should conduct the tasks described in this section of the manual.

NOTICE

If the sensor is not fully inserted, sun protection is recommended in high ambient temperatures and intense solar radiation to protect against thermal and UV effects.

3.1 Connect sensor cable

⚠ CAUTION

Always put the cables and hoses in a position that does not bend or cause a trip hazard.

⚠ CAUTION

Before power is applied, refer to the controller operation instructions.

1. Connect the polarized socket on the connector cable to the sensor plug (8-pin plug) (refer to Figure 3 step 1).
2. Push the safety sleeve on the plug (step 2).
3. Hand-tighten the safety sleeve in position (step 3).

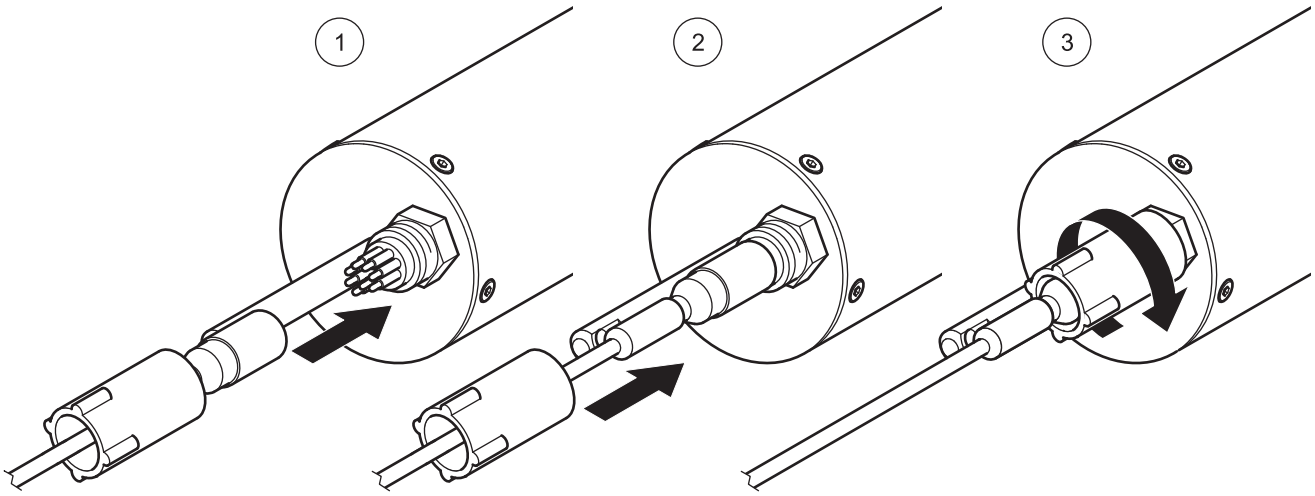

Figure 3 Connect the sensor cable to the sensor

4. Remove the protective cap on the controller socket and keep it to seal the connector opening in case the sensor must be removed.
5. Connect the sensor to the controller using the keyed quick-connect fitting. Hand-tighten (refer to Figure 4).

Note: *Connector cables are available in various lengths (refer to section 7.2 on page 27). Maximum overall cable length is 40 m (131,23 ft).*

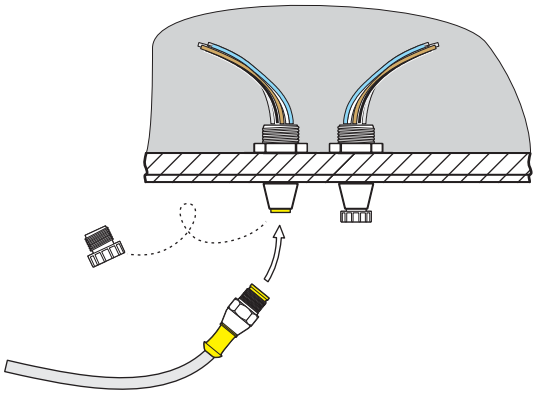

Figure 4 Connect the sensor to the controller

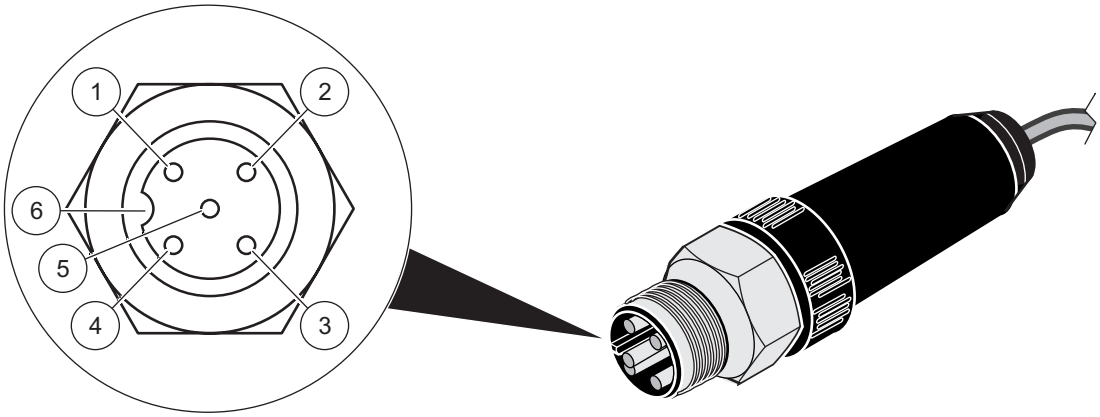

Figure 5 Pin configuration

Number	Description	Standard cable, cable color
1	+12 VDC	brown
2	Ground	black
3	Data (+)	blue
4	Data (–)	white
5	Screen	Screen (gray)
6	Guide	

3.2 Installation options

The sensor may need to be installed with additional optional accessories depending on the area of application (refer to section 7.3 on page 27).

Note: *Refer to the documentation supplied with the accessories for detailed installation instructions.*

3.2.1 Installation with the chain mount kit

The FP 360 sc sensor is installed with the chain mount kit in open channels, shafts and tanks.

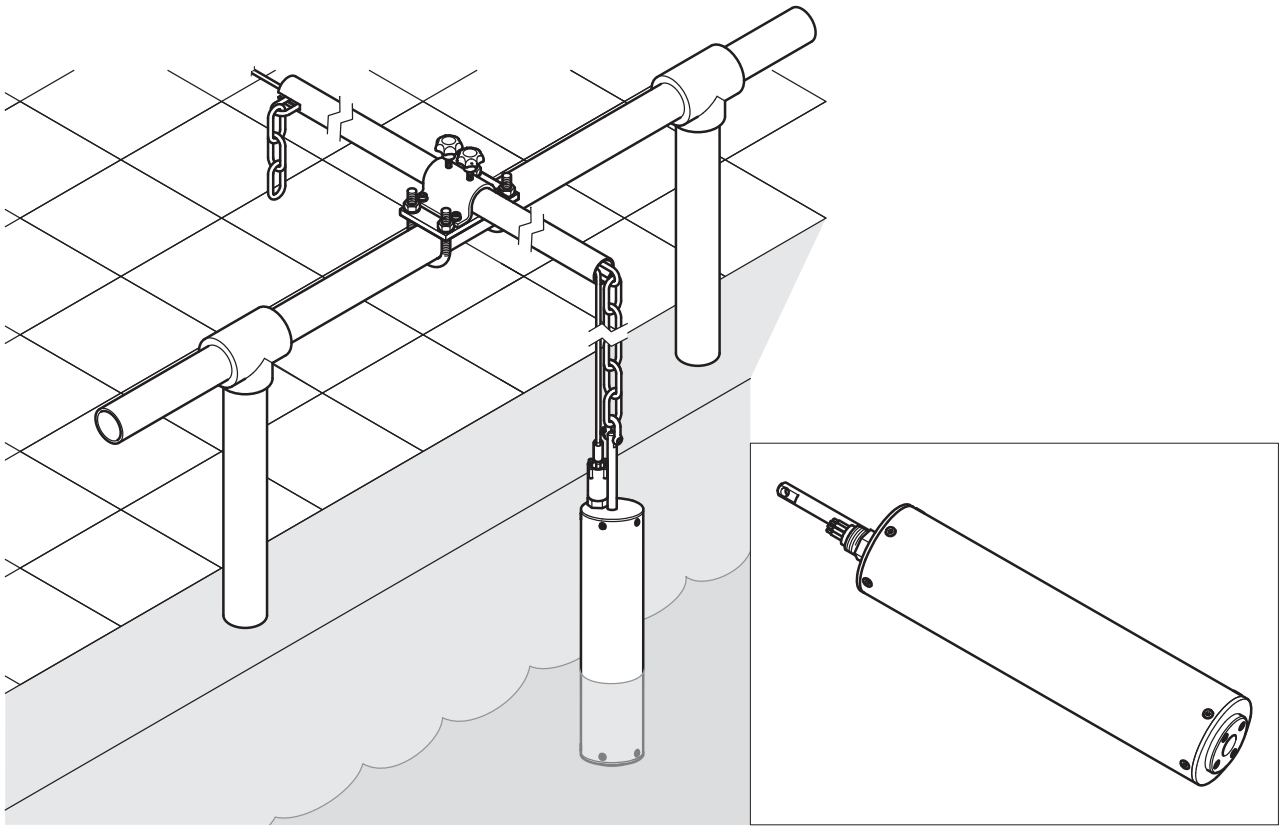

Figure 6 FP 360 sc measurement sensor with chain mount kit

3.2.2 Installation of chain mount kit for sensors with cleaning unit

3.2.2.1 Install the cleaning unit hose

Note: *An air hose is required, to operate the sensor with the optional cleaning unit. An oil-free compressed air (6 bar) and a solenoid valve or the HOAB compressed air cleaning system is also required (refer to section 7.3 on page 27).*

With the HOAB compressed air cleaning system, replace the end of the hose connection that is connected to the compressed air on the underside of the instrument with the straight 6 mm fitting (refer to Figure 2 on page 9, item 5) supplied with the probe.

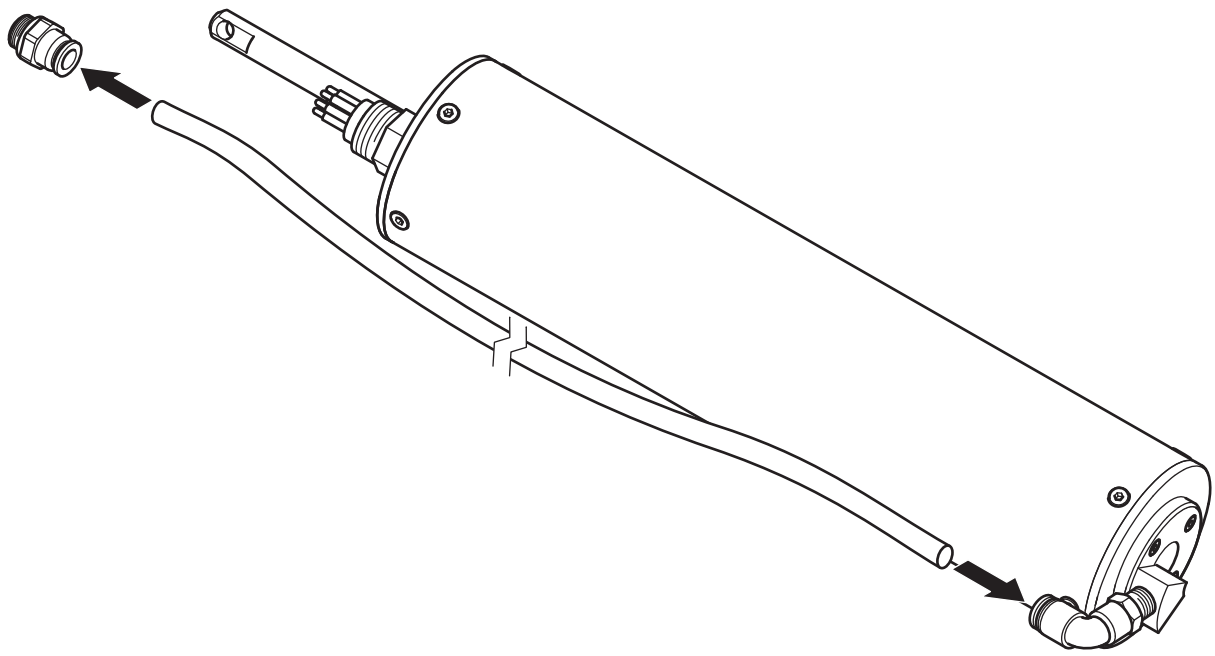

Figure 7 Install the cleaning unit hose

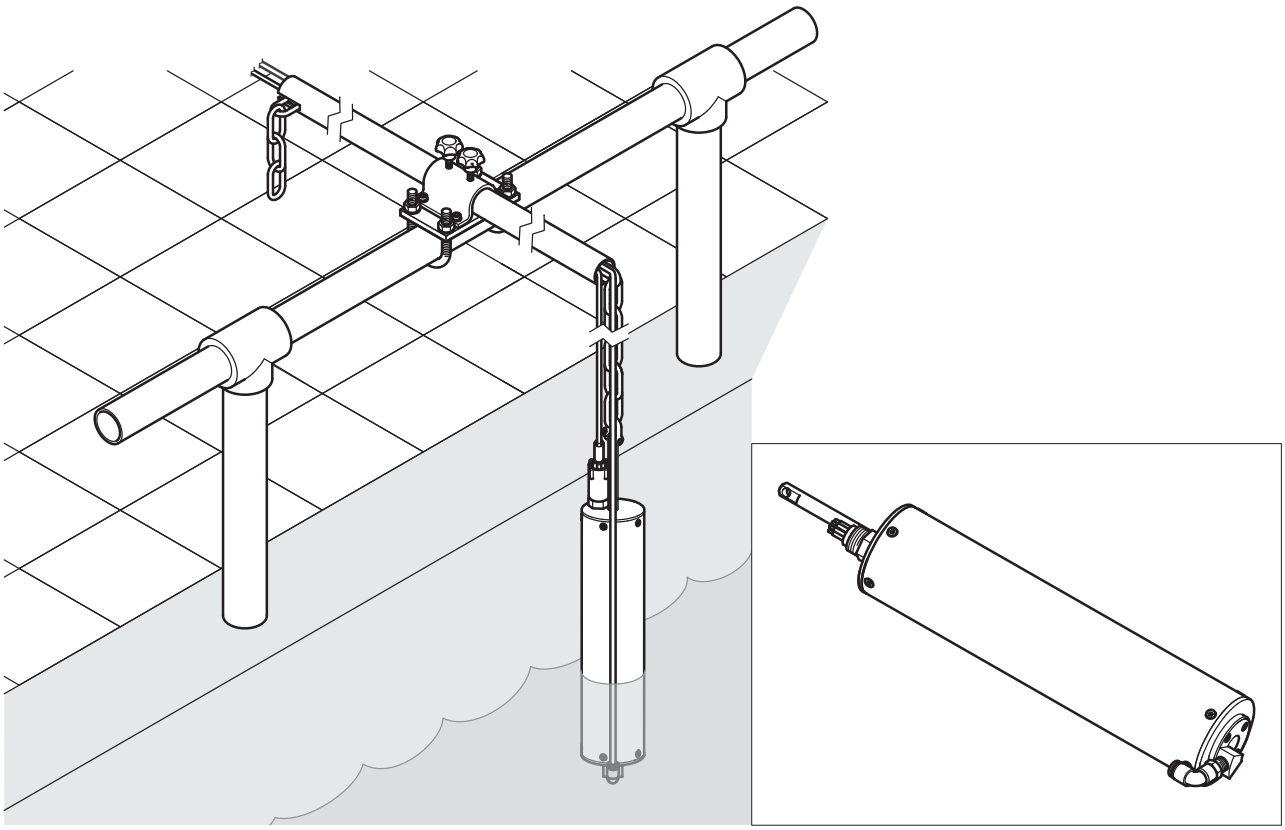

Figure 8 FP 360 sc measurement sensor with cleaning unit and chain mount kit

3.2.3 Installation with flow cell

The FP 360 sc sensor with flow cell is installed for samples free of solids and particulates and limited sample flows.

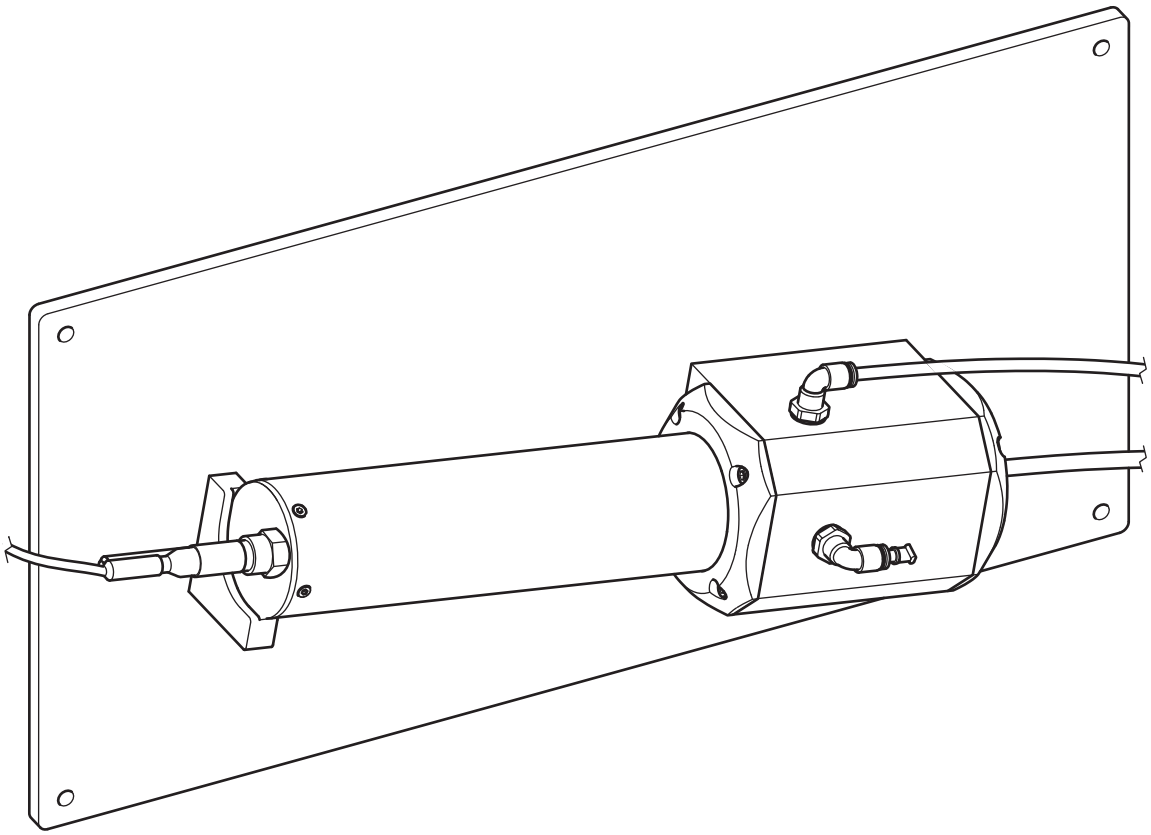

Figure 9 Installation with flow cell

Section 4 Operation

4.1 User interface and navigation

The sensor can be used with sc controllers from sc100. Refer to the controller documentation for keypad description and navigation information.

4.2 Sensor setup

When the sensor is connected for the first time, the sensor serial number is displayed as the name of the sensor. To change the sensor name:

1. Open the MAIN MENU.
2. Select SENSOR SETUP and confirm.
3. Select the corresponding sensor and confirm.
4. Select CONFIGURE and confirm.
5. Select EDIT NAME and confirm.
6. Edit the name and confirm to return to the SENSOR SETUP menu.

Complete sensor configuration in the same manner, with the following menu options selected:

- SET PARAMETER
- SELECT UNITS
- AVERAGE
- LOG SETUP
- GAIN VALUE

4.3 Sensor data logger

There is a data log and event log available for each sensor.
In the data log, the measurement data are stored at preset intervals; the event log stores events such as configuration changes, alarm messages and warning messages. Both logs can be exported to CSV format (refer to the controller manual).

4.4 Menu structure

4.4.1 SENSOR STATUS

SELECT SENSOR (if there is more than one sensor)	
ERROR LIST	Possible error messages: SENSOR ERROR
WARNING LIST	Possible warning messages: TEST/MAINT, BULB CHANGE, LAST CONFIGUR, TARGET VALUE

Note: *Refer to Section 6 on page 25 for a list of all possible error and warning messages together with a description of all necessary countermeasures to be taken.*

4.4.2 SENSOR SETUP

SELECT SENSOR (if there is more than one sensor)		
CALIBRATE		
	SET OUTMODE	Behavior of the outputs during calibration and zero point adjustment
	HOLD	
	ACTIVE	
	SET TRANSFER	
	SENSOR MEASURE	Current, uncorrected measurement value
	CONFIGURE	FACTOR: 0.1 to 100 OFFSET: –1000 to +1000
	FACTOR	
	OFFSET	
	2 POINT	
	3 POINT	
	4 POINT	
	5 POINT	
	FACTOR	Is shown when FACTOR has been selected under CONFIGURE. Refer to section 4.5 on page 20 for detailed information.
	OFFSET	Is shown when OFFSET has been selected under CONFIGURE. Refer to section 4.5 on page 20 for detailed information.
	2 POINT	Is shown when 2 POINT has been selected under CONFIGURE. Refer to section 4.5 on page 20 for detailed information.
	3 POINT	Is shown when 3 POINT has been selected under CONFIGURE. Refer to section 4.5 on page 20 for detailed information.
	4 POINT	Is shown when 4 POINT has been selected under CONFIGURE. Refer to section 4.5 on page 20 for detailed information.
	5 POINT	Is shown when 5 POINT has been selected under CONFIGURE. Refer to section 4.5 on page 20 for detailed information.
	SET CAL DEFLT	Security query, reset to (FACTOR=1, OFFSET=0)

4.4.2 SENSOR SETUP (Continued)

SELECT SENSOR (if there is more than one sensor)		
CONFIGURE		
	EDIT NAME	Name can include up to 16 characters, DEFAULT CONFIG: sensor serial number
	SET PARAMETER	PAH: Measurement value related to PAH calibration standard OIL: Measurement value related to oil calibration standard DEFAULT CONFIG: PAH
	SELECT UNITS	ppb, ppm, µg/L, mg/L, DEFAULT CONFIG: ppb
	AVERAGE	1 to 300 s, DEFAULT CONFIG: 3 s
	LOG SETUP	5 s, 30 s, 1 min, 2 min, 3 min, 4 min, 5 min, 6 min, 10 min, 15 min, 30 min, DEFAULT CONFIG: 10 min
	GAIN VALUE	Range 0 to 500 ppb: AUTO, 0.01 to 50, 0.01 to 500, Range 0 to 5000 ppb: AUTO, 0.01 to 500, 0.01 to 5000 DEFAULT CONFIG: AUTO
	SET DEFAULTS	Security query, reset to preset configuration for all menu options listed above.
DIAG/TEST		
	PROBE INFO	
		SENSOR NAME	Device name
		EDIT NAME	
		SERIAL NUMBER	Device serial number
		RANGE	0 to 500 or 0 to 5000
		MODEL NUMBER	Item no. Sensor
		CODE VERSION	Sensor software
	COUNTER	
		OPERATING HOURS	Operating hours counter
		MAINTENANCE	Counter counting down days
		BULB CHANGE	Counter counting down days
	TEST/MAINT	
		SET OUTMODE	Equipment output behavior in the SERVICE menu
			HOLD	
			ACTIVE	
			SET TRANSFER	
		SIGNALS	
			LAMP CURR	Flash lamp intensity
		DIAG/TEST	Zero point and slope check with external standards
			REDADING OFFSET	
				CUBE CAL	
				Password-protected access for the service

4.5 Calibration

4.5.1 Factory calibration

The calibration curve zero point and slope are preset. Retrospective calibration of these basic settings is generally not required outside of the inspection intervals.

Do regular zero point checks to make sure that impurities or faults are being detected (refer to section 4.5.3 on page 21).

If the zero signal increases due to the measuring medium components or the installation conditions, you can compensate for this influence via an offset correction. Carry out a lab analysis of the sample to do this. If there is no PAH/oil contamination in the measuring medium, enter the measurement value shown by the device as the offset (refer to section 4.5.4.2 on page 22).

4.5.2 Process calibration/adjustment

The sensor is pre-calibrated with various concentrations of a special calibration standard in ultra-pure water. These ideal measurement conditions rarely occur in reality. The measurement values shown are qualitative trend indicators if no adjustment is made to the on-site measurement conditions.

If you require quantitatively correct measurement values, either a slope adjustment or a multi-point calibration needs to be carried out. Both of these operations must be carried out on site using lab analysis data. Basic prerequisites for quantitative measurements are precise knowledge about the oil type in occurrence and constant measurement conditions, e.g. in cool water in a heat exchanger. If several oils are present in varying quantities, it is generally not possible to carry out a quantitative measurement.

If the measurement conditions change, you must check the accuracy of the results again through lab analyses and make any adjustments where necessary.

The measurement conditions can change in terms of

- Composition of PAH or oil impurities
- Distribution of impurities in water
- Temp
- Measuring medium composition
- Measurement sensor and measurement window

4.5.2.1 Determination of factors and adjustment of slope

To adjust the slope:

1. At the sensor installation site, draw a lab sample of the measuring medium and promptly analyze the sample for PAH and oil content.
2. Make a note of the measurement value shown on the controller at the time of the sample being taken. Make sure the correct unit is shown for the measurement value, e.g. as ppm oil.
3. Repeat steps 1 and 2 several times.
4. Use the sample value and the value shown on the controller at the time of sampling to calculate a factor.
5. Find an average value from the factors.

6. Enter the factor as the slope (refer to section 4.5.4.1 on page 21).

Example for engine oil	Example for naphthalene
Lab value: 4.0 ppm oil Measurement value shown[1]: 2.4 ppm oil Calculated factor: 1.67	Lab value: 420 ppb PAH Measurement value shown[1]: 120 ppb PAH Calculated factor: 3.5

[1] At the time of sampling

It is advisable to adjust the slope if the following conditions apply:

- If the measuring sample is PAH-/oil free, the measurement value must almost be zero.
- The factors calculated from the lab values must enable a sensible average value to be derived.

If these conditions do not apply, do a multi-point calibration.

Note: *If both the zero point and the slope must be changed, use a 2-point calibration (refer to section 4.5.4.3 on page 22).*

4.5.2.2 Multi-point calibration

In the event of a multi-point calibration, enter the lab value as the target value and the value shown as the actual value. Make sure that all values are entered in the same unit, e.g. oil in ppm. (refer to section 4.5.4.3 on page 22).

4.5.3 Check the zero point

- Medium: ultra-pure water
- Target value: < 1 ppb. Clean the window in the event of deviations.

Use a glass container (not plastic) large enough to enable the measurement to be taken with an 8 to 10 cm distance between the measurement window and the base (e.g. a 1000 mL glass beaker). Place a black, non-reflective underlay under the container and switch off artificial lights during the measurement process.

Note: *In air, the measurement value displayed is not exactly zero due to reflections on the window surface. This is standard sensor behavior and not an indicator of malfunction.*

Note: *Always use ultra-pure water. Distilled water and demineralized water are not suitable as these can contain organic compounds.*

4.5.4 Adjustment of slope and zero point; multi-point calibration

4.5.4.1 Adjust the slope (FACTOR)

1. Open the MAIN MENU.
2. Select SENSOR SETUP and confirm.
3. Select the corresponding sensor and confirm.
4. Select CALIBRATE and confirm.
5. Select CONFIGURE and confirm.
6. Select FACTOR and confirm.
7. Enter the calculated factor and confirm.
8. Go back to the MAIN MENU or the Measurement mode display.

4.5.4.2 Adjust the zero point (OFFSET)

1. Open the MAIN MENU.
2. Select SENSOR SETUP and confirm.
3. Select the corresponding sensor and confirm.
4. Select CALIBRATE and confirm.
5. Select CONFIGURE and confirm.
6. Press OFFSET and confirm.
7. Enter the required offset and confirm.
8. Go back to the MAIN MENU or the Measurement mode display.

4.5.4.3 Multi-point calibration (2 to 5-point calibration)

Note: *Multi-point calibration means that the pairs must be input in ascending order.*

1. Open the MAIN MENU.
2. Select SENSOR SETUP and confirm.
3. Select the corresponding sensor and confirm.
4. Select CALIBRATE and confirm.
5. Select CONFIGURE and confirm.
6. Select the type of calibration, e.g. 2 POINT and confirm.
7. Select 1PAIR and confirm.
8. Edit the TARGET VALUE and confirm.
9. Edit the ACTUAL VALUE and confirm.
10. Repeat the process for 2PAIR and confirm.
11. Go back to the MAIN MENU or the Measurement mode display.

Section 5 Maintenance

The inside of the sensor is maintenance-free.

The cleanliness of the measurement window in the sensor head has an impact on the accuracy of measurements. Check the measurement window at regular intervals to make sure it is clean. The required frequency of these checks is dependent on the measuring medium. Also do a check in the event of unusually high measurement values and clean the measurement window if necessary (refer to section 5.3 on page 24).

For sensors with a cleaning unit, adjust the frequency of cleaning to the measurement conditions. The inspection interval must be shortened to reflect any increase in solid matter.

NOTICE

Individual components of the suspension device (shackle and chain of the chain mount kit) are made of stainless steel and may corrode.

5.1 Maintenance schedule

	Interval	Maintenance task[1]
Visual inspection	Application-dependent	Check for contamination and corrosion.
System inspection	Every 2 years	Check plugs and flash bulb.
Calibration check	Every 2 years	Check calibration

[1] When operated according to factory settings and appropriate use

Contact the manufacturer's service department every 2 years to arrange sensor inspection, testing, calibration and seal replacement. The flash bulb is also replaced every 4 years.

5.2 Maintenance for the connectors on the sensor

The 8-pin connector on the sensor is designed for constant usage under water. The connector is lubricated with high-performance grease at the factory and does not require any additional maintenance from the recommended sensor inspection cycles.

To maintain the performance of the connectors:

- Protect the neoprene components of the connector against high temperatures and intense solar radiation. If this cannot be avoided, moisten the dried out neoprene components with clean, clear water. Subsequently, loosen the connector.
- The pins must always be lightly lubricated. Only apply a very thin film of lubricant. Recommended lubricants are Loctite 8021 as a spray or Molykote 44 Medium. The lubricant must not come into contact with the measurement window.
- Rinse out grains of sand and solid matter from the cable socket.
- To loosen the connector, unscrew the safety sleeve and pull out the plug longitudinally.
- Avoid flexing the plug and pulling on the cable.
- Do not loosen the connector at ambient temperatures below 0 °C. Heat the neoprene components carefully to temperatures above 0 °C and then loosen the connector.
- Avoid kinks or tight bend in the cables.

5.3 Cleaning the measurement windows

⚠CAUTION

Cleaning agents can be hazardous to health.

Wear protective equipment and avoid direct contact with cleaning fluids.

NOTICE

Other cleaning agents can damage the material. Damage caused by cleaning carried out incorrectly is not covered by the warranty.

1. Rinse the sensor with fresh water until all attached solid matter has been removed.
2. Use pure acetone and a soft, clean cloth (e.g. camera lens cleaning paper) to carefully remove the deposits on the measurement window. Avoid sharp objects on the measurement window surface.
3. Rinse the residue from the cleaning agent with fresh water.

Section 6 Troubleshooting

6.1 Error messages

Possible sensor errors displayed by the sc controller.

Displayed errors	Definition	Resolution
SENSOR ERROR	Electronic defect	Call manufacturer customer service

6.2 Warnings

Possible sensor warning messages displayed by the sc controller.

Displayed warnings	Definition	Resolution
DIAG/TEST	Counter expired	Call manufacturer customer service
BULB CHANGE	Counter expired	Call manufacturer customer service
LAST CONFIGUR	Changed configuration was not accepted	Send configuration again
TARGET VALUE	With multi-point calibration, values not entered in ascending order	Enter calibration values in ascending order

6.3 Replacement parts

Designation	Quantity	Service life
Flash bulb	1	4 years
O-Rings	4	2 years

Section 7 Replacement parts and accessories

7.1 Sensor options

Description	Cat. no.
Range 0 to 50/500 ppb, stainless steel housing, cable length 10 m without cleaning unit	LXV441.99.11101
Range 0 to 50/500 ppb, stainless steel housing, cable length 10 m with cleaning unit and fittings (not in connection with flow cell)	LXV441.99.11201
Range 0 to 50/500 ppb, stainless steel housing, cable length 1.5 m without cleaning unit	LXV441.99.11301
Range 0 to 50/500 ppb, titanium housing, cable length 10 m without cleaning unit	LXV441.99.12101
Range 0 to 50/500 ppb, titanium housing, cable length 10 m with cleaning unit and fittings (not in connection with flow cell)	LXV441.99.12201
Range 0 to 50/500 ppb, titanium housing, cable length 1.5 m without cleaning unit	LXV441.99.12301
Range 0 to 500/5000 ppb, stainless steel housing, cable length 10 m without cleaning unit	LXV441.99.21101
Range 0 to 500/5000 ppb, stainless steel housing, cable length 10 m with cleaning unit and fittings (not in connection with flow cell)	LXV441.99.21201
Range 0 to 500/5000 ppb, stainless steel housing, cable length 1.5 m without cleaning unit	LXV441.99.21301
Range 0 to 500/5000 ppb, titanium housing, cable length 10 m without cleaning unit	LXV441.99.22101
Range 0 to 500/5000 ppb, titanium housing, cable length 10 m with cleaning unit and fittings (not in connection with flow cell)	LXV441.99.22201
Range 0 to 500/5000 ppb, titanium housing, cable length 1.5 m without cleaning unit	LXV441.99.22301

7.2 Replacement parts

Description	Cat. no.
Connector cable 1.5 m	LZY623
Connector cable 10 m	LZY624
Shackle, stainless steel 1.4301	LZY668
Gasket and screw set for flow cell	LZY625
Fitting set for flow cell	LZY626
Pressure ring and angle bracket for flow cell	LZY674
Chain mount kit instructions	DOC273.99.90164
Flow cell instructions	DOC273.99.90165

7.3 Accessories

Description	Cat. no.
Extension cable (5 m/16.40 ft)	LZX848
Extension cable (10 m/32.81 ft)	LZX849
Extension cable (15 m/49.21 ft)	LZX850
Extension cable (20 m/65.62 ft)	LZX851
Extension cable (30 m/98.43 ft)	LZX852
Flow cell on prefabricated wall including gasket set	LZY669
V4A chain mount kit	LZX914.99.11110
HOAB compressed air cleaning system, 230 V	6860103.99.0001
HOAB compressed air cleaning system, 115 V, HACH Lange version	6860003.99.0001
Hose for air and measuring medium 5 m, 6/4 mm external/internal diameter	LZY619
Hose for air and measuring medium 10 m, 6/4 mm external/internal diameter	LZY620
Hose for air and measuring medium 25 m, 6/4 mm external/internal diameter	LZY621

7.3 Accessories (table continued)

Description	Cat. no.
Hose for measuring medium 5 m, 8/6 mm external/internal diameter	LZY672
Hose for measuring medium 10 m, 8/6 mm external/internal diameter	LZY673

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Section 9 Warranty and Liability

The manufacturer warrants that the product supplied is free of material and manufacturing defects and undertakes the obligation to repair or replace any defective parts at zero cost.

The warranty runs for 24 months. If a maintenance contract is taken out within 6 months of purchase, the warranty period is extended to 60 months.

With the exclusion of the further claims, the supplier is liable for defects including the lack of assured properties as follows: all those parts that, within the warranty period calculated from the day of the transfer of risk, can be demonstrated to have become unusable or that can only be used with significant limitations due to a situation present prior to the transfer of risk, in particular due to incorrect design, poor materials or inadequate finish will be improved or replaced, at the supplier's discretion. The identification of such defects must be reported to the supplier in writing without delay, but no later than 7 days after the identification of the fault. If the customer fails to notify the supplier, the product is considered approved despite the defect. Further liability for any direct or indirect damages is not accepted.

If instrument-specific maintenance and servicing work defined by the supplier is to be performed within the warranty period by the customer (maintenance) or by the supplier (servicing) and these requirements are not met, claims for damages due to the failure to comply with the requirements are rendered void.

Any further claims, in particular claims for consequential damages cannot be made.

Consumables and damage caused by improper handling, poor installation or incorrect use are excluded from this clause.

The process instruments of the manufacturer are of proven reliability in many applications and are therefore often used in automatic control loops to provide the most economical possible operation of the related process.

To avoid or limit consequential damage, it is therefore recommended to design the control loop such that a malfunction in an instrument results in an automatic change over to the backup control system. This establishes the most secure operating condition for the environment and for the process.

Appendix A Modbus register

Table 1 Sensor Modbus registers

Register#	Data type	Length	R/W	Description
40001	Unsigned integer	1	R	Reserved
40002	Float	2	R	Measurement value as PAH, unit PPB
40004	Float	2	R	Measurement value as PAH, unit PPM
40006	Float	2	R	Measurement value as OIL, unit PPB
40008	Float	2	R	Measurement value as OIL, unit PPM
40016	String	6	R	Serial number
40022	String	8	R/W	Name of location
40030	Unsigned integer	1	R/W	Choose the parameter, 47=PAH, 48=OIL
40031	Unsigned integer	1	R/W	Measurement units 38=ppb, 39= g/L, 2=ppm, 0=mg/L
40040	Float	2	R/W	Offset for calibration
40042	Float	2	R/W	Factor for calibration
40050	Unsigned integer	1	R/W	Logging interval from 5 sec to 1800 sec
40051	Unsigned integer	1	R/W	Measuring interval from 1 sec to 300 sec
40052	Unsigned integer	1	R/W	Amplification for the low/high range probe, 0=AUTO, 1= 0.01 to 50/500 PPB, 2= 0.01 to 500/5000 PPB
40055	Unsigned integer	1	R/W	Set output mode for calibration
40056	Unsigned integer	1	R/W	Set output mode for service
40057	Float	2	R	Version of application file
40059	Float	2	R	The entry is for the application file
40061	Float	2	R	Version of the probe
40063	Unsigned integer	1	R	The entry is for the device driver file
40064	Unsigned integer	1	R	The entry is for the device driver file
40065	Unsigned integer	1	R	The entry is for the device driver file
40066	Integer	1	R	Days left until exchanging lamp, negative values show that exchange is overdue
40067	Integer	1	R	Days left until maintenance, negative values show that service is overdue
40068	Unsigned integer	2	R	Operating hours of analyzer

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