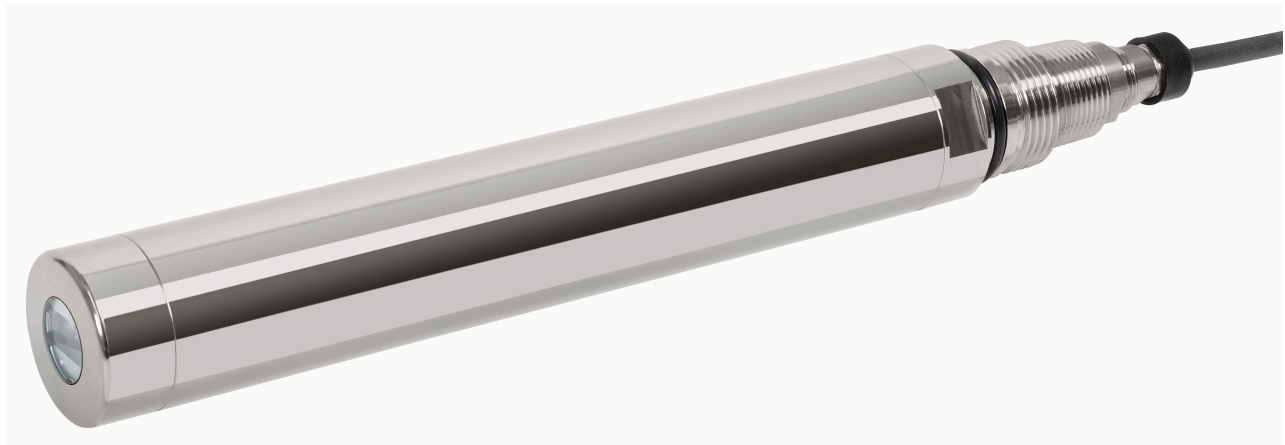


Technical Information

Memosens CFS51

Sensor for fluorescence measurement



Application

The sensor is used to measure polycyclic aromatic hydrocarbons PAHs (PAH) using fluorescence measurement.

The device is suitable for the following field of application:
Monitoring of scrubber washwater on ships

Your benefits

- Measurement of PAH according to MEPC.259(68) and MEPC.340(77) with a measuring range spanning all scrubber sizes
- Very high accuracy
- Made from seawater-resistant materials largely of low flammability according to IACS E10
- Long service intervals thanks to approved calibration and adjustment concept
- Out of the box and ready to go: standardized communication (Memosens technology) enables "plug and play"

Function and system design

Measuring principle

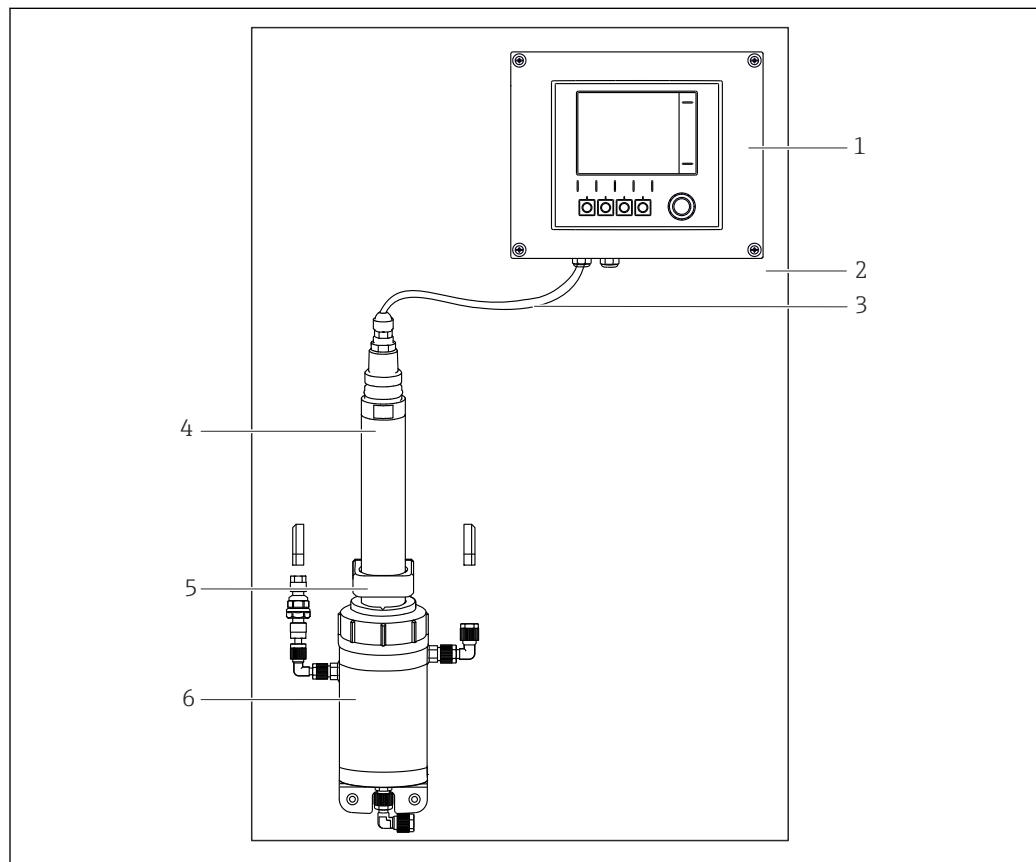
Fluorescence measurement is used to demonstrate the presence of polycyclic aromatic hydrocarbons PAHs (PAH) in water. The device stimulates the PAHs with UV light and detects the fluorescent radiation emitted by the PAHs as a result. The PAH concentration is measured in units of phenanthrene equivalents (PAH_{phe}) according to MEPC.259(68) and MEPC.340(77)¹⁾. The measurement is performed in the excitation wavelength range of 254 nm and in the reception wavelength range up to 360 nm.

Measuring system

The sensor is secured to a panel with the assembly.

A complete measuring system comprises:

- Sensor
- Liquiline CM44x multi-channel transmitter
- Flow assembly



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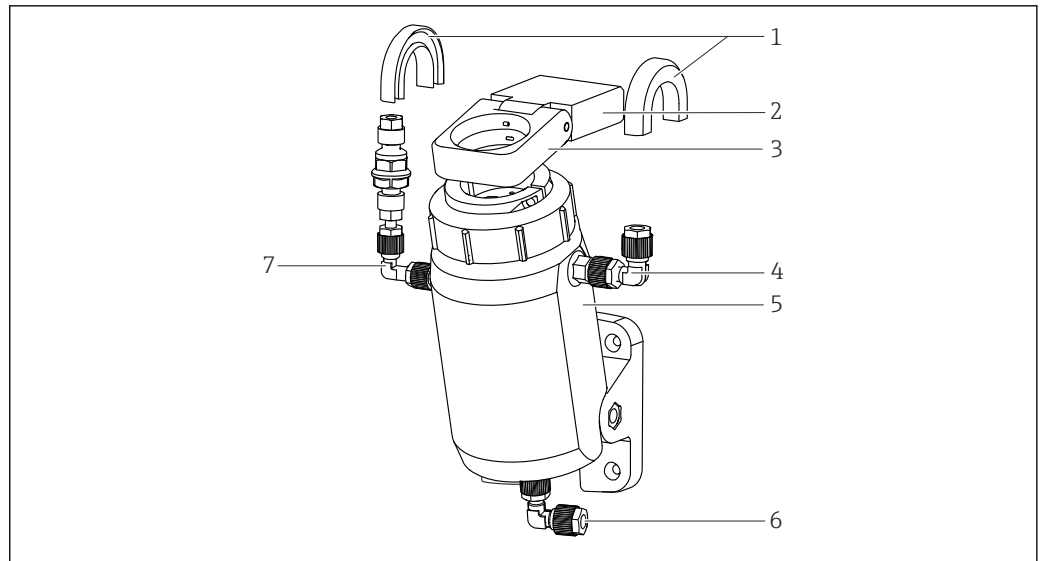
1 Measuring system

- 1 Transmitter
- 2 Panel
- 3 Fixed cable
- 4 Sensor
- 5 Ring clip/spacer
- 6 Assembly

Assembly

The assembly has the following structure:

1) Marine Environment Protection Committee



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2 Flow assembly

- 1 Hose bracket (anti-bend protection)
- 2 Spacer
- 3 Ring clip
- 4 Hose connection, outlet
- 5 Flow assembly
- 6 Hose connection, inlet
- 7 Connection for cleaning (optional)

If possible, the measuring system setup should be free of air bubbles . The assembly offers an integrated bubble trap for assistance. This works best at flow rates of at least 100 l/h (26.4 gal/h).

Communication and data processing

Communication with the transmitter

 Always connect digital sensors with Memosens technology to a transmitter with Memosens technology. Data transmission to a transmitter for analog sensors is not possible.

Digital sensors can store measuring system data in the sensor. These include the following:

- Manufacturer data
 - Serial number
 - Order code
 - Date of manufacture
- Calibration data
 - Calibration date
 - Number of calibrations
 - Serial number of the transmitter used to perform the last calibration or adjustment
- Operating data
 - Temperature application range
 - Date of initial commissioning

Dependability

Reliability

Easy handling

Sensors with Memosens technology have integrated electronics that store calibration data and other information (e.g. total hours of operation or hours of operating under extreme measuring conditions). Once the sensor has been connected, the sensor data are transferred automatically to the transmitter and used to calculate the current measured value. As the calibration data are stored in the sensor, the sensor can be calibrated and adjusted independently of the measuring point. The result:

- Pre-calibrated sensors can be replaced quickly and easily, resulting in a dramatic increase in the availability of the measuring point.
- The sensor history can be documented on external data carriers and evaluation programs.

Input

Measured variable

- PAH concentration in phenanthrene equivalents PAH_{phe}
- Temperature

Measuring range

0 to 5 000 µg/l PAH_{phe}

Power supply

Electrical connection



Device is live!

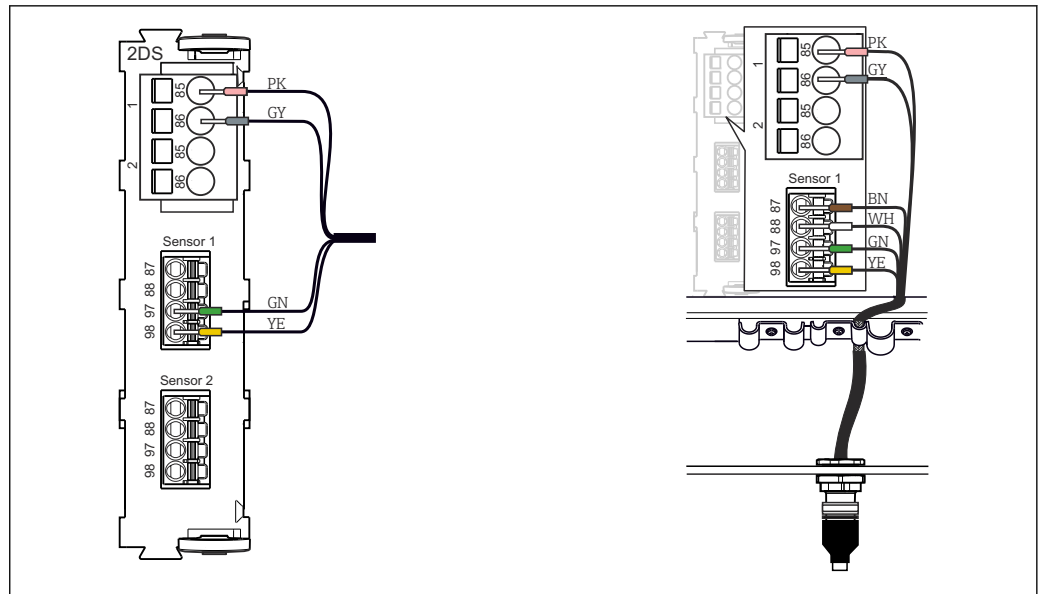
Incorrect connection may result in injury or death!

- ▶ The electrical connection may be performed only by an electrical technician.
- ▶ The electrical technician must have read and understood these Operating Instructions and must follow the instructions contained therein.
- ▶ **Prior** to commencing connection work, ensure that no voltage is present on any cable.

Connecting the sensor

The following connection options are available:

- Via M12 plug (version: fixed cable, M12 plug)
- Via the cable of the spectrometer to the plug-in terminals of an input of the transmitter (version: fixed cable, end sleeves)



3 Spectrometer connection to input (left) or via M12 plug (right)

The maximum cable length is 100 m (328.1 ft).

Connecting the cable shield

The device cable must be shielded cables.

i Only use terminated original cables where possible.

1. Loosen a suitable cable gland on the bottom of the housing.
2. Remove the dummy plug.
3. Attach the gland to the cable end, making sure the gland is facing the right direction.
4. Pull the cable through the gland and into the housing.
5. Route the cable in the housing in such a way that the **exposed** cable shield fits into one of the cable clamps and the cable cores can be easily routed as far as the connection plug on the electronics module.
6. Connect the cable to the cable clamp.
7. Clamp the cable.
8. Connect cable cores as per the wiring diagram.
9. Tighten the cable gland from outside.

Ensuring the degree of protection

Only the mechanical and electrical connections which are described in these instructions and which are necessary for the required, designated use, may be carried out on the device delivered.

- ▶ Exercise care when carrying out the work.

Individual types of protection permitted for this product (impermeability (IP), electrical safety, EMC interference immunity) can no longer be guaranteed if, for example :


- Covers are left off
- Different power units to the ones supplied are used
- Cable glands are not sufficiently tightened (must be tightened with 2 Nm (1.5 lbf ft) for the permitted level of IP protection)
- Unsuitable cable diameters are used for the cable glands
- Modules are not fully secured
- The display is not fully secured (risk of moisture entering due to inadequate sealing)
- Loose or insufficiently tightened cables/cable ends
- Conductive cable strands are left in the device

Cable specification	The device is available with the following fixed cable lengths: <ul style="list-style-type: none"> ■ 3 m (9.84 ft) ■ 7 m (22.97 ft) ■ 15 m (49.22 ft)
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Performance characteristics

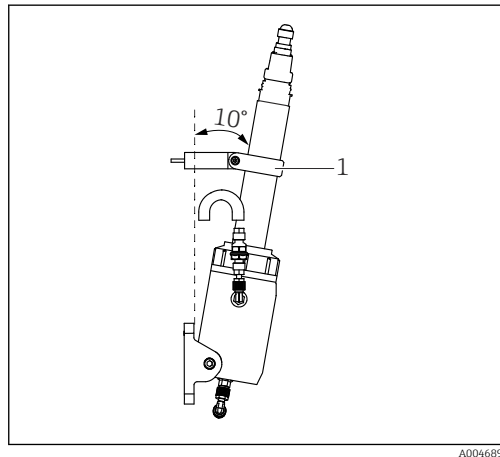
Maximum measured error	< 5 % of reading or 6.7 µg/l, at 20 °C (68 °F) according to DIN EN ISO 15839 and MEPC.259(68) and MEPC.340(77)
Reading stability over temperature	Measured with solid state reference at 100 µg/l in the temperature range from -5 to 55 °C (23 to 131 °F) < 5 % of reading
Repeatability	< 1 % of reading or 1 µg/l PAH _{phe} , the larger value applies in each case
Long-term reliability	Relative measured value deviation per year Relative measured value deviation per year: < 5%
Response time	< 10 seconds adjustable
Limit of detection	Limit of detection in accordance with ISO 15839 in ultrapure water: 2 µg/l PAH _{phe}
Turbidity compensation	<ul style="list-style-type: none"> ■ Measured error with turbidity compensation switched off: 0 to 5 FNU, < 5 % of measured value ■ Measured error with turbidity compensation switched on: 0 to 50 FNU, < 5 % of measured value

Mounting

Orientation	The angle of inclination of the sensor can affect the formation of air bubbles below the sensor. The greater the angle of inclination of the sensor, the more insensitive the measurement is to air bubbles. <ul style="list-style-type: none"> ▶ Adjust the angle of inclination if many air bubbles form →  7.
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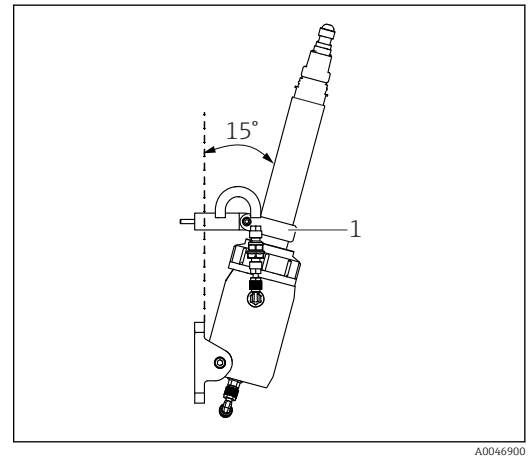
Setting the angle of inclination of the sensor

Depending on the measuring point, the angle of inclination for the sensor can be set individually. The angle of inclination is determined by the location of the spacer on the panel.



4 Example with spacer mounted at top, 10° angle in relation to panel

1 Ring clip with spacer



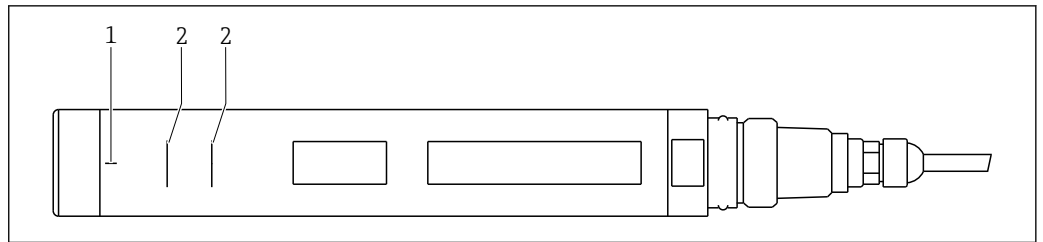
5 Example with spacer mounted at bottom, 15° angle in relation to panel

1 Ring clip with spacer

 For detailed information on setting the angle of inclination of the sensor, see BA02165C

Installation instructions

Installation in flow assembly



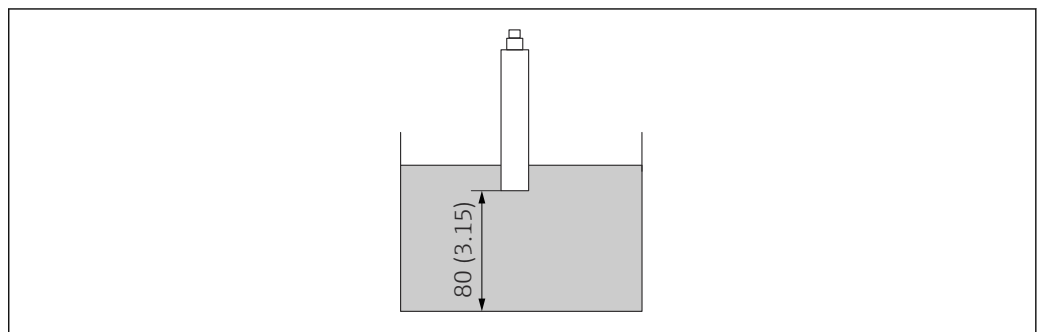
6 Installation markings for clamping ring

1 Vertical alignment line for solid state reference

2 Horizontal alignment lines for clamping ring

The vertical alignment line on the sensor is used to align the solid state reference. The horizontal alignment lines on the sensor indicate the exact positions where the upper and lower end of the clamping ring must be located.

Installation without flow assembly



7 Positioning the sensor. Dimensions: mm (in)

Please note the following when installing the sensor without a flow assembly:

- The immersion depth of the sensor must be selected in such a way that the optical window of the sensor is always fully immersed in the medium.
- The distance to the bottom of the vessel must be at least 80 mm (3.15 in).

Environment

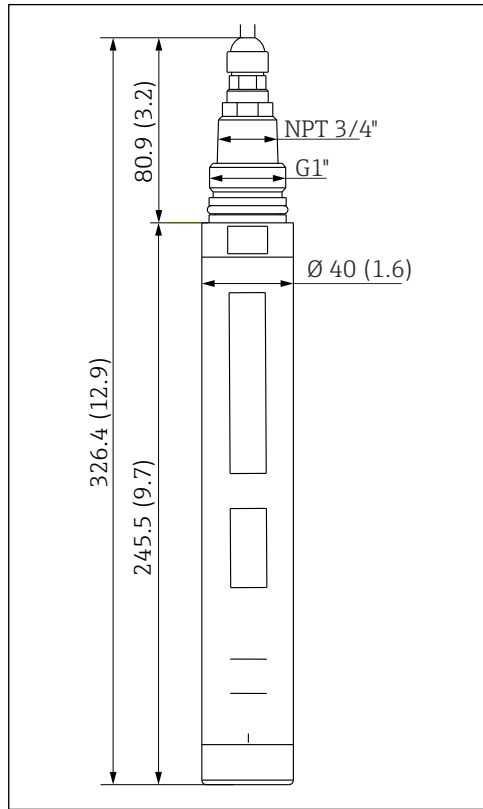
Ambient temperature range	Sensor -20 to 60 °C (-4 to 140 °F)
	Solid state reference -5 to 60 °C (23 to 140 °F), without condensation
Storage temperature	-20 to 70 °C (-4 to 158 °F)
Degree of protection	<ul style="list-style-type: none">■ IP 68■ NEMA 6P
Electromagnetic compatibility (EMC)	Interference emission and interference immunity according to: <ul style="list-style-type: none">■ EN 61326-1:2013■ EN 61326-2-3:2013■ NAMUR NE21: 2012

Process

Process temperature range	-5 to 55 °C (20 to 130 °F)
Process pressure range	<ul style="list-style-type: none">■ Sensor: 0.5 to 10 bar (7.3 to 145 psi)■ Sensor with assembly: 0.5 to 6 bar (7.3 to 87 psi)
Flow limit	Minimum flow No minimum flow required.

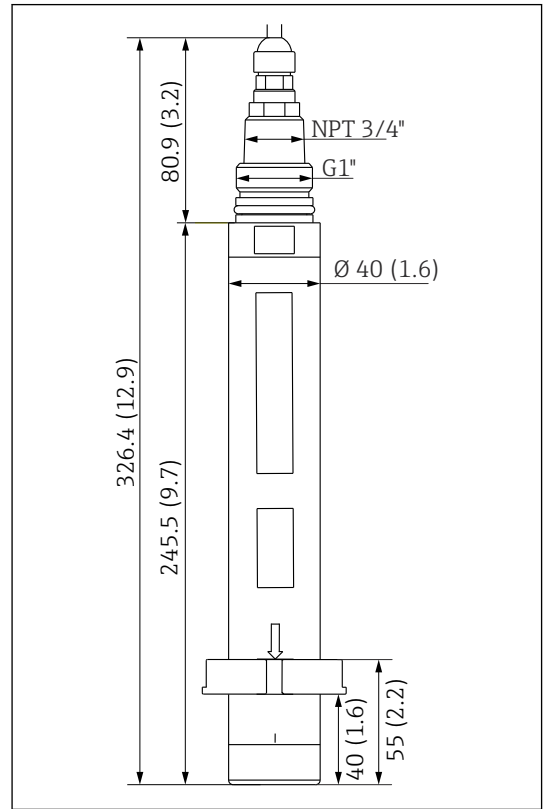
Mechanical construction

Dimensions



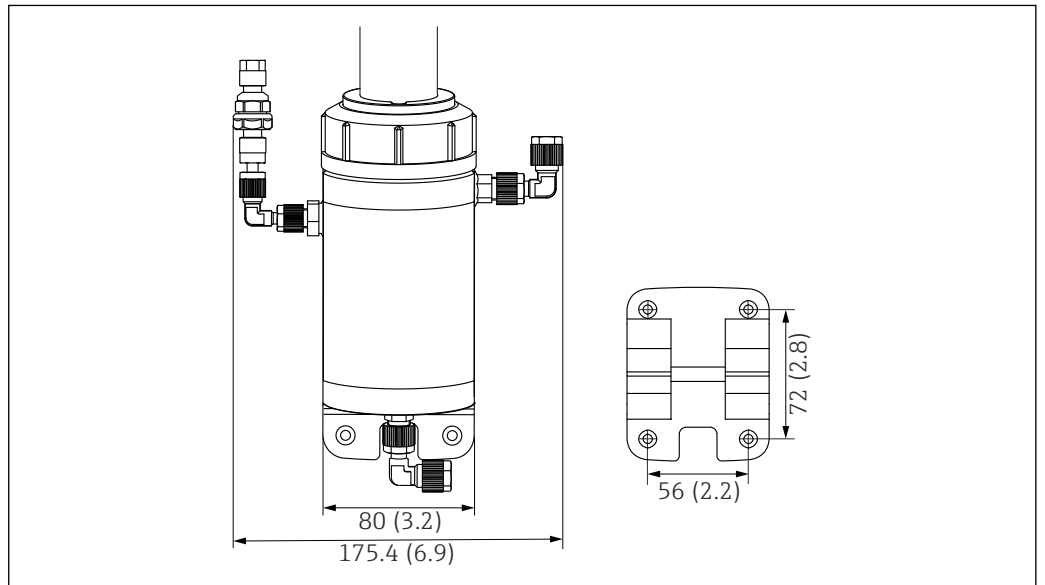
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8 Dimensions of sensor. Engineering unit: mm (in)



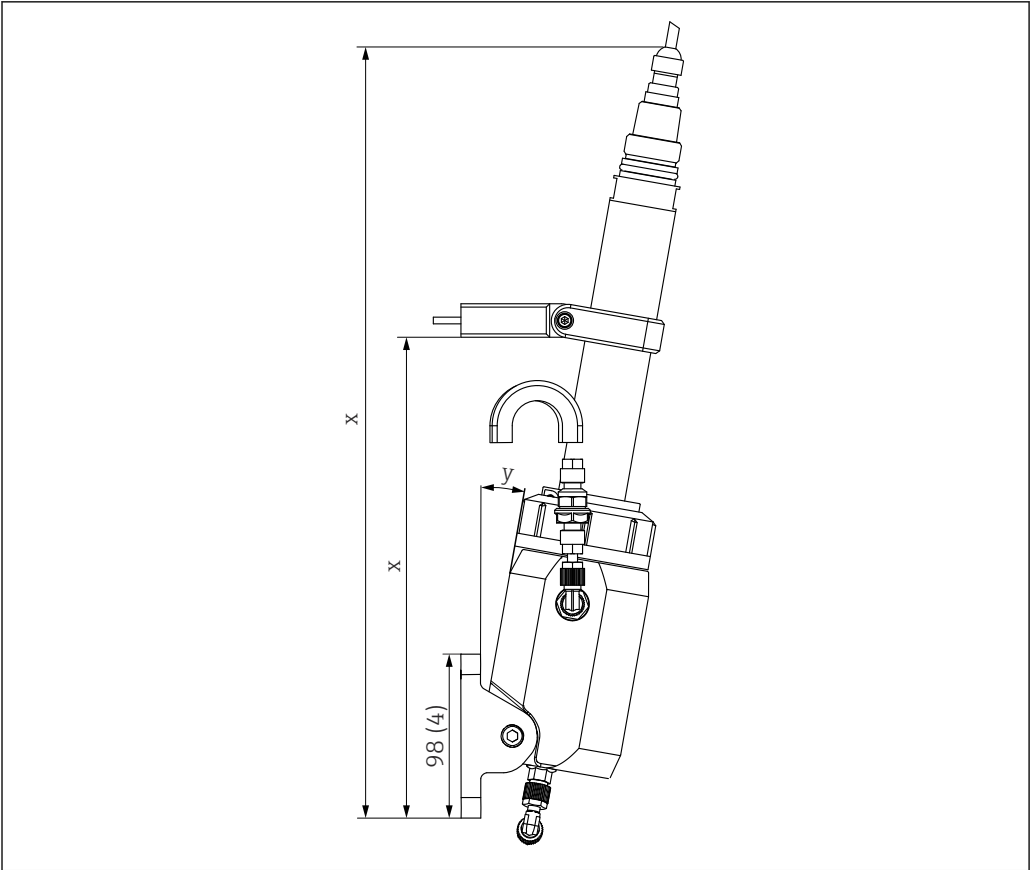
A0046128

9 Dimensions of sensor with clamping ring. Engineering unit: mm (in)



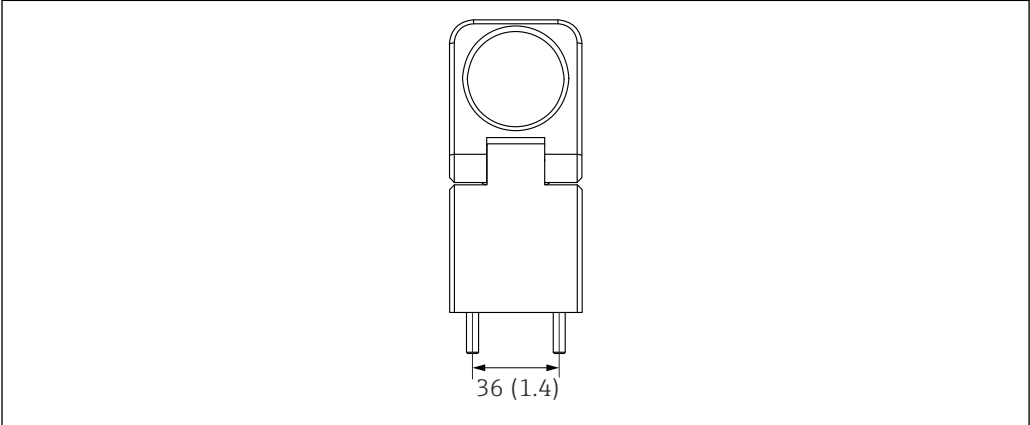
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10 Dimensions of assembly with securing plate (right). Engineering unit: mm (in)



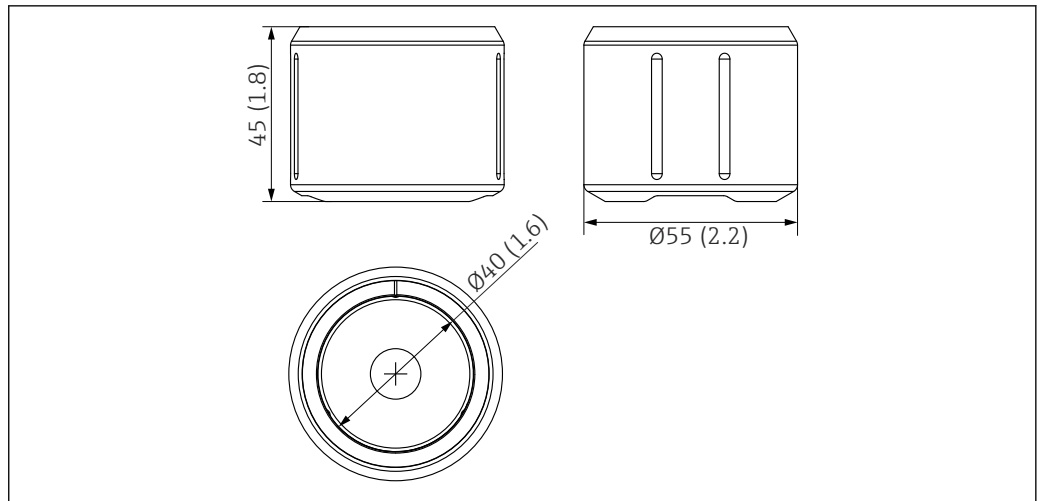
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11 Dimensions of mounted sensor with assembly. Engineering unit: mm (in)
x Variable length (depending on mounting)
y Variable angle (depending on mounting)



A0047395

12 Dimensions of ring clip with spacer. Engineering unit: mm (in)



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13 Dimensions of solid state reference. Engineering unit: mm (in)

Weight	Sensor without clamping ring:	0.69 kg (1.52 lb)
	Sensor with clamping ring:	0.78 kg (1.72 lb)

Materials	Sensor	
	Housing:	Titanium 3.7035
	Optical window:	Sapphire
	O-rings:	FKM, EPDM (seal of cable assembly)
	Assembly	
	Flow cell:	PVDF V0, PA6FR (low flammability)
	O-rings:	FKM
	Clamping ring:	Titanium 3.7035

Process connections	<ul style="list-style-type: none"> ■ Sensor: G1" and NPT ¾" ■ Assembly: G1/4" DN 4/6 (cleaning connection), G1/4" DN6/8 (process connection)
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Certificates and approvals

Current certificates and approvals that are available for the product can be selected via the Product Configurator at www.endress.com:


1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Configuration**.

Ordering information

Scope of delivery	<p>The scope of delivery comprises:</p> <ul style="list-style-type: none"> ■ Sensor, version as ordered ■ Operating Instructions
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Product page	www.endress.com/cfs51
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Product Configurator	1. Configure : Click this button on the product page.
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2. Select **Extended selection**.
 - ↳ The Configurator opens in a separate window.
 3. Configure the device according to your requirements by selecting the desired option for each feature.
 - ↳ In this way, you receive a valid and complete order code for the device.
 4. **Apply**: Add the configured product to the shopping cart.
-  For many products, you also have the option of downloading CAD or 2D drawings of the selected product version.
5. **Show details**: Open this tab for the product in the shopping cart.
 - ↳ The link to the CAD drawing is displayed. If selected, the 3D display format is displayed along with the option to download various formats.

Accessories

The following are the most important accessories available at the time this documentation was issued.

- ▶ For accessories not listed here, please contact your Service or Sales Center.

Device-specific accessories

Flow assembly 71546713

- Material: PVDF V0
- Process pressure range: 6 bar (87 psi) (20 °C (68 °F))
- Process temperature range: -5 to 55 °C (23 to 131 °F)
- Flow rate: 40 to 120 l/h (10.6 to 31.7 gal/h)
- Order No. 71546713



71572451

www.addresses.endress.com
