



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

- Out of the box and ready to go: standardized communication (Memosens technology) enables "plug and play"

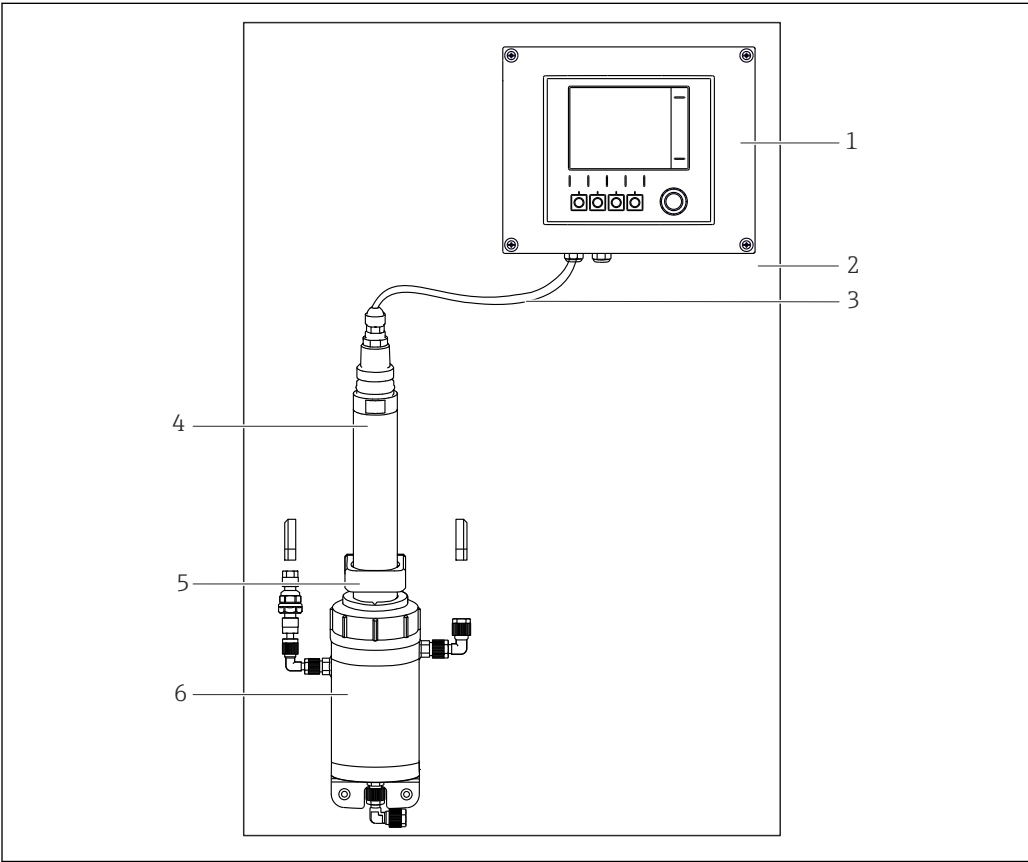
Your benefits

- 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

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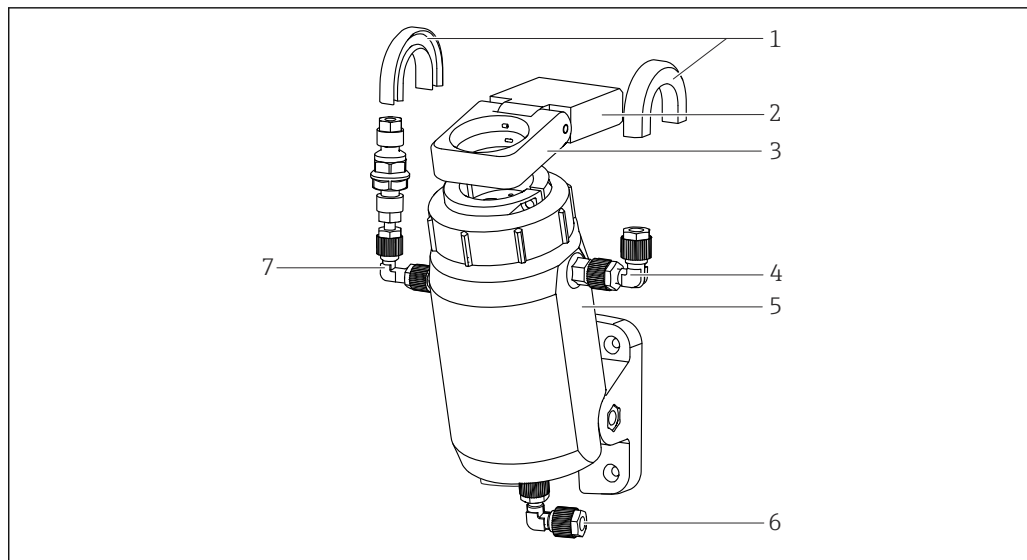
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- 1 Measuring system
- 1 Transmitter
 - 2 Panel
 - 3 Fixed cable
 - 4 Sensor
 - 5 Ring clip/spacer
 - 6 Assembly

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 $\mu\text{g/l}$ PAH_{phe}

Power supply

Electrical connection



Device is live!

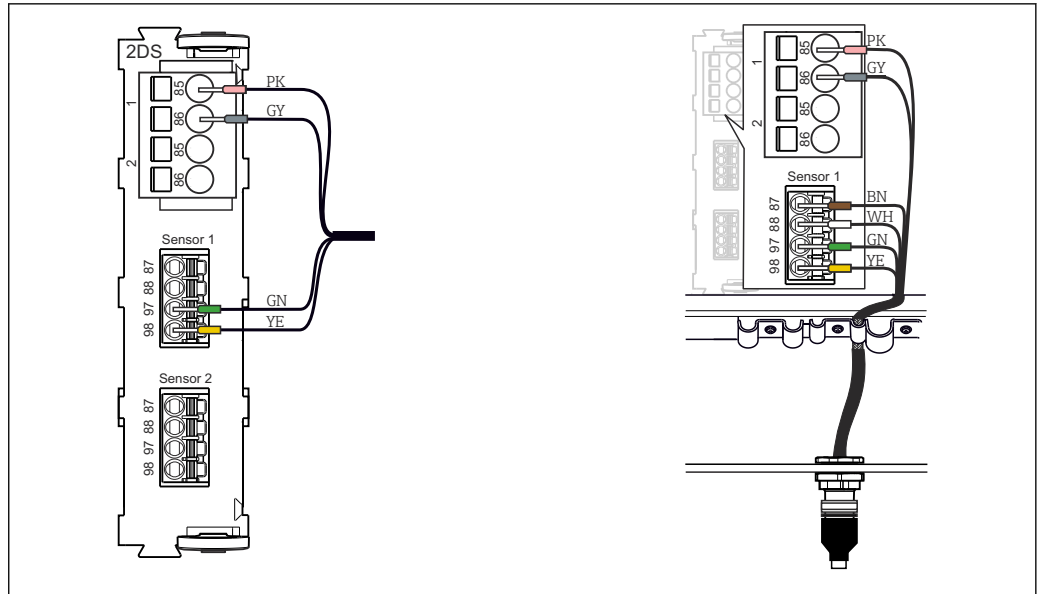
Incorrect connection may result in injury or death!

- ▶ 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 a transmitter input (version: fixed cable, wire end ferrules)



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

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

Cable specification	The device is available with the following fixed cable lengths: ■ 3 m (9.84 ft) ■ 7 m (22.97 ft) ■ 15 m (49.22 ft)
Performance characteristics	
Maximum measurement 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)
Measured value 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
Detection limit	Limit of detection in accordance with ISO 15839 in ultrapure water: 2 µg/l PAH_{phe}
Turbidity compensation	■ 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

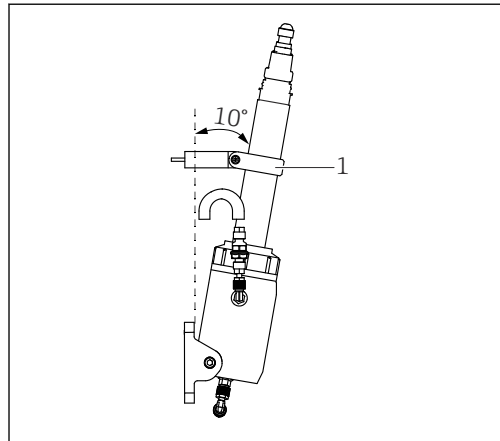
Orientation

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.

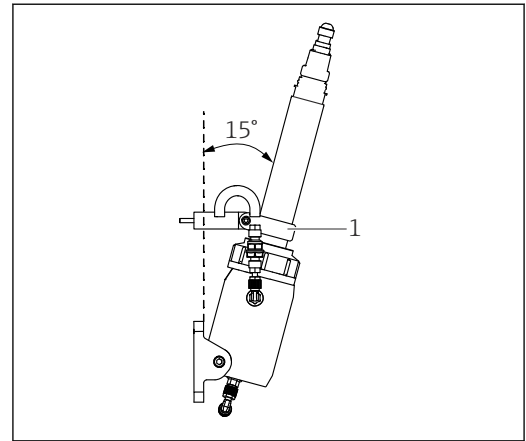
- Adjust the angle of inclination if many air bubbles form → 6.

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



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

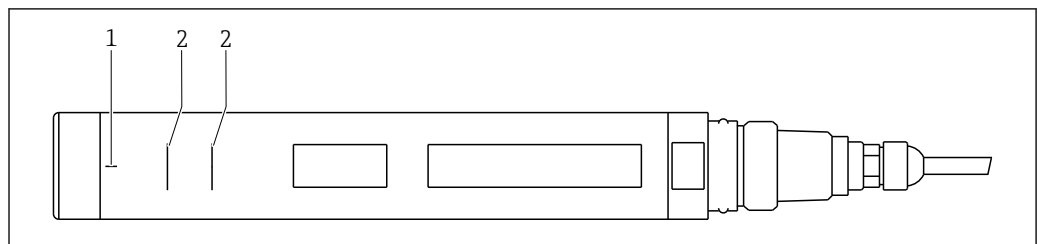
1 Ring clip with spacer

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



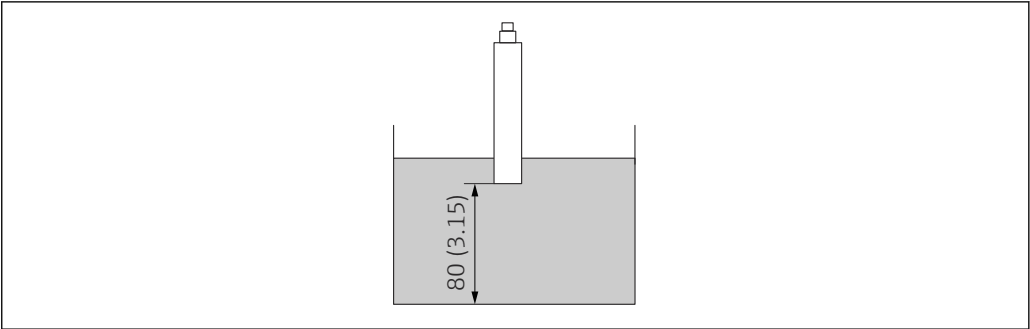
6 Installation markings for clamping ring

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



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 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

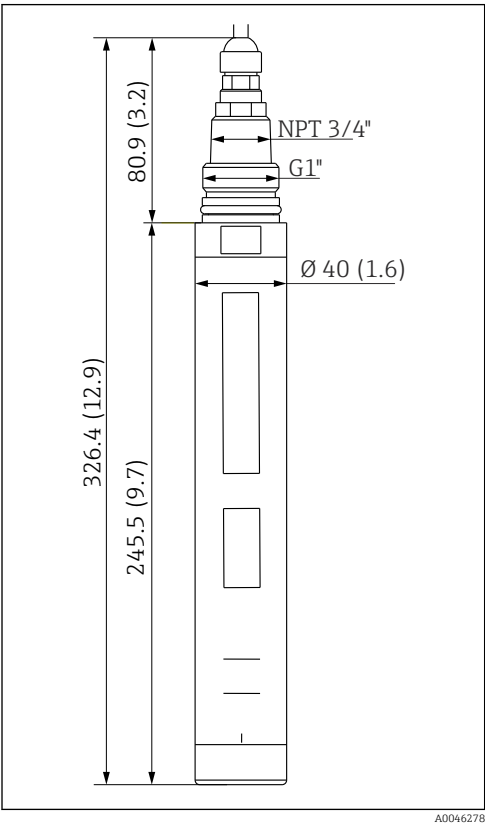
Ambient temperature range	Sensor
	–20 to 60 °C (–4 to 140 °F)
	Solid state reference
	–5 to 60 °C (23 to 140 °F), without condensation
Storage temperature	–20 to 70 °C (–4 to 158 °F)
Degree of protection	■ IP 68 (1.83 m (6 ft) water column over 24 hours) ■ IP 66 ■ Type 6P

Process

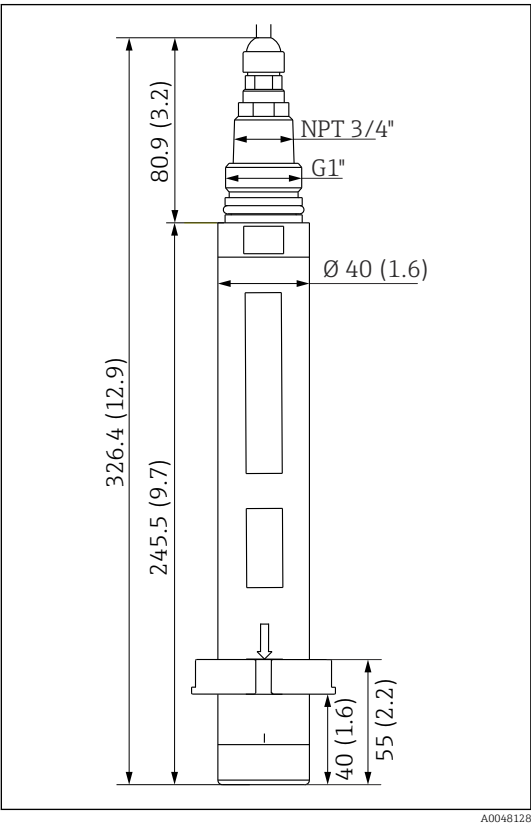
Process temperature range	–5 to 55 °C (20 to 130 °F)
Process pressure range	■ Sensor: 0.5 to 10 bar (7.3 to 145 psi) ■ Sensor with assembly: 0.5 to 6 bar (7.3 to 87 psi)
Flow limit	Minimum flow No minimum flow required.

Mechanical construction

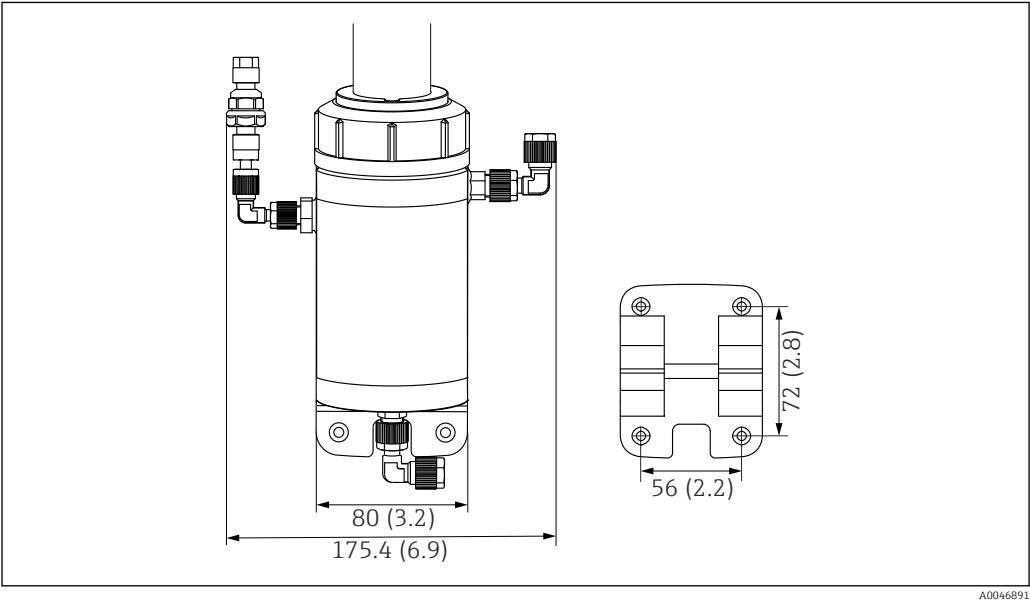
Dimensions



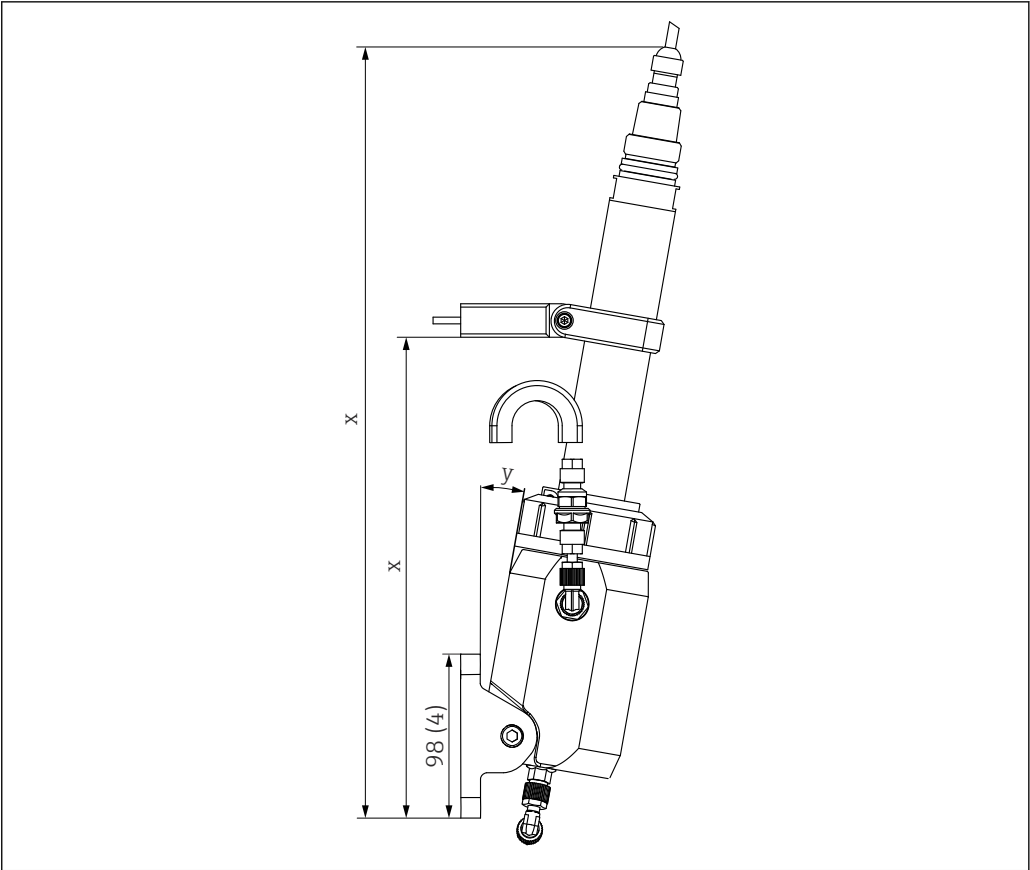
8 Dimensions of sensor. Engineering unit: mm (in)



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

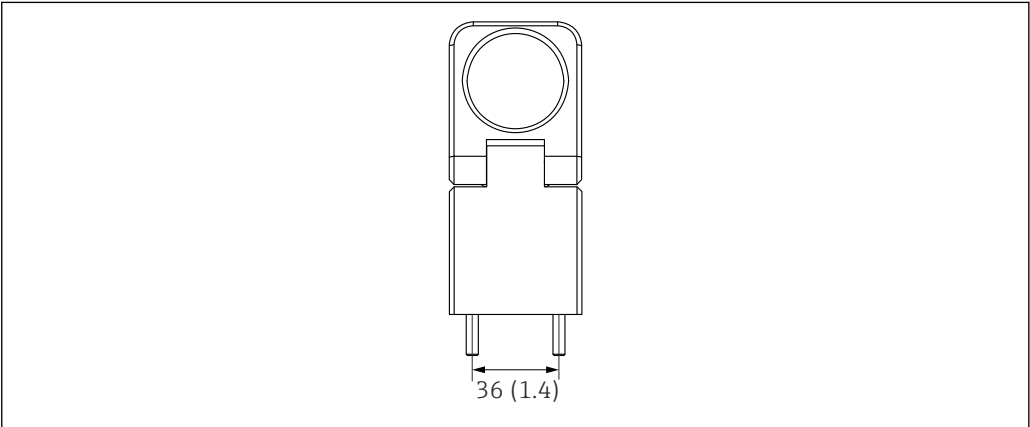


10 Dimensions of assembly with securing plate (right). Engineering unit: mm (in)



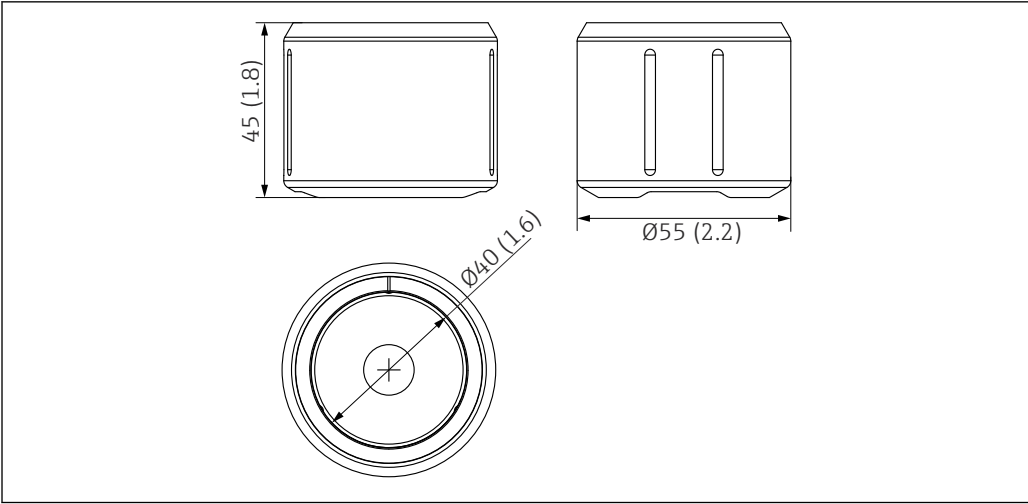
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11 Dimensions of mounted sensor with assembly. Engineering unit: mm (in)
x Variable length (depending on mounting)
y Variable angle (depending on mounting)



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



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:	Black PEHD, UL94: HB
Process connections	O-rings:	FKM
	Clamping ring:	Titanium 3.7035
Process connections		
■ Sensor: G1" and NPT ¾"		
■ Assembly: G1/4" DN 4/6 (cleaning connection), G1/4" DN6/8 (process connection)		

Certificates and approvals

Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

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

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Marine approvals	The product has certificates for marine applications, issued by the following classification societies: ABS (American Bureau of Shipping), BV (Bureau Veritas), DNV (Det Norske Veritas) and LR (Lloyd's Register).

Ordering information

Scope of delivery	The scope of delivery comprises: ■ Sensor, version as ordered ■ Operating Instructions
Product page	www.endress.com/cfs51
Product Configurator	1. Configure: Click this button on the product page. - Select Extended selection. ↳ The Configurator opens in a separate window. - 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. Accept: 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. CAD: Open this tab. ↳ The drawing window is displayed. You have a choice between different views. You can download these in selectable formats.

Accessories

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

Listed accessories are technically compatible with the product in the instructions.

- 1.** Application-specific restrictions of the product combination are possible.
Ensure conformity of the measuring point to the application. This is the responsibility of the operator of the measuring point.
- 2.** Pay attention to the information in the instructions for all products, particularly the technical data.
- 3.** For accessories not listed here, please contact your Service or Sales Center.

Device-specific accessories	Flow assembly 71546713 ■ Material: black PEHD ■ 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
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