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Operating Instructions
CAV01

Flow assembly for optical sensors

Endress+Hauser
People for Process Automation

Table of contents

1 About this document

1.1 Warnings

Structure of information	Meaning
DANGER **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation **will** result in a fatal or serious injury.
WARNING **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation **can** result in a fatal or serious injury.
CAUTION **Causes (/consequences)** If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or more serious injuries.
NOTICE **Cause/situation** If necessary, Consequences of non-compliance (if applicable) ▶ Action/note	This symbol alerts you to situations which may result in damage to property.

1.2 Symbols used

- Additional information, tips
- Permitted
- Recommended
- Not permitted or not recommended
- Reference to device documentation
- Reference to page
- Reference to graphic
- Result of an individual step

1.2.1 Symbols on the device

- Reference to device documentation
- Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.

2 Basic safety requirements

2.1 Requirements concerning personnel

- Installation, commissioning, operation and maintenance of the measuring system may be carried out only by specially trained technical personnel.
- The technical personnel must be authorized by the plant operator to carry out the specified activities.
- The electrical connection may be performed only by an electrical technician.
- The technical personnel must have read and understood these Operating Instructions and must follow the instructions contained therein.
- Faults at the measuring point may only be rectified by authorized and specially trained personnel.

Repairs not described in the Operating Instructions provided must be carried out only directly at the manufacturer's site or by the service organization.

2.2 Intended use

The flow assembly is suitable for the installation of the optical sensors Viomax CAS51D and Memosens Wave CAS80E. Thanks to its design, it can be operated in pressurized systems.

The assembly is designed exclusively for use in liquid media.

Any use other than that intended puts the safety of people and the measuring system at risk. Therefore, any other use is not permitted.

The manufacturer is not liable for harm caused by improper or unintended use.

2.3 Workplace safety

The operator is responsible for ensuring compliance with the following safety regulations:
- Installation guidelines
- Local standards and regulations
- Regulations for explosion protection

2.4 Operational safety

Before commissioning the entire measuring point:

1. Verify that all connections are correct.
2. Ensure that electrical cables and hose connections are undamaged.

Procedure for damaged products:

1. Do not operate damaged products, and protect them against unintentional operation.
2. Label damaged products as defective.

During operation:

- If errors cannot be rectified,
  take products out of service and protect them against unintentional operation.

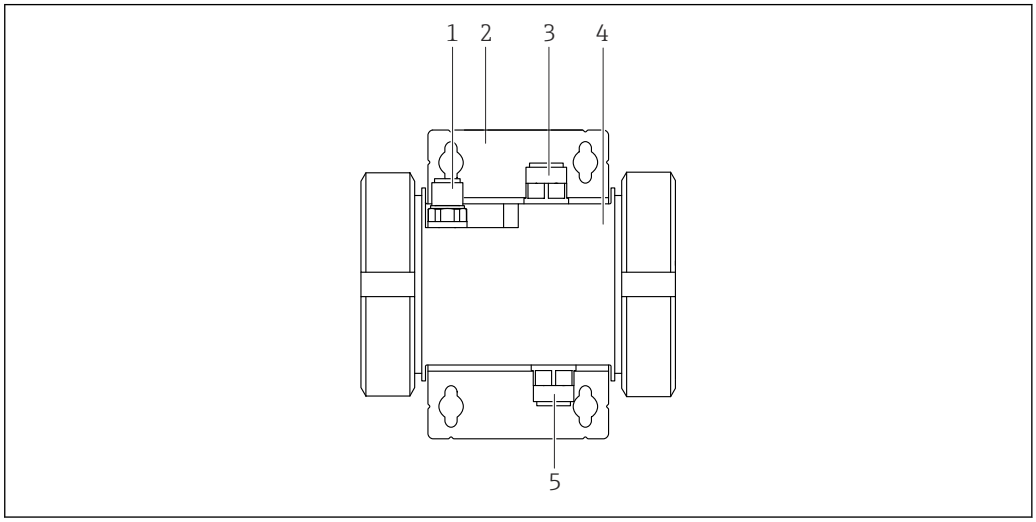
2.5 Product safety

The product is designed to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate. The relevant regulations and international standards have been observed.

3 Product description

3.1 Product design

The flow assembly is suitable for optical sensors with different optical path lengths.



1 *Flow assembly*

1 *Connection fitting for cleaning connection (optional)*
2 *Wall holder (preassembled on flow vessel)*
3 *Medium outlet (adapter optional)*
4 *Flow vessel*
5 *Medium inflow (adapter optional)*

4 Incoming acceptance and product identification

4.1 Incoming acceptance

On receipt of the delivery:

1. Check the packaging for damage.
   ↳ Report all damage immediately to the manufacturer.
   Do not install damaged components.
2. Check the scope of delivery using the delivery note.
3. Compare the data on the nameplate with the order specifications on the delivery note.
4. Check the technical documentation and all other necessary documents, e.g. certificates, to ensure they are complete.

If one of the conditions is not satisfied, contact the manufacturer.

4.2 Product identification

4.2.1 Nameplate

The following information on the device can be found on the nameplate:
- Manufacturer identification
- Extended order code
- Serial number
- Ambient and process conditions
- Safety information and warnings
- Certificate information

▶ Compare the information on the nameplate with the order.

4.2.2 Product identification

Product page

www.endress.com/cav01

Interpreting the order code

The order code and serial number of your product can be found in the following locations:
- On the nameplate
- In the delivery papers

Obtaining information on the product

1. Go to www.endress.com.
2. Page search (magnifying glass symbol): Enter valid serial number.
3. Search (magnifying glass).
   ↳ The product structure is displayed in a popup window.
4. Click the product overview.
   ↳ A new window opens. Here you will find information pertaining to your device, including the product documentation.

4.2.3 Manufacturer's address

Endress+Hauser Conducta GmbH+Co. KG
Dieselstraße 24
70839 Gerlingen
Germany

4.3 Scope of delivery

The scope of delivery comprises:
- Device, version as ordered
- Process connections POM G1/4" (optional)
- Rinse connection with check valve for hose connection DN6/4 mm (optional)
- Operating instructions

4.4 Certificates and approvals

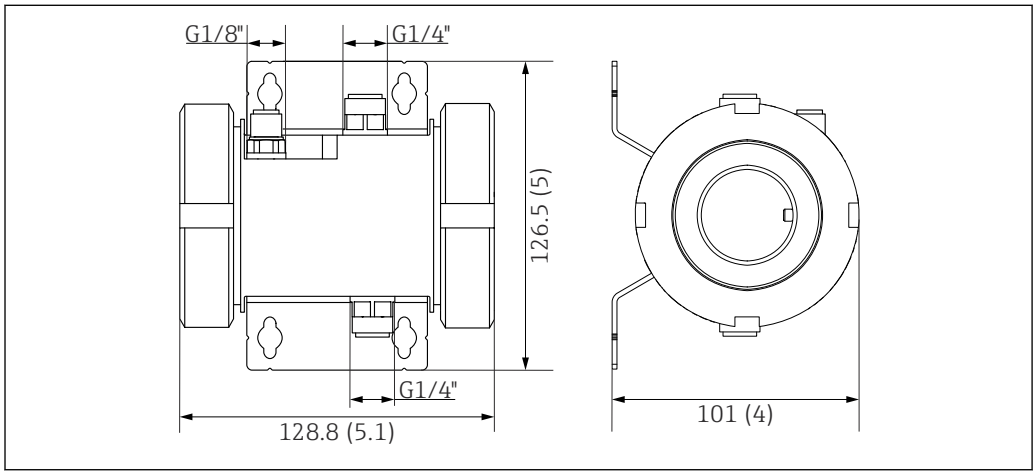
Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

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

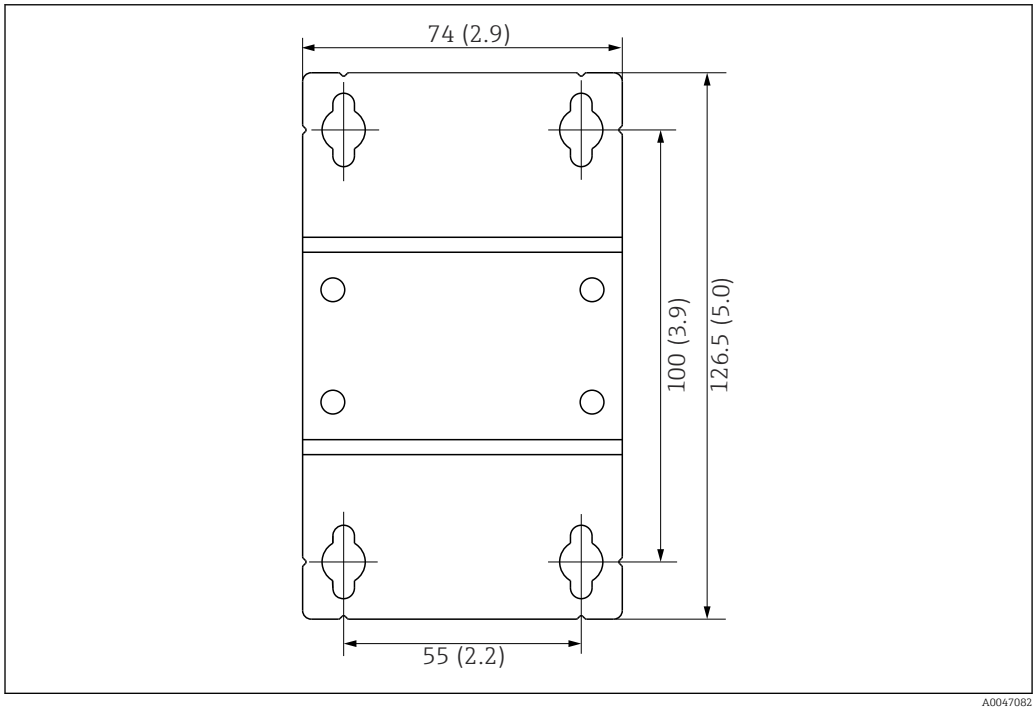
5 Installation

5.1 Installation requirements

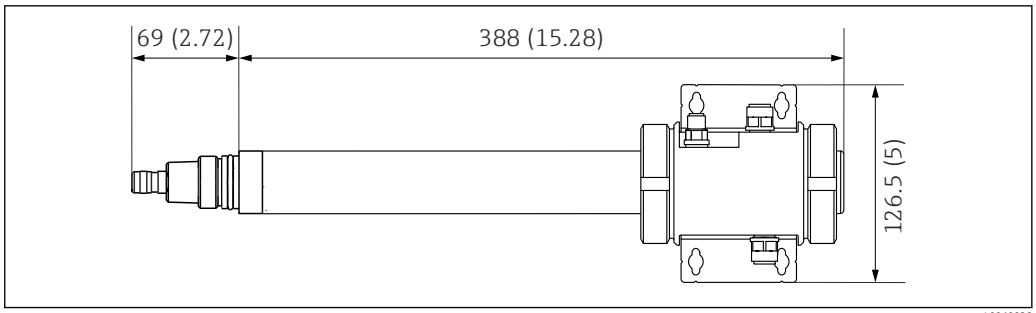
5.1.1 Dimensions



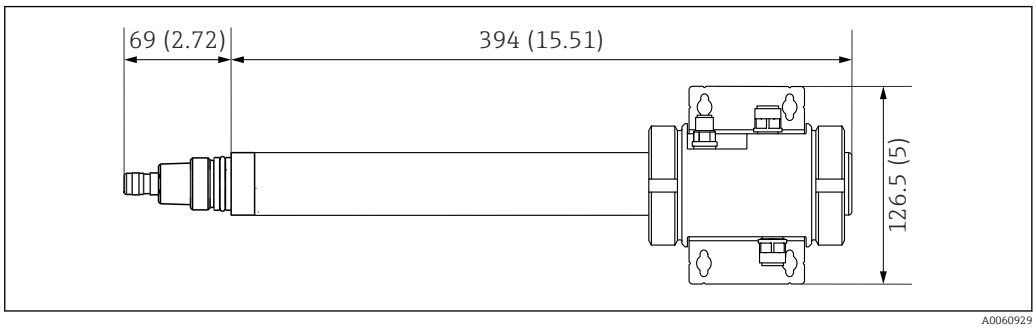
2 *Dimensions. Dimensions: mm (in)*



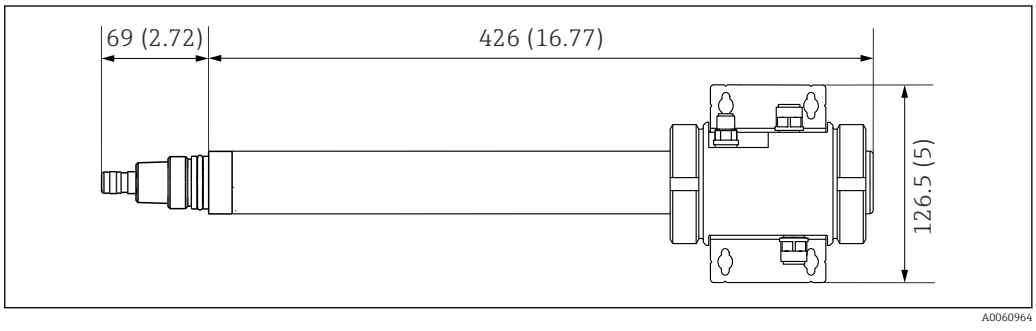
3 *Dimensions of wall holder Dimensions: mm (in)*



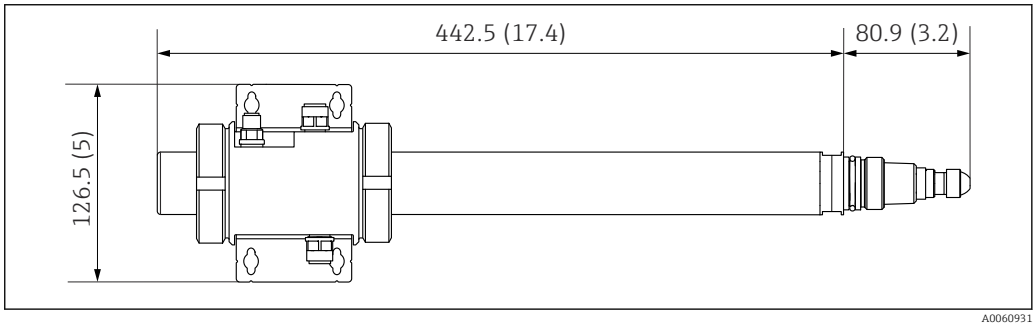
4 Assembly with installed CAS51D sensor with measurement gap 2 mm (0.08 in)



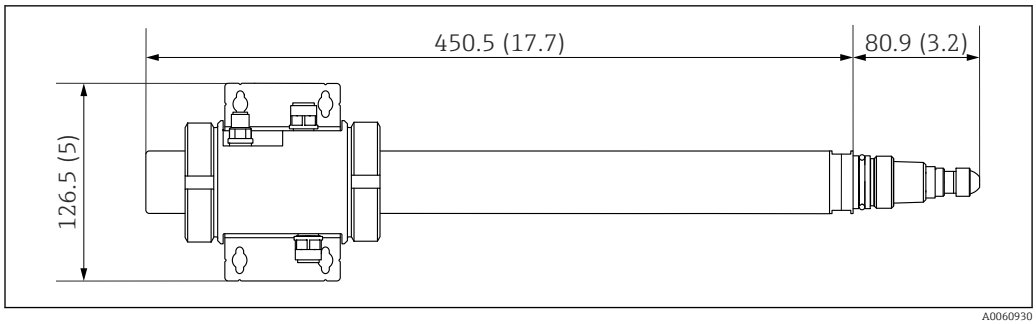
5 Assembly with installed CAS51D sensor with measurement gap 8 mm (0.31 in)



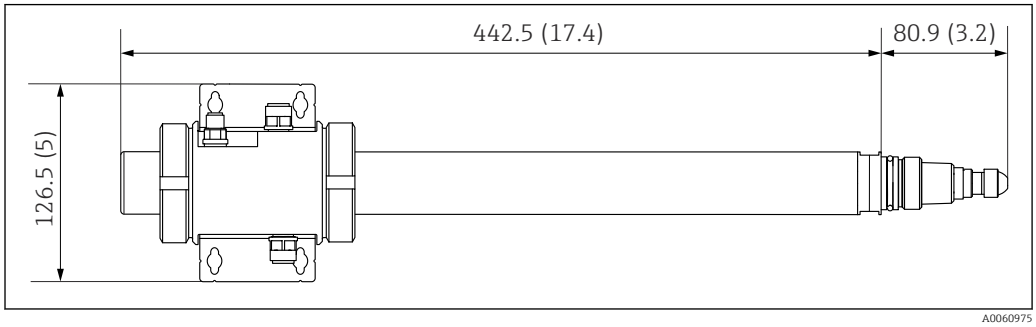
6 Assembly with installed CAS51D sensor with measurement gap 40 mm (1.57 in)



7 Assembly with installed CAS80E sensor with measurement gap 2 mm (0.08 in)



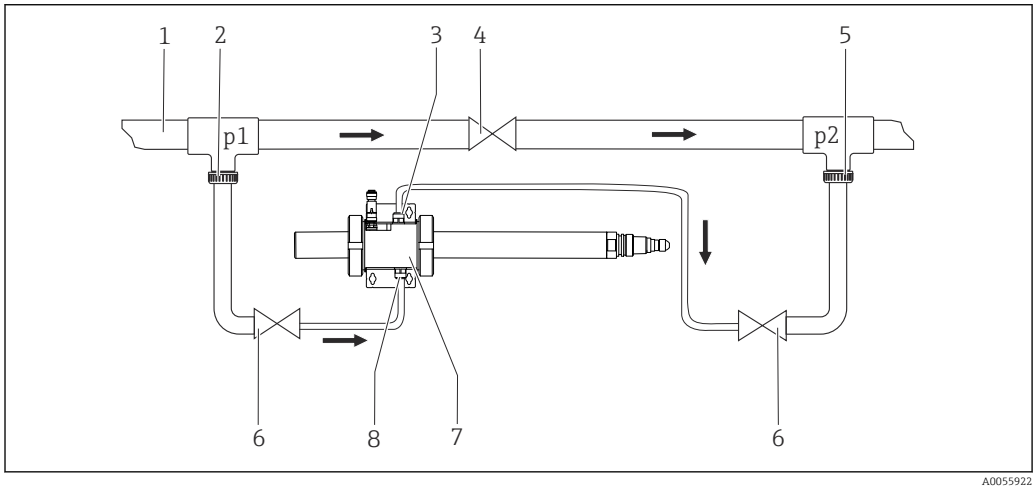
8 Assembly with installed CAS80E sensor with measurement gap 10 mm (0.4 in)



9 Assembly with installed CAS80E sensor with measurement gap 50 mm (1.97 in)

5.1.2 Orientation

Assembly in the bypass



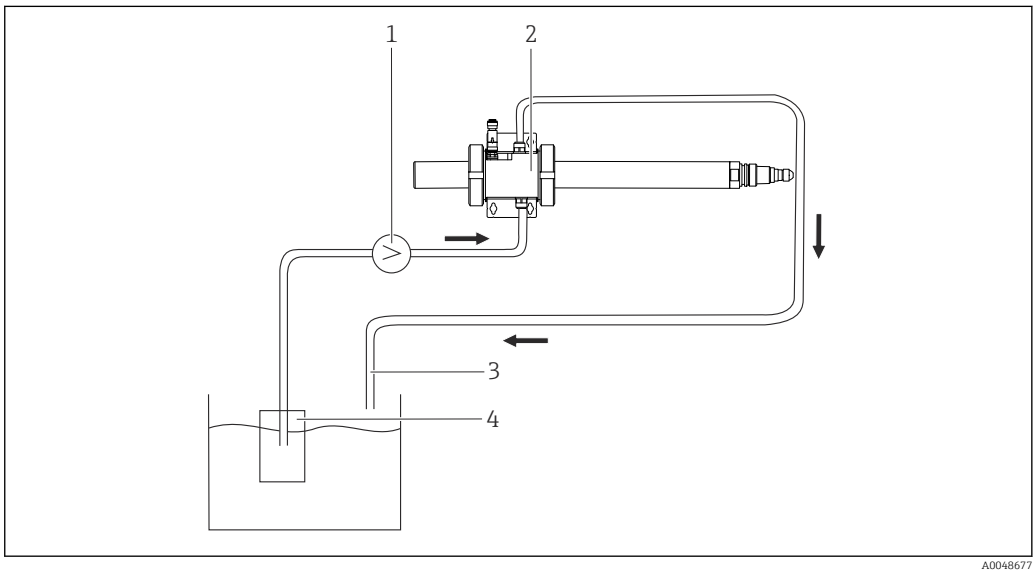
10 Connection diagram with bypass using the example of CAS80E, arrow indicates the flow direction

1 Main pipe
2 Medium sampling
3 Medium outlet
4 Adjustment and shut-off valve or orifice plate
5 Medium return
6 Adjustment and shut-off valves
7 Flow assembly
8 Medium inlet
p1 Pressure
p2 Pressure

To achieve flow through the assembly with a bypass, pressure p1 must be higher than pressure p2. No measures to increase pressure are required for branch pipes that branch off from the main pipe (no return medium).

1. Connect the medium inlet and outlet to the hose connections of the assembly.
   ↳ The assembly is filled from below and is therefore self-venting.
2. Install an orifice plate or adjustment valve in the main pipe to ensure that pressure p1 is higher than pressure p2.
3. Make sure that the flow is at least 0.1 l/h (0.026 gal/h).
4. Take the extended response times into consideration.

Assembly in open outlet



11 *Connection diagram with open outlet using the example of CAS80E, arrow indicates the flow direction*

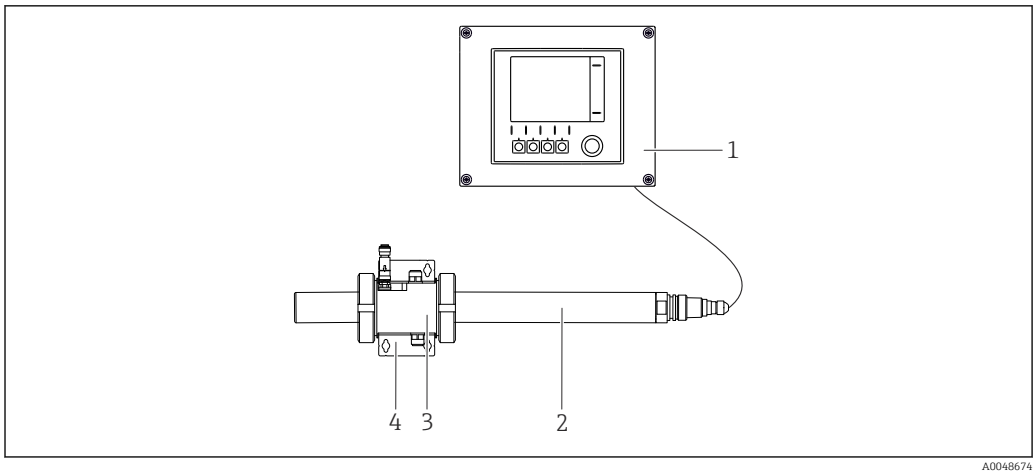
1 Pump
2 Flow assembly
3 Open outlet
4 Filter unit

As an alternative to operation in the bypass, it is also possible to direct the sample flow from a filter unit with an open outlet through the assembly.

5.2 Installing the assembly

5.2.1 Measuring system

A complete measuring system comprises:
- Sensor, e.g Memosens Wave CAS80E or Viomax CAS51D
- Liquiline CM44x multi-channel transmitter
- Flow assembly CAV01



12 *Measuring system*

1 *Transmitter*
2 *Sensor*
3 *Flow assembly*
4 *Holder*

5.2.2 Mounting the wall holder with the flow vessel on the panel

The wall holder and flow vessel are pre-assembled.

1. Position the wall holder at the desired fastening point.
2. Mark the 4 boreholes on the panel. In doing so, pay attention to the dimensions → 3, 10.
3. Drill holes for the wall holder.
4. Fasten the wall holder.

5.2.3 Installation with CAS51D sensor

CAUTION

Residual medium and high temperatures

Risk of injury!

- When working with parts that are in contact with the medium, protect against residual medium and elevated temperatures.
- Wear protective goggles and safety gloves.

NOTICE

Turning the sensor inside the flow assembly can cause the sensor tube to untwist and allow liquid penetration.

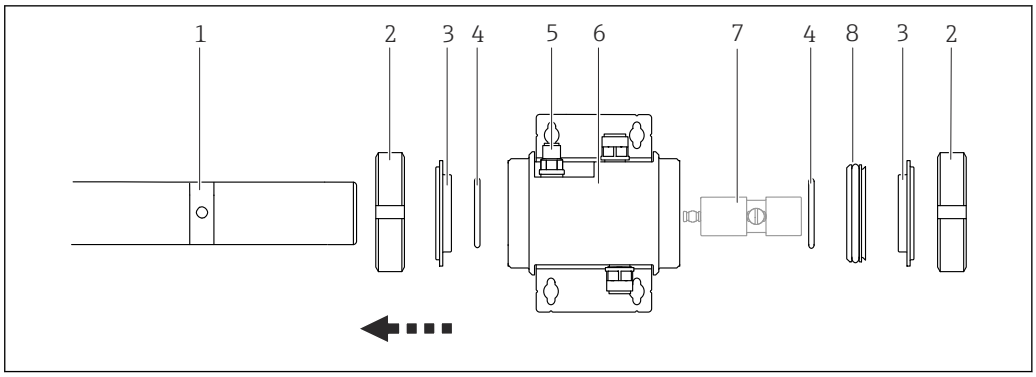
- Only slide the sensor forwards or backwards in the flow assembly along its longitudinal axis.
- Do not turn the sensor.

NOTICE

Lateral forces on the connecting fittings and cleaning connection can result in leakage.

- Connect hoses so that they are straight.

Preferably align the assembly so that the adapter for the cleaning connection (5) is facing upward. This makes it easier for any air remaining in the pipe after cleaning or maintenance to escape.

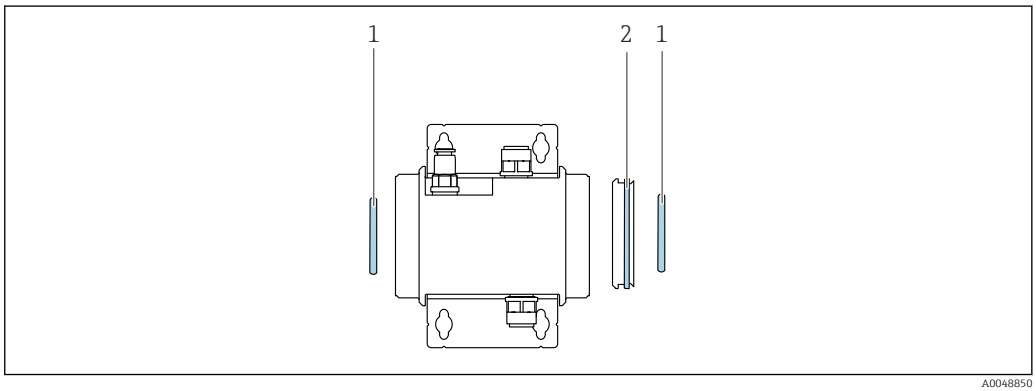


13 *Individual parts of the assembly*

1 *Back of sensor (mounting hole for air distributor)*
2 *Union nut*
3 *Ring*
4 *O-ring*
5 *Adapter for cleaning connection/locking screw*
6 *Flow vessel with wall holder*
7 *Air distributor*
8 *Lock ring with O-ring*

Preparatory steps

- Before use, moisten all O-rings with water or lubricate them with the grease supplied.
  - The O-rings slide more easily over the sensor and do not twist.



14 *Arrangement of the O-rings on the assembly*

1 *O-ring with outer diameter 44.75 mm (1.76 in)(included in scope of delivery)*
2 *O-ring with outer diameter 60.63 mm (2.39 in) on the lock ring*

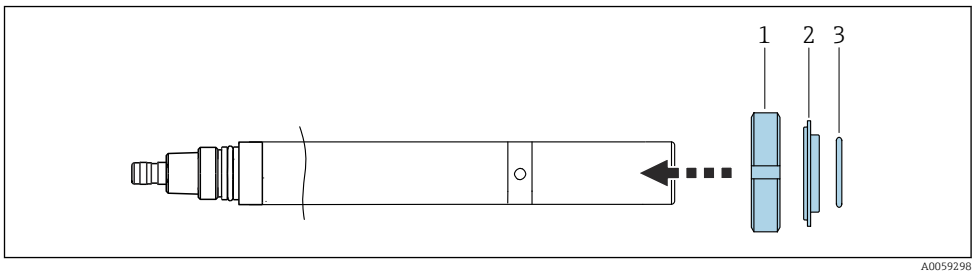
NOTICE

Malfunction due to contamination of the optical window.

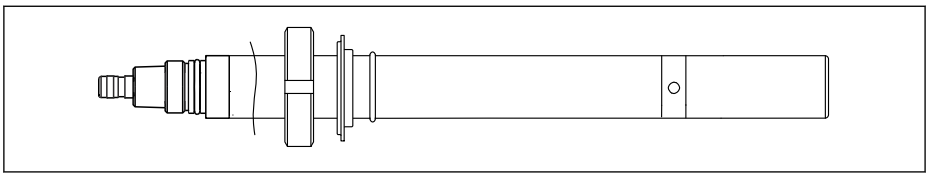
- Make sure that optical windows do not come into contact with grease.

Installation with the CAS51D sensor

1.

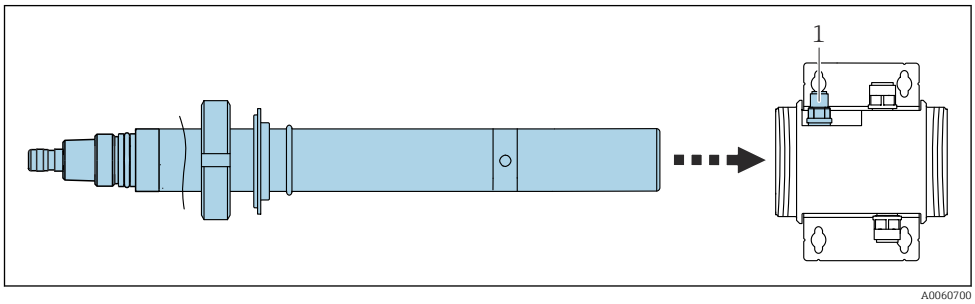


Slide the union nut (1), the ring (2) and the O-ring (3) over the sensor in the specified order.



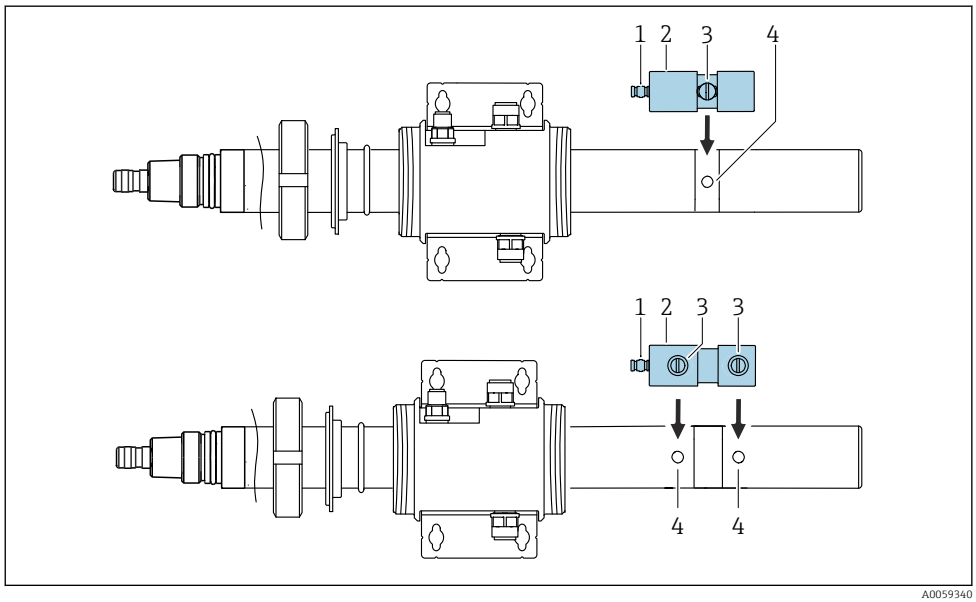
All components are located behind the measurement gap.

2.

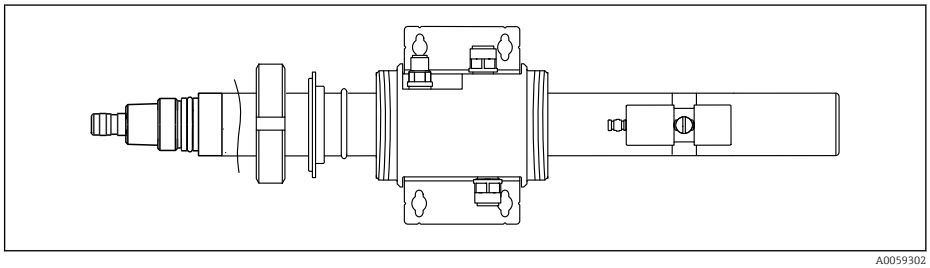


Slide the sensor from the side with the cleaning connection adapter or lock screw (1) through the flow vessel.

3.

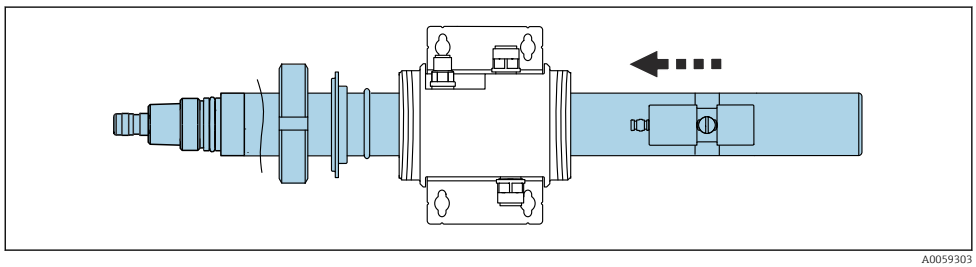


Screw the air distributor (2) onto the sensor using the screws (3). The double nipple (1) must face the direction of the flow vessel. Depending on the measurement gap width, the sensor has one or two holes (4) for fastening the air distributor. Use the appropriate air distributor in each case.



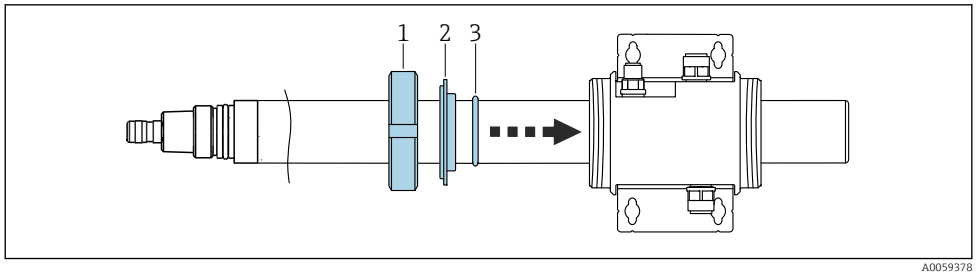
15 *Sensor with installed air distributor*

4.



Slide the sensor back in the direction of the arrow until the air distributor engages.

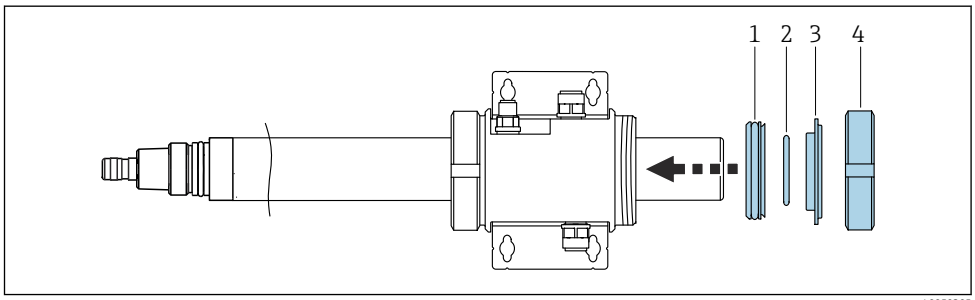
5.



Slide the O-ring (3) and the ring (2) into the flow vessel as far as they will go.

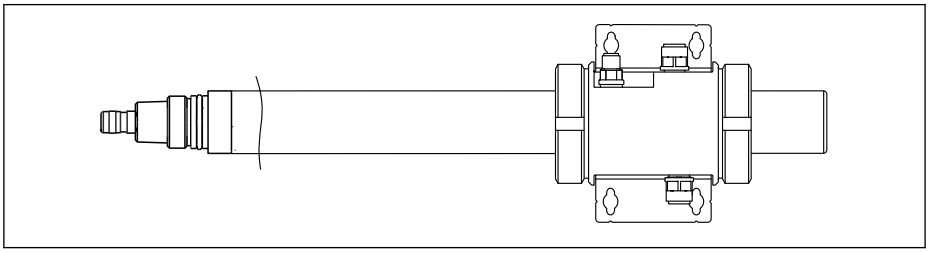
6. Screw the union nut (1) onto the flow vessel.

7.



Insert the lock ring with O-ring (1), the O-ring (2) and the ring (3) into the flow vessel.

8. Screw the union nut (4) onto the flow vessel.



16 *Assembly with installed CAS51D sensor*

5.2.4 Installation with CAS80E sensor

⚠ CAUTION

Residual medium and high temperatures

Risk of injury!

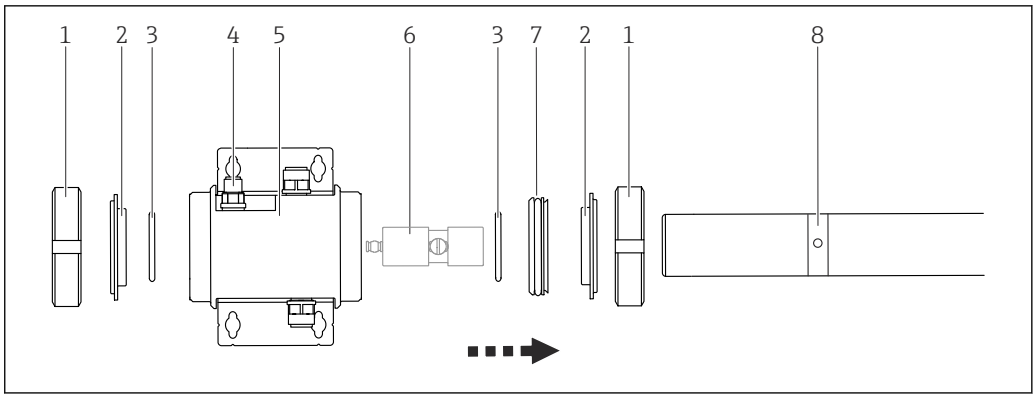
- ▶ When working with parts that are in contact with the medium, protect against residual medium and elevated temperatures.
- ▶ Wear protective goggles and safety gloves.

NOTICE

Turning the sensor inside the flow assembly causes the sensor tube to loosen and allow liquid penetration.

- ▶ Only slide the sensor forwards or backwards in the flow assembly along its longitudinal axis.
- ▶ Do not turn the sensor.

Preferably align the assembly so that the cleaning connection adapter (4) is facing upward. This makes it easier for any air remaining in the pipe after cleaning or maintenance to escape.



17 *Individual parts of the assembly*

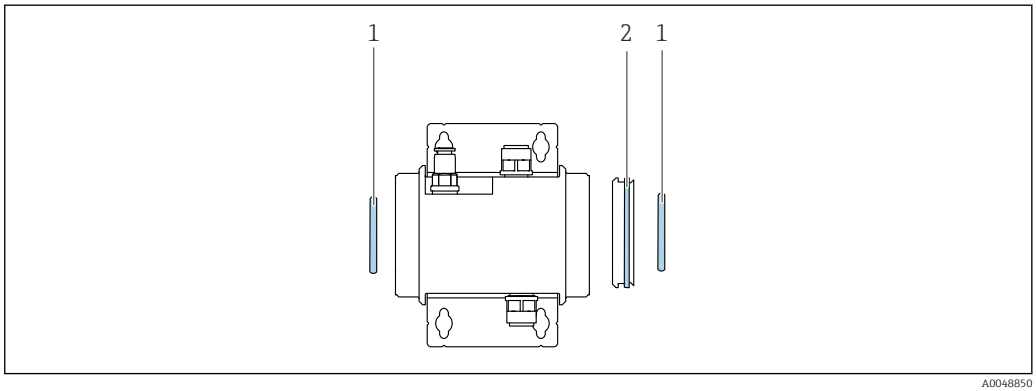
1 *Union nut*
2 *Ring*
3 *O-ring*
4 *Adapter for cleaning connection/locking screw*
5 *Flow vessel with wall holder*
6 *Air distributor*
7 *Lock ring with O-ring*
8 *Back of sensor (mounting hole for air distributor)*

Preparatory steps

1. Wet the O-rings with water or grease them before use.
   ↳ The O-rings slide more easily over the sensor and do not twist.
2. Make sure that optical windows do not come into contact with grease.

Preparatory steps:

- Before use, moisten all O-rings with water or lubricate them with the grease supplied.
  ↳ The O-rings slide more easily over the sensor and do not twist.



18 *Arrangement of the O-rings on the assembly*

1 *O-ring with outer diameter 44.75 mm (1.76 in)(included in scope of delivery)*
2 *O-ring with outer diameter 60.63 mm (2.39 in) on the lock ring*

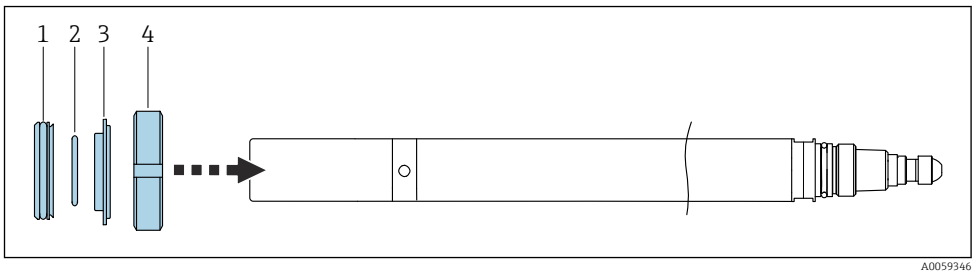
NOTICE

Malfunction due to contamination of the optical window.

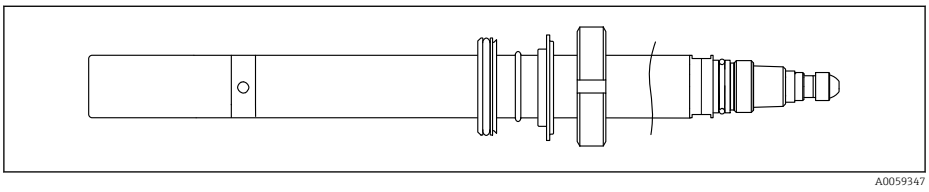
- Make sure that optical windows do not come into contact with grease.

Installation with the CAS80E sensor

1.

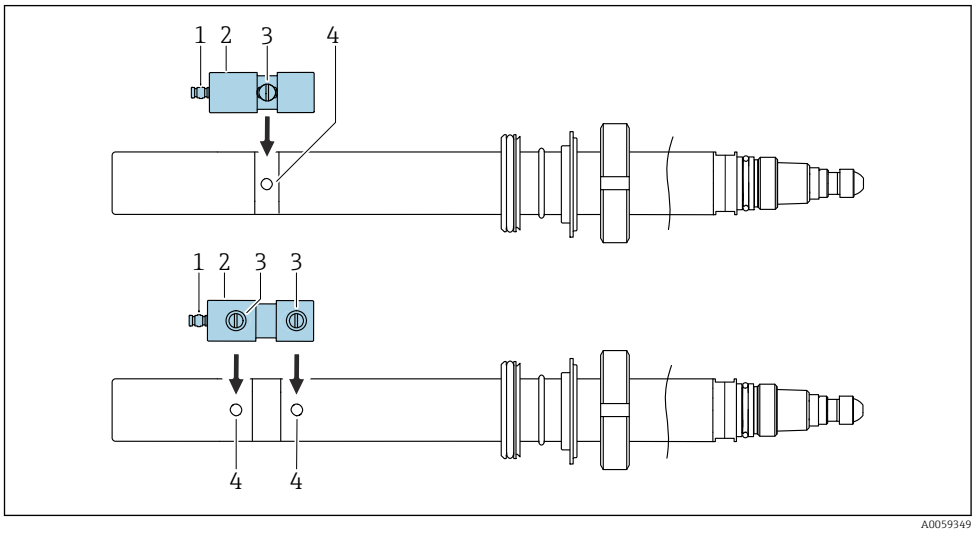


Slide the union nut (4), the ring (3) and the O-ring (2), as well as the lock ring with O-ring (1) over the sensor in the specified order.

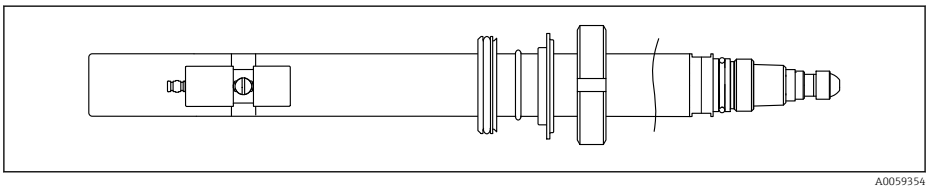


All components are located behind the measurement gap.

2.

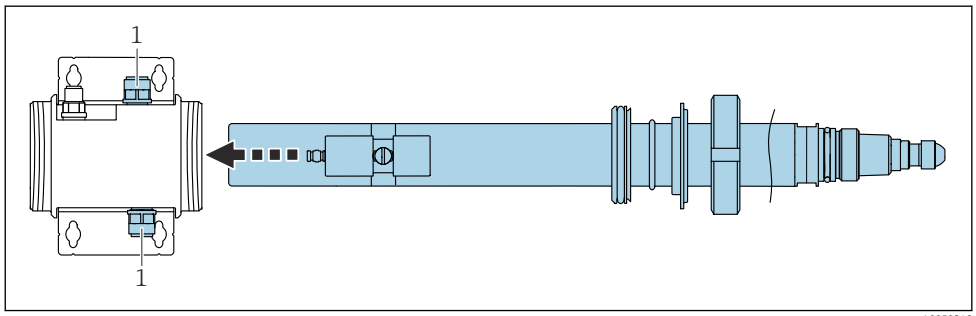


Screw the air distributor (2) onto the sensor using the screws (3). The double nipple (1) must face the direction of the sensor head. Depending on the measurement gap width, the sensor has one or two holes (4) for fastening the air distributor. Use the appropriate air distributor in each case.



19 *Sensor with installed air distributor*

3.



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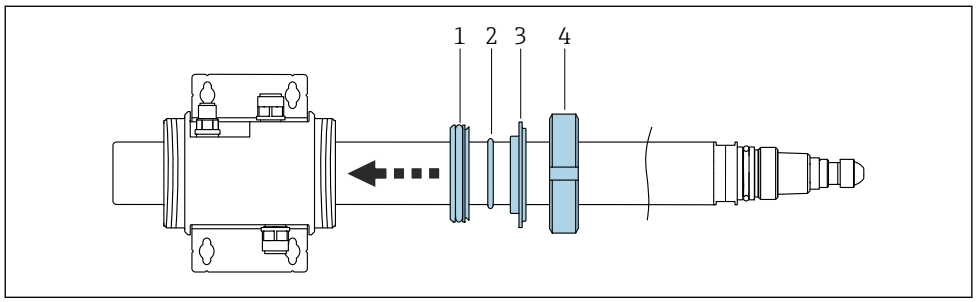
Slide the sensor from the side with the process connections (1) through the mounted flow vessel until the air distributor engages.

4.



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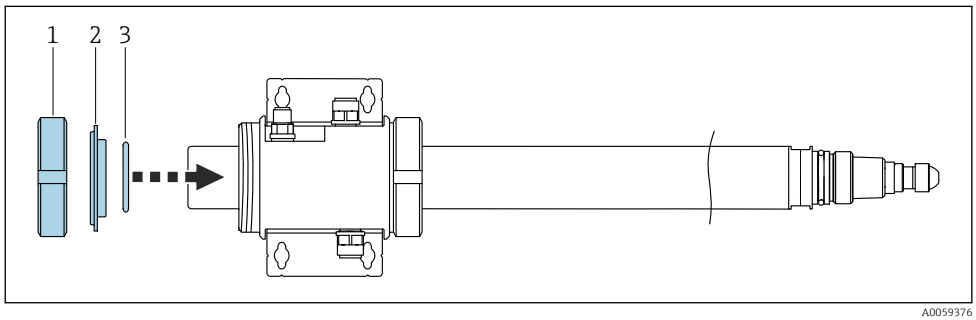
Slide the lock ring (1), the O-ring (2) and the ring (3) into the flow housing.

5. Screw the union nut (4) onto the flow vessel.

6.



A0059376

Insert O-ring (3) and ring (2) into the flow housing.

7. Screw the union nut (1) onto the flow vessel.

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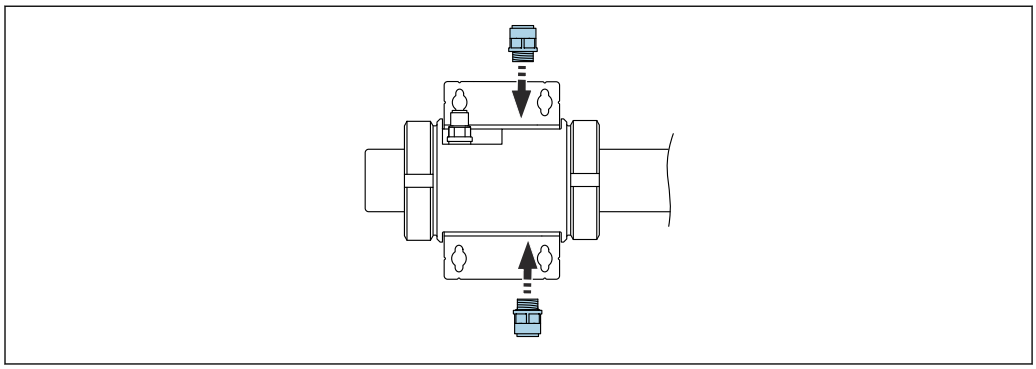
20 Assembly with installed CAS80E sensor

5.3 Install medium inlet and outlet (if not included in scope of supply)



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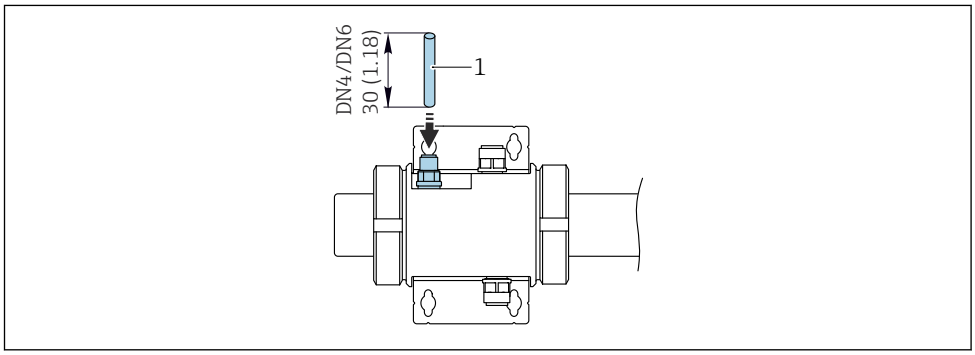
- If the connections for the medium inlet and medium outlet are not included in the scope of delivery, screw in and hand-tighten the threaded connections (G1/4", DN 6/8).

5.4 Installing the cleaning connection (optional)

Installation

1.

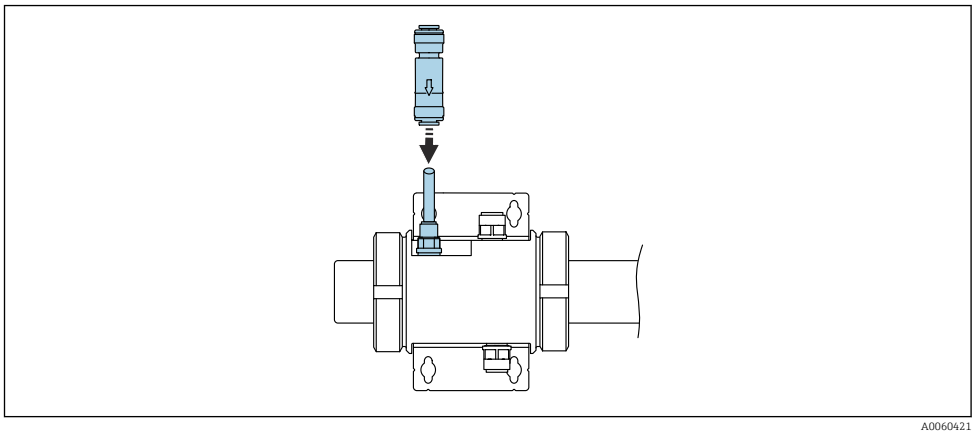


A0060420

1 DN4/DN6 compressed air hose, length 30 mm (1.18 in)

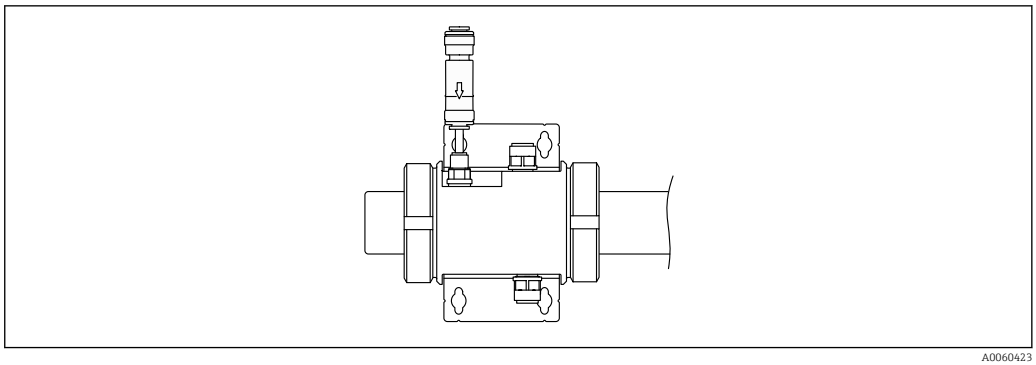
Insert the compressed air hose DN4/DN6, length 30 mm (1.18 in) (not included in scope of delivery) into the connection fitting as far as it will go.

2.



A0060421

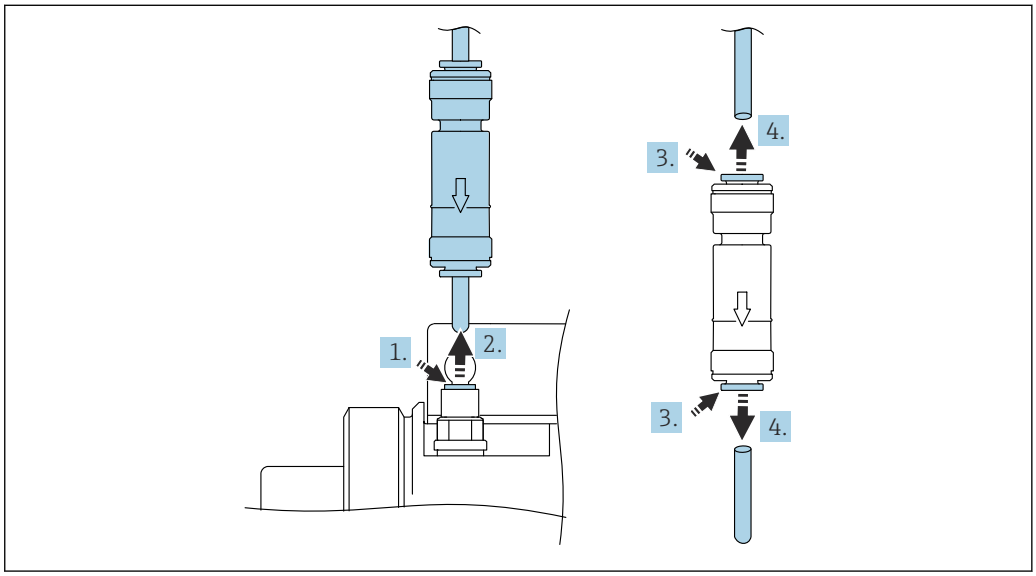
Fit the cleaning connection onto the compressed air hose with the arrow pointing downwards as far as it will go.



A0060423

21 Cleaning connection mounted

Disassembly



A0060424

1. Hold the ring on the connection fitting in the lower position.
2. Pull the cleaning connection off the hose.
3. To remove the hoses from the cleaning connection, push the rings fully into the cleaning connection and hold them there.
4. Remove the hoses.

5.5 Post-installation check

1. After mounting, check all the connections to ensure they are secure.
2. Check the tight sealing of all the seals on the assembly (no leaks).
3. Check whether the sensor is installed and connected correctly.

6 Commissioning

⚠ WARNING

Risk of injury if medium escapes!

- ▶ Before applying pressure to the assembly, ensure that the medium is correctly connected.
- ▶ If the medium connection is not correct, do not introduce the assembly into the process.
- ▶ Before commissioning, check the chemical compatibility of materials, the temperature range and the pressure range.

6.1 Preparatory steps

The flow assembly is optionally fitted with a cleaning connection.

Connect the compressed air hose:

- ▶ Connect a compressed air hose (outer diameter 6 mm (0.24 in)) to the cleaning connection with the connection supplied (G1/8" DN4/6, 6 mm (0.24 in)).

7 Maintenance

⚠ WARNING

Risk of injury if medium or cleaner escapes!

- ▶ Before each maintenance task, ensure that the process pipe is unpressurized, empty and rinsed.
- ▶ Switch off the cleaning unit before the sensor is removed from the medium.

7.1 Maintenance work

⚠ CAUTION

Risk of injury due to residual medium and elevated temperatures!

- ▶ When handling parts that are in contact with the medium, protect against residual medium and elevated temperatures.
- ▶ Wear protective goggles and safety gloves.

7.1.1 Cleaning agent

⚠ WARNING

Organic solvents containing halogens

Limited evidence of carcinogenicity! Dangerous for the environment with long-term effects!

- ▶ Do not use organic solvents that contain halogens.

⚠ WARNING

Thiocarbamide

Harmful if swallowed! Limited evidence of carcinogenicity! Possible risk of harm to the unborn child! Dangerous for the environment with long-term effects!

- ▶ Wear protective goggles, protective gloves and appropriate protective clothing.
- ▶ Avoid all contact with the eyes, mouth and skin.
- ▶ Avoid discharge into the environment.

The most common types of contamination and the cleaning agents used in each case are shown in the following table.

Pay attention to the material compatibility of the materials to be cleaned.

Type of contamination	Cleaning agent
Greases and oils	Hot water or tempered (alkaline) agents containing surfactants or water-soluble organic solvents (e.g. ethanol)
Limescale deposits, metal hydroxide buildup, lyophobic biological buildup	Approx. 3% hydrochloric acid Max. 10% phosphoric acid
Sulfide deposits	Mixture of 3% hydrochloric acid and thiocarbamide (commercially available) Max. 10% phosphoric acid
Protein buildup	Mixture of 3% hydrochloric acid and pepsin (commercially available) Max. 10% phosphoric acid
Fibers, suspended substances	Pressurized water, possibly surface-active agents
Light biological buildup	Pressurized water

▶ Choose a cleaning agent to suit the degree and type of soiling.

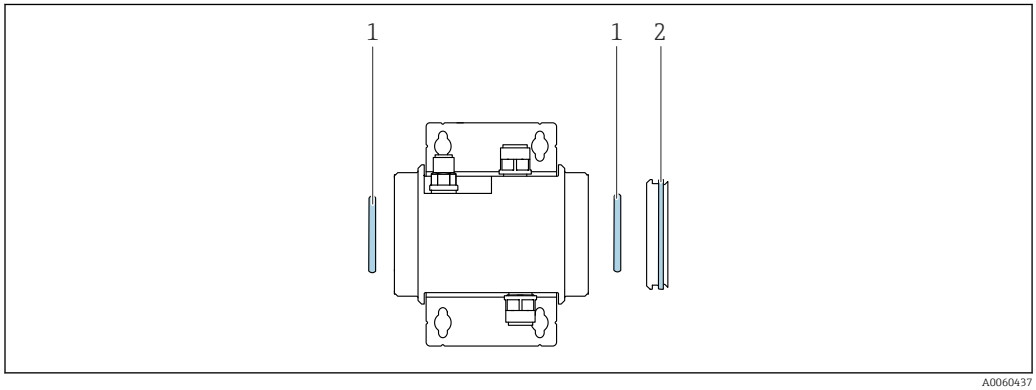
7.1.2 Cleaning the assembly

To ensure stable and reliable measurements, the assembly and the sensor must be cleaned regularly. The frequency and intensity of the cleaning depend on the medium.

1. Remove the sensor.
2. Clean the assembly depending on the degree of fouling.
3. Remove light dirt and fouling using suitable cleaning agents → 25.
4. Remove heavy soiling using a soft brush and a suitable cleaning agent.
5. For very persistent dirt, soak the parts in a cleaning solution.
6. After soaking the parts, clean them with a brush.

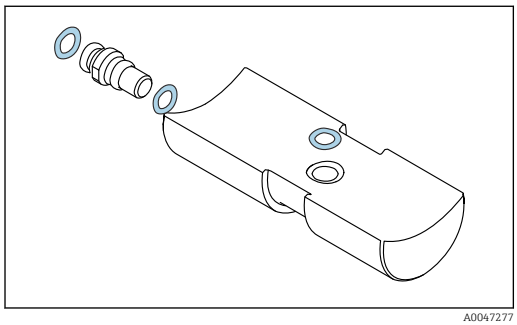
A typical cleaning interval for drinking water, for example, is 6 months.

7.1.3 Replacing the O-rings

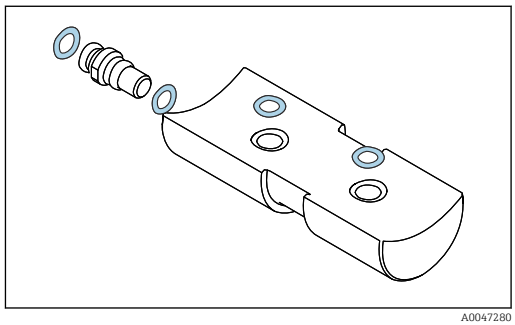


22 *O-rings on assembly*

1 O-ring
2 O-ring on lock ring



23 *O-rings on air distributor with one mounting hole*



24 *O-rings on air distributor with 2 mounting holes*

The air distributor for the sensors with a gap width of 40 mm (1.57 in) or 50 mm (1.97 in) has 2 mounting holes, each with an O-ring. It is recommended to replace the O-rings annually.

1. Replace the O-rings at regular intervals.
2. Ensure the appropriate process conditions are in place.

8 Repair

8.1 General notes

The repair and conversion concept provides for the following:
- The product has a modular design
- Spare parts are grouped into kits which include the associated kit instructions
- Only use original spare parts from the manufacturer
- Repairs are carried out by the manufacturer's Service Department or by trained users
- Certified devices can only be converted to other certified device versions by the manufacturer's Service Department or at the factory
- Observe applicable standards, national regulations, Ex documentation (XA) and certificates

1. Carry out the repair according to the kit instructions.
2. Document the repair and conversion and enter, or have entered, in the Life Cycle Management tool (W@M).

8.2 Spare parts

Spare parts currently available for the device can be found at:
www.endress.com/onlinetools

▶ Quote the serial number of the device when ordering spare parts.

8.3 Return

The product must be returned if repairs or a factory calibration are required, or if the wrong product was ordered or delivered. As an ISO-certified company and also due to legal regulations, Endress+Hauser is obliged to follow certain procedures when handling any returned products that have been in contact with medium.

www.endress.com/support/return-material

8.4 Disposal

▶ Observe the local regulations.

9 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.

9.1 Device-specific accessories

Process connection: POM G1/4" DN6/8

10 Technical data

10.1 Environment

10.1.1 Ambient temperature range

0 to 60 °C (32 to 140 °F)

10.2 Process

10.2.1 Process temperature range

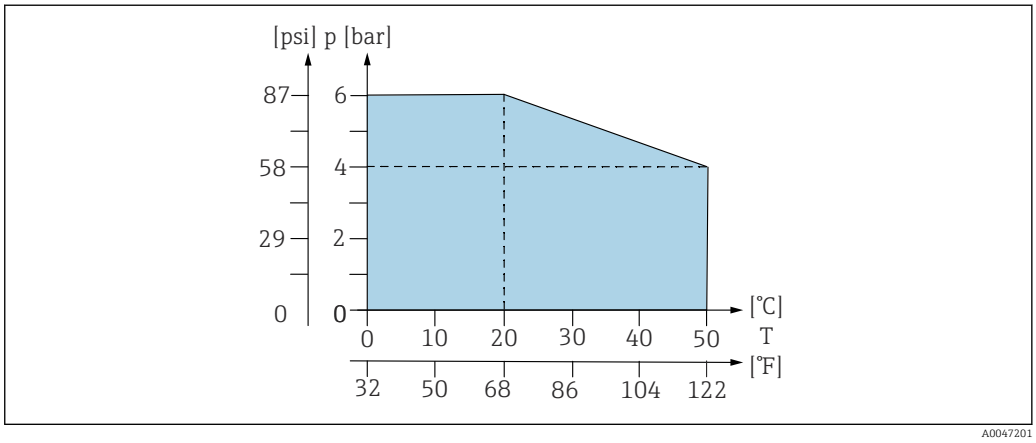
0 to 50 °C (32 to 122 °F)

10.2.2 Process pressure range

At 20 °C (68 °F)
Maximum 6 bar (87 psi)

At 50 °C (122 °F)
Maximum 4 bar (58 psi)

10.2.3 Pressure-temperature ratings



25 Pressure/temperature ratings

10.2.4 Flow limit

The flow limit depends on the sensor used and its properties. The data are based on water.

- At least 0.1 l/h (0.026 gal/h)
- Maximum 10 l/h (2.64 gal/h)

10.3 Mechanical construction

10.3.1 Dimensions

→ Section "Installation"

10.3.2 Weight

1.48 kg (3.26 lb)

10.3.3 Materials

Wetted material

Specifications apply for the standard version.

Housing:	POM-C
O-rings:	EPDM
Process connections, rinse connection (optional)	POM
Other parts:	Stainless steel 1.4404, PTFE

10.3.4 Process connections

Standard version:

Medium inlet:	Thread G1/4" Preassembled process connection (optional): ▪ Thread G1/4" ▪ Hose connection DN6/8 (for hoses with outer diameter 8 mm (0.31 in) ▪ Material: POM
Medium outlet:	Thread G1/4" Preassembled process connection (optional): ▪ Thread G1/4" ▪ Hose connection DN6/8 (for hoses with outer diameter 8 mm (0.31 in) ▪ Material: POM
Rinse connection:	Preassembled cleaning connection (optional): ▪ Thread G1/8" ▪ Hose connection DN4/6 (for hoses with outer diameter 6 mm (0.24 in) ▪ Material: POM

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