

# Operating Instructions

## Memosens Wave CKI50

Process spectrometer for the measurement of color








# Table of contents









<b>1</b>	<b>About this document</b> .....	<b>4</b>	<b>11</b>	<b>Repair</b> .....	<b>36</b>
1.1	Warnings .....	4	11.1	General notes .....	36
1.2	Symbols .....	4	11.2	Spare parts .....	36
1.3	Symbols on the device .....	4	11.3	Return .....	36
1.4	Documentation .....	5	11.4	Disposal .....	36
<b>2</b>	<b>Basic safety instructions</b> .....	<b>6</b>	<b>12</b>	<b>Technical data</b> .....	<b>38</b>
2.1	Requirements of the personnel .....	6	12.1	Input .....	38
2.2	Intended use .....	6	12.2	Performance characteristics .....	38
2.3	Occupational safety .....	6	12.3	Environment .....	39
2.4	Operational safety .....	6	12.4	Process .....	39
2.5	Product safety .....	7	12.5	Mechanical construction .....	40
<b>3</b>	<b>Product description</b> .....	<b>8</b>	<b>Index</b> .....		<b>41</b>
3.1	Product design .....	8			
3.2	Measuring principle .....	8			
<b>4</b>	<b>Incoming acceptance and product identification</b> .....	<b>10</b>			
4.1	Incoming acceptance .....	10			
4.2	Product identification .....	10			
4.3	Scope of delivery .....	11			
4.4	Certificates and approvals .....	11			
<b>5</b>	<b>Mounting the device</b> .....	<b>12</b>			
5.1	Mounting requirements .....	12			
5.2	Mounting the process spectrometer .....	15			
5.3	Post-installation check .....	16			
<b>6</b>	<b>Electrical connection</b> .....	<b>17</b>			
6.1	Connecting the device .....	17			
6.2	Ensuring the degree of protection .....	19			
6.3	Post-connection check .....	20			
<b>7</b>	<b>Commissioning</b> .....	<b>21</b>			
7.1	Preparations .....	21			
7.2	Function check .....	21			
<b>8</b>	<b>Operation</b> .....	<b>22</b>			
8.1	Adapting the measuring device to the process conditions .....	22			
<b>9</b>	<b>Diagnostics and troubleshooting</b> ...	<b>24</b>			
9.1	General troubleshooting .....	24			
<b>10</b>	<b>Maintenance</b> .....	<b>25</b>			
10.1	Maintenance work .....	25			

# 1 About this document

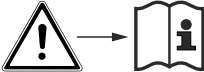
## 1.1 Warnings

Structure of information	Meaning
 <b>DANGER</b> <b>Causes (/consequences)</b> If necessary, Consequences of non-compliance (if applicable) <ul style="list-style-type: none"> <li>▶ Corrective action</li> </ul>	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation <b>will</b> result in a fatal or serious injury.
 <b>WARNING</b> <b>Causes (/consequences)</b> If necessary, Consequences of non-compliance (if applicable) <ul style="list-style-type: none"> <li>▶ Corrective action</li> </ul>	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation <b>can</b> result in a fatal or serious injury.
 <b>CAUTION</b> <b>Causes (/consequences)</b> If necessary, Consequences of non-compliance (if applicable) <ul style="list-style-type: none"> <li>▶ Corrective action</li> </ul>	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or more serious injuries.
<b>NOTICE</b> <b>Cause/situation</b> If necessary, Consequences of non-compliance (if applicable) <ul style="list-style-type: none"> <li>▶ Action/note</li> </ul>	This symbol alerts you to situations which may result in damage to property.

## 1.2 Symbols

Symbol	Meaning
	Additional information, tips
	Permitted or recommended
	Recommended
	Not permitted or not recommended
	Reference to device documentation
	Reference to page
	Reference to graphic
	Result of a step

## 1.3 Symbols on the device

Symbol	Meaning
	Reference to device documentation

## 1.4 Documentation

The following manuals, which complement these Operating Instructions, can be found on the product pages on the Internet:



Technical Information Memosens Wave CKI50, TI01431C



Operating Instructions Liquiline CM44P, BA01954C


In addition to the Operating Instructions and depending on the relevant approval, XA "Safety instructions" are supplied with sensors for the hazardous area.

- ▶ Please follow the XA instructions when using the device in the hazardous area.

## 2 Basic safety instructions

### 2.1 Requirements of the 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 process spectrometer is used for the in-line analysis of liquids. It is used to detect color using VIS spectroscopy (VIS = visible). The device can measure and determine color, color variations or the accuracy of the color in liquids.

Use of the device for any purpose other than that described, poses a threat to the safety of people and of the entire measuring system and is therefore not permitted.

The manufacturer is not liable for damage caused by improper or non-designated use.

### 2.3 Occupational safety

As the user, you are responsible for complying with the following safety conditions:

- Installation guidelines
- Local standards and regulations
- Regulations for explosion protection

#### **Electromagnetic compatibility**

- The product has been tested for electromagnetic compatibility in accordance with the applicable international standards for industrial applications.
- The electromagnetic compatibility indicated applies only to a product that has been connected in accordance with these Operating Instructions.

### 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.
3. Do not operate damaged products, and protect them against unintentional operation.
4. Label damaged products as defective.

#### **During operation:**

- ▶ If faults cannot be rectified:  
products must be taken out of service and protected against unintentional operation.

**⚠ CAUTION****Programs not switched off during maintenance activities.**

Risk of injury due to medium or cleaning agent!

- ▶ Quit any programs that are active.
- ▶ Switch to the service mode.
- ▶ If testing the cleaning function while cleaning is in progress, wear protective clothing, goggles and gloves or take other suitable measures to protect yourself.

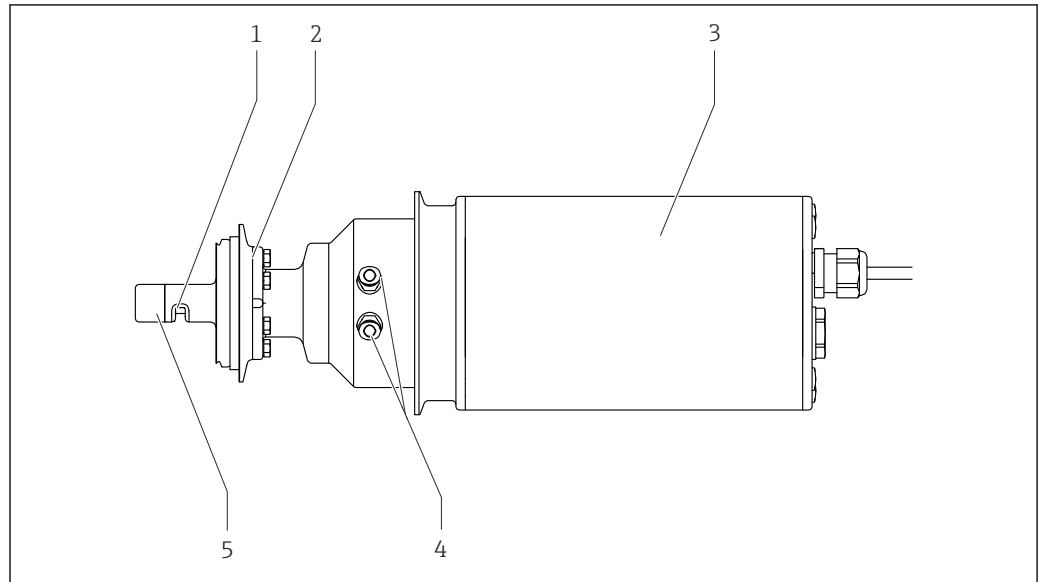
## 2.5 Product safety

### 2.5.1 State of the art


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



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 1 Process spectrometer CKI50

- 1 Measurement gap
- 2 Process connection
- 3 Electronics unit
- 4 Cooling connections for water cooling
- 5 Measuring head

The process spectrometer can be operated directly in-line without any additional sampling.

All the necessary modules are contained in the electronics unit:

- Power supply
- Light sources
- Spectrometer
  - Receives the measurement signals, digitalizes them and converts them to a measurement value.
- Microcontroller
  - Responsible for controlling internal processes and transmitting data.
- Processor unit

The process spectrometer contains the following light source:

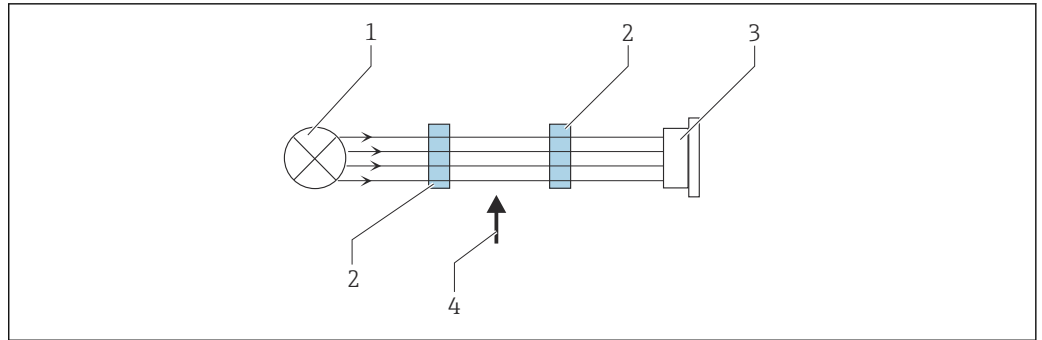
Halogen bulb: 380 to 830 nm

### 3.2 Measuring principle

The process spectrometer uses optical signals to analyze the medium. Information about the medium is then output as measurement parameters. The transmitter displays the measurement parameters. These are used to monitor or directly control a process.

The process spectrometer measures the portion of the sample that is located in the measurement gap of the measuring head. The sample is illuminated with light and an interaction takes place between the sample and the introduced light. The transmitted light is collected again via the observation window and analyzed in the electronics unit. The spectrum of the collected light is then analyzed and the corresponding measurement parameter is calculated.





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2 Absorption measurement

- 1 Light source
- 2 Optical windows
- 3 Detector
- 4 Direction of medium flow

A light source sends a beam of light through the medium via the optical windows. The incident light beam is measured on the detector side → 2, 9.

### 3.2.1 Light absorption

The measuring principle is based on the Lambert-Beer law.

There is a linear dependency between the absorption of light and the concentration of the absorbing substance:

$$A = -\log_{10} (I/I_0) = \epsilon \cdot c \cdot OPL$$

A	Absorption
I	Intensity of received light at detector
I <sub>0</sub>	Intensity of transmitted light of light source
ε	Extinction coefficient
c	Concentration
OPL	Optical path length

## 4 Incoming acceptance and product identification

### 4.1 Incoming acceptance

1. Verify that the packaging is undamaged.
  - ↳ Notify the supplier of any damage to the packaging.  
Keep the damaged packaging until the issue has been resolved.
2. Verify that the contents are undamaged.
  - ↳ Notify the supplier of any damage to the delivery contents.  
Keep the damaged goods until the issue has been resolved.
3. Check that the delivery is complete and nothing is missing.
  - ↳ Compare the shipping documents with your order.
4. Pack the product for storage and transportation in such a way that it is protected against impact and moisture.
  - ↳ The original packaging offers the best protection.  
Make sure to comply with the permitted ambient conditions.

If you have any questions, please contact your supplier or your local Sales Center.

### 4.2 Product identification

#### 4.2.1 Nameplate

The nameplate provides you with the following information on your device:

- Manufacturer identification
  - Extended order code
  - Serial number
  - Safety information and warnings
- ▶ Compare the information on the nameplate with the order.

#### 4.2.2 Identifying the product

##### Product page

[www.endress.com/cki50](http://www.endress.com/cki50)

##### 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](http://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 fill information pertaining to your device, including the product documentation.

**Manufacturer address**

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

**4.3 Scope of delivery**

The scope of delivery comprises:

- 1 process spectrometer, version as ordered
- 1 USB stick
- 1 x Operating Instructions
- Safety instructions for hazardous areas (for devices with hazardous area approval)

**4.4 Certificates and approvals**

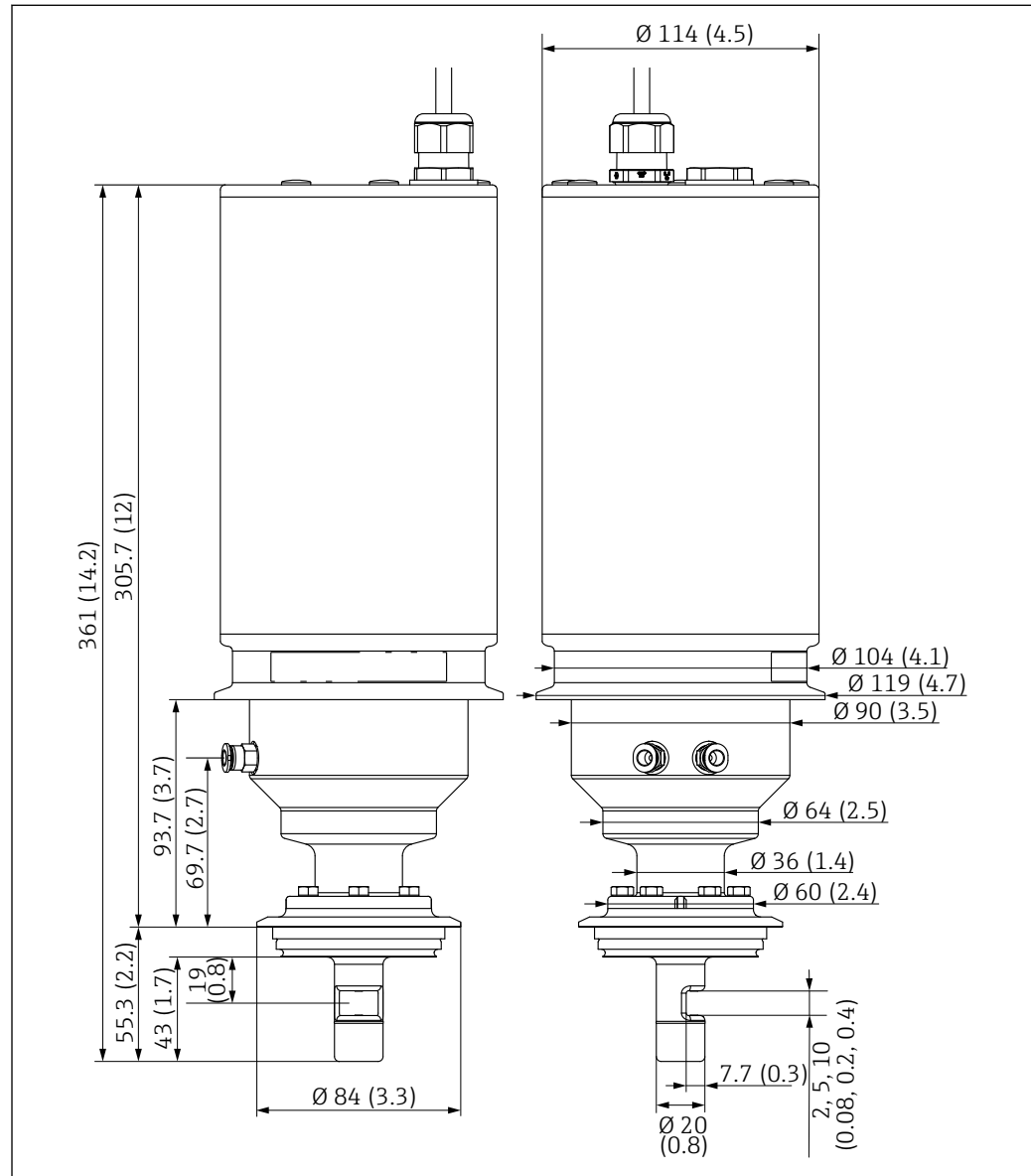
Current certificates and approvals for the product are available at [www.endress.com](http://www.endress.com) on the relevant product page:

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

## 5 Mounting the device

### 5.1 Mounting requirements

#### 5.1.1 Dimensions



3 Dimensions of CKI50. Dimensions: mm (in)

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#### 5.1.2 Mounting instructions

##### **⚠ WARNING**

##### **Escaping process medium**

Risk of injury from high pressure, high temperatures or chemical hazards!

- ▶ Only mount the device if the pipes are empty and unpressurized.
- ▶ Wear protective gloves, protective goggles and protective clothing.

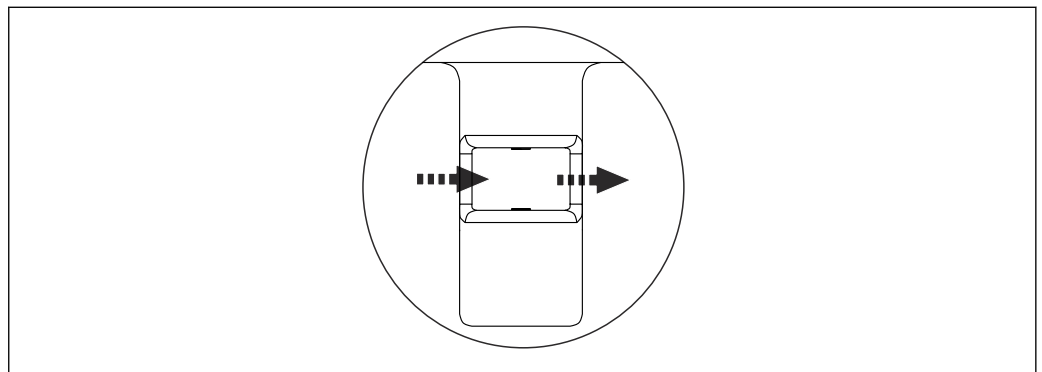
**⚠ WARNING**

**Device not securely fitted**

Risk of injury from falling device parts!

- ▶ Fasten and secure the device sufficiently.
- Choose a mounting location that can be easily accessed at a later stage. Installation in a bypass is particularly suitable for this.
- Install the device upstream from the pressure regulators. The operation of the device under pressure helps prevent the formation of air or gas bubbles.
- Install the device in places with uniform flow conditions.
- Install the device in places with low vibration.
- Do not install the process spectrometer in places where air may collect and foam bubbles form or where suspended particles may settle.
- Align the device so that the measurement gap is rinsed by the flow of medium.
- Install the device so that it can be cleaned in the process.

**5.1.3 Orientation**



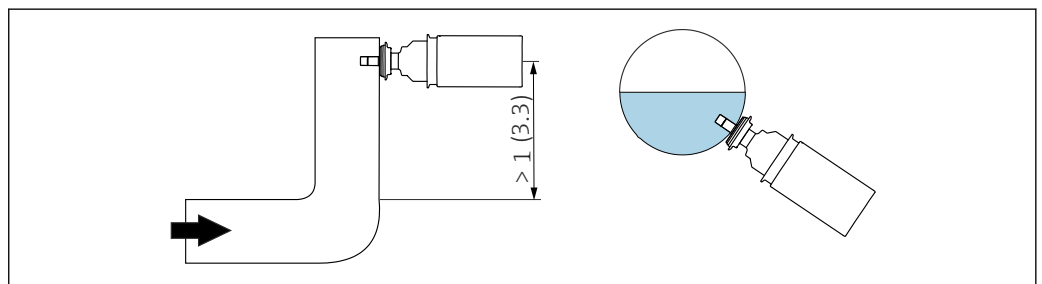
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4 Flow direction of the medium (arrows)

- ▶ Align the device in such a way that the medium flows through the measurement gap.

**i** To align the device, pay attention to the orientation → 13 and the installation marking on the process connection → 7, 14.

**Orientation in pipes**

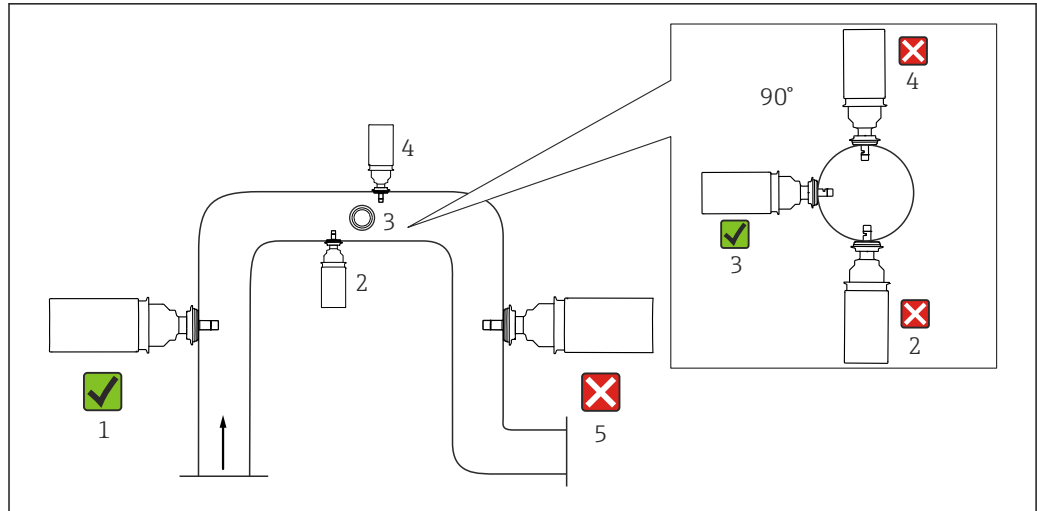


A0041393

5 Orientation of process spectrometer and flow direction (arrows). Engineering unit: m (ft)

Changes in the flow direction after pipe bends can cause turbulence in the medium.

The distance between the process spectrometer and a pipe bend must be at least 1 m (3.28 ft).

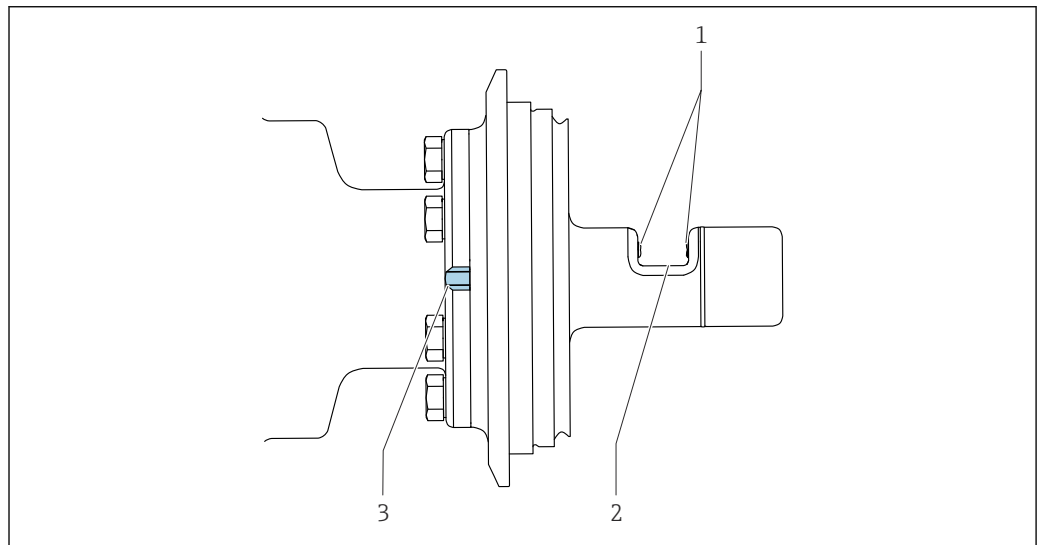


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6 Permitted and forbidden orientations in a pipe

The best installation location is in the ascending pipe (item 1).

### 5.1.4 Installation marking



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7 Installation marking for alignment

- 1 Optical windows
- 2 Measurement gap
- 3 Installation marking

The installation markings are located on both sides of the process connection.

- Align the process spectrometer so that the installation markings follow the flow direction.

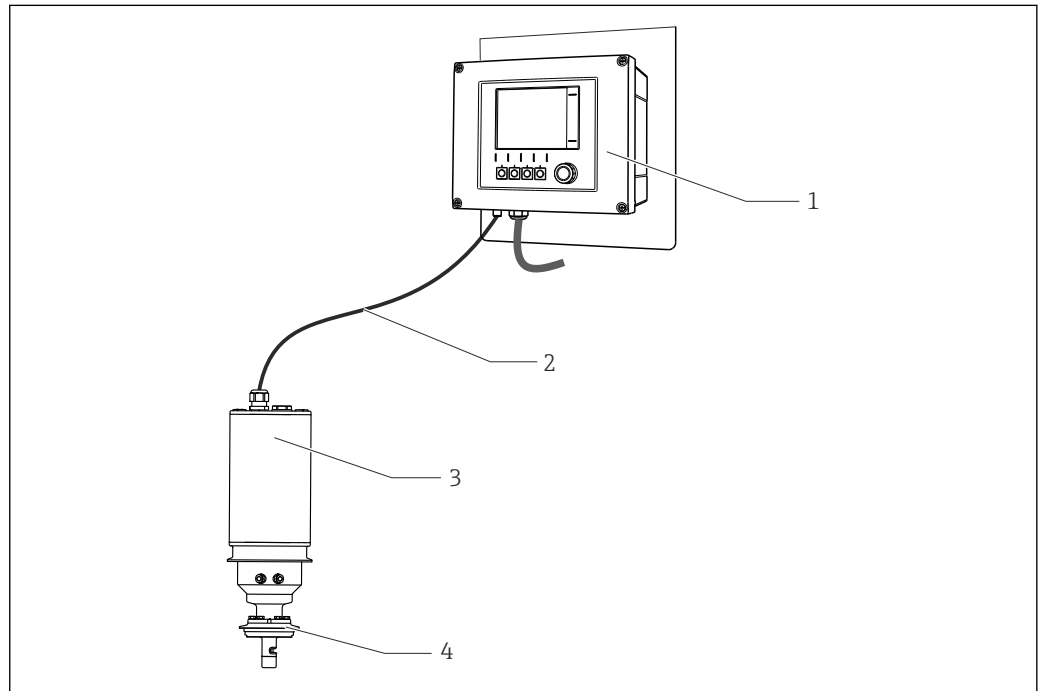
## 5.2 Mounting the process spectrometer

### 5.2.1 Measuring system


The complete measuring system comprises at least:

- Process spectrometer CKI50
- Liquiline CM44P transmitter
- Process connection Varivent N DN50 - 125 immersion depth 68 mm (2.7 in) (included in the delivery)

 Pay attention to the specifications for the process connection Varivent N DN50 - 125.

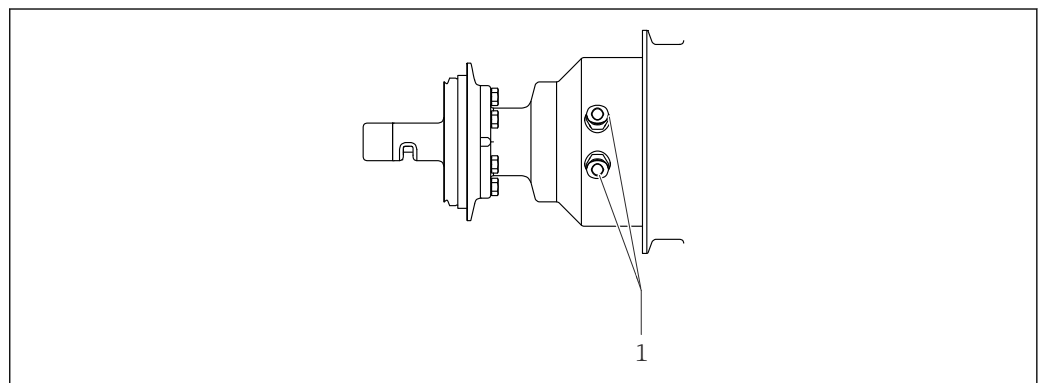


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 8 Example of a measuring system with a process spectrometer

- 1 Liquiline CM44P transmitter
- 2 Fixed cable (15 m (49.2 ft))
- 3 Process spectrometer CKI50
- 4 Process connection

### 5.2.2 Water cooling




A0044153

 9 Process spectrometer

- 1 Cooling connections for water cooling

There are cooling connections on the device for water cooling. These connections prevent the device from overheating due to the heat flow of the process.

1. Ensure the connecting requirements are met for water cooling →  39.
2. If necessary, connect the water cooling to the process spectrometer.

### 5.3 Post-installation check

Put the device into operation only if you can answer "yes" to the following questions:

- Are the device and cable undamaged?
- Is the orientation correct?
- Has the process spectrometer been installed with the process connection, and does not suspend freely from the cable?
- Are all screws secured?



## 6 Electrical connection

### **⚠ WARNING**

#### **Device is live!**

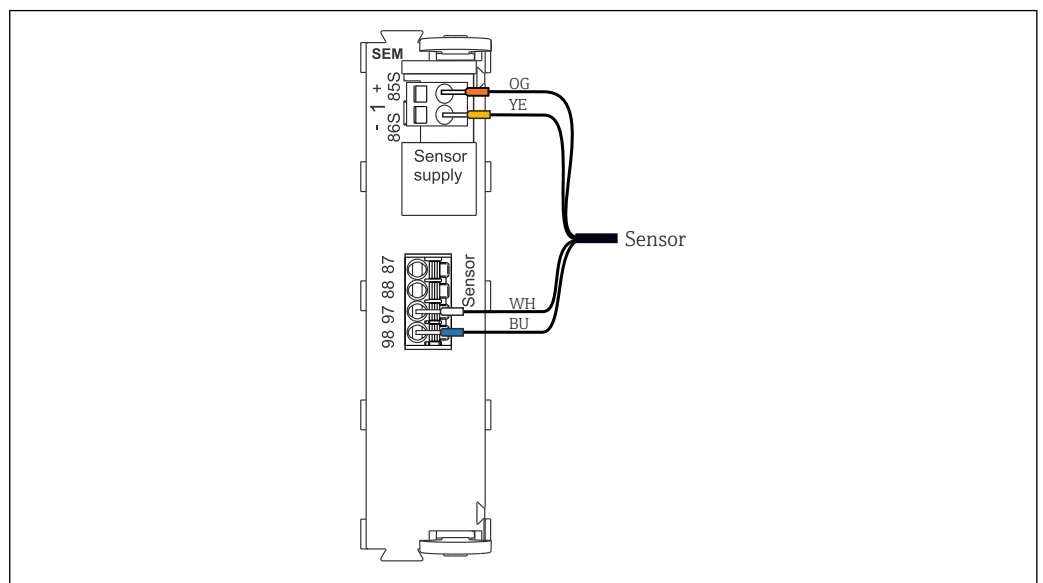
Incorrect connection may result in injury or death!

- ▶ 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.

### 6.1 Connecting the device

The device can be connected as follows:

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



10 Connection of the process spectrometer to the input

A0041609

The cable length is 15 m (49.2 ft).

### **NOTICE**

**Incorrect connection of the cables can result in uncontrolled energy transmission!**

- ▶ Ensure the cables are connected at the correct input point on the transmitter.

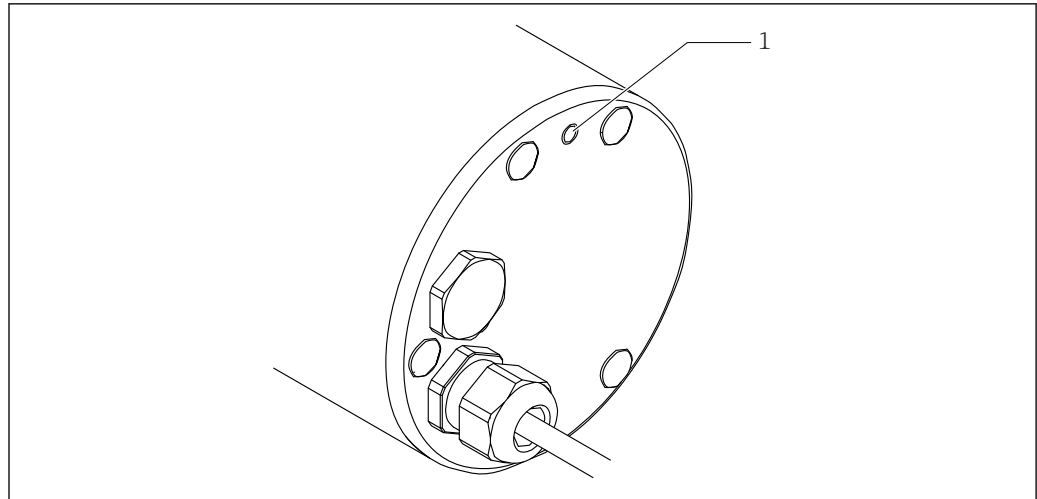
#### 6.1.1 Ground connection

### **⚠ CAUTION**


#### **Ground connection not connected correctly**

Uncontrolled voltage transmission on the device housing!

- ▶ Properly connect the ground connection to the device housing.
- ▶ For grounding, only use the screw provided for the ground connection.




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 11 Cover of the process spectrometer

1 Ground connection

This is an absolute requirement for devices with hazardous area approval →  11.

The ground connection is located on the cover of the device. An M4 thread is provided there for connecting the grounding cable. The ground cable diameter must be at least  $4 \text{ mm}^2$  ( $0.16 \text{ in}^2$ ). The ground cable must be conductively connected to the cover by means of a cable lug.

 Connecting the process spectrometer to the pipe means that the device can also be connected electrically to this pipe.

1. Hold the cable lug against the bore hole of the ground connection.
2. Insert the screw through the bore hole of the cable lug.
3. Screw the cable lug onto the housing cover.
4. Tighten the screw with an Allen key.
5. Connect the ground cable to the cable lug on the housing cover.
  - ↳ The grounding connection is established.

Do not open the cable glands.

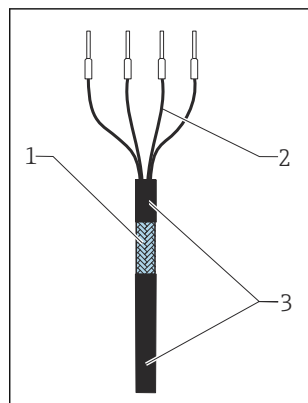
### 6.1.2 Connecting the cable shield

Device cable must be shielded cables.

 Only use terminated original cables where possible.

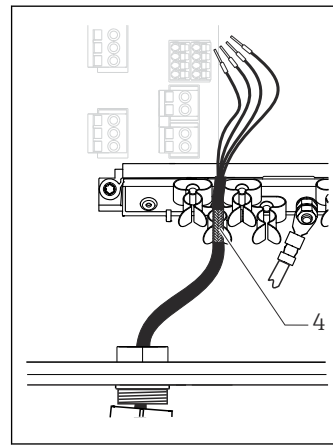
Clamping range of cable clamps: 4 to 11 mm (0.16 to 0.43 in)

Cable sample (does not necessarily correspond to the original cable supplied)



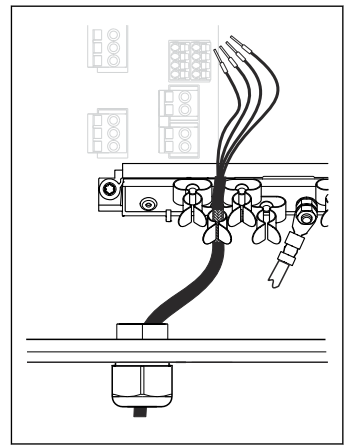
12 Terminated cable

- 1 Outer shield (exposed)
- 2 Cable cores with ferrules
- 3 Cable sheath (insulation)



13 Connect the cable to the grounding clamp

- 4 Grounding clamp



14 Press the cable into the grounding clamp

The cable shield is grounded using the grounding clamp <sup>1)</sup>

1) Please note the instructions in the "Ensuring the degree of protection" section

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.

## 6.2 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 established 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, explosion protection) can no longer be guaranteed if, for example:


- Covers are left off
- 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)
- Cables/cable ends are loose or insufficiently tightened
- Cable strands that may be conductive are left in the device

### 6.3 Post-connection check

Device health and specifications	Action
Is the outside of the spectrometer, assembly or cable free from damage?	▶ Perform a visual inspection.
Electrical connection	Action
Are the mounted cables strain-relieved and not twisted?	▶ Perform a visual inspection. ▶ Untwist the cables.
Is a sufficient length of the cable cores stripped, and are the cores positioned in the terminal correctly?	▶ Perform a visual inspection. ▶ Pull gently to check they are seated correctly.
Are the power supply and signal lines correctly connected?	▶ Refer to the wiring diagram for the transmitter.
Are all screw terminals tightened?	▶ Tighten the screw terminals.
Are all the cable entries installed, tightened and leak-tight?	▶ Perform a visual inspection. In the case of lateral cable entries:
Are all cable entries mounted on the side or pointing downwards?	▶ Point cable loops downward so that water can drip off.

## 7 Commissioning

### 7.1 Preparations

- ▶ To ensure high measurement accuracy, observe the warm-up time of the process spectrometer before commissioning: 25 °C (77 °F), 1013 hPa (15 psi), 5 hours warm-up time →  38.


### 7.2 Function check

 **WARNING**

**Escaping process medium**

Risk of injury from high pressure, high temperatures or chemical hazards!

- ▶ Check the connections to ensure they are sealed tightly.
- ▶ Wear protective gloves, protective goggles and protective clothing.

-  Prior to initial commissioning, ensure that:
  - The process spectrometer has been installed correctly
  - The electrical connection is correct

## 8 Operation

### 8.1 Adapting the measuring device to the process conditions

#### 8.1.1 Recording the reference spectrum

A reference spectrum must be created for reference measurements. All the subsequent measurements are then calculated in relation to the reference spectrum.

- ▶ Measure a spectrum of a uniform and transparent medium (zero solution), e.g. distilled water.

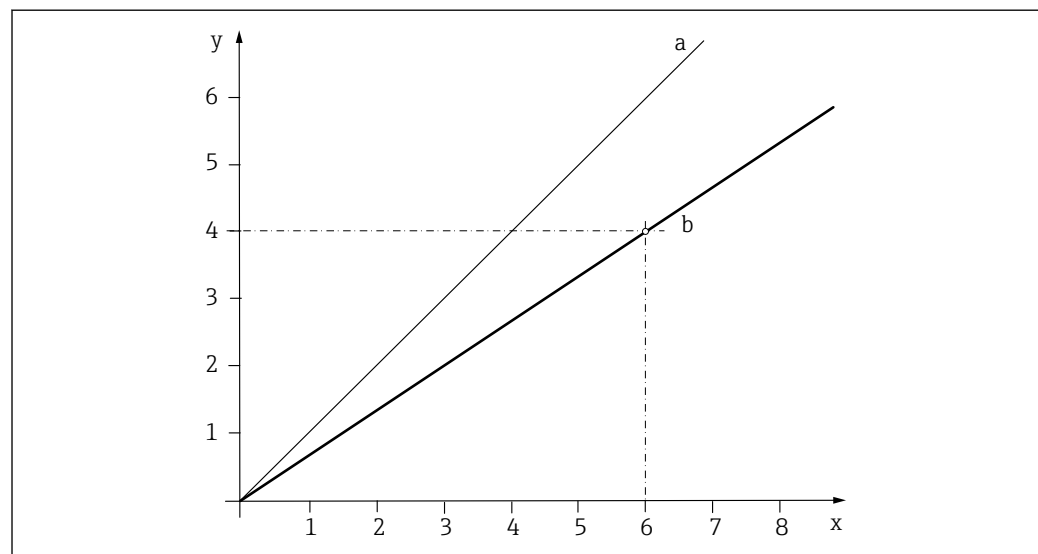


For detailed information on the settings on the CM44P transmitter, see BA01954C

#### 8.1.2 Calibration

##### One-point calibration

The measured error between the measured value of the device and the laboratory measured value is too large. This is corrected by a 1-point calibration.



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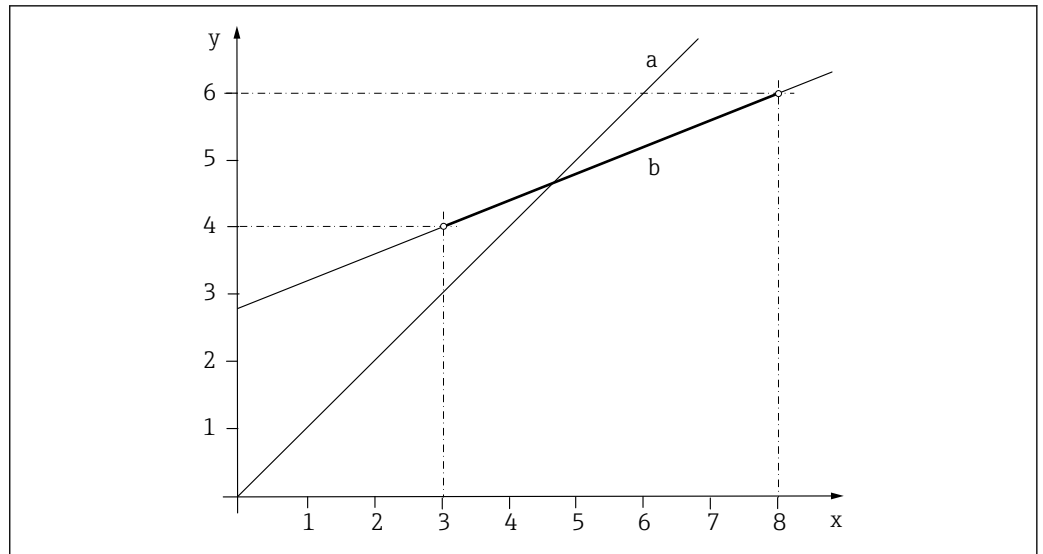
15 Principle of a 1-point calibration

- $x$  Measured value
- $y$  Target sample value
- $a$  Factory calibration
- $b$  Application calibration

1. Select data record.
2. Set the calibration point in the medium and enter the target sample value (laboratory value).

##### Two-point calibration

Measured value deviations are to be compensated for at 2 different points in an application (e.g. the maximum and minimum value of the application). This aims to ensure a maximum level of accuracy between these two extreme values.



A0039325

**16** Principle of a 2-point calibration

- x* Measured value
- y* Target sample value
- a* Factory calibration
- b* Application calibration

1. Select a data record.
2. Set 2 different calibration points in the medium and enter the corresponding set points.

**i** A linear extrapolation is performed outside the calibrated operational range (gray line).

The calibration curve must be monotonically increasing.

## 9 Diagnostics and troubleshooting

### 9.1 General troubleshooting

When troubleshooting, the entire measuring point must be taken into account:

- Transmitter
- Electrical connections and cables
- Process spectrometer

The possible causes of error in the following table relate mainly to the process spectrometer.

Problem	Check	Solution
No information displayed, device does not respond	<ul style="list-style-type: none"> <li>■ Power supplied to transmitter?</li> <li>■ Device connected correctly?</li> <li>■ Buildup on optical windows?</li> <li>■ Light defective?</li> </ul>	<ul style="list-style-type: none"> <li>▶ Connect mains voltage.</li> <li>▶ Establish correct connection.</li> <li>▶ Clean device.</li> <li>▶ Replace lamp.</li> </ul>
Display value too high or too low	<ul style="list-style-type: none"> <li>■ Buildup on optical windows?</li> <li>■ Process spectrometer calibrated?</li> </ul>	<ul style="list-style-type: none"> <li>▶ Clean optical windows.</li> <li>▶ Calibrate device.</li> </ul>
Display value fluctuating greatly	Is the mounting location correct?	<ul style="list-style-type: none"> <li>▶ Select a different mounting location.</li> <li>▶ Adjust measured value filter.</li> </ul>

1. Pay attention to the troubleshooting information in the Operating Instructions for the transmitter.
2. Check the transmitter if necessary.



## 10 Maintenance

### CAUTION

#### Acid or medium

Risk of injury, damage to clothing and the system!

- ▶ Wear protective goggles and safety gloves.
- ▶ Clean away splashes on clothes and other objects.
  
- ▶ You must perform maintenance tasks at regular intervals.

We recommend setting the maintenance times in advance in an operations journal or log.

The maintenance cycle primarily depends on the following:

- The system
- The installation conditions
- The medium in which measurement takes place

### 10.1 Maintenance work

#### WARNING

#### Leaking medium

Risk of injury!

- ▶ Before each maintenance task, ensure that the process pipe is empty and rinsed.
- ▶ As the device may contain residual medium, rinse it thoroughly before starting work.

#### 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

#### Dirt on the optical components

- ▶ Perform maintenance work at a clean workplace.

#### NOTICE

#### Work performed carelessly

Damage to the optical components!

- ▶ Ensure that maintenance work is carried out by qualified specialists only.


#### NOTICE

#### Effects on process and process control

- ▶ When carrying out any work on the system, bear in mind any potential impact this could have on the process control system and the process itself.
- ▶ For your own safety, only use original accessories and parts. With genuine parts, the function, accuracy and reliability are also ensured after maintenance work.

To facilitate maintenance work on the device:

- Install the cable so that it is easily accessible.
- Ensure that the device can be safely stored after removal.

This is an absolute requirement for devices with hazardous area approval →  11.



The spare part kits from Endress+Hauser are required for the following work.

→  36

### 10.1.1 Removing the device from the process

Method 1:

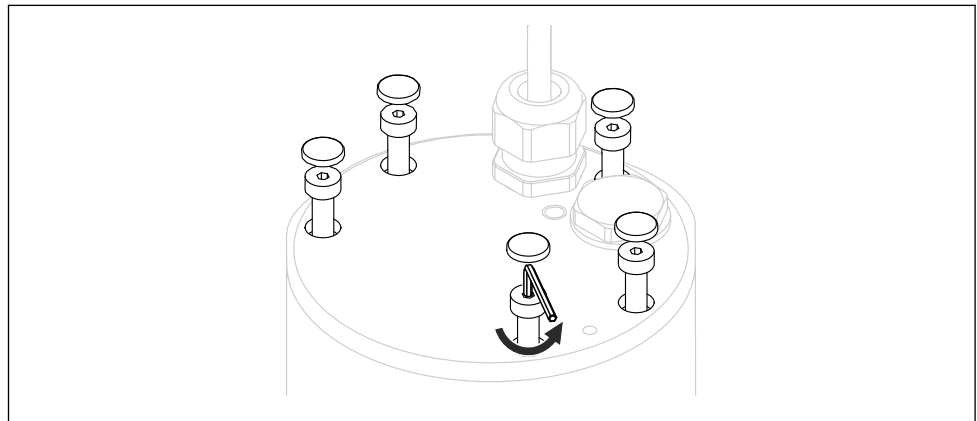
1. Disconnect the cable from the transmitter.
2. Remove the device, along with the cable, from the process.

Method 2 (cable cannot be removed):


Required tools:

- Allen key 3 mm (0.12 in)
- Allen key 6 mm (0.24 in)
- Disassembly tool for the lid (kit order number: 71462057)

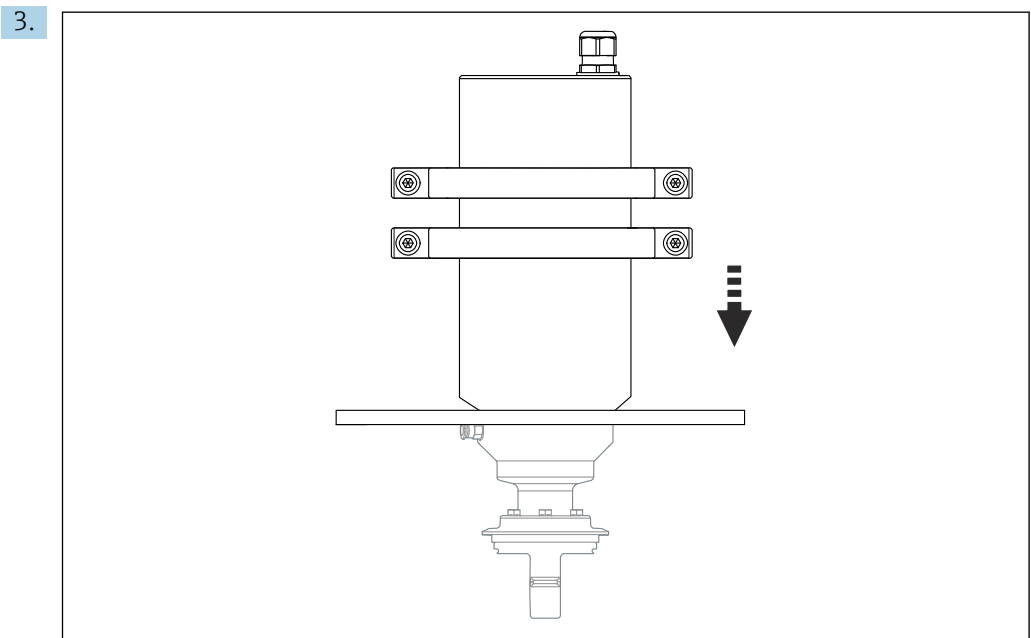
1. Remove the screw cover from all the screws on the lid.
- 2.




A0041847

 17 Loosen the screws.

Loosen the screws uniformly with an Allen key 3 mm (0.12 in).

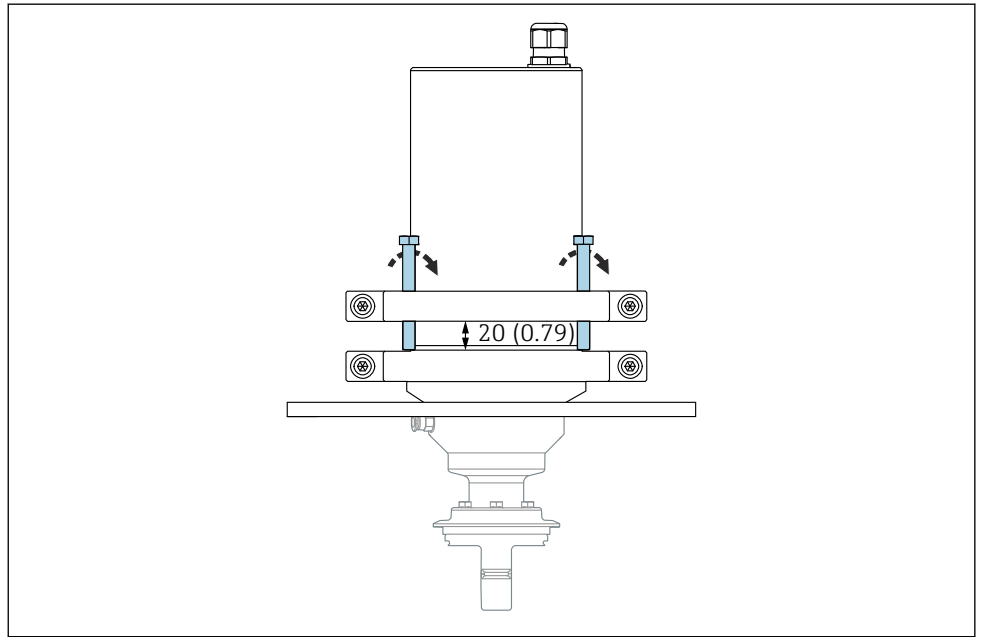


A0044095

 18 Placing the disassembly tool

Place the disassembly tool for the lid on the device.

4.



A0044096

19 Positioning the disassembly tool

Use an Allen key 6 mm (0.24 in) to tighten two screws in the top part of the disassembly tool so that the screws project by 20 mm (0.8 in).

5. Tighten the screws until the housing is pushed up.
6. Remove the housing of the process spectrometer.
7. With one hand, push the underside of the cover from the inside to the outside.
8. Remove the cover from the housing.
9. Using the plastic bag supplied, protect the lid and cable from moisture at the installation location.
10. Remove the electronics unit from the measuring head.
11. Cover the opening on the measuring head with the plug to prevent dust from penetrating.
12. Remove the device from the process.
  - ↳ Additional maintenance work can now be carried out at a safe place.

Preferably carry out method 1 → 26. Method 1 presents the lowest risk of contaminating the optical components.


### 10.1.2 Introducing the device into the process

If method 2 → 26 was used to open the device, introduce the device into the process as follows:

#### Preparations

Required tools:  
O-ring picker made of plastic

1. Replace the surface seals of the screws.
2. Replace the O-rings on the cover and the base.
3. Lubricate the new O-rings.
4. Fit the lubricated O-ring onto the pipe. The pipe serves as a mounting aid.

5. Mount the pipe.
-  Ensure that the O-ring does not become jammed.
6. Position the O-ring in the groove provided.

### Closing the lid

Required tools:

Allen key 3 mm (0.12 in)

1. Turn the fitting screws briefly in the wrong direction.
  - ↳ The fitting screws snap into the thread.
2. Tighten the screws uniformly and in diagonally opposite sequence with an Allen key 3 mm (0.12 in) and a torque of 1.5 Nm (1.1 lbf ft).
3. Fit the screw covers back on.

### 10.1.3 Cleaning the device

- ▶ Clean the process spectrometer at regular intervals via system cleaning.

### 10.1.4 Replacing the lamp

This work must be carried out by Endress+Hauser Service.

- ▶ Contact your Endress+Hauser sales organization. →  36

### 10.1.5 Replacing the seals

#### O-ring (FFKM) on the measuring head

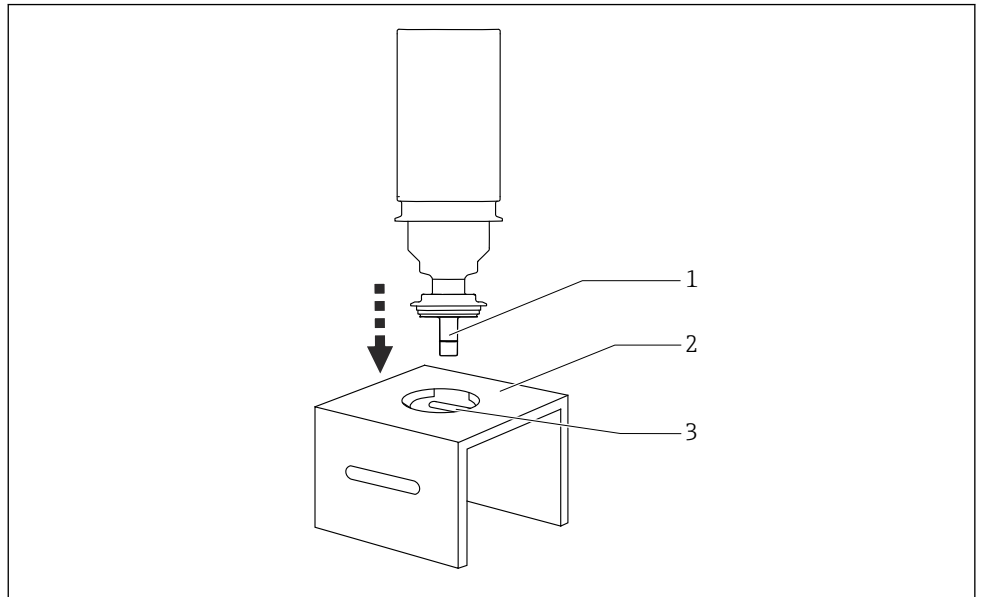
It is recommended to replace the O-ring on the measuring head annually. The replacement interval depends on the application.

-  The material FFKM withstands media normally used in the food industry. The maintenance intervals can therefore vary.

Required tools:

- Stand (kit order number: 71462060)
- O-ring-picker made of plastic

1.



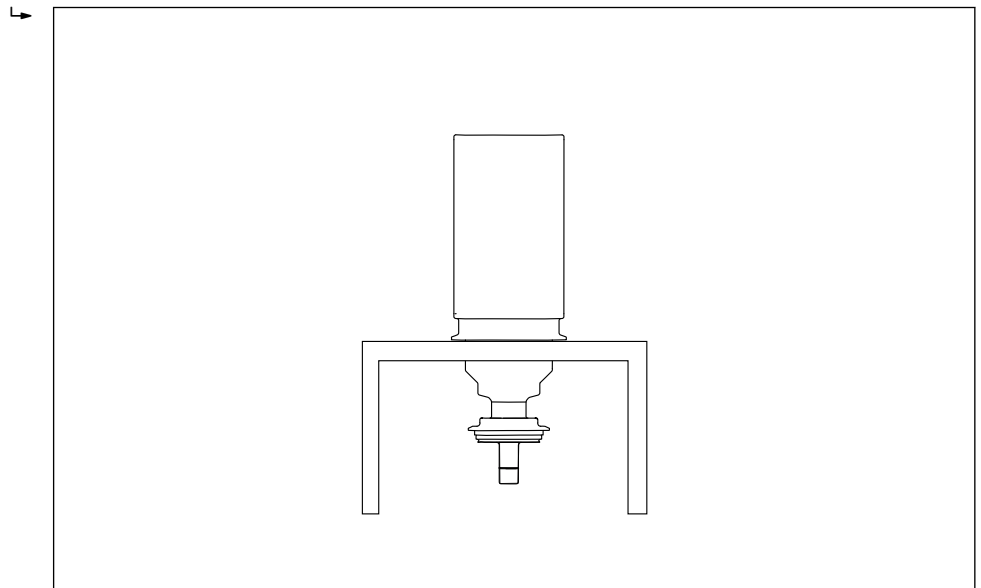
A0041710

☑ 20 Put the process spectrometer into the maintenance position.

- 1 Measuring head
- 2 Stand
- 3 Recess in (sensor) stand

Position the assembled stand with the recess at the top.

2. Place the device into the recess.



A0041711

☑ 21 Process spectrometer in maintenance position

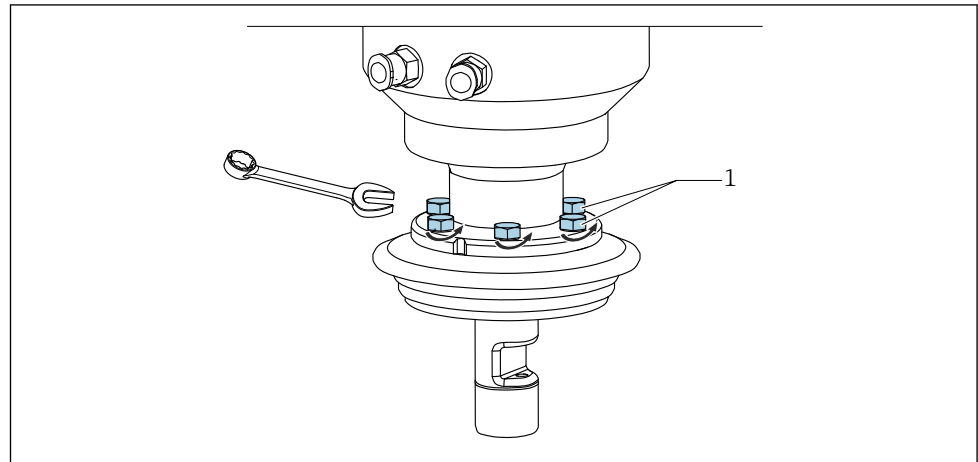
3. Ensure the device is securely seated.

### Disconnect the measuring head from the device.

Required tools:

- Wrench, 8 mm across flats
- Holder (kit order number: 71462060)

1.



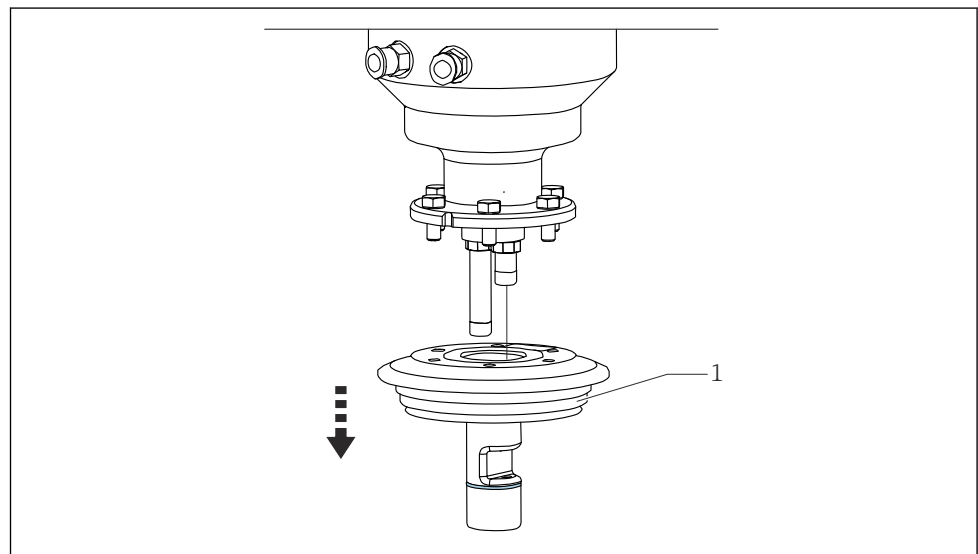
A0041694

1 6 hexagonal-headed bolts M5x12

Using a wrench, loosen the 6 hexagonal-headed bolts.

2. Release the measuring head from the top part of the device.

3.



A0041695

1 O-ring on measuring head

Pull the measuring head down.

4. Fit the yellow protective caps supplied on the 2 optical sleeves.



5. Put the device (without the measuring head) in a safe place.

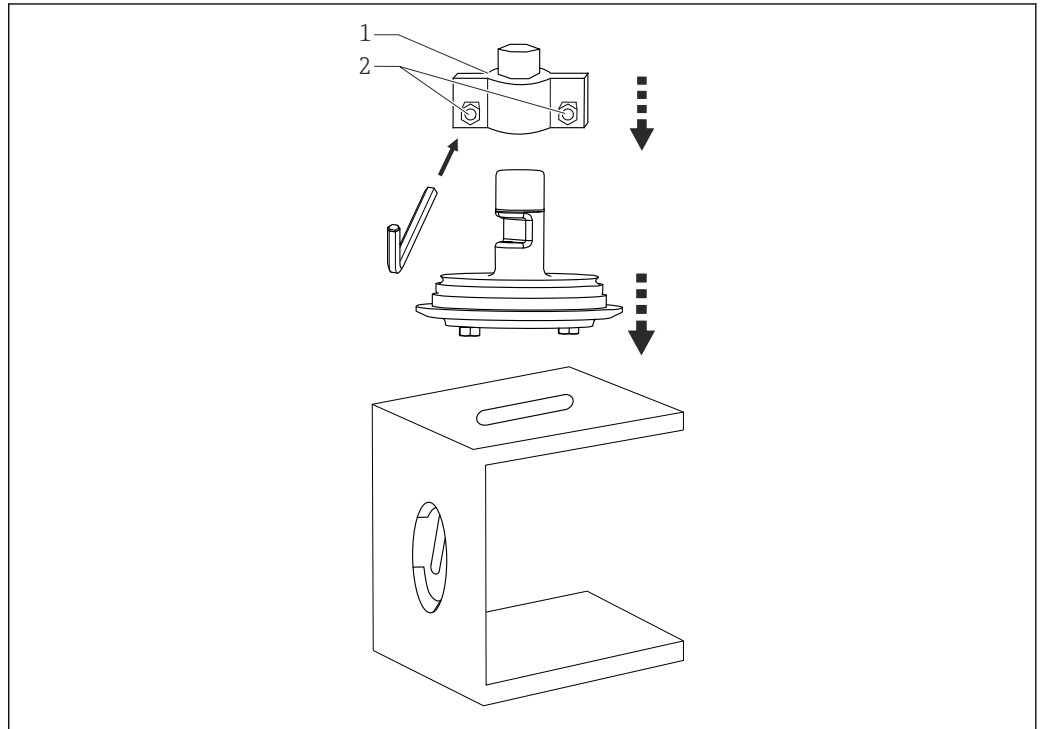
### Attaching the disassembly tool to the measuring head

Required tools:


- Disassembly tool for the measuring head (kit order number: 71462055)
- Allen key, across flats 5 mm (0.2 in)
- Holder (kit order number: 71462060)

1. Degrease the cap on the measuring head of the device with one of the cleaning cloths provided.

2. Also use the cloth to degrease the inside of the disassembly tool for the measuring head.
3. Fit the disassembly tool on the cap of the measuring head →  22,  31.
4. Fasten the 2 Allen screws on the disassembly tool with an Allen key (5 mm (0.2 in) across flats).
  - ↳ The disassembly tool is now securely seated on the cap of the measuring head.



A0041726



 22 Fitting the measuring head on the holder

- 1 Disassembly tool for the measuring head
- 2 2 Allen screws

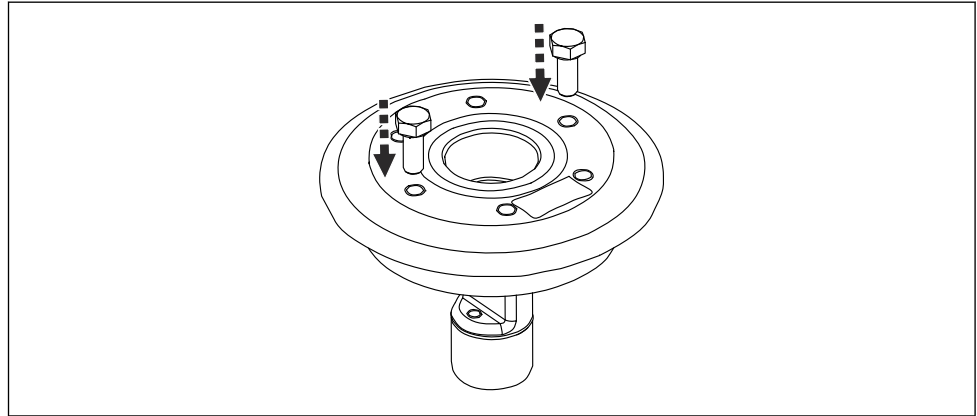
### Moving the measuring head to the maintenance position

Required tools:

- Disassembly tool for the measuring head (kit order number: 71462055)
- Holder (kit order number: 71462060)
- Wrench, across flats 8 mm (0.31 in) with torque 6 Nm (4.4 lbf ft)

1. Place the holder sideways so that the recess in the side wall is facing upwards →  22,  31.

2.



A0041734

23 Underside of the measuring head

Screw 2 hexagonal-headed bolts diagonally into the underside of the measuring head .

3. Fit the measuring head with the disassembly tool into the recess of the holder so that the screw heads lock in the holder.

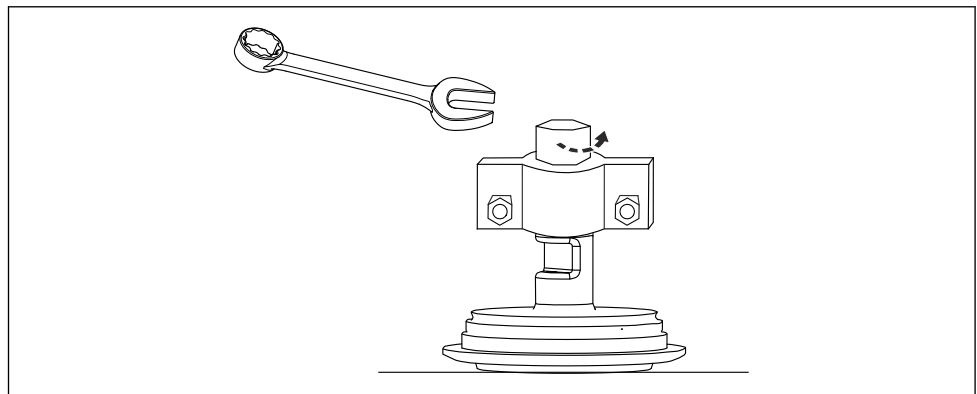
#### Remove the cap from the measuring head.

Required tools:

- Disassembly tool for the measuring head (kit order number: 71462055)
- Wrench, across flats 19 mm (0.75 in)

1. Position a wrench (19 mm (0.75 in) width across flats) on the disassembly tool.

2.



A0041729

Turn the wrench (19 mm (0.75 in) width across flats) to release the cap on the measuring head.

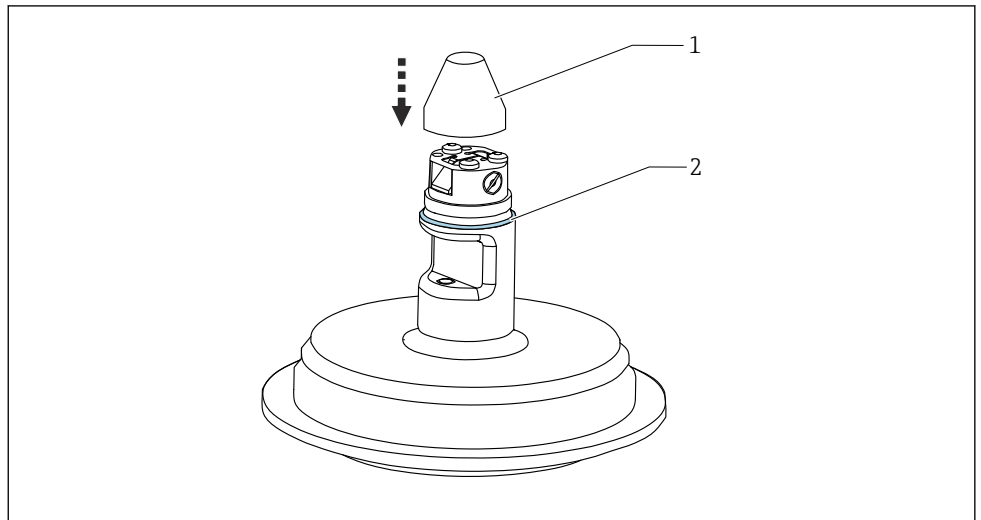
3. Remove the cap from the measuring head.



**Replace the O-ring.**

Required tools:  
O-ring picker

1.



A0041730

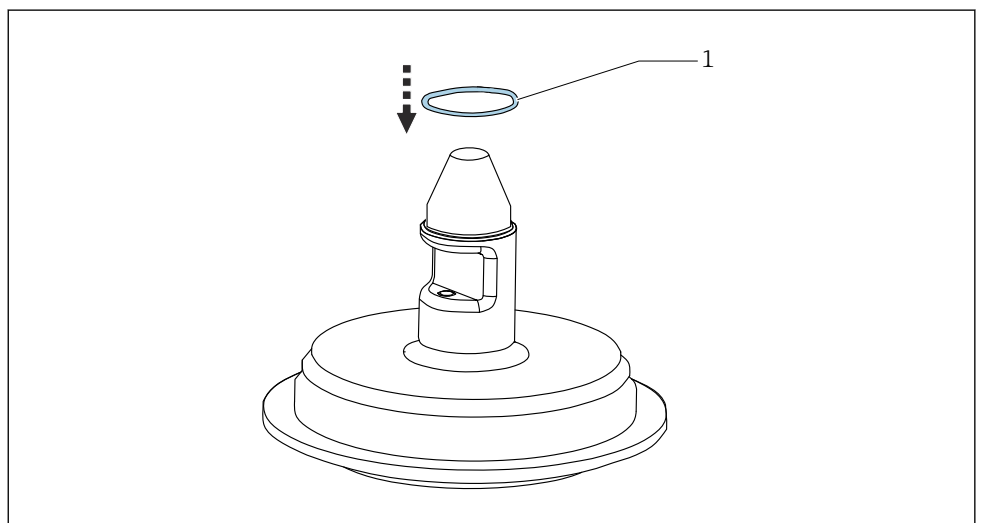
- 1 Protective cap
- 2 O-ring

Fit the protective cap on the open measuring head.

2. Carefully remove the O-ring from the measuring head.

3. Lubricate a new O-ring.

4.



A0041731

- 1 Freshly lubricated O-ring

Fit the freshly lubricated O-ring over the protective cap and onto the measuring head.

5. Ensure the O-ring is securely seated.

**Closing the measuring head**

Required tools:

- Disassembly tool for the measuring head (kit order number: 71462055)
- Holder (kit order number: 71462060)
- Wrench, across flats 19 mm (0.75 in) with torque 10 Nm (7.38 lbf ft)

1. Remove the protective cap again.

2. Fit the cap on the measuring head.

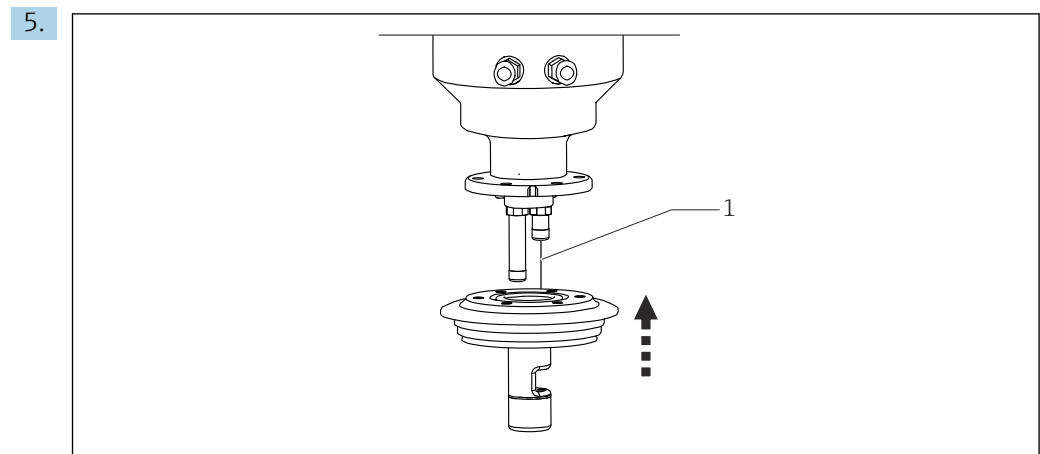
3. Fit the disassembly tool on the cap of the measuring head.
4. Using a wrench (19 mm (0.75 in) across flats), fasten the cap of the measuring head with a torque of 10 Nm (7.38 lbf ft).
5. Remove the disassembly tool from the measuring head again.
6. Untighten the two screws on the underside of the measuring head.
7. Remove the measuring head from the holder.

### Mounting the measuring head on the device

Required tools:

- Holder (kit order number: 71462060)
- Wrench, across flats 8 mm (0.31 in) with torque 6 Nm (4.4 lbf ft)

1. Make sure that the green O-ring (non-lubricated) is located in the groove provided for this purpose.
  2. Remove the yellow protective caps from the optical sleeves.
  3. Insert the temperature sensor into the opening provided in the measuring head.
  4. Place the sleeves over the corresponding points in the measuring head.
- i** Make sure that the short sleeve is located on the side of the measurement gap.  
Make sure that the cable of the temperature sensor does not become jammed.



A0041735


1 Temperature sensor

Fit the measuring head on the device.

6. Tighten the six hexagonal-headed bolts (8 mm (0.3 in) across flats) diagonally with a torque of 6 Nm (4.4 lbf ft).
7. Clean the measuring head and the optical windows with a cleaning cloth.


### Gasket seal (PEEK)

Maintenance of the gasket seal on the windows (PEEK) is not necessary but can be performed at the factory at the customer's request.

This work must be carried out by Endress+Hauser Service. Contact your Endress+Hauser sales organization. →  36

### **10.1.6 Replacing the measuring head**

For the shortest possible downtimes during maintenance work, it is possible to replace the measuring head. The measuring head that is removed can then be sent to Endress+Hauser for reconditioning.

This work must be carried out by Endress+Hauser Service. Contact your Endress+Hauser sales organization. →  36

## 11 Repair

### 11.1 General notes

The repair work may only be performed by Endress+Hauser.

- ▶ Only use spare parts from Endress + Hauser to guarantee the safe and stable functioning of the device.

Detailed information on the spare parts is available at:

[www.endress.com/device-viewer](http://www.endress.com/device-viewer)

### 11.2 Spare parts

Identifier	Order number
Kit CKI50 O-ring on measuring head, FFKM	71462042
Kit CKI50 measuring head 2 mm (0.08 in)	71462045
Kit CKI50 measuring head 5 mm (0.2 in)	71462049
Kit CKI50 measuring head 10 mm (0.4 in)	71462051
Kit CKI50 disassembly tool for measuring head	71462055
Kit CKI50 disassembly tool for lid	71462057
Kit CKI50 sensor holder	71462060

For more detailed information on spare parts kits, please refer to the "Spare Part Finding Tool" on the Internet:

[www.products.endress.com/spareparts\\_consumables](http://www.products.endress.com/spareparts_consumables)

### 11.3 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.

To ensure the swift, safe and professional return of the device:

- ▶ Refer to the website [www.endress.com/support/return-material](http://www.endress.com/support/return-material) for information on the procedure and conditions for returning devices.

### 11.4 Disposal

The device contains electronic components. The product must be disposed of as electronic waste.

- ▶ Observe the local regulations.



If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.

## 12 Technical data

### 12.1 Input

Measured variable

CIE L\*a\*b\*<sup>1)</sup>, observer 2°, illuminant D65, as per DIN EN ISO 11664-4  
 CIE L\*a\*b\* is a device-independent color space consisting of 3 color values:

- L\* lightness axis  
 Specified operational range: 0 to 100
- a\* green-red axis  
 Specified operational range: -150 to 100
- b\* yellow-blue axis  
 Specified operational range: -100 to 150

Measuring range

Application	Specified operational range
Halogen wavelength range	380 to 830 nm
CIE L*a*b*	L* = 0 to 100 a* = -150 to 100 b* = -100 to 150

### 12.2 Performance characteristics

Reference conditions

25 °C (77 °F), 1013 hPa (15 psi), heat-up time 5 hours

Repeatability

#### Repeatability

	Specified operational range	Repeatability
L*	0 to 100	< 0.1 % of the span of the specified operational range <sup>1)</sup>
a*	-150 to 100	
b*	-100 to 150	

1) Measured according to DIN ISO 15839 with liquid color solutions in the range L\* from 60 to 100, a\* from -47 to 85; b\* from -44 to 98

Long-term reliability

#### Drift per 24h

	Specified operational range	Drift per 24h
L*	0 to 100	< 0.03 % of the span of the specified operational range <sup>1)</sup>
a*	-150 to 100	
b*	-100 to 150	

1) Measured according to DIN ISO 15839 with liquid color solutions in the range L\* from 60 to 100, a\* from -47 to 85; b\* from -44 to 98





Regular referencing ensures the drift is largely compensated.

1) L\*a\*b\* color model defined by the International Commission of Illumination

## 12.3 Environment

Ambient temperature range	-20 to 45 °C (-4 to 113 °F) The temperature displayed can deviate significantly from the temperature of the medium due to the ambient conditions and the internal heating of the process spectrometer.
Storage temperature	-20 to 70 °C (-4 to 158 °F)
Degree of protection	<ul style="list-style-type: none"> <li>■ IP 69</li> <li>■ NEMA 6P (1.8 m (5.9 ft) water column over 24 hours, 1 mol/l KCl)</li> </ul>

## 12.4 Process

Process temperature range	-20 to 60 °C (-4 to 140 °F) 60 to 140 °C (140 to 284 °F) with water cooling  The process spectrometer must be cooled depending on the duration of operation and the ambient temperature →  39. <b>NOTICE</b> <b>The process spectrometer can be permanently damaged at process temperatures of 60 °C (140 °F) and higher without cooling!</b> ▶ Ensure the device is sufficiently cooled at process temperatures of 60 °C (140 °F) and higher.										
Process pressure range	0.5 to 10 bar (7.3 to 145 psi) (absolute)										
Flow limit	<b>Minimum flow</b> No minimum flow required.  For media that have a tendency to form deposits, ensure that the medium is mixed sufficiently.										
Thermal insulation	<b>Water cooling</b> <table border="1" data-bbox="501 1554 1533 1769"> <tr> <td>Recommended flow</td> <td>10 l/h (2.64 gal/h)</td> </tr> <tr> <td>Recommended inlet temperature</td> <td>20 °C (68 °F)</td> </tr> <tr> <td>Pressure</td> <td>Maximum 2 bar (29 psi)</td> </tr> <tr> <td>Connection</td> <td>Male thread M6</td> </tr> <tr> <td>Coolant</td> <td>Water</td> </tr> </table>  The use of any coolant other than water is not recommended.	Recommended flow	10 l/h (2.64 gal/h)	Recommended inlet temperature	20 °C (68 °F)	Pressure	Maximum 2 bar (29 psi)	Connection	Male thread M6	Coolant	Water
Recommended flow	10 l/h (2.64 gal/h)										
Recommended inlet temperature	20 °C (68 °F)										
Pressure	Maximum 2 bar (29 psi)										
Connection	Male thread M6										
Coolant	Water										

## 12.5 Mechanical construction

Design, dimensions	Measurement gap with 3 different gap widths: <ul style="list-style-type: none"> <li>■ 2 mm (0.08 in)</li> <li>■ 5 mm (0.2 in)</li> <li>■ 10 mm (0.4 in)</li> </ul>										
Dimensions	→ Section "Installation"										
Weight	With a cable length of 15 m (49.2 ft) with clamp: 7.9 kg (17.4 lb)										
Materials	<p><b>Materials in contact with the medium</b></p> <table> <tr> <td>Measuring head:</td> <td>1.4404/AISI316L</td> </tr> <tr> <td>Window:</td> <td>Sapphire</td> </tr> <tr> <td>O-rings:</td> <td>FFKM</td> </tr> <tr> <td>Gasket seal:</td> <td>PEEK</td> </tr> </table> <p><b>Materials not in contact with the medium</b></p> <table> <tr> <td>Housing:</td> <td>1.4404/AISI316L</td> </tr> </table>	Measuring head:	1.4404/AISI316L	Window:	Sapphire	O-rings:	FFKM	Gasket seal:	PEEK	Housing:	1.4404/AISI316L
Measuring head:	1.4404/AISI316L										
Window:	Sapphire										
O-rings:	FFKM										
Gasket seal:	PEEK										
Housing:	1.4404/AISI316L										
Process connections	Varivent N DN50 - 125 immersion depth 68 mm (2.7 in)										



# Index

## A

Approvals . . . . . 11

## C

Calibration . . . . . 22

Certifications . . . . . 11

Cleaning . . . . . 28

Commissioning . . . . . 21

## D

Degree of protection . . . . . 19

Diagnosis . . . . . 24

Dimensions . . . . . 12

Documentation . . . . . 5

## E

Electrical connection . . . . . 17

Environment . . . . . 39

## F

Function check . . . . . 21

## G

Ground connection . . . . . 17

## I

Incoming acceptance . . . . . 10

Input . . . . . 38

Installation . . . . . 13

Installation conditions . . . . . 12

Installation marking . . . . . 14

Intended use . . . . . 6

## L

Light absorption . . . . . 9

## M

Maintenance . . . . . 25

Measuring principle . . . . . 8

Measuring system . . . . . 15

Mechanical construction . . . . . 40

Mounting requirements . . . . . 12

Mounting the device . . . . . 12

## N

Nameplate . . . . . 10

## O

One-point calibration . . . . . 22

Operation . . . . . 22

## P

Performance characteristics . . . . . 38

Post-connection check . . . . . 20

Post-installation check . . . . . 16

Process . . . . . 39

Product description . . . . . 8

Product design . . . . . 8

Product identification . . . . . 10

Product safety . . . . . 7

## R

Reference measurement . . . . . 22

Repair . . . . . 36

Replacing the lamp . . . . . 28

Replacing the measuring head . . . . . 35

Replacing the seals . . . . . 28

Return . . . . . 36

## S

Safety Instructions . . . . . 6

Scope of delivery . . . . . 11

Spare parts . . . . . 36

Symbols . . . . . 4

## T

Technical data . . . . . 38

Troubleshooting . . . . . 24

Two-point calibration . . . . . 22

## U

Use . . . . . 6

## W

Warnings . . . . . 4

Wiring . . . . . 17







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