

# Operating Instructions

## GM700

Gas Analyzer,  
Probe Version



**Described product**

GM700

Probe version

GM700-02, GM700-03, GM700-04, GM700-05, GM700-07, GM700-08, GM700-09

**Manufacturer**

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## 1 About this document

### 1.1 Function of this document

These Operating Instructions describe:

- Device components
- Installation
- Operation
- Maintenance work required for reliable operation

### 1.2 Scope of application

These Operating Instructions are only applicable for the measuring device described in the product identification.

They are not applicable to other Endress+Hauser measuring devices.

The standards referred to in these Operating Instructions are to be observed in the respective valid version.

### 1.3 Target groups

This Manual is intended for persons installing, operating and maintaining the device.

#### Operation

The device may only be operated by qualified persons who, based on their device-specific training and knowledge as well as knowledge of the relevant regulations, can assess the tasks given and recognize the hazards involved.

#### Installation and maintenance

Installation and maintenance may only be carried out by trained specialists familiar with the installation conditions.

Please observe the information at the beginning of the respective Sections.

### 1.4 Further information

- Purge air unit Operating Instructions
- Final inspection record



#### NOTE






- Observe all documents provided.

### 1.5 Symbols and document conventions

#### 1.5.1 Warning symbols

Table 1: Warning symbols

Symbol	Significance
	Hazard (general)
	Hazard by voltage
	Hazard by oxidizing substances

Symbol	Significance
	Hazard by laser radiation
	Hazard by toxic substances
	Hazard by acidic substances
	Hazard by high temperature
	Hazard for the environment/nature/organic life

### 1.5.2 Warning levels / Signal words

#### **DANGER**

Risk or hazardous situation which will result in severe personal injury or death.

#### **WARNING**

Risk or hazardous situation which could result in severe personal injury or death.

#### **CAUTION**

Hazard or unsafe practice which could result in less severe or minor injuries.

#### **Notice**



Hazard which could result in property damage.

#### **Note**

Hints

### 1.5.3 Information symbols

Table 2: Information symbols

Symbol	Significance
	Important technical information for this product
	Important information on electric or electronic functions

## 1.6 Data integrity

Endress+Hauser uses standardized data interfaces, such as standard IP technology, in its products. The focus here is on the availability of the products and their properties.

Endress+Hauser always assumes the integrity and confidentiality of data and rights affected in connection with the use of the products are ensured by the customer.

In all cases, the customer is responsible for the implementation of safety measures suitable for the respective situation, e.g., network separation, firewalls, virus protection and Patch Management.

## 2 Safety information

### 2.1 Main operating information

**NOTICE****Risk for system safety through work on the device not described in these Operating Instructions**

Work on the device not described in these Operating Instructions or associated documents can lead to unsafe operation of the measuring system and therefore endanger plant safety.

- ▶ Only carry out the work described in these Operating Instructions or the corresponding documents on the device.

**WARNING****Danger of ineffectiveness of the protective device**

In case of nonobservance, persons or parts of the body to be protected are not detected.

- ▶ Pay special attention to all safety information in these Operating Instructions.

**CAUTION****Hazard for persons and plant through unsafe operation of the measuring device**

If the device is or could be in an unsafe state:

- ▶ Put the device out of operation.
- ▶ Disconnect the device from the main supply voltage and signal voltage.
- ▶ Secure the device against unallowed or unintentional start-up.

**Laser radiation****DANGER****Important information for safe handling of the GM700 sender/receiver unit on the device version with HF measurement**

For device software versions before 9105060\_YEK0, a higher laser radiation might occur.

- ▶ Laser class 1 of IEC 60825-1:2014-5: Only use device software 9105060\_YEK0 or a newer software version.
- ▶ Before working on the sender/receiver unit, take appropriate safety measures to protect uninvolved persons from the laser beam.
- ▶ Never look directly into the laser aperture when opening the sender/receiver unit or the reflector.
- ▶ Always wear laser goggles or switch the device off during maintenance work.
- ▶ Observe valid national limit values and respective standards for work safety.

**NOTICE****Deviations of EN 60825-1/A11/AC:2022-03 “Laser safety” from the Directive 2006/25/EC**

The Directive has been adapted to cover changes in the health and safety regulation for artificial optical radiation. Deviations occurred through changes in EN 60825-1/A11/AC:2022-03 “Laser safety” from Directive 2006/25/EC.

- ▶ Always observe the user information in the Annex of these Operating Instructions.

## 2.2 Warning information on the device

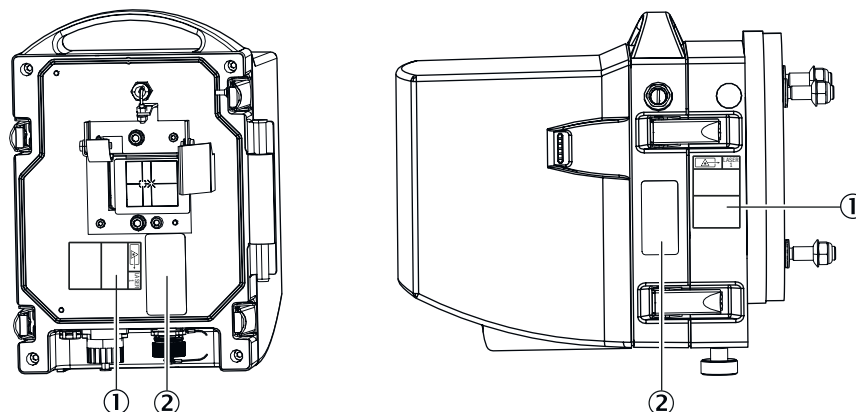
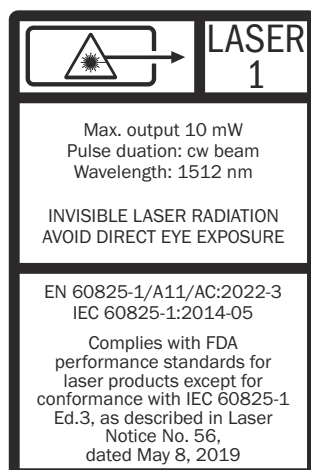


Figure 1: Warning information on the sender/receiver unit

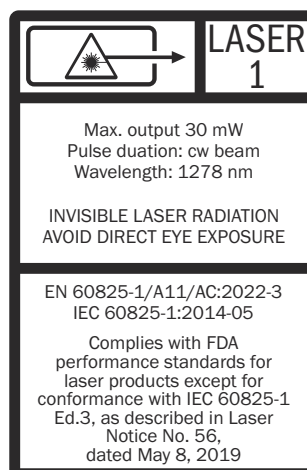
- ① Laser radiation danger sign
- ② Type plate

### Laser signs

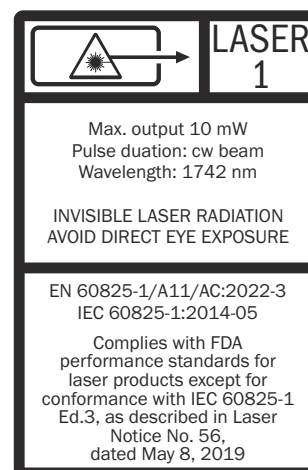
The laser wavelength varies for the respective measuring components (NH<sub>3</sub>, HF, HCl).  
The maximum laser output at the optical interface depends on the respective measuring component and is shown on the laser warning sign.



Laser sign: NH<sub>3</sub> measurement



Laser sign: HF measurement



Laser sign: HCl measurement

## 2.3 Intended use

The device serves exclusively for emission and process monitoring of gases in industrial plants.

The device measures continuously directly in the gas duct (in-situ).

## 2.4 Responsibility of user

### Designated users

see "Target groups", page 6.

**Correct project planning**

- This Manual presumes that the device has been delivered as specified during project planning and with the relevant delivery state of the device (see delivered system documentation).
  - ▶ If you are not sure whether the device corresponds to the state defined during project planning or to the delivered system documentation: Contact Endress+Hauser Service.

**Correct use**

- ▶ Use the device only as described in “Intended use”.  
The manufacturer bears no responsibility for any other use.
- ▶ Perform the specified maintenance work.
- ▶ Do not carry out any work or repairs on the device not described in this Manual.  
Do not remove, add or modify any components to or on the device unless described and specified in the official manufacturer information.  
Use only original spare parts and wear and tear parts from Endress+Hauser.  
If you do not observe this:
  - The manufacturer's warranty becomes void.
  - The device could become dangerous.

**Special local requirements**

In addition to the information in these Operating Instructions, follow all local laws, technical rules and company-internal operating directives applicable wherever the device is installed.

**Read the Operating Instructions**

- ▶ Read and observe these Operating Instructions.
- ▶ Observe all safety instructions.
- ▶ If there is something you do not understand: Contact Endress+Hauser Service.

**Retention of documents****These Operating Instructions:**

- ▶ Must be available for reference.
- ▶ Must be passed on to new owners.

## 3 Product description

### 3.1 Product identification

Product name	GM700
Device version	Measuring Probe Version
Manufacturer	Endress+Hauser SICK GmbH+Co. KG Bergener Ring 27 · D-01458 Ottendorf-Okrilla · Germany
Type plates	<ul style="list-style-type: none"> <li>• Sender/receiver unit: On right side</li> <li>• On purge air fixture: On tube</li> <li>• Control unit: On right side</li> </ul>

### 3.2 Product characteristics

- The device serves for continuous measurement of the gas concentrations in industrial plants.
- A variant GM700-04 or GM700-07 is provided for applications with high water contents, e.g. in waste incineration plants.
- The device is an in-situ measuring device which means measuring is done directly in the gas carrying duct.
- Measuring components: HF, HCl, NH<sub>3</sub>, NH<sub>3</sub> + H<sub>2</sub>O, HCl + H<sub>2</sub>O
- Measuring principle: Diode laser spectroscopy (TDLS)
- Stable operation through integrated gas-filled reference cells and line locking.

### 3.3 Device variants

The following device variants are available depending on the measuring task and application:

Variants	Measured components
GM700-02	HF
GM700-03	HCl
GM700-04	NH <sub>3</sub> , high humidity
GM700-05	NH <sub>3</sub>
GM700-07	NH <sub>3</sub> + H <sub>2</sub> O, high humidity
GM700-08	HCl + H <sub>2</sub> O
GM700-09	NH <sub>3</sub> + H <sub>2</sub> O

### 3.4 Layout and function

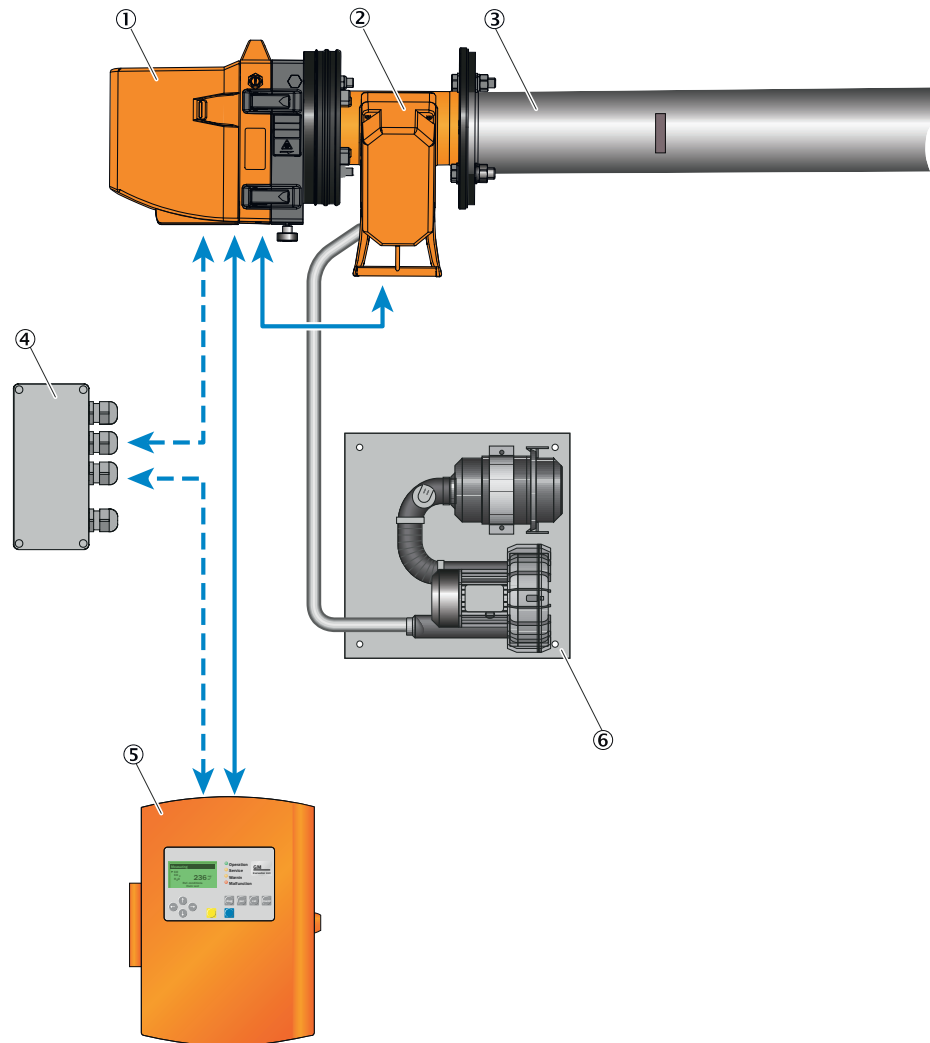




Figure 2: Measuring device components layout

-  Connection cables
-  Purge air hose (only for GMP)
- ① Sender/receiver unit
- ② Purge air attachment, pressure and temperature sensor integrated
- ③ Probe tube
- ④ Connection unit
- ⑤ Control unit
- ⑥ Purge air unit (only for GMP)

**The measuring device comprises the following components:**

#### Sender/receiver unit

The sender/receiver unit contains the optical-electronic assemblies and determines the measured values of the concentration of the measuring component(s) of the measuring device.

#### Measuring probe

The measuring probe takes the sample gases at the measuring location and passes these to the sender/receiver unit for determination of the measured values. Two measuring probe versions are available for the different application conditions:

- Open GMP measuring probe with open measuring gap as measuring distance and purge air attachment.
- Gas-testable GPP measuring probe with ceramic filter for dry sample gases and test gas attachment.

#### Purge air attachments

The purge air attachments serve to attach the sender/receiver unit and reflector unit to the flanges with tube. They contain the purge air nozzles for connecting the purge air hoses of the purge air units and the connections for external sensors e.g., temperature or pressure sensors as well as the connections for purge air monitoring.

#### Control unit

The control unit serves as user interface, and prepares and outputs the measured values and performs control and monitoring functions.

These functions include the following:

- Output of measured values, computed data and operating states
- Communication with peripheral equipment
- Output of error messages and other status signals
- Control of automatic test functions and access during service work (diagnosis)

#### Flanges with tube

The flanges with tube are attached directly to the gas duct of the measuring point and serve to fit the purge air attachments of the sender/receiver unit and reflector unit. ANSI or DIN flanges can be used alternatively to the flanges supplied.

#### Purge air unit

The purge air unit supplies filtered ambient air to the purge air attachments and protects the optical surfaces of the sender/receiver unit and reflector unit from contamination and high gas temperatures.



#### NOTE

As standard, Endress+Hauser recommends a separate purge air unit for the sender/receiver unit when using the GMP measuring probe to ensure an optimal purge air supply. If the supply of purge air is insufficient, hot and corrosive gases can destroy the measuring device within a few minutes.

Further information on the purge air unit, see Operating Instructions of the purge air unit.

## 3.5 Options

#### Connection unit

If the distance between the sender/receiver unit and control unit is > 4 m, the connection can be established via the connection unit and a CAN bus line provided by the customer.

Total length of all CAN bus lines: max. 300 m.

#### Weather hoods

For the components sender/receiver unit, reflector unit and purge air unit when installing the measuring device outdoors.

#### Air heater for purge air supply

To avoid condensation in the purge air. An air heater is required when the difference between gas temperature and dew point temperature is too small.

The following formula serves as a guideline:

- Gas temperature [°C] – dew point temperature [°C] < abs. humidity [Vol.-%].
- Values are compared without considering the units of measure.

### 3.6 Check cycle

#### Check cycle for NH<sub>3</sub> and HCl measurement

The check cycle serves to check the zero point and a reference point without feeding test gases. Here, a measuring sequence is run through to determine the zero and check point (usually 70 % of the measuring range end value).

“Function check” is signaled per digital output during output of the zero and reference point.

The output for each takes 90 s for the zero point, followed by the reference point.

- Unit and scaling for the current zero point according to the setting.
- Reference point is displayed as percentage scaled to 70 % of the measuring range.

#### Checking the HF measurement with test gas



#### NOTE

Contact the relevant sales company or Endress+Hauser Service for further information.

### 3.7 Measuring probes

The measuring probe versions are compatible with all sender/receiver units. The sender/receiver unit is calibrated to the respective probe length on delivery.

Table 3: Measuring probes: Characteristics and application

Characteristic	Open GMP measuring probe	Gas-testable GPP measuring probe
Version	Measuring path open in flow direction; purge air guidance with outlet aligned 90° to gas flow	Gas-testable measuring probe with ceramic filter, for dry sample gas
Maximum process temperature	≤ +250 °C As from 200 °C with heated purge air	<ul style="list-style-type: none"> <li>• HCl: +130 °C ... +430 °C</li> <li>• NH<sub>3</sub>: +300 °C ... +430 °C</li> </ul>
Gas test according to EPA regulation	No	Yes
Purge air supply required	Yes	No
Suitable for wet sample gas	Yes	No
Measurable components	NH <sub>3</sub> , HF, HCl	NH <sub>3</sub> , HCl
Response time (t <sub>90</sub> )	> 5 s	> 120 s
Duct diameter	> 500 mm	> 380 mm
Dust load	≤ 3 g/m <sup>3</sup> Relative to 1 m measuring distance, depending on application	≤ 30 g/m <sup>3</sup>
Probe lengths available	see "Dimension drawing, open GMP measuring probe", page 73	see "Dimension drawing, gas-testable GPP measuring probe", page 74
Available measuring distances	see "Dimension drawing, open GMP measuring probe", page 73	see "Dimension drawing, gas-testable GPP measuring probe", page 74

### 3.7.1 Open GMP measuring probe in detail

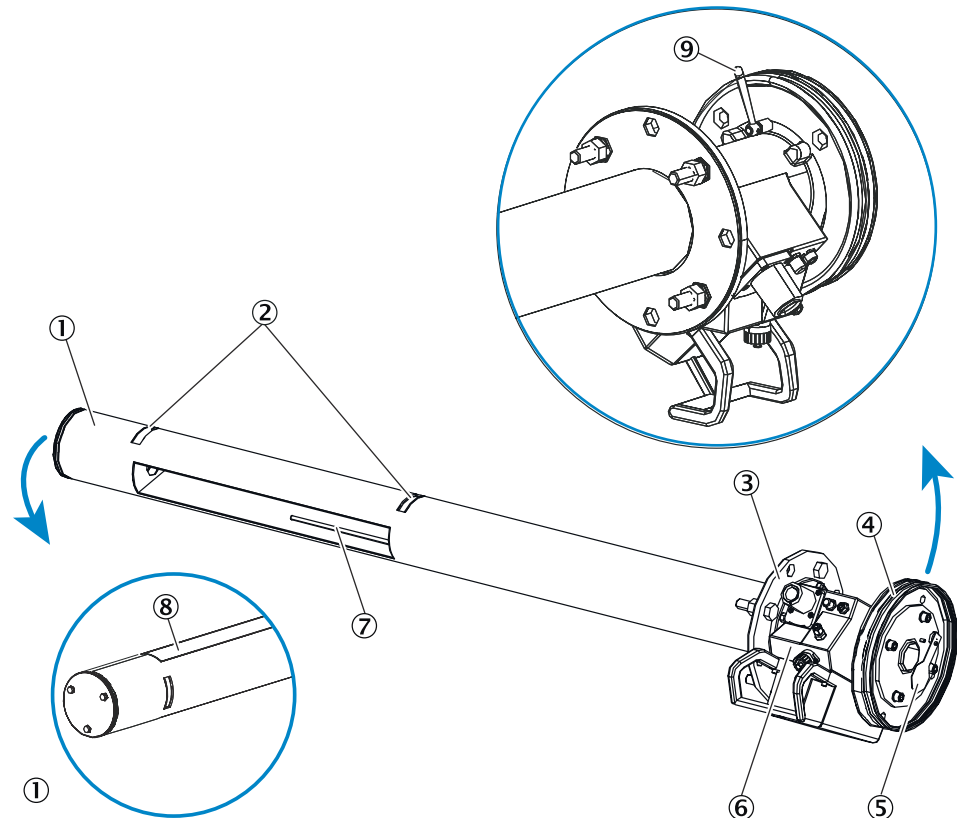


Figure 3: Open measuring probe GMP

- ① Probe end with reflector assembly
- ② Air slots: Purge air outlet 90° to gas flow (directed purge air)
- ③ Process flange: Attached to flange with tube (at installation location)
- ④ Device flange: Attached to sender/receiver unit
- ⑤ Locking device
- ⑥ Purge air attachment with connections (purge air, electric connection cables)
- ⑦ Integrated temperature sensor PT1000
- ⑧ Measuring gap
- ⑨ Lever for locking device

### 3.7.2 Gas-testable GPP measuring probe in detail

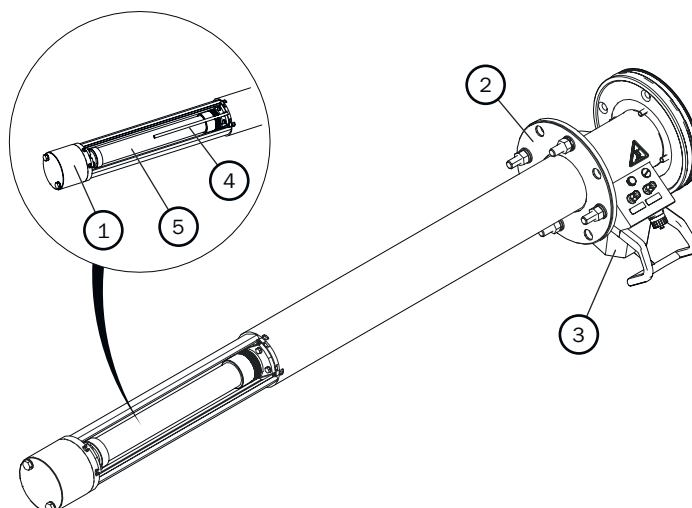


Figure 4: Gas-testable measuring probe GPP

- ① Probe end with reflector assembly
- ② Process flange: Attached to flange with tube (at installation location)
- ③ Test gas attachment with connections
- ④ Integrated temperature sensor PT1000
- ⑤ Filter element (gas permeable)

## 4 Transport and storage

### 4.1 Storage

- ▶ Clean all components of the measuring device (not the optical surfaces) with slightly moistened cleaning cloths. Use a mild cleaning agent here.
- ▶ Protect the openings of the sender/receiver-unit and measuring probe from atmospheric influences, preferably with the original transport safety devices.
- ▶ Pack all components for storage or transport. Preferably use the original packing.
- ▶ Store all components of the measuring device in a dry, clean area.

## 5 Mounting

### 5.1 Safety

**WARNING****Risk of injury through improper assembly work**

All assembly work must be carried out only by authorized persons who, based on their training and knowledge as well as knowledge of the relevant regulations, can assess the tasks given and recognize the hazards involved.

**CAUTION****Accident risk through inadequate fastening of the device**

- ▶ Consider the device weight specifications when planning the fitting supports.
- ▶ Check the load capacity/condition of the duct on which the device is to be installed.

**NOTICE****Damage to device and plant through unsecured parts during installation**

During installation, parts of the device or flange can fall into the duct and cause damage.

- ▶ Secure all parts with wire.

**NOTICE****Damage to the measuring device due to premature installation on the stack**

Unsuitable ambient conditions in the measuring duct can damage the measuring device and make commissioning impossible.

- ▶ First install the measuring device on the stack after commissioning.

### 5.2 Tools required

- Fork or ring spanner set
- Insulated screwdriver set
- Allen key set, metric

### 5.3 Material required

- Optics cleaning wipes without detergent
- Personal protective equipment

### 5.4 Preparing the measuring point

**Responsibility of the operator**

- Determining the measuring point (e.g. determining a representative sampling point)
- Preparing the measuring point (e.g. load capacity of welded-on flange)

**NOTICE**

Basis for determining the measuring point:

- Preceding project planning
- Final inspection specifications for device
- Regulations of local authorities

## 5.5 Checking the scope of delivery

- ▶ Check the scope of delivery according to the order confirmation/delivery note.
- ▶ Ensure the supply voltages indicated on the type plates correspond to the system conditions.
- ▶ Check all components for externally perfect delivery condition.

## 5.6 Installation sequence

### 5.6.1 Installation steps

Installation comprises two main steps:

- 1 Installing the required **device components** at the measuring point **before** commissioning.
- 2 Installing the **measuring device** at the measuring point (carried out by Endress+Hauser Service **during** commissioning).



#### NOTICE

GMP measuring probe device damage: To prevent contamination of the optical surfaces, the purge air must be connected immediately after installation.

Table 4: GMP measuring probe: Overview of installation steps before commissioning

Step	Procedure	Reference
1	Install the flange with tube.	see "Installing the flange with tube", page 19
2	Install the purge air unit.	see Purge air unit Operating Instructions
3	Connect the purge air unit electrically.	see Purge air unit Operating Instructions
4	Remove the transport safety devices of the measuring probe.	see "Removing the transport safety device of the GMP measuring probe", page 21
5	Install the measuring probe.	see "Fitting the measuring probe on the flange with tube", page 22
6	Put the purge air unit into operation.	see "Putting the purge air unit into operation", page 23
7	Fit the flange attachment on the measuring probe.	see "Fitting the flange fixture on the measuring probe", page 24
8	Fit the control unit.	see "Fitting the control unit", page 25

Table 5: GPP measuring probe: Overview of installation steps before commissioning

Step	Procedure	Reference
1	Install the flange with tube.	see "Installing the flange with tube", page 19
2	Remove the transport safety devices of the measuring probe.	see "Removing the transport safety device of the GPP measuring probe", page 22
3	Install the measuring probe.	see "Fitting the measuring probe on the flange with tube", page 22
4	Fit the flange attachment on the measuring probe.	see "Fitting the flange fixture on the measuring probe", page 24
5	Fit the control unit.	see "Fitting the control unit", page 25

### 5.6.2 Installing the flange with tube

#### Prerequisite

- Installation location was determined during the project planning.
- Stability of the duct wall has been checked.

**DANGER****Health risk through hot or toxic gases/dusts in the measuring duct**

The measuring duct can contain hot or toxic gases or dust deposits which can escape when opening the duct-side flange. Even if the measuring duct is out of operation during the installation, escaping gases can lead to severe damage to health.

- ▶ Always put the measuring duct out of operation for the duration of the installation.
- ▶ If required, purge the measuring duct with ambient air before starting installation work.
- ▶ Always wear suitable or company-specified protective clothing during installation work.

**NOTICE****Device damage through incorrect/missing insulation of the duct when the measuring duct is hot**

- ▶ When the measuring duct is hot, plan the duct and flange insulation so that the device is protected against high temperatures.

**NOTE**

- Flange with tube dimensions: see ["Dimension drawing, flange with tube, DN125"](#), page 76

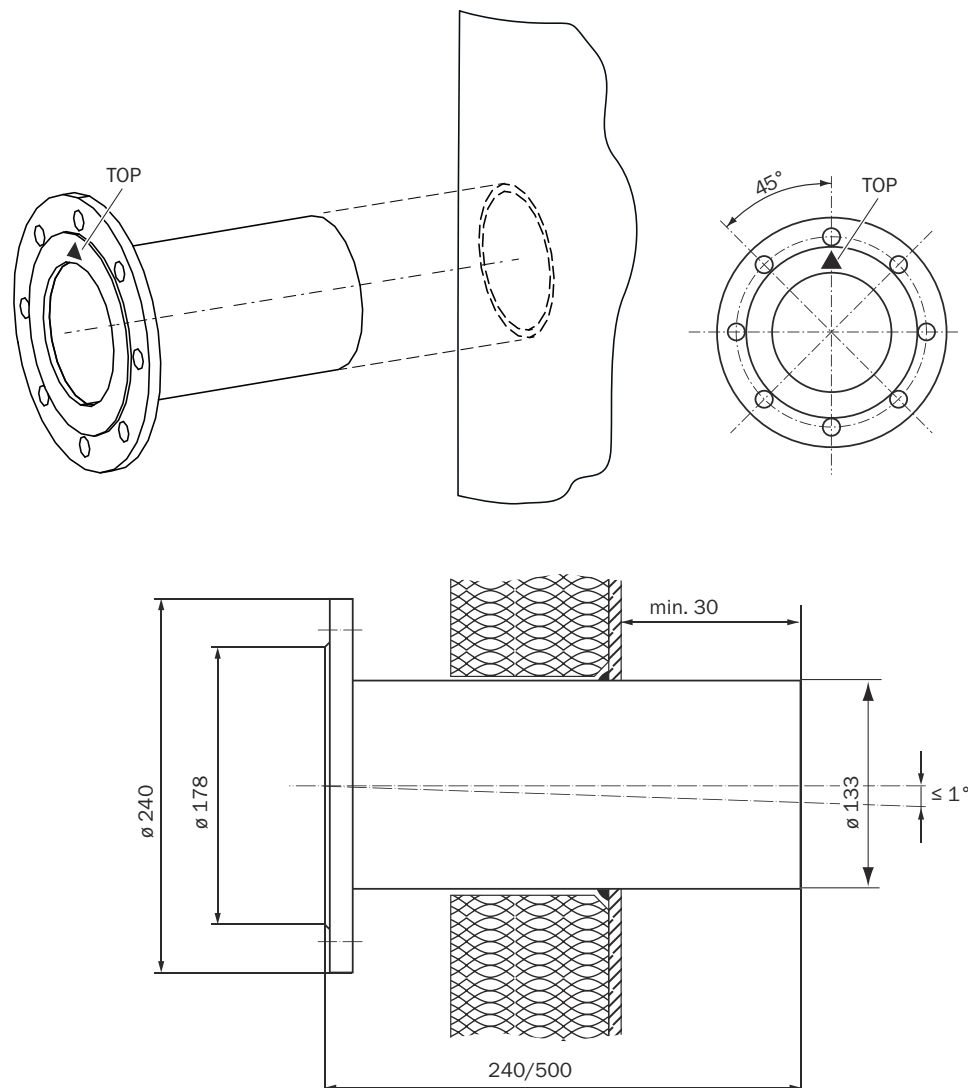
**Installing the flange with tube**

Figure 5: Flange with tube incl. orientation "TOP"

**Steps**

1. Cut openings on the gas duct for the flange with tube.
2. Position the flange with tube. Make sure:
  - Marking "TOP" must point vertically upwards independent of the gas duct angle.
  - The tube must project at least 30 mm into the gas duct.
  - Tube axis deviations between sender/receiver unit and reflector unit: Max. 1°
3. Attach the flange with tube.

**NOTE**

Other devices or fittings must not cut or interrupt the measuring device beam path.

**Permanently fasten the flange with tube****Steps**

1. Permanently weld or fasten the flange with tube.
2. If necessary, fit duct insulation around the flanges with tube to protect the measuring device from heat.

**5.6.3 Installing the purge air unit****NOTE**

For information on the purge air unit, see the Operating Instructions of the purge air unit (SLV4).

**5.6.4 Connecting the purge air unit electrically****NOTE**

For information on the purge air unit, see the Operating Instructions of the purge air unit (SLV4).

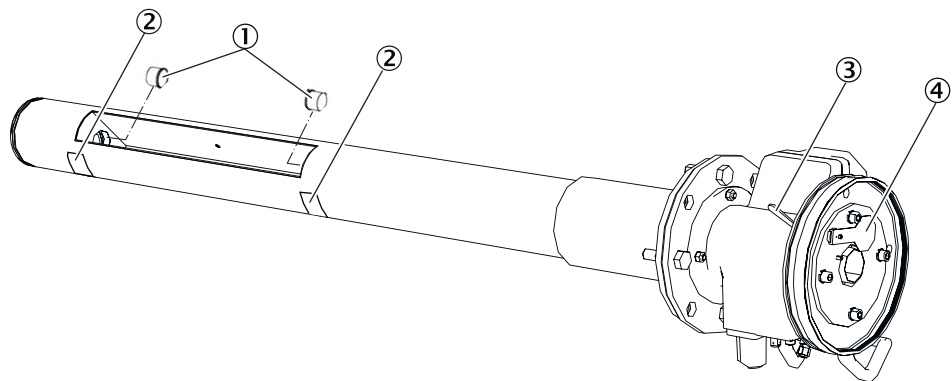
**5.6.5 Removing the transport safety devices of the measuring probe****5.6.5.1 Removing the transport safety device of the GMP measuring probe**

Figure 6: Transport safety device of the GMP measuring probe

- ① 2 × protective caps to cover the optics
- ② Protective stickers
- ③ Lever of locking device
- ③ Set the locking device to the "close" position

**Steps**

1. Remove the protective stickers.
2. Remove the protective caps.
3. Store the transport safety device.

### 5.6.5.2 Removing the transport safety device of the GPP measuring probe

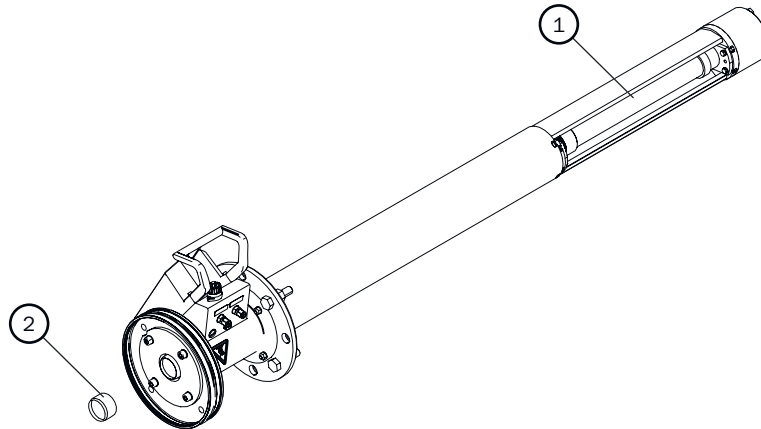


Figure 7: Transport safety device of the GPP measuring probe

- ① Filter with protective cover
- ② Protective cap for covering

#### Steps

1. Remove the protective cover of the filter.
2. Remove the protective cap.
3. Store the transport safety device.

### 5.6.6 Fitting the measuring probe on the flange with tube

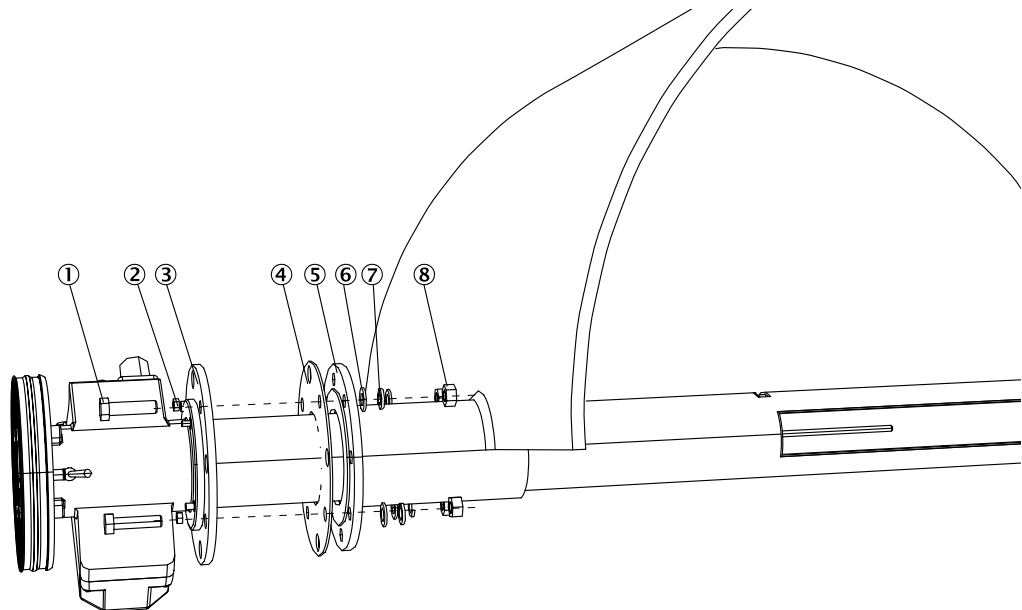


Figure 8: Fit the measuring probe with pre-fitted purge air attachment on the flange with tube (on the duct).

- ① M16 screw
- ② Washer
- ③ Flange
- ④ Flange seal
- ⑤ Flange with tube
- ⑥ Washer
- ⑦ Spring washer
- ⑧ Nut

**Steps**

1. Fit the measuring probe with pre-fitted purge air attachment on the flange with tube.
2. Tighten the nuts.

**NOTE**

The installation steps of the measuring probe on the flange with tube are identical for all measuring probes.

### 5.6.7 Putting the purge air unit into operation

**NOTE**

Electrical connections for the purge air unit, see Purge air unit Operating Instructions.

**Preparation**

Switch the power supply for the purge air unit on for a short time to check the function and to remove any dust that may have penetrated the purge air hose.

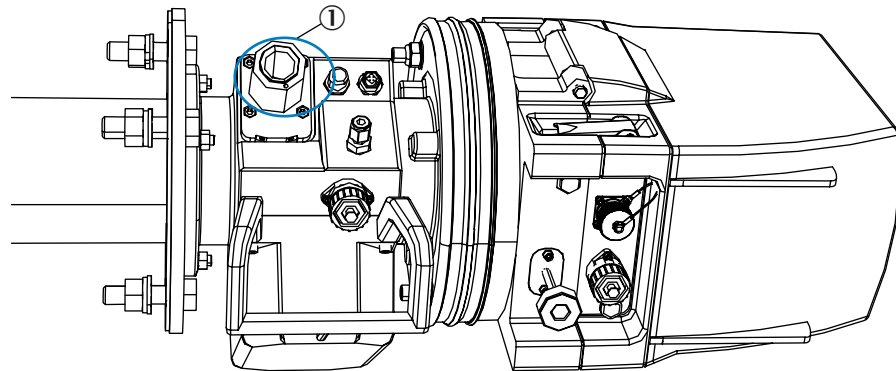


Figure 9: Purge air connection on the purge air fixture of the measuring probe

- ① Purge air hose connection (purge air bracket)

**Steps**

1. Connect the purge air hose of the purge air unit with a hose clamp to the purge air bracket connection of the purge air attachment.
2. Switch on the purge air supply.
- ✓ Purge air supply is now activated and protects the measuring system against contamination and overheating.

**NOTICE**

Attach clearly visible warning information against unintentional switching off on all switching devices with which the purge air units can be switched off.

### 5.6.8 Fitting the flange fixture on the measuring probe

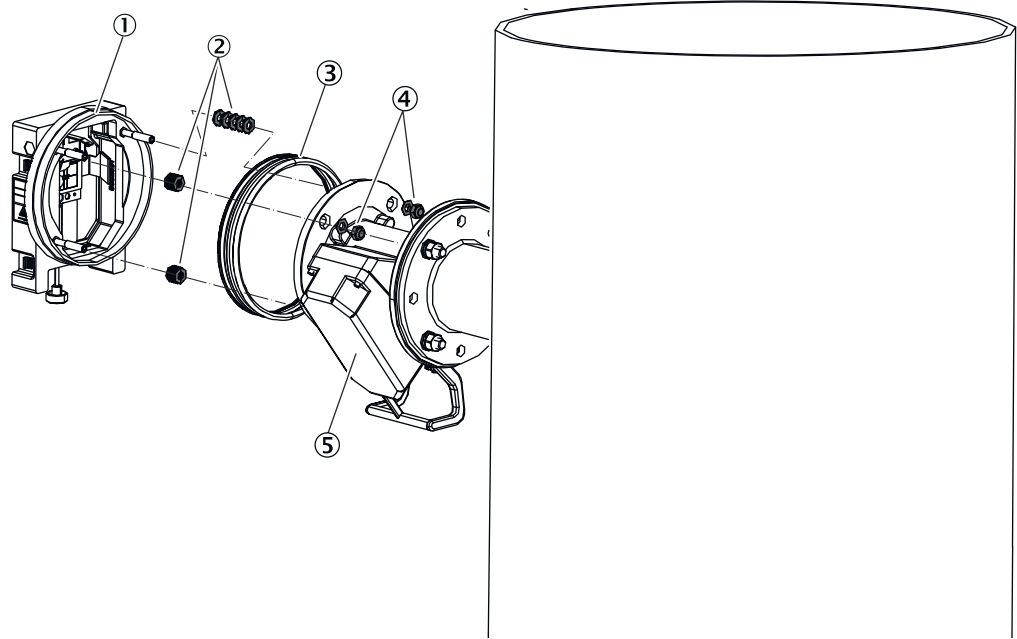


Figure 10: Fitting the flange fixture

- ① Flange fixture, sender/receiver unit
- ② Cup springs set (10 per fixture, positioned back-to-back)
- ③ Sealing ring
- ④ Lock nut with centering disc
- ⑤ Purge air attachment

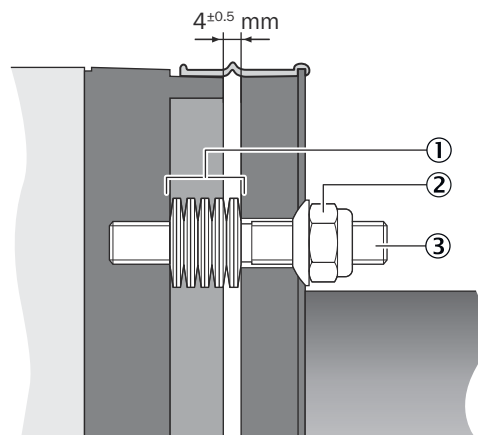


Figure 11: Detail view, alignment of cup springs

- ① Alignment of cup springs set
- ② Lock nut with centering disc
- ③ Threaded bolt, device flange



#### NOTICE

Cup springs must be used to enable correct alignment of the sender/receiver unit. Do not use washers or other springs.

#### Steps

1. Place 10 cup springs, individually directed against each other, on each of the three threaded bolts on the device flange.
2. Pull the sealing ring over the flange of the measuring probe and hang it loosely over the purge air unit.

3. Push the device flange onto the measuring probe.
4. Position the centering discs.

**NOTICE**

Observe the direction of the centering disc: The convex side must fit into the groove on the purge air attachment.

5. Tighten the self-locking nuts with a wrench (19 mm) so that the cup springs are slightly compressed and an even gap of approx. 4 mm remains.

### 5.6.9 Fitting the control unit

#### Prerequisite

- Installation location already determined during project planning.
- Minimum line length of 4 m for the connection line to the measuring device.
- Maximum line length of 300 m for CAN bus connection between control unit and sender/receiver unit.
- The maximum line length of 300 m for all CAN bus and RS-485 connections has been considered.
- Good accessibility to the device, flat, vertical mounting surface.
- Weather hood, observe IP protection class.

#### Prepare the installation location

- Based on the control unit dimension drawing, ensure enough space is available at the planned installation location for assembly as well as opening the enclosure door.

#### Control unit AWE (sheet steel enclosure version)

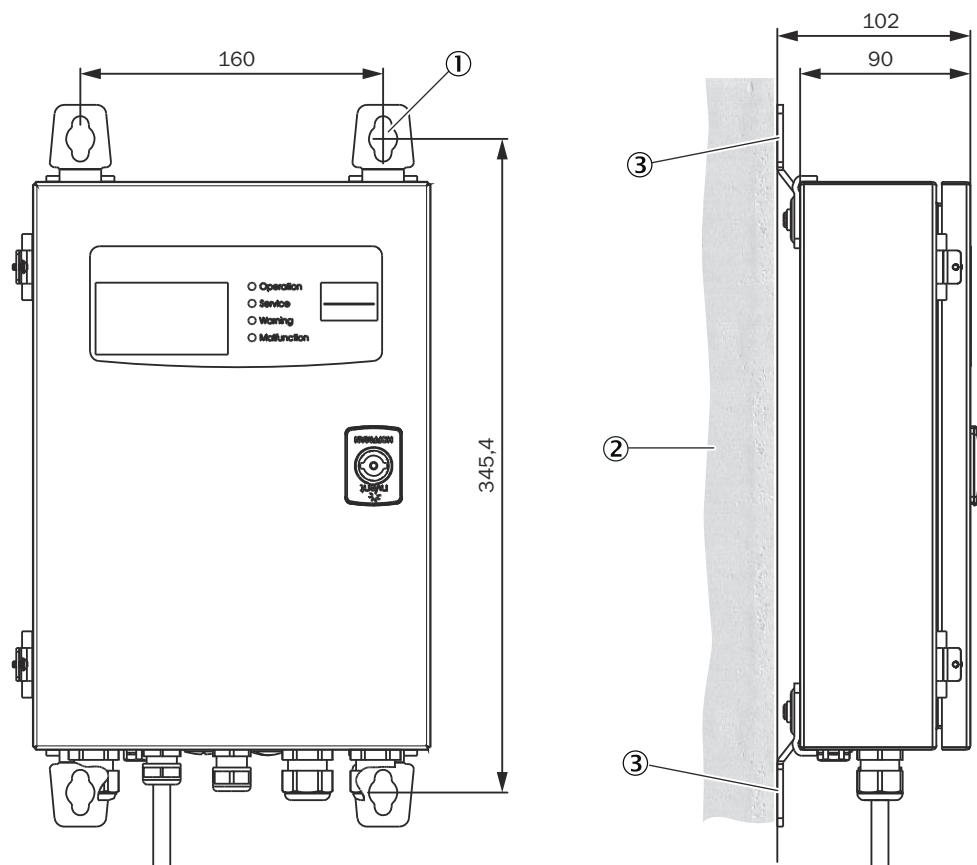


Figure 12: Fitting the control unit AWE, sheet steel enclosure (dimensions in mm)

- ① 4 × mounting holes,  $\varnothing$  7.2 mm
- ② Mounting surface
- ③ Fastening brackets

**Steps**

1. Drill the holes according to the installation drawing (Ø 7.2 mm for M8).
2. Fasten the control unit to the four fastening brackets.

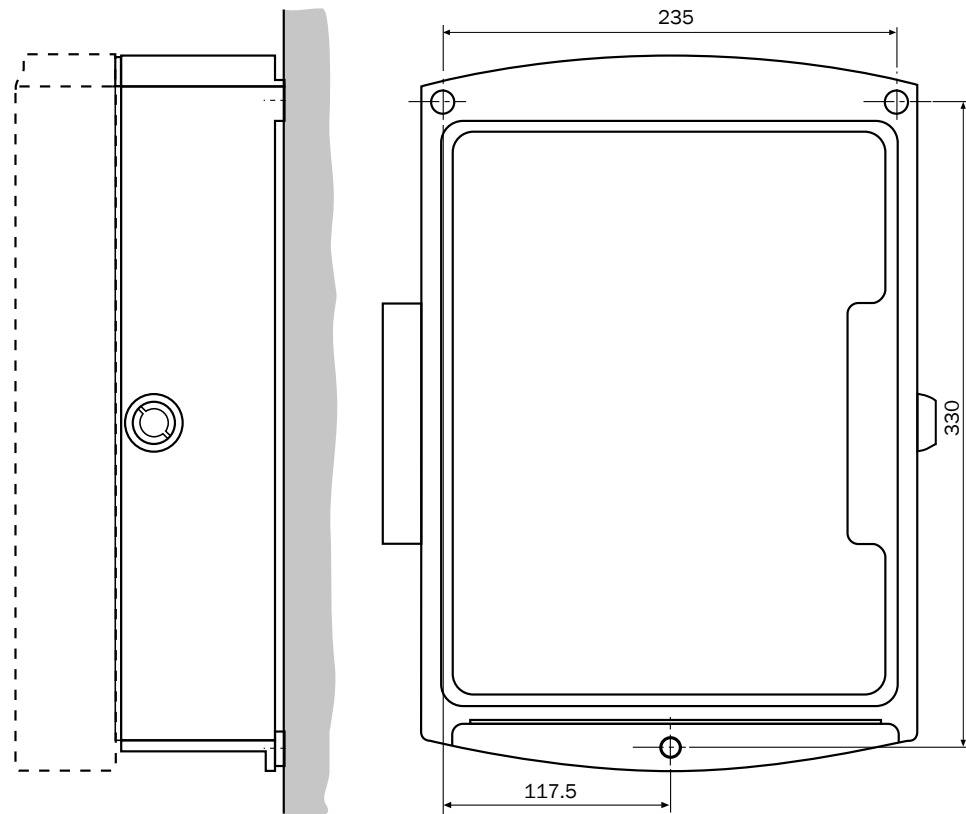
**Control unit AWE (cast metal enclosure version)**

Figure 13: Fitting the control unit AWE, cast metal enclosure (dimensions in mm)

**Steps**

1. Drill the holes according to the installation drawing (Ø 7.2 mm for M8).
2. Fasten the control unit to the three fastening brackets.

**5.6.9.1 Fitting the control unit at a greater distance (option)**

To be used when the distance between the control unit and the sender/receiver unit is greater than 19 m

**Prerequisite**

- Connection unit with a 24V power supply unit (option)
- Connection unit – sender/receiver unit: 4 m CAN bus line (in scope of delivery)
- Connection unit – control unit: 6-pole line (provided by customer) suitable for prefabricated extension line (option) or CAN bus

**NOTE**

The total length of the CAN bus connections may be up to 300 m.

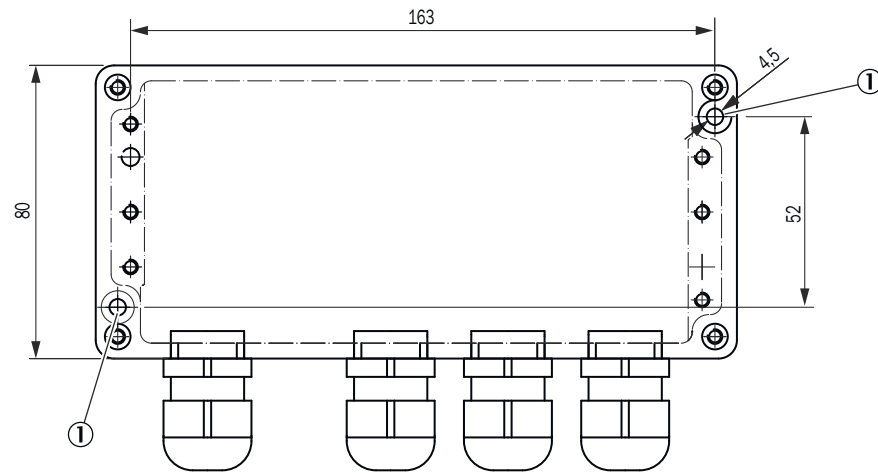


Figure 14: Fitting the connection unit (dimensions in mm)

① Mounting hole Ø 5 mm

### Steps

#### Install the connection unit

1. Drill the holes according to the installation drawing (Ø 5 mm for M4).
2. Remove the enclosure cover. To do this, unscrew the 4 screws.
3. Screw the enclosure tightly to the two mounting holes.

## 6 Electrical installation

### 6.1 Safety

**DANGER****Danger to life through electric shock**

There is a risk of electric shock when working on the device with the voltage supply switched on.

- ▶ Before starting work on the device, ensure the voltage supply can be switched off in accordance with the valid Standard using a power isolating switch/circuit breaker.
- ▶ Make sure the disconnect switch is easily accessible.
- ▶ An additional disconnecting device is mandatory when the power disconnect switch cannot be accessed or only with difficulty after installation of the device connection.
- ▶ Switch off the voltage supply before starting any work on the device.
- ▶ After completion of the work or for test purposes, calibration of the power supply may only be activated again by authorized personnel complying with the safety regulations.

**WARNING****Endangerment of electrical safety through power cable with incorrect rating**

Electrical accidents can occur when the specifications for installation of a power line have not been adequately observed.

- ▶ Always observe the exact specifications in the Operating Instructions (see ["Technical data", page 68](#)) for installation of a power line.

**DANGER****Electrical accident due to improper performance of the electrical work**

The electrical work described in these Operating Instructions requires specialist knowledge. Electrical work can lead to serious electrical accidents if not carried out properly.

- ▶ Only let the work described in the following be carried out by electricians familiar with potential hazards.

**NOTICE****Risk of device damage**

Electronic components are accessible when the enclosure is open. The circuit board can be severely damaged when a contact is not grounded when the power supply is switched on.

- ▶ First switch the power supply on when the sender/receiver unit and the control unit are closed.

**NOTICE****Pay attention to connection values for power supply**

The control unit AWE is configured to 230 V AC on delivery.

- ▶ For 115 V AC, plug the respective bridges as shown on the connection plate of the control unit AWE.

**NOTICE****Device damage through short circuit on the device**

When power supply is available, signal short circuits can occur and damage the internal electronics. This is also valid for plug connections.

- ▶ Clean work is required. Do not leave any metal cuttings in the device.

## 6.2 Tools required

- Phillips screwdriver set
- Multimeter
- Control cabinet key

## 6.3 Overview of electrical connection steps

Connecting is done in two main steps:

- 1 **Before** commissioning: Make the connections for the **device components** at the measuring point.
- 2 **During** commissioning: Create the remaining necessary connections **on the measuring device** at the measuring point (will be carried out by Endress+Hauser Service **during** commissioning).

Table 6: Overview of electrical connection steps

Step	Procedure	Reference
1	Lay lines.	see "Connection overview", page 30
2	Connect control unit.	see "Electrical connection of the control unit", page 31
3	Optional: Connect the connection unit.	see "Connecting the connection unit (option)", page 35

6.4 Connection overview

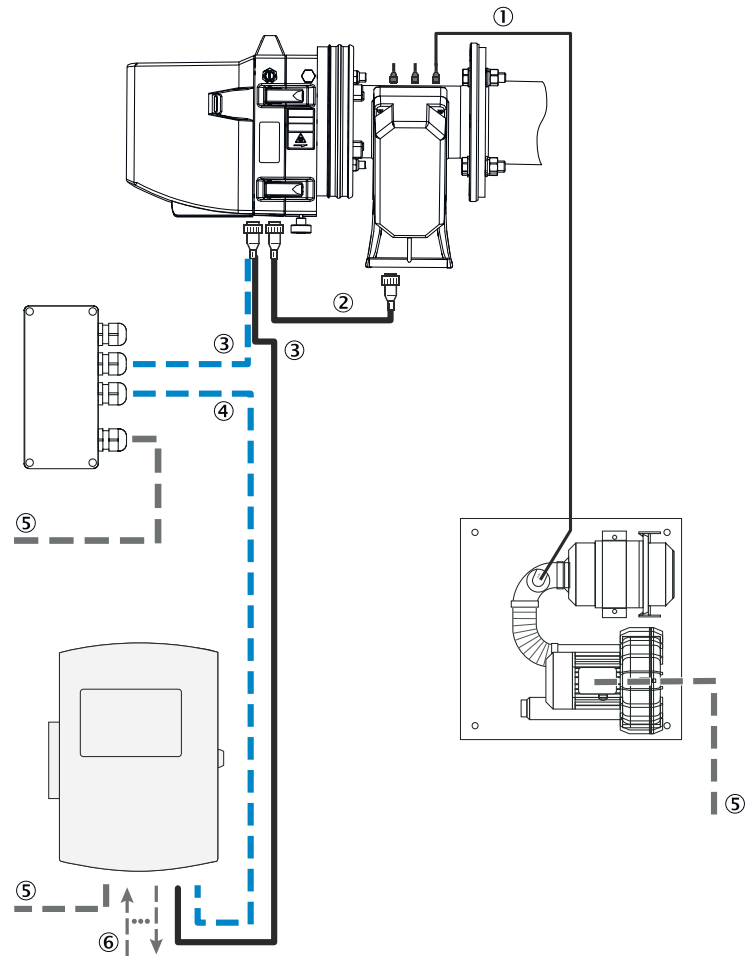


Figure 15: Electrical wiring of device components

- Standard scope of delivery
- - - Option
- - - Provided by customer
- ① Connection line, purge air attachment and low-pressure monitor purge air unit (only for GMP measuring probe)
- ② Connecting line, sender/receiver unit and purge air attachment
- ③ Connection line, sender/receiver unit and control unit or connection unit (option)
- ④ Line (extension), connection unit (option) and control unit
- ⑤ Power supply, purge air unit, provided by customer (only for measuring probe GMP)  
Power supply, control unit, provided by customer  
Power supply, connection unit, provided by customer
- ⑥ Signal lines, control unit (provided by customer)

6.4.1 Lines overview

Table 7: Lines overview

No.	Line	Length [m]	Scope of delivery	Specification
①	Purge air attachment, sender/receiver unit – low-pressure monitor for purge air unit (open line end)	5	Included	Prefabricated with plug-in connector, open line end
②	Sender/receiver unit – purge air attachment (CAN bus)	0.8	Included	Prefabricated with plug-in connector
③	Sender/receiver unit – control unit (CAN bus) or Sender/receiver unit – connection unit (option)	4	Included	Prefabricated with plug-in connector, open line end

No.	Line	Length [m]	Scope of delivery	Specification
④	Connection unit (option) — control unit (CAN bus)	Max. 300	Option	Open line ends, 5 × 0.5 mm <sup>2</sup>
⑤	Power supply <ul style="list-style-type: none"> <li>• Purge air unit</li> <li>• Control unit</li> <li>• Connection unit (option)</li> </ul>		Not included	4 × 1.5 mm <sup>2</sup>
⑥	Control unit: Signal lines to system periphery		Not included	Each 0.5 mm <sup>2</sup>

#### 6.4.2 Laying lines

- Do not lay power supply and signal lines immediately next to each other.
- Close off open ends of prefabricated lines with the protective caps against weather effects until device installation.
- Install separate power supply cables and circuit breakers for:
  - Purge air units
  - Control unit
  - Connection unit (option)
- Carry out installation of all lines according to valid local regulations.
- Wire cross-section specifications are recommendations. The cross-sections of lines for analog and digital signals and for the power supply must not be reduced. The CAN bus lines from the scope of delivery must be used.
- Signal lines from the control unit to the connection terminals of the customer's status/message devices can be added later as required.

### 6.5 Electrical connection of the control unit

#### Standard cabling

For standard cabling, the device must be installed near the measuring point so that the cabling can be carried out with the supplied 4 m CAN bus line.

Connection lines to the CAN bus extensions are optionally available.

### 6.5.1 Correct connection of the CAN bus line

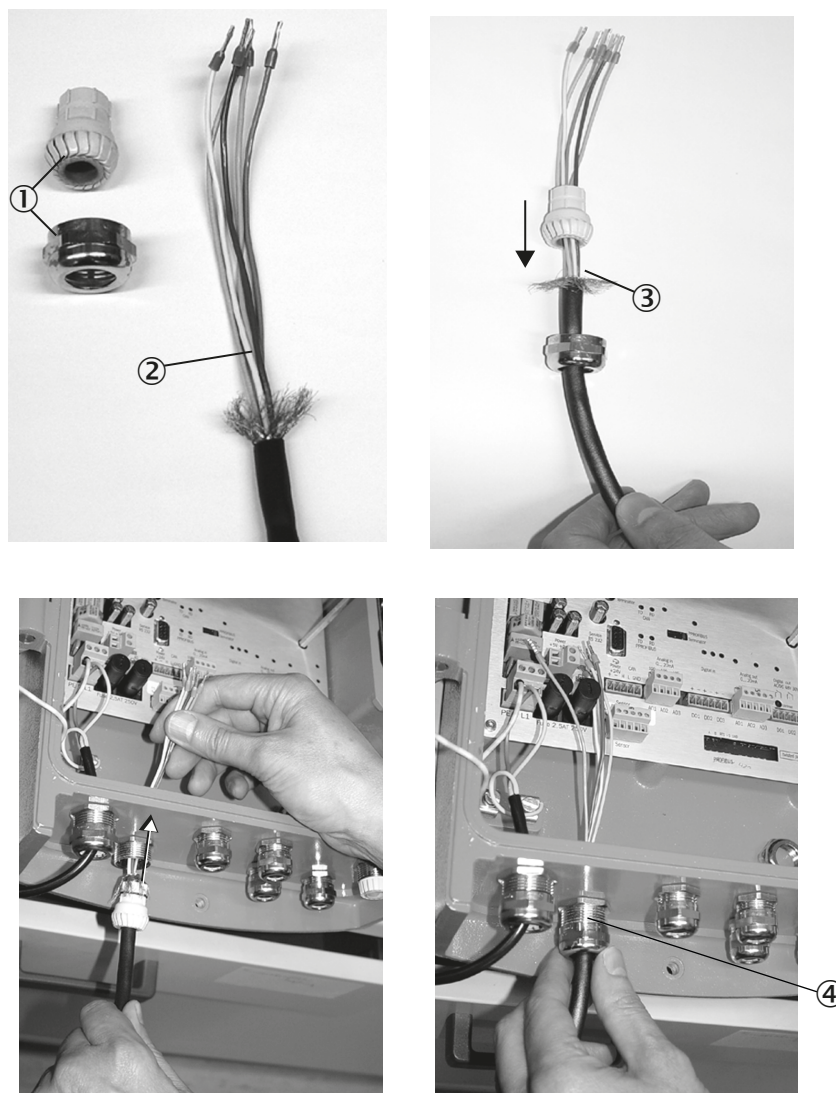


Figure 16: CAN bus line fitted correctly (shown on the AWE)

- ① M screw fitting on the control unit
- ② CAN bus line
- ③ CAN bus line shielding
- ④ M screw fitting fitted in the control unit

### 6.5.2 Connecting the control unit electrically



#### NOTE

The analog input assignment shown in the following Chapters is the factory setting. This setting may not be changed.

### Control unit AWE

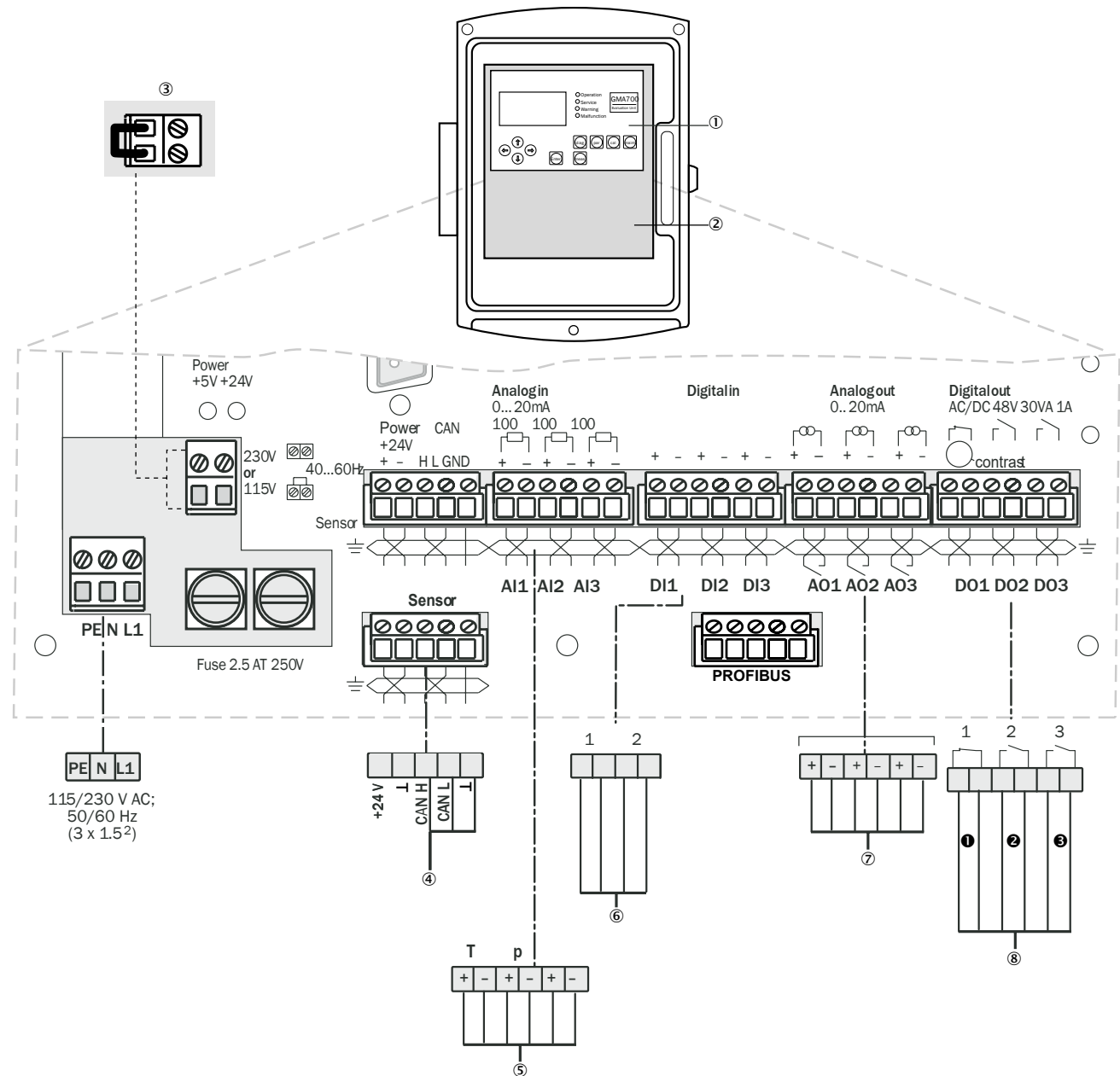


Figure 17: Electrical wiring of control unit AWE

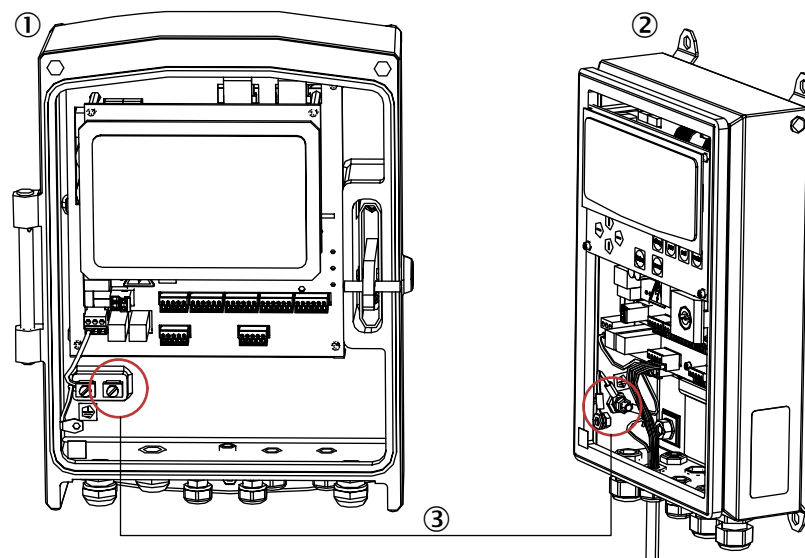
- ① Operating elements board
  - ② Connections board
  - ③ Plug this bridge for 115 V or 120 V power supply
  - ④ CAN H + L, twisted pair, shielded. Connection for GM700 sender/receiver unit or connection unit
  - ⑤ Analog inputs: 0 ... 20 mA ( $6 \times 0.5^2$ )
  - ⑥ Digital inputs: Potential-free contacts ( $6 \times 0.75^2$ )
  - ⑦ Analog outputs: 0 ... 20 mA ( $6 \times 0.75^2$ )
  - ⑧ Digital outputs: 48 V AC/DC; 60 VA, 1 A ( $6 \times 0.75^2$ )
- 
- ❶ Failure (NC contact)
  - ❷ Maintenance request (NO contact)
  - ❸ Function check (NO contact)

**CAN bus line: Color marking of wiring**

Wiring	Color code
CAN-H	Yellow
CAN-L	Green
CAN GND	Brown
0 ... 20 mA	White
GND	Black

**Steps**

1. Ensure the power supply has been installed according to the specification (observe country-specific requirements) and is switched off.
2. Unlock the door lock with the control cabinet key. Open the enclosure door of the control unit.
3. Lead the connection line for power supply through the line duct and wire connections L1, N and PE (protective ground).
4. Lead the connection line from the measuring device through the line duct and wire on.
5. Lead the signal lines for the analog and digital inputs and outputs through the line duct at the bottom of the enclosure and wire on.

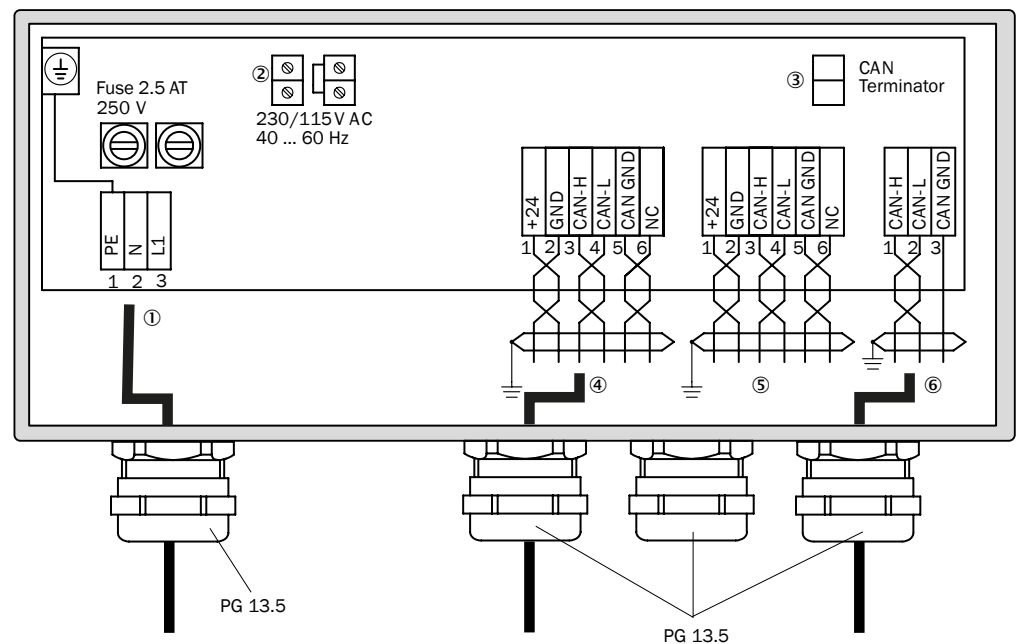
**6.5.3 Connecting the grounding conductor on the control unit***Figure 18: Connection for grounding conductors*

- ① Control unit AWE (cast metal enclosure version)
- ② Control unit AWE (sheet steel enclosure version)
- ③ Connection for grounding conductor

**Steps**

1. Lead the potential equalization (4 mm<sup>2</sup>) of the plant ground with one eyelet over the bolt.
2. Position and tighten the M6 nut.

6.6 Connecting the connection unit (option)



- ① Power supply 115 / 230 V AC (3 x 1.5 mm<sup>2</sup>)
- ② Supply voltage selection: 115 V / 230 V
- ③ CAN terminator
- ④ Sensor, CAN connection 1\*: Connection line to the sender/receiver unit
- ⑤ Sensor, CAN connection 2\*: Connection line to the sender/receiver unit
- ⑥ CAN connection: Connection line to the control unit
- \*Only one of the two CAN connection terminal strips available is required for the device.

**NOTE**

The maximum line length between the connection unit and the control unit is 300 m.

- Steps**
- Determine no voltage is applied.
  - Connect bridge (jumper) according to suitable voltage supply (ST2).
  - Lead CAN line for the control unit through the right M screw fitting to the terminal strip.
  - Connect shielding on the M screw fitting on the enclosure.
  - Connect the wires.
  - Connect the respective signals in the control unit and connection unit.

**NOTICE**

The CAN-H and CAN-L lines must be twisted pairs.

CAN bus line: Color marking of wiring

Wiring	Color code
CAN-H	Yellow
CAN-L	Green
CAN GND	Brown
0 ... 20 mA	White
GND	Black

## 7 Commissioning

### 7.1 Safety

#### Technical knowledge needed / requirements for commissioning

---



##### NOTICE

- You are basically familiar with the GM700.
- You are familiar with conditions at the installation location, especially possible hazards through the gases in the gas duct (hot/dangerous to health). You are capable of recognizing and preventing danger by possibly escaping gases.

If one of these requirements is not met:

- Contact Endress+Hauser Customer Service or your local Endress+Hauser representative.
- 

#### Laser radiation

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##### WARNING

##### Eye injuries through laser radiation

The invisible laser beam is not accessible when the sender/receiver unit is closed. Observe the following when the sender/receiver unit of the device is swiveled open during installation work for test purposes and the laser beam is activated:

- Before working on the sender/receiver unit, take appropriate safety measures to protect uninvolved persons from the laser beam.
  - Never look directly into the laser aperture when opening the sender/receiver unit.
  - Laser protection class 1: Wear laser protection glasses despite low radiation.
  - Observe national valid limit values and relevant standards for industrial safety.
  - The laser beam can be made visible with a suitable detector card.
- 

#### Grounding

---



##### NOTICE

##### Device damage through incorrect or missing grounding

It must be ensured during installation and maintenance work that the protective grounding of the device or cables involved is established in accordance with EN 61010-1.

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### 7.2 Requirements

- Operating Instructions for purge air supply
- Final inspection protocol
- Documentation Checklist
- Measuring device switched on (2 hours warm-up phase)

### 7.3 Tools required

- Fork or ring spanner set
- Optical alignment tool (not included in standard scope of delivery)

### 7.4 Material required

- Optics cleaning wipes without detergent

## 7.5 Commissioning steps overview

Commissioning comprises two main steps:

- 1 Installation and connection of the measuring device at the measuring point
- 2 Fine optical alignment with internal alignment tool

Table 8: Commissioning steps

Step	Procedure	Reference
1	Remove the transport safety devices.	see "Removing the transport safety device on the sender/receiver unit", page 37
2	<b>Only for GMP:</b> Make sure that the purge air supply is in operation.	see "Putting the purge air unit into operation", page 23
3	Fitting the sender/receiver unit on the flange fixture.	see "Fitting the sender/receiver unit on the flange fixture", page 38
5	Connect the sender/receiver unit electrically.	see "Connecting the sender/receiver unit with measuring probe", page 39
6	Carry out fine optical adjustment.	see "Fine optical alignment for device versions for NH <sub>3</sub> and HF measurement", page 40 see "Fine optical alignment for device version for HCl measurement", page 41
7	Fit the weather hood (option).	see "Fitting the weather hood (option)", page 42
8	Start measuring operation.	see "Starting measuring operation", page 44

## 7.6 Removing the transport safety device on the sender/receiver unit

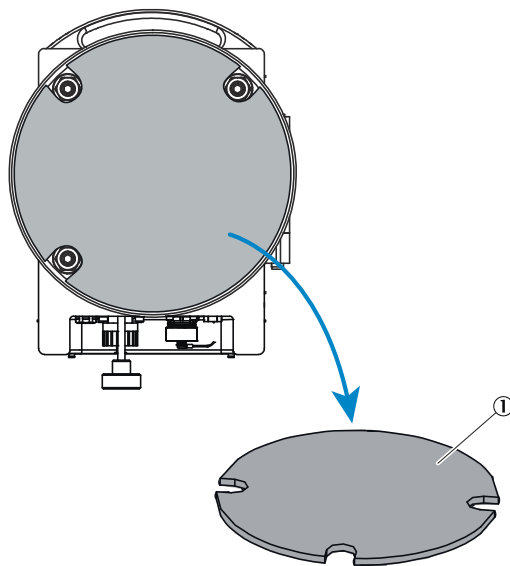


Figure 20: Transport safety devices

- ① Transport safety device, sender/receiver unit

### Steps

1. Open the locks. Swivel the flange fixture open.
2. Remove the transport safety devices.
3. Check the transport safety device for damage.
4. Store the transport safety device.

## 7.7 Fitting the sender/receiver unit on the flange fixture



### WARNING

#### Risk of injury when the device drops down

The weight of the device can cause it to drop down and cause injuries during the work described in this Section.

- Carry out assembly work on parts of the device together with another person when necessary.

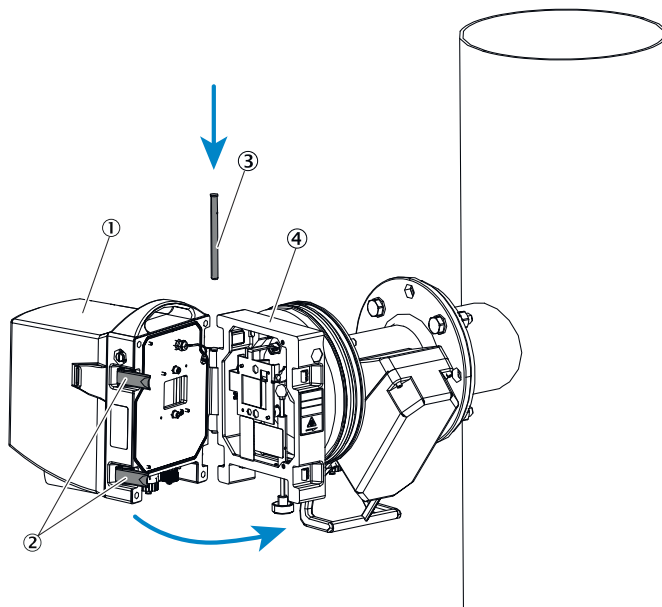


Figure 21: Fitting the sender/receiver unit on the flange fixture

- ① Sender/receiver unit
- ② Quick-release fasteners
- ③ Hinge pin
- ④ Flange fixture

### Steps

1. Insert the sender/receiver unit into the hinge.
2. Insert the pin from the top downwards through the hinge.
3. Fold the sender/receiver unit flange fixture together.
4. Close the quick-release fasteners.

## 7.8 Connecting the sender/receiver unit with measuring probe

### Sender/receiver unit with GMP measuring probe

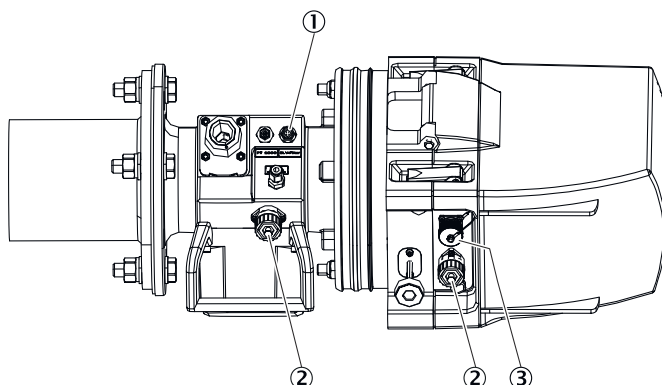


Figure 22: Electrical connections on the sender/receiver unit with GMP measuring probe

- ① Purge air unit low-pressure monitor connection
- ② Sender/receiver unit — purge air attachment connection cable connection
- ③ Control unit connection cable connection

#### Steps



#### NOTE

Connection overview [see "Connection overview", page 30](#)

1. Connect the purge air unit low-pressure monitor.
2. Connect the connection cable between the sender/receiver unit and the purge air attachment of the GMP measuring probe.
3. If necessary, connect the connection cable to the connection unit (option).
4. Connect the connection cable to the control unit.
5. On the measuring probe: Set the lever of the locking device to "Open".

### Sender/receiver unit with GPP measuring probe

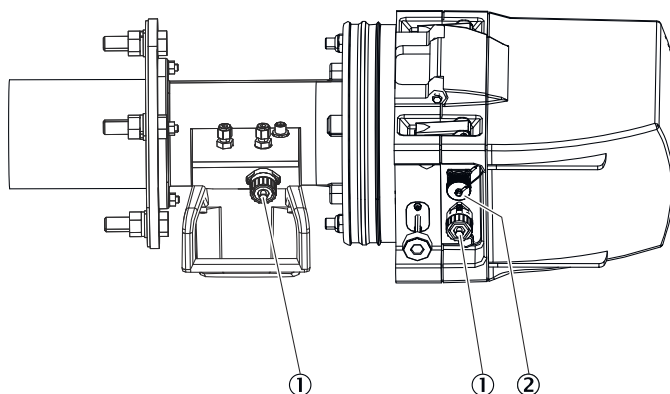


Figure 23: Electrical connections on the sender/receiver unit with GPP measuring probe

- ① Connection of sender/receiver unit — test gas attachment connection cable
- ② Connection of control unit connection cable

#### Steps



#### NOTE

Connection overview [see "Connection overview", page 30](#)

1. Connect the connection cable between the sender/receiver unit and the test gas attachment of the GPP measuring probe.
2. If necessary, connect the connection cable to the connection unit (option).
3. Connect the connection cable to the control unit.

## 7.9 Fine optical alignment for device versions for NH<sub>3</sub> and HF measurement



### CAUTION

#### Hazard by laser radiation

Device with a laser with protection class 1.

- ▶ Do not hold any reflecting objects or objects that bundle the laser beam in the laser beam.
- ▶ During installation or maintenance: Disconnect the power supply before opening the device.



### WARNING

#### Eye injuries through laser radiation

The invisible laser beam is not accessible when the sender/receiver unit is closed. Observe the following when the sender/receiver unit of the device is swiveled open during installation work for test purposes and the laser beam is activated:

- ▶ Before working on the sender/receiver unit, take appropriate safety measures to protect uninvolved persons from the laser beam.
- ▶ Never look directly into the laser aperture when opening the sender/receiver unit.
- ▶ Laser protection class 1: Wear laser protection glasses despite low radiation.
- ▶ Observe national valid limit values and relevant standards for industrial safety.
- ▶ The laser beam can be made visible with a suitable detector card.

#### Description of the alignment tool on the sender/receiver unit

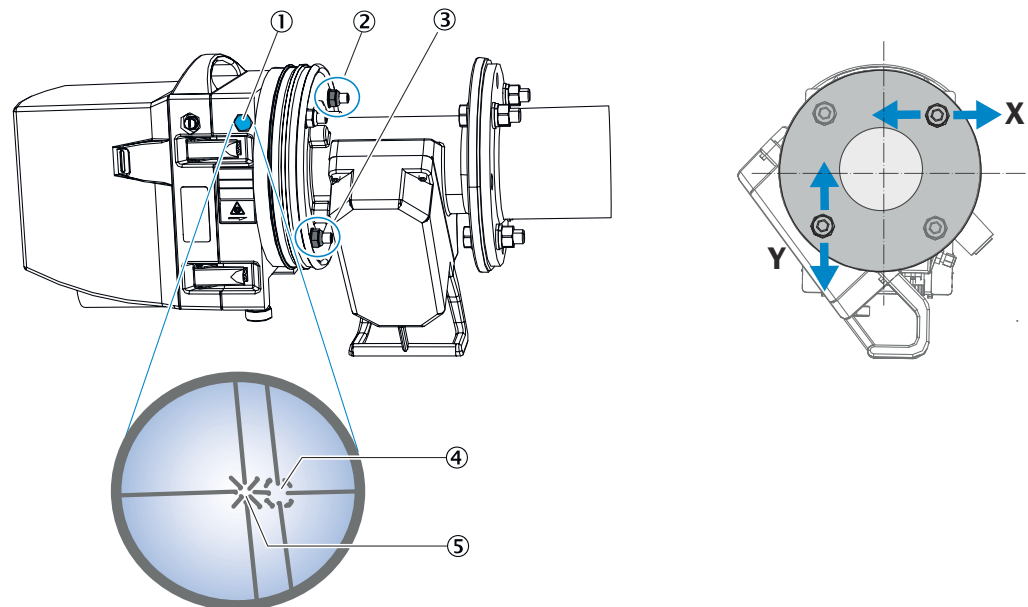
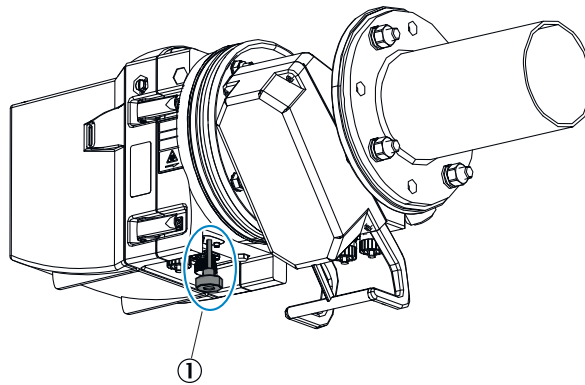


Figure 24: Fine optical alignment on sender/receiver unit (NH<sub>3</sub>, HF)

- ① Visor for fine optical alignment of device versions: NH<sub>3</sub> and HF
- ② Nut for horizontal adjustment (X)
- ③ Nut for vertical adjustment (Y)
- ④ Target: Alignment on probe version
- ⑤ Target: Alignment on Cross-Duct version



① Alignment device rotary knob

#### On the control unit:

##### Switch to Maintenance mode

1. Press button "maint".
2. Select "Maintenance mode" and choose "Mode On" in the menu.
- ✓ Maintenance mode is activated.

#### On the sender/receiver unit:

##### Alignment with visor

1. Push the rotary knob of the built-in alignment tool upwards, turn it and release it downwards to bring it into the alignment position.
2. Look through the visor on the right enclosure side in drilling direction at the mirror with the target.



#### NOTE

The red light spot shines only weakly and does not allow any conclusions about the signal strength.

3. Align the position of the light spot. To do this, adjust the nuts for the X and Y alignment on the device flange so that the light spot is positioned in the center of the corresponding target (Cross-Duct or probe version).
- ✓ Fine alignment is completed when the light spot is positioned in the center of the target, see Figure "Alignment tool on the sender/receiver unit".
4. After successful alignment, push the rotary knob of the alignment tool back to the original position. Secure it with a quarter turn.

## 7.10 Fine optical alignment for device version for HCl measurement



#### DANGER

Observe laser beam warning, see ["Fine optical alignment for device versions for NH<sub>3</sub> and HF measurement"](#), page 40.

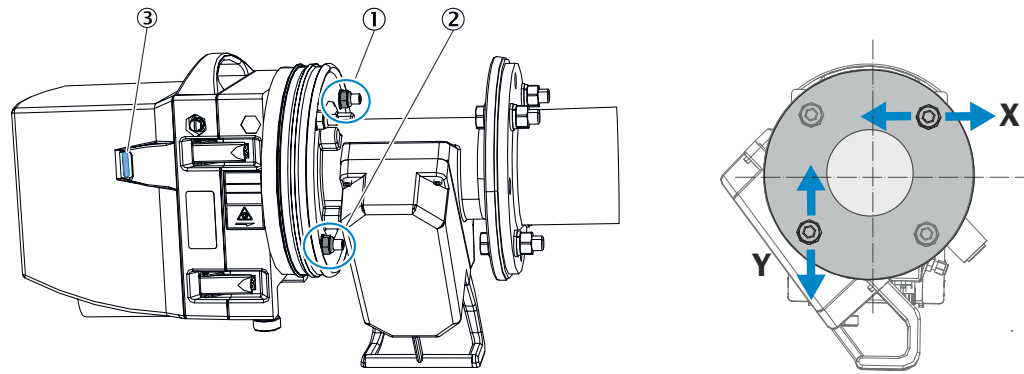


Figure 25: Fine optical alignment on the sender/receiver unit (HCI)

- ① Nut for horizontal adjustment (X)
- ② Nut for vertical adjustment (Y)
- ③ LED strip

#### On the control unit:

##### Switch to Maintenance mode

1. Press button "maint".
  2. Select "Maintenance mode" and choose "Mode On" in the menu.
  3. Select submenu item "Adjust Optical Alignment"
- ✓ Maintenance mode is activated. The measuring duct brightness appears on the control unit.

#### On the sender/receiver unit:

##### Alignment with LED strip

1. Adjust the nuts for X and Y alignment on the device flange so that the maximum I-value is reached on the display of the control unit.
2. Pay attention to the LED strip as well as the display in the control unit. Ideal alignment is achieved with 6 LEDs.

## 7.11 Fitting the weather hood (option)

### Weather hood installation preparation

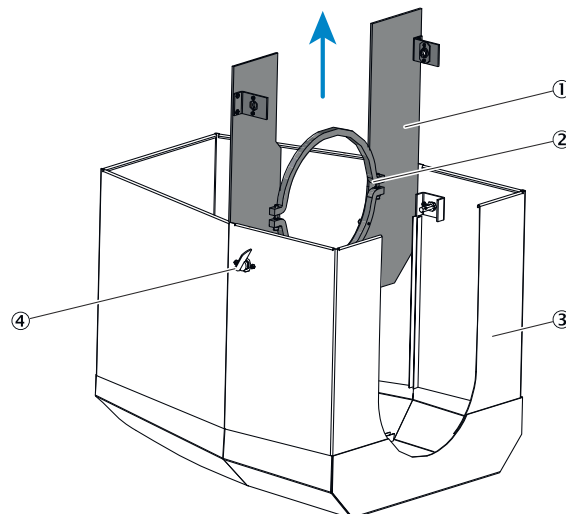


Figure 26: Weather hood installation preparation, sender/receiver unit

- ① Installation plate
- ② Mounting ring
- ③ Hood
- ④ Bayonet lock with lock

**Steps**

1. Place the weather hood on the floor with the opening facing upwards.
2. Open and unhinge the bayonet locks on both sides.
3. Pull the installation plate upwards and remove it from the hood.
4. Remove the bottom mounting ring.

**Fit the installation plate on the flange of the purge air attachment.**

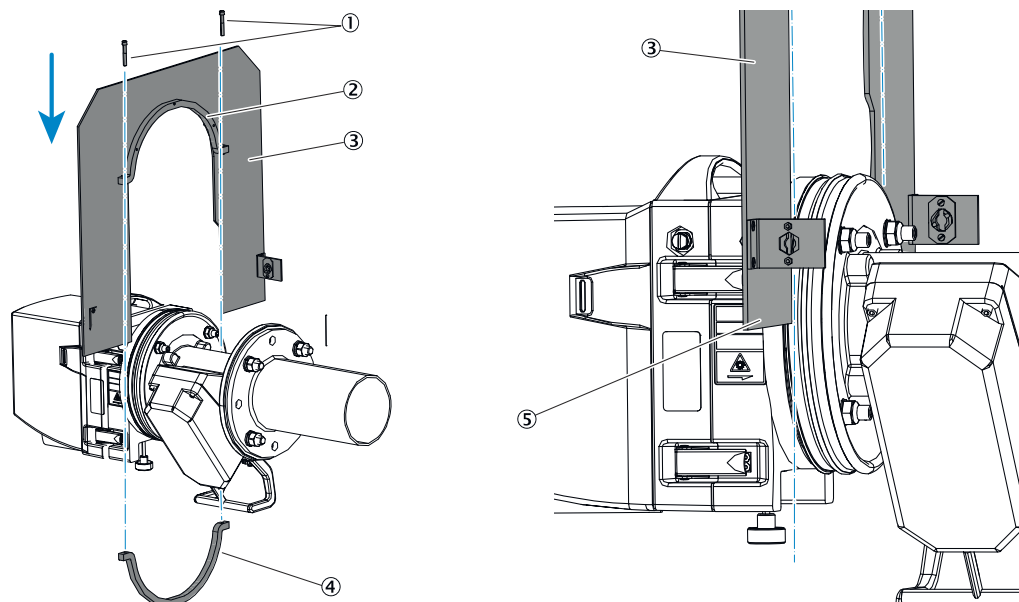


Figure 27: Fitting the mounting plate.

- ① Screws
- ② Upper mounting ring
- ③ Installation plate
- ④ Lower mounting ring
- ⑤ Detail: Placing the mounting plate on the rubber band

**Steps**

1. Place the installation plate from the top on the rubber band of the purge air attachment
2. Screw the lower mounting ring to the upper mounting ring.

### Placing the weather hood on the mounting plate.

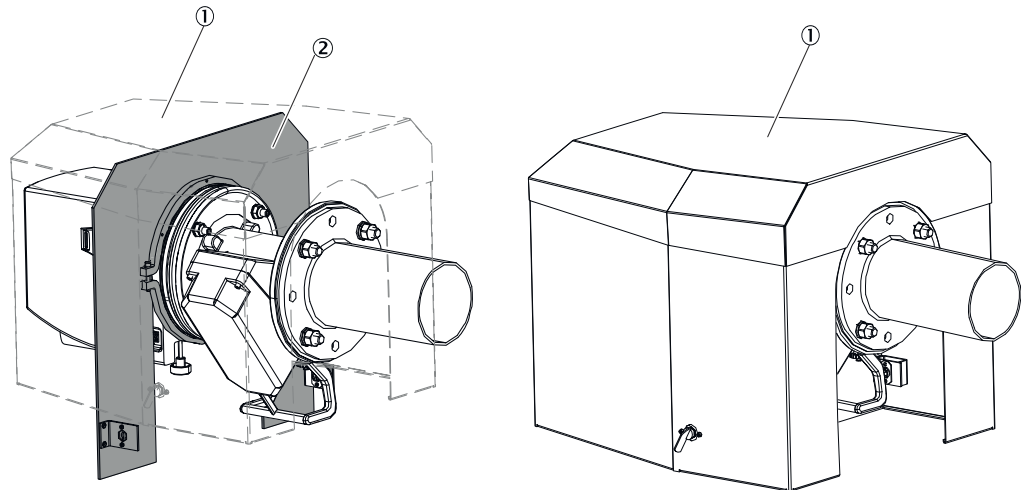


Figure 28: Fitting weather hood.

- ① Hood
- ② Installation plate

#### Steps

1. Place the hood from above on the installation plate.
2. Engage the bayonet lock.



#### NOTE

The weather hoods for the reflector unit and control unit are mounted in the same manner.

## 7.12 Starting measuring operation



#### NOTE

The device is delivered from the factory with the parameter settings specified by the customer when ordering. When these parameter specifications match the parameters during commissioning, measuring operation can be started after fine optical alignment.

The device can be configured to meet the plant conditions when required.

#### Steps

##### Switch the maintenance signal off

1. Press button "maint".
2. Menu: Select Maintenance → Maint. Mode.
3. Set Mode to "Off".

##### Starting measuring operation

1. Press button "Meas".
- ✓ The device switches to Measuring mode.

Check status LEDs, malfunction and warning messages.



#### NOTE

Quick check of Measuring screens on the LC display of the control unit:

- Using the Operating Instructions, see ["Operating and display elements", page 46](#).

When malfunction or warning messages are present:

- Troubleshoot and clear the cause using the Error and Warning Message Tables, see ["Troubleshooting", page 59](#).
- If the error cause cannot be cleared: Contact Endress+Hauser Service.

### 7.12.1 Operating states

Message on display	Meaning
DOWNLOAD	Download new software (for Service purposes only)
INIT	Initialization of control unit
INITIALISATION	Initialization of sender/receiver unit
MAINTENANCE	Maintenance mode (no measurement)
MEASURING	Measuring operation
MEASURING LD	Measuring operation; beam length tracked (line locking done)
MEASURING LL	Measuring operation with active tracking of laser beam length (line locking)
SIGNAL_ADJUST	Adjusting amplification to changed transmission

### 7.12.2 Selecting the ambient temperature range



#### NOTICE

##### Temperature stabilization: 30 minutes

The device stabilizes the temperature after the temperature is modified.

- Warning message “DEV TEMP” is output during temperature stabilization.

#### Steps

##### Value for ambient temperature

1. Press button “par”.
2. Menu: Select Settings → Ambient Temp.
3. Select temperature range in the “Range” field.



#### NOTICE VALUE FOR AMBIENT TEMPERATURE

Select the temperature value from the Table that matches the ambient conditions best at the measuring location, see ["Possible ambient temperatures"](#), page 78.

8 Operation

8.1 Operating and display elements

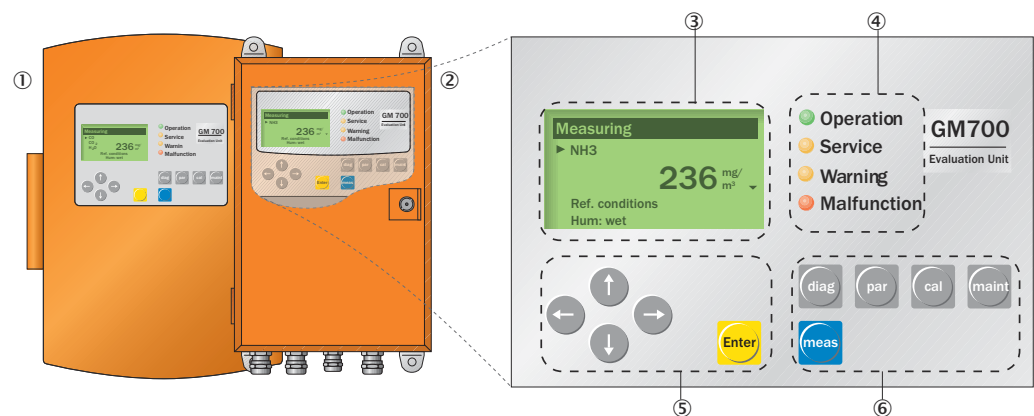






Figure 29: Operating and display elements

- ① Control unit AWE, cast metal enclosure
- ② Control unit, AWE, sheet steel enclosure
- ③ Display for
  - All current measured values
  - Computed value
  - Menu navigation
- ④ Status LEDs to signal operating and malfunction states
- ⑤ Function buttons for menu navigation and input
- ⑥ Function buttons for menu selection

Status LEDs

Table 9: Significance of Status LEDs

LED	Significance
 OPERATION	<ul style="list-style-type: none"><li>• Measuring mode</li><li>• Device is switched on. Power voltage available.</li></ul>
 SERVICE	<ul style="list-style-type: none"><li>• Service mode</li></ul>
 Warning	<ul style="list-style-type: none"><li>• Warning message</li><li>• At least one warning message pending.</li><li>• Read the warning message, see Diagnosis mode (diag)</li></ul>
 MALFUNCTION	<ul style="list-style-type: none"><li>• Device malfunction</li><li>• At least one malfunction message pending.</li><li>• Read the malfunction message, see Diagnosis mode (diag)</li></ul>

8.2 Control unit menu tree



**NOTE**  
Menu texts are shown in **English**.

8.2.1 Menu tree, Measuring



Menu level		Explanation
Measuring		<b>Measure</b> <ul style="list-style-type: none"><li>• Current measured values: Depending on device version</li><li>• Reference variables (wet, dry)</li></ul>

8.2.2 Menu tree Diagnosis



Menu level			Explanation
Diagnosis			<b>Diagnosis</b>
Malfunction			Current error messages (plain text)
Warning			Current warning messages (plain text)
Sensor values			Displays diagnostic values and control values
GM700	Sensor values GM700		Current monitored sensor values (amplification setting, internal temperature control, control values, etc.)
	Cross-Duct: OH Cross-Duct: Reflector		

## 8.2.3 Menu tree Parameter



Menu level			Explanation
Parameters			Parameter
Settings			Parameter settings/display of system components
	Physical Unit	Unit	mg/m <sup>3</sup> , ppm
	Component	Ref. condition	<ul style="list-style-type: none"> <li>t: actual, 25 °C, 20 °C, 0 °C</li> <li>p: actual, 1013 mbar</li> <li>Hum.: wet, dry</li> </ul>
	Average	Avg. Time	0 ... 300 s
	Meas. Distance	Active	200 ... 8000 mm
	Gas temperature	Source	Probe, Subst. Analog In
		Subst.	-100 ... 2000 °C
		Unit	°C, °F, K
	Pressure	Source	Probe, Subst. Analog In
		Subst.	600 ... 15000 hPa
	Humidity	Subst.	Subst.: 0 ... 93.0 %Vol
	Analog Out	Live Zero	0, 4 mA
		Output 1	Component: e.g.. NH <sub>3</sub> , - -, p, T
			Range low: 0 ... 999999
			Range high: 0 ... 999999
			Cycle Out: No, Yes
		Output 2	Component: E.g. NH <sub>3</sub> , - -, p, T
			Range low: 0 ... 999999
			Range high: 0 ... 999999
			Cycle Out: No, Yes
		Output 3	Component: E.g. NH <sub>3</sub> , - -, p, T
			Range low: 0 ... 999999
			Range high: 0 ... 999999
			Cycle Out: No, Yes

Menu level			Explanation
	Analog In	Input 1 T	Unit: °C, K, °F
			Live Zero: 0, 2, 4 mA
			Range low: 0 ... 15000
			Range high: 0 ... 15000
		Input 2 p	Unit: hPa
			Range low: 0 ... 15000
			Range high: 0 ... 15000
	Regress Funct.	Span	0.50 ... 1.99
		Zero	±999
	Ambient Temp.	Range	<ul style="list-style-type: none"> <li>• 0 ... 50 °C</li> <li>• -10 ... 40 °C</li> <li>• -20 ... 30 °C</li> <li>• -30 ... 20 °C</li> <li>• -40 ... 10 °C</li> </ul>
	t (Feed Test Gas)	Period	d (days), only when purge cell is included
	Check cycle	Period	0 ... 24 h
Device	Serial Number	Head	-----
		Laser	-----
		EvU	-----
	Software Revision		<ul style="list-style-type: none"> <li>■ GMM700-X</li> <li>■ XXXXXXX XXXX</li> <li>■ GMM700/DSP</li> <li>■ XXXXXXX XXXX</li> </ul>

### 8.2.4 Menu tree Calibration



Menu level			Explanation
<b>Calibration</b>			<b>Calibration</b>
Check cycle	Start CCY (Check Cycle)		Check cycle for test purposes, e.g., after maintenance
Zero Adjust	Start ZeroAdjust	Password (1234)	Zero point determination, e.g., during commissioning or maintenance tasks based on the zero path
Zero Adj. Stack	Start ZeroAdjust		Only GPP measuring probe: Zero point determination with measuring device on gas duct Zero gas must be connected to the GPP probe.
Box measuring	Start Meas.		Check of measuring components with span gas via a filter box

### 8.2.5 Menu tree Maintenance



Menu level			Explanation
<b>Maintenance</b>			<b>Maintenance</b>
Maint. Mode	Mode: Off, On		Maintenance operation: On, Off
Adj. Opt. Align.	Opt. Alignment		Optical alignment function for the sender/receiver unit and reflector unit
Test Analog Out	AO 1: 4 mA		Tests the analog outputs
	AO 2: 4 mA		
	AO 3: 12.5 mA		
Test Analog In	AI 1: 0 mA		Tests the analog inputs
	AI 2: 0 mA		
	AI 3: 0 mA		
Test Relay	Relay 1: On (Off)		Tests the relay outputs
	Relay 2: On (Off)		
	Relay 3 Off (On)		
Test Digital In	DI 1: Open		Tests the digital inputs
	DI 2: Open		
	DI 3: Open		
Push Diag	RS-232		Output of the complete parameter set via the RS-232 Service interface
Reset System			Restarts the measuring system
Reset Parameter			Resets parameters to factory settings ⚠ All settings are overwritten!

## 9 Maintenance

### 9.1 Safety



#### **DANGER**

##### **Danger to life through electric shock**

There is a risk of electric shock when working on the device with the voltage supply switched on.

- ▶ Before starting work on the device, ensure the voltage supply can be switched off in accordance with the valid Standard using a power isolating switch/circuit breaker.
- ▶ Make sure the disconnecter switch is easily accessible.
- ▶ An additional disconnecting device is mandatory when the power disconnecter switch cannot be accessed or only with difficulty after installation of the device connection.
- ▶ Switch off the voltage supply before starting any work on the device.
- ▶ After completion of the work or for test purposes, calibration of the power supply may only be activated again by authorized personnel complying with the safety regulations.



#### **DANGER**

##### **Risk of injury due to electrical accident**

- **If the device must be opened for adjustment or repair:**
  - ▶ Disconnect the device from all voltage sources beforehand.
- **If the device must be live during work:**
  - ▶ Have this work performed by skilled persons who are familiar with the possible hazards. If internal components are removed or opened, live parts may be exposed.
- **If liquid has penetrated electrical equipment components:**
  - ▶ Take the device out of operation. Disconnect the power voltage at an external point (e.g. pull out the power cable). Then call the manufacturer's service or appropriately trained skilled persons to have the device repaired.
- **If safe operation with the device is no longer possible:**
  - ▶ Take the device out of operation. Secure against unauthorized startup.
- Do not interrupt the protective conductor connections inside or outside the device.



#### **WARNING**

##### **Health risk through contact with toxic gases**

The modules and devices contain enclosed, potentially dangerous gases that can escape should a defect or leak occur.

- ▶ Check the state of the seals on the device/module regularly.
- ▶ Only open the device when good ventilation is available, especially when a leak of one of the device components is suspected.

**WARNING****Risk of chemical burns/poisoning through caustic/toxic residues on components with sample gas contact**

After the device has been decommissioned or removed from the measuring duct, process gas residues can exist as deposits on components with sample gas contact (e.g., gas filter, gas-carrying lines etc.). These residues can be odorless or invisible depending on the gas mixture in the duct. Without protective clothing, contact with such contaminated components can lead to severe burns or poisoning.

- ▶ Take appropriate protective measures for work (e.g., by wearing a safety mask, protective gloves and acid resistant clothes).
- ▶ In case of contact with skin or the eyes, rinse immediately with clear water and consult a doctor.
- ▶ Decontaminate all contaminated components according to regulations after disassembly.

**NOTICE****Risk of device damage when the purge air is switched off too soon**

Hot and contaminated gas can cause device damage when the purge air is switched off when the device is still in the gas duct.

- ▶ Do not switch the purge air unit off as long as the measuring device is still in the gas duct.

## 9.2 Maintenance plan

**NOTICE**

There is a risk of damage to the device when the maintenance intervals are not observed.

Table 10: Maintenance intervals

Interval <sup>1)</sup>	Maintenance work	Reference
1W	Check measured values in the control area are plausible	see "Menu tree Diagnosis", page 47
1M	Visual inspection of system	see "Visual check", page 53
	Clean window	see "Cleaning optical surfaces", page 54
	Check optical alignment	see "Fine optical alignment for device versions for NH <sub>3</sub> and HF measurement", page 40 or see "Fine optical alignment for device version for HCl measurement", page 41
	Check ambient temperature range	see "Ambient temperature ranges with reference cell", page 78
	Check and/or clean the purge air unit	see "Cleaning the purge air unit", page 58 and purge air unit Operating Instructions
1Y	Check analyzer with span gas	Normally carried out by Endress+Hauser Service.

1) 1W = Weekly, 1M = Monthly, 1Y = Yearly

### 9.2.1 Maintenance protocol

Log the following data:

- Maintenance dates
- Work done
- Special observations
- Required consumables and spare parts

### 9.2.2 Expendable, wearing and spare parts

Contact Endress+Hauser Service.

### 9.3 Preparatory work

**NOTE**

Some maintenance tasks will cause the measuring device to switch to malfunction

- ▶ Activate Maintenance mode before starting the work.

**NOTE**

- ▶ Ensure good accessibility to the device in accordance with valid accident prevention regulations.
- ▶ Provide suitable work platforms/pedestals.

### 9.4 Visual check

**All device components**

- ▶ Check enclosures for mechanical damage.
- ▶ Check enclosures for soiling and clean.
- ▶ Check all lines for damage. Pay attention to chafe marks and kinks on line ducts.
- ▶ Check all hose fittings for tight seat.
- ▶ Check all electrical connections are free from corrosion and have a tight seat.
- ▶ Check grounding conductors are free from corrosion.
- ▶ Check flanges and screw fittings for tight seat.

**Control unit**

- ▶ Check for moisture outside and inside the enclosure.
- ▶ Check inspection window for soiling and clean.
- ▶ Check LEDs.
- ▶ If the control unit is damaged (e.g. LC display failure): Contact Endress+Hauser Service.

**Weather hood**

- ▶ Check condition of the weather hood from the outside and inside.

## 9.5 Removing the sender/receiver unit

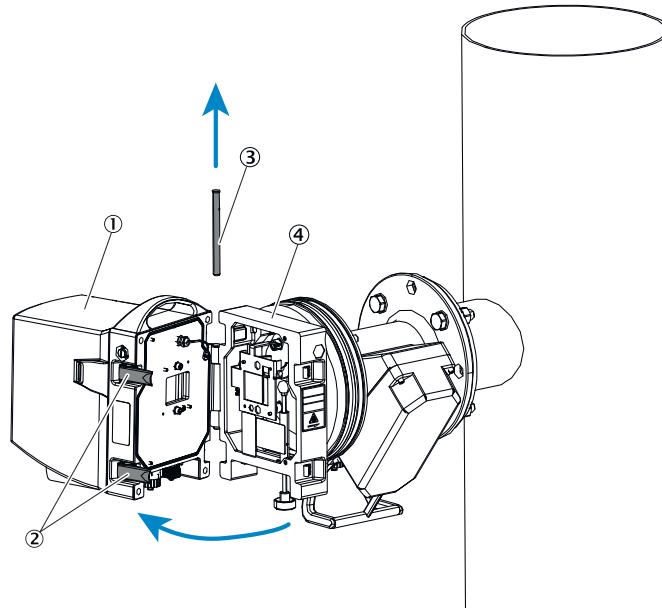


Figure 30: Disassembly of sender/receiver unit

- ① Sender/receiver unit
- ② Quick-release fasteners
- ③ Hinge pin
- ④ Device flange

### Steps

1. Switch device off.
2. Release the quick-release fasteners to open the sender/receiver unit .
3. Immediately attach the cover on the device flange opening.
4. Pull out the hinge pin (in the direction of the arrow) to release the hinge between the sender/receiver unit and device flange.
5. Carefully remove the sender/receiver unit.
6. Place the sender/receiver unit in a safe place, protected from weather and dust.

## 9.6 Cleaning optical surfaces



### CAUTION

Sample gases can cause injuries when working on the device.

- Before starting work, read the safety information in the Section “Commissioning”.



### NOTICE

- Do not use cleaning agents. Residues can falsify measuring results.

### Material required

- Optics cleaning cloth
- Demineralized water

### 9.6.1 Cleaning the optical surface of the sender/receiver unit

#### Sender/receiver unit

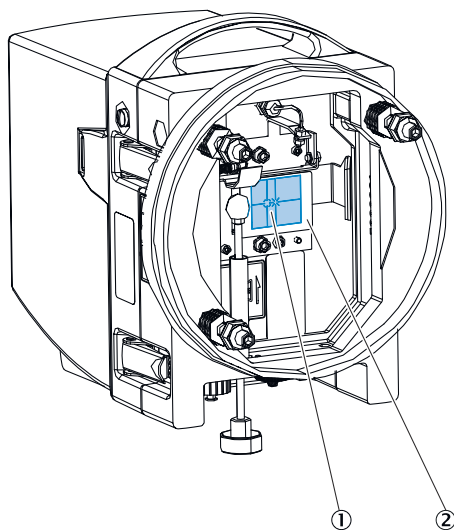


Figure 31: Optical surface of the sender/receiver unit

- ① Optical surface
- ② Target holder

#### Steps

1. Switch device off.
2. Open the sender/receiver unit enclosure and swing open by releasing the quick-release fasteners.
3. Flap the target upwards. Check the optical surface below for contamination.
4. If required: Clean optical surface with optics cleaning cloth and demineralized water.
5. Close the enclosure immediately after cleaning to protect the cleaned optical surfaces against moisture and dust.

### 9.6.2 Cleaning the optical surface of the GMP measuring probe



#### NOTICE

- Do not use cleaning agents. Residues can falsify measuring results.

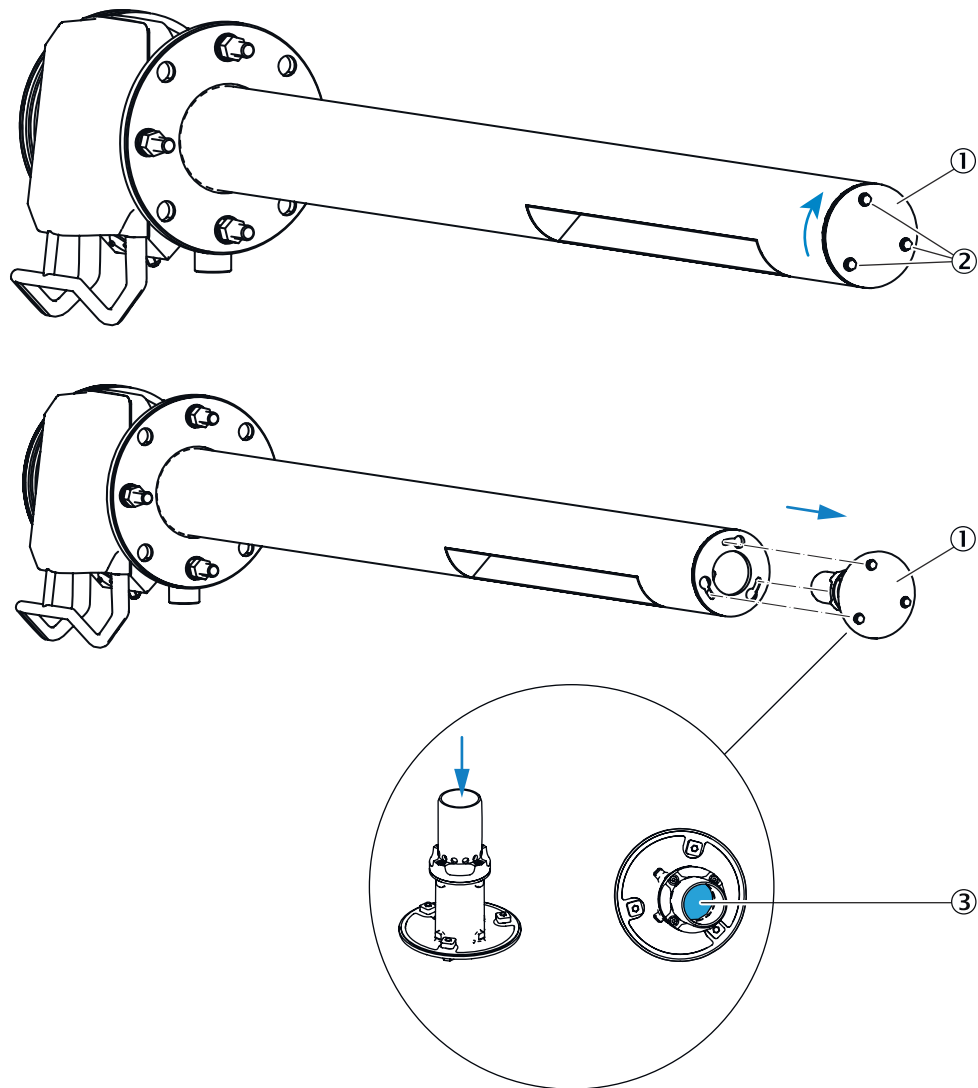


Figure 32: Optical surface of the GMP measuring probe

- ① Probe cover
- ② Screws
- ③ Optical surface

#### Steps

1. Switch the device off. Allow the measuring probe to cool down to room temperature.
2. Loosen the screws on the probe cover.
3. Loosen the probe cover from the bayonet catch with a clockwise rotation and remove it.
4. Blow dirt off the optical surface with compressed air.
5. If required: Clean the optical surface with optics cleaning cloth and demineralized water.
6. Replace the probe cover. Turn to the left as far as it will go.
7. Tighten the screws on the probe cover.

### 9.6.3 Cleaning the optical surface of the GPP measuring probe

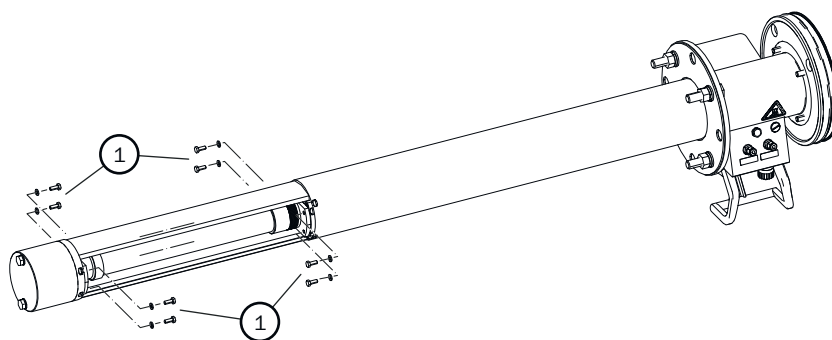


#### NOTICE

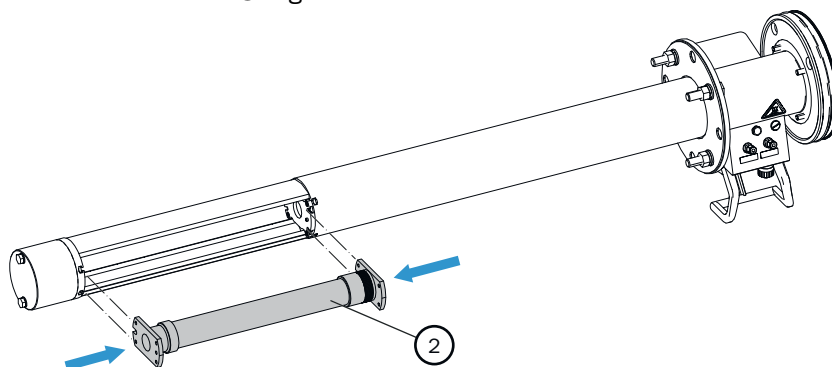
- Do not use cleaning agents. Residues can falsify measuring results.

#### Steps

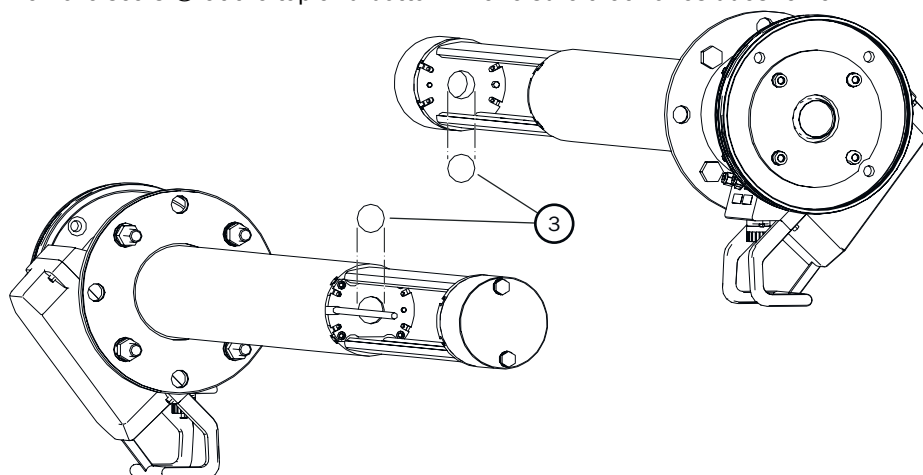
1. Switch the device off. Allow the measuring probe to cool down to room temperature.
2. Remove 8 screws ① at the filter element.



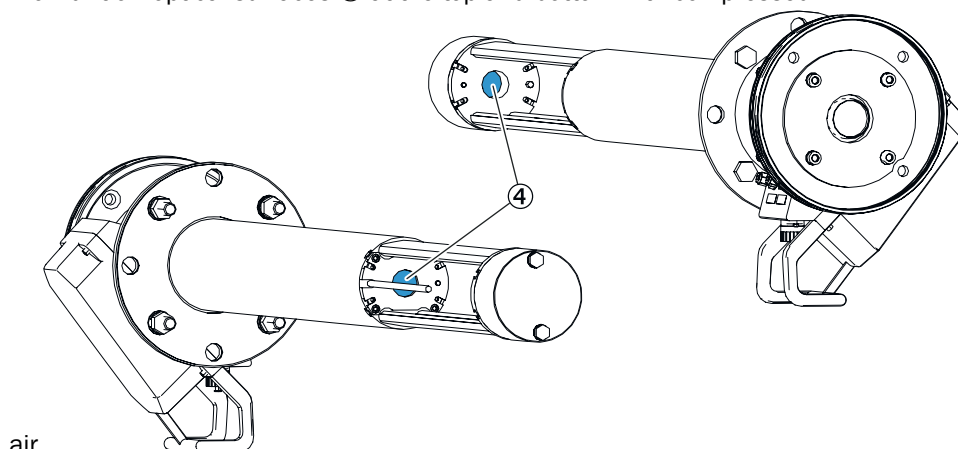
3. Press filter element ② together and take it out.



4. Remove seals ③ at the top and bottom. Make sure that no residues remain.



5. Blow dirt off optical surfaces ④ at the top and bottom with compressed



air.

6. If required: Clean the optical surfaces with an optics cleaning cloth and demineralized water.  
 7. Insert new seals at the top and at the bottom.  
 8. Press the filter element together and push it in carefully. Make sure that the seals are not damaged.  
 9. Screw in and tighten 8 screws on the filter element.

## 9.7 Cleaning the control unit

The device operates maintenance-free during operation.

Depending on the installation location, the following preventive maintenance work may be required for the device at regular intervals:

*Table 11: Maintenance work*

Maintenance work	Interval	To be carried out by
Clean enclosure and operator panel.	Cleaning interval depending on ambient conditions and climate	Qualified personnel
Check screw fittings and plug connections.	Depending on the installation location or operational requirements	Authorized electrician (authorized skilled electrician or person with similar training)

## 9.8 Cleaning the purge air unit



### NOTE

For information on the purge air unit, see the Operating Instructions of the purge air unit (SLV4).

## 10 Troubleshooting

### 10.1 Safety

**DANGER**

**Important information for safe handling of the GM700 sender/receiver unit on the device version with HF measurement**

For device software versions before 9105060\_YEK0, a higher laser radiation might occur.

- ▶ Laser class 1 of IEC 60825-1:2014-5: Only use device software 9105060\_YEK0 or a newer software version.
- ▶ Before working on the sender/receiver unit, take appropriate safety measures to protect uninvolved persons from the laser beam.
- ▶ Never look directly into the laser aperture when opening the sender/receiver unit or the reflector.
- ▶ Always wear laser goggles or switch the device off during maintenance work.
- ▶ Observe valid national limit values and respective standards for work safety.

**WARNING**

**Health risk through contact with toxic gases**

The modules and devices contain enclosed, potentially dangerous gases that can escape should a defect or leak occur.

- ▶ Check the state of the seals on the device/module regularly.
- ▶ Only open the device when good ventilation is available, especially when a leak of one of the device components is suspected.

**DANGER**

**Hazard by voltage**

Lines in the subassemblies of the measuring system are live and can cause serious injuries through electric shock when touched.

- ▶ Disconnect the subassemblies or lines involved from the power supply during installation, maintenance and repair work.

**WARNING**

**Risk of chemical burns/poisoning through caustic/toxic residues on components with sample gas contact**

After the device has been decommissioned or removed from the measuring duct, process gas residues can exist as deposits on components with sample gas contact (e.g., gas filter, gas-carrying lines etc.). These residues can be odorless or invisible depending on the gas mixture in the duct. Without protective clothing, contact with such contaminated components can lead to severe burns or poisoning.

- ▶ Take appropriate protective measures for work (e.g., by wearing a safety mask, protective gloves and acid resistant clothes).
- ▶ In case of contact with skin or the eyes, rinse immediately with clear water and consult a doctor.
- ▶ Decontaminate all contaminated components according to regulations after disassembly.

**CAUTION**

Safety when dismantling the sender/receiver unit with mounted measuring probe from the gas duct

- ▶ Safe pulling out of the measuring probe from the gas duct requires:
  - A safe working platform at the measuring point
  - Free space on the working platform for pulling out the measuring probe (note the dimensions of the sender/receiver unit and the measuring probe)
  - At least 2 persons
  - Personal protective equipment in accordance with plant regulations
  - Cleaning material (cloth/brush) to remove coarse dirt from the measuring probe when it is pulled out
  - Protective cover for the process flange on the duct side
  - Suitable support to be able to place the sender/receiver unit with mounted measuring probe and connected plug connectors protruding at the bottom side safely and without damage on the ground
  - Alternatively, the angle flange that may have been used during commissioning is particularly suitable as support during maintenance work. However, high sample gas temperatures or restricted space conditions (duct insulation) may limit the use of the angle flange.
  - Coordination of maintenance work and associated interruption of measuring operation with persons responsible for operation of the plant

## 10.2 Monitoring and diagnostic system

The device has an integrated system that continually checks the operating state of the sender/receiver unit and the control unit. Corresponding messages are displayed for deviations from the normal state and recorded in the devices for later evaluation. Messages for the two system components are categorized into warning and malfunction messages depending on the effects to be expected:

### Significance of warning messages

- Measuring results are not (yet) directly influenced by a deviating system state.
- Observance and clearance of the cause(s), e.g., through maintenance measures, are necessary to prevent subsequent errors or device damage

### Significance of malfunction messages

- Measuring operation is no longer possible or no longer reliable.

**NOTE**

Warning and malfunction messages are stored in the built-in message memory of the control unit.

## 10.3 Device not functioning

Table 12: Device not functioning

Possible cause	Measure
Power supply not connected.	Check power lines and connections.
Main power supply failure.	Check power supply (e.g. socket, external disconnecting device).
Internal operating temperatures are incorrect.	Check whether error messages exist.
Internal software not functioning.	Can only occur with complex internal malfunctions or after strong external influences (e.g., strong electromagnetic interfering pulse). Switch device off. Switch back on again after a few seconds.

## 10.4 Clearing malfunctions on the control unit

Table 13: Possible causes and clearance

Malfunction	Possible cause	Clearance
Malfunction LED blinks, (Warning LED possibly on)	Plain-text error messages indicate possible causes.	<ol style="list-style-type: none"> <li>1. Press the "diag" button to trigger Diagnostic mode.</li> <li>2. Call menu Malfunction (and/or Warning).</li> <li>3. Check and clear the specified malfunction.</li> </ol>
Control unit not responding.	Supply voltage not set correctly.	<ol style="list-style-type: none"> <li>1. Check supply voltage setting.</li> <li>2. Replace fuse if necessary.</li> </ol>
	Power supply on evaluation unit incorrect.	<ol style="list-style-type: none"> <li>1. Provide power supply from plant.</li> <li>2. Check connections on system components and reconnect if necessary.</li> </ol>
	Defective fuse	<ol style="list-style-type: none"> <li>1. Check fuse in control unit.</li> <li>2. Replace fuse if necessary.</li> </ol>
	Cause cannot be determined.	<ol style="list-style-type: none"> <li>1. Disconnect all system components from the power supply. Reconnect one at a time.</li> <li>2. Check CAN bus line from the control unit to the sender/receiver unit or to the connection unit.</li> </ol>
	Malfunction occurs again.	<ol style="list-style-type: none"> <li>1. Replace the last connected component. Consult Endress+Hauser Service.</li> </ol>
	24V/5V supply defective	<ol style="list-style-type: none"> <li>1. Check 24V/5V supply.</li> <li>2. Replace control unit or printed circuit board.</li> <li>3. Contact Endress+Hauser Service.</li> </ol>
Display output: Corrupt Parameters: Reset Memory	Inconsistent data detected in parameter memory	<ol style="list-style-type: none"> <li>1. Press Enter.</li> <li>✓ A system restart is performed. This resets the parameters to the factory settings.</li> <li>2. If necessary, reconfigure individual parameters</li> <li>3. If the error message appears again: Replace control unit.</li> <li>4. Contact Endress+Hauser Service.</li> </ol>

### 10.4.1 Communication error between control unit and receiver

Error message: "Sensor Communication"

The receiver sends data continually to the control unit, an error message is generated automatically when no data is received there.

Check following connections:

1. Control unit -> receiver.
2. Line connection on the plug-in terminal in the control unit.
3. Cable to receiver.
4. Outer plug-in connector on receiver.
5. Inner plug-in connector in receiver.


## 10.5 Malfunction messages

Table 14: Malfunction message

Message	Description	Clearance
System		
DSP: BOOT ERROR DSP...Digital Signal Processor	Error during start process	<ul style="list-style-type: none"> <li>▶ Restart device. <ul style="list-style-type: none"> <li>– Press maint button to activate maintenance.</li> <li>– Trigger menu Reset System or switch device off and on again.</li> </ul> </li> <li>▶ If not successful, contact Endress+Hauser Service.</li> </ul>
DSP: INV PARA	Incompatible software (sender/receiver unit) Invalid values entered	<ul style="list-style-type: none"> <li>▶ Check software version; contact SICK Service if necessary.</li> <li>▶ Correct erroneous values.</li> </ul>

Message	Description	Clearance
DSP: NO RESP	Communication problem of the electronics (sender/receiver unit).	<ul style="list-style-type: none"> <li>▶ Restart device; see above.</li> <li>▶ If not successful, contact Endress+Hauser Service.</li> </ul>
EEPROM: CONTROL	Invalid parameters of the microcontroller (sender/receiver unit).	<ul style="list-style-type: none"> <li>▶ Restart device; see above.</li> <li>▶ If not successful, contact Endress+Hauser Service.</li> </ul>
EEPROM: LASER	Invalid laser parameters	<ul style="list-style-type: none"> <li>▶ Restart device; see above.</li> <li>▶ If not successful, contact Endress+Hauser Service.</li> </ul>
FIT: DIV BY 0	Error during signal evaluation: <ul style="list-style-type: none"> <li>• Incorrect parameter values</li> <li>• Hardware defect</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check <b>measuring distance</b>, <b>substitute for temperature</b> and <b>pressure</b> parameters, correct when necessary.</li> <li>▶ Restart device; see above.</li> <li>▶ If not successful, contact Endress+Hauser Service.</li> </ul>
FIT: NO CONV	Error during signal evaluation: <ul style="list-style-type: none"> <li>• Incorrect parameter values</li> <li>• Hardware defect</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check <b>measuring distance</b>, <b>substitute for temperature</b> and <b>pressure</b> parameters.</li> <li>▶ Increase parameter <b>Average</b>.  ⚠ Attention, these parameters may only be modified by trained personnel.</li> <li>▶ Restart device; see above.</li> <li>▶ If not successful, contact Endress+Hauser Service.</li> </ul>
FIT: S MATRIX	Error during signal evaluation: <ul style="list-style-type: none"> <li>• Incorrect parameter values</li> <li>• Hardware defect</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check <b>measuring distance</b>, <b>substitute for temperature</b> and <b>pressure</b> parameters, correct when necessary.</li> <li>▶ Restart device; see above.</li> <li>▶ If not successful, contact Endress+Hauser Service.</li> </ul>
Incompatible device	Incompatible software (sender/receiver unit)	<ul style="list-style-type: none"> <li>▶ Check software version.</li> <li>▶ Contact Endress+Hauser Service.</li> </ul>
INIT: NO LINE	Incompatible software (sender/receiver unit)	<ul style="list-style-type: none"> <li>▶ Restart device; see above.</li> <li>▶ If not successful, contact Endress+Hauser Service.</li> </ul>
LD: PELT ERROR LD...laser diode	Temperature measurement on Peltier element defective: <ul style="list-style-type: none"> <li>▶ Possible hardware defect</li> </ul>	<ul style="list-style-type: none"> <li>▶ Restart device; see above.</li> <li>▶ If not successful, contact Endress+Hauser Service.</li> </ul>
LD: TEMP ERROR	Laser wavelength adjustment outside allowed range. <ul style="list-style-type: none"> <li>▶ Absorption line "lost"</li> <li>▶ Laser diode defect</li> </ul>	<ul style="list-style-type: none"> <li>▶ Restart device; see above.</li> <li>▶ If not successful, contact Endress+Hauser Service.</li> </ul>
MEAS: M PLAUS	Measuring results from measuring channel not plausible: <ul style="list-style-type: none"> <li>▶ Incorrect parameter values</li> <li>▶ Strong signal interference</li> <li>▶ Hardware defect</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check <b>measuring distance</b>, <b>substitute for temperature</b> and <b>pressure</b> parameters.</li> <li>▶ Increase <b>Average</b> parameter.  ⚠ Attention, these parameters may only be modified by trained personnel.</li> <li>▶ Restart device; see above.</li> <li>▶ If not successful, contact Endress+Hauser Service.</li> </ul>
MEAS: R PLAUS	Measuring results from measuring channel not plausible: <ul style="list-style-type: none"> <li>▶ Incorrect parameter values</li> <li>▶ Strong signal interference</li> <li>▶ Hardware defect</li> </ul>	<ul style="list-style-type: none"> <li>▶ Restart device; see above.</li> <li>▶ If not successful, contact Endress+Hauser Service.</li> </ul>
MEAS: REF CONC	Gas concentration in reference cell too low	<ul style="list-style-type: none"> <li>▶ Exchange reference cell.</li> <li>▶ Contact Endress+Hauser Service.</li> </ul>
Sensor communication	Sender/receiver unit not correctly connected.	<ul style="list-style-type: none"> <li>▶ Check CAN connection and repair if necessary.</li> </ul>
SIG: DARK VALUE	Dark values of receiver element too high: <ul style="list-style-type: none"> <li>▶ Possible hardware defect</li> </ul>	<ul style="list-style-type: none"> <li>▶ Contact Endress+Hauser Service.</li> </ul>
SIG: K HIGH	Monitoring channel signal too high	<ul style="list-style-type: none"> <li>▶ Contact Endress+Hauser Service.</li> </ul>
SIG: K LOW	Monitoring channel signal too low	<ul style="list-style-type: none"> <li>▶ Contact Endress+Hauser Service.</li> </ul>
SIG: M HIGH	Measuring channel signal too high	<ul style="list-style-type: none"> <li>▶ Contact Endress+Hauser Service.</li> </ul>
SIG: M LOW	Measuring channel signal too low: <ul style="list-style-type: none"> <li>▶ Optical surfaces (front window) of the sender/receiver unit or reflector dirty</li> <li>▶ Optical axes alignment too inaccurate</li> <li>▶ Hardware defect</li> </ul>	<ul style="list-style-type: none"> <li>▶ Clean front window, <a href="#">section 9.6.1</a>.</li> <li>▶ Check optical alignment and correct if necessary, <a href="#">section 7.9</a> and see "Fine optical alignment for device version for HCl measurement", <a href="#">page 41</a>.</li> <li>▶ If not successful, contact Endress+Hauser Service.</li> </ul>
SIG: R HIGH	Reference channel signal too high	<ul style="list-style-type: none"> <li>▶ Contact Endress+Hauser Service.</li> </ul>
SIG: R LOW	Reference channel signal too low	<ul style="list-style-type: none"> <li>▶ Contact Endress+Hauser Service.</li> </ul>
Zero gas measurement for NH <sub>3</sub>		

Message	Description	Clearance
Z MEAS: RANGE	Unallowed results during zero gas measurement: <ul style="list-style-type: none"> <li>▶ Zero gas missing.</li> <li>▶ Optical interfaces (front window) of the sender/receiver unit or reflector dirty</li> <li>▶ Optical axes alignment too inaccurate</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check zero gas supply and repair if necessary.</li> <li>▶ Clean front window, <a href="#">section 9.6.1</a>.</li> <li>▶ Check optical alignment and correct if necessary, <a href="#">section 7.9</a> and see "Fine optical alignment for device version for HCl measurement", page 41.</li> </ul>
Sensor communication???	Communication interference between control unit and GM700 sender/receiver unit	Check connections: <ul style="list-style-type: none"> <li>▶ Control unit - sender/receiver unit</li> <li>▶ Lines to the sender/receiver unit</li> <li>▶ Outer connectors on sender/receiver unit</li> <li>▶ Inner connectors in sender/receiver unit</li> </ul>


 **NOTE**  
This Table also contains recommended solutions that can only be performed by specially trained personnel.

## 10.6 Warning messages

Table 15: Warning messages

Message	Description	Clearance
Feed Test Gas	No detectable sample gas concentration (see Interval).	▶ Feed span gas. (GMK)
FIT: LINEPOS	Deviation of absorption line position: <ul style="list-style-type: none"> <li>▶ Line not aligned properly during start process.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Wait until the warning message disappears after a few minutes.</li> <li>▶ Restart device. <ul style="list-style-type: none"> <li>- Activate Maintenance mode with <b>maint</b> button.</li> <li>- Trigger menu item <b>Reset System</b> or switch device off and on again.</li> </ul> </li> <li>▶ If not successful, contact Endress+Hauser Service.</li> </ul>
MEAS: REF CONC (only for device with closed cell)	Gas concentration in reference cell too low; Measurement still however possible	▶ Plan and prepare reference cell replacement.
DEV: TEMP	Optic of sender/receiver unit outside allowed temperature range: <ul style="list-style-type: none"> <li>▶ Warm-up phase after switching on</li> <li>▶ Ambient temperature too high</li> </ul>	<ul style="list-style-type: none"> <li>▶ Wait until the temperature has stabilized.</li> <li>▶ Select different ambient temperature range.</li> <li>▶ Cool device.</li> </ul>

## 10.7 Repairing inadequate purge air supply

 **NOTE**  
For information on the purge air unit, see the Operating Instructions of the purge air unit (SLV4).

## 10.8 Corrosion on flange

Table 16: Possible causes and clearance

Possible errors	Possible causes	Clearance
Corrosion on flange	Unsuitable materials	▶ Check project planning.

## 11 Decommissioning

### 11.1 Safety

#### Required technical knowledge

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##### NOTICE

- You are basically familiar with the device.
- You are familiar with conditions at the installation location, especially possible hazards through the gases in the gas duct (hot/dangerous to health).
- You are capable of recognizing and preventing danger by possibly escaping gases.

When one of these requirements is **not** met:

- Contact Endress+Hauser Service or your local Endress+Hauser representative.
- 

#### Gas

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##### DANGER

###### Hazard through gas escaping when the sender/receiver unit is swiveled out

Overpressure in the gas duct can cause hot and/or noxious gases to escape when the sender/receiver unit is swiveled out.

- Take appropriate safety measures: Only then swing open the sender/receiver unit.
  - Set the lever on the purge air attachment to the "Close" position.
- 



##### DANGER

###### Danger to life by leaking hot and toxic gases

Hot and/or noxious gases can escape during work on the gas duct, depending on the plant conditions.

- Work on the gas duct may only be performed by skilled technicians who, based on their technical training and knowledge as well as knowledge of the relevant regulations, can assess the tasks given and recognize the hazards involved.
- 

#### Hot measuring probe

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##### CAUTION

###### Risk of burns when touching the hot measuring probe

When temperatures in the sample gas duct are high, the removed measuring probe remains hot for a long time.

- Wear protective clothing when working on the hot measuring probe.
  - Faster cooling of the measuring probe can be achieved by keeping the purge air supply switched on for the time being.
- 

#### Device damage

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##### NOTICE

###### Risk of device damage when the purge air is switched off too soon

Hot and contaminated gas can cause device damage when the purge air is switched off when the measuring device is still fitted in the gas duct.

- Do not switch the purge air unit off as long as the measuring device is still in the gas duct.
-

## 11.2 Removing the device



### CAUTION

Safety when dismantling the sender/receiver unit with mounted measuring probe from the gas duct

- ▶ Safe pulling out of the measuring probe from the gas duct requires:
  - A safe working platform at the measuring point
  - Free space on the working platform for pulling out the measuring probe (note the dimensions of the sender/receiver unit and the measuring probe)
  - At least 2 persons
  - Personal protective equipment in accordance with plant regulations
  - Cleaning material (cloth/brush) to remove coarse dirt from the measuring probe when it is pulled out
  - Protective cover for the process flange on the duct side
  - Suitable support to be able to place the sender/receiver unit with mounted measuring probe and connected plug connectors protruding at the bottom side safely and without damage on the ground
  - Alternatively, the angle flange that may have been used during commissioning is particularly suitable as support during maintenance work. However, high sample gas temperatures or restricted space conditions (duct insulation) may limit the use of the angle flange.
  - Coordination of maintenance work and associated interruption of measuring operation with persons responsible for operation of the plant



### NOTE

Quick-release fasteners at the sender/receiver unit on the measuring duct

- When the GMP measuring probe is used: Do not open the quick-release fasteners.
- When using the GPP measuring probe and/or with negative pressure in the sample gas duct: Quick release fasteners can be opened.

Material required	Required for
Personal protective equipment	Protection when working on the stack or hot or aggressive sample gases
Angled flange or other suitable support	For safe storage of the sender/receiver unit with mounted measuring probe and screwed cables
Flange cover	Covering the flange
Brush, cleaning cloth	Cleaning the measuring probe

### Removing the measuring device

#### Steps

1. Remove weather hood when fitted.
2. Loosen the locking sleeves of the three plug-in connectors on the underside of the sender/receiver unit and disconnect the plug-in connectors.
3. Loosen the cable clamp for the grounding conductor and disconnect the line.
4. Switch purge air supply off. Remove purge air hose.
5. Let the measuring probe cool down for approx. 30 minutes.
6. Remove the sender/receiver unit. [see "Removing the sender/receiver unit", page 54.](#)
7. Unscrew the flange fixture on the flange. Pull out the measuring probe and lay it down..
8. Close off the flange on the gas duct with a cover..
9. Clean the measuring probe under consideration of all protective measures.

#### Information on storage

[see "Storage", page 17.](#)

### 11.3 Preparing the device ready for shipping

**Before shipping:**

- ▶ Contact your local Endress+Hauser representative.
- ▶ Your Endress+Hauser representative can advise you whether the defective device can be repaired locally or whether it would more advantageous for you to return the device for repair.
- ▶ Observe the following when returning the device to Endress+Hauser:
  - Flat rates for repairs (concerning duration and costs)
  - Safety protection for the transport
  - Replacement devices or putting the device back into operation by Endress+Hauser Service

**NOTICE****Correct device preparation for return delivery**

- ▶ Clean all device components.
- ▶ Use the original packaging for the transport.
- ▶ Complete the Non-Risk Declaration (NRD) and lay these clearly visible in the packaging.

Without the Non-Risk Declaration, the device will either be cleaned by a third-party company at the customer's expense or the package will not be accepted.

**Clean the device before returning**

Prerequisite: Switch device free from voltage.

**NOTICE**

Close the enclosure before cleaning so that no fluid can penetrate.

Clean surfaces and parts with media contact:

- ▶ Remove loose contamination with compressed air.
- ▶ Remove adhering contamination with a mild soap solution and a soft cloth.

**NOTE**

Cleaning agents not to be used

- High-pressure cleaners
- Aggressive mechanical or chemical cleaning agents

- ▶ Clean optical surfaces.

### 11.4 Environmentally compatible disposal

The device should be disposed as industrial waste.

**NOTICE**

- ▶ Observe relevant local conditions for disposal of industrial waste.

**WARNING****Disposal of subassemblies containing residual substances which are harmful to the environment**

The following subassemblies could contain substances that have to be disposed of separately:

- Electronics: Capacitors, rechargeable batteries, batteries
- Display: Liquid of LC-Display

### 11.4.1 Removing the battery

To remove the battery, the AWE control unit must be dismantled.

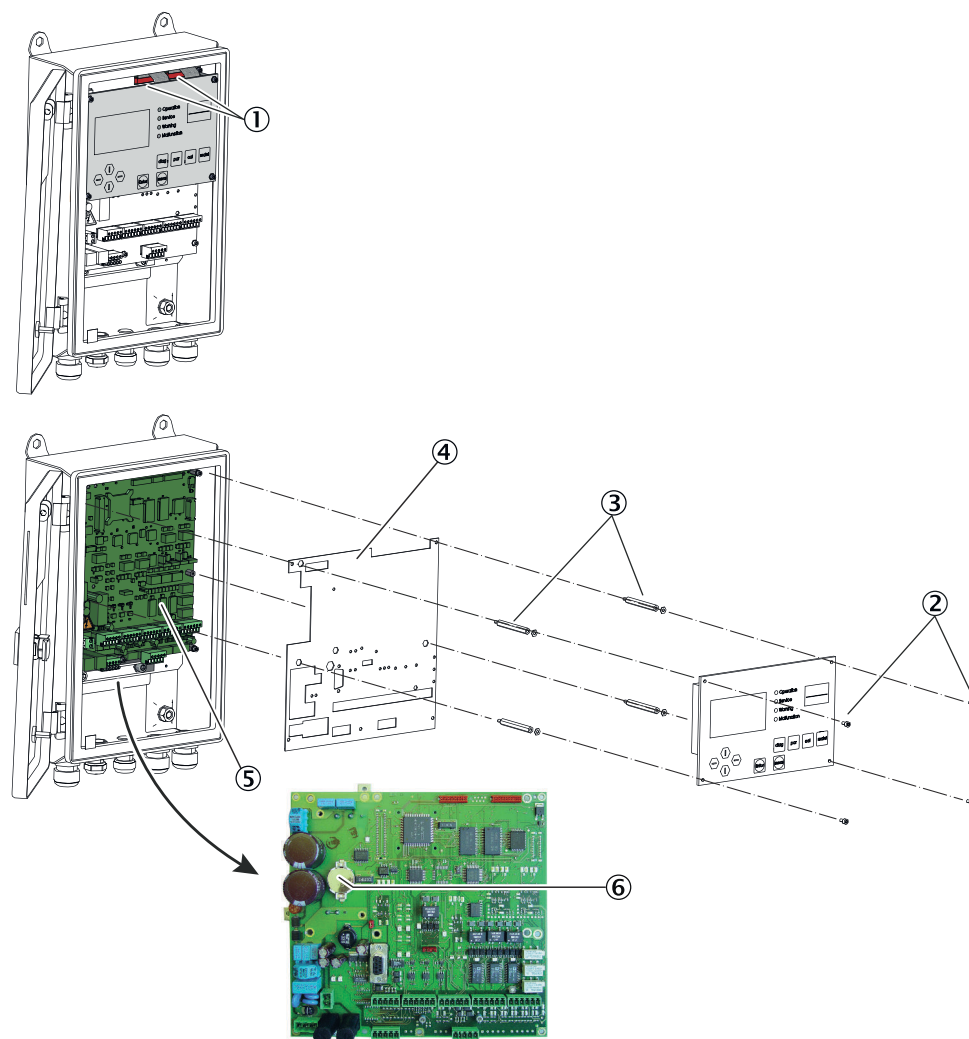


Figure 33: Removing the control unit

#### Steps

1. Disconnect the complete device (control unit and sender/receiver unit) from the power supply.
2. Open control unit with control cabinet key.
3. Disconnect plug connections ①.
4. Remove the display:
  - Remove 4 × 2.5 mm screws ②.
  - Pull off the display.
5. Remove 4 × 5.5 mm spacer bolts ③.
6. Remove cover plate ④.
7. Remove button cell ⑥ from electronic board ⑤.

## 12 Technical data

### 12.1 GM700 system

Table 17: Technical data, GM700 system

<b>Description</b>	In-situ gas analyzer for emission monitoring and process measurement
<b>Measured variables</b>	NH <sub>3</sub> , HF, HCl, H <sub>2</sub> O
<b>Performance-tested measured variables</b>	HF
<b>Measuring principles</b>	Diode laser spectroscopy (TDLs)
<b>Measuring ranges</b>	<p>NH<sub>3</sub> to 20 Vol.-% H<sub>2</sub>O:</p> <ul style="list-style-type: none"> <li>0 ... 25 ppm / 0 ... 4,000 ppm</li> </ul> <p>NH<sub>3</sub> high moisture to 40 Vol.-% H<sub>2</sub>O:</p> <ul style="list-style-type: none"> <li>0 ... 25 ppm / 0 ... 100 ppm</li> </ul> <p>HF:</p> <ul style="list-style-type: none"> <li>0 ... 5 ppm / 0 ... 2,000 ppm</li> </ul> <p>HCl:</p> <ul style="list-style-type: none"> <li>0 ... 10 ppm / 0 ... 3,000 ppm</li> </ul> <p>Measuring ranges refer to 1 m measuring distance. Measuring ranges depending on application and device version</p>
<b>Dual measuring ranges</b>	<p>HCl / H<sub>2</sub>O:</p> <ul style="list-style-type: none"> <li>0 ... 10 ppm / 0 ... 3,000 ppm (HCl)</li> <li>0 ... 50 Vol.-% / 0 ... 100 Vol.-% (H<sub>2</sub>O)</li> </ul> <p>NH<sub>3</sub> / H<sub>2</sub>O (bis 20 Vol.-%):</p> <ul style="list-style-type: none"> <li>0 ... 25 ppm / 0 ... 4,000 ppm (NH<sub>3</sub>)</li> <li>0 ... 20 Vol.-% / 0 ... 20 Vol.-% (H<sub>2</sub>O)</li> </ul> <p>NH<sub>3</sub> / H<sub>2</sub>O high moisture (to 40 Vol.-%):</p> <ul style="list-style-type: none"> <li>0 ... 25 ppm / 0 ... 100 ppm (NH<sub>3</sub>)</li> <li>0 ... 40 Vol.-% / 0 ... 40 Vol.-% (H<sub>2</sub>O high moisture)</li> </ul> <p>Measuring ranges refer to 1 m measuring distance. Measuring ranges depending on application and device version</p>
<b>Response time (t<sub>90</sub>)</b>	<p><b>Standard</b></p> <ul style="list-style-type: none"> <li>1 ... 360 s Adjustable, preset to 4 s</li> </ul> <p><b>HF measurement</b></p> <ul style="list-style-type: none"> <li>1 ... 180 s Adjustable, preset to 4 s, performance-tested acc. to EN 15267</li> </ul>
<b>Accuracy</b>	<p><b>Zero point :</b></p> <ul style="list-style-type: none"> <li>≤ ±2%, relative to upper measuring range value</li> </ul> <p><b>Sensitivity:</b></p> <ul style="list-style-type: none"> <li>≤ ±2 %, in maintenance interval (6 months), relative to upper measuring range value</li> </ul>
<b>Usage</b>	Indoor and outdoor
<b>Altitude</b>	Max. 2000 m (above sea level)
<b>Ambient temperature</b>	-20 °C ... +50 °C, depending on device configuration; Temperature change maximum ±10 °C/h
<b>Storage temperature</b>	-40 °C ... +55 °C
<b>Ambient humidity</b>	≤ 95 % relative humidity, non-condensing
<b>Electrical safety</b>	CE
<b>Overvoltage category</b>	II
<b>Degree of contamination</b>	2

Assembly	Mounting flange, DN125, PN6 Mounting flange, ANSI, 5"
Control functions	Automatic check cycle for zero and reference point (for NH <sub>3</sub> and HCl)
Options	Control unit SCU (only for non-Ex areas)

## 12.2 Sender/receiver unit

Table 18: Technical data, sender/receiver unit

Description	Analyzer unit of measuring system
Degree of protection	IP65
Dimensions (W × H × D)	239 mm × 316 mm × 338 mm
Weight	13 kg
Power supply	<ul style="list-style-type: none"> <li>Voltage: 24 V DC, supply via control unit</li> <li>Power input: 36 W</li> </ul>

## 12.3 Open GMP measuring probe

Table 19: Technical data, open GMP measuring probe

Description	Measuring probe in open design version with integrated purge air guidance system
Measuring distance	see Dimension drawing
Accuracy	<ul style="list-style-type: none"> <li>Pressure sensor: 1 %</li> <li>Temperature sensor: 1 %</li> </ul>
Process temperature	≤ +250 °C As from 200 °C with heated purge air
Process pressure	–60 ... +30 hPa, depending on purge air supply
Dust load	≤ 3 g/m <sup>3</sup> Relative to 1 m measuring distance, depending on application
Degree of protection	IP66
Dimensions (W × H × D)	see Dimension drawing
Weight	see Dimension drawing
Material, media contact	Stainless steel 1.4571, stainless steel 1.4539
Power supply	Supply via sender/receiver unit
Auxiliary gas connections	Purge air: Hose nozzle 40 mm
Built-in components	<ul style="list-style-type: none"> <li>Flow monitor for purge air monitoring</li> <li>Temperature sensor PT1000</li> <li>Pressure sensor</li> </ul>

## 12.4 Gas-testable GPP measuring probe

Table 20: Technical data, gas-testable GPP measuring probe

Description	Measuring probe with gas permeable filter element for adjustment with test gas
Measuring distance	see Dimension drawing
Accuracy	<ul style="list-style-type: none"> <li>Pressure sensor: 1%</li> <li>Temperature sensor: 1%</li> </ul>
Process temperature	<ul style="list-style-type: none"> <li>HCl: +130 °C ... +430 °C</li> <li>NH<sub>3</sub>: +300 °C ... +430 °C</li> </ul>
Process pressure	–120 ... +200 hPa
Dust load	≤ 30 g/m <sup>3</sup>
Degree of protection	IP65

<b>Dimensions (W × H × D)</b>	see Dimension drawing
<b>Weight</b>	see Dimension drawing
<b>Material, media contact</b>	Stainless steel 1.4571, stainless steel 1.4539, ceramic, PTFE
<b>Power supply</b>	Supply via sender/receiver unit
<b>Auxiliary gas connections</b>	Test gas: Clamping ring screw connection 1/4"
<b>Built-in components</b>	<ul style="list-style-type: none"> <li>• Temperature sensor PT1000</li> <li>• Pressure sensor</li> </ul>

## 12.5 Control unit, AWE, sheet steel enclosure

Table 21: Technical data, control unit, AWE, sheet steel version

<b>Description</b>	The control unit serves as user interface, for data processing and output as well as control and monitoring functions.
<b>Degree of protection</b>	IP65
<b>Analog outputs</b>	<b>3 outputs:</b> <ul style="list-style-type: none"> <li>• 0/4 ... 20 mA, 500 Ω</li> <li>• Electrically isolated</li> </ul>
<b>Analog inputs</b>	<b>2 inputs:</b> <ul style="list-style-type: none"> <li>• 0 ... 20 mA, 100 Ω</li> </ul> For gas temperature and gas pressure
<b>Digital outputs</b>	<b>3 relay contacts:</b> <ul style="list-style-type: none"> <li>• 48 V AC, 1 A, 60 W / 48 V DC, 1 A, 30 W</li> <li>• Preset for malfunction, maintenance and function check</li> </ul>
<b>Digital inputs</b>	<b>3 inputs:</b> <ul style="list-style-type: none"> <li>• +24 V</li> </ul>
<b>Serial</b>	✓ <ul style="list-style-type: none"> <li>• Type of field bus integration; RS-232</li> <li>• Function: Proprietary Service Interface</li> </ul>
<b>PROFIBUS DP</b>	✓ Only for HF
<b>CAN bus</b>	✓ Function: Internal System bus
<b>Display</b>	LC-Display Status LEDs: Operation, Service, Warning, Malfunction
<b>Input</b>	Arrow buttons Function buttons
<b>Operation</b>	Menu-guided operation via LC-display and membrane keyboard
<b>Version</b>	Sheet steel enclosure
<b>Dimensions (W × H × D)</b>	210 mm × 381.4 mm × 108 mm
<b>Weight</b>	4.7 kg
<b>Power supply</b>	<ul style="list-style-type: none"> <li>• Voltage: 115 V / 230 V AC, ±10% (line voltage fluctuation)</li> <li>• Frequency: 50 Hz / 60 Hz</li> <li>• Power input : ≤ 50 W</li> </ul>
<b>Battery</b>	<ul style="list-style-type: none"> <li>• Type: Button cell 3V CR2032</li> <li>• Chemical system: Lithium-ion (Li-ion)</li> </ul>

## 12.6 Control unit, AWE, cast metal enclosure

Table 22: Technical data, control unit, AWE, cast metal version

<b>Description</b>	The control unit serves as user interface, for data processing and output as well as control and monitoring functions.
<b>Degree of protection</b>	IP67

Analog outputs	<b>3 outputs:</b> <ul style="list-style-type: none"> <li>0/4 ... 20 mA, 500 <math>\Omega</math></li> <li>Electrically isolated</li> </ul>
Analog inputs	<b>2 inputs:</b> <ul style="list-style-type: none"> <li>0 ... 20 mA, 100 <math>\Omega</math></li> <li>For gas temperature and gas pressure</li> </ul>
Digital outputs	<b>3 relay contacts:</b> <ul style="list-style-type: none"> <li>48 V AC, 1 A, 60 W / 48 V DC, 1 A, 30 W</li> <li>Preset for malfunction, maintenance and function check</li> </ul>
Digital inputs	<b>3 inputs:</b> <ul style="list-style-type: none"> <li>+24 V</li> </ul>
Serial	✓ <ul style="list-style-type: none"> <li>Type of field bus integration; RS-232</li> <li>Function: Proprietary Service Interface</li> </ul>
PROFIBUS DP	✓ Only for HF
CAN bus	✓ Function: Internal System bus
Display	LC-Display Status LEDs: Operation, Service, Warning, Malfunction
Input	Arrow buttons Function buttons
Operation	Menu-guided operation via LC-display and membrane keyboard
Version	Cast metal enclosure
Dimensions (W × H × D)	289 mm × 370 mm × 138 mm
Weight	8.6 kg
Power supply	<ul style="list-style-type: none"> <li>Voltage: 115 V / 230 V AC, <math>\pm 10\%</math> (line voltage fluctuation)</li> <li>Frequency: 50 Hz / 60 Hz</li> <li>Power input : <math>\leq 50</math> W</li> </ul>
Battery	<ul style="list-style-type: none"> <li>Type: Button cell 3V CR2032</li> <li>Chemical system: Lithium-ion (Li-ion)</li> </ul>

## 12.7 Connection unit

Table 23: Technical data, connection unit

Description	To extend the CAN bus connection with a line provided by the customer
Degree of protection	IP66
Dimensions (W × H × D)	175 mm × 110.5 mm × 175 mm
Weight	3 kg
Power supply	<ul style="list-style-type: none"> <li>Voltage: 115 V / 230 V AC, <math>\pm 10\%</math> (line voltage fluctuation)</li> <li>Frequency: 50 Hz / 60 Hz</li> </ul>
Built-in components	Integrated 24 V power supply unit for supply of the sender/receiver unit

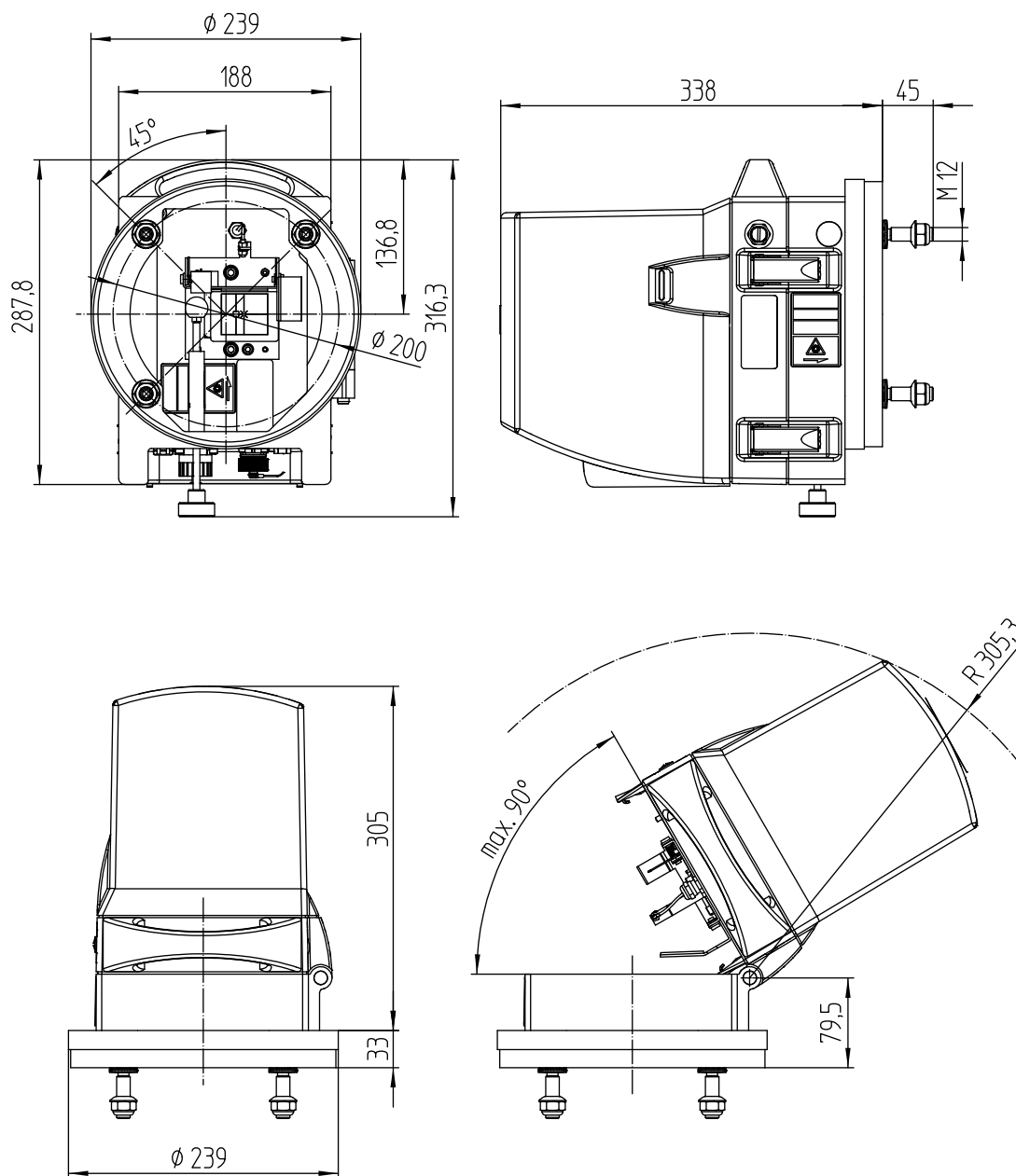
**12.8 Dimension drawing, sender/receiver unit**

Figure 34: GM700 sender/receiver unit (dimensions in mm)

12.9 Dimension drawing, open GMP measuring probe

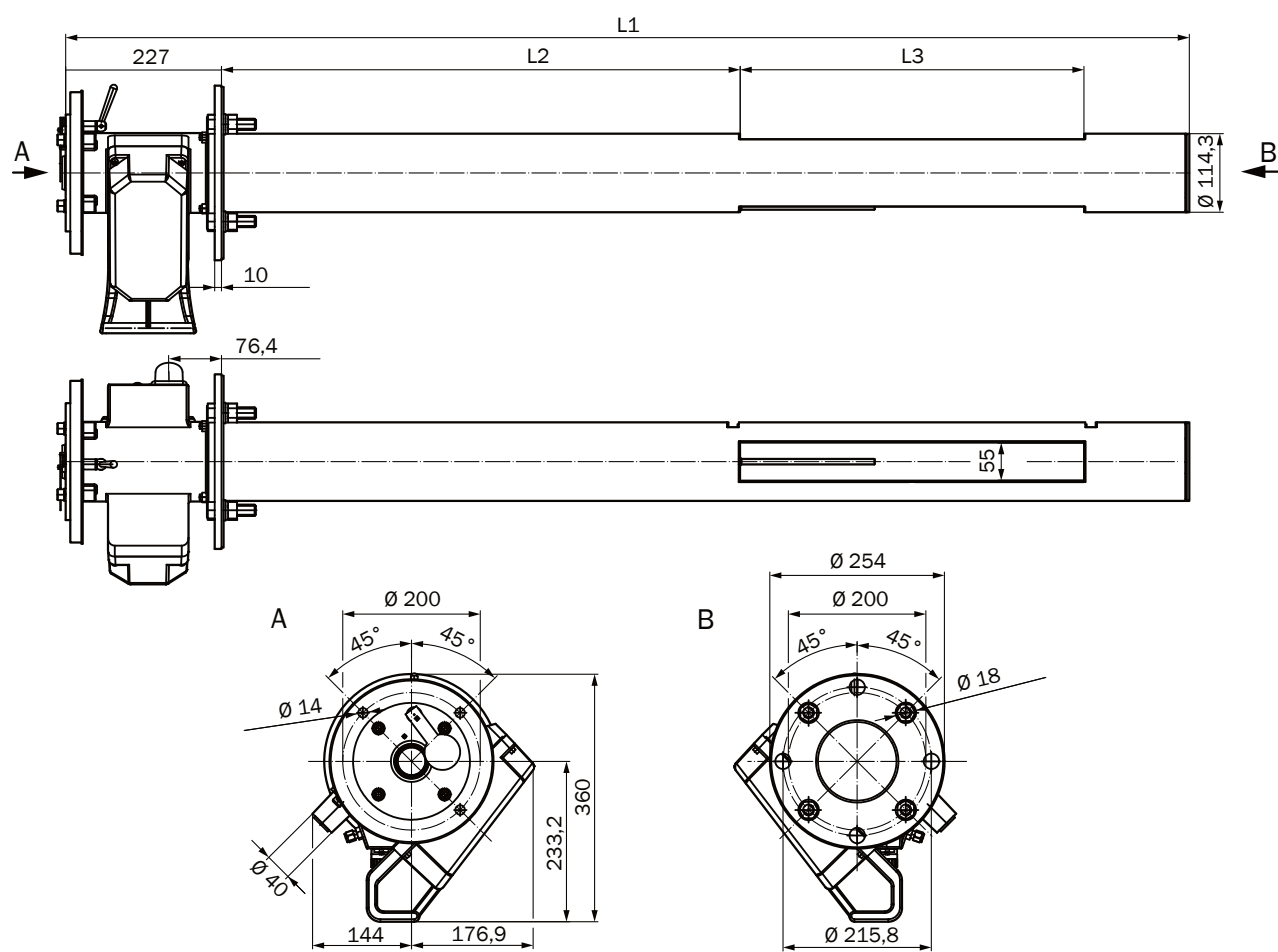


Figure 35: GMP measuring probe (all dimensions in mm)

Table 24: GMP measuring probe versions

GMP measuring probe		L3						
		250	500	750	1,000	1,250	1,500	
Probe length, nominal	L1	L2						Weight
900	935	296	–	–	–	–	–	21
1,500	1,644	1,005	755	505	255	–	–	24
2,000	2,128	1,489	1,239	989	739	489	239	30
All lengths in mm, all weights in kg								
Application-specific lengths on request								

12.10      Dimension drawing, gas-testable GPP measuring probe

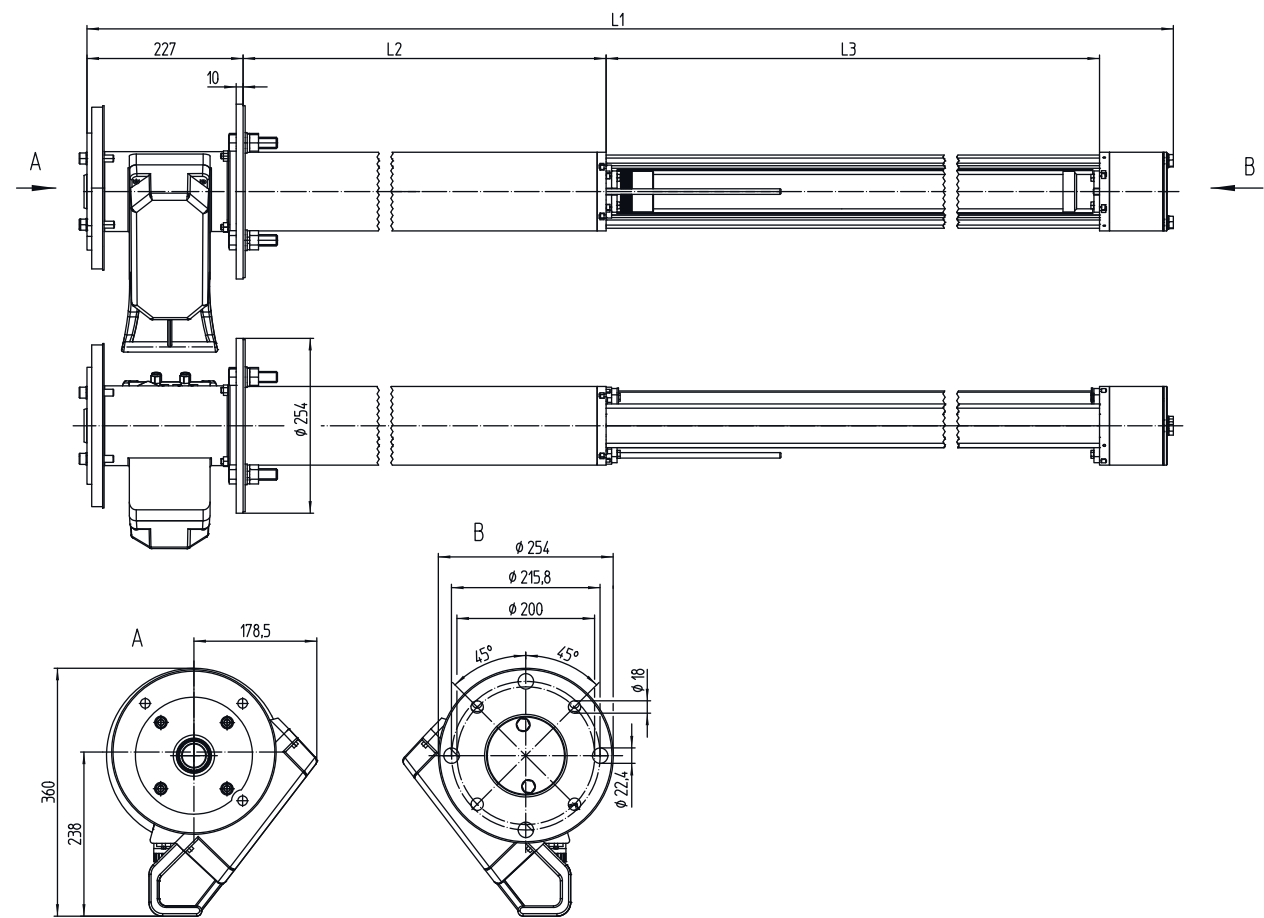


Figure 36: GPP measuring probe (all dimensions in mm)

Table 25: GPP measuring probe versions

GPP measuring probe		Length L3				
		227	477	727	977	
Probe length, nominal	L1	L2				Weight
900	914	353	103	–	–	27
1.500	1,624	1,063	813	563	313	35
2.000	2,108	1,547	1,297	1,047	797	42
All lengths in mm, all weights in kg						
Application-specific lengths on request						

## 12.11 Dimension drawing, control units

Control unit AWE (sheet steel enclosure version)

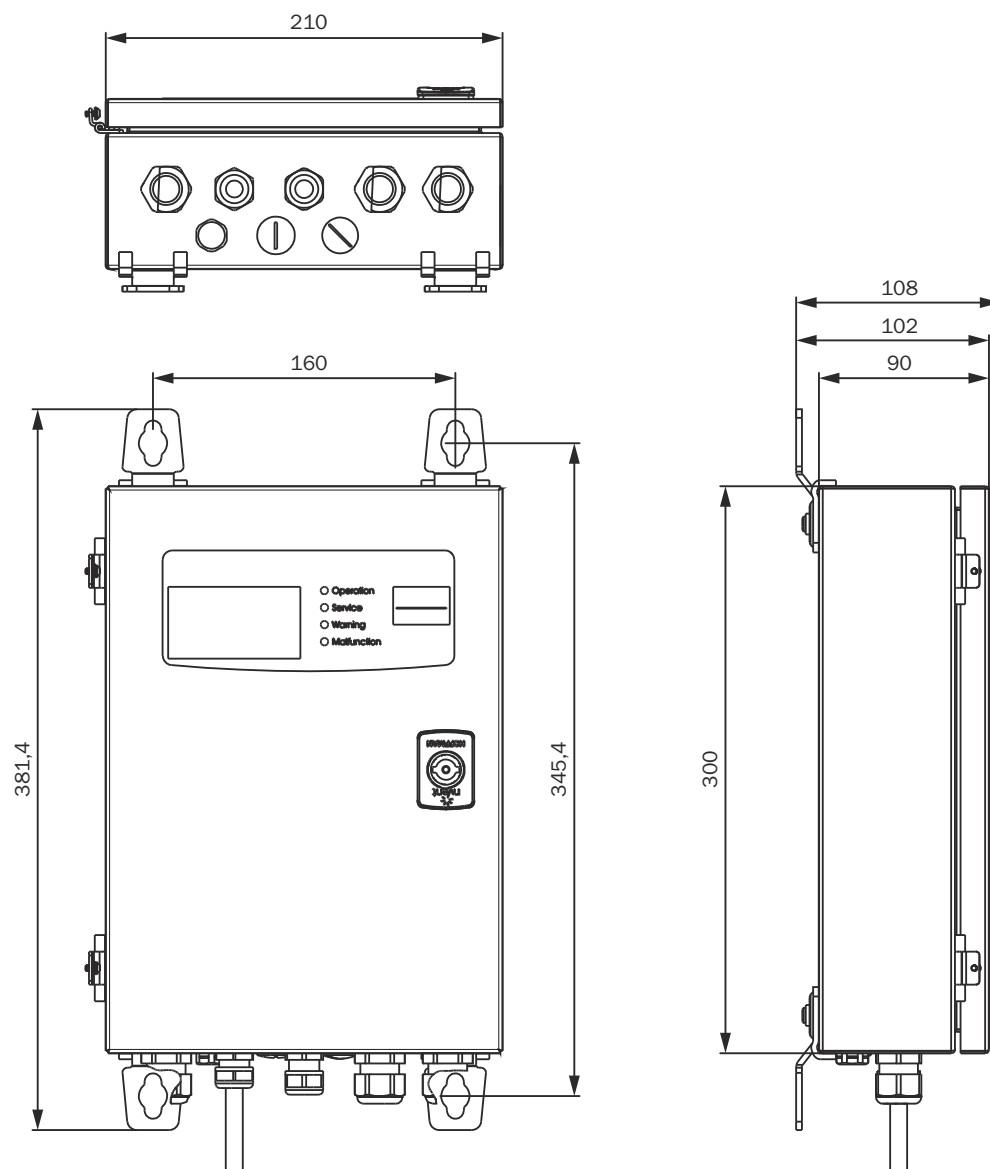


Figure 37: Control unit AWE (sheet steel enclosure version), dimensions in mm

Control unit AWE (cast metal enclosure version)

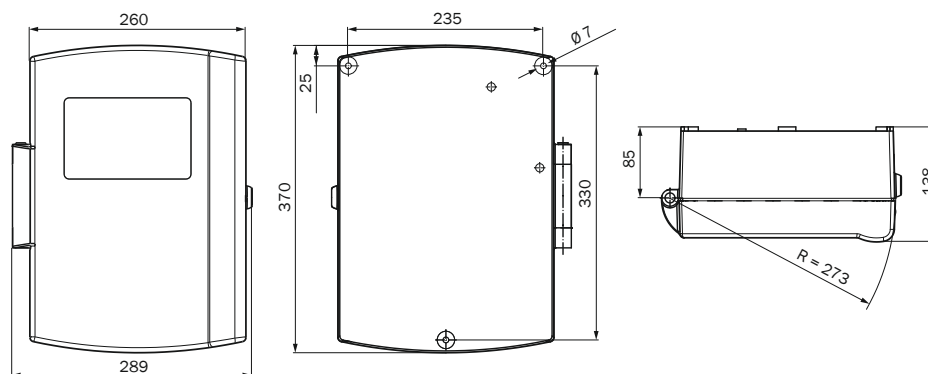


Figure 38: Fitting the control unit AWE (sheet steel enclosure version), dimensions in mm

## 12.12 Dimension drawing, flange with tube, DN125

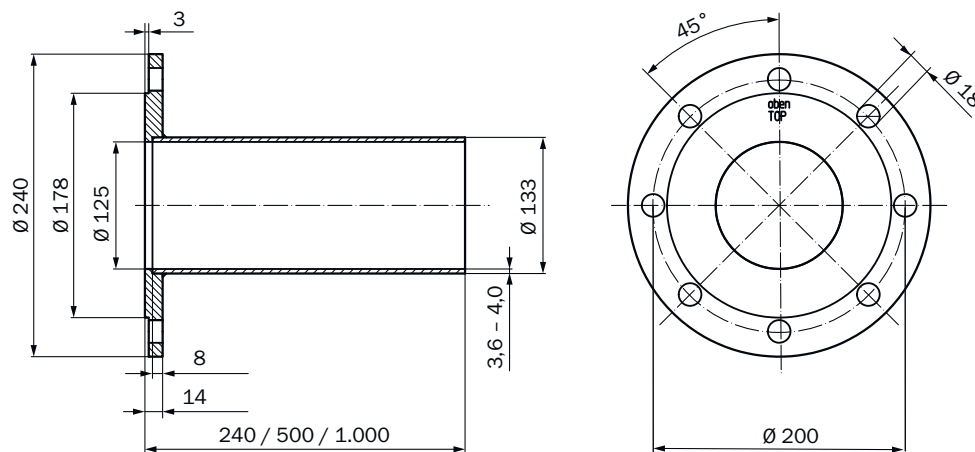


Figure 39: Flange with tube, DN125 (dimensions in mm)

## 12.13 Dimension drawing, connection unit

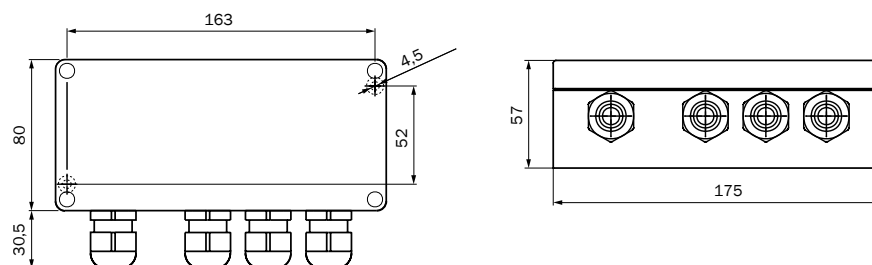


Figure 40: Dimensions, connection unit (dimensions in mm)

## 12.14 Dimension drawing, purge air unit, SLV4-2

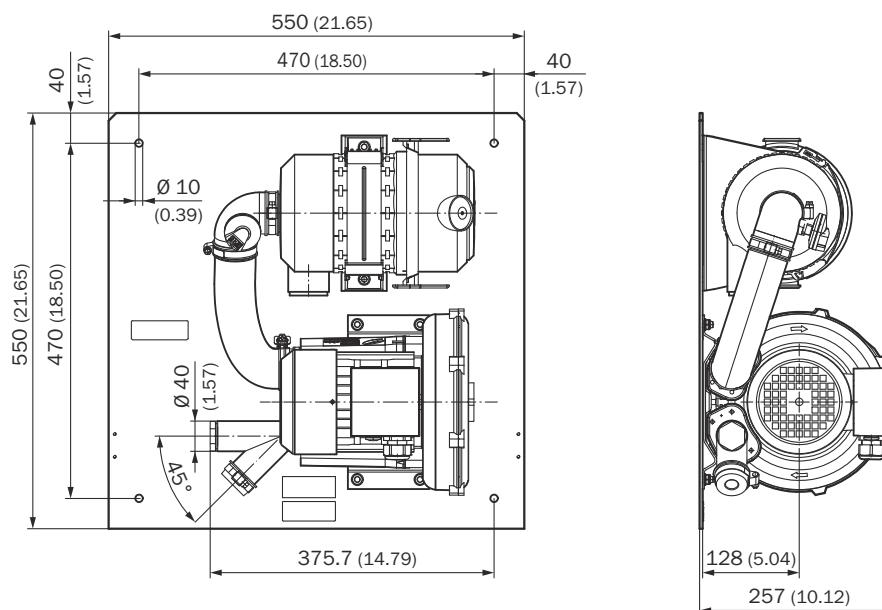


Figure 41: Dimension drawing SLV4-2, type 2BH1300 (dimensions in mm)

## 12.15 Dimension drawing, weather hoods

### Weatherproof cover for sender/receiver unit

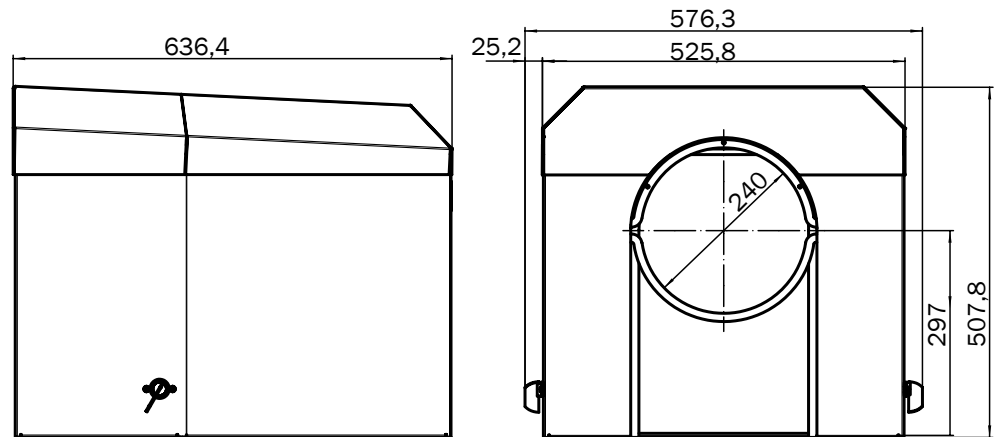


Figure 42: Weather hood for sender/receiver unit (dimensions in mm)

## 13 Annex

### 13.1 Possible ambient temperatures

#### 13.1.1 Ambient temperature ranges with reference cell

Table 26: Possible ambient temperature ranges (reference cell)

Possible ambient temperature ranges		
Degrees Centigrade (°C)	Kelvin (K)	Degrees Fahrenheit (°F)
-40 ... 10	233 ... 283	-40 ... 50
-30 ... 20	243 ... 293	-22 ... 68
-20 ... 30	253 ... 303	-4 ... 86
-10 ... 40	263 ... 313	14 ... 104
0 ... 50	273 ... 323	32 ... 122

### 13.2 User information on laser safety

Concerns the deviation of EN 60825-1/A11/AC:2022-03 "Laser safety" from Directive 2006/25/EC and/or the health and safety regulation, issued based on the Directive regarding artificial optical radiation ("OstrV").

This product has been classified and manufactured according to the harmonized standard EN 60825-1/A11/AC:2022-03.

However, this manufacturer classification does not in every case result in the compliance/non-compliance of the exposure limit values with the European Directive 2006/25/EC.

The limit values for the exposure of workers to artificial optical radiation are determined in "Directive 2006/25/EC of the European Parliament and of the Council of 5 April 2006 on the minimum health and safety requirements regarding the exposure of workers to risks arising from physical agents (artificial optical radiation)" of the European Union. This Directive has been implemented by the health and safety regulations concerning artificial optical radiation (OstrV) into national legislation.

Endress+Hauser assumes that the limit value concept of Directive 2006/25/EC will be adapted according to EN 60825-1/A11/AC:2022-03, however, Endress+Hauser is not aware of the time horizon.

The values for maximum permissible exposure (MPE) stated in EN 60825-1/A11/AC:2022-03, which are used as basis for the risk assessment, are based on the exposure limit values of an internationally accepted scientific board (ICNIRP), which represents international state-of-the-art technology with its guidelines. These MPE values of the EN 60825-1/A11/AC:2022-03, however, do **not** comply with the exposure limit values of the European Directive 2006/25/EC, as they **are higher or lower** in certain areas. Both MPE observations are based on the ICNIRP; the EN 60825-1/A11/AC:2022-03, however, takes the **more recent** guidelines of the ICNIRP into account.

The following overview shows applications of the product where the exposure limit values of the European Directive 2006/25/EC can be exceeded under the predictable conditions.

Our product has been manufactured and classified according to EN 60825-1/A11/AC:2022-03, it is therefore possible that it deviates from the European minimum requirements for protection against risks due to laser radiation at the workplace.

#### GM700-02

The GM700-02 can **emit maximum 25 mW**, provided software version 9105060\_YEK0 (or newer version with same functionality) is used, even in case of an unfavorable parameter choice or a reasonably predictable error case.

**This is below the limit values of the allowable radiation (AEL = allowable emission limit) of laser class 1, according to IEC 60825-1:2014-5 (30.3 mW for GM700-02 laser radiation), but factor 1.6 above the limit value of the European health and safety regulations for artificial optical radiation and/or EN 60825-1:2007.**

As general precautionary measure for all GM700s, the user is requested to avoid looking into the beam and to switch the device off and thus **the laser for all maintenance and service work.**

The following overview shows applications of product GM700-02 where the exposure limit values of the European Directive 2006/25/EC can be exceeded under the predictable conditions.

Table 27: Limit values for accessible radiation for the radiation of the GM700-02

	IEC 60825-1:2014-5	EN 60825-1:2007, Directive 2006/25/EC, Health and safety regulations concerning artificial optical radiation ("OstrV")
<b>Limit value laser class 1</b> <ul style="list-style-type: none"> <li>• <math>\lambda_{\text{worst case}} = 1272 \text{ nm}</math></li> <li>• <math>\lambda_{\text{typical}} = 1278 \text{ nm}</math></li> </ul>	<ul style="list-style-type: none"> <li>• 30.3 mW</li> <li>• 41.3 mW</li> </ul>	<ul style="list-style-type: none"> <li>• 15.6 mW</li> <li>• 15.6 mW</li> </ul>
<b>Limit value laser class 3R</b> <ul style="list-style-type: none"> <li>• <math>\lambda_{\text{worst case}} = 1272 \text{ nm}</math></li> <li>• <math>\lambda_{\text{typical}} = 1278 \text{ nm}</math></li> </ul>	<ul style="list-style-type: none"> <li>• 155 mW</li> <li>• 211.8 mW</li> </ul>	<ul style="list-style-type: none"> <li>• 80 mW</li> <li>• 80 mW</li> </ul>

Table 28: Power output of the GM700 in planned operating state (normal operation/maintenance)

Power output GM700, normal operation with correct parameter choice and valid measurement in a non-error case with SW as from version 9105060_YEK0	15 mW	<ul style="list-style-type: none"> <li>• &lt; AEL of laser class 1 (IEC 60825-1:2014-05)</li> <li>• &lt; AEL of laser class 1 (IEC 60825-1:2007-03)</li> </ul>
Power output GM700, in reasonably predictable single error case or with incorrect parameter settings with SW as from version 9105060_YEK0	25 mW	<ul style="list-style-type: none"> <li>• &lt; AEL laser class 1 (IEC 60825-1:2014-05)</li> <li>• &lt; AEL laser class 3R (IEC 60825-1:2007-03) (factor approx. 1.6 above LC1 )</li> </ul>
<ul style="list-style-type: none"> <li>• Remark 1: 10% safety value additionally considered for the measurement uncertainties and rounded up to 1 mW..</li> <li>• Remark 2: When old software versions are used (prior to 9105060_YEK0), dangerous laser radiation can be emitted especially during start-up with low ambient temperatures (&lt;0 °C).</li> </ul>		

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