

# Operating Instructions

## GM700

Gas Analyzer,  
Cross-Duct Version



**Described product**

GM700

Cross-Duct Version

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

GM700-02, HF version, was performance-tested for measuring ranges 5 and 25 mg/m<sup>3</sup> in accordance with EN15267-3 (TÜV Rheinland 936/21210058/A dated September 30.09.2010, 2010)

**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

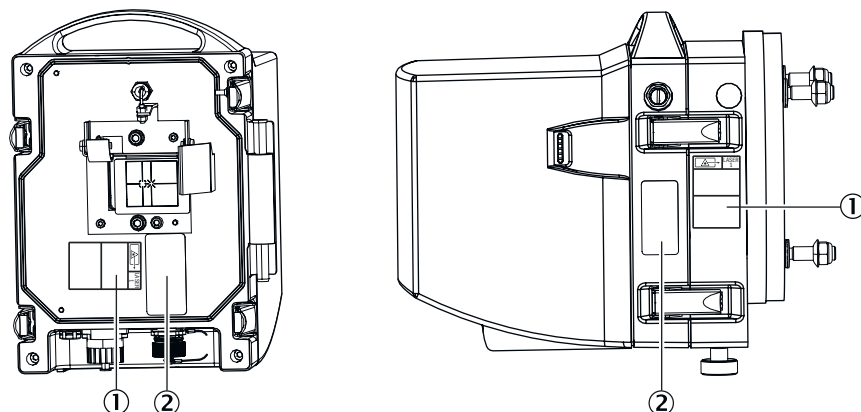
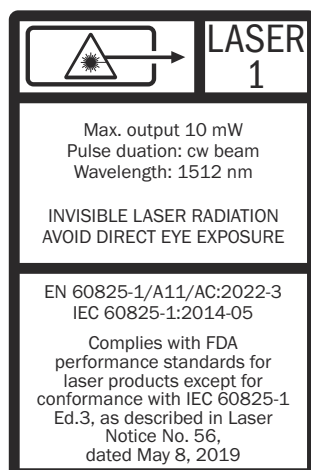


Figure 1: Warning information on the sender/receiver unit

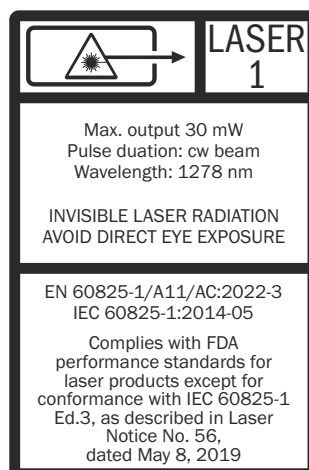
- ① Laser radiation danger sign
- ② Type plate

### Laser signs

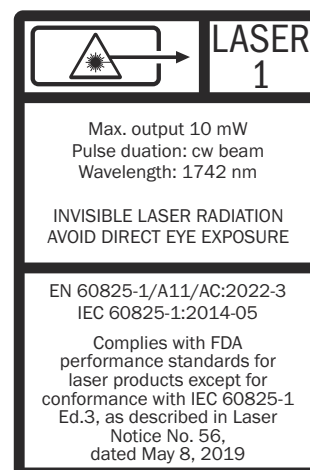
The laser wavelength varies for the respective measuring components (NH<sub>3</sub>, HF, HCl).  
The maximum laser output at the optical interface depends on the respective measuring component and is shown on the laser warning sign.



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	Cross-Duct 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>• On reflector unit: On right side</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 <sup>1)</sup>	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

<sup>1)</sup> The GM700-02, HF-version device type was performance-tested for measuring ranges 5 and 25 mg/m<sup>3</sup> in accordance with EN15267-3 (TÜV Rheinland 936/21210058/A dated 30.09.2010)

### 3.4 Layout and function

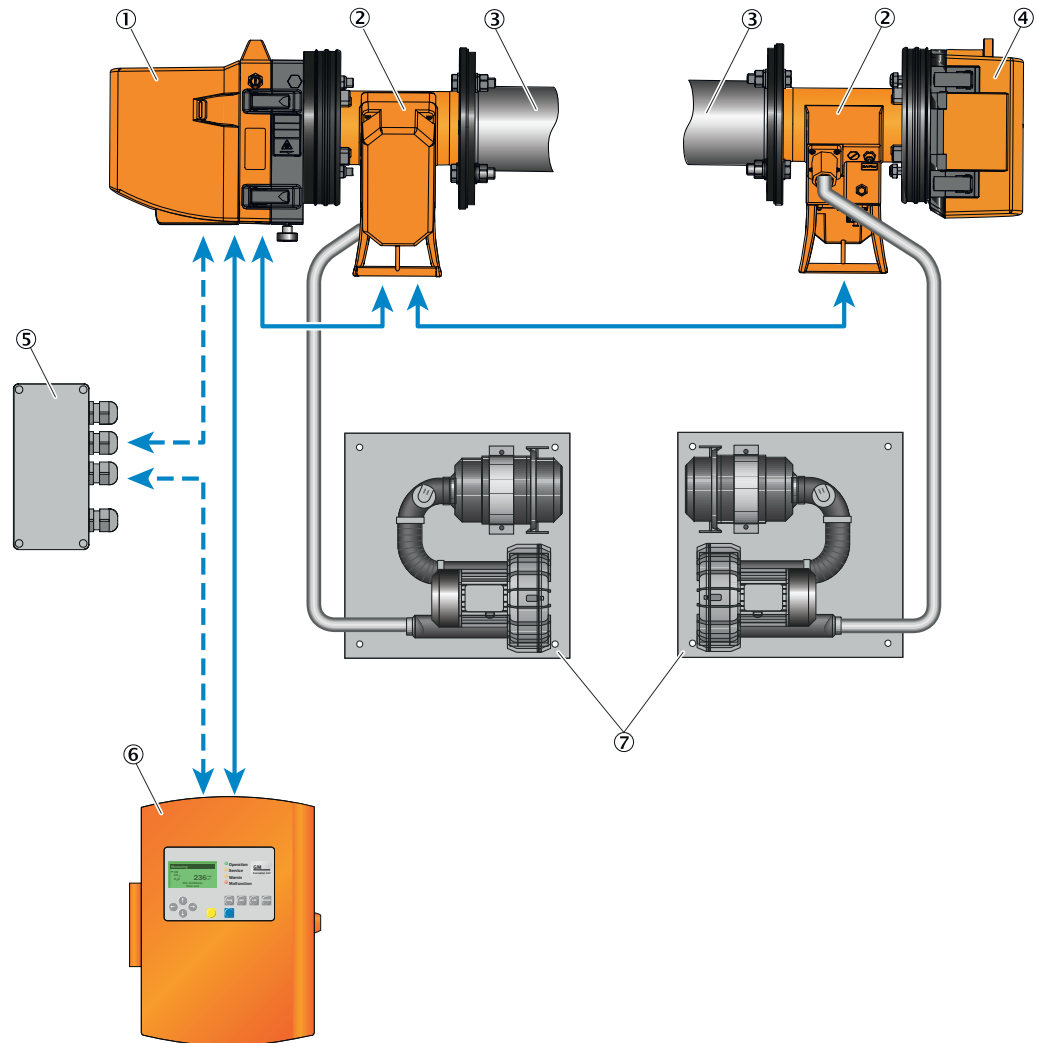




Figure 2: Measuring device components layout

-  Connection lines
-  Purge air hose
- ① Sender/receiver unit
- ② Purge air attachment
- ③ Flange with tube
- ④ Reflector unit
- ⑤ Connection unit (option)
- ⑥ Control unit
- ⑦ Purge air unit

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.

#### Reflector unit

The reflector unit contains the triple reflector assembly and reflects the measuring beam back to the sender/receiver unit.



**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 and reflector unit 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.

**3.4.1 Pressure and temperature sensor****NOTE**

It is necessary to install and use a pressure and temperature sensor (available as accessory) to calculate the concentrations at standard conditions.

**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.

## 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 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
- Flange alignment tool (not included in standard scope of delivery)

### 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).

Table 3: Overview of installation steps before commissioning

Step	Procedure	Reference
1	Install the flanges with tube.	see "Installing the flange with tube", page 17.
2	Install the purge air attachments.	see "Fitting the purge air attachments", page 21.
3	Install the flange fixtures on the purge air attachments.	see "Fitting the flange fixture on the purge air attachment", page 21.
4	Fit control unit.	see "Fitting the control unit", page 23.
5	Install one or two purge air units (according to project planning).	see Purge air unit Operating Instructions



#### NOTICE

Sender/receiver unit and reflector unit may only be installed in the specified sequence during commissioning. Otherwise the device may be damaged.

### 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 channel

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 channel is hot

- ▶ When the measuring channel 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 75](#)

**Arrangement of the flanges with tube on the gas duct**

- Determine flange - flange distance and measuring distance.

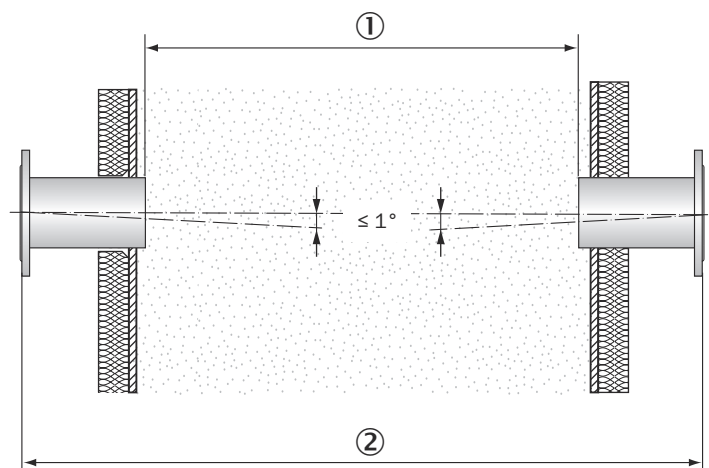


Figure 3: Flanges with tube — determining the measuring distance

- ① Measuring distance
- ② Flange - flange distance

**NOTE**

The installation steps for the flanges with tube are identical for the sender/receiver unit and reflector unit.

## Installing the flange with tube

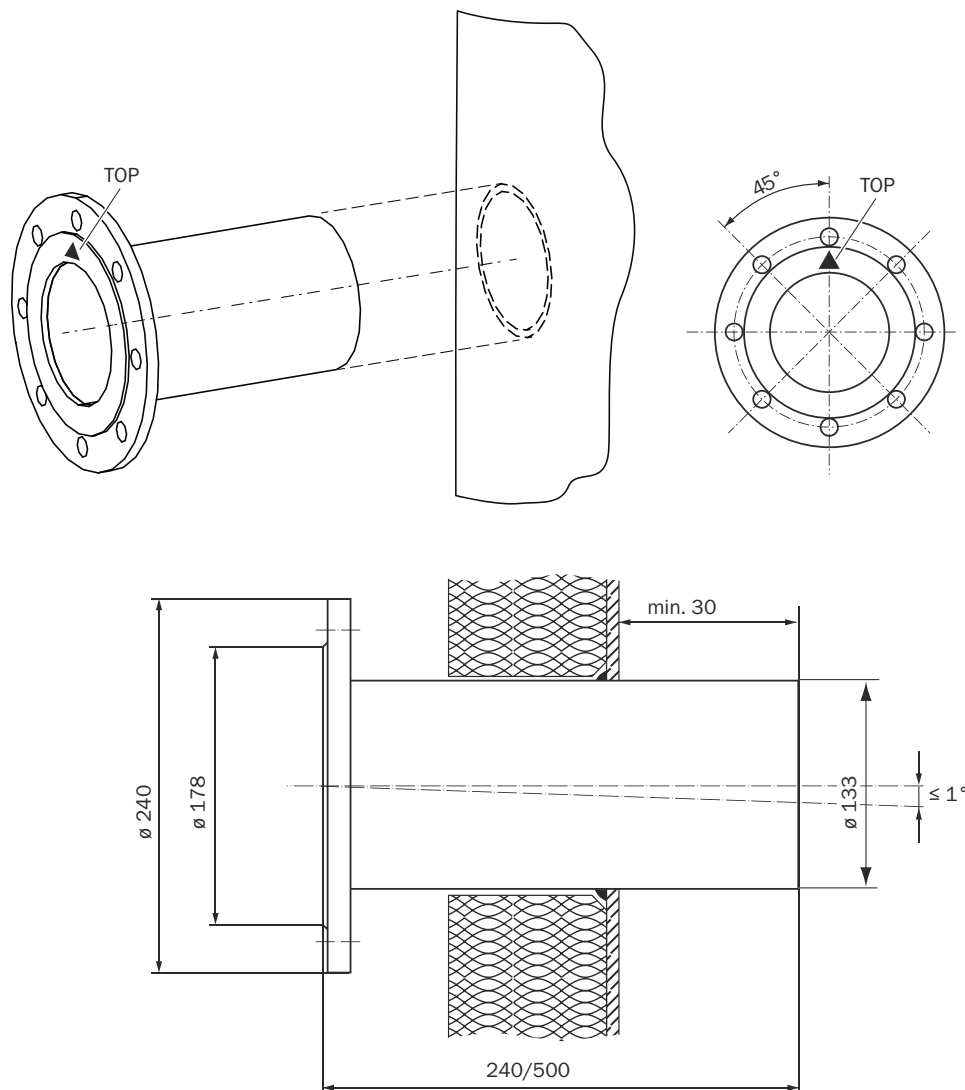


Figure 4: Flange with tube incl. orientation "TOP"

## 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.

### Optical alignment of the flanges with tube

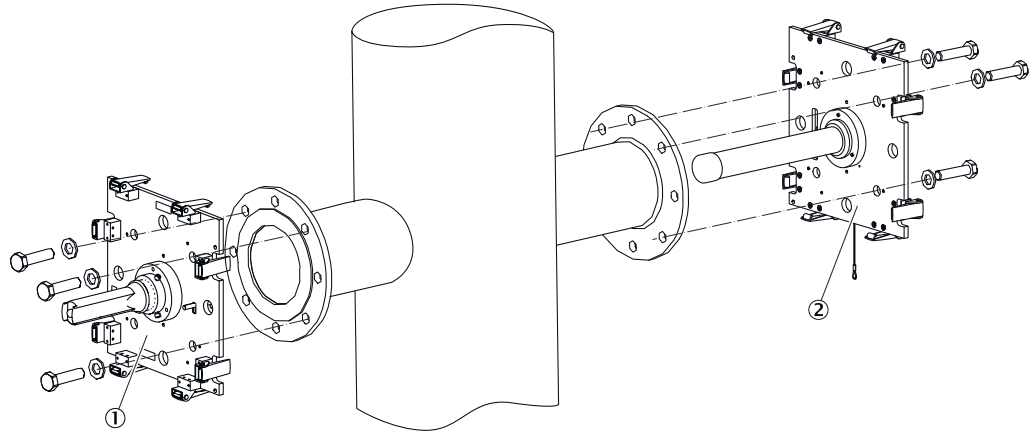


Figure 5: Fitting the alignment tool

- ① Alignment tool, sender
- ② Alignment tool, reflector

### Fit the alignment tools

#### Steps

1. Remove the protective caps of the alignment tools.
2. Position the sender unit alignment tool on the flange with tube (sender/receiver unit side) and fasten with the delivered screw set.
3. Position the receiver unit alignment tool on the flange with tube (reflector unit side) and fasten with the delivered screw set.
4. Switch on the light source of the sender unit alignment tool.

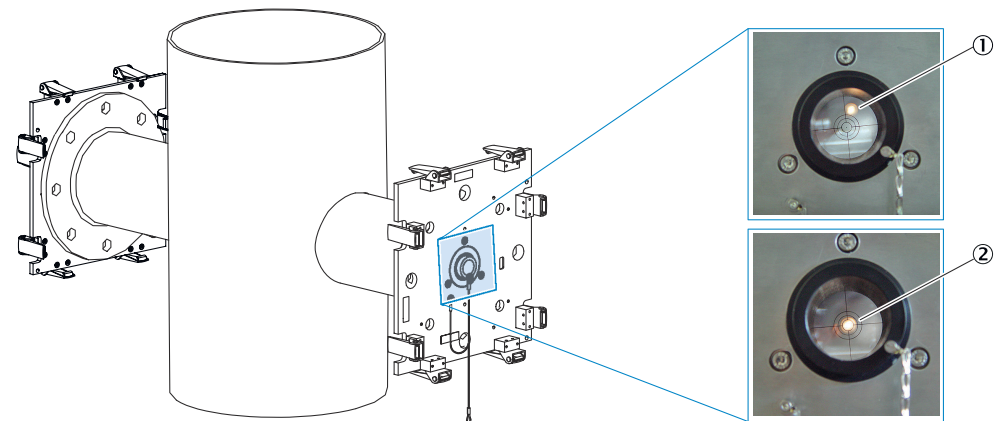


Figure 6: Checking the alignment

- ① Light spot not correctly aligned
- ② Light spot correctly aligned

### Check the alignment

#### Steps

1. Shift the alignment tube to focus the light point of the light source in the window of the reflector unit alignment tool.
2. Align the flange with tube on the reflector side so that the light spot appears centred in the target.

### Check the alignment on the other flange with tube

#### Steps

1. Fit the adjustment devices to the other flange with tube.



2. Check the alignment as described above.
3. Remove the alignment tools after successfully checking the alignment.

#### Permanently fasten the flanges with tube

##### Steps

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

### 5.6.3 Fitting the purge air attachments



#### NOTE

The installation steps for the purge air attachments on the flanges with tube are identical for the sender/receiver unit and reflector unit.

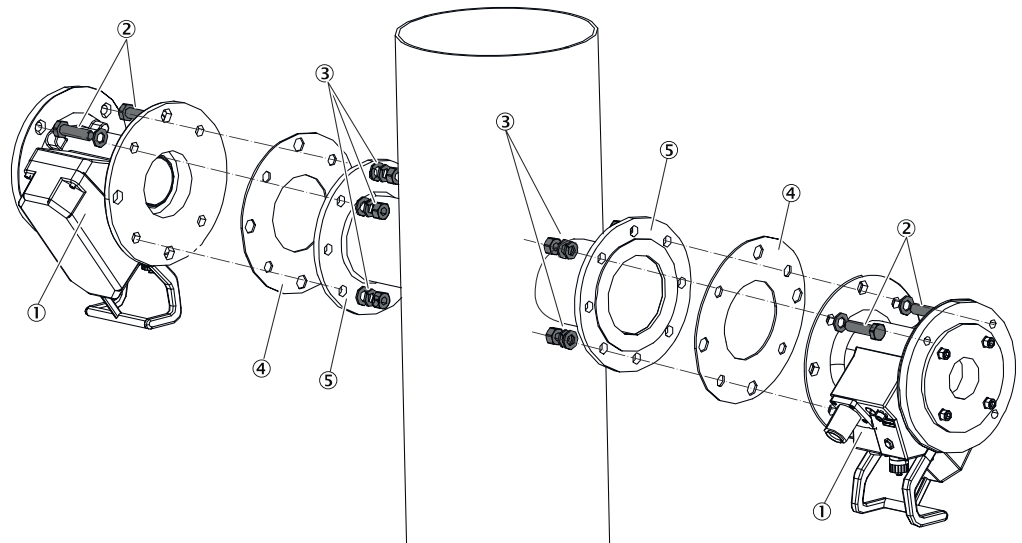


Figure 7: Fitting the purge air attachments on the flanges with tube

- ① Purge air attachment
- ② Screw bolts M16 x 60 with washer
- ③ Nut M16 with lock washer
- ④ Sealing ring
- ⑤ Flange with tube

##### Steps

1. Attach purge air attachment to flange with sealing ring.
2. Tighten the nuts.

### 5.6.4 Fitting the flange fixture on the purge air attachment



#### NOTE

The installation steps for the purge air attachments on the device flanges are identical for the sender/receiver unit and reflector unit.

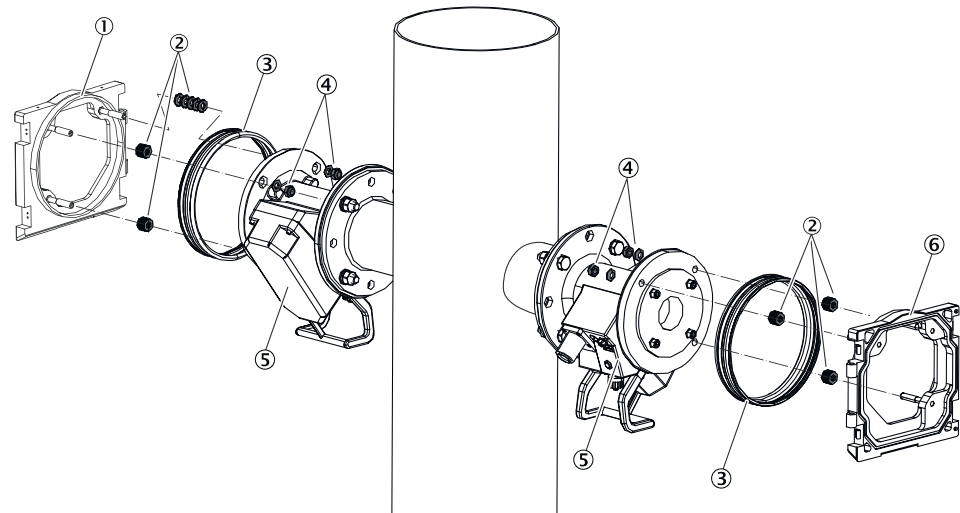


Figure 8: Fitting the flange fixtures

- 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
- ⑥ Flange fixture, reflector unit

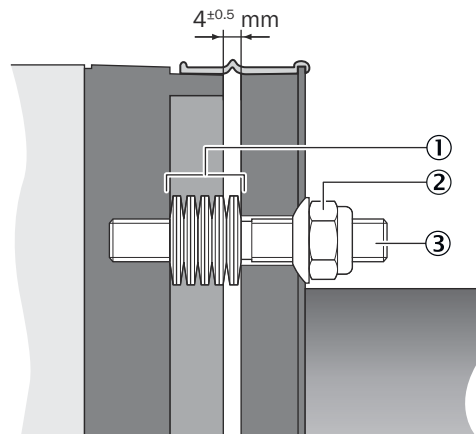


Figure 9: Detail view, alignment of cup springs

- 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 to the reflector 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 purge air attachment and hang it loosely over the purge air unit.
3. Push the device flange onto the purge air attachment.
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.

### 5.6.5 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)

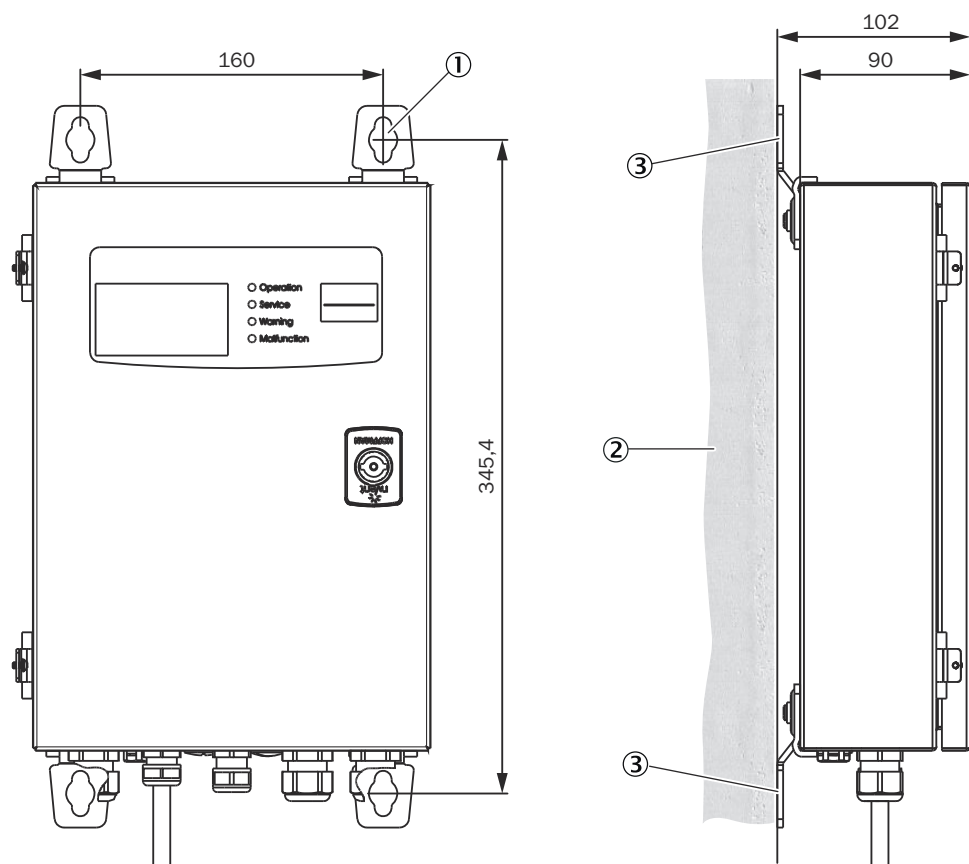


Figure 10: Fitting the control unit AWE, sheet steel enclosure (dimensions in mm)

- 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.

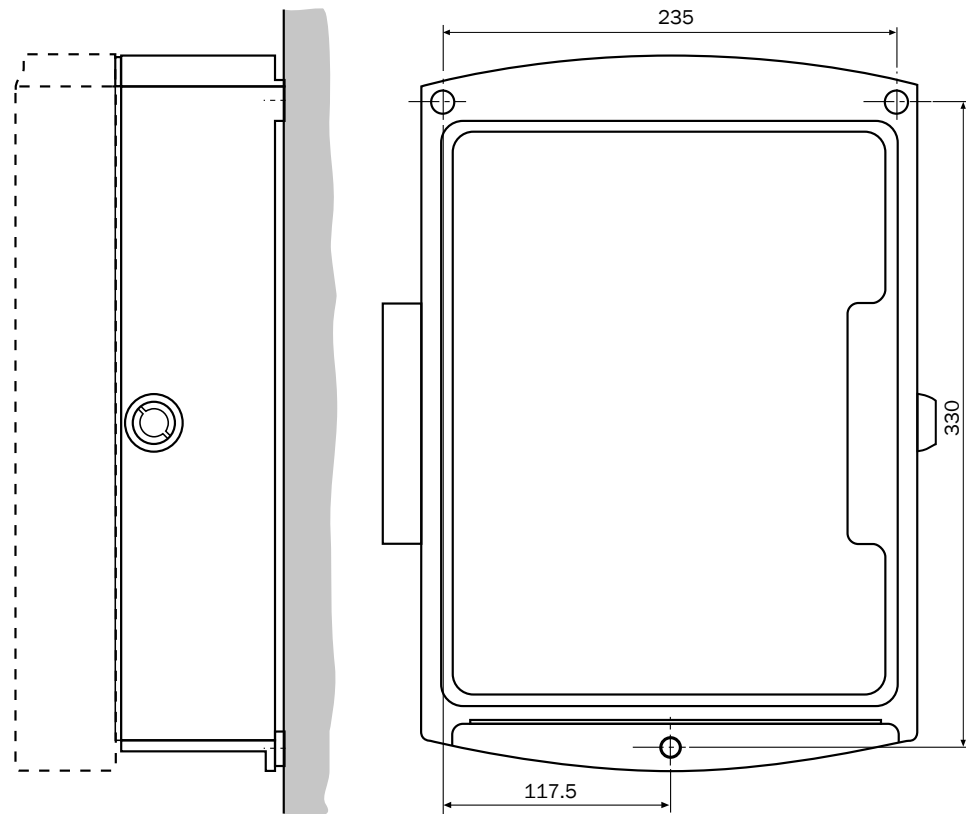
**Control unit AWE (cast metal enclosure version)**

Figure 11: 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.

**5.6.5.1 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.

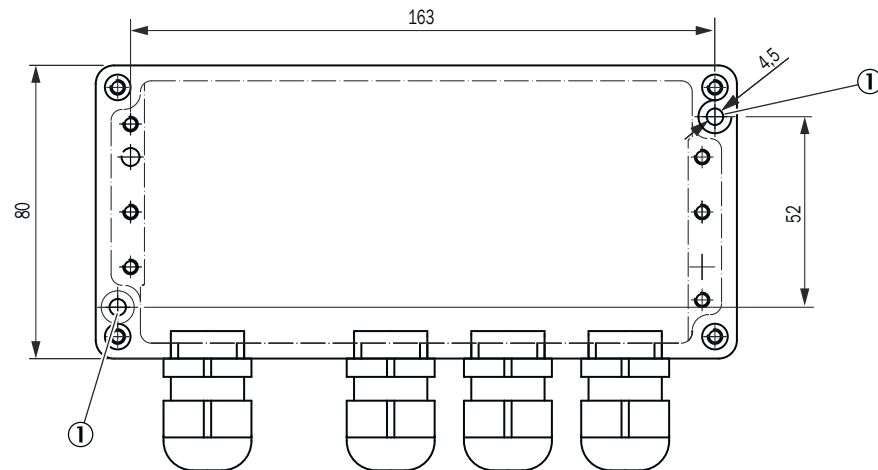


Figure 12: Fitting the connection unit (dimensions in mm)

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.

### 5.6.6 Installing the purge air unit



#### NOTE

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

## 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 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.

**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 4: Overview of electrical connection steps

Step	Procedure	Reference
1	Lay lines.	see "Connection overview", page 28
2	Connect control unit.	see "Electrical connection of the control unit", page 29
3	Connect one or two purge air units (according to project planning).	see "Connecting the purge air unit electrically", page 32
4	Put the purge air unit into operation.	see "Putting the purge air unit into operation", page 33
5	Optional: Connect the connection unit.	see "Connecting the connection unit (option)", page 34



### NOTE

The power supply of the sender/receiver unit is provided by the control unit via the CAN bus connection.

## 6.4 Connection overview

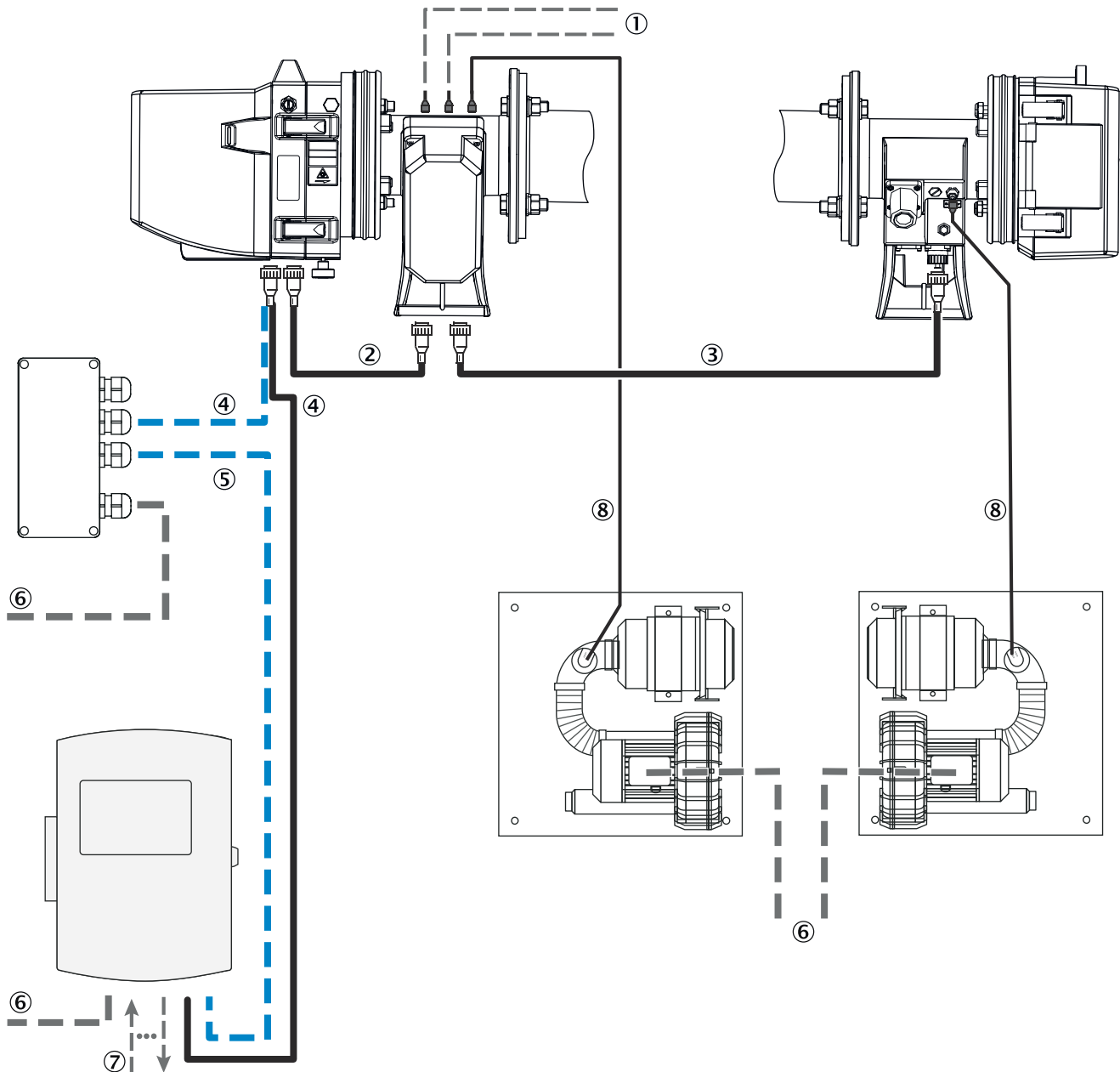


Figure 13: Electrical wiring of device components

- Standard scope of delivery
- - - Option
- - - Provided by customer

- ① Lines, temperature and pressure sensor on purge air attachment sender/receiver unit, provided by customer
- ② Connecting line, sender/receiver unit and purge air attachment
- ③ Connecting line, sender/receiver unit and reflector unit
- ④ Connection line, sender/receiver unit and control unit or connection unit (option)
- ⑤ Line (extension), connection unit (option) and control unit
- ⑥ Power supply, purge air unit, provided by customer  
Power supply, control unit, provided by customer  
Power supply, connection unit, provided by customer
- ⑦ Signal lines, control unit (provided by customer)
- ⑧ Connection line, purge air attachment and low-pressure monitor purge air unit



### 6.4.1 Lines overview

Table 5: Lines overview

No.	Line	Length [m]	Scope of delivery	Specification
①	Purge air attachment, sender/receiver unit — external temperature and pressure sensor		Not included	0.5 mm <sup>2</sup>
②	Sender/receiver unit — purge air attachment (CAN bus)	0.8	Included	Prefabricated with plug-in connector
③	Sender/receiver unit — reflector unit (CAN bus)	5 10 12 15	Included Option Option Option	Prefabricated with plug-in connector
④	Sender/receiver unit — control unit (CAN bus) or Sender/receiver unit — connection unit (option)	4	Included	Prefabricated with plug-in connector, open line end
⑤	Connection unit (option) — control unit (CAN bus)	Max. 300	Option	Open line ends, 5 × 0.5 mm <sup>2</sup>
⑥	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>
⑦	Control unit: Signal lines to system periphery		Not included	Each 0.5 mm <sup>2</sup>
⑧	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

### 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

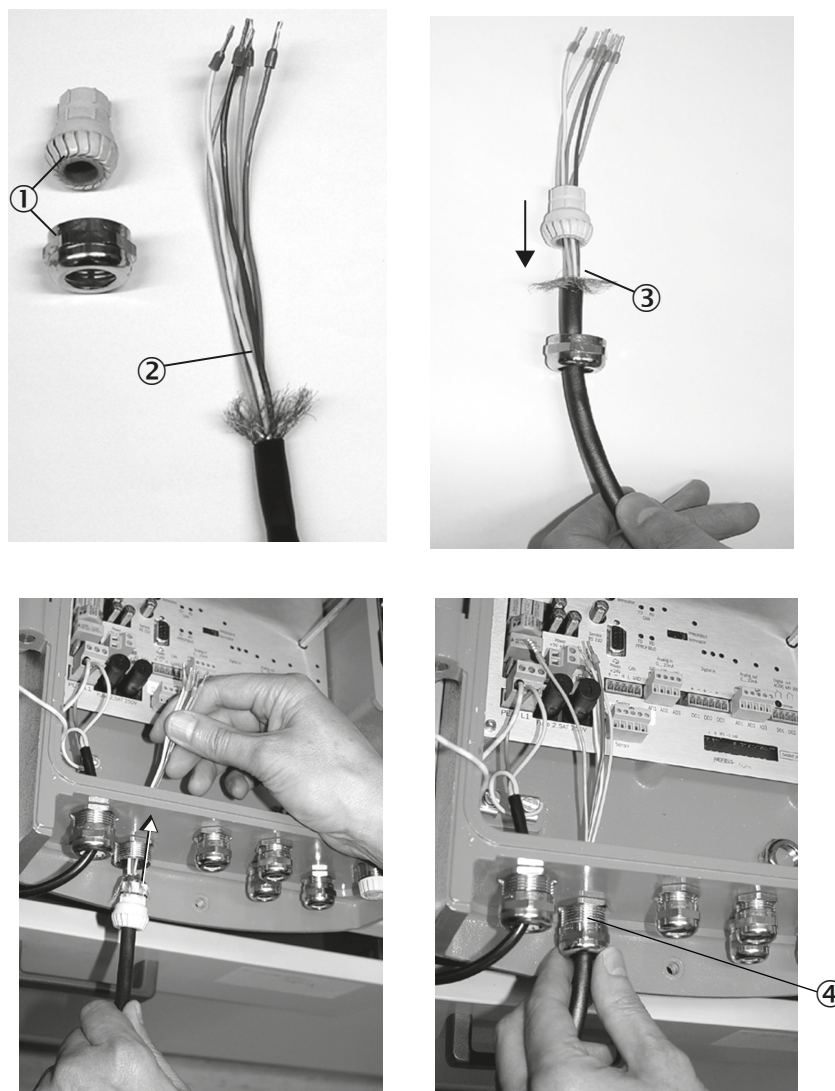


Figure 14: CAN bus line fitted correctly (shown on the AWE)

- 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

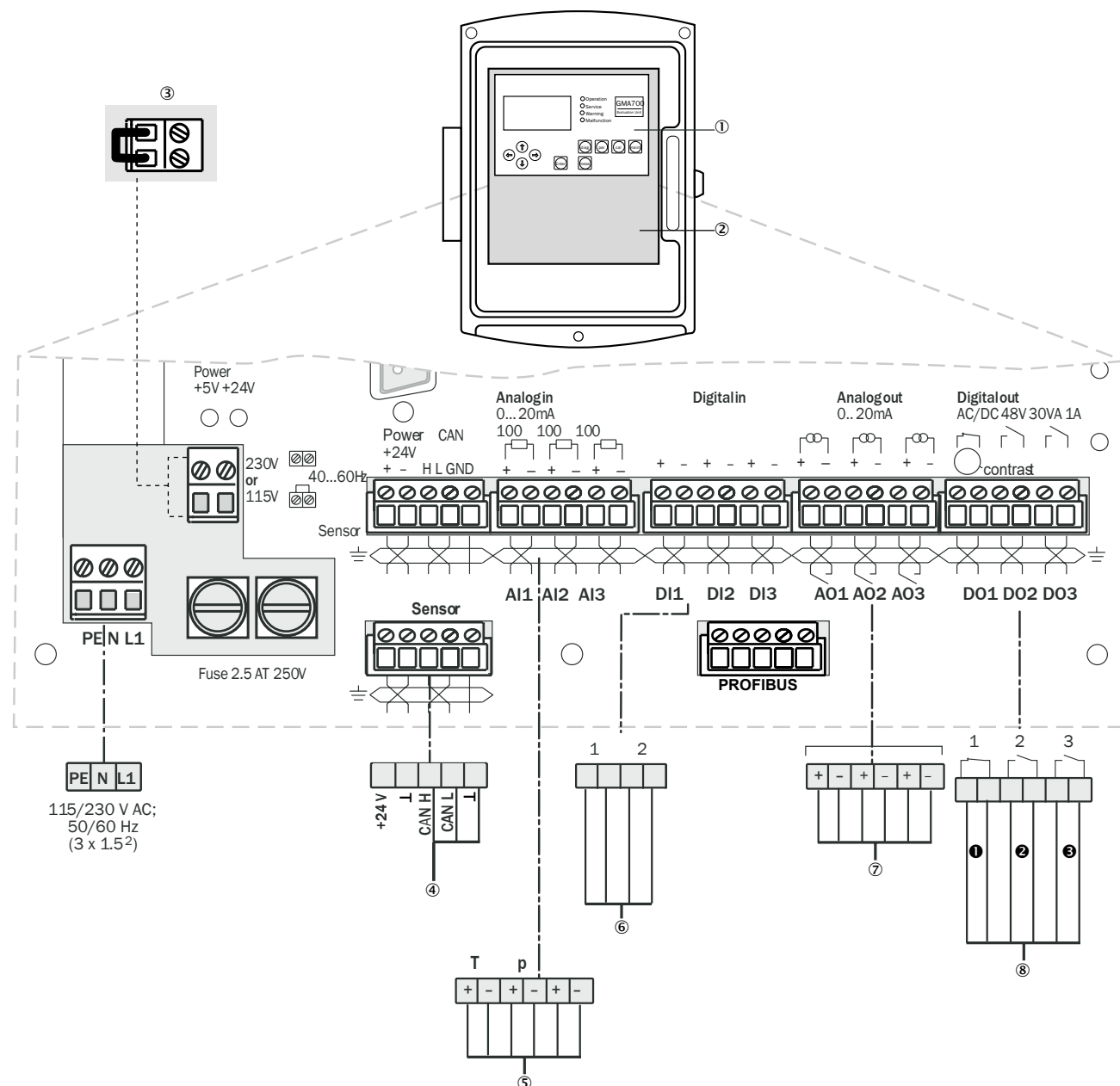


Figure 15: Electrical wiring of control unit AWE

- 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.

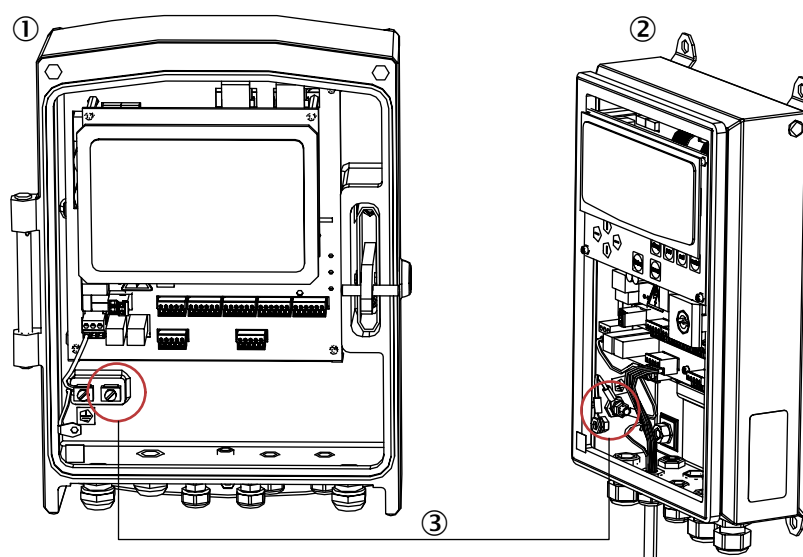
**6.5.3 Connecting the grounding conductor on the control unit**

Figure 16: 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 purge air unit electrically****NOTE**

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

## 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 each of the purge air units on for a short time to check the function and to remove any dust that may have penetrated the purge air hose.

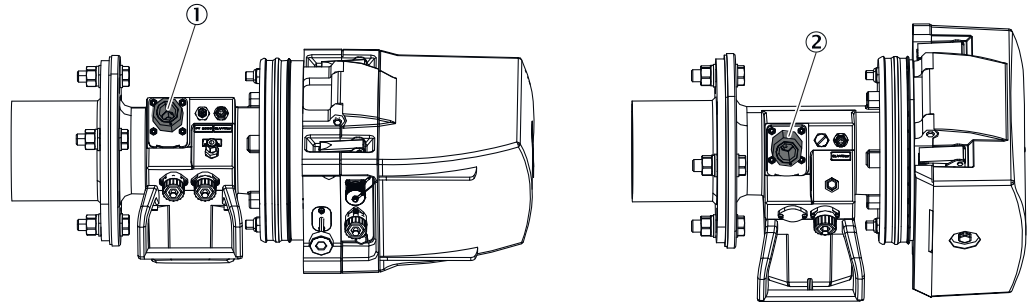


Figure 17: Purge air connections on sender/receiver unit and reflector unit

- ① Sender/receiver unit: Purge air hose connection
- ② Reflector unit: Purge air hose connection

### Steps

1. Connect each of the purge air hoses (from the purge air unit) to the connection of the purge air attachment with a hose clamp.
2. Switch on the purge air supply.



### NOTICE

The purge air supply must not be switched off under any circumstances while the sender/receiver unit and reflector unit are on the sample gas duct.



### NOTICE

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

6.8 Connecting the connection unit (option)

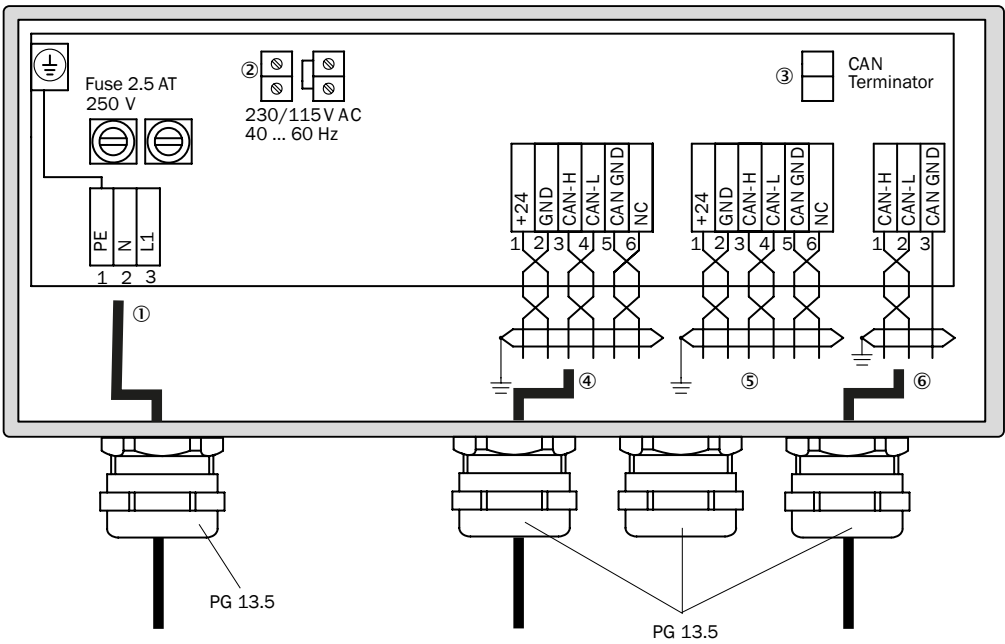


Figure 18: Connection unit electrical connection

- 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**

1. Determine no voltage is applied.
2. Connect bridge (jumper) according to suitable voltage supply (ST2).
3. Lead CAN line for the control unit through the right M screw fitting to the terminal strip.
4. Connect shielding on the M screw fitting on the enclosure.
5. Connect the wires.
6. 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

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##### 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

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##### 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 three main steps:

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

Table 6: Commissioning steps

Step	Procedure	Reference
1	Remove the transport safety devices.	see "Remove the transport safety device", page 36
2	Carrying out coarse optical alignment.	see "Carrying out coarse optical alignment", page 37
3	Fitting the sender/receiver unit and reflector unit on the flange fixtures.	see "Fitting the sender/receiver unit and reflector unit on the flange fixtures", page 40
4	Connect the sender/receiver unit electrically.	see "Connecting the sender/receiver unit", page 41
5	Connect the reflector unit electrically.	see "Connecting the reflector unit", page 41
6	Carry out fine optical adjustment.	see "Fine optical alignment for device versions for NH <sub>3</sub> and HF measurement", page 42 see "Fine optical alignment for device version for HCl measurement", page 43
7	Fit the weather hood (option).	see "Fitting the weather hood (option)", page 44
8	Start measuring operation.	see "Starting measuring operation", page 46

## 7.6 Remove the transport safety device

Removing the transport safety device on the sender/receiver unit and reflector unit

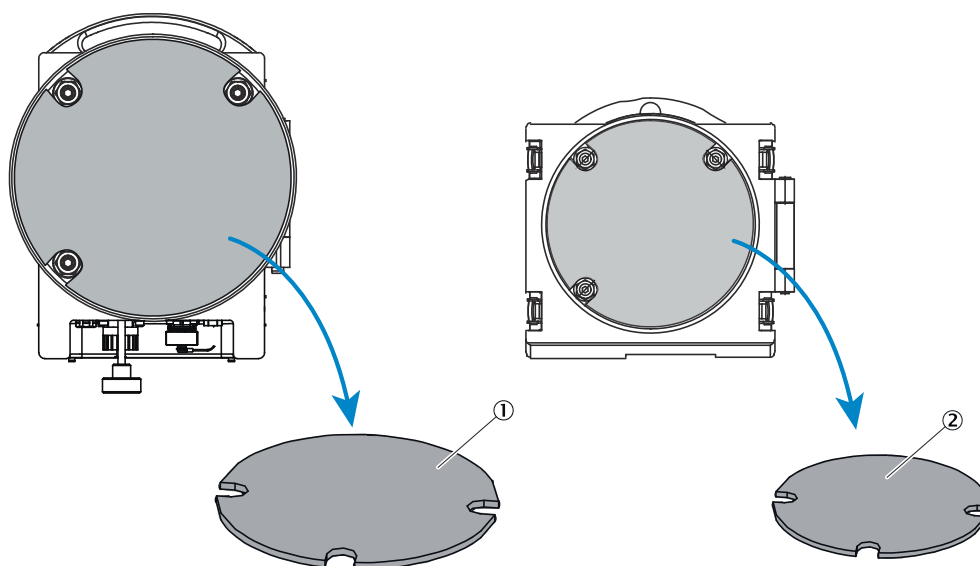


Figure 19: Transport safety devices

- ① Transport safety device, sender/receiver unit
- ② Transport safety device, reflector unit



**Steps**

1. Open the locks and swivel the flange fixture open.
2. Removing the transport safety devices.
3. Check the transport safety device for damage.
4. Store the transport safety device.

## 7.7 Carrying out coarse optical alignment

### 7.7.1 Optical alignment tool

**NOTE**

Additional plate must be mounted and fixed on the sender unit alignment tool .

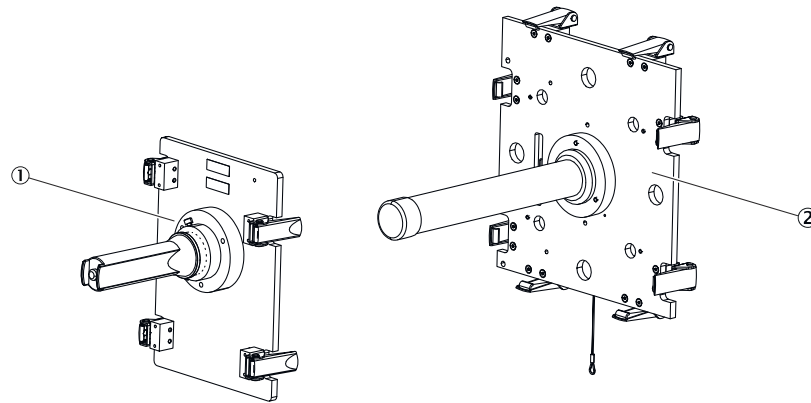


Figure 20: Alignment tool

- ① Alignment tool, sender unit (light source)
- ② Alignment tool, receiver unit (aiming device with visor)

### 7.7.2 Fitting the alignment tool on the sender/receiver unit

See also ["Removing the sender/receiver unit and/or reflector unit", page 56.](#)

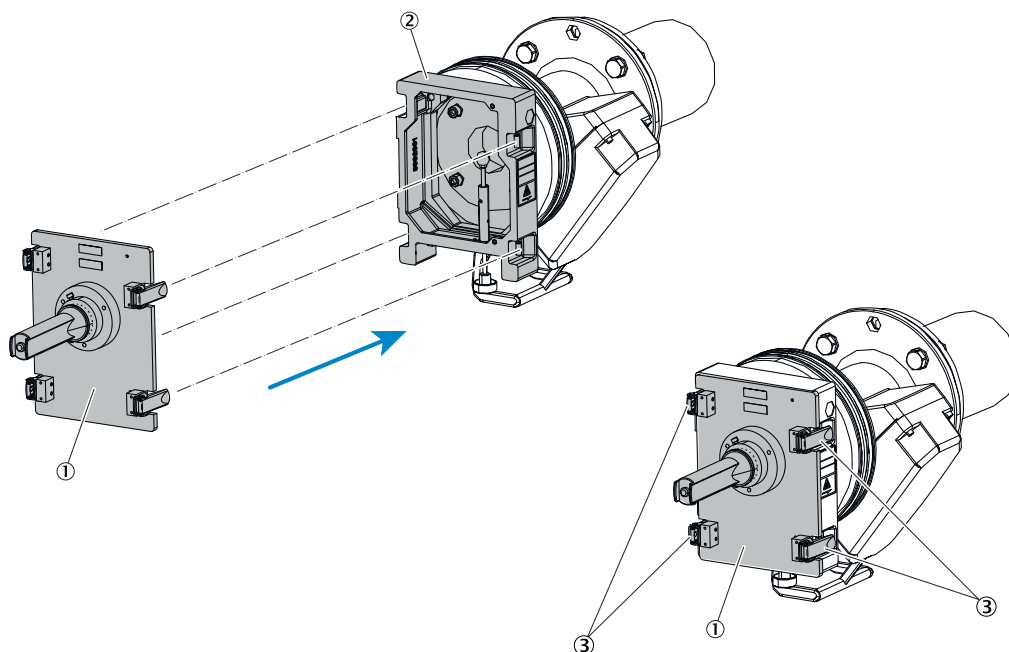


Figure 21: Fitting the alignment tool, sender/receiver unit

- ① Alignment tool, sender/receiver unit
- ② Intermediate enclosure with flange fixture
- ③ Quick-release fasteners

#### Steps

1. Position the alignment tool with the light source on the device flange of the sender/receiver unit and fasten it with the quick-release fasteners.

### 7.7.3 Fitting the alignment tool on the reflector unit

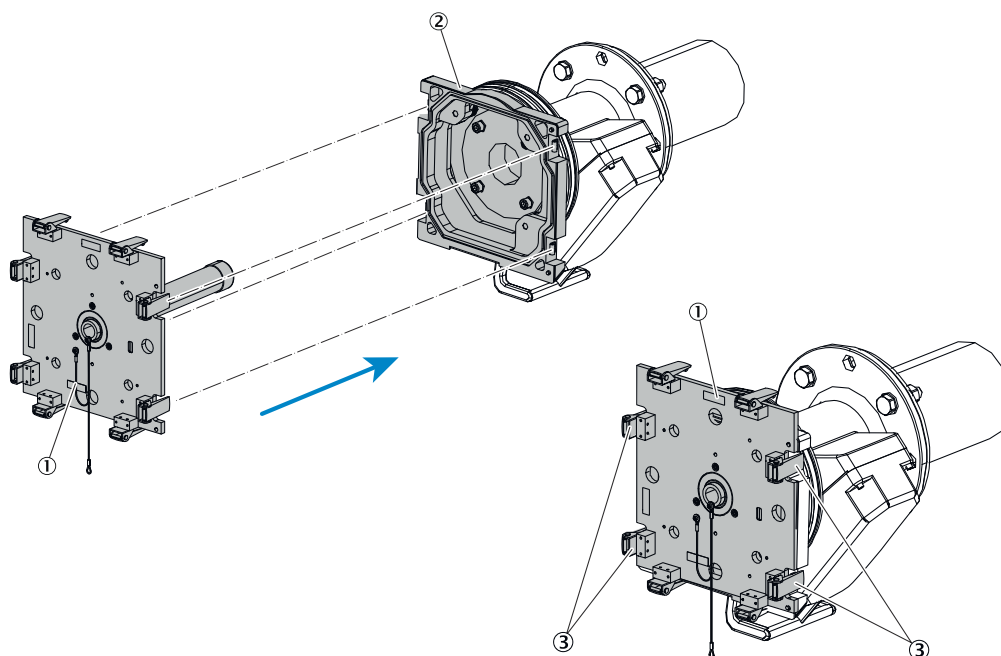


Figure 22: Fitting the alignment tool, reflector unit

- ① Alignment tool, reflector unit
- ② Flange fixture
- ③ Quick-release fasteners

**Steps**

1. Insert the alignment tool telescope into the device flange of the reflector unit. Fasten with the quick-release fasteners.

**7.7.4****Carrying out coarse optical alignment of the reflector unit****NOTE**

The laser beam is set by adjusting the adjustment screws. During adjustment, pressure is applied to the centering discs. It is essential that the gap caused by the centering discs is covered with the rubber sealing tape to prevent disturbances through incident light.

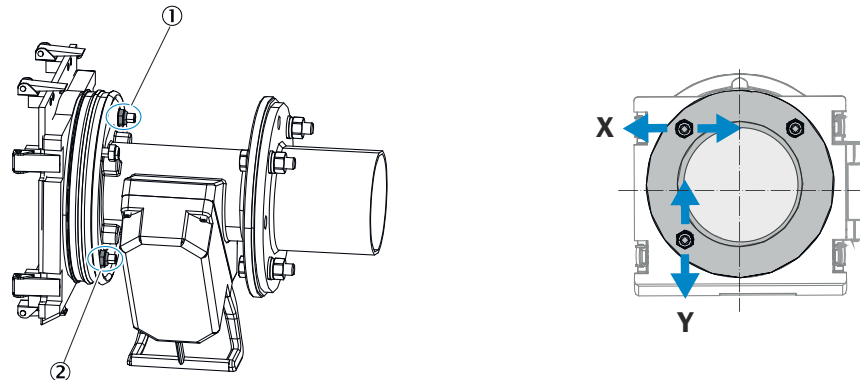


Figure 23: Optical alignment of the reflector unit

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

**Steps**

1. Ensure the gap between the flange fixture and the device flange of the purge air attachment is covered with the rubber sealing tape.
2. Adjust both nuts (opposite each other) for horizontal and vertical adjustment until the light spot in the alignment tool telescope appears in the center of the target.
3. Remove the alignment tool after coarse alignment is complete.

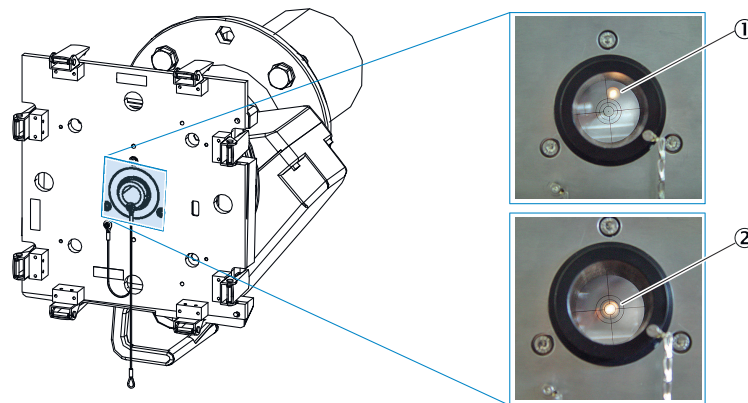


Figure 24: Checking optical alignment, reflector unit

- ① Light spot not correctly aligned
- ② Light spot correctly aligned

**7.7.5****Carrying out coarse optical alignment of the sender/receiver unit****NOTE**

The coarse optical alignment of the sender/receiver unit is carried out in the same way as for the reflector unit.

### 7.7.6 Checking coarse optical alignment

#### Steps

1. Exchange the alignment tool elements on the purge air attachments.
  2. Check the optical alignment for correct adjustment.
  3. Adjust the nuts of the adjustment screws accordingly when the light spot is not shown centred.
- ✓ Change the alignment tool elements until the correct alignment on both sides is achieved.

### 7.8 Fitting the sender/receiver unit and reflector unit on the flange fixtures



#### 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.

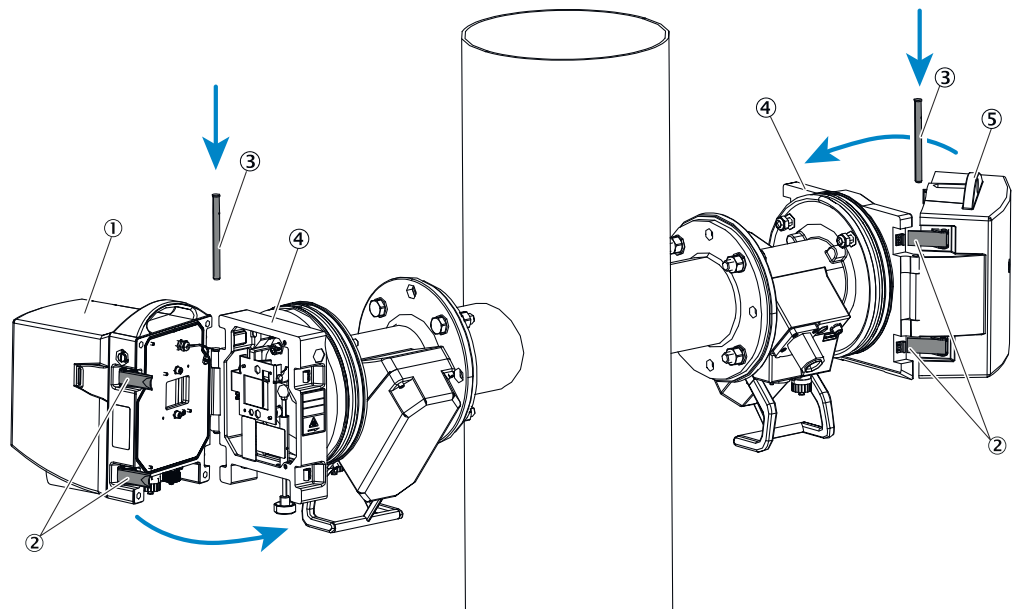


Figure 25: Fitting the sender/receiver unit and reflector unit on the flange fixture

- ① Sender/receiver unit
- ② Quick-release fasteners
- ③ Hinge pin
- ④ Flange fixture
- ⑤ Reflector unit

#### 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.



#### NOTE

Fitting the reflector unit is identical.

## 7.9 Connecting the sender/receiver unit

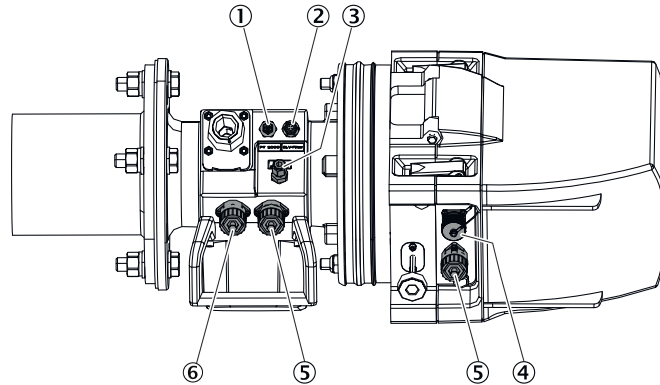


Figure 26: Sender/receiver unit electrical connections

- ① Temperature sensor connection
- ② Purge air unit low-pressure monitor connection
- ③ Pressure sensor connection
- ④ Control unit connection line connection
- ⑤ Sender/receiver unit — purge air attachment connection line connection
- ⑥ Reflector unit connection line connection



### NOTE

Connection overview "[Connection overview](#)", page 28

### Steps

1. Connect the temperature sensor PT1000.
2. Connect the purge air unit low-pressure monitor
3. Connect the pressure sensor hose piece (accessory).
4. Connect the connection line between the sender/receiver unit and the purge air attachment.
5. Connect the connection line to the reflector unit.
6. If necessary, connect the connection line to the connection unit (option).
7. Connect the connection line to the control unit.

## 7.10 Connecting the reflector unit

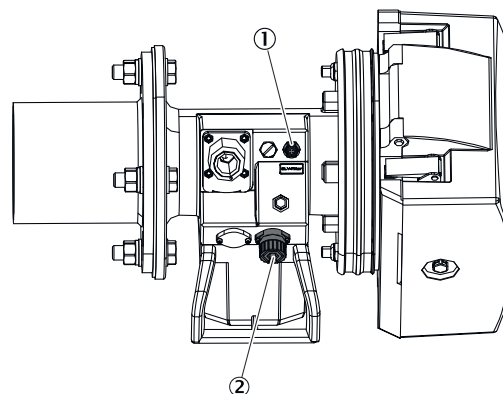


Figure 27: Reflector unit electrical connections

- ① Purge air unit low-pressure monitor connection
- ② Sender/receiver connection line connection

### Steps

1. Connect the purge air unit low-pressure monitor.
2. Connect the connection line between the sender/receiver unit and the purge air attachment.

## 7.11 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

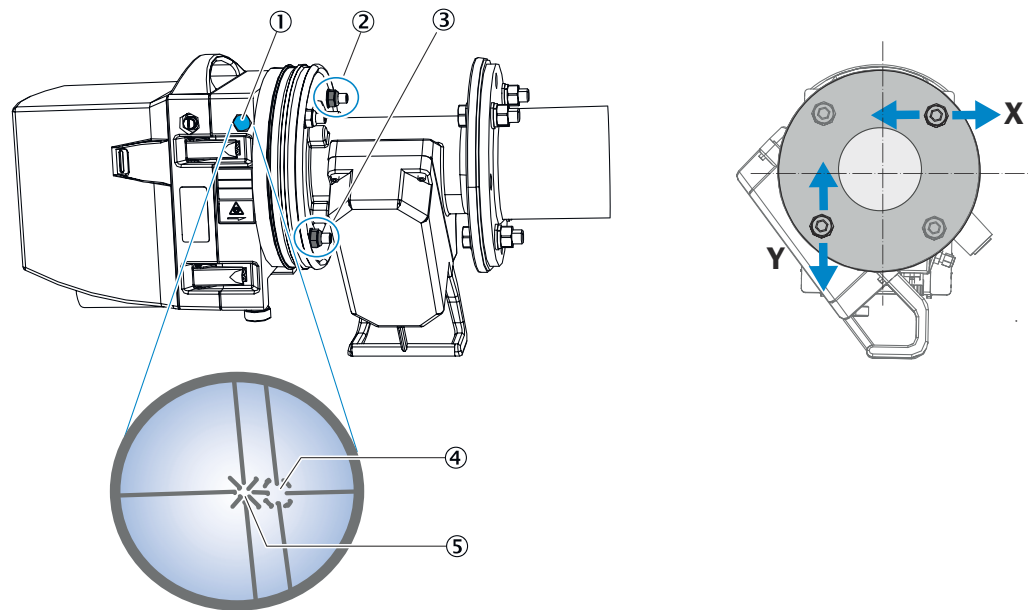
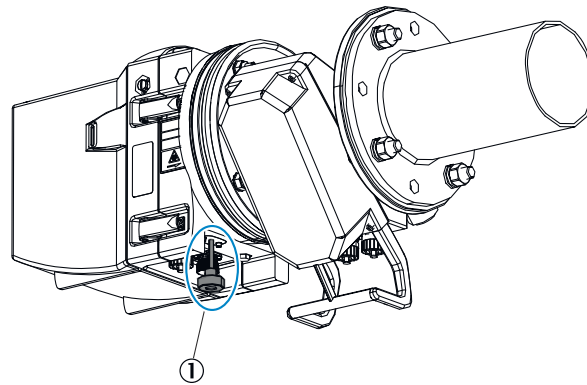


Figure 28: Fine optical alignment on sender/receiver unit (NH<sub>3</sub>, HF)

- 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.

## 7.12 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 42.

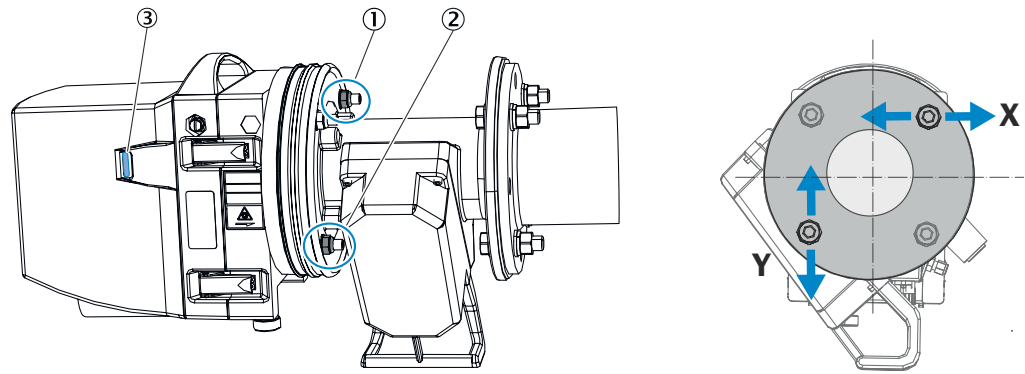


Figure 29: Fine optical alignment on the sender/receiver unit (HCI)

- 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.

## 7.13 Fitting the weather hood (option)

### Weather hood installation preparation

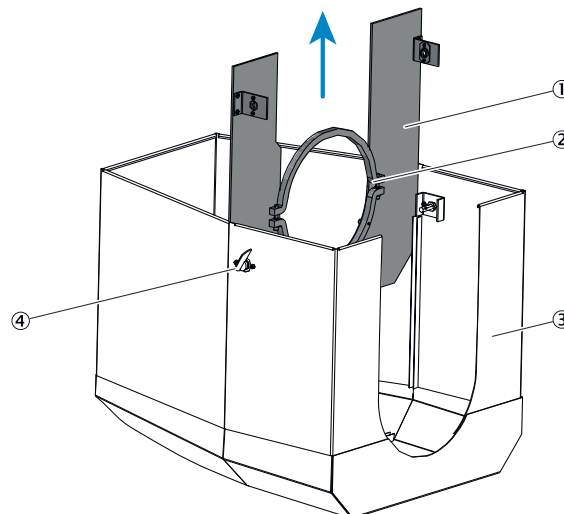


Figure 30: Weather hood installation preparation, sender/receiver unit

- 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.**

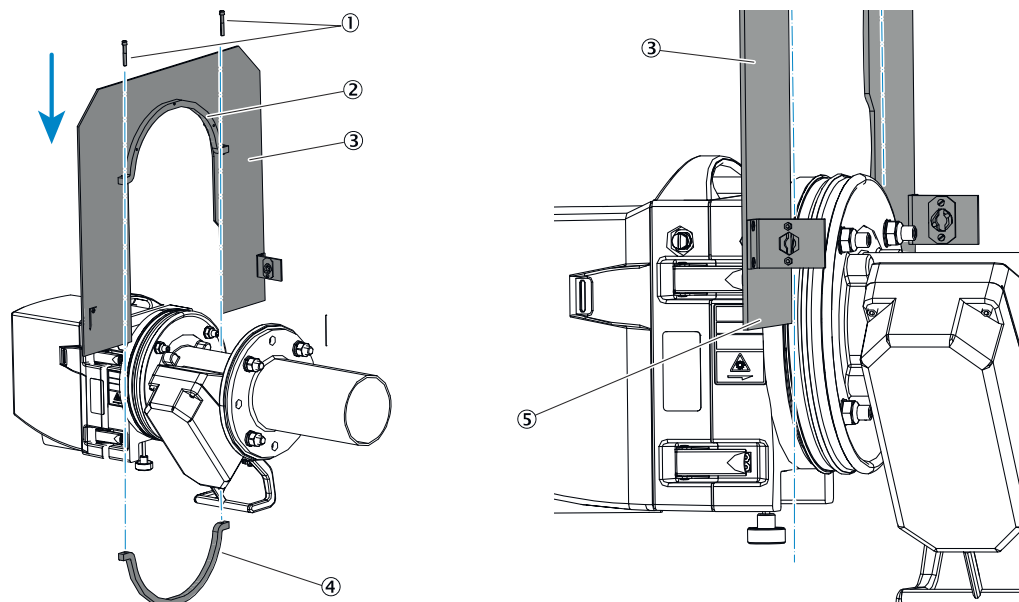
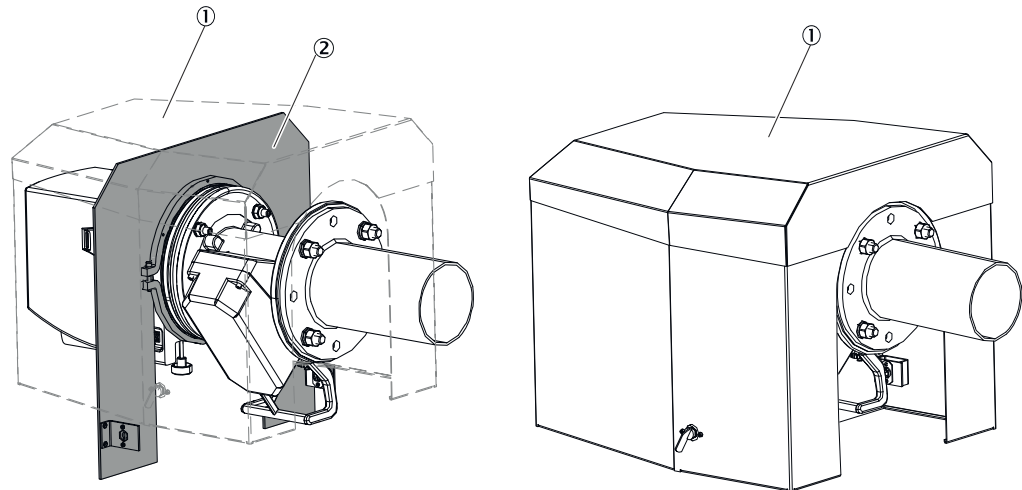


Figure 31: Fitting the mounting plate.

- 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 32: 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.

**7.14 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 48](#).

**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.

### 7.14.1 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

### 7.14.2 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

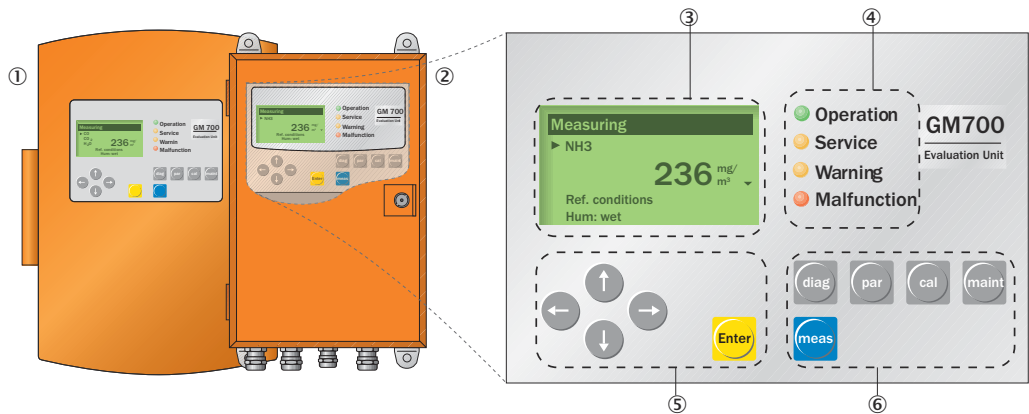






Figure 33: Operating and display elements

- 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 7: 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
	Zero Adjust	Enable	Yes, No
		Repet.	0 ... 24 h (only GPP)
		t (purge)	0 ... 900 s; purge time until the process gas concentration is zero.
		t (delay)	0 ... 1800 s; delay until gas enters again.
		Delta T	0 ... 999 °C; temperature difference at which a zero adjust is carried out.
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 8: Maintenance intervals

Interval <sup>1)</sup>	Maintenance work	Reference
1W	Check measured values in the control area are plausible	see "Menu tree Diagnosis", page 49
1M	Visual inspection of system	see "Visual check", page 55
	Clean window	see "Cleaning optical surfaces", page 56
	Check optical alignment	see "Fine optical alignment for device versions for NH <sub>3</sub> and HF measurement", page 42, see "Fine optical alignment for device version for HCl measurement", page 43
	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.
	Control and track laser working point during measurement	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 and/or reflector unit

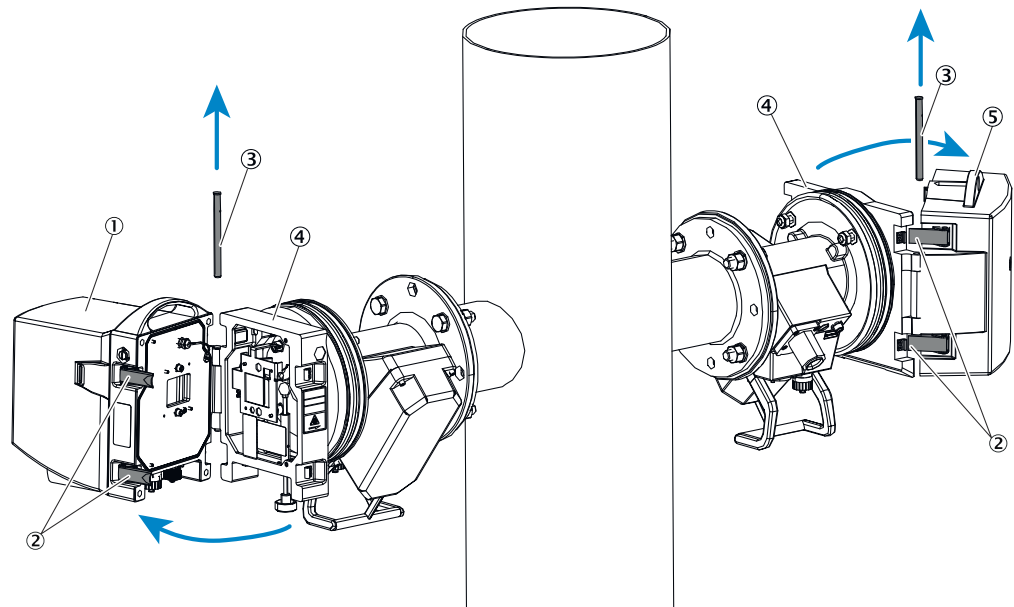


Figure 34: Disassembly of sender/receiver unit and reflector unit

- ① Sender/receiver unit
- ② Quick-release fasteners
- ③ Hinge pin
- ④ Device flange
- ⑤ Reflector unit

### 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.



### NOTE

The disassembly steps for removing the reflector unit are identical.

## 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”.

### Material required

- Optics cleaning cloth
- Demineralized water

Sender/receiver unit and reflector unit

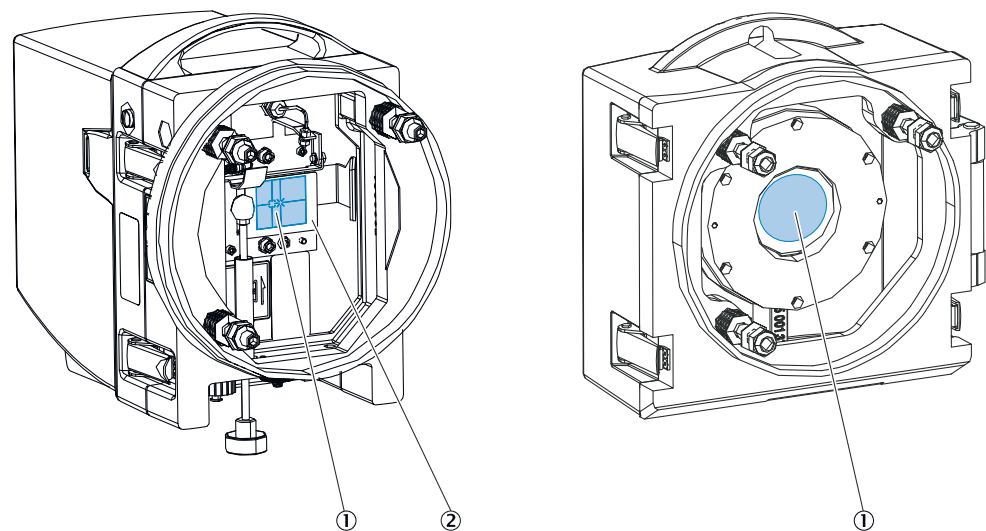


Figure 35: Optical interfaces on sender/receiver unit and reflector unit

- ① Optical surface
- ② Target holder



NOTICE

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

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 interfaces against moisture and dust.

Reflector unit



NOTE

Open the reflector unit as well. Check optical surface. Clean with an optics cloth and demineralized water when necessary.

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 9: 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

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**NOTE**

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

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## 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\_YEKO, a higher laser radiation might occur.

- ▶ Laser class 1 of IEC 60825-1:2014-5: Only use device software 9105060\_YEKO 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.

### 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 10: 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 11: 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. ✓ 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


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

Table 12: Malfunction messages

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 Endress+Hauser Service if necessary.</li> <li>▶ Correct erroneous values.</li> </ul>
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>

Message	Description	Clearance
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 (only for device with closed cell)	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</a>.</li> <li>▶ Check optical alignment and correct if necessary, <a href="#">section 7.11</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>		
Z MEAS: RANGE	Unallowed results during zero gas measurement: <ul style="list-style-type: none"> <li>▶ Zero gas missing.</li> <li>▶ Optical surfaces (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</a>.</li> <li>▶ Check optical alignment and correct if necessary, <a href="#">section 7.11</a>.</li> </ul>
Sensor communication	Communication interference between control unit and GM700 sender/receiver unit	<b>Check connections:</b> <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>

## 10.6 Warning messages

Table 13: Warning messages

Message	Description	Clearance
Feed Test Gas	No detectable sample gas concentration (see Interval).	<ul style="list-style-type: none"> <li>▶ Feed span gas. (GMK)</li> </ul>
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</li> <li>– 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	<ul style="list-style-type: none"> <li>▶ Plan and prepare reference cell replacement.</li> </ul>
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 14: 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



#### 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



#### DANGER

**Hazard through gas escaping when the sender/receiver unit and reflector unit are swiveled out**

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

- Take appropriate safety measures: Only then swivel the sender/receiver unit or reflector unit out.



#### 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.

#### Electricity

Observe all safety information in Sections Commissioning and Electrical installation.

#### Device damage



#### 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

Material required	Required for
Flange cover	Covering the flange
Personal protective equipment	Protection when working on the stack or hot or aggressive sample gases

### Removing the measuring device

#### Steps

1. Loosen and remove all connecting lines of the device components.
2. Remove the sender/receiver unit and/or reflector unit [see "Removing the sender/receiver unit and/or reflector unit", page 56](#).
3. When necessary, unscrew and remove device flanges.
4. When necessary, unscrew and remove purge air attachments on the flanges.
5. Switch purge air supply off and remove purge air hoses on device flanges.
6. Close the flanges on the gas duct with a cover.

#### Information on storage

[see "Storage", page 15](#).

## 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.

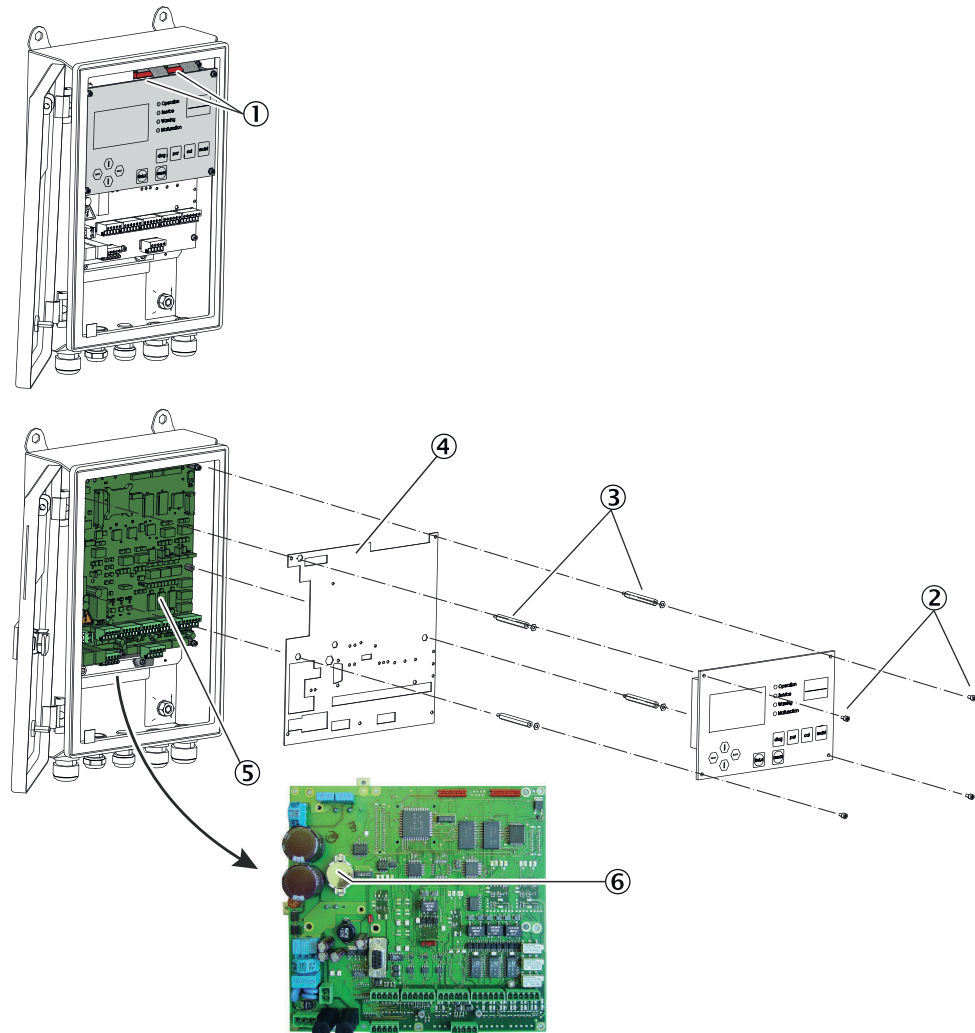


Figure 36: Removing the control unit

#### 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 15: 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 distance</b>	0.25 m to max. 6 m ("Flange - flange distance" minus 2 × flange length)
<b>Measuring ranges</b>	<p><b>NH<sub>3</sub> to 20 Vol.-% H<sub>2</sub>O:</b></p> <ul style="list-style-type: none"> <li>0 ... 25 ppm / 0 ... 4,000 ppm</li> </ul> <p><b>NH<sub>3</sub> high moisture to 40 Vol.-% H<sub>2</sub>O:</b></p> <ul style="list-style-type: none"> <li>0 ... 25 ppm / 0 ... 100 ppm</li> </ul> <p><b>HF:</b></p> <ul style="list-style-type: none"> <li>0 ... 5 ppm / 0 ... 2,000 ppm</li> </ul> <p><b>HCl:</b></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><b>HCl / H<sub>2</sub>O:</b></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><b>NH<sub>3</sub> / H<sub>2</sub>O (bis 20 Vol.-%):</b></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><b>NH<sub>3</sub> / H<sub>2</sub>O high moisture (to 40 Vol.-%):</b></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>Certified measuring ranges</b>	<p><b>HF:</b></p> <ul style="list-style-type: none"> <li>0 ... 5 mg/m<sup>3</sup> / 0 ... 25 mg/m<sup>3</sup></li> </ul> <p>Cross-Duct version is performance-tested.</p>
<b>Response time (t<sub>90</sub>)</b>	<p><b>Standard</b></p> <ul style="list-style-type: none"> <li>1 ... 360 s</li> </ul> <p>Adjustable, preset to 4 s</p> <p><b>HF measurement</b></p> <ul style="list-style-type: none"> <li>1 ... 180 s</li> </ul> <p>Adjustable, preset to 4 s, performance-tested acc. to EN 15267</p>
<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



Ambient humidity	≤ 95 % relative humidity, non-condensing
Conformities	<b>Only for HF</b> <ul style="list-style-type: none"> <li>• Approved for plants requiring approval</li> <li>• 2001/80/EG (13. BImSchV)</li> <li>• 2000/76/EG (17. BImSchV)</li> <li>• 27.BImSchV</li> <li>• 30.BImSchV</li> <li>• TA Luft</li> <li>• EN 15267</li> <li>• EN 14181</li> </ul>
Electrical safety	CE
Overvoltage category	II
Degree of contamination	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 16: 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 Reflector unit

Table 17: Technical data, reflector unit

Description	Reflector unit with hollow triple reflector
Degree of protection	IP65
Process temperature	≤ +250 °C As from 200 °C only with heated purge air
Process pressure	–60 hPa ... +30 hPa Depending on purge air supply
Dust load	≤ 3 g/m <sup>3</sup> Relative to 1 m measuring distance, depending on application
Dimensions	291 mm × 280 mm × 161 mm
Weight	8.5 kg

## 12.4 Control unit, AWE, sheet steel enclosure

Table 18: Technical data, control unit, AWE, sheet steel version

Description	The control unit serves as user interface, for data processing and output as well as control and monitoring functions.
Degree of protection	IP65
Analog outputs	<b>3 outputs:</b> <ul style="list-style-type: none"> <li>• 0/4 ... 20 mA, 500 Ω</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> </ul> For gas temperature and gas pressure
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	Sheet steel enclosure
Dimensions (W × H × D)	210 mm × 381.4 mm × 108 mm
Weight	4.7 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>

## 12.5 Control unit, AWE, cast metal enclosure

Table 19: Technical data, control unit, AWE, cast metal version

Description	The control unit serves as user interface, for data processing and output as well as control and monitoring functions.
Degree of protection	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> </ul> For gas temperature and gas pressure
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

<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>	Cast metal enclosure
<b>Dimensions (W × H × D)</b>	289 mm × 370 mm × 138 mm
<b>Weight</b>	8.6 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 Connection unit

Table 20: Technical data, connection unit

<b>Description</b>	To extend the CAN bus connection with a line provided by the customer
<b>Degree of protection</b>	IP66
<b>Dimensions (W × H × D)</b>	175 mm × 110.5 mm × 175 mm
<b>Weight</b>	3 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> </ul>
<b>Built-in components</b>	Integrated 24 V power supply unit for supply of the sender/receiver unit

## 12.7 Purge air attachment

Table 21: Technical data, purge air attachment

<b>Description</b>	Flange fixture with connections for purge air hose and temperature and pressure sensors
<b>Dimensions (W × H × D)</b>	309 mm × 364 mm × 242 mm Details, see Dimension drawings
<b>Weight</b>	9.6 kg
<b>Auxiliary gas connections</b>	Purge air: Hose nozzle, 40 mm
<b>Electrical connections</b>	<p><b>Sender/receiver unit:</b></p> <ul style="list-style-type: none"> <li>SLV filter (low-pressure monitor, purge air unit)</li> <li>Temperature sensor PT1000</li> <li>Pressure sensor</li> </ul> <p><b>Reflector unit:</b></p> <ul style="list-style-type: none"> <li>SLV filter (low-pressure monitor, purge air unit)</li> </ul>
<b>Built-in components</b>	<p><b>Sender/receiver unit:</b></p> <ul style="list-style-type: none"> <li>Flow monitor for purge air monitoring</li> <li>Pressure sensor</li> </ul> <p><b>Reflector unit:</b></p> <ul style="list-style-type: none"> <li>Flow monitor for purge air monitoring</li> </ul>

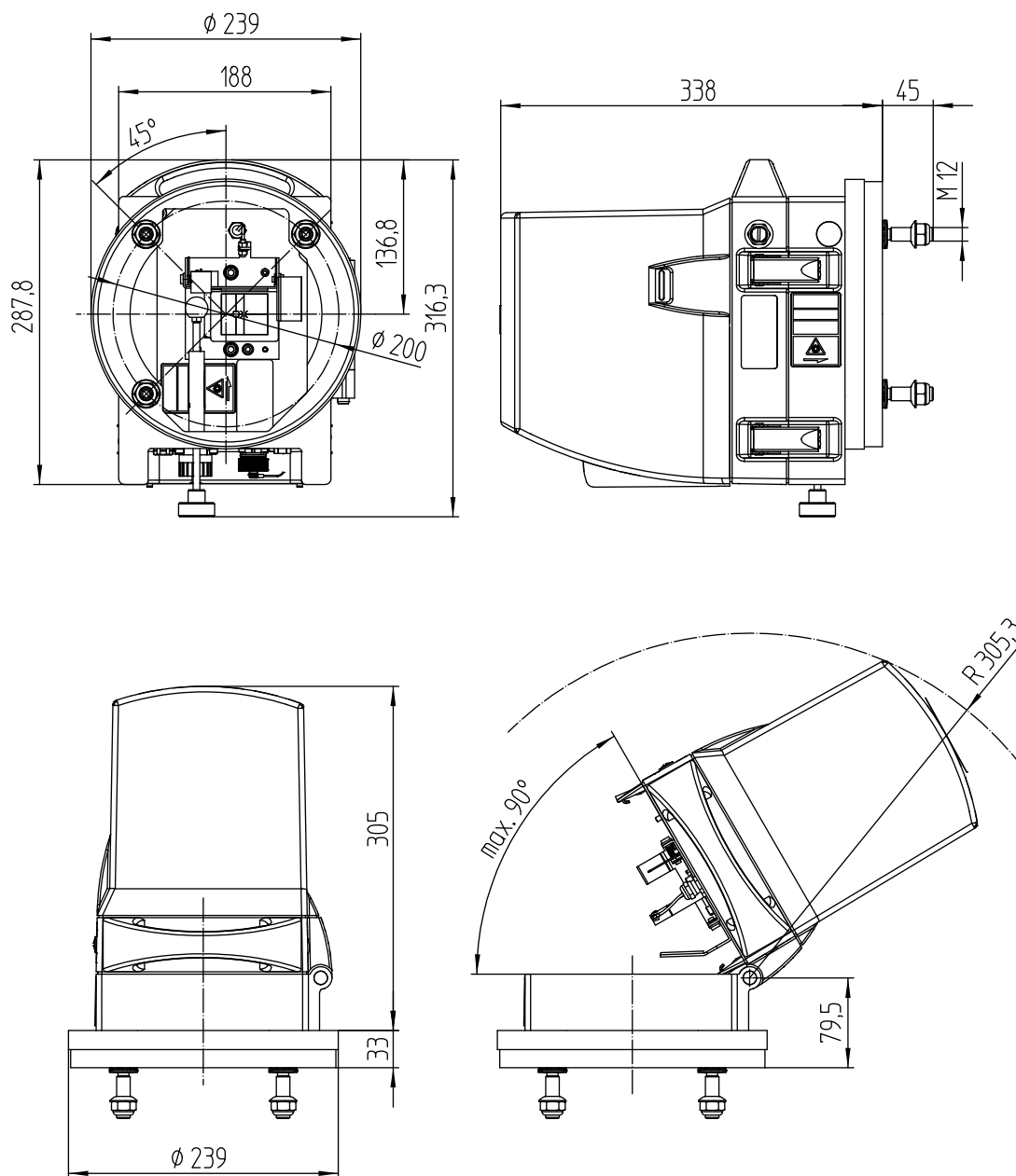
**12.8 Dimension drawing, sender/receiver unit**

Figure 37: GM700 sender/receiver unit (dimensions in mm)

## 12.9 Dimension drawing, reflector unit

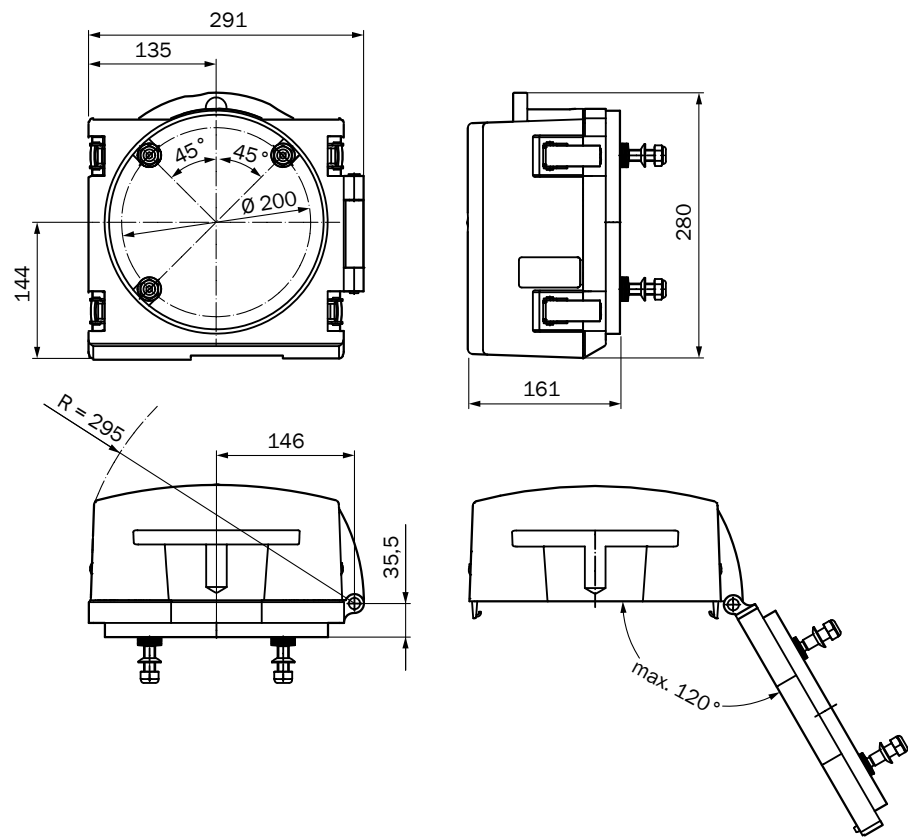


Figure 38: Reflector unit (dimensions in mm)

## 12.10 Dimension drawing, control units

Control unit AWE (sheet steel enclosure version)

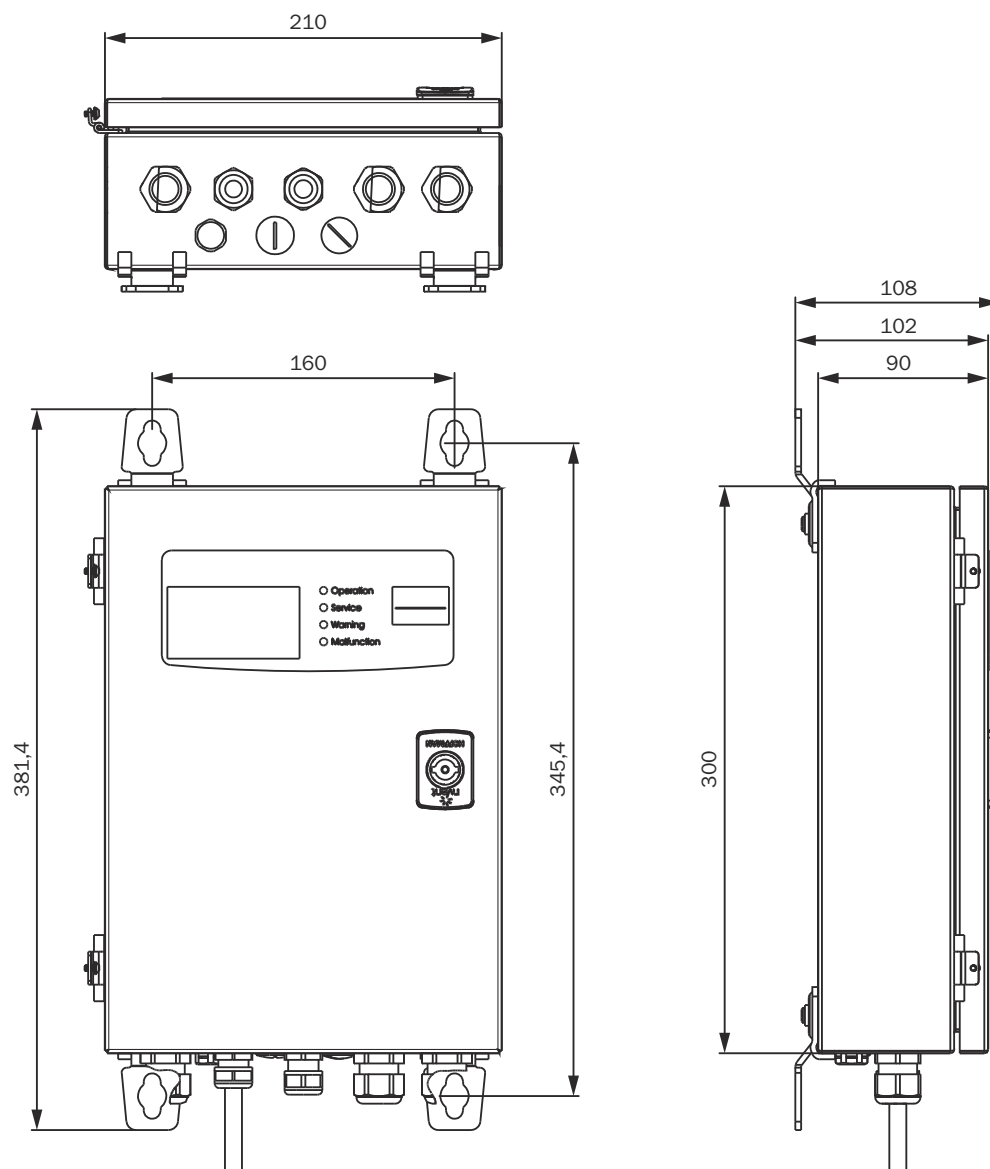


Figure 39: Control unit AWE (sheet steel enclosure version), dimensions in mm

Control unit AWE (cast metal enclosure version)

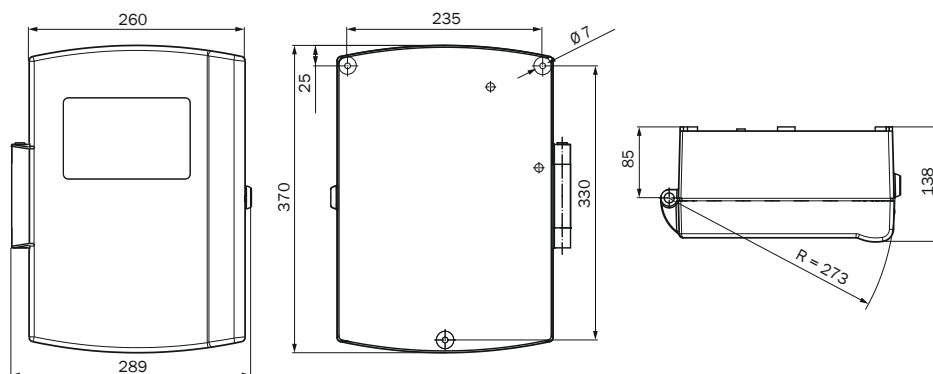


Figure 40: Fitting the control unit AWE (sheet steel enclosure version), dimensions in mm

### 12.11 Dimension drawing, flange with tube, DN125

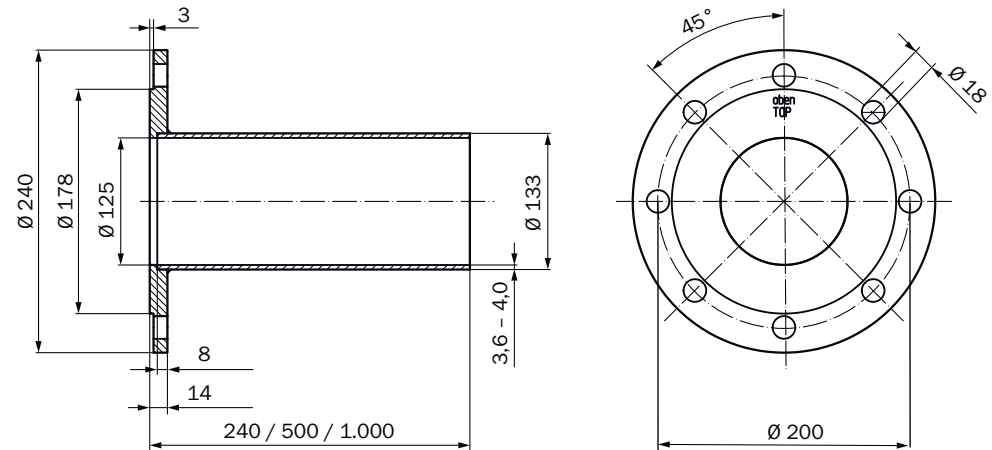


Figure 41: Flange with tube, DN125 (dimensions in mm)

### 12.12 Dimension drawing, purge air attachment

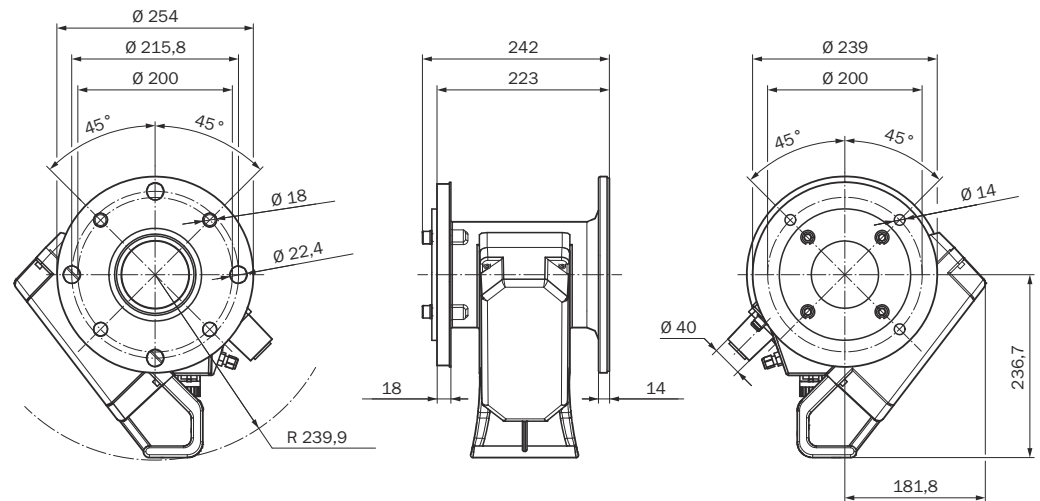


Figure 42: Purge air attachment (dimensions in mm)

### 12.13 Dimension drawing, connection unit

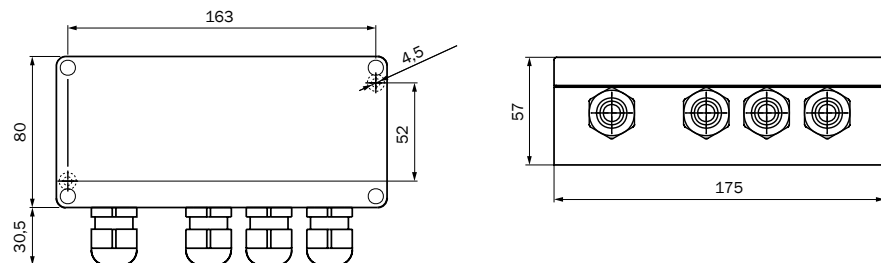


Figure 43: Dimensions, connection unit (dimensions in mm)

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

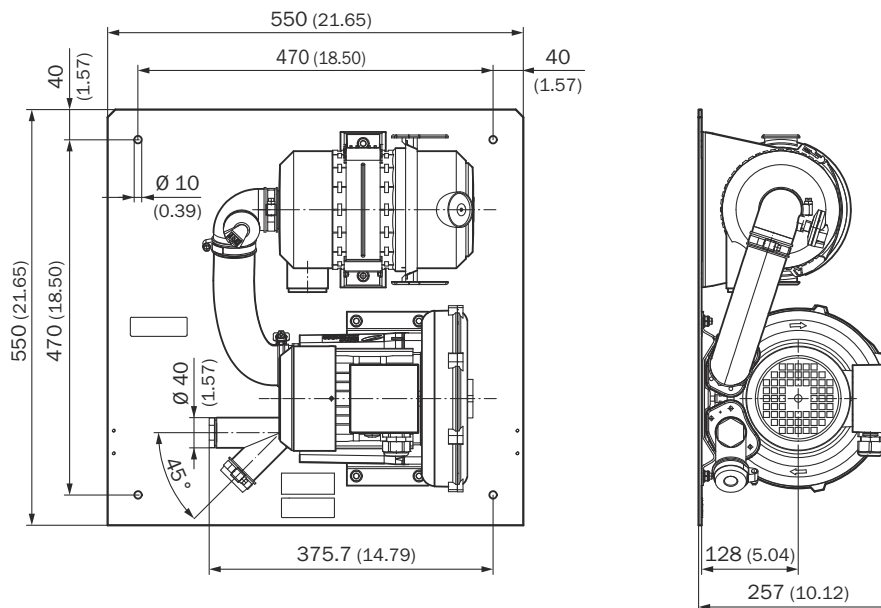


Figure 44: Dimension drawing SLV4-2, type 2BH1300 (dimensions in mm)

## 12.15 Dimension drawing, weather hoods

Weatherproof cover for sender/receiver unit

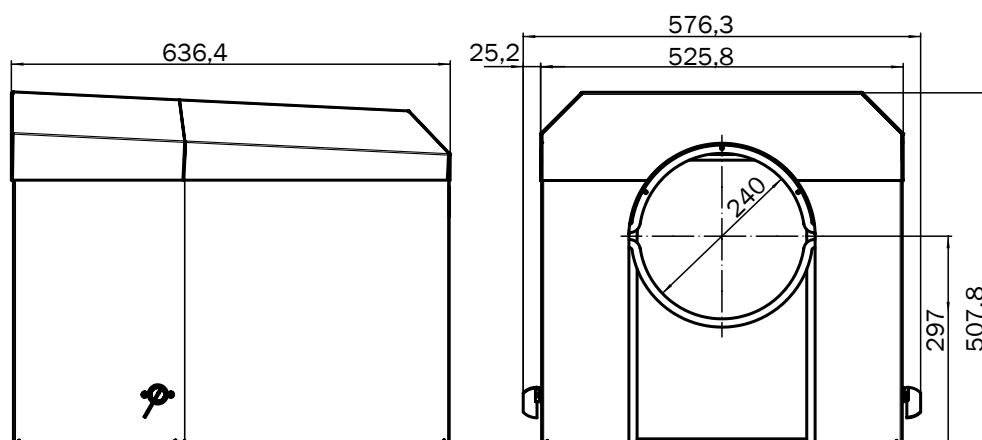


Figure 45: Weather hood for sender/receiver unit (dimensions in mm)



Weather hood for reflector unit

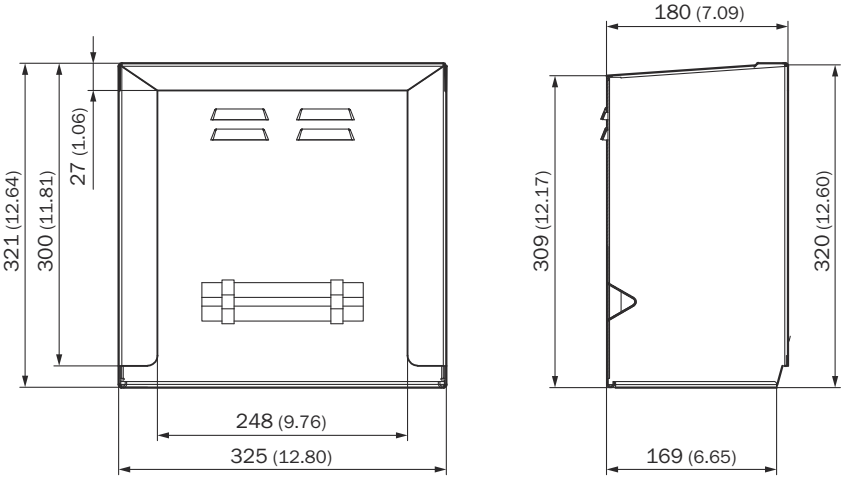


Figure 46: Weather hood for reflector unit (dimensions in mm)

## 13 Annex

### 13.1 Possible ambient temperatures

#### 13.1.1 Ambient temperature ranges with reference cell

Table 22: 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 23: 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 24: 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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