

# Operating Instructions

## GM35

Gas Analyzer,  
Cross-Duct Version



**Described product**

GM35

Cross-Duct Version

GM35-1, GM35-2, GM35-3, GM35-4, GM35-5, GM35-6, GM35-7

**Manufacturer**

Endress+Hauser SICK GmbH+Co. KG

Bergener Ring 27

01458 Ottendorf-Okrilla

Germany

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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






#### ADVICE




- 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 electrical voltage
	Hazard by toxic substances

Symbol	Significance
	Hazard through acidic substances
	Hazard through pressure/temperature
	Hazard for environment and organisms

### 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

**IMPORTANT**

**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.

**CAUTION**

**Risk of injury through incorrect lifting and carrying the device**

Injuries can occur due to the weight and projecting enclosure parts when the equipment tips over or drops.

- ▶ Consider the device weight before lifting.
- ▶ Observe the regulations for protective clothing (e.g., safety shoes, non-slip gloves).
- ▶ Grip underneath the equipment when possible to carry it safely.
- ▶ Do not use projecting parts on the device to carry the device.
- ▶ Call in further personnel for assistance as required.
- ▶ Use a hoist or transport equipment as an option.
- ▶ Pay attention to the transport safety device.
- ▶ Clear obstacles that could cause falls and collisions out of the way.

## 2.2 Warning information on the device

### Sender/receiver unit

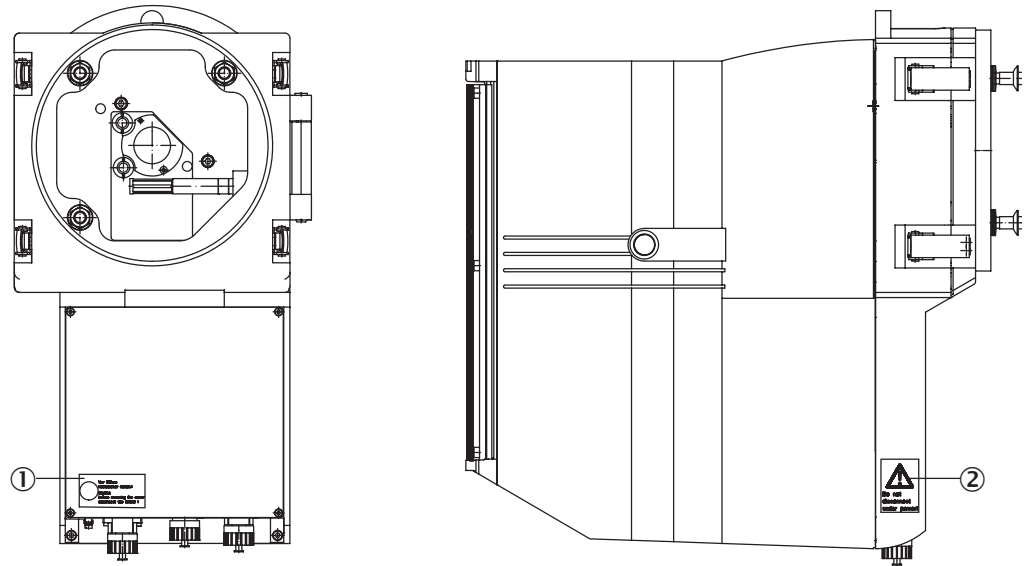


Image 1: Sender/receiver unit from the front and right side

- ① Warning sign: Disconnect the power plug before opening the device.
- ② Do not disconnect under voltage.

## 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	GM35
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..
- The device is an in-situ measuring device which means measuring is done directly in the gas carrying duct.
- Measuring components: CO<sub>2</sub>, H<sub>2</sub>O, CO
- Measuring principle:
  - Gas filter correlation
  - Interference filter correlation

### 3.3 Device variants

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

Variant	Measured components
GM35-1	CO
GM35-2	CO, H <sub>2</sub> O
GM35-3	CO, H <sub>2</sub> O, CO <sub>2</sub>
GM35-4	CO, CO <sub>2</sub>
GM35-5	H <sub>2</sub> O, CO <sub>2</sub>
GM35-6	H <sub>2</sub> O
GM35-7	CO <sub>2</sub>

### 3.4 Layout and function

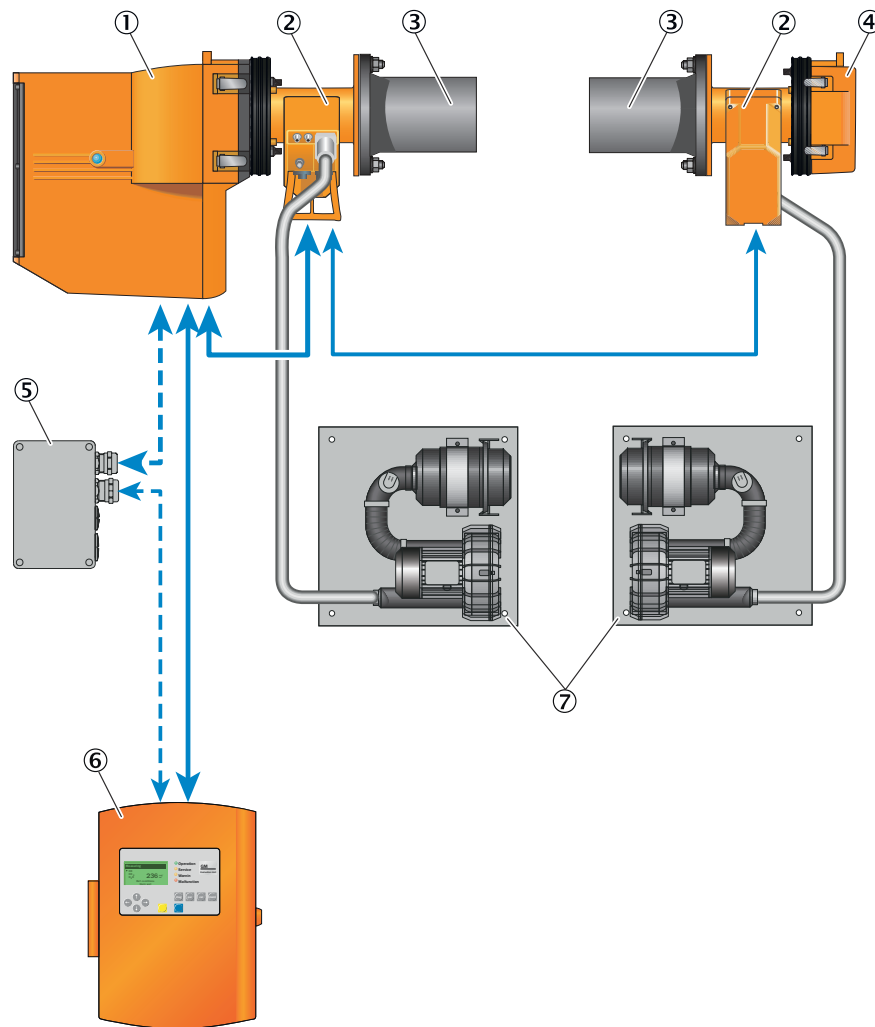


Image 2: Layout, GM35, cross-duct version

- ↔ 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.



#### ADVICE

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



#### ADVICE

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

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.

## 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.

**IMPORTANT****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.

**IMPORTANT****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)

**IMPORTANT**

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



#### IMPORTANT

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.



#### IMPORTANT

##### 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.

**ADVICE**

- Flange with tube dimensions: [See "Dimension drawing, flange with tube, DN125", Page 72](#)

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

- Determine flange - flange distance and measuring distance.

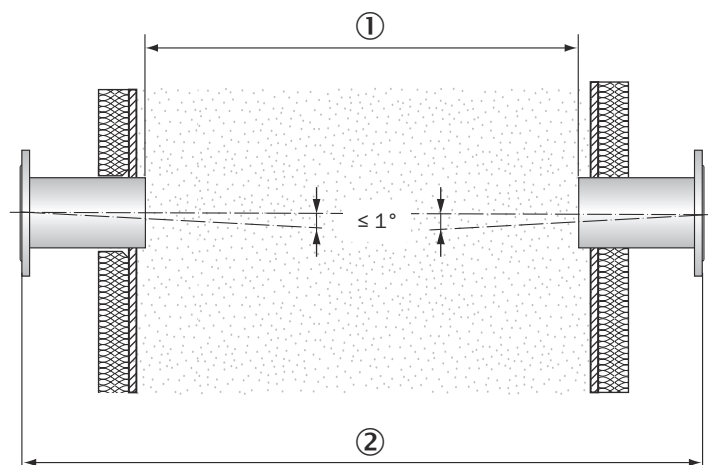


Image 3: Flanges with tube — determining the measuring distance

- ① Measuring distance
- ② Flange - flange distance

**ADVICE**

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

## Installing the flange with tube

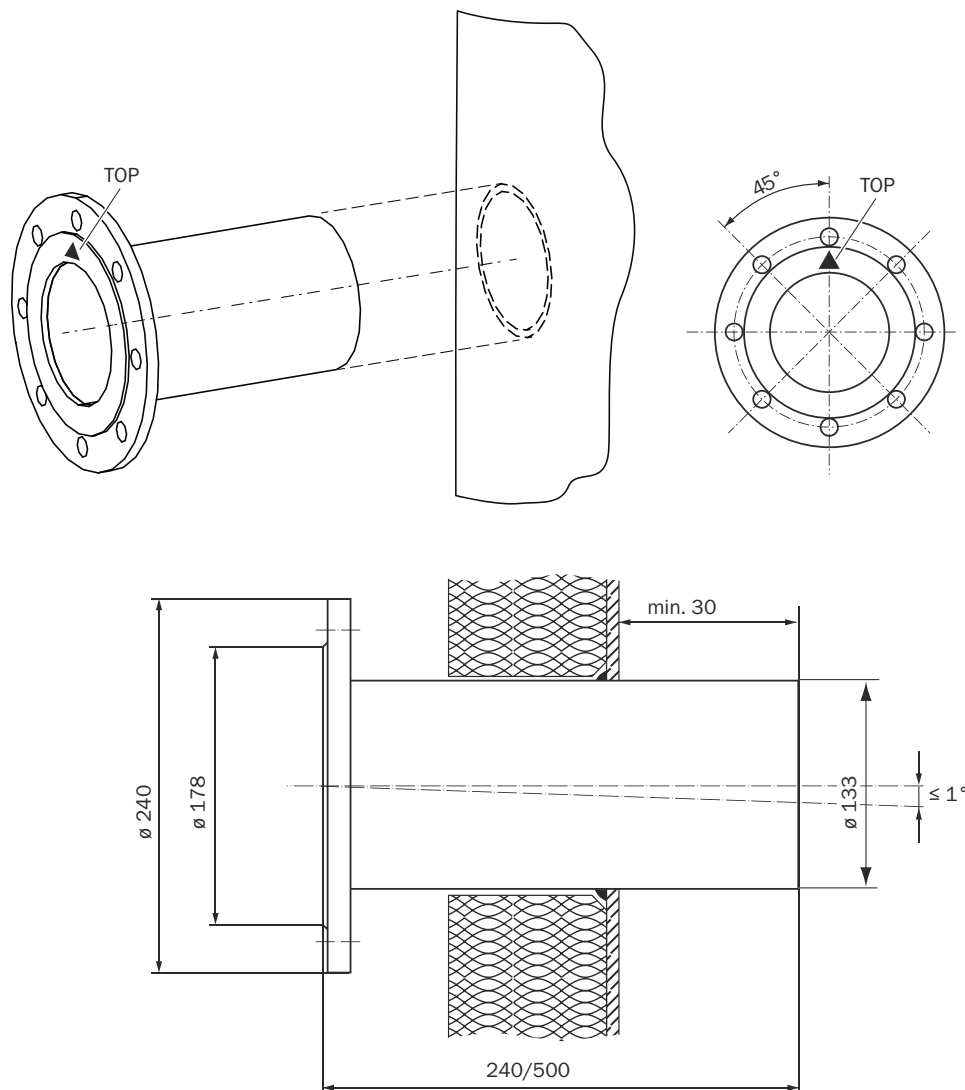


Image 4: Flange with tube incl. orientation "TOP"

## 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.



## ADVICE

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

### Optical alignment of the flanges with tube

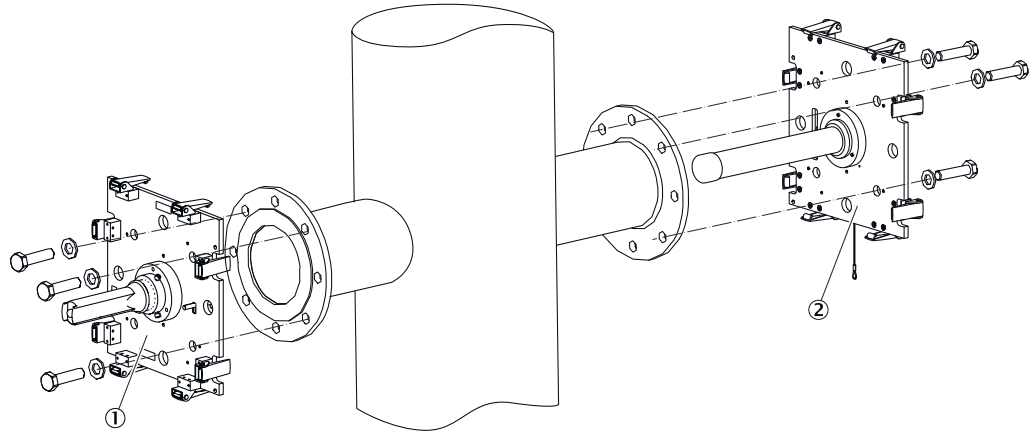


Image 5: Fitting the alignment tool

- 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.

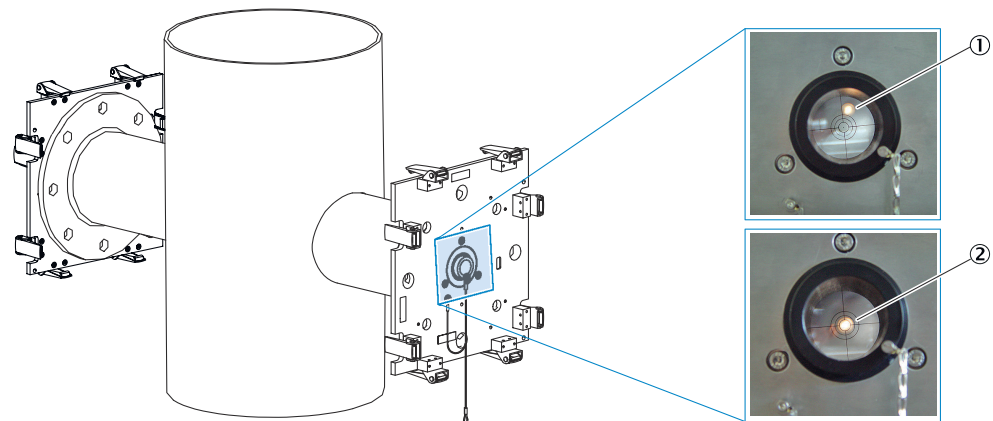


Image 6: Checking the alignment

- 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



#### ADVICE

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

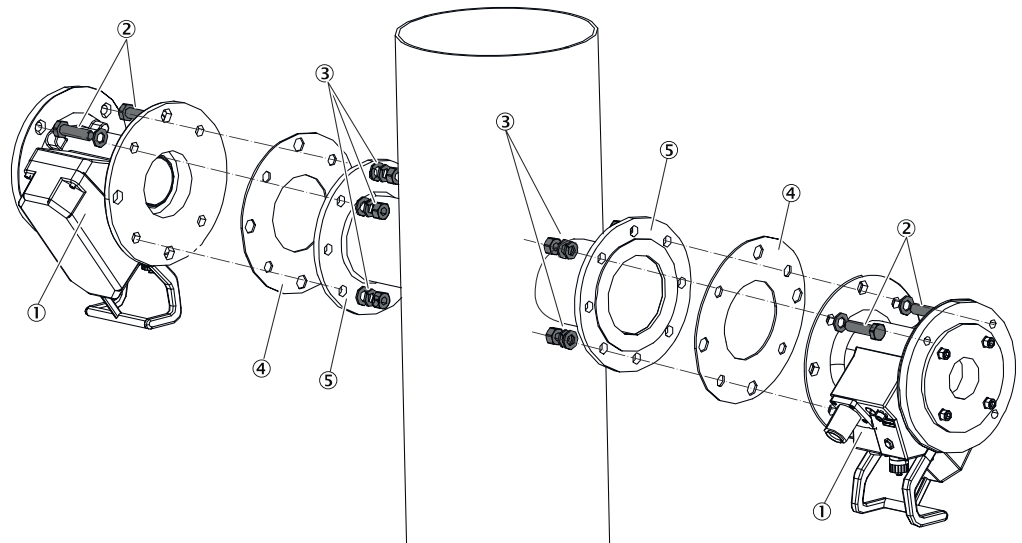


Image 7: Fitting the purge air attachments on the flanges with tube

- 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



#### ADVICE

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

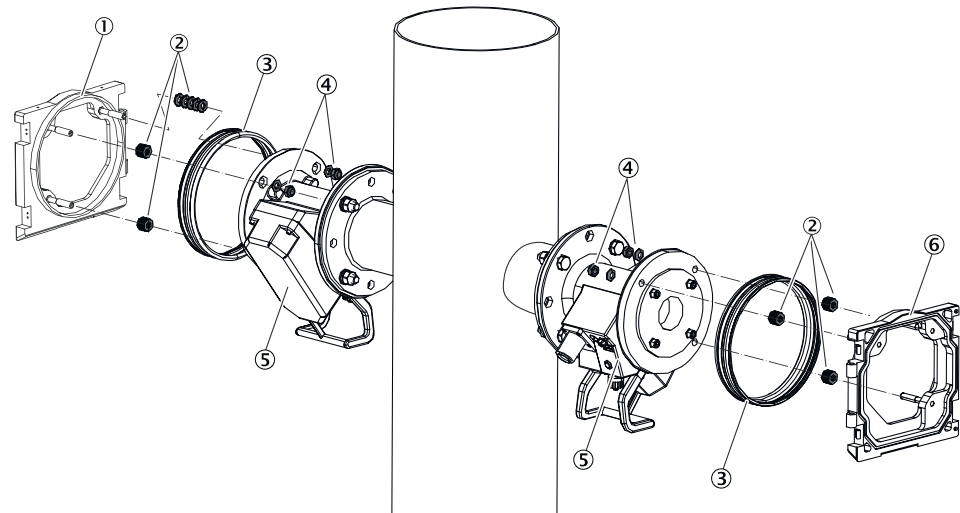


Image 8: Fitting the flange fixtures

- 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

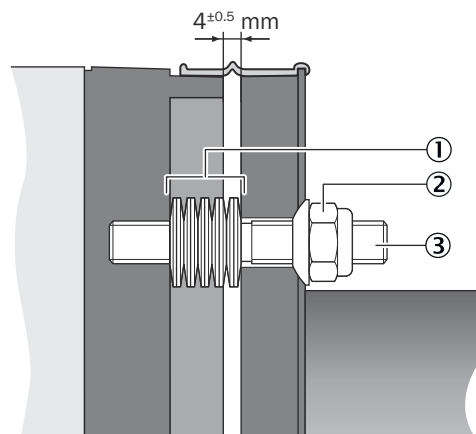


Image 9: Detail view, alignment of cup springs

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



#### IMPORTANT

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.

**IMPORTANT**

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)

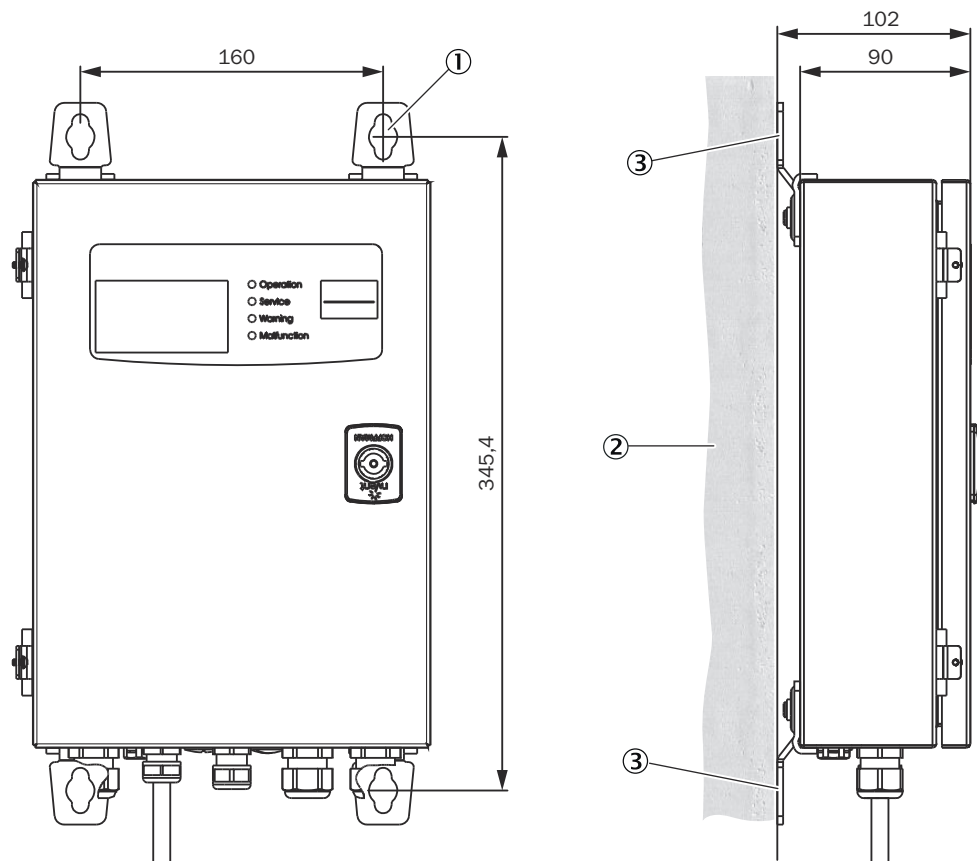


Image 10: Fitting the control unit AWE, sheet steel enclosure (dimensions in mm)

- 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.

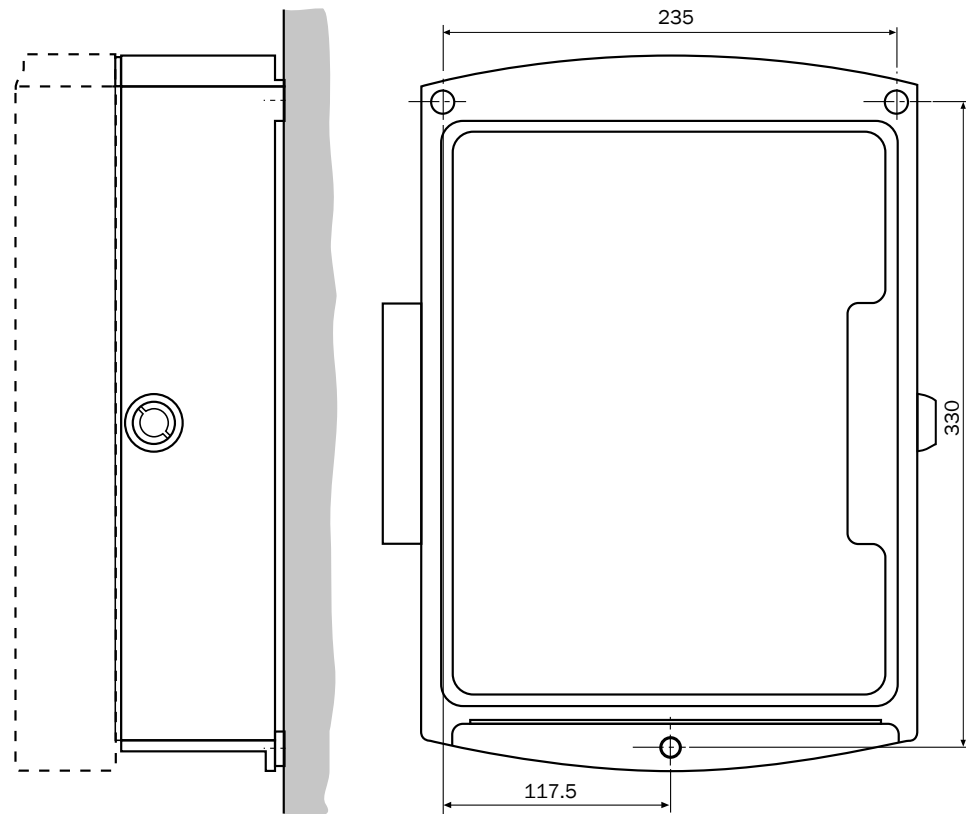
**Control unit AWE (cast metal enclosure version)**

Image 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 – 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

**ADVICE**

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

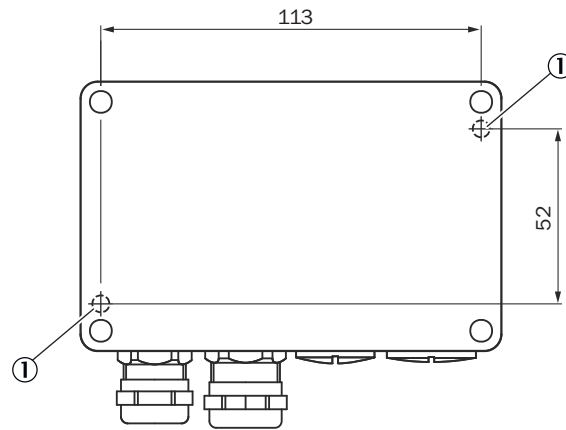


Image 12: Fitting the connection unit (dimensions in mm)

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



#### ADVICE

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 65](#)) 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.

**IMPORTANT****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.

**IMPORTANT****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.

**IMPORTANT****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 33
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

## 6.4 Connection overview

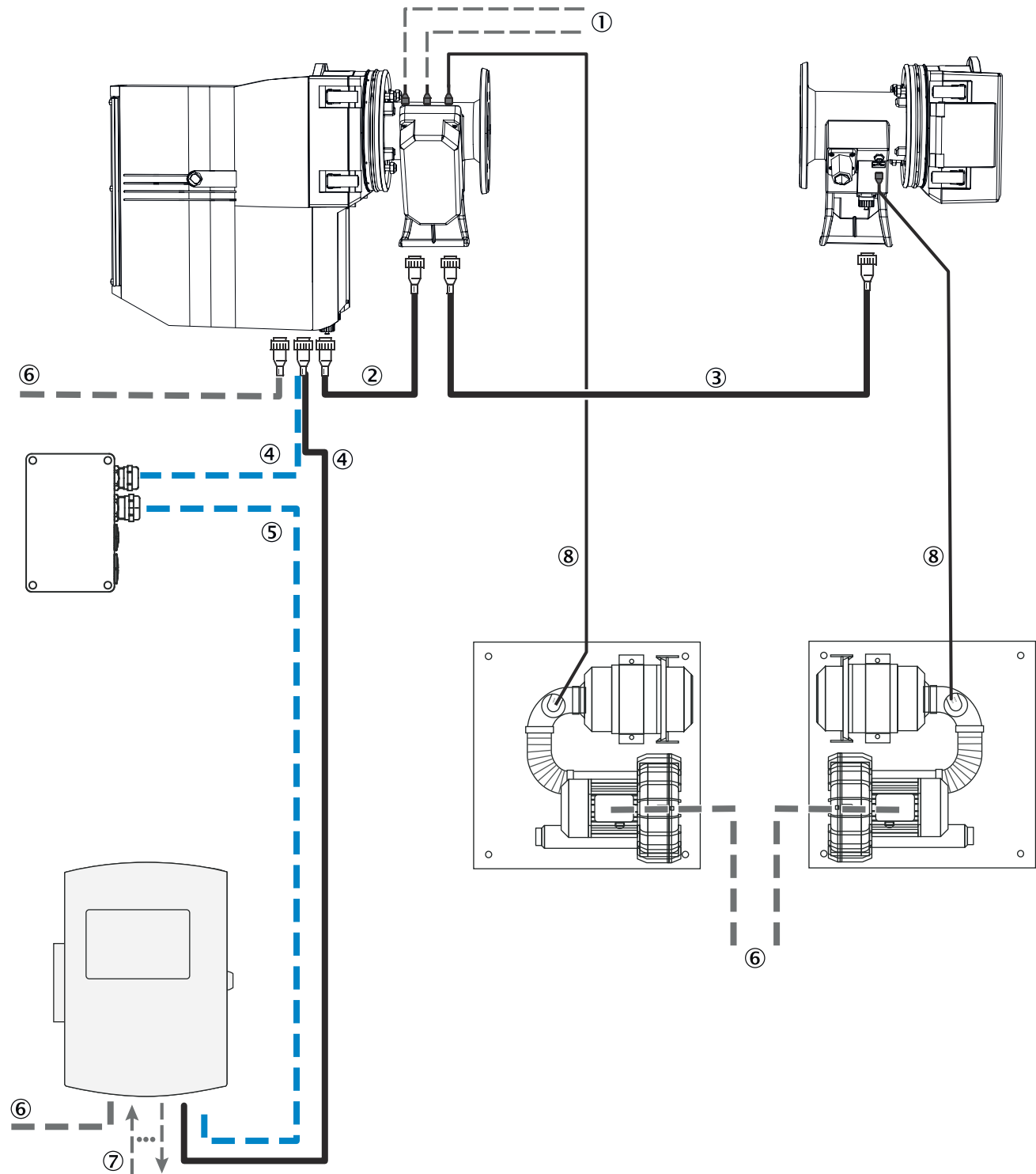


Image 13: Electrical wiring of device components

— Standard scope of delivery

- - - Option

- - - Provided by customer

① Line, 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, sender/receiver unit, purge air unit, control unit (provided by customer)



- ⑦ Signal line, control unit (provided by customer)
- ⑧ Connection line, purge air attachment and purge air unit low-pressure monitor

#### 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>• Sender/receiver unit</li> <li>• Purge air unit</li> <li>• Control unit</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 — purge air unit low-pressure monitor (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

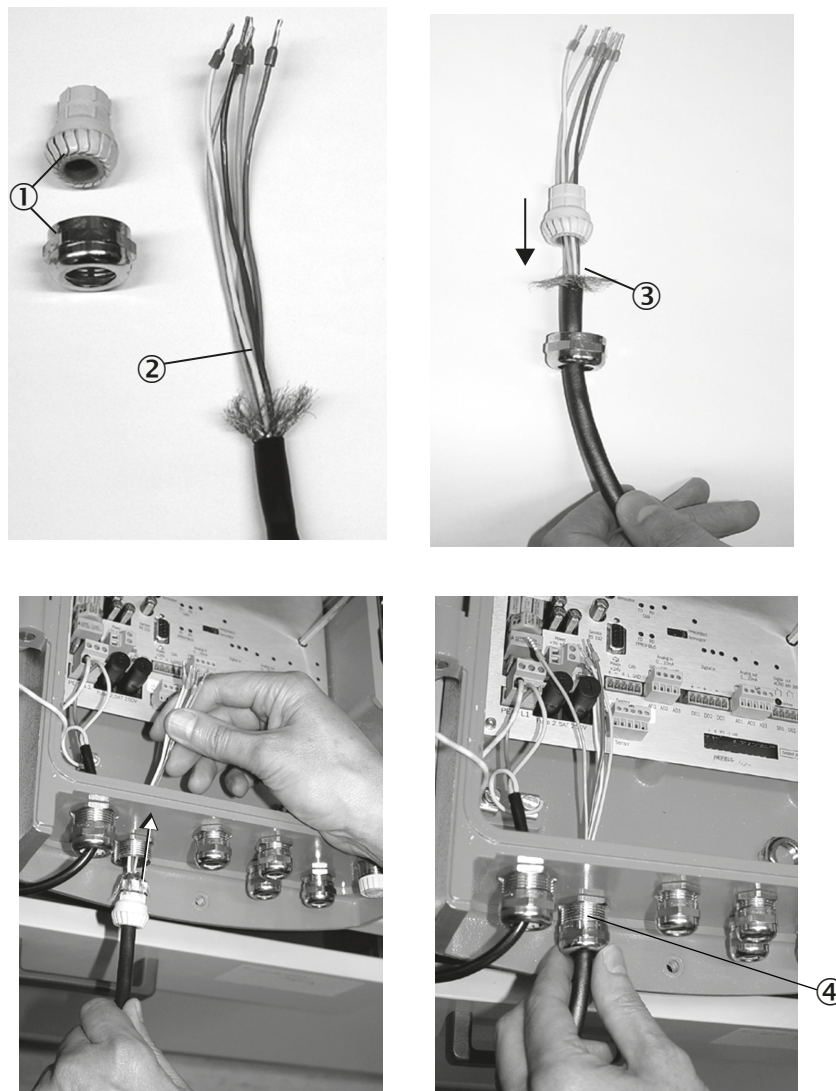


Image 14: CAN bus line fitted correctly (shown on the AWE)

- 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



#### ADVICE

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

## Control unit AWE

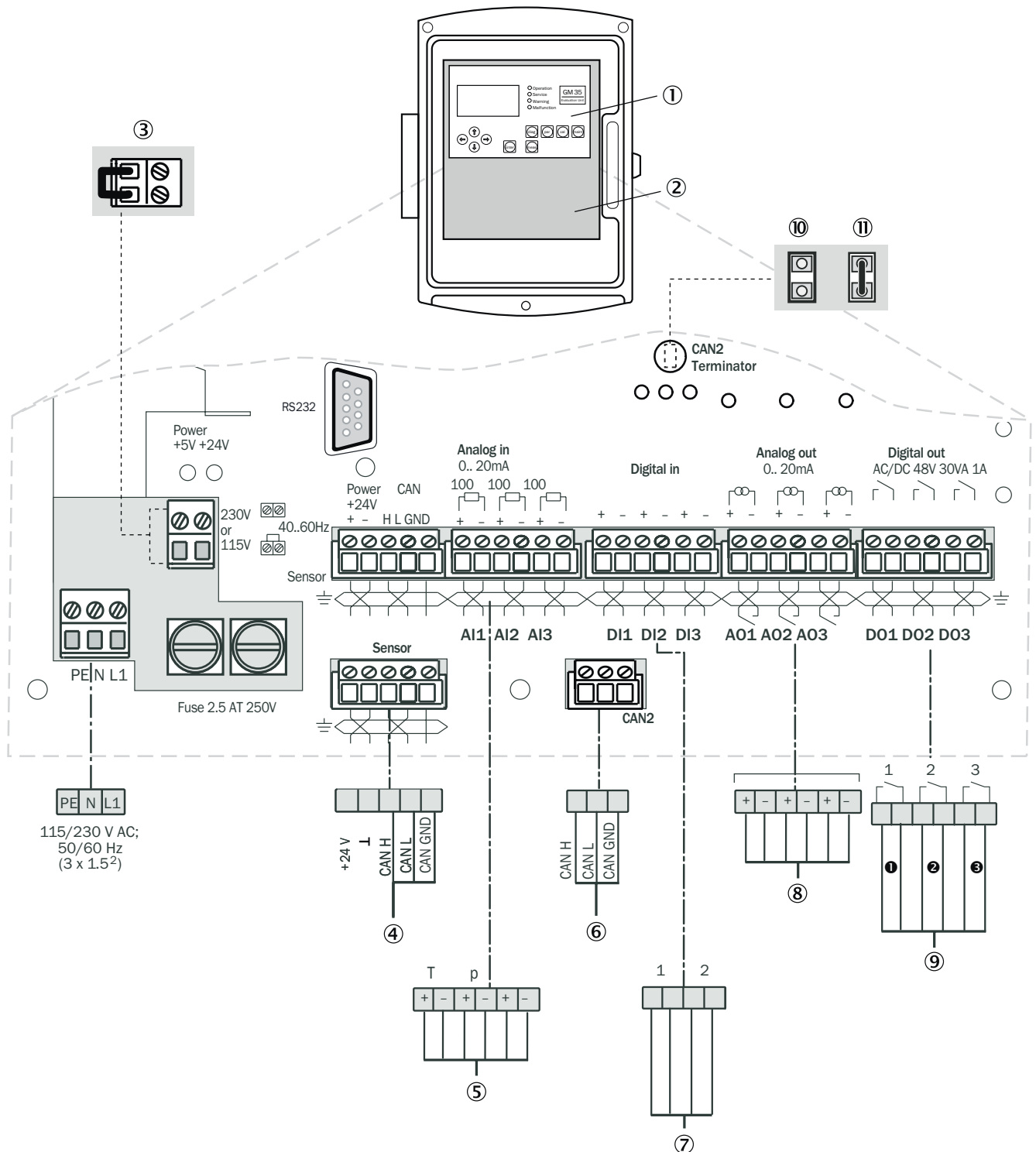


Image 15: Electrical wiring of control unit AWE

- ① Circuit board, operating elements
- ② Connections circuit board
- ③ Plug this bridge for 115 V or 120 V power supply
- ④ CAN H + L, twisted pair, shielded. Connection for sender/receiver unit or connection unit
- ⑤ Analog inputs: 0 ... 20 mA ( $6 \times 0.5^2$ )
- ⑥ CAN H + L, twisted pair, shielded. Connection for SCU
- ⑦ Digital inputs: Potential-free contacts ( $6 \times 0.75^2$ )
- ⑧ Analog outputs: 0 ... 20 mA ( $6 \times 0.75^2$ )
- ⑨ Digital outputs: 48 V AC 60 VA, 1 A ( $6 \times 0.75^2$ )

- ❶ Failure (NC contact)
- ❷ Maintenance request (NO contact)
- ❸ Function control (NO contact)
- ❷ For SCU connection: Jumper not connected (not activated)
- ❸ For SCU connection: Jumper connected (activated)

#### 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

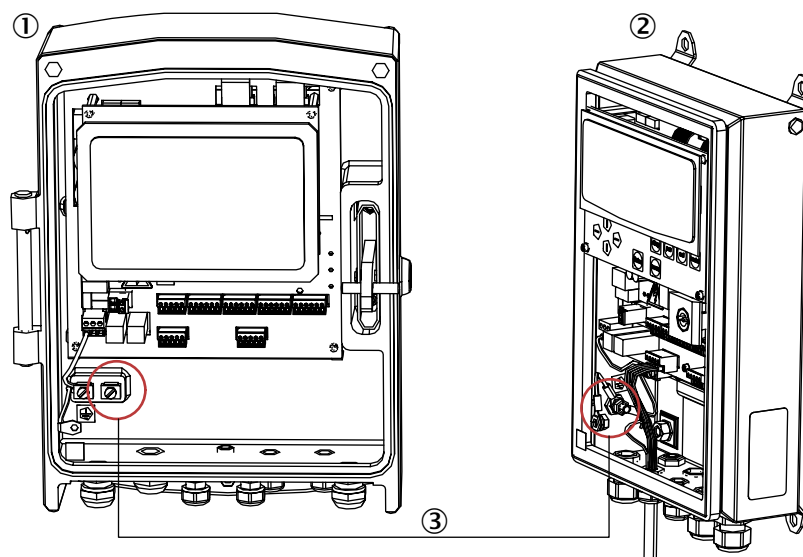


Image 16: Connection for grounding conductors

- ❶ Control unit AWE (cast metal enclosure version)
- ❷ Control unit AWE (sheet steel enclosure version)
- ❸ 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



### ADVICE

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



### ADVICE

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.

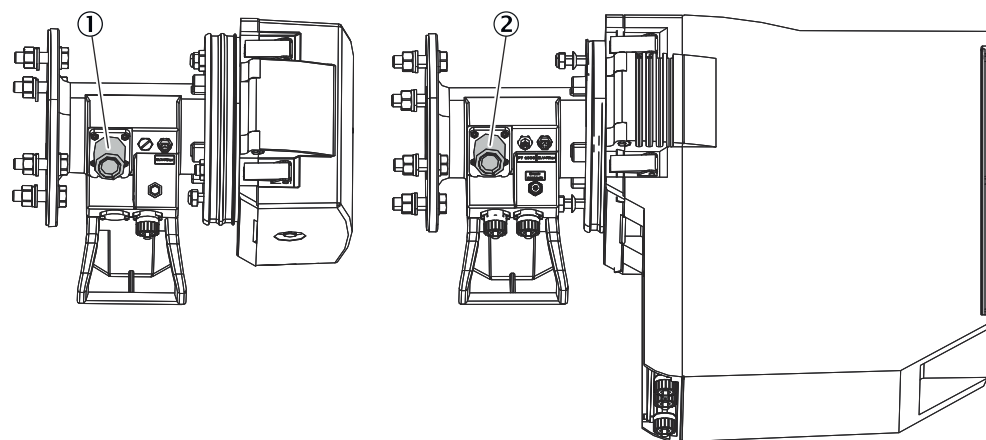


Image 17: Purge air connections on sender/receiver unit and reflector unit

- ① Reflector unit: Purge air hose connection
- ② Sender/receiver 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.
- ✓ Purge air supply is now activated and protects the measuring system against contamination and overheating.



### IMPORTANT


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.



### IMPORTANT

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)



**ADVICE CAN BUS WIRING PROJECT PLANNING**

The following options are available for wiring the CAN bus connection between sender/receiver transceiver unit and control unit:

- Standard cable, 4 m, prefabricated.
- Connection unit with ready-made, 4 m long line to the sender/receiver unit; wiring to the control unit is done with the customer's cable.

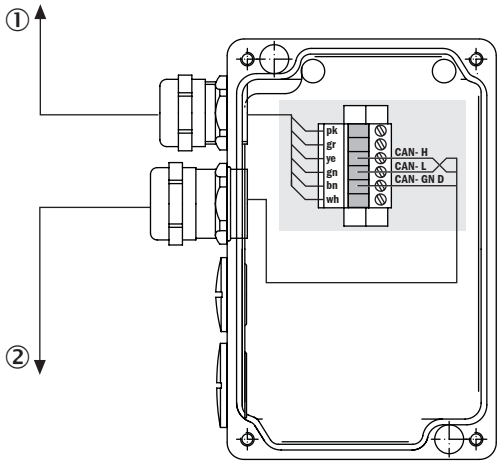



Image 18: Connection unit electrical connection


- ① Connection line to sender/receiver unit  
M screw fitting (Ø 5 ... 10)
- ② Connection line to control unit  
M screw fitting (Ø 6 ... 12)



**ADVICE**

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

- Steps**
1. Determine no voltage is applied.
  2. Lead CAN line for the sender/receiver unit through right M screw fitting ① to the terminal strip.
  3. Lead CAN line for the control unit through M screw fitting ② 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.



**IMPORTANT**

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



#### IMPORTANT

- 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 Customer Service or your local Endress+Hauser representative.

#### Grounding



#### IMPORTANT

#### 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.

### 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 "Removing the transport safety device", Page 36
2	Put the purge air supply into operation.	See "Putting the purge air unit into operation", Page 33
3	Carrying out coarse optical alignment.	See "Carrying out coarse optical alignment", Page 36
4	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 39

Step	Procedure	Reference
5	Connect the sender/receiver unit electrically.	See "Connecting the sender/receiver unit", Page 41
6	Connect the reflector unit electrically.	See "Connecting the reflector unit", Page 42
7	Carry out fine optical adjustment.	See "Fine optical alignment", Page 42
8	Fit the weather hood (option).	See "Fitting the weather hood (option)", Page 44
9	Start measuring operation.	See "Starting measuring operation", Page 45

## 7.6 Removing the transport safety device

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



#### ADVICE

The front cover of the sender/receiver unit and the reflector unit is clamped between the flange fixture and enclosure.

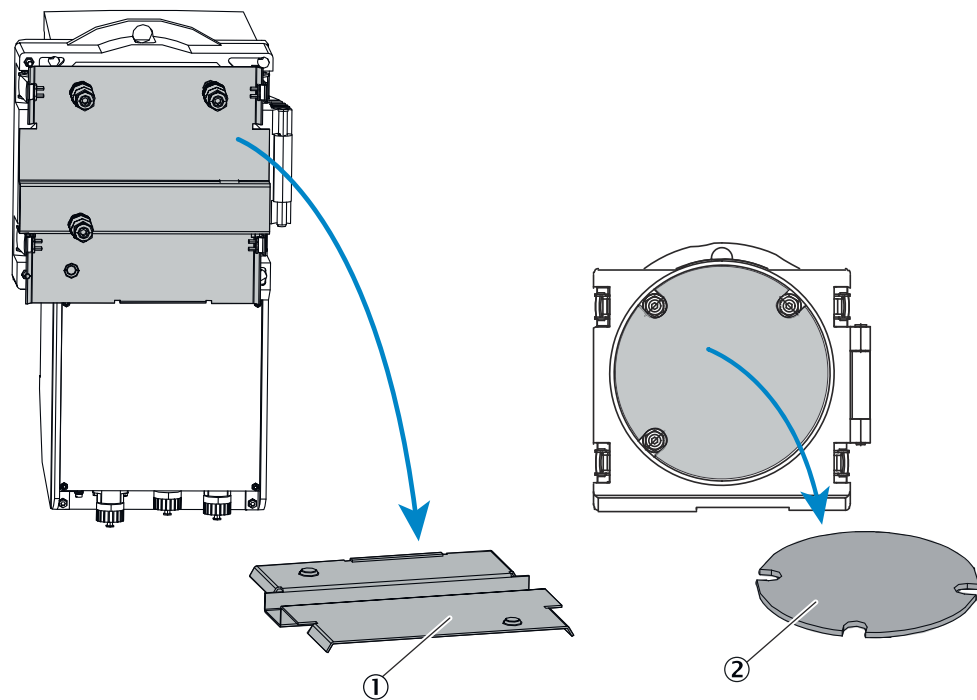


Image 19: Transport safety devices

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

#### Steps

1. Remove protective sticker.
2. Remove the protective plate to the front cover:
  - a) Open the quick-release fasteners. Swivel the flange fixture open.
  - b) Remove the protective cover.
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

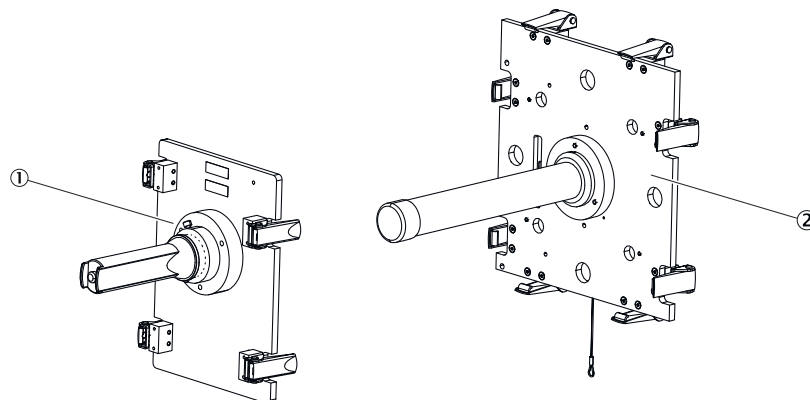


Image 20: Alignment tool

- 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 reflector unit", Page 52.](#)

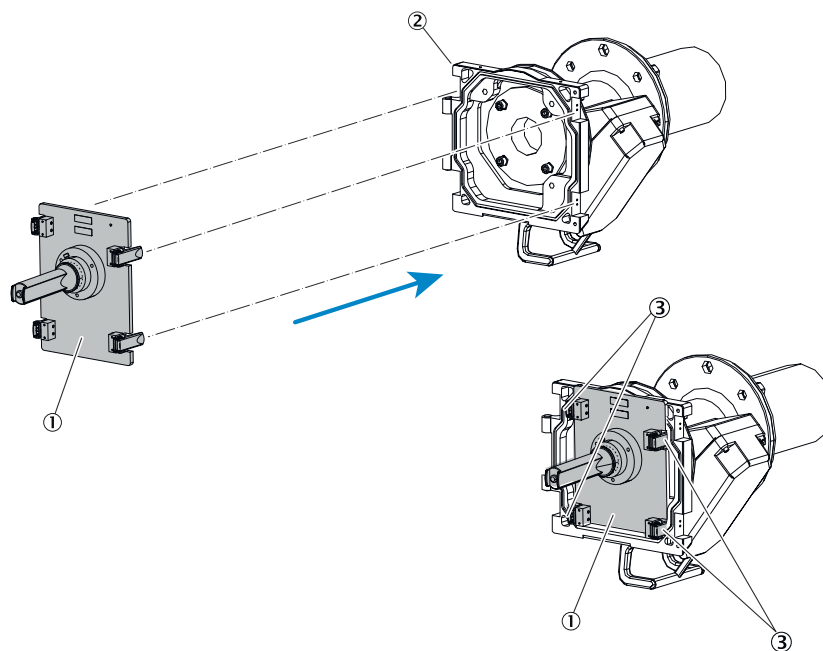


Image 21: Fitting the alignment tool, sender/receiver unit

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

#### Steps

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

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

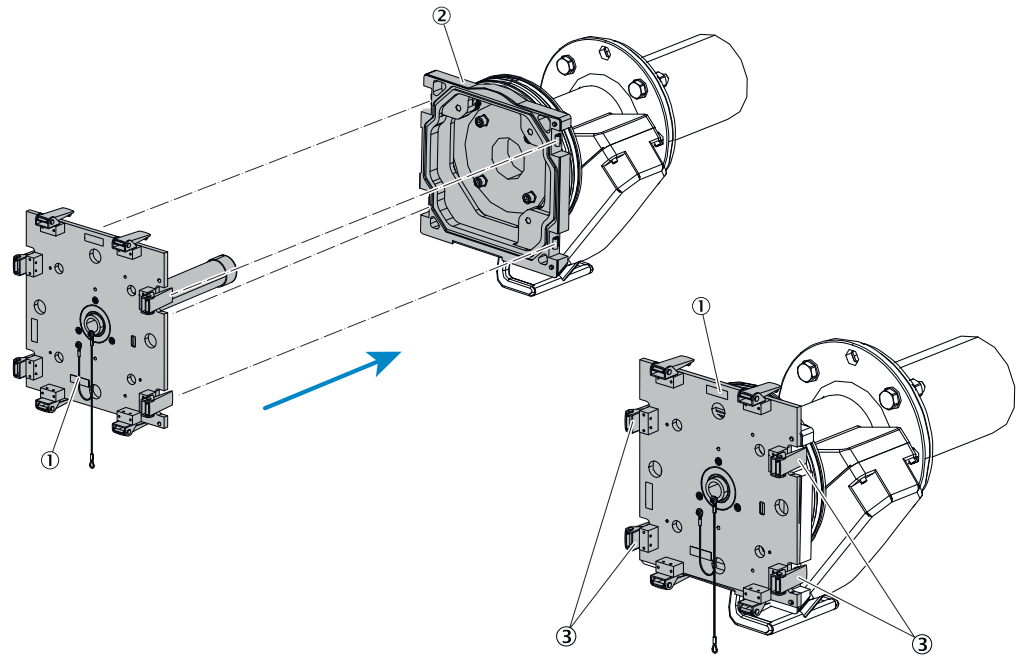


Image 22: Fitting the alignment tool, reflector unit

- 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



#### ADVICE

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.

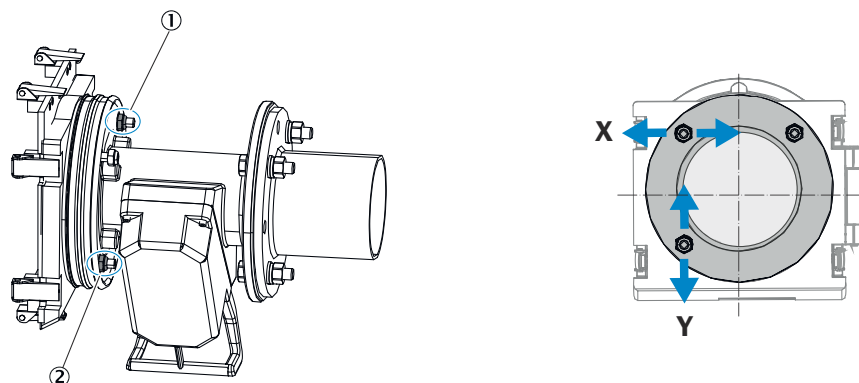


Image 23: Optical alignment of the reflector unit

- 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.

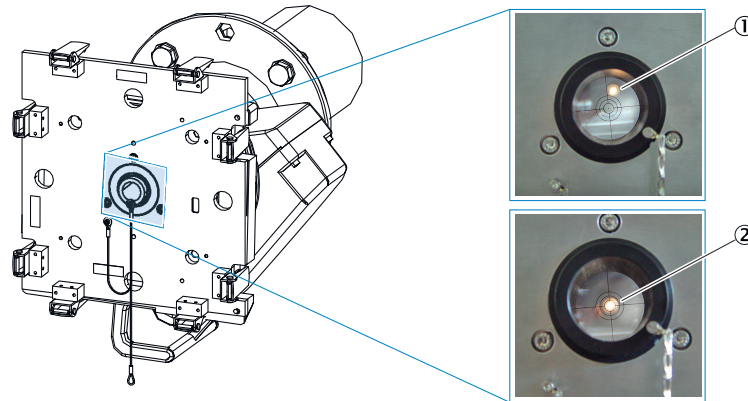


Image 24: Checking optical alignment, reflector unit

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

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



#### ADVICE

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.

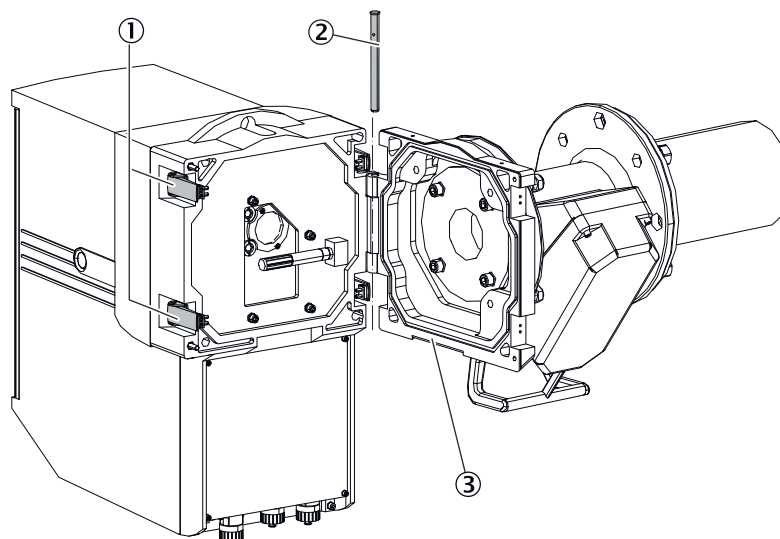
**Sender/receiver unit**

Image 25: Fitting the sender/receiver unit on the flange fixture

- ① Quick-release fasteners
- ② Hinge pin
- ③ Flange fixture

**Steps**

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

**Reflector unit****ADVICE**

Fitting the reflector unit is identical.

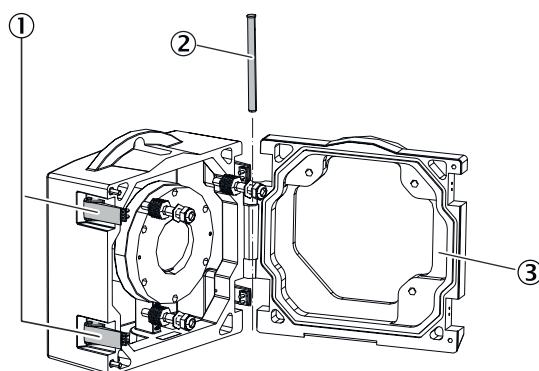


Image 26: Fitting the reflector unit on the flange fixture

- ① Quick-release fasteners
- ② Hinge pin
- ③ Flange fixture

## 7.9 Connecting the sender/receiver unit

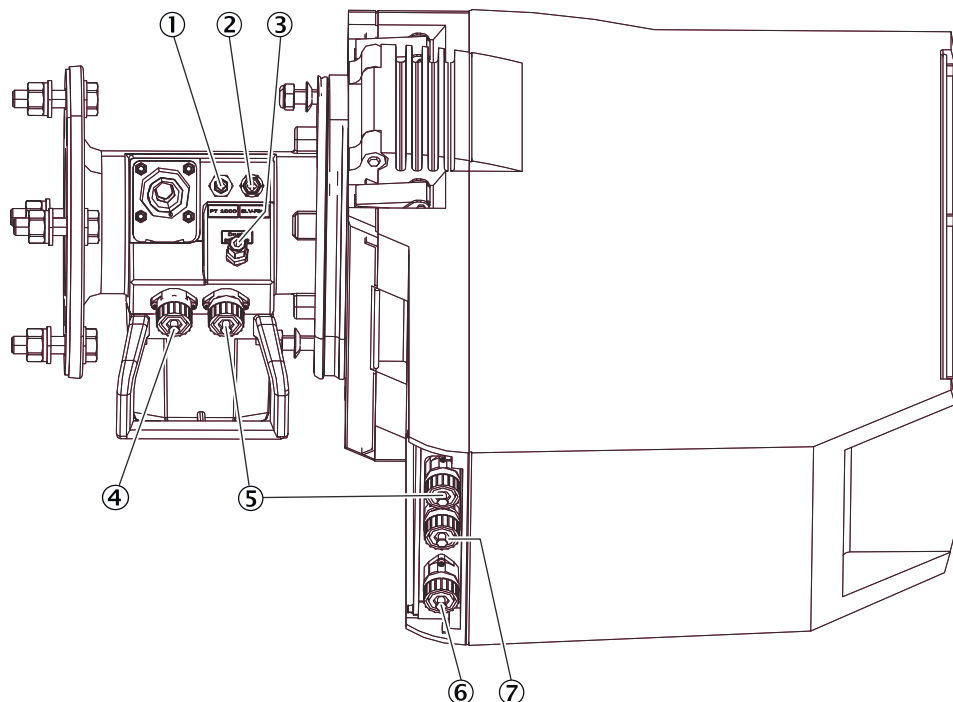


Image 27: Sender/receiver unit electrical connections

- ① Temperature sensor connection
- ② Purge air unit low-pressure monitor connection
- ③ Pressure sensor connection
- ④ Reflector unit connection line connection
- ⑤ Purge air attachment — sender/receiver unit connection line
- ⑥ Power supply line connection
- ⑦ Control unit connection line connection



### ADVICE

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.
8. Connect the power supply line.

## 7.10 Connecting the reflector unit

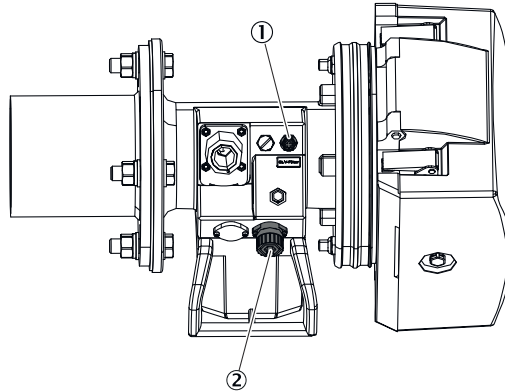


Image 28: Reflector unit electrical connections

- 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

The measuring function requires that the optical axis of the reflector assembly of the measuring probe (probe version) or the reflector unit (cross duct) is precisely aligned with the light beam of the sender/receiver unit. The optical alignment and control is carried out via:

- Control unit
- Visor on the sender/receiver unit:

The device is equipped with an automatic beam tracking system which ensures optimum alignment of the sender/receiver unit and reflector unit or measuring probe at all times during normal measuring operation - even under changing system conditions.

The automatic beam tracking has to be adjusted just once.

### Prerequisite

- Device has warmed up to operating temperature (approx. 2 hours).

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

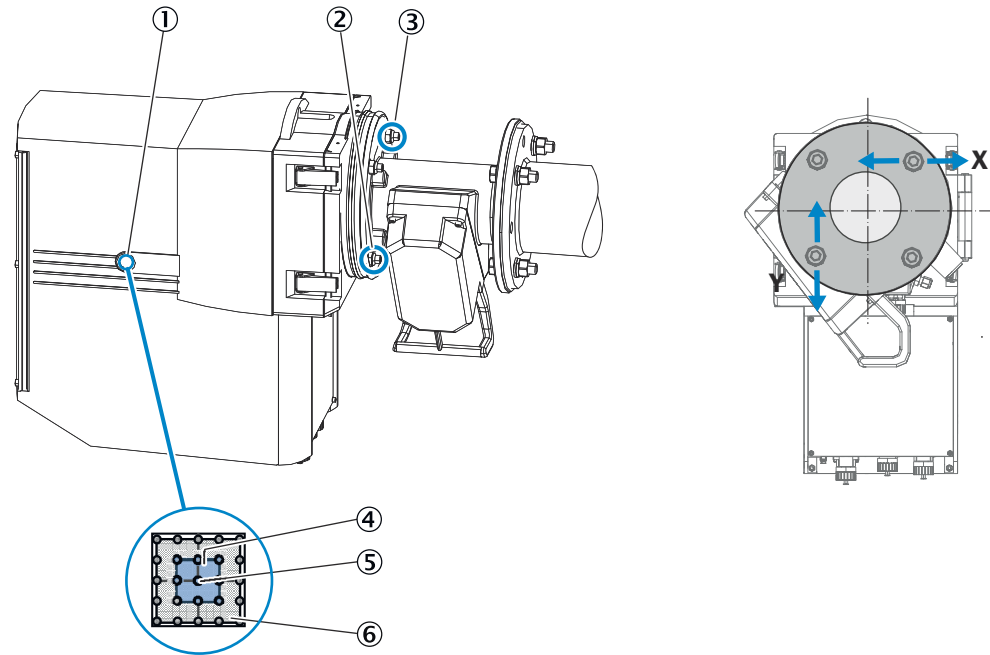


Image 29: Fine optical alignment on the sender/receiver unit

- ① Visor for fine optical alignment:  
5 × 5-LED matrix for displaying the light beam on the reflector element
- ② Nut for vertical adjustment (Y)
- ③ Nut for horizontal adjustment (X)
- ④ Visor: LED field for valid alignment
- ⑤ Visor: LED field for optimum alignment
- ⑥ LED matrix: LED field in case of invalid alignment

#### On the control unit:

##### Start optical alignment

1. Press button “maint”.
  2. Select “Adj. Opt. Align”.
- ✓ The values for the horizontal and vertical position (dx, dy) of the light beam are displayed on the reflector element.
  - ✓ Signal for optical alignment is sent to the control center. For devices with automatic beam tracking, the optical reference position is now approached.

#### On the sender/receiver unit:

##### Alignment with visor

3. Align the position of the light spot. To do this, use a 19 mm wrench to adjust the nuts for X and Y alignment on the device flange so that the light spot is imaged in the valid LED field of the visor; ideally in the central LED.

#### On the control unit:

##### Adjust optical alignment precisely

4. Check on the display that the values for dx and dy are  $\leq \pm 0.1$ .

#### ADVICE

- dx value: Horizontal position or adjustment
- dy value: Vertical position or adjustment
- Values A, B, C and D are values of device-internal parameters. These should each be in the range of 350 ... 450.

5. If not, adjust the two nuts on the device flange until these values are reached.

## 7.12 Fitting the weather hood (option)

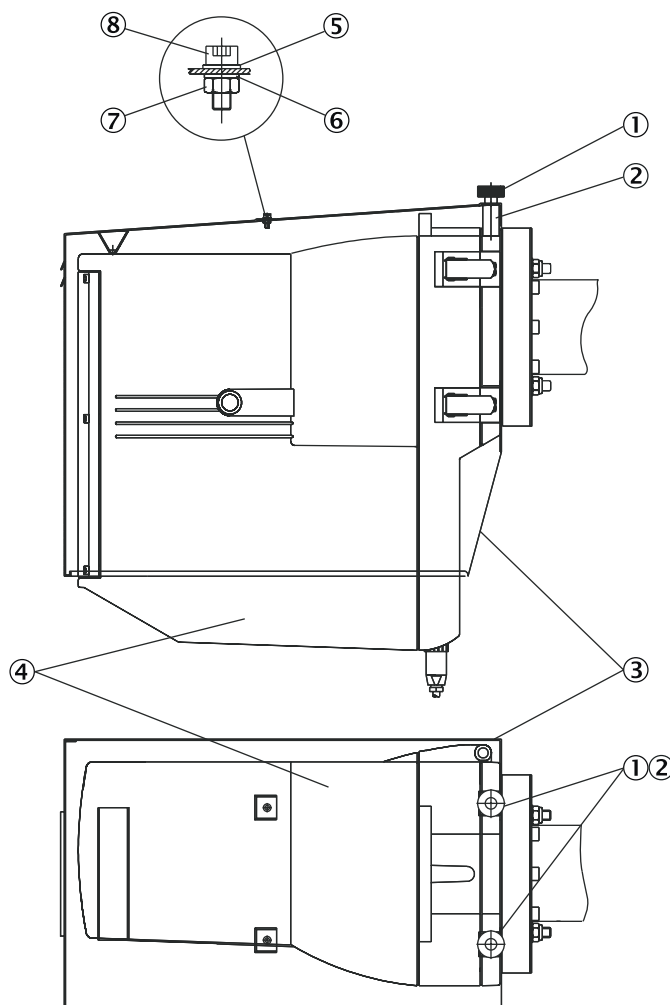


Image 30: Fitting the weather hood for the sender/receiver unit

- ① Knurled nut
- ② Spacer bolt
- ③ Weather hood
- ④ Sender/receiver unit
- ⑤ Washer
- ⑥ Spring washer
- ⑦ Nut
- ⑧ Screw

### Material required

- Fast curing epoxy resin two-component adhesives

### Steps

1. Glue the two spacer bolts supplied onto the flange fixture of the sender/receiver unit each at a distance of 85 mm from the center.
2. Seal the two unused mounting holes in the center of the weather hood with dummy screws.
3. Place the weather hood on the sender/receiver unit.
- ✓ The threads of the spacer bolts protrude through the front mounting holes of the weather hood.
4. Secure the weather hood in position with the two knurled nuts.



## 7.13 Starting measuring operation



### ADVICE

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

#### Starting measuring operation

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

**Check status LEDs, malfunction and warning messages.**



### ADVICE

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

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

**When malfunction or warning messages are present:**

- If the error cause cannot be cleared: Contact Endress+Hauser Service.

### 7.13.1 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

8 Operation

8.1 Operating and display elements

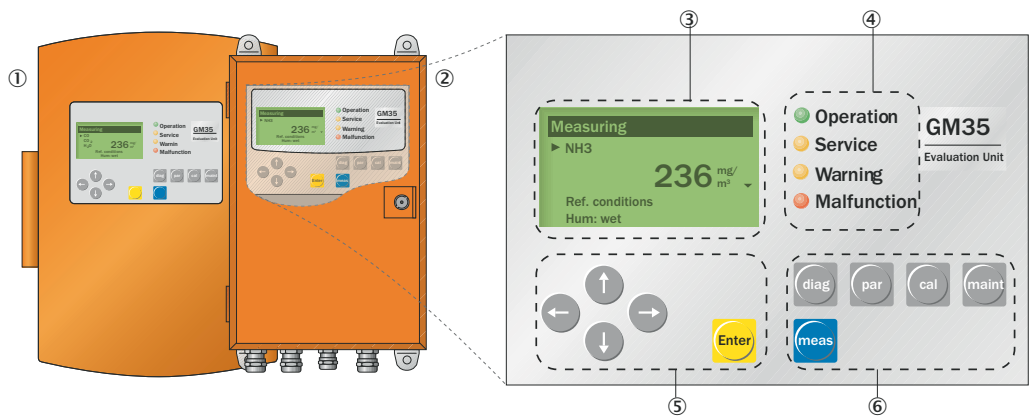






Image 31: Operating and display elements

- 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 indicating operating and fault conditions
- 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



### ADVICE

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	GM35	VIS AMP	Display of diagnostic values and control values
	CO		
	H2O		
	Probe	Cross-Duct OH Cross-Duct Refl	<b>Cross-Duct version</b> <ul style="list-style-type: none"> <li>Sender/receiver unit (OH)</li> <li>Reflector unit</li> </ul>
Check values	CO CO2 H2O		Current monitored sensor values (amplification setting, internal temperature control, control values, etc.)
Show Opt. Align			Displays the optical alignment

### 8.2.3 Menu tree, Parameters



Menu level	Explanation
Parameters	Parameters

Menu level			Explanation
Settings			Parameter settings/display of system components
	Configuration	Components Probe	Measuring components: CO or CO <sub>2</sub> , H <sub>2</sub> O CAN connection (probe or cross-duct)
	Phys. Units	ppm Ref. conditions	Setting for units and reference values for individual gases
	Average	Avg. Time	Setting for averaging time for device
	Meas. Distance	Active Tube 1 Tube 2	Measuring distance
	Temperature	Source Subst. Unit	Setting for temperature: Source (probe/replacement/AI1), unit (K, °C, °F)
	Pressure	Source Subst.	Setting for pressure: Source (probe/replacement/AI2)
	Analog Out	Live zero Output1 Output2 Output3	Setting for analog outputs: Live Zero, component display area, cycle output
	Analog In	Input1 Input2 Input3	Setting for analog inputs: e.g. AI1, unit (K, °C, °F), live zero (0, 2, 4 MA, read range)
	Check Cycle	Rep. time	Setting for check cycle interval: 1 ... 1440
Device	Serial Number Software Revision		Retrieval of device information: Serial number and software version
	Calibration CO Calibration CO <sub>2</sub> Calibration H <sub>2</sub> O		Service area for calibration of measuring components

## 8.2.4 Menu tree, Calibration



Menu level			Explanation
<b>Calibration</b>			<b>Calibration</b>
Check Cycle			Check cycle for test purposes, e.g. after maintenance activities
	Zero Adjust		Zero point determination, e.g., during commissioning or maintenance tasks
	Boxmeasuring		Checking measuring components with test gas using a gas adjustment unit
	Manual Test	Zero gas	Manual test with zero gas Adjustment of device-internal pressure and temperature measurement to reference measurements

## 8.2.5 Menu tree, Maintenance



Menu level			Explanation
<b>Maintenance</b>			<b>Maintenance</b>
Maintenance			Maintenance operation: On, off
Adj. Opt. Align.			Optical alignment function for the sender/receiver unit and reflector unit
Analog Out	AO 1:		Testing the analog outputs
	AO 2:		
	AO 3:		
Test Analog In	AI 1:		Testing the analog inputs
	AI 2:		
	AI 3:		
Test Relay	Relay 1		Testing the relay outputs
	Relay 2		
	Relay 3		
Test Digital In	DI 1		Testing the digital inputs
	DI 2		
	DI 3		
Reset System			Restarting the measuring system
Reset Parameter			Resetting parameters to factory settings ⚠ All settings will be 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 disconnect switch is easily accessible.
- ▶ An additional disconnecting device is mandatory when the power disconnect switch cannot be accessed or only with difficulty after installation of the device connection.
- ▶ Switch off the voltage supply before starting any work on the device.
- ▶ After completion of the work or for test purposes, calibration of the power supply may only be activated again by authorized personnel complying with the safety regulations.

**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. Concentrations inside the closed unit can rise up to 350 ppm.

- CO: 10 ml maximum total amount
- ▶ Check the unit regularly for the condition of the seals.
- ▶ 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.

**IMPORTANT****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

**IMPORTANT**

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

Table 8: Maintenance intervals

Inter-val <sup>1)</sup>	Maintenance work	Reference
1W	Check measured values in the control area are plausible	See "Menu tree, Diagnosis", Page 47
1M	Visual control of the system	See "Visual check", Page 52
	Clean windows.	See "Cleaning optical surfaces", Page 53
	Check optical alignment	See "Fine optical alignment", Page 42
	Check IR source	See "Checking the function of the IR source", Page 54
	Check and/or clean purge air unit	See "Cleaning the purge air unit", Page 54 and purge air unit Operating Instructions
1Y	Check analyzer with span gas	Normally carried out by Endress+Hauser Service.

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

### 9.2.1 Maintenance protocol

Log the following data:

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

### 9.2.2 Expendable, wearing and spare parts

Contact Endress+Hauser Service.

### 9.3 Preparatory work

**ADVICE**

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

- ▶ Activate Maintenance mode before starting the work.

**ADVICE**

- ▶ 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 reflector unit

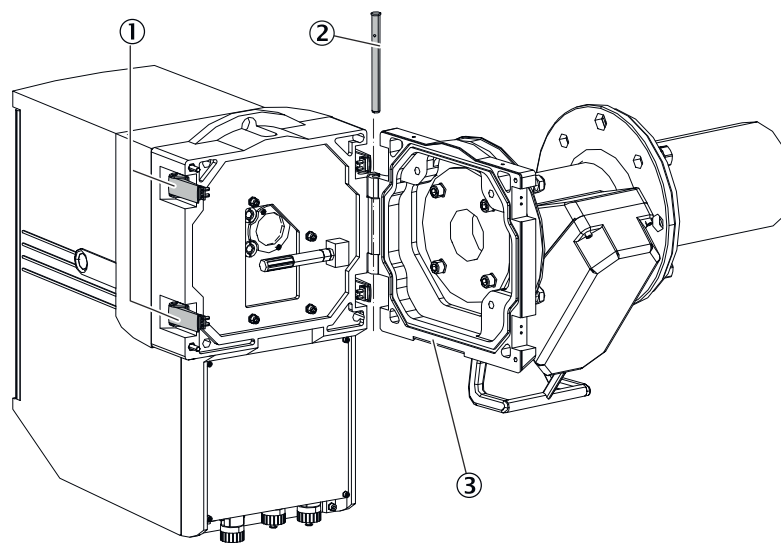


Image 32: Removing the sender/receiver unit

- ① Quick-release fasteners
- ② Hinge pin
- ③ Flange fixture



**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.

**ADVICE**

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

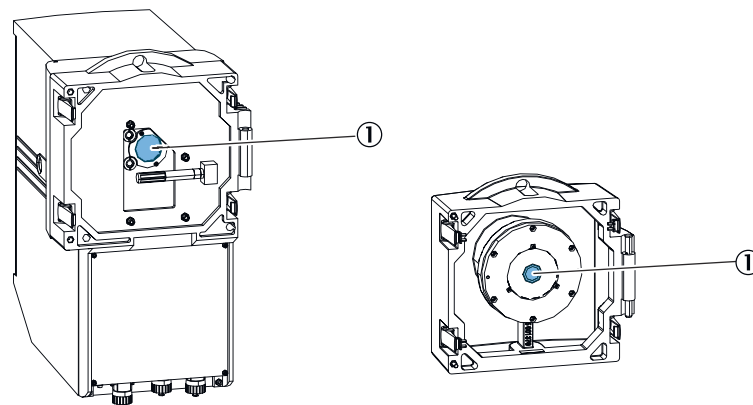
**Sender/receiver unit and reflector unit**

Image 33: Optical surfaces on sender/receiver unit and reflector unit

- ① Optical surface

**IMPORTANT**

- 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. Remove hinge pin upwards.
4. Remove the sender/receiver unit.
5. If required: Clean optical surface with optics cloth and demineralized water.
6. Close the enclosure immediately after cleaning to protect the cleaned optical surfaces against moisture and dust.
7. Refit the sender/receiver unit on the device flange of the purge air attachment.

### Reflector unit



#### ADVICE

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



#### ADVICE

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

## 9.9 Checking the function of the IR source

### Control unit AWE

1. Press the “diag” button.
  2. Select menu Sensor Values → GM35 general → VIS AMP MR.
- ✓ Current sensor value is displayed.
  - ✓ The value for the amplification: Max. 255



#### ADVICE

Perform a zero point adjustment after installing a new IR source module.

## 10 Troubleshooting

### 10.1 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. Concentrations inside the closed unit can rise up to 350 ppm.

- CO: 10 ml maximum total amount
- ▶ Check the unit regularly for the condition of the seals.
- ▶ 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.

**ADVICE**

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

**ADVICE**

This Table also contains recommended solutions that should only be carried out by specially trained personnel.

Table 12: Malfunction messages

Message	Description	Clearance
CDOH: No communication SLV	CAN connection between control unit and purge air attachment of the sender/receiver unit is interrupted.	► Check CAN connection. Repair if necessary.
CDR: No communication SLV	CAN connection between control unit and purge air attachment of the reflector unit is interrupted.	
CO Ampl. max	CO measuring amplifier is above its modulation range.	► Check optical alignment , <a href="#">See "Fine optical alignment", Page 42.</a> ► Check contamination of the optical surfaces. Clean if necessary, <a href="#">See "Cleaning optical surfaces", Page 53.</a> ► If not successful, contact Endress+Hauser Service.
CO com.	No connection between CO module and CO module.	► Check lines and plugs. Repair if necessary. ► If not successful, contact Endress+Hauser Service.
CO CUVETTE com.	No connection between CO module and CO cell motor	► Contact Endress+Hauser Service.
CO CUVETTE range	<ul style="list-style-type: none"> <li>CO duct in the reference cycle outside the expected range</li> <li>CO cell possibly leaking</li> </ul>	
CO div. zero	Adjustment data of CO module invalid.	
CO EEPROM	CO module parameter record invalid	► Contact Endress+Hauser Service.
CO Motor fault	Motor fault of CO filter wheel	► Contact Endress+Hauser Service.
CO No signal	<ul style="list-style-type: none"> <li>CO signals too low, no measurement possible</li> <li>Dust content too high</li> <li>CO detector or IR source defective</li> <li>CO, H<sub>2</sub>O measurement ducts continue running.</li> </ul>	► Check contamination of the optical surfaces. Clean if necessary, <a href="#">See "Cleaning optical surfaces", Page 53.</a> ► Check optical alignment , <a href="#">See "Fine optical alignment", Page 42.</a> ► Have IR source or measuring module replaced. Contact Endress+Hauser Service.
CO Sig. High	CO signals distorted, CO <sub>2</sub> , H <sub>2</sub> O measuring ducts continue running.	► Contact Endress+Hauser Service.
CO temp. detec.	Temperature of CO detector outside tolerance	► Contact Endress+Hauser Service.
EI too hot SLV	Electronics too hot	► Improve cooling of sender/receiver unit.
Filter com.	No connection between CO <sub>2</sub> , H <sub>2</sub> O module and control filter motor	► Contact Endress+Hauser Service.

Message	Description	Clearance
H2O Ampl. Max	CO <sub>2</sub> , H <sub>2</sub> O measuring amplifier above its modulation range.	<ul style="list-style-type: none"> <li>▶ Check optical alignment , <a href="#">See "Fine optical alignment", Page 42.</a></li> <li>▶ Check contamination of the optical surfaces. Clean if necessary, <a href="#">See "Cleaning optical surfaces", Page 53.</a></li> <li>▶ Contact Endress+Hauser Service.</li> </ul>
H2O CUVETTE com.	No connection between CO <sub>2</sub> , H <sub>2</sub> O module and cell motor.	<ul style="list-style-type: none"> <li>▶ Contact Endress+Hauser Service.</li> </ul>
H2O div. Zero	Adjustment data of CO <sub>2</sub> /H <sub>2</sub> O module invalid.	<ul style="list-style-type: none"> <li>▶ Contact Endress+Hauser Service.</li> </ul>
H2O EEPROM	Parameter record of CO <sub>2</sub> /H <sub>2</sub> O module invalid	
H2O Motor fault	Motor fault of CO <sub>2</sub> /H <sub>2</sub> O filter wheel	<ul style="list-style-type: none"> <li>▶ Contact Endress+Hauser Service.</li> </ul>
H2O No signal	<ul style="list-style-type: none"> <li>• H<sub>2</sub>O signals too low, no measurement possible</li> <li>• Dust content too high</li> <li>• H<sub>2</sub>O detector or IR source defective</li> <li>• CO measuring duct still running.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check contamination of the optical surfaces. Clean if necessary, <a href="#">See "Cleaning optical surfaces", Page 53.</a></li> <li>▶ Check optical alignment , <a href="#">See "Fine optical alignment", Page 42.</a></li> <li>▶ Have IR source or measuring module replaced. Contact Endress+Hauser Service.</li> </ul>
H2O Sig. High	CO <sub>2</sub> /H <sub>2</sub> O measuring signal distorted.	<ul style="list-style-type: none"> <li>▶ Contact Endress+Hauser Service.</li> </ul>
H2O temp. detec.	CO <sub>2</sub> /H <sub>2</sub> O detector temperature outside tolerance	<ul style="list-style-type: none"> <li>▶ Contact Endress+Hauser Service.</li> </ul>
Mirror adj. End	Automatic beam tracking at end stop, further tracking not possible	<ul style="list-style-type: none"> <li>▶ Check optical alignment , <a href="#">See "Fine optical alignment", Page 42.</a></li> <li>▶ If not successful, contact Endress+Hauser Service.</li> </ul>
Mirror com.	No communication to automatic beam tracking, measurement continues.	<ul style="list-style-type: none"> <li>▶ Contact Endress+Hauser Service.</li> </ul>
Sensor communication	No connection between control unit and analyzer	<ul style="list-style-type: none"> <li>▶ Check CAN connection. Repair if necessary.</li> </ul>
VISOR com.	No connection between CO <sub>2</sub> /H <sub>2</sub> O module and visor unit	<ul style="list-style-type: none"> <li>▶ Check lines and plugs. Repair if necessary.</li> <li>▶ If not successful, contact Endress+Hauser Service.</li> </ul>
VISOR fault	Visor unit data or signals distorted	<ul style="list-style-type: none"> <li>▶ Check optical alignment , <a href="#">See "Fine optical alignment", Page 42.</a></li> </ul>
VISOR init.	Basic setting of visor unit invalid.	<ul style="list-style-type: none"> <li>▶ Contact Endress+Hauser Service.</li> </ul>
VISOR No signal	<ul style="list-style-type: none"> <li>• Visor signals too low</li> <li>• Dust content too high</li> <li>• IR source defective</li> <li>• Measurement continues.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check contamination of the optical surfaces. Clean if necessary, <a href="#">See "Cleaning optical surfaces", Page 53.</a></li> <li>▶ Check optical alignment , <a href="#">See "Fine optical alignment", Page 42.</a></li> <li>▶ If not successful, contact Endress+Hauser Service.</li> </ul>
Zero com.	No connection between CO <sub>2</sub> /H <sub>2</sub> O module and motor of zero point reflector	

## 10.6 Warning messages

Table 13: Warning messages

Message	Description	Clearance
Air purge low SLV	Volume flow is below the set threshold.	<ul style="list-style-type: none"> <li>▶ Check purge air supply (blower, hoses), change filter on purge air blower if necessary, see Purge Air Supply Manual.</li> </ul>
Chopper freq.	Chopper wheel frequency outside tolerance.	<ul style="list-style-type: none"> <li>▶ Replace lamp module.</li> <li>▶ If not successful, contact Endress+Hauser Service.</li> </ul>
CD: Filter watch SLV	Purge air unit low-pressure monitor switches on binary input.	<ul style="list-style-type: none"> <li>▶ Check purge air supply (blower, hoses), change filter on purge air blower if necessary, see Purge Air Supply Manual.</li> </ul>

Message	Description	Clearance
CD: P No Signal SLV	No signal from pressure sensor	► Check connection and line connections of the pressure sensor on the purge air attachment. Repair if necessary.
CD: P out of range SLV	Sample gas pressure < 500 or > 1200 hPa/mbar.	► Check or replace pressure sensor.
CD: T Air Sign. SLV	Sensor break or no temperature sensor (purge air temperature) connected.	► Check connection and line connection of the temperature sensor (purge air temperature) on the purge air attachment. Repair if necessary.
CD: [t] No Signal SLV	Sensor break or no temperature sensor (flue gas temperature) connected.	► Check connection and line connection of the temperature sensor (flue gas temperature) on the purge air attachment. Repair if necessary.
CO Low sig.	<ul style="list-style-type: none"> <li>Contamination of the CO measuring duct</li> <li>Dust content too high</li> <li>IR source aged</li> </ul>	► Check contamination of the optical surfaces. Clean if necessary. <a href="#">See "Cleaning optical surfaces", Page 53</a> ► Check optical alignment <a href="#">See "Fine optical alignment", Page 42</a> ► If not successful, contact Endress+Hauser Service.
CO not ready	<ul style="list-style-type: none"> <li>CO measurement not ready yet.</li> <li>Signal distorted.</li> <li>The device is in the warm-up phase.</li> </ul>	► Wait until the operating temperature is reached (30 minutes). ► If not successful, contact Endress+Hauser Service.
CO2 Reference	Deviation of control value measurement too large	► Perform maintenance. ► Contact Endress+Hauser Service.
H2O Low sig.	<ul style="list-style-type: none"> <li>Contamination of the H<sub>2</sub>O measuring duct</li> <li>Dust content too high</li> <li>IR source aged</li> </ul>	► Check contamination of the optical surfaces. Clean if necessary. <a href="#">See "Cleaning optical surfaces", Page 53</a> ► Check optical alignment <a href="#">See "Fine optical alignment", Page 42</a> ► Contact Endress+Hauser Service.
H2O not ready	<ul style="list-style-type: none"> <li>CO<sub>2</sub>, H<sub>2</sub>O measurement not ready yet.</li> <li>Signal distorted.</li> <li>The device is in the warm-up phase.</li> </ul>	► Wait until the operating temperature is reached (30 minutes). ► Contact Endress+Hauser Service.
H2O Reference	Deviation of control value measurement too large	► Perform maintenance. ► Contact Endress+Hauser Service.
HYGRO com	No connection between CO <sub>2</sub> , H <sub>2</sub> O module and humidity sensor.	► Check line connection and correct seating of the plug connection; Repair if necessary. ► Switch to default value. ► Contact Endress+Hauser Service.
HYGRO internal	No communication to the internal humidity sensor <ul style="list-style-type: none"> <li>Sensor defective/line break</li> </ul>	► Check line connections. ► Exchange sensor.
MIRROR adj.	Automatic beam tracking: Optical axis tilt greater than trackable range	► Check optical alignment, <a href="#">See "Fine optical alignment", Page 42</a>
MR Adjustment	Visor unit shows deviation (> 0.5 from nominal position)	► Check optical alignment, <a href="#">See "Fine optical alignment", Page 42</a>
Software version	Software of control unit and sender/receiver unit not compatible	► Install latest software. ► Contact Endress+Hauser Service.
VISOR amplifier	Amplifier in visor at limit. The amplifier control takes place in the control cycle; maximum value 255.	► Check contamination of the optical surfaces. Clean if necessary. <a href="#">See "Cleaning optical surfaces", Page 53</a>

## 10.7 Repairing inadequate purge air supply

**ADVICE**

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



#### IMPORTANT

- 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



#### IMPORTANT

**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 reflector unit", Page 52.](#)
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



#### IMPORTANT

##### 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.



#### IMPORTANT

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.



#### ADVICE

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.



### IMPORTANT

- 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.

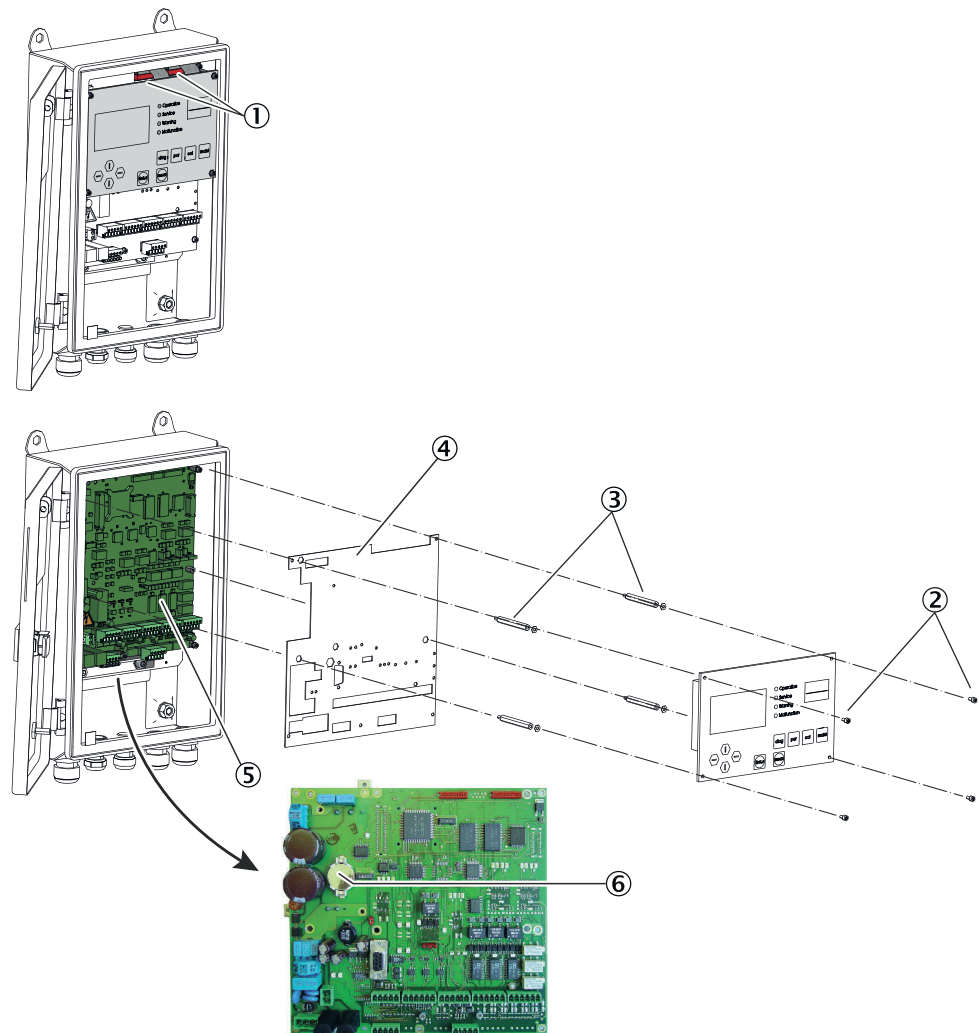


Image 34: Removing the control unit

#### 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 GM35 system

Table 15: Technical data System GM35

<b>Description</b>	In-situ gas analyzer for emission monitoring and process measurement
<b>Measured variables</b>	CO, CO <sub>2</sub> , H <sub>2</sub> O
<b>Performance-tested measured variables</b>	CO, CO <sub>2</sub> , H <sub>2</sub> O
<b>Measuring principles</b>	Gas filter correlation, Interference filter correlation
<b>Measuring distance</b>	0.25 m to max. 11.5 m ("Flange - flange distance" minus 2 × flange length)
<b>Measuring ranges</b>	<b>CO:</b> <ul style="list-style-type: none"> <li>0 ... 180 ppm / 0 ... 20,000 ppm</li> </ul> <b>CO<sub>2</sub>:</b> <ul style="list-style-type: none"> <li>0 ... 22.5 Vol.-% / 0 ... 100 Vol.-%</li> </ul> <b>H<sub>2</sub>O:</b> <ul style="list-style-type: none"> <li>0 ... 25 Vol.-% / 0 ... 100 Vol.-%</li> </ul> Measuring ranges refer to 1 m measuring distance. Measuring ranges depending on application and device version
<b>Certified measuring ranges</b>	<b>CO:</b> <ul style="list-style-type: none"> <li>0 ... 75 mg/m<sup>3</sup> / 0 ... 2,000 mg/m<sup>3</sup></li> </ul> <b>CO<sub>2</sub>:</b> <ul style="list-style-type: none"> <li>0 ... 15 Vol.-%</li> </ul> <b>H<sub>2</sub>O:</b> <ul style="list-style-type: none"> <li>0 ... 25 Vol.-%</li> </ul> Cross-Duct and GMP versions are performance-tested.
<b>Zero point drift</b>	± 2%: relative to upper measuring range value
<b>Reference point drift</b>	± 2%: in maintenance interval (6 months), relative to upper measuring range value
<b>Use</b>	Indoor and outdoor
<b>Altitude</b>	Max. 2000 m (above sea level)
<b>Ambient temperature</b>	-20 °C ... +50 °C Temperature change maximum ±10 °C/h
<b>Storage temperature</b>	-40 °C ... +55 °C
<b>Ambient humidity</b>	≤ 96% relative humidity, non-condensing
<b>Conformities</b>	EN 15267 (MCERTS)
<b>Electrical safety</b>	CE
<b>Overvoltage category</b>	II
<b>Degree of contamination</b>	2
<b>Assembly</b>	Mounting flange, DN125, PN6 Mounting flange, ANSI, 5"
<b>Control functions</b>	Automatic check cycle for zero and reference point
<b>Options</b>	Control unit SCU (only for non-Ex areas)

### 12.2 Sender/receiver unit

Table 16: Technical data, GM35 sender/receiver unit

<b>Description</b>	Analyzer unit of measuring system
<b>Degree of protection</b>	IP66

<b>Dimensions (W × H × D)</b>	291 mm × 527 mm × 529 mm
<b>Weight</b>	29 kg
<b>Power supply</b>	<ul style="list-style-type: none"> <li>• Voltage: 115 V AC / 230 V AC, ±10% (line voltage fluctuation)</li> <li>• Frequency: 48 ... 62 Hz</li> <li>• Power input: ≤ 350 W</li> </ul>

### 12.3 Reflector unit

Table 17: Technical data, reflector unit

<b>Description</b>	Reflector unit with hollow triple reflector
<b>Degree of protection</b>	IP65
<b>Process temperature</b>	≤ +500 °C
<b>Process pressure</b>	–60 hPa ... +30 hPa Depending on purge air supply
<b>Dust load</b>	≤ 3 g/m <sup>3</sup> Relative to 1 m measuring distance, depending on application
<b>Dimensions</b>	291 mm × 280 mm × 161 mm
<b>Weight</b>	8.5 kg

### 12.4 Control unit, AWE, sheet steel enclosure

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

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

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

## 12.6 Connection unit

Table 20: Technical data, connection unit

Description	To extend the CAN bus connection with a line provided by the customer
Degree of protection	IP65
Dimensions (W × H × D)	125 mm × 103 mm × 57 mm
Weight	3 kg

## 12.7 Purge air attachment

Table 21: Technical data, purge air attachment

Description	Flange fixture with connections for purge air hose and temperature and pressure sensors
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<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>	<b>Sender/receiver unit:</b> <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> <b>Reflector unit:</b> <ul style="list-style-type: none"><li>• SLV filter (low-pressure monitor, purge air unit)</li></ul>
<b>Built-in components</b>	<b>Sender/receiver unit:</b> <ul style="list-style-type: none"><li>• Flow monitor for purge air monitoring</li><li>• Pressure sensor</li></ul> <b>Reflector unit:</b> <ul style="list-style-type: none"><li>• Flow monitor for purge air monitoring</li></ul>



12.8 Dimension drawing, sender/receiver unit

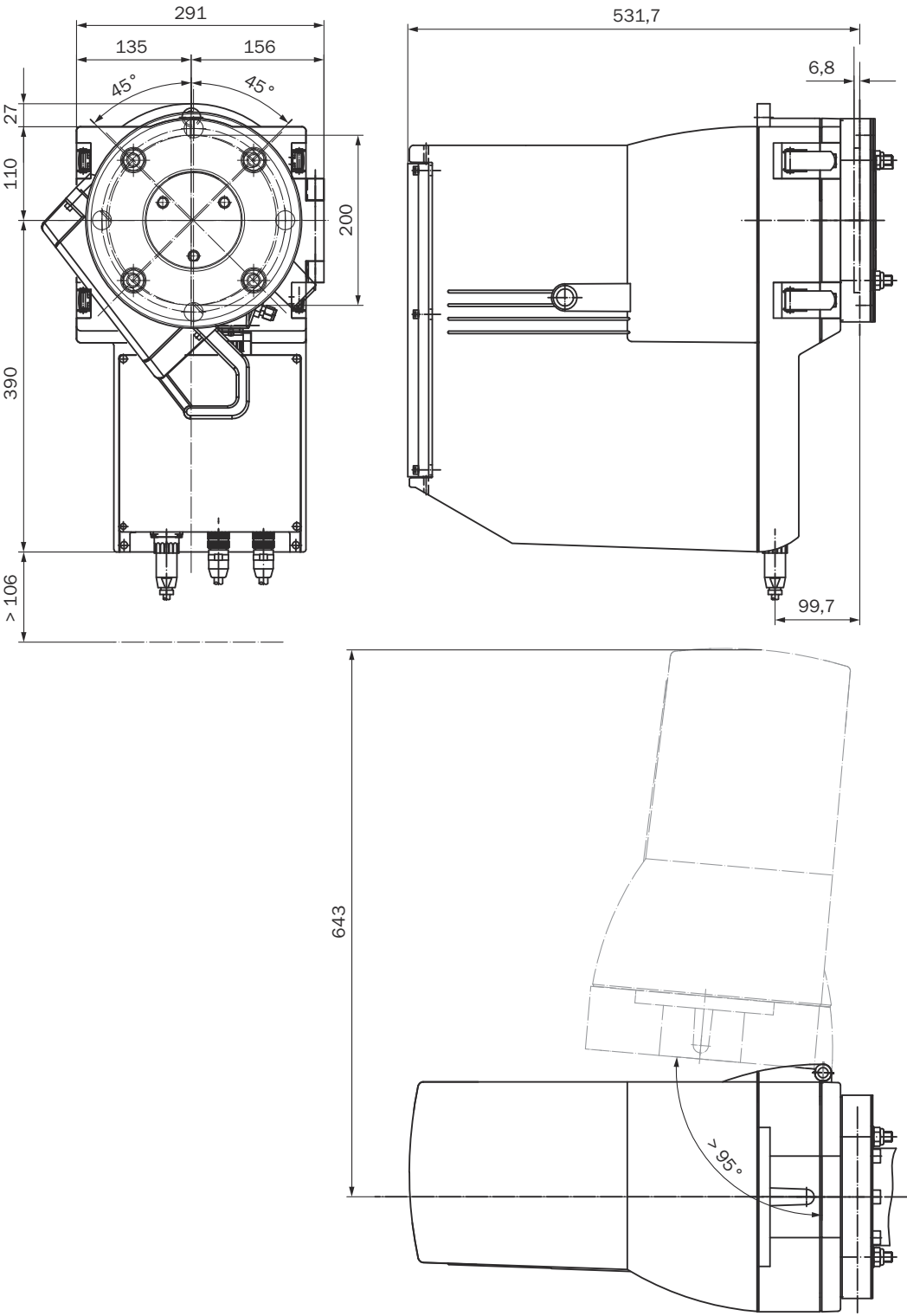


Image 35: GM35 sender/receiver unit (all dimensions in mm)

## 12.9 Dimension drawing, reflector unit

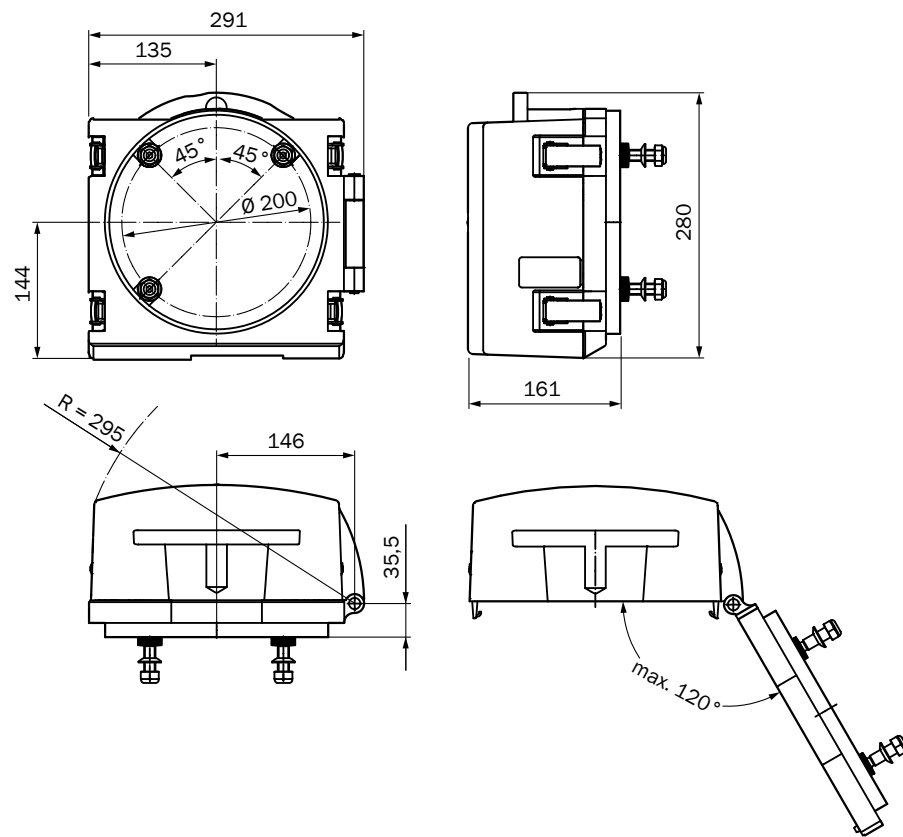


Image 36: Reflector unit (dimensions in mm)

## 12.10 Dimension drawing, control units

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

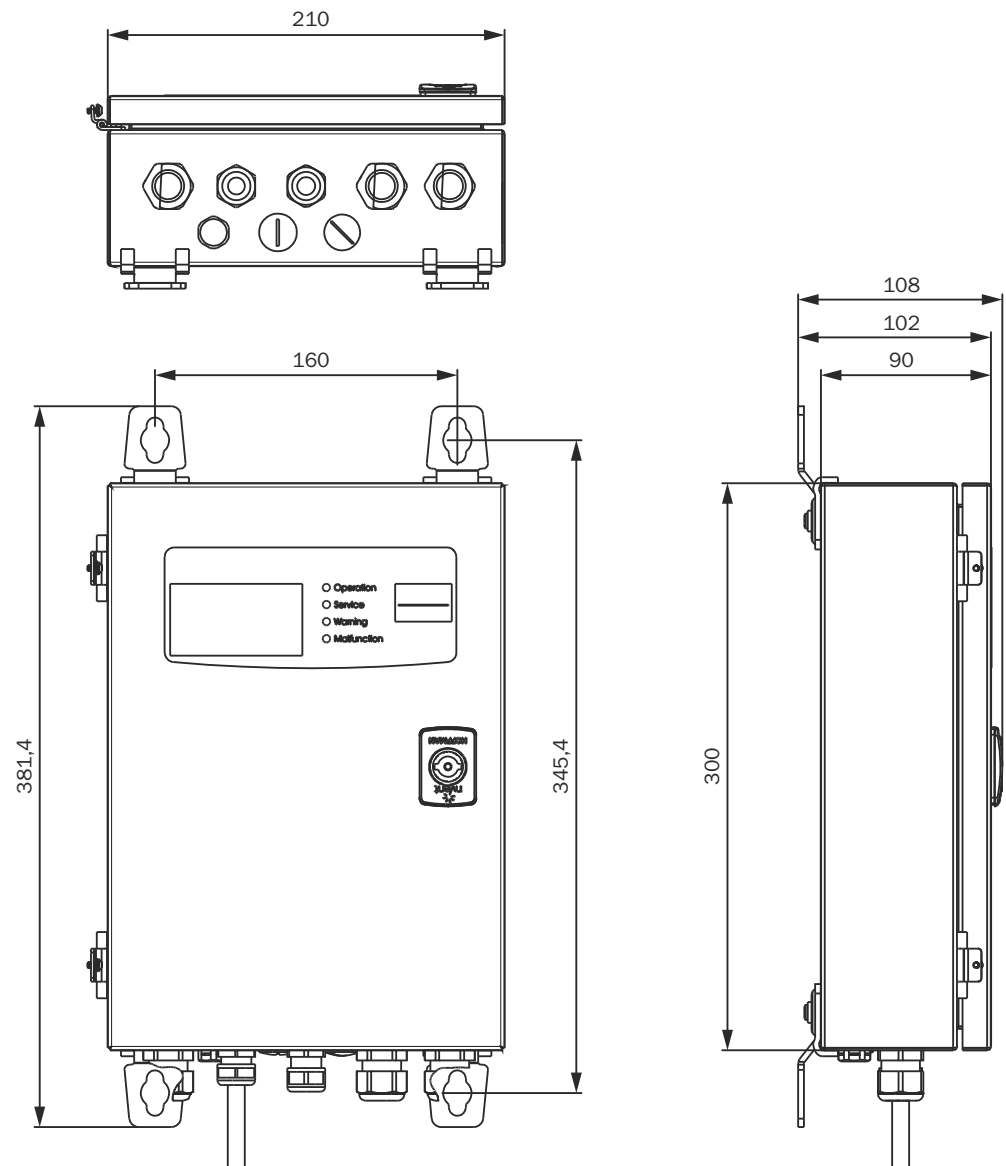


Image 37: Control unit AWE (sheet steel enclosure version), dimensions in mm

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

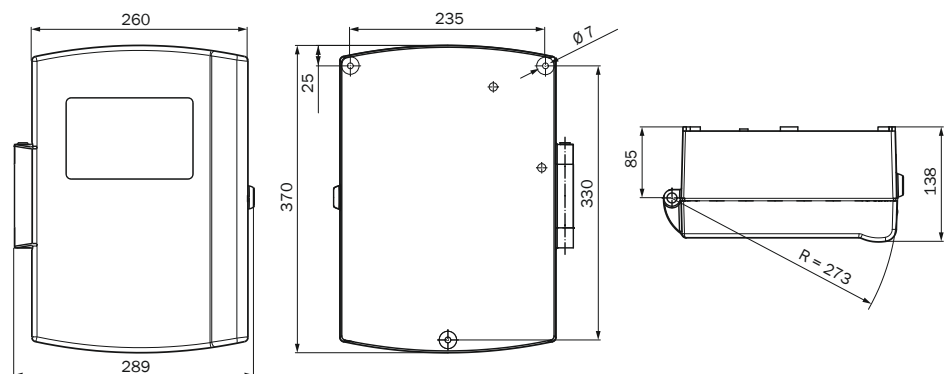


Image 38: Fitting the control unit AWE (sheet steel enclosure version), dimensions in mm

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

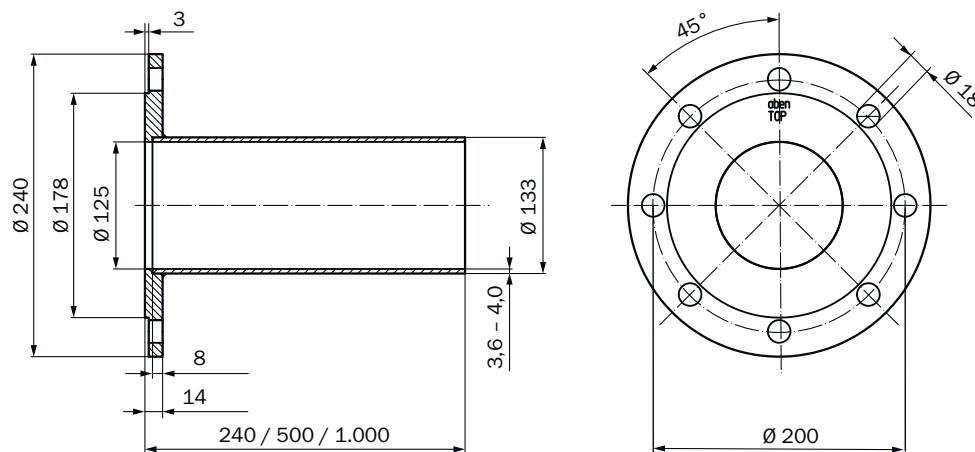


Image 39: Flange with tube, DN125 (dimensions in mm)

### 12.12 Dimension drawing, purge air attachment

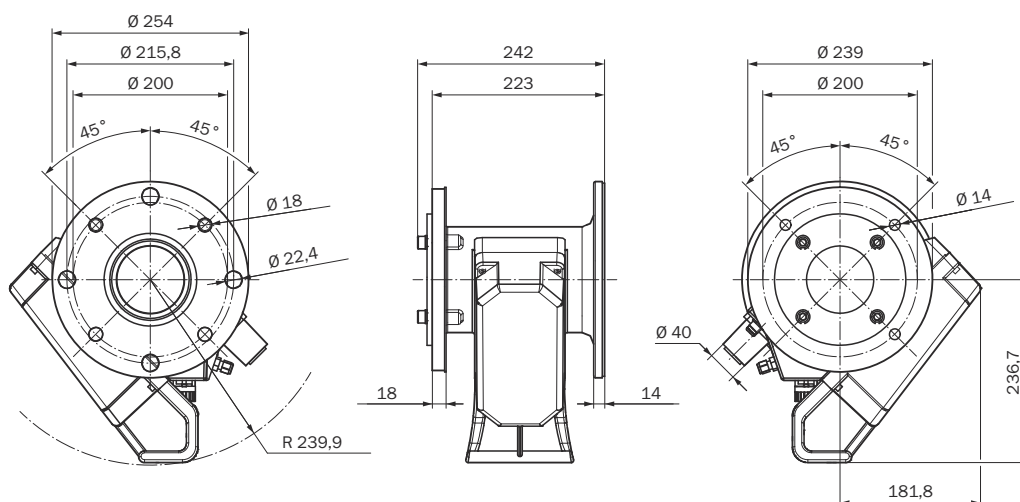


Image 40: Purge air attachment (dimensions in mm)

12.13      Dimension drawing, connection unit

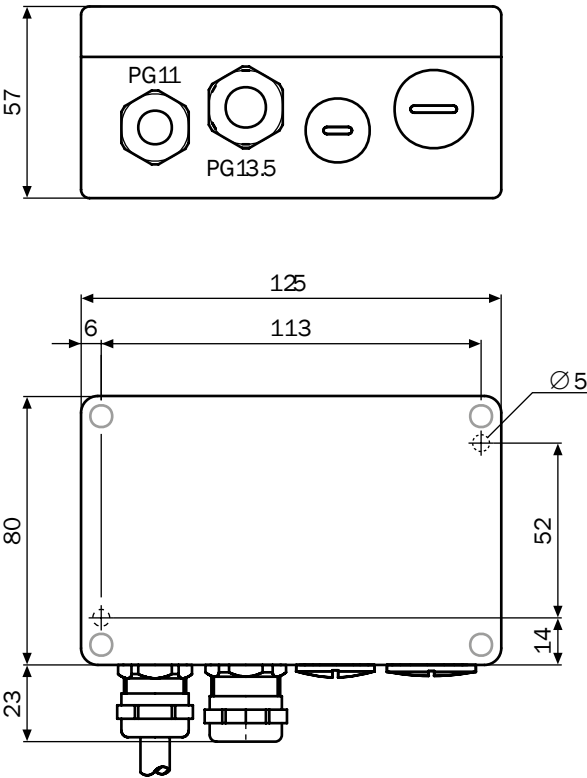


Image 41: Dimensions, connection unit (dimensions in mm)

## 12.14 Dimension drawing, weather hoods

### Weatherproof cover for sender/receiver unit

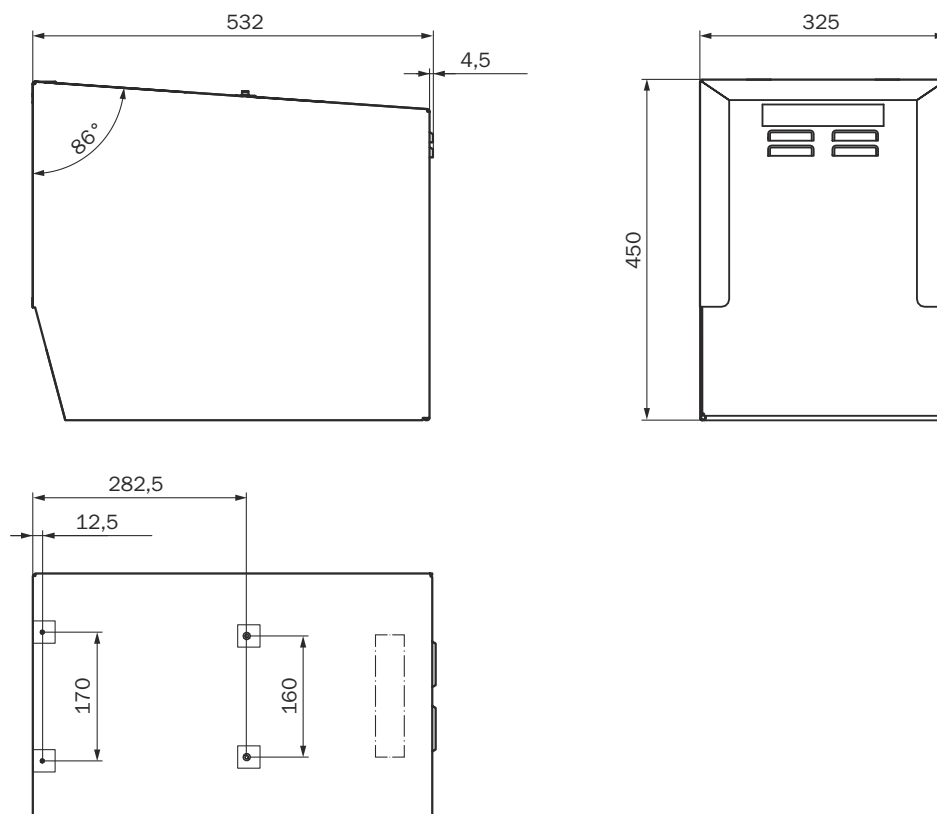


Image 42: Weather hood for sender/receiver unit (dimensions in mm)

### Weather hood for reflector unit

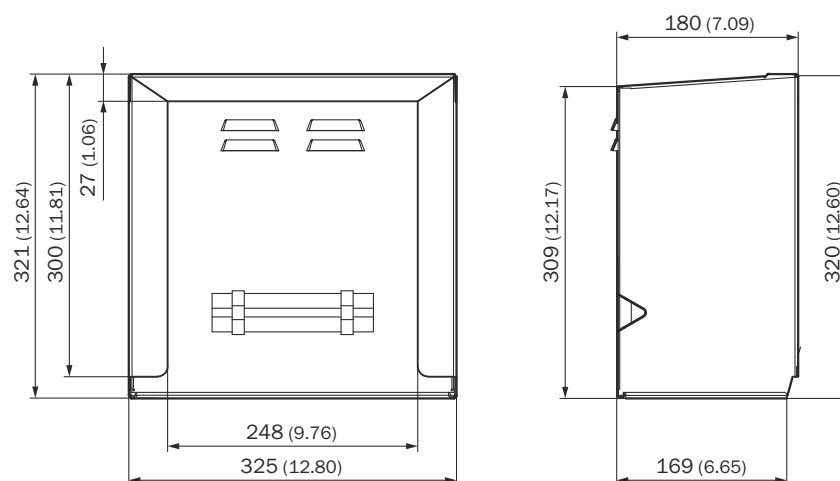


Image 43: Weather hood for reflector unit (dimensions in mm)



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