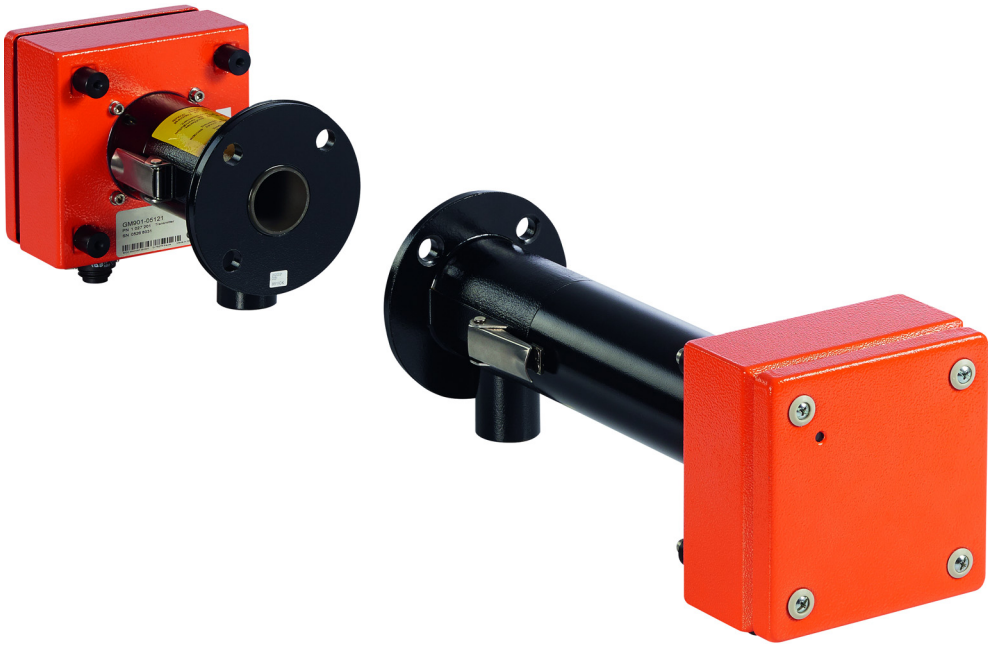
BA02562C/90/EN/01.25-00

Operating Instructions
GM901-S

Carbon Monoxide Gas Analyzer, Cross-Duct Version



Endress+Hauser
People for Process Automation

Described product
Product name: GM901-S
Variant: Cross-Duct version

Manufacturer
Endress+Hauser SICK GmbH & Co. KG
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Legal information

Original document
This document is an original document of Endress+Hauser SICK GmbH & Co. KG.

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Contents

1 About this document

Function of this document

These Operating Instructions describe the standard scope of delivery of CO measuring device GM901-S. They serve understanding the function and describe mounting, installing and commissioning as well as operating the GM901-S.

NOTE: Safety-relevant information in the Operating Instructions

- ▶ Only put the GM901-S into operation after reading the Operating Instructions.
- ▶ Observe all safety information.
- ▶ If anything is not clear: Contact Endress+Hauser.

Retention of Operating Instructions

- This Addendum to Operating Instructions must be kept available for reference with the Operating Instructions.
- Must be passed on to new owners.

Warning symbols in this document

The following symbols are used in these Operating Instructions to identify important safety information for the user. They are located within the respective Sections where the information is required. Safety information, especially warnings, must be observed and followed.


Hazard (general)


Hazard by voltage


Hazard by oxidizing substances


Hazard by noxious substances


Hazard for the environment/nature/organic life

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.

Information symbols


Important technical information for this product


Important information on electrical or electronic functions


Supplementary information

2 For your safety

2.1 Intended use

CO analyzer GM901-S may only be used to monitor CO concentrations. If the device is used for any other purpose or changed in any way, also during mounting and installation, any warranty claims against Endress+Hauser will be rendered invalid.

Persons responsible for safety must ensure that all potential risks of hazards are recognized and avoided in good time.

2.2 Authorized users

All planning, mounting, mounting, commissioning, maintenance and repair work must be carried out by adequately instructed personnel only and checked by the responsible skilled persons.

Persons responsible for safety must ensure the following:

- All safety-relevant work is carried out by qualified personnel only.
- Qualified persons are those who, based on their training, experience or instruction as well as their knowledge of relevant standards, regulations, accident prevention rules and plant conditions, are authorized by those responsible for safety for personnel and the plant to carry out such work. It is decisive that these persons can recognize and avoid any possible hazards in good time.
- These persons have access to the documentation supplied with the system as well as the relevant technical documentation for all work carried out, and these persons adhere to the information in this documentation in order to prevent danger or damage.

2.3 Correct handling

To ensure safety precautions are observed and the device is used for its intended purpose, it is important that:

- The system is used in accordance with the technical data and specifications regarding permissible usage, mounting, connection, ambient, and operating conditions. These conditions are governed by the order documents, device user information (type plates etc.), as well as the documentation supplied with the system, which includes these Operating Instructions.
- Users act in accordance with local, system-specific conditions and with due consideration paid to operational hazards and specifications.
- All measures necessary for conservation of value are observed, e.g., during transport and storage and/or maintenance and inspection.

2.4 Important safety information

Basic measures to prevent property damage and injury to persons

WARNING: Health and material damage due to improper handling of CO measuring device GM901-S

- Observe all safety information and valid safety regulations

NOTE: Responsibility for the safety of a system

If GM901-S is used as a sensor in combination with a regulating and control system, the operator or installer must ensure that a failure or malfunction of GM901-S cannot lead to unallowed hazardous operating states or damage.

WARNING: Hazard through incorrect use

Equipment-internal protective devices can be affected when the device is not used as defined.

- Read the Manual before installation, start-up, operation and maintenance and observe all information on using the device.

Protection against hazards through electrical equipment

WARNING: Health hazard due to electrical accident

GM901-S system components include electrical equipment designed for use in industrial high-voltage plants where the relevant standards and regulations must be observed.

- Disconnect power supply cables before working on power connections or live parts.

Protection against hazards through gases

WARNING: Risk of injury from hot/aggressive gases

When working on the measuring channel with hot and/or aggressive sample gases or a high dust load, unforeseen contact with the sample gas may occur.

- Always use the prescribed/suitable protective clothing and protective mask for all work on the measuring channel.

Protection against overpressure in the measuring channel

WARNING: Risk of injury due to overpressure in the measuring channel

- Never open the enclosure or switch off the purge air feed without taking appropriate protective measures when the channel is pressurized.

Troubleshooting precautions

NOTE: Quick rectification of device malfunctions
Malfunctions on the device should be rectified as quickly as possible to ensure smooth operation. The plant operator must ensure that:

- Maintenance personnel can be alerted immediately and at any time.
- Maintenance personnel are trained to be able to respond to malfunctions on the GM901-S and correctly clear the operational malfunction involved.
- Suitable protective equipment, tools and auxiliary means are available at all times.
- Malfunctions are analyzed by qualified personnel, faults corrected, and operation optimized to prevent similar malfunctions in the future.

Behavior after purge air failure

Certain configurations of the GM901-S measuring system demand immediate or short term measures to protect the measuring system should the purge air supply fail.

WARNING: Risk of fire through hot gas escaping in installations with overpressure conditions
On installations with overpressure, the purge air hose can be severely damaged by escaping hot gas and can catch fire depending on the temperature.

On plants with overpressure and gas temperatures over 200 °C at the same time:

- ► Ensure reverse flow is prevented by fitting a (trip) flap or a valve.
- ► Regularly check the functionality of the reverse flow safeguards.

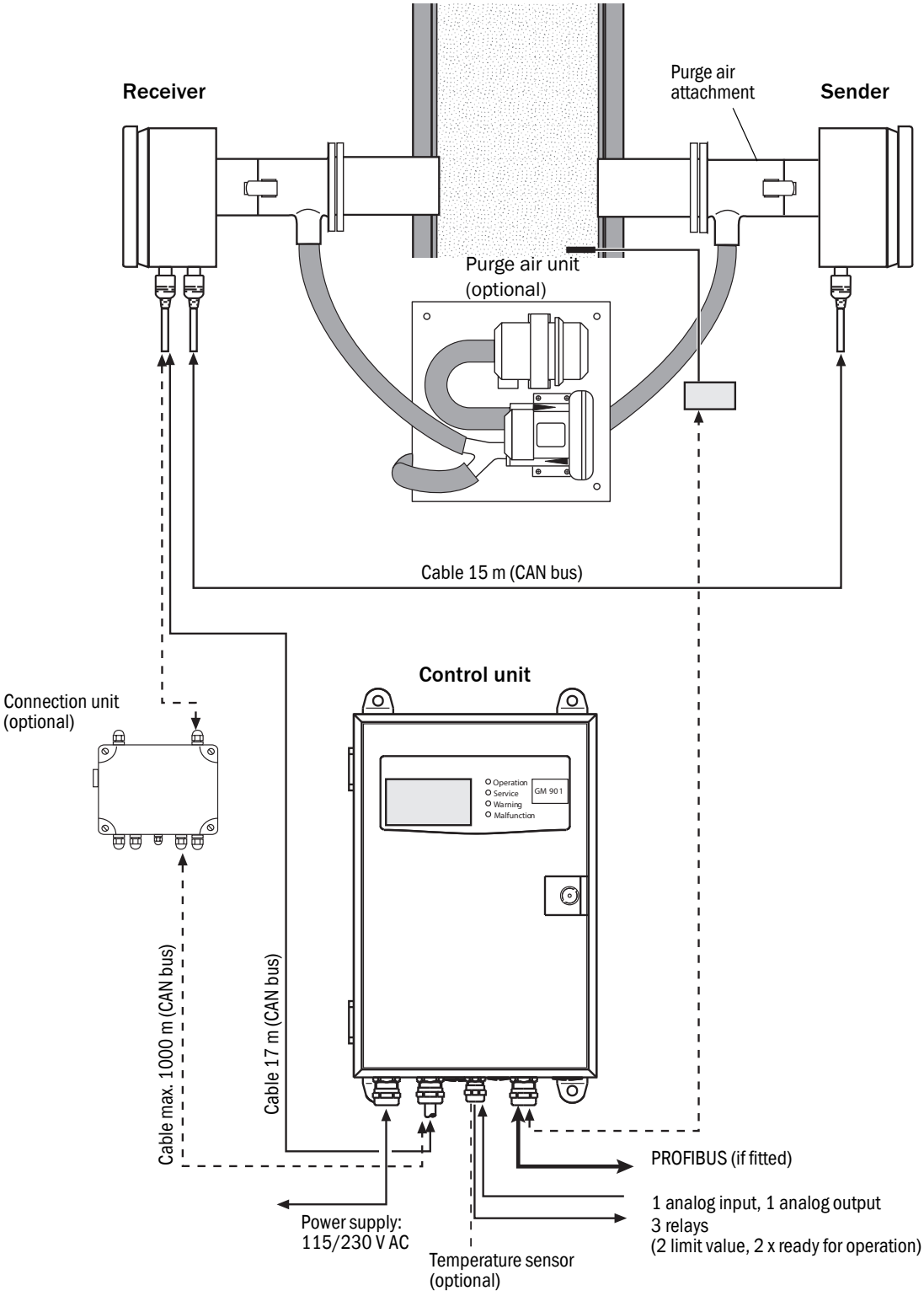
2.5 Environment-friendly behavior

The GM901-S has been designed in accordance with ecological criteria. The assemblies can be easily separated, sorted and recycled. All materials used in the GM901-S are groundwater-neutral.

3 GM901-S overview

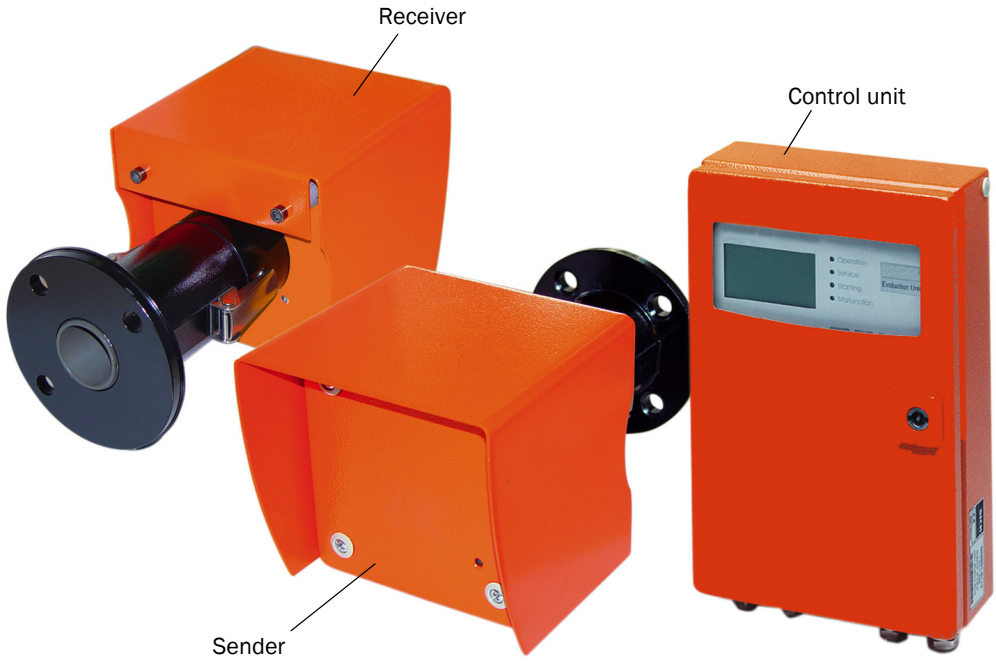
3.1 Device component overview

Fig. 1: Device component overview



3.2 Standard scope of delivery

Fig. 2: CO measuring device GM901-S



The basic configuration of GM901-S comprises:

- Sender
- Receiver
- Control unit with connecting cable (17 m)
- Sender-receiver connection cable 15 m

3.3 Optional accessories

- Connection unit for distances longer between 17 m and 1000 m
- Purge air unit to protect the optical interfaces of sender and receiver
- Flanges
- Optical adjustment device
- CO test cells with holder (SPAN test)
- Adjustment bracket to create a zero path
- Dummy flange
- Temperature sensor PT 1000

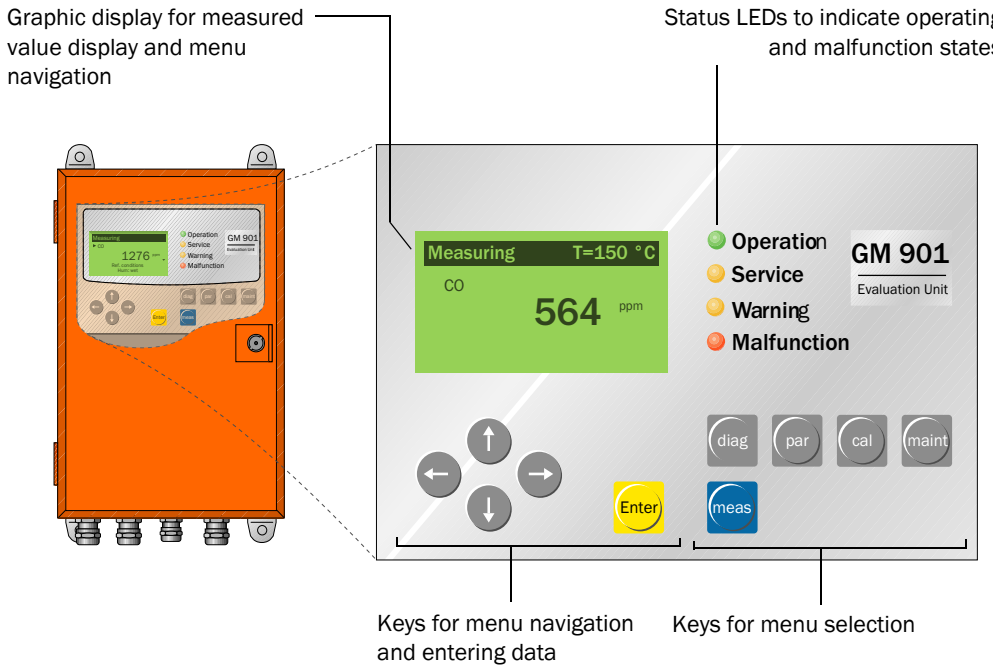
3.3.1 Control unit

The control unit serves as user interface and prepares and outputs the measured values and performs control and monitoring functions. The evaluation unit can be positioned close to the sender; It can also be located up to about 1000 meters from the measuring point, e.g., installed in the switch center or monitoring center of the industrial plant.

Display and operating elements of the control unit

The control unit serves to display, enter and set parameters and control functions on the system. The operating panel with the display, status indicators and key field is accessible when the enclosure door is opened.

Fig. 3: Display and operating elements of the control unit



3.3.2 PROFIBUS interface

The PROFIBUS interface is **not** available on all device versions.

PROFIBUS connects the process control level (e.g., central computer, host, control room) to the measuring device. Measured values, status states and error messages are queried cyclically via the PROFIBUS. The GM901-S supports PROFIBUS-DP-V1 with transfer rates from 9.6 to 187 kBit/s. A device master file (GSD) is available for the control unit to define the interface. It contains specifications on device manufacturer, identification number, transfer rates available, etc. This GSD (Profile GSD) of the device can be easily used for project planning purposes of the PROFIBUS.

A unique 7 bit device address (1-127) serves to identify PROFIBUS participants and can be entered when setting control unit parameters. Addresses 126 and 127 are reserved and must not be used.

A terminator (terminating resistor) must be plugged to the final device.

- Measured values provided

  The measured values provided by the GM901-S are defined in the device master file (GSD) as input channels for the process control level (AI). The following Table shows the measured variables with the respective assigned units of measure:

Measured variable	CO
CO	ppm
CO	mg/m³ normalized
CO	mg/m³ a.c.

4 Mounting

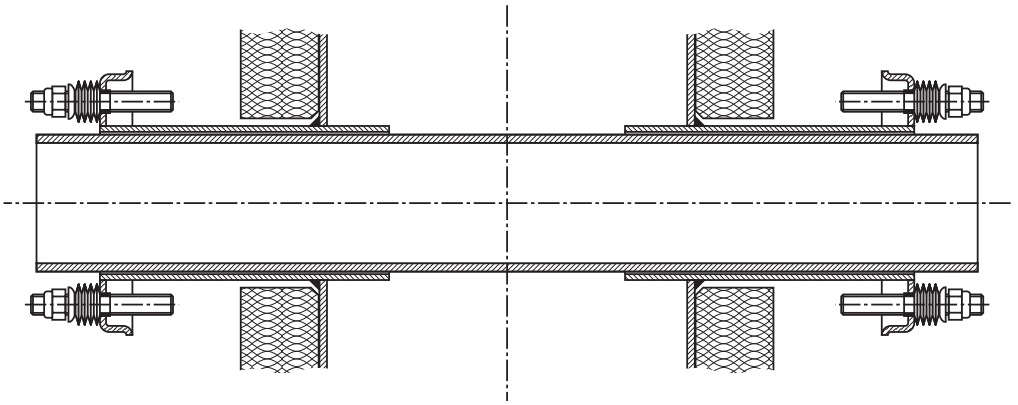
4.1 Installing the flanges with tube

Installing the flanges with tube

NOTE:
The axes of the flanges with tube must be aligned carefully to each other during assembly. The angle deviation must be under 1°. Plan suitable reinforcements or support constructions on thin-walled steel ducts.

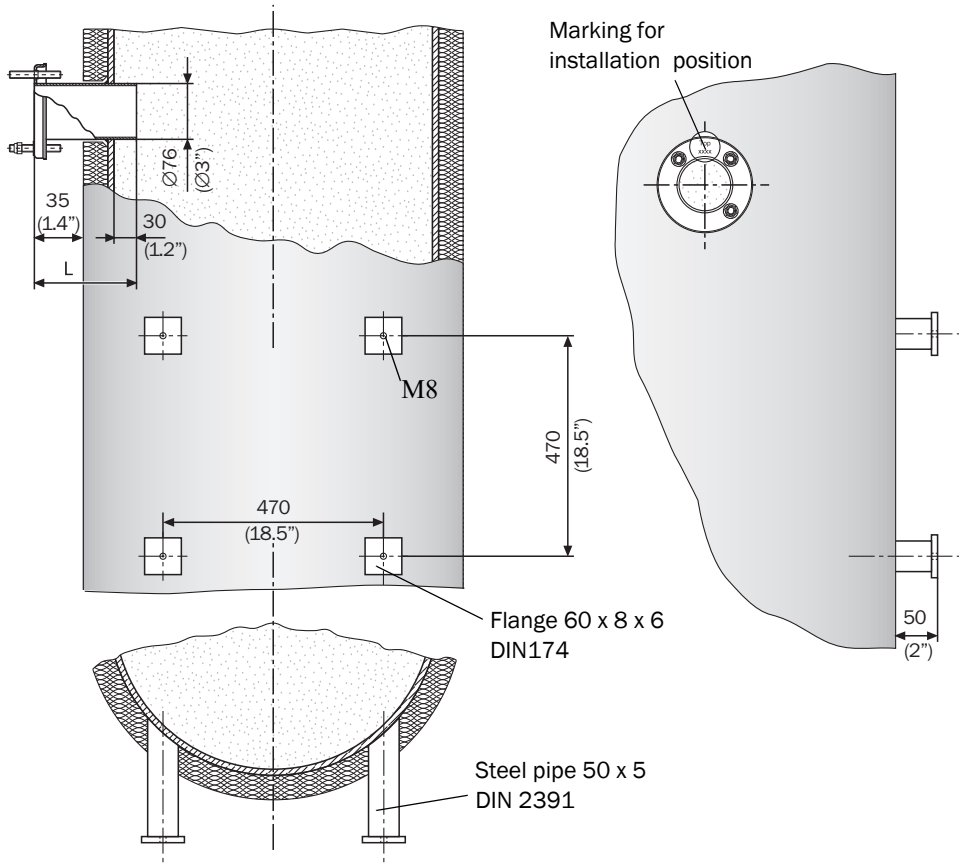
NOTE:
On easily accessible measuring distances up to 2 m, the flanges with tube can be aligned using a suitable auxiliary tube (for standard flange diameter 70 mm).

Fig. 4: Auxiliary tube to align the flanges on measuring distances under 2 m



Use an optical adjustment device on longer or not easily accessible measuring distances.

Fig. 5: Recommendation for installation



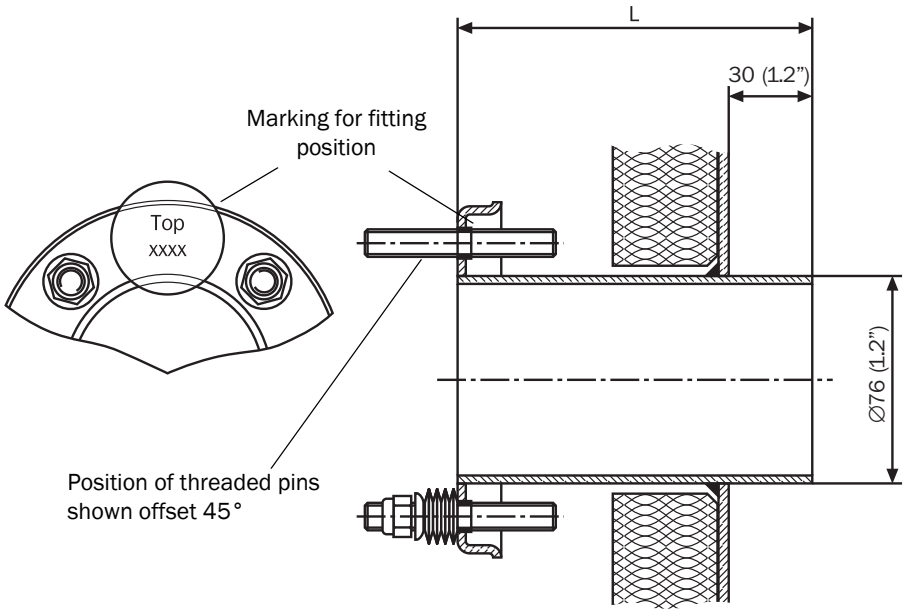
4.1.1 Installing the standard flanges

CAUTION: Possible damage when opening the duct!

▶ Make sure parts cut off do not fall into the duct.

1 Mark the assembly position of the “flange with tube”, cut a hole with a blowtorch.
2 The supports for the “flange with tube” should protrude approx. 30 mm into the duct. If necessary, adjust the tube supports.
3 Tack-weld the flange with tube and maintain the exact measuring distance flange-flange and dimensions for the “Top” marking of the fitting position.

Fig. 6: Flange with tube, standard version



4 To align the flange with tube on-site: Use a tube or the adjustment device.

Fig. 7: Aligning the flange using an optical adjustment device

5 When using the adjustment device, position the light source and the receiver part, see “Aligning the flange using an optical adjustment device”, page 17
6 Align flange No. 1 until the light spot of the light source appears centered in the adjustment circle of the receiver part. Tack-weld flange 1.
7 Reposition the adjustment device swapped.

8 Align flange No. 2 and tack-weld.

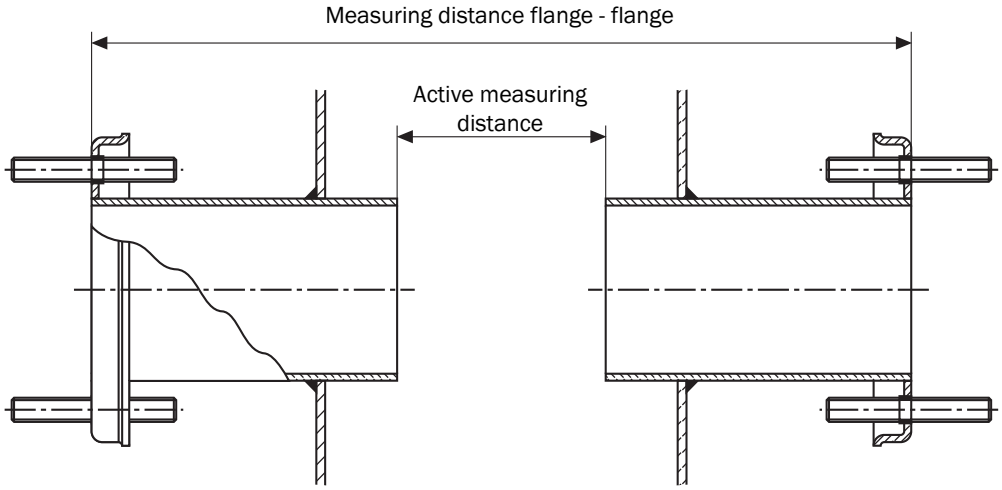
During welding and alignment work, make sure the planned flange - flange measuring distance is observed exactly when a zero path has already been ordered or delivered. Otherwise the zero path must be adapted, see see “Creating the zero path”, page 38.

Table 1: Part numbers of standard flange with tube

Length in mm	Part No.	Material
130	2017845	ST37
240	2017847	ST37
130	2017846	1.4571
240	2017848	1.4571
500	2017849	ST37
500	2017850	1.4571

4.1.2 Measuring distance definition

Fig. 8: Measuring distance flange - flange



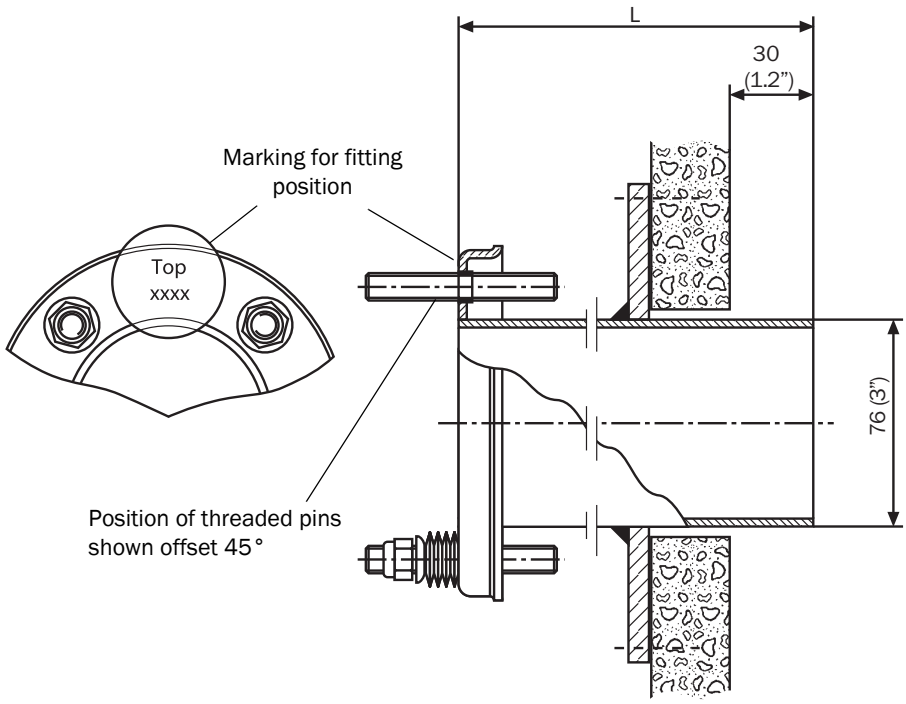
The “flanges with tube” must be aligned exactly within 1°.

1 Correct the alignment when necessary. Circular-weld to finish.
2 Determine and note the exact flange - flange distance and the active measuring distance length. Keep the measures available for commissioning.

4.1.3 Mounting variant for brick stacks

For brick ducts, attach a suitable anchor plate to the stack wall and then weld the flanges with tube on.

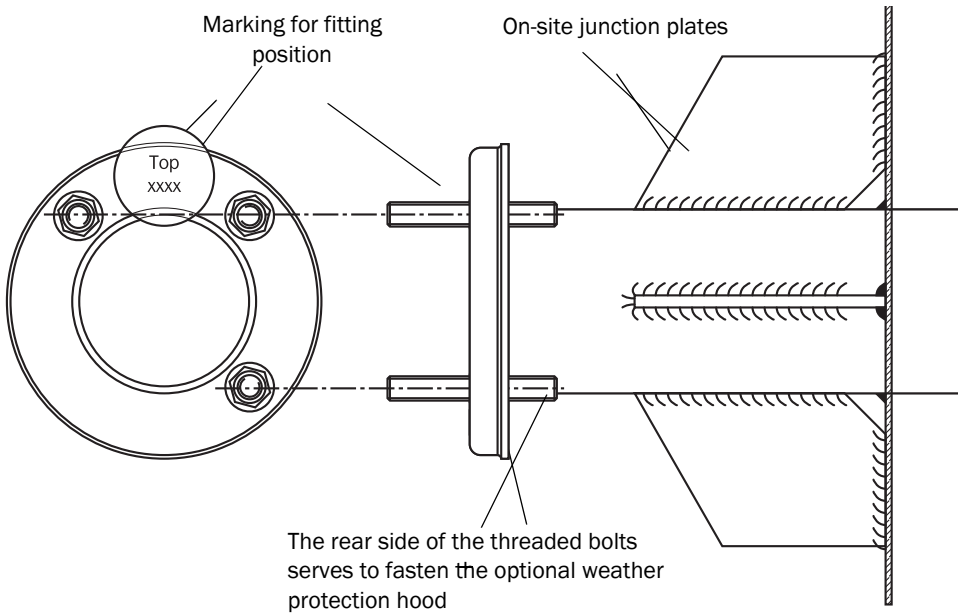
Fig. 9: Flange with tube for brick stacks



4.1.4 Mounting variant for thin-walled ducts

Thin-walled ducts or fitting locations that are subject to vibration must be reinforced by the customer by welding on reinforcing junction plates.

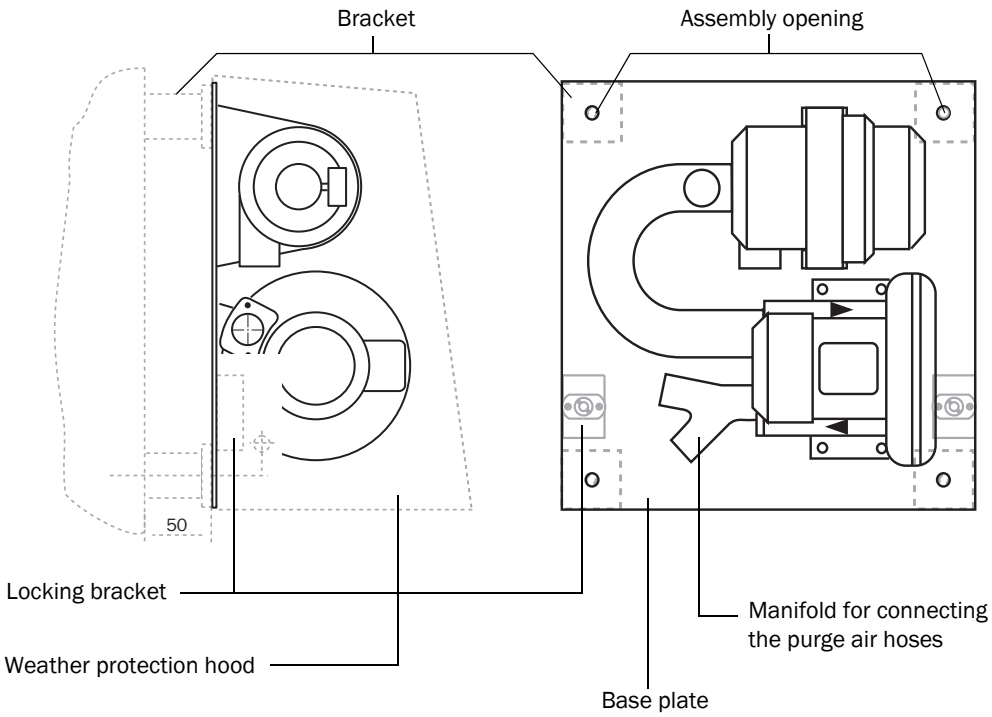
Fig. 10: Example for reinforced fitting location



4.2 Installing the purge air unit

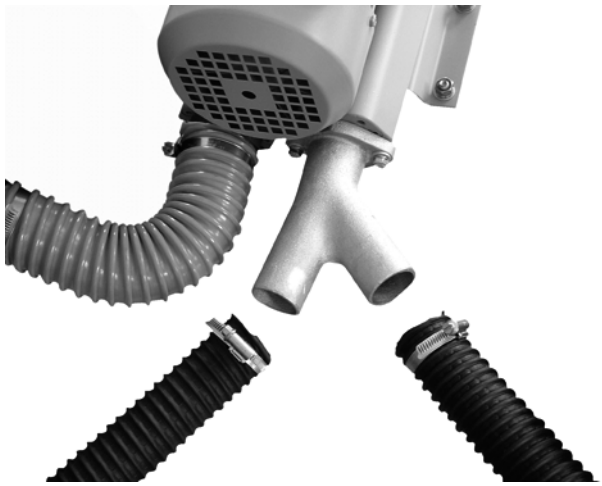
Observe the recommendation for installation when installing the purge air unit, see "Recommendation for installation", page 16.

Fig. 11: Fitting the purge air unit SLV 4



1 Prepare and attach the holders according to the recommendation for installation (see "Recommendation for installation", page 16).
2 Secure the base plate with the purge air unit with 4 screws
3 Prepare the hose lengths:
   – Cut the purge air hoses to the same length and fasten to the Y-piece of the purge air unit with hose clamps.
4 Close off the hose ends when the purge air unit is not going to be used for a longer period.

Fig. 12: Installing the purge air hoses



With optional weather protection hood

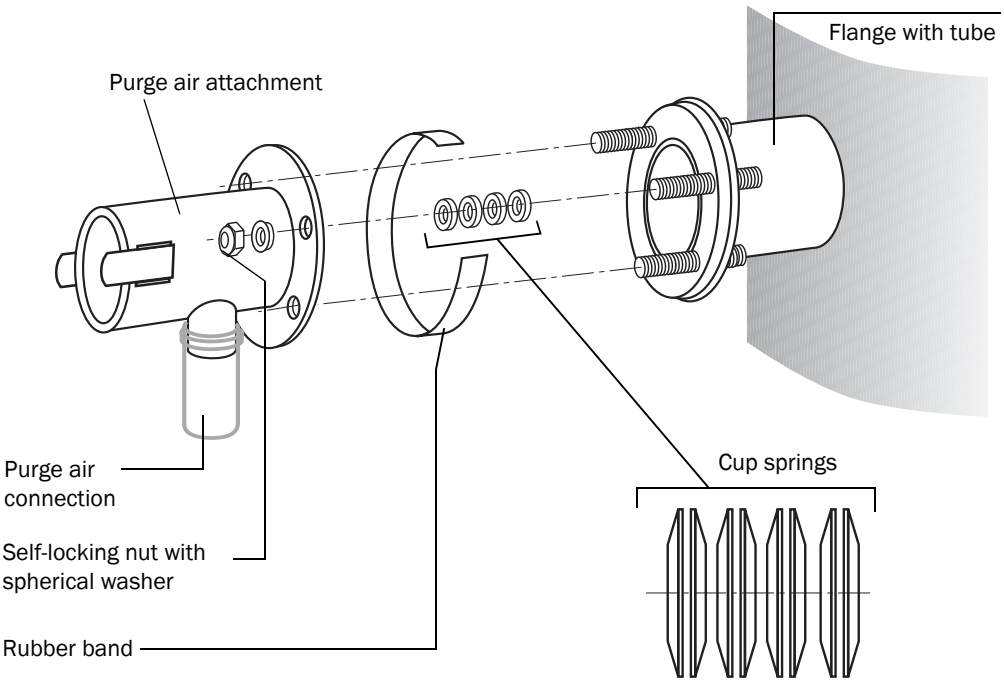
The weather protection hood comprises the hood and a lock set for fastening.

1 Fit the locking bracket with the screws on the base plate of the purge air unit
2 Put the hood on from above
3 Insert the side lock bolts in the counterparts, rotate and latch into place

4.3 Installing the CO measuring device GM901-S

Adjust theGM901-S beforehand to ensure trouble-free installation and, most important, commissioning. A CO-free environment must be available for this zero point adjustment. The adjustment can be made directly at the measuring point when the plant is switched off and the duct free from CO. See see “Starting zero point adjustment”, page 38.

Fig. 13: Installing the purge air attachments on the flange with tube



1. Purge air unit is installed, see “Installing the purge air unit”, page 20.
2. Push the purge air hoses onto the purge air attachments and fasten with hose clamps.
3. Switch the power supply for the purge air unit on, see “Electrical connection of the purge air motor”, page 31.
4. Check that purge air is available on the purge air attachments of the sender and receiver.
5. Pull the rubber band onto the flange with tube.
6. Push 4 cup springs on each of the 3 threaded bolts.
7. Position the purge air attachments of the sender and/or receiver on the flange.
8. Push spherical washers onto the 3 threaded bolts.
9. Turn in the self-locking nuts (SW17) and tighten so that a gap of 8.5...10 mm is between both flange plates.
10. Pull the rubber band over this connection gap.

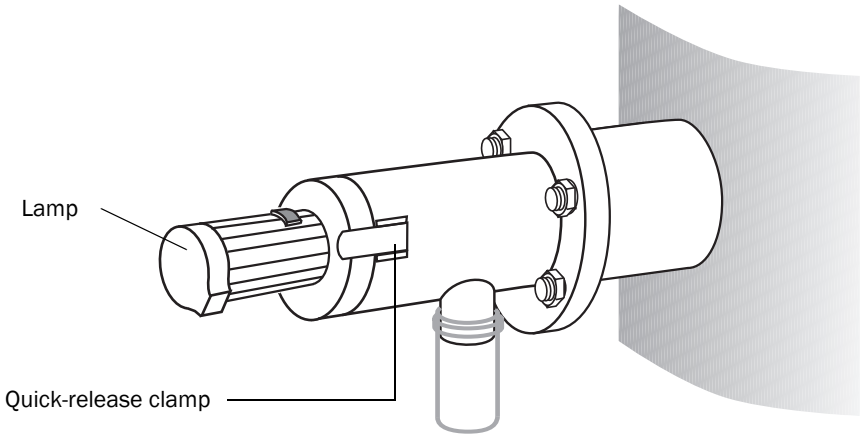
4.3.1 Aligning the optical axis

An adjustment device with a lamp and an optional adjustment tube is available for simple alignment of the purge air attachments.

Fig. 14: Adjustment device (option)

- Fasten the lamp on the sender over the quick-release clamps on the purge air attachment.

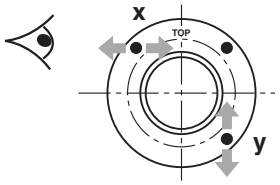
Fig. 15: Optical adjustment device (lamp)

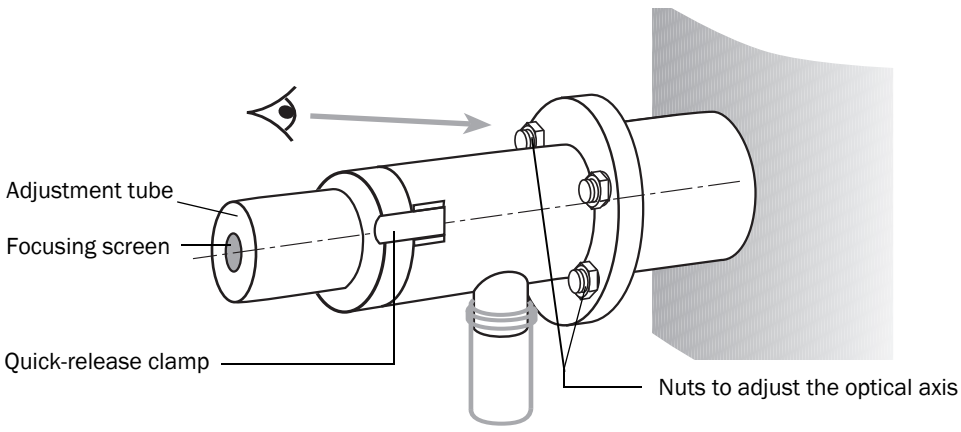


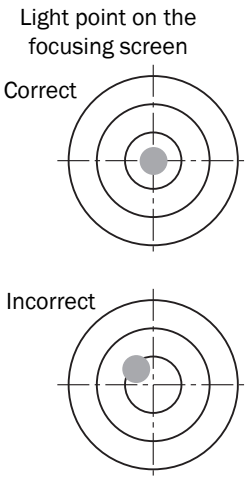
- Fasten the adjustment tube on the receiver using the quick-release clamps on the purge air attachment.

Fig. 16: Aligning the optical axis of sender and receiver

X-Y-adjustment







On the receiver

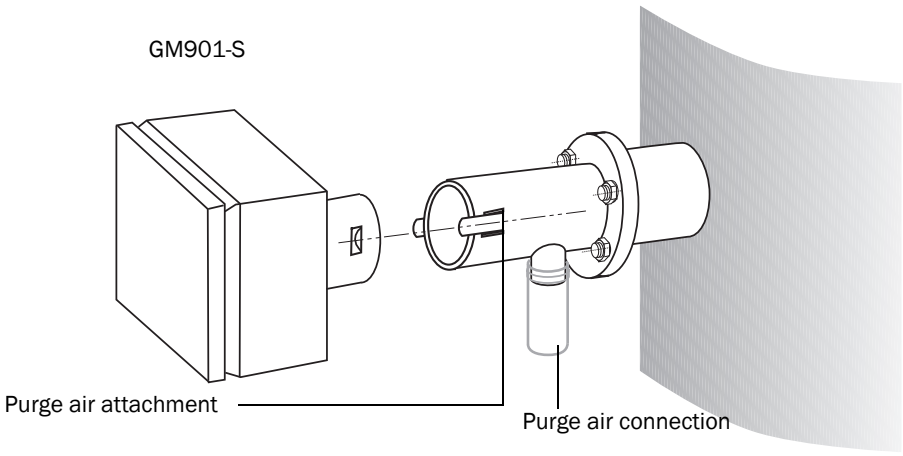
- Tighten the 2 nuts on the horizontal adjustment (X) and vertical adjustment (Y) so that the light spot is shown centered on the focusing screen of the adjustment tube.
- Swap the optical adjustment device on the purge air attachments of the sender and/or receiver.

On the sender

- Tighten the 2 nuts on the horizontal adjustment (X) and vertical adjustment (Y) so that the light spot is shown centered on the focusing screen of the adjustment tube.
- Check the adjustment of the purge air attachments again on both sides.

4.3.2 Installing the sender and receiver

Fig. 17: Fastening the GM901-S



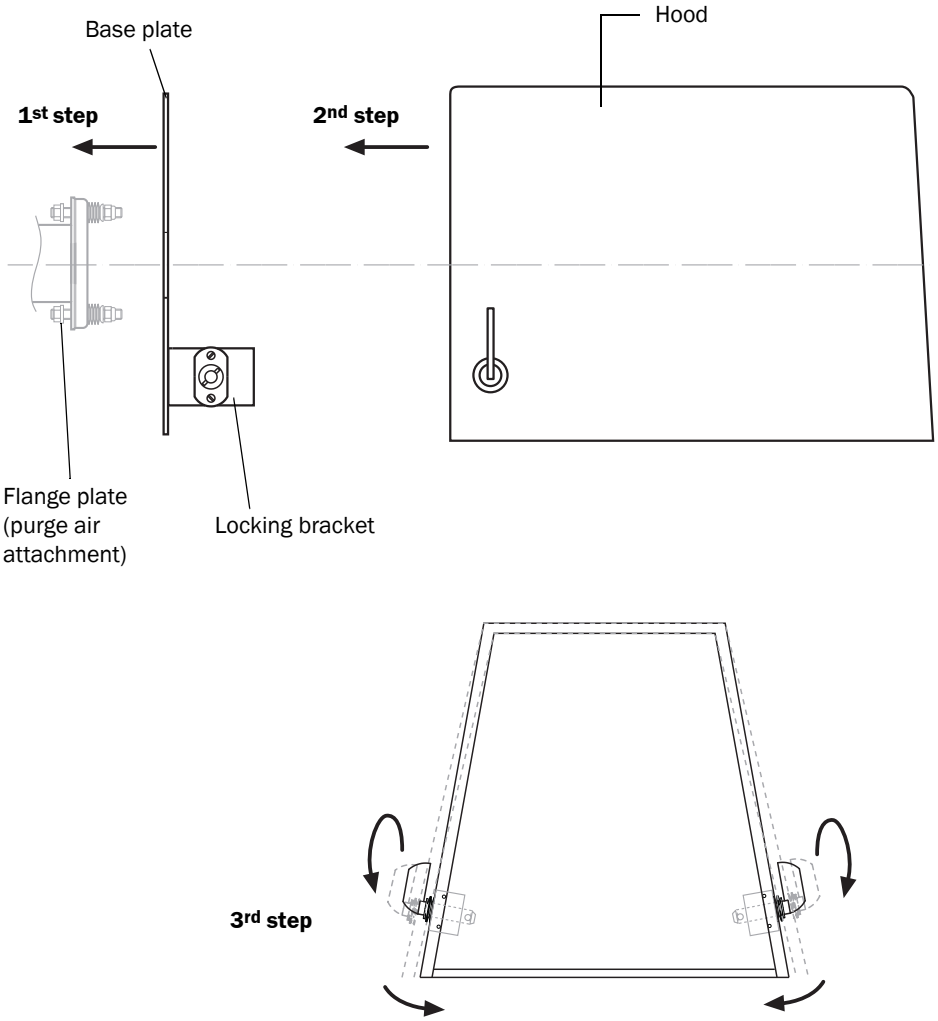
- Remove the optical adjustment device and fasten the sender and receiver using the quick-release clamps.

4.3.3 Installing the weather protection hood for the GM901-S

The optionally available weather protection hood comprises a base plate (with locking bracket) and a hood.

NOTE:
When using the additional weather protection hood, the protective plate must be removed from the receiver.

Fig. 18: Fastening the weather protection hood for the GM901-S



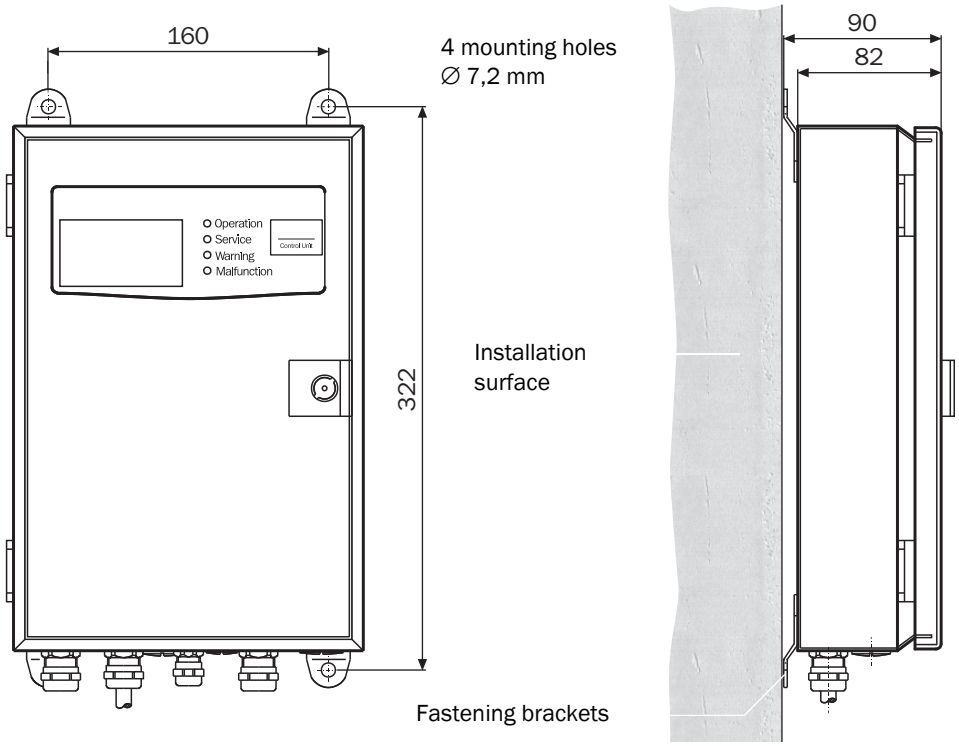
1. Push the base plate onto the side of the flange with tube and screw it to the duct-side surface of the flange plate (purge air attachment) with the threaded bolts provided.
2. Position the hood on the base plate from the top; hold the hood panels slightly apart at the side at the same time.
3. Insert the side holding catches into the counterpieces, twist and lock in.

4.4 Installing the control unit

NOTE: Ensure access is easy and without problems. In particular, make sure the swivel door of the control unit can be opened without hindrance after fitting.

1 Install the control unit on an easily accessible, flat, vertical surface protected from the weather.
2 Drill mounting holes ∅7.2 mm (for M8) at the fitting location according to the Drilling plan.
3 Attach the control unit at the installation location using the 4 planned fastening brackets with suitable screws.

Fig. 19: Installing the control unit



5 Electrical installation

5.1 Safety information

Warning: Risk to electrical safety during installation and maintenance work when the power supply is not switched off

An electrical accident can occur during installation and maintenance work when the power supply to the device or lines is not switched off using a power isolating switch/ circuit breaker.

- Before starting the work on the device, ensure the power supply can be switched off using a power isolating switch/circuit breaker in accordance with DIN EN 61010.
- Make sure the power isolating switch is easily accessible.
- An additional disconnecting device is mandatory when the power isolating switch cannot be accessed, or only with difficulty, after installation of the device connection.
- The voltage supply may only be activated again after work completion or for test purposes by personnel carrying out the work under consideration of valid safety regulations.

Warning: Risk to electrical safety through power supply cable with incorrect rating

Electrical accidents can occur when the specifications of a replacement for a removable power cable have not been adequately observed.

- Always observe the exact specifications in the Operating Instructions (Technical Data Section) when replacing a removable power supply cable.

Caution: Device damage through incorrect or missing grounding

During installation and maintenance work, it must be ensured that the protective grounding to the devices and/or cables involved is effective in accordance with EN 61010-1.

WARNING: Risk to electrical safety through heat damage to cables

When planning the cables, take into account that the connection unit can reach a temperature >60 °C due to self-heating at maximum ambient temperature.

- Only use cables specified for temperatures >80 °C.

5.1.1 Safety instructions for the purge air unit

WARNING: Device damage due to insufficient power of the purge air unit
The standard version of the GM901-S contains one single purge air unit. For high duct overpressure (> 10 mbar), a more powerful fan or one purge air unit each for the sender and receiver can be used divergent from the standard version. A wide range of purge air motors with varying performance and different power connections is available.

► Before starting installation, check the versions and number of purge air units delivered and change circuit planning, if necessary!

CAUTION: Prevent purge air failure due to loss of power supply

- The power connection for the control unit and purge air motor must be stationary.
- Install and secure a separate power supply for the control unit and for the purge air unit.
- Install a dedicated power circuit breaker switch - a motor circuit breaker when possible - for the purge air unit in the vicinity of the measuring devices.
- Position a clearly visible warning sign to secure the switch against unintentional switch-off.

NOTE: A protective phase failure switch is recommended for 3-phase motors.

5.2 Project planning of electrical installation

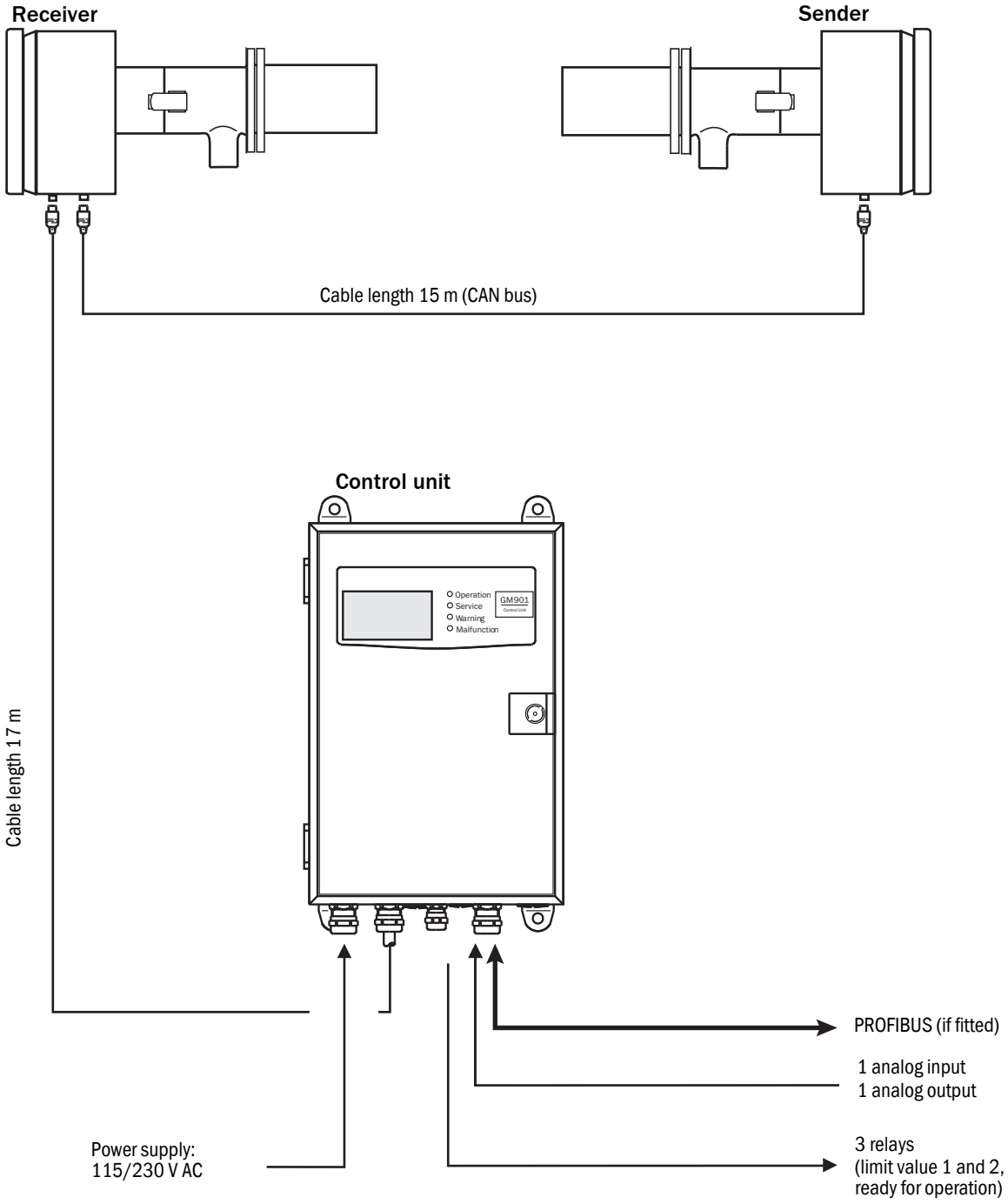
The customer must carry out the installation and final wiring on-site if not otherwise agreed with Endress+Hauser.

To be provided by the customer on-site:

- The main power supply for the GM901-S as well as for the purge air unit (3-phase)
- Signal cables according to task definition
- PE conductors for connection to the exterior of the control unit (to comply with the EMC regulations)

5.3 Electrical wiring for the standard version

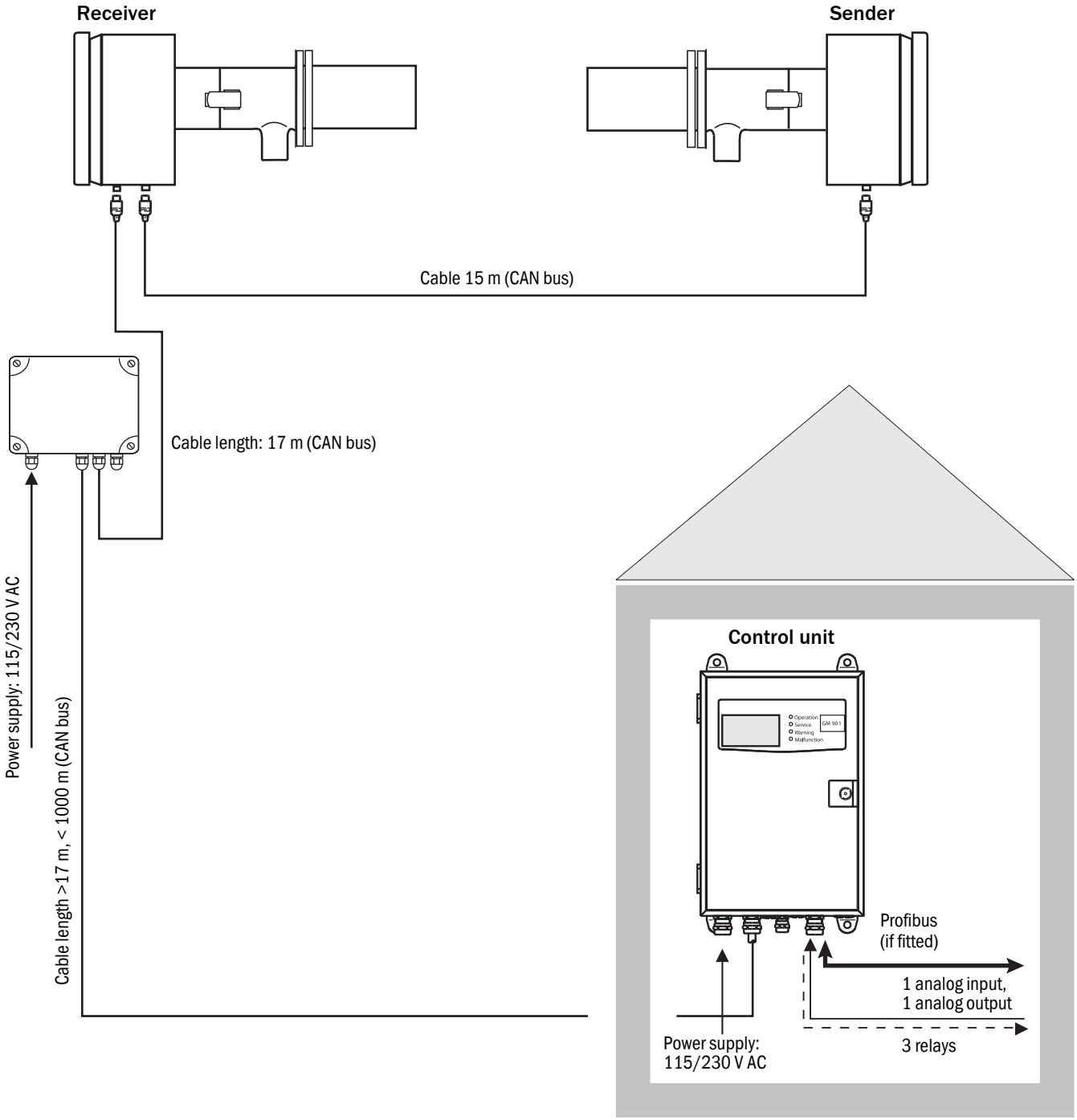
Fig. 20: Electrical connections GM901-S (standard)



▶ Connect system components.

5.4 Electrical wiring with connection unit

Fig. 21: Connection unit for distances up to 1000 m



▶ Connect system components.

5.5 Electrical connection of the purge air motor

Various motors can be connected to the purge air unit. Compare the power voltage and power type against the type plate on the purge air motor before connecting. Only connect when these match!

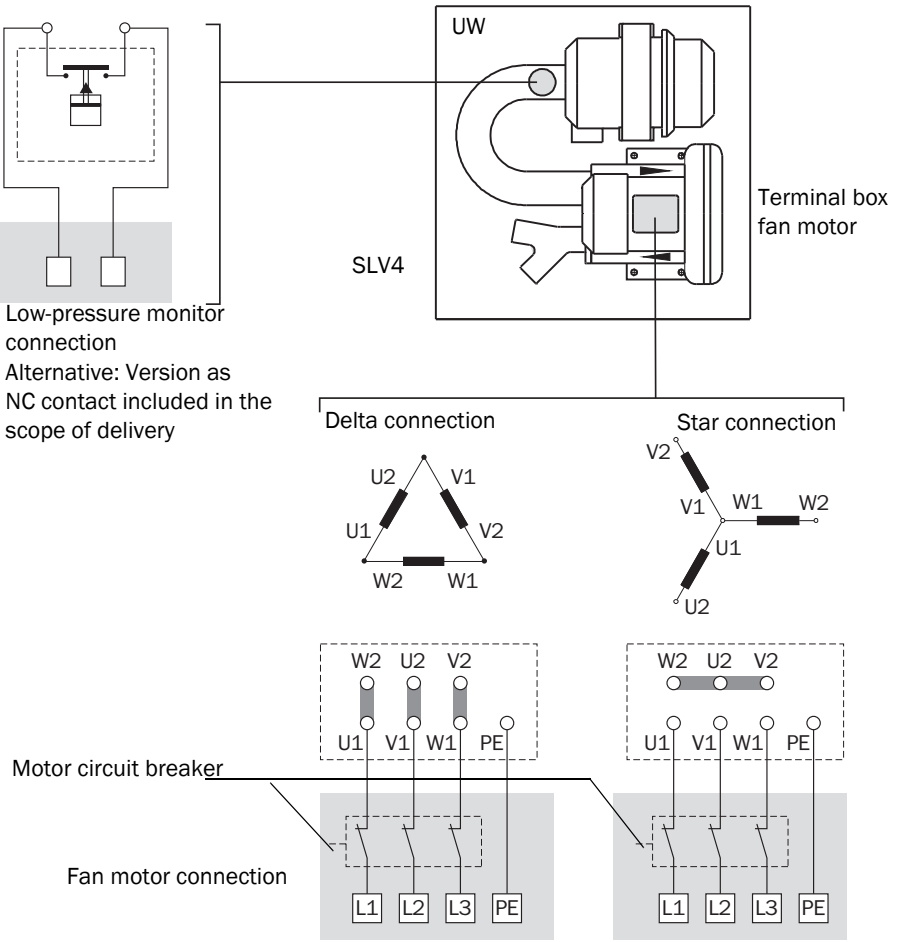
Technical data of purge air supply

	Rated voltage V AC	Rated current A	Power kW	Motor type	Part No.
50 Hz	Δ 200 ... 240 Y 345 ... 415	Δ 2.6 Y 1.5	0.4	2BH1300-7AH16	1 012 409 with 10 m (32 ft) hose 1 012 424 with 5 m (16 ft) hose
60 Hz	Δ 220 ... 275 Y 380 ... 480	Δ 2,6 Y 1.5	0,5		

WARNING: Risk of injury due to electrical accident
Switch the power voltage off before starting work. Observe safety regulations.

- ▶ Switch the power voltage off
- ▶ Connect the purge air motor according to the specifications in the terminal box and the description delivered

Fig. 22: Electrical connection of the purge air supply



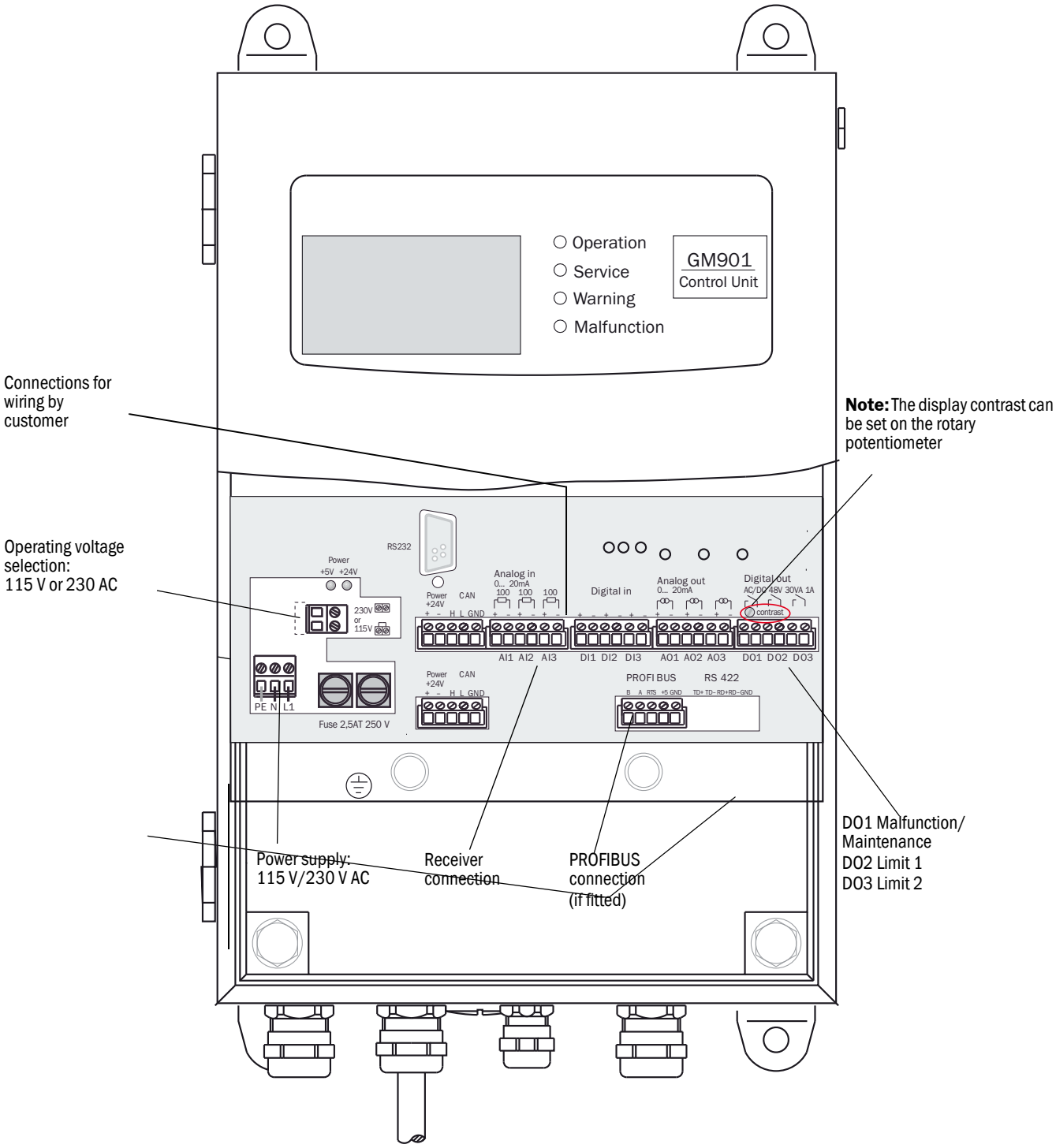
1. Switch the motor on and check the rotation direction: An arrow on the face side of the compressor shows the correct rotation direction. Switch the connections when necessary.
2. Check the function of the motor circuit breaker - if installed - and set it to a value 10% higher than the rated current. Rated current, see type plate.
3. Connect the purge air motor.

NOTE: Important: Check the motor rotation direction!
No air may escape from the intake opening. When the rotation direction is incorrect, the purge air fan suctions gas from the duct which can severely damage the measuring device as well as the purge air unit.

► Switch the voltage connections on the motor when necessary

5.6 Electrical wiring: Control unit

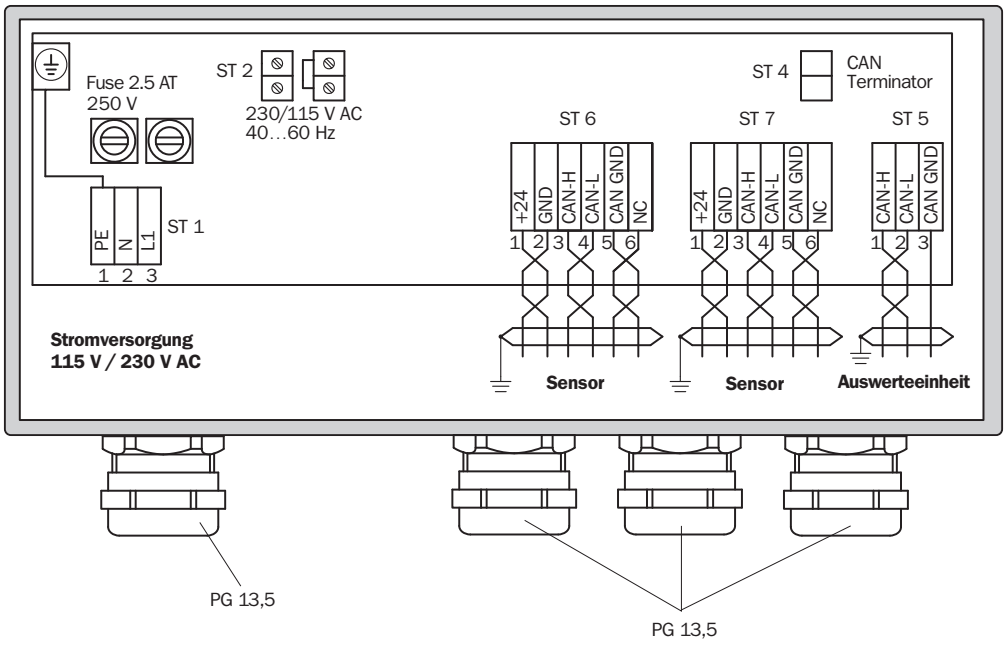
Fig. 23: Electrical connections on the control unit with PROFIBUS (if fitted)



The control unit is delivered from the factory as 230 V AC version.

5.7 Electrical connections of the connection unit

Fig. 24: Electrical connections of the connection unit



Connection on the control unit – terminal strip ST 5

Cable length max. 1000 m

CAN-H / CAN-L / CAN GND

Connection on the GM901-S receiver – terminal strip ST 6 or ST 7

Standard cable (2 m)

+24 V	pk
GND	gy
CAN-H	ye
CAN-L	gn
CAN-GND	bn

6 Commissioning

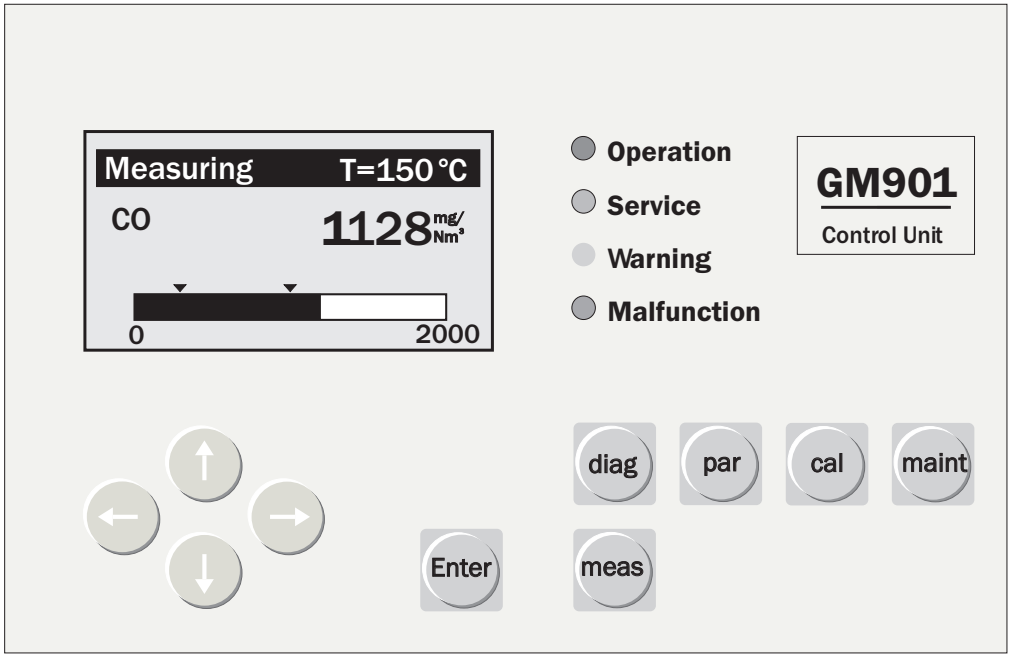
6.1 Requirements for commissioning

The following work must be completed or checked again before commissioning:

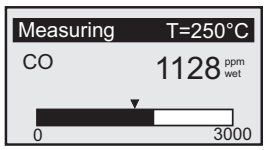
- Check the electric installation
- Check and perform function tests (fan rotation direction) of the purge air unit (option)
- Flange alignment
- Check (measure) the active measuring distance, see “Measuring distance definition”, page 18

6.2 Operating panel of control unit

Fig. 25: Operating panel of control unit



Arrow buttons — for editing units, digits



T=250 °C — Measured value of an external temperature sensor or an internal adjustable substitute value

1128 ppm — Current measured value

0 — Measuring range start value

3000 — Measuring range end value, adjustable

t — Adjustable limit value

6.2.1 Function buttons and submenus

Diagnosis

- Malfunction / Malfunction message
- Warning / Warning messages
- Sensor values / Display of sensor measured values for error diagnosis

Parameters

- Settings / Setting of parameters
  - Physical Unit — Selection of 3 physical units: ppm, mg/m³ N, mg/m³
  - Normalization — Humidity correction
  - Response Time — Time setting from 5 s to 360 s
  - Measuring Range — Measuring range adjustable from 100 ppm to 60,000 ppm
  - Limit Value — Limit value freely adjustable within the selected measuring range
  - Meas. Distance — Measuring path adjustable from 100 mm to 8000 mm
  - Temperature — Exhaust gas temperature: Adjustable as analog input or fixed value up to 500 °C
  - Humidity — Exhaust gas humidity: Fixed value input for normalization and correction
  - Pressure — Pressure: Fixed value input for normalization
  - Analog Out — Analog output: Live Zero 0 mA to 4 mA
  - Calibration — SPAN and zero correction
  - Station address — PROFIBUS sensor address
  - Median Filter — Value input to reduce signal noise
- Device (device data)
  - Serial Number — Serial number
  - Software Revision — Software version
  - Configuration — Configuration of control unit
- Service
  - Calibration Values — Calibration values, device-specific

Calibration

- Zero Adjust — Zero point adjustment
- SPAN Test — SPAN test

Maintenance

- Reset System — Restart system
- Maint Mode — Maintenance mode
- Test analog output — Check power value on analog output
- Test Relays — Relay test
- Reset Parameter — Reset parameters to the default setting
- Init PBUS Warm

- Init PBUS Cold
- Reset PROFIBUS — Loading the default values in PROFIBUS and transferring the sensor address

Measuring mode (Measurement)

- Measuring — Measuring mode

6.3 Zero point adjustment

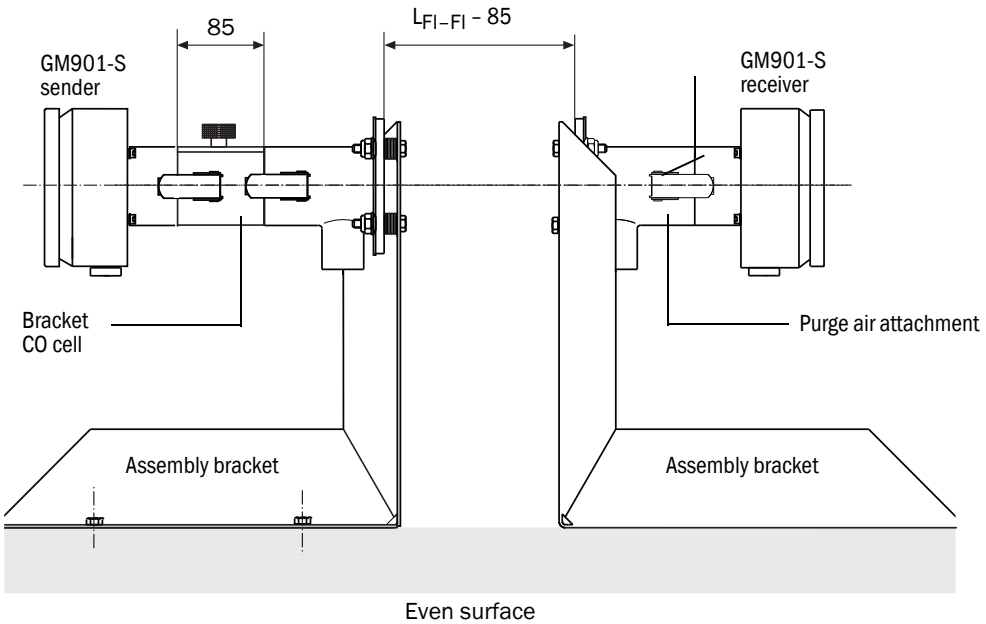
6.3.1 Requirements for the zero point adjustment

- Carry out the zero point adjustment **only** before initial commissioning or recommissioning!
  The environment must be free from CO. The adjustment can be made directly at the measuring point when the plant is switched off and the duct free from CO. If this is not possible, carry out the zero point adjustment with the sender and receiver of the GM901-S on the assembly brackets.
- The system is stable after a warm-up phase of approx. 30 minutes after switching the power supply on.
- Never align the assembly brackets during zero point adjustment!

The purge air attachments of the GM901-S of the must be readjusted on the duct, see “Installing the CO measuring device GM901-S”, page 22! Setting the measuring distance alters the device parameters and therefore this value must be set before the zero point adjustment (see “Measuring path flange - flange and active measuring path”, page 49).

Fig. 26: Zero path of GM901-S

L_{Fl-Fl}... Measure - flange - flange of the duct measuring distance



6.3.2 Creating the zero path

1 Have the assembly bracket for zero point adjustment ready.
2 Remove the purge air attachments from the sender and receiver and secure them on the assembly bracket (available as an option).
3 Attach the bracket for the CO cell, e.g., on the sender; but do **not** use a cell filled with CO (when a sensitivity test is also planned.)
4 Adjust the assembly bracket to the flange - flange (cell holder) measure minus 85 mm of the duct measuring distance. See also see “GM901 -S sender with test cell holder”, page 40.
5 Align the purge air attachments optically using the adjustment device.
6 Fasten the sender and receiver on the purge air attachments.

Fig. 27: Alignment using the adjustment device (lamp, tube)

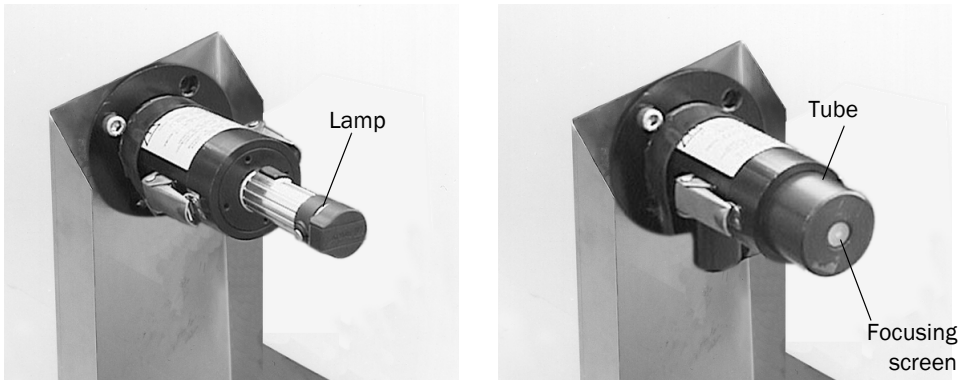
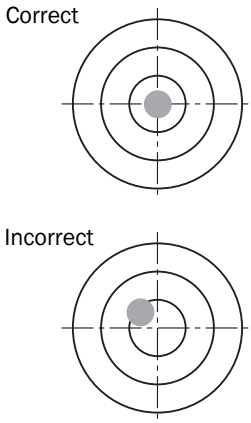


Fig. 28: Light point on the focusing screen



NOTE: Do not change the alignment of the assembly brackets.

6.3.3 Starting zero point adjustment

▶ Press CAL on the operating panel of the control unit to start zero point adjustment (see “Zero point adjustment”, page 61).

6.3.4 Fitting the GM901-S CO measuring device on the duct

1 Remove the sender and receiver from the purge air attachments.
2 Remove the holder for the CO cells.
3 Remove the purge air attachments from the assembly bracket.
4 Keep the zero path parts such as assembly bracket, holder for CO cells, in a safe place.
5 Mount the GM901-S at the measuring point, see “Installing the sender and receiver”, page 24.
6 Manual SPAN test (optional) for linearity control.

6.3.5 Test cells

Test cells are available depending on the application-specific measuring range, measuring path and test point (e.g., 70%).

6.3.6 Determining the test values

Determine the test concentration (test cell value) using the following formula:

TW [ppm · m] = MB [ppm] · x · S[m]

TW = Test value
MB = Full scale value
S = Measuring distance
x = Test point location

To convert mg/m³ N to ppm: 1 mg/m³ N = 0.8 ppm

Example: Full scale value MB = 1500 ppm
Active measuring distance S = 4 m
Test point at 70% of MB x = 0.7

TW [ppm · m] = MB [ppm] · x · S[m]
TW [ppm · m] = 1500 [ppm] · 0.7 · 4 [m]
TW [ppm · m] = 4200 [ppm · m]

The test cell should have the value 4 200 ppm · m.

6.3.7 Performing the SPAN test

- Preparations for performing the SPAN test, see “SPAN test”, page 62.
- Insert test cell holder into sender.

Do not insert a cell filled with CO yet.

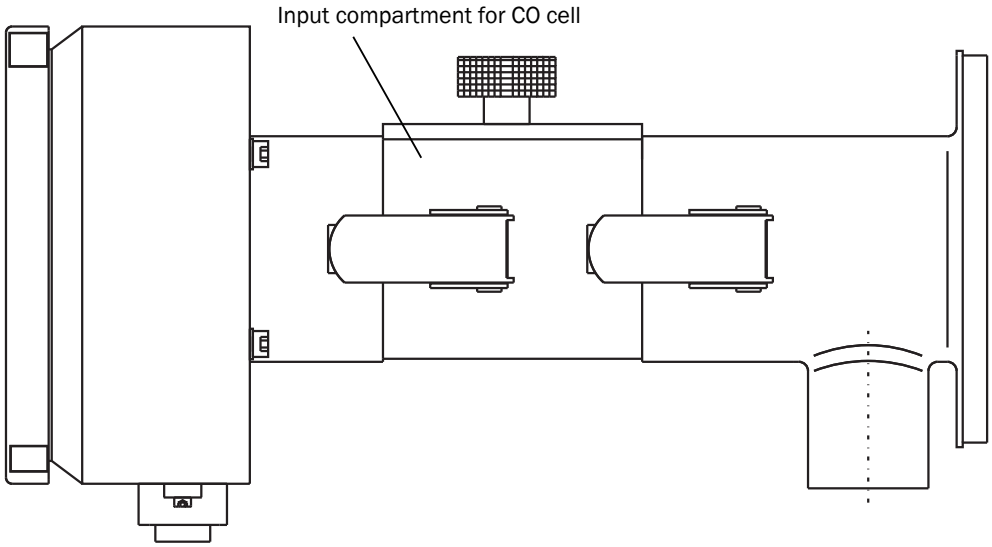


Fig. 29: GM901 -S sender with test cell holder

- Press CAL on the operating panel of the control unit to start the SPAN test (see “SPAN test”, page 62) and follow the instructions displayed.

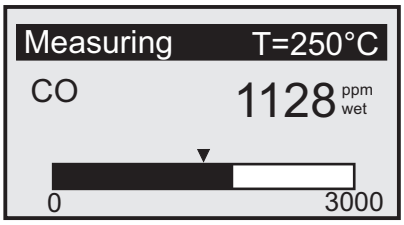
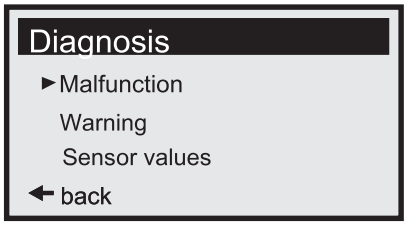
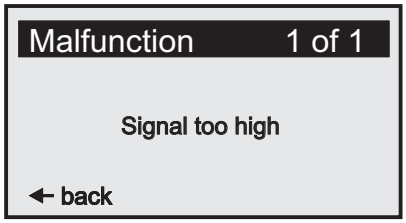
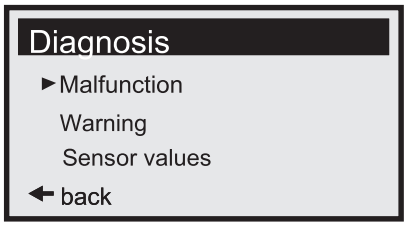
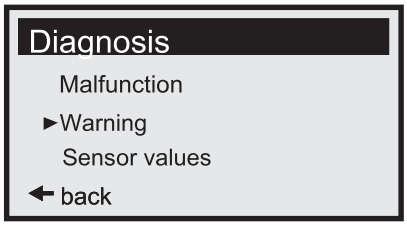
6.4 Preset parameter values

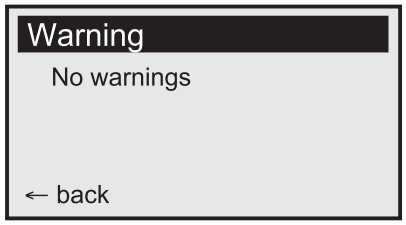
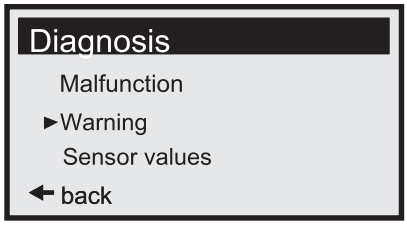
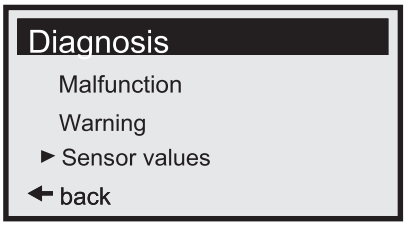
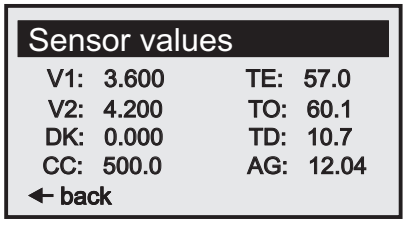
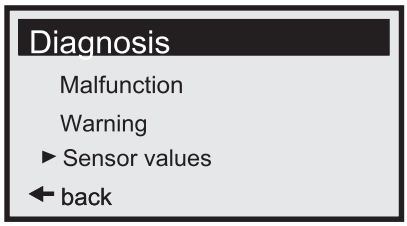
- Parameter Settings
  - Physical Unit ppm
  - Normalization wet
  - Response Time 6 s
  - Measuring Range 0 ... 30,000 ppm
  - Limit Value 1 18,000 ppm
  - Limit Value 2 25,000 ppm
- Measuring Distance
  - Flange to flange _1,000 mm (98.4 in)
  - Active Measuring Distance _900 mm (78.7 in)
- Temperature
  - Substitute 250 °C (480 °F)
  - External Ana-In
  - Scale Low __0 °C (32 °F)
  - Scale High 400 °C (930 °F)
  - Input Low _4.0 mA
  - Input High 20.0 mA
- Humidity
  - Substitute 25%(Vol.)
- Pressure
  - Substitute 1013 hPa (14.7 psi)
- Analog Out
  - Live Zero 4 mA
- Calibration
  - Span 1.00
  - Zero +000
- Median Filter
  - Size 1 (off)
- Parameter Device
  - Serial Number _ _ _ _ _ _ _ _Entered during final inspection
- Software Revision
  - Sensor Unit _ _ _ _ _ _ _ _ _ _ _ _ Current software version
  - Evaluation Unit _ _ _ _ _ _ _ _ _ _ _ _ Current software version
  - Configuration _ _ _ _ Type code of the control unit
- Service
  - C1 Determined by zero point adjustment
  - C2 Determined by zero point adjustment
  - C3 Factory data,
  - C4 assigned to the GM901-S
  - C5 receiver.
  - C6 (individual for each device)
  - C7
  - C8

7 Setting the parameters

7.1 Diagnosis

Return or Cancel: Press “**Arrow left**” (back)
Return at any time to Measuring mode: Press “**meas**”.

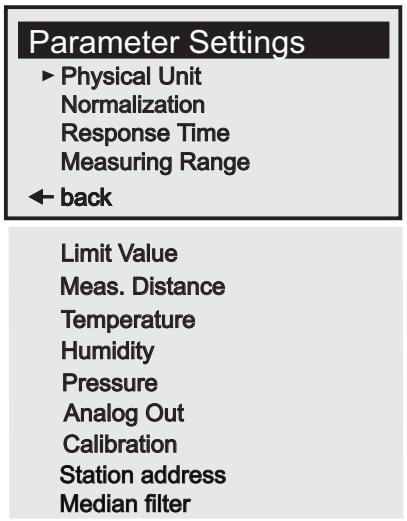
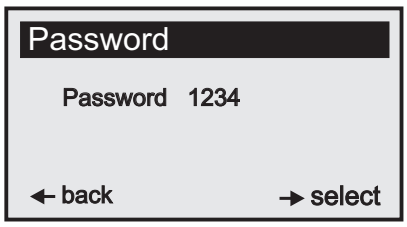
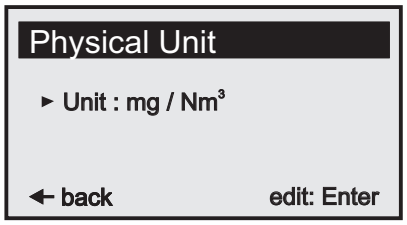
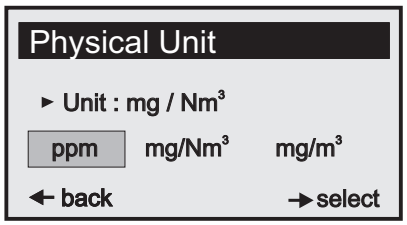
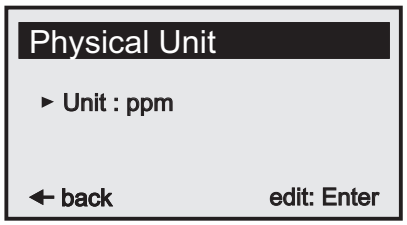
Display	Action	Note
	Press “**diag**”	Display switches to Diagnosis mode
	► Select “Malfunction” with ”**Arrow down**” ► Press “**Enter**”	Display of malfunction messages
	► Press “**Arrow left**” (back)	Display of possible malfunctions, see “Malfunctions”, page 76
		
	► Select “Warning” with “**Arrow down**” ► Press “**Enter**”	Display of warning messages

Display	Action	Note
	▶ Press “**Arrow left**” (back)	Display of possible warnings (see “Warnings”, page 75) and malfunctions (see “Malfunctions”, page 76)
		
	▶ Select Sensor values with “**Arrow down**” ▶ Press “**Enter**”	Display of sensor measured values for error diagnosis
		Use these data when completing the Diagnosis form, see “Diagnosis form (see next page)”, page 81,
		

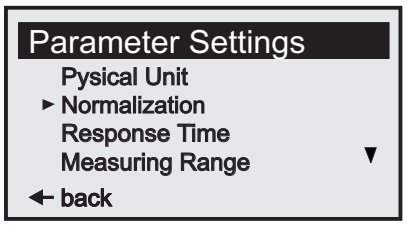
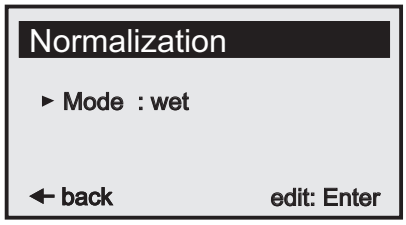
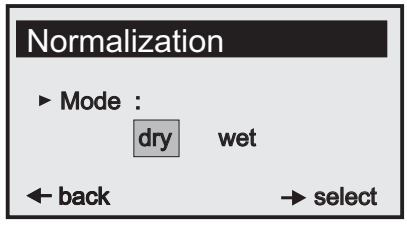
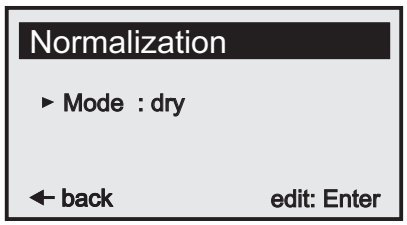
7.2 Setting the parameters

7.2.1 Settings

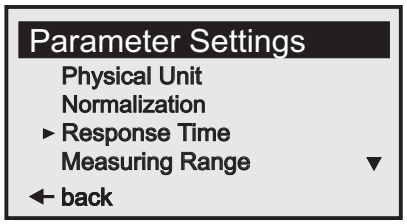
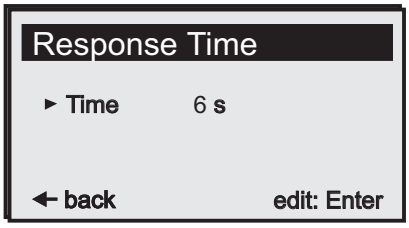
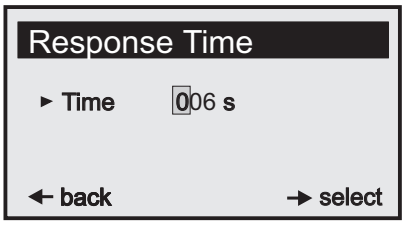
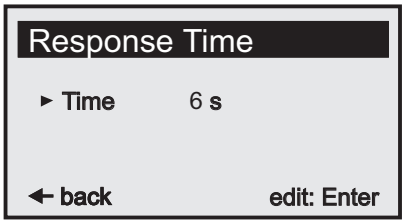
7.2.1.1 *Physical unit*

Display	Action	Note
	► Select “**Physical Unit**” ► Confirm with “**Enter**”	All parameters that can be edited are accessible in this menu
	► Enter password and press “**Enter**”	The password is 1234 The password remains active for 30 minutes
	► Press “**Enter**”	Display of physical unit
	► Select with “**Arrow right**” ► Confirm with “**Enter**”	Selection of physical unit
	► Press “**Arrow left**” (back)	Display returns to selection screen

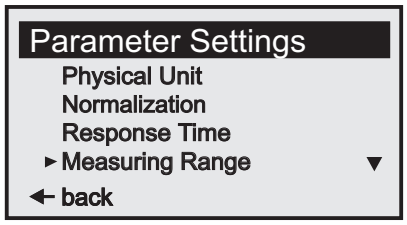
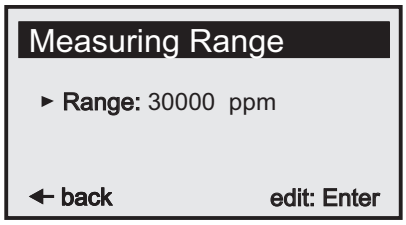
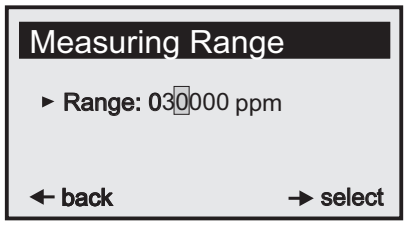
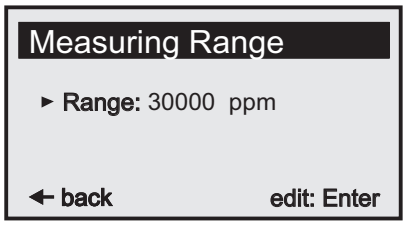
7.2.1.2 *Normalization*

Display	Action	Note
	▶ Select “Normalization” ▶ Press “**Enter**”	Measured value normalization
	▶ Press “**Enter**”	Default factory setting
	▶ Select with “**Arrow right**” ▶ Press “**Enter**”	Confirm with “**Enter**” to save new mode.
	▶ Press “**Arrow left**” (back)	Display returns to selection screen

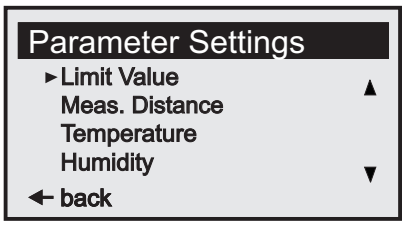
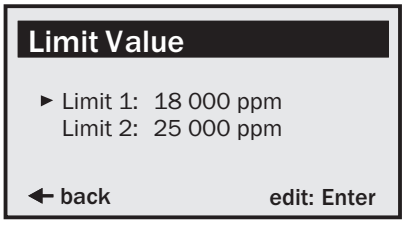
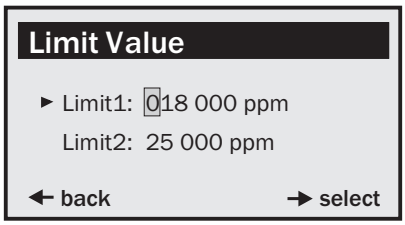
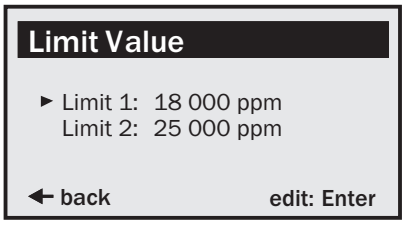
7.2.1.3 *Response time*

Display	Action	Note
	▸ Select “**Response Time**” ▸ Press “**Enter**”	Response time
	▸ Press “**Enter**”	Basic factory setting: 6 s Min: 5 s Max: 360 s Note: The Median Filter value can affect the response time, see “Median Filter”, page 58.
	▸ Select with “**Arrow right**” ▸ Enter new value with “**Arrow up**” or “**Arrow down**” ▸ Press “**Enter**”	Confirm with “**Enter**” to save new value.
	▸ Press “**Arrow left**” (back)	Display returns to selection screen

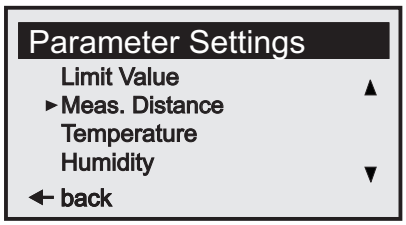
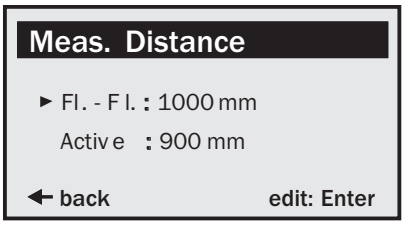
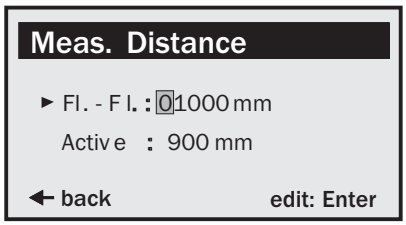
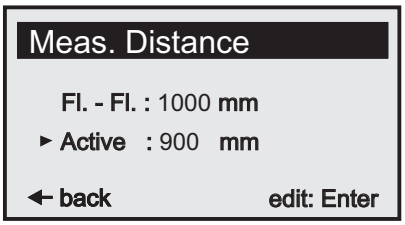
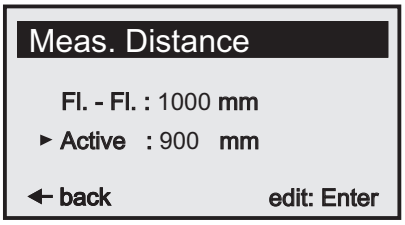
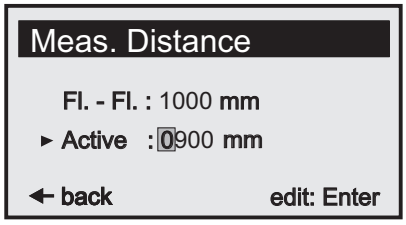
7.2.1.4 *Measuring range*

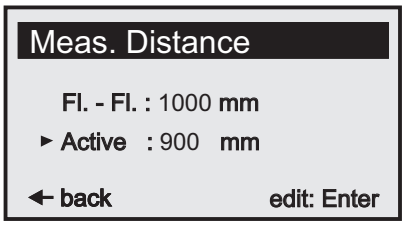
Display	Action	Note
	► Select “**Measuring Range**” ► Press “**Enter**”	Measuring range
	► Press “**Enter**”	Basic factory setting: 30 000 ppm Min: 100 Max: 60 000
	► Select with “**Arrow right**” ► Enter new value with “**Arrow up**” or “**Arrow down**” ► Press “**Enter**”	Confirm with “**Enter**” to save new value.
	► Press “**Arrow left**” (back)	Display returns to selection screen

7.2.1.5 *Limit value*

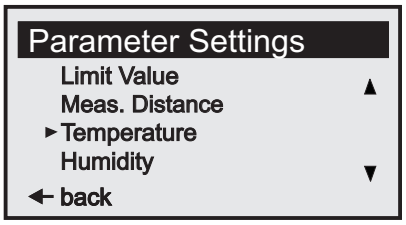
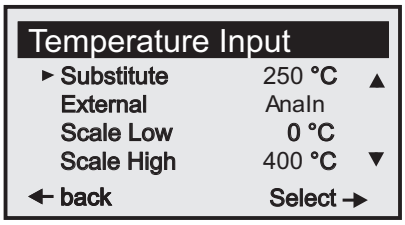
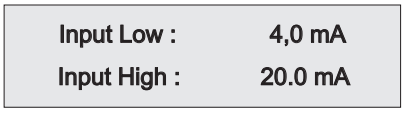
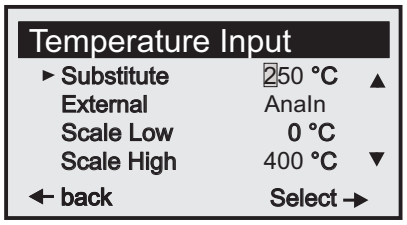
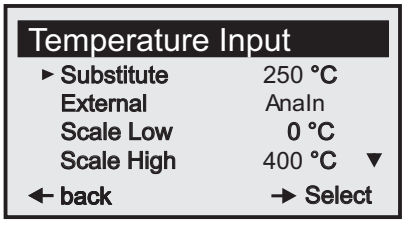
Display	Action	Note
	► Select “**Limit Value**” ► Press “**Enter**”	Limit value
	► Press “**Enter**”	Basic factory setting: 18000 - 25000 ppm **Attention**: Is the value within the selected measuring range?
	► Select with “**Arrow right**” ► Enter new value with “**Arrow up**” or “**Arrow down**” ► Press “**Enter**”	Confirm with “**Enter**” to save new value.
	► Press “**Arrow left**” (back)	Display returns to selection screen

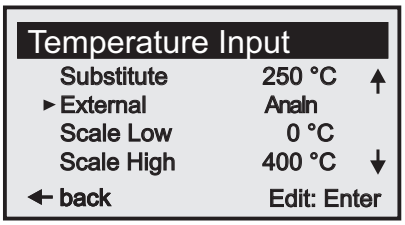
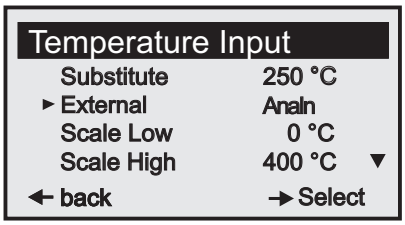
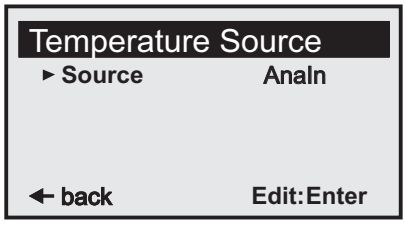
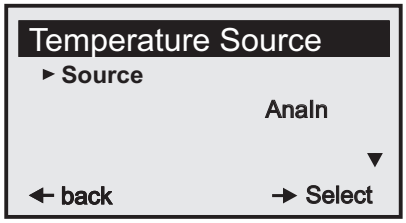
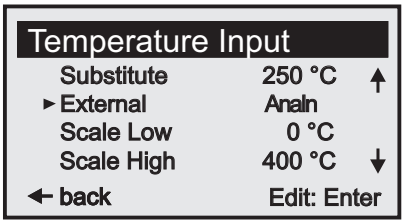
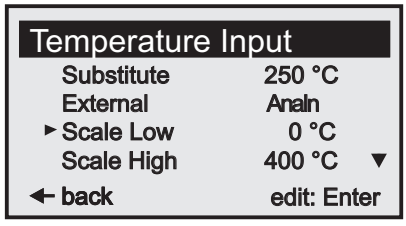
7.2.1.6 *Measuring path flange - flange and active measuring path*

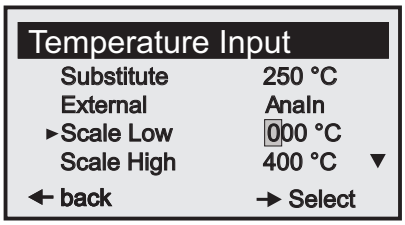
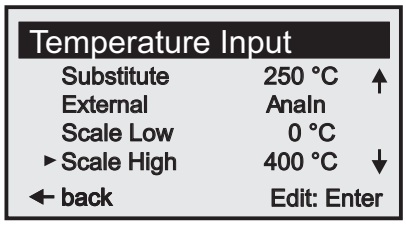
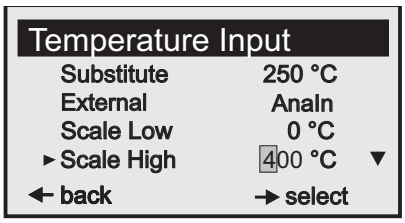
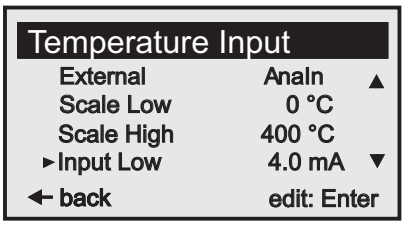
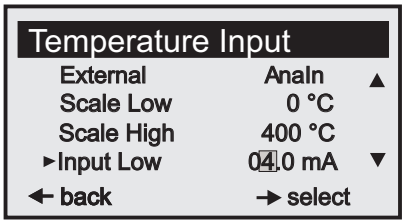
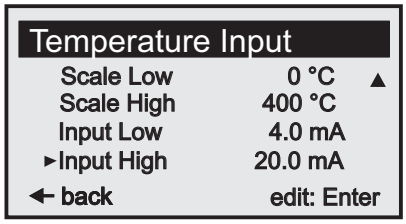
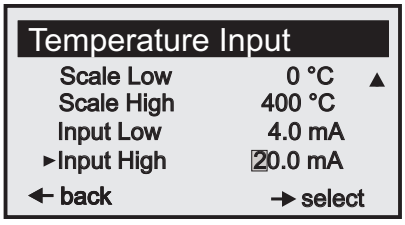
Display	Action	Note
	► Select “**Meas Distance**” ► Press “**Enter**”	Measuring distance Setting the measuring distance alters the device parameters and therefore this value must be set before the zero point adjustment.
	► Select “**Fl.-Fl.**” and confirm with “**Enter**”	Basic factory setting for measuring distance Fl.-Fl.: 1000 mm Min: 500 mm Max: 8 000 mm
	► Select with “**Arrow right**” ► Enter new value with “**Arrow up**” or “**Arrow down**” ► Press “**Enter**”	Confirm with “**Enter**” to save new value.
		
	► Select “**Active** with “**Arrow down**” ► Press “**Enter**”	Enter the active measuring distance Entering the **active measuring distance** must be **very precise (± 1%)**!
	► Select with “**Arrow right**” ► Enter new value with “**Arrow up**” or “**Arrow down**” ► Press “**Enter**”	Default factory setting for the active measuring distance: 900 mm Confirm with “**Enter**” to save new value.

Display	Action	Note
	▸ Press “**Arrow left**” (back)	Display returns to selection screen

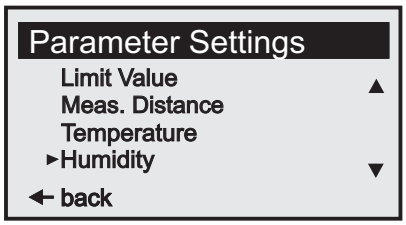
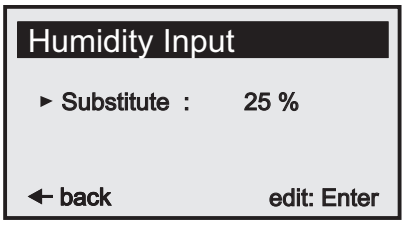
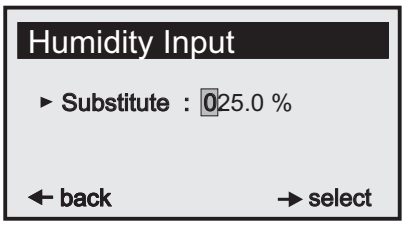
7.2.1.7 *Temperature*

Display	Action	Note
	▸ Select “**Temperature**” ▸ Press “**Enter**”	Exhaust gas temperature
 	▸ Select with “**Arrow down**” or “**Arrow up**” ▸ Press “**Enter**”	Enter the substitute temperature Further input options are explained in the following screens
	▸ Select with “**Arrow right**” ▸ Enter new value with “**Arrow down**” or “**Arrow up**” ▸ Press “**Enter**”	Default factory setting for substitute temperature value: 250 °C
		

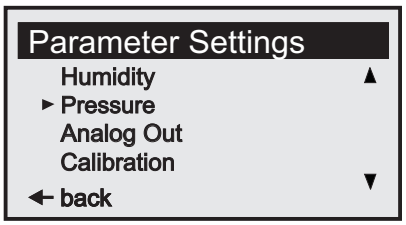
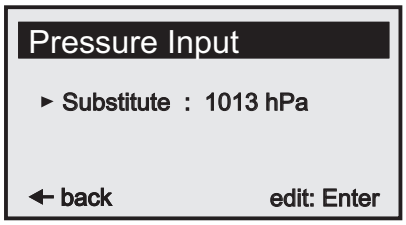
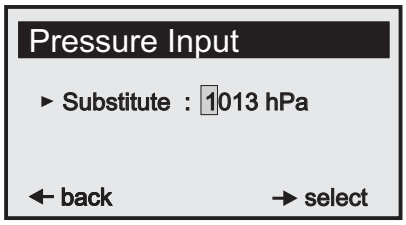
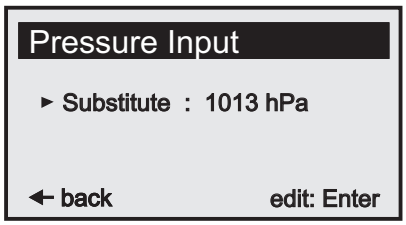
Display	Action	Note
	▶ Select with “**Arrow down**” or “**Arrow up**” ▶ Press “**Enter**”	Using an external temperature sensor
	▶ Select with “**Arrow right**” ▶ Press “**Enter**”	Confirm with “**Enter**” to save the selection
		
		
		
	▶ Select with “**Arrow down**” or “**Arrow up**” ▶ Press “**Enter**”	Basic factory setting: 0 °C

Display	Action	Note
	▶ Select with “**Arrow right**” ▶ Enter new value with “**Arrow down**” or “**Arrow up**” ▶ Press “**Enter**”	Confirm with “**Enter**” to save new value.
	▶ Select with “**Arrow down**” or “**Arrow up**” ▶ Press “**Enter**”	Basic factory setting: 400 °C Max: 500 °C
	▶ Select with “**Arrow right**” ▶ Enter new value with “**Arrow down**” or “**Arrow up**” ▶ Press “**Enter**”	
	▶ Select with “**Arrow down**” or “**Arrow up**” ▶ Press “**Enter**”	Signal for measuring range start Basic factory setting: 4.0 mA
	▶ Select with “**Arrow right**” ▶ Enter new value with “**Arrow down**” or “**Arrow up**” ▶ Press “**Enter**”	Confirm with “**Enter**” to save new value.
	▶ Select with “**Arrow down**” or “**Arrow up**” ▶ Press “**Enter**”	Signal for measuring range end Basic factory setting: 20.0 mA
	▶ Select with “**Arrow right**” ▶ Enter new value with “**Arrow down**” or “**Arrow up**” ▶ Press “**Enter**”	Confirm with “**Enter**” to save new value.

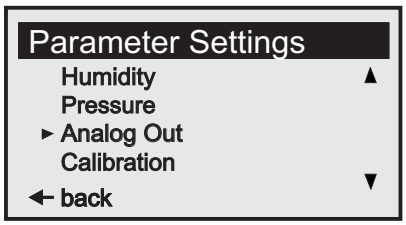
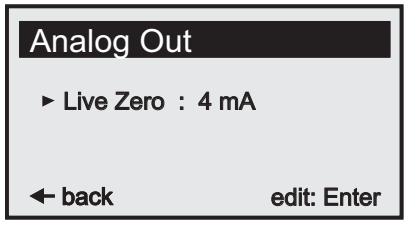
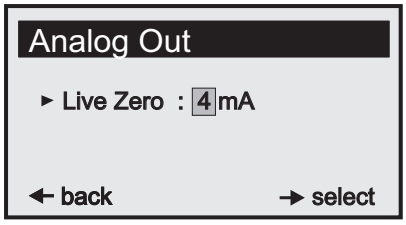
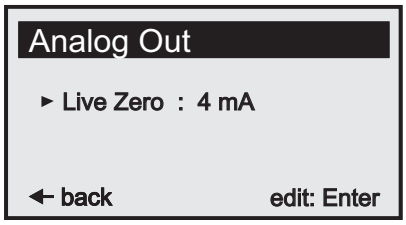
7.2.1.8 *Humidity*

Display	Action	Note
	► Select “**Humidity**” ► Press “**Enter**”	Exhaust gas humidity
	► Press “**Enter**”	Basic factory setting: 25% This is the dry correction value Max.: 99.9%
	► Select with “**Arrow right**” ► Enter new value with “**Arrow down**” or “**Arrow up**” ► Press “**Enter**”	Confirm with “**Enter**” to save new value.

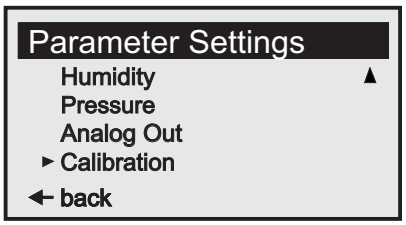
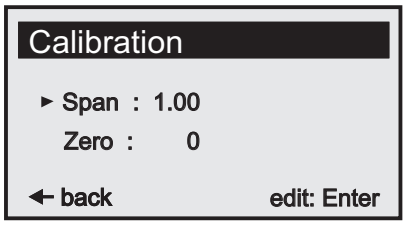
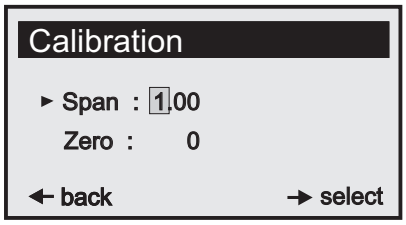
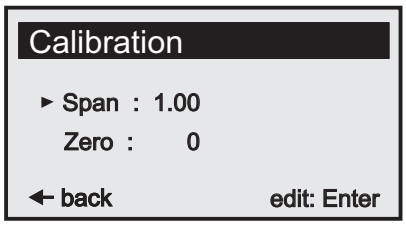
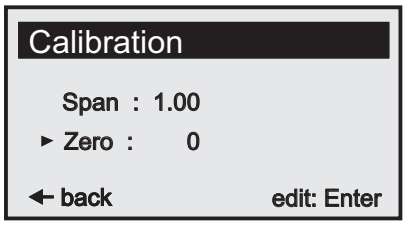
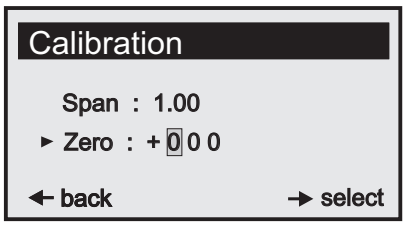
7.2.1.9 *Pressure*

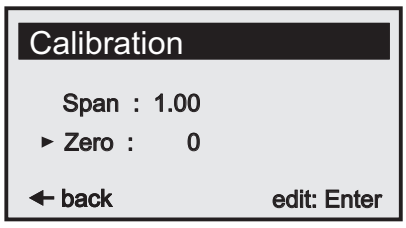
Display	Action	Note
	► Select “**Pressure**” ► Press “**Enter**”	Exhaust gas pressure
	► Press “**Enter**”	Basic factory setting: 1013 hPa Min.: 800 Max.: 1200
	► Select with “**Arrow right**” ► Enter new value with “**Arrow down**” or “**Arrow up**” ► Press “**Enter**”	Confirm with “**Enter**” to save new value. The pressure correction is made in ppm or standard in the display using this value
		

7.2.1.10 *Analog output*

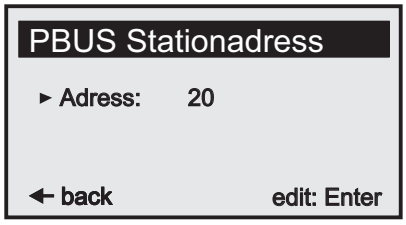
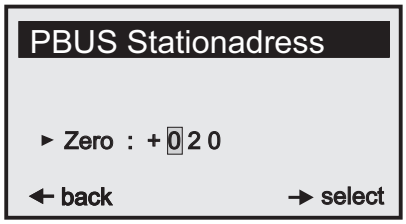
Display	Action	Note
	► Select “**Analog Out**” ► Press “**Enter**”	Analog output/Live Zero
	► Press “**Enter**”	Basic factory setting: 4 mA
	► Select with “**Arrow right**” ► Enter new value with “**Arrow down**” or “**Arrow up**” ► Press “**Enter**”	Confirm with “**Enter**” to save new value. Possible values: 0 to 4 mA
		

7.2.1.11 *Calibration,*

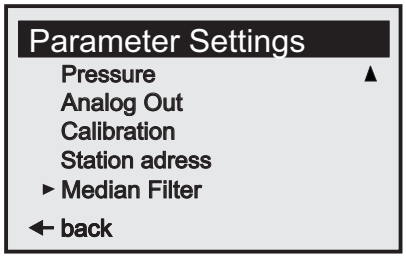
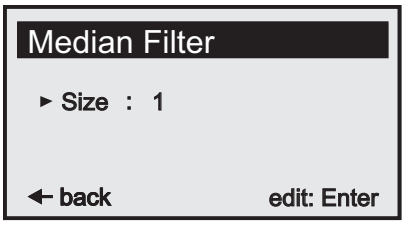
Display	Action	Note
	► Select “**Calibration**” ► Press “**Enter**”	On-site calibration
	► Press “**Enter**”	SPAN / characteristic curve slope Basic factory setting: 1.00 Change possible, e.g., after successful Span test
	► Select with “**Arrow right**” ► Enter new value with “**Arrow down**” or “**Arrow up**” ► Press “**Enter**”	Confirm with “**Enter**” to save new value. Possible setting range for Span: 0,50 … 1,99
		
	► Press “**Enter**”	Basic factory setting: 0 Offset correction possible, e.g., after a reference measurement
	► Select with “**Arrow right**” ► Enter new value with “**Arrow down**” or “**Arrow up**” ► Press “**Enter**”	Confirm with “**Enter**” to save new value.

Display	Action	Note
	► Press “**Arrow left**” (back)	Display returns to selection screen

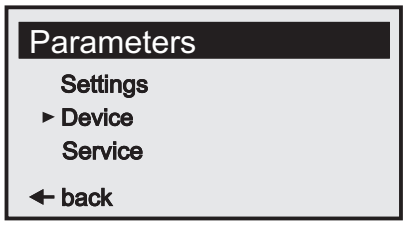
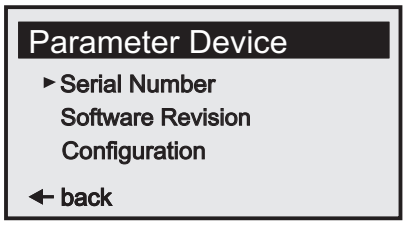
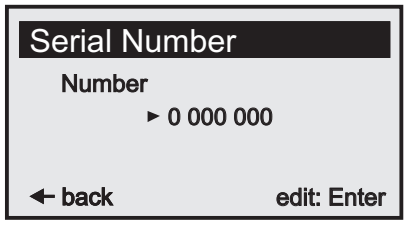
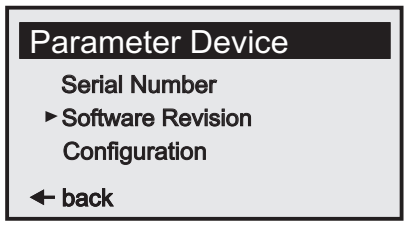
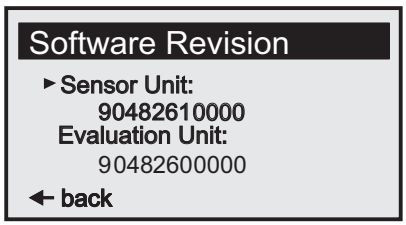
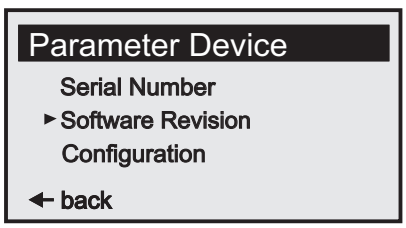
7.2.1.12 *PROFIBUS sensor address*

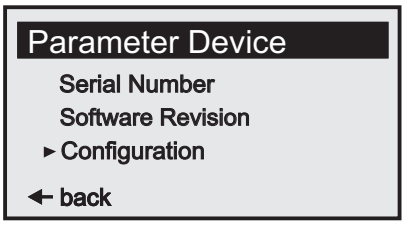
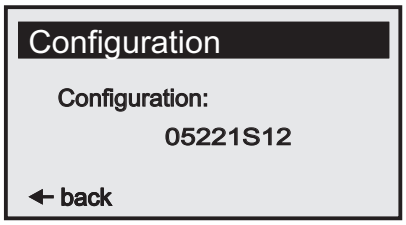
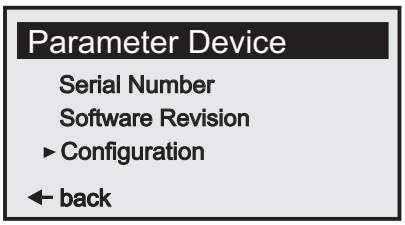
Display	Action	Note
	► Press “**Enter**”	When PROFIBUS available!
	► Select with “**Arrow right**” ► Enter new value with “**Arrow down**” or “**Arrow up**” ► Press “**Enter**”	Confirm with “**Enter**” to save new value

7.2.1.13 *Median Filter*

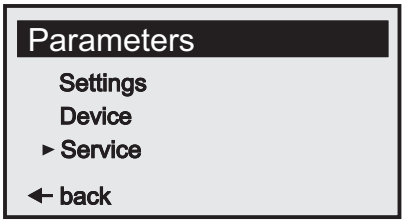
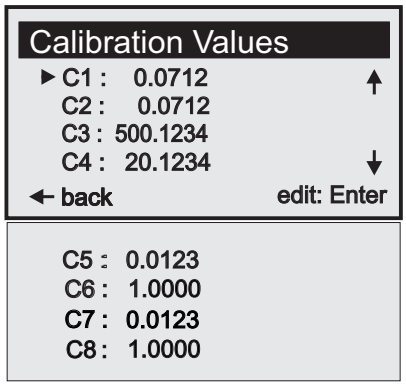
Display	Action	Note
	▶ Select “**Median Filter**” ▶ Press “**Enter**”	The median filter reduces signal noise caused by high dust concentrations or rapidly changing processes. Median Filter value: “1” = no filter “17” = highest value “11” = preset value
	▶ Select with “**Arrow right**” ▶ Enter new value with “**Arrow down**” or “**Arrow up**” ▶ Press “**Enter**”	The Median Filter adds 1 to 9 seconds to the response time according to the following formula: $\frac{(\text{Median Filter} + 1)}{2}$ Example: – Desired response time: 20 s – When Median Filter = 15: (15 +1)/2 = 8 s extension – Enter new value “Response Time”: 12 s (see “Response time”, page 46)

7.2.1.14 *Device data*

Display	Action	Note
	▶ Select “**Device**” ▶ Press “**Enter**”	Key device data
	▶ Press “**Enter**”	
	▶ Press “**Arrow left**” (back)	Displays the device serial number
	▶ Select with “**Arrow down**” or “**Arrow up**” ▶ Press “**Enter**” ▶	Displays the software version
	▶ Press “**Arrow left**” (back)	
		

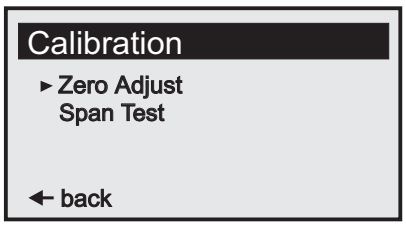
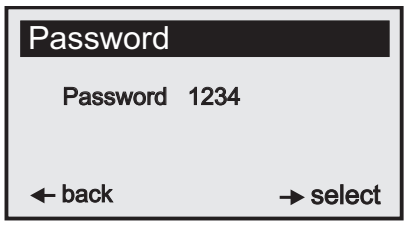
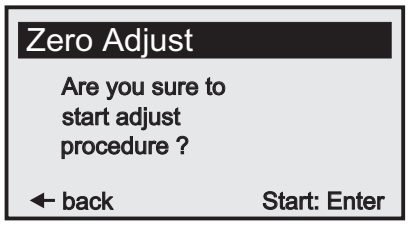
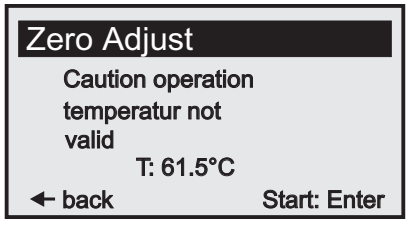
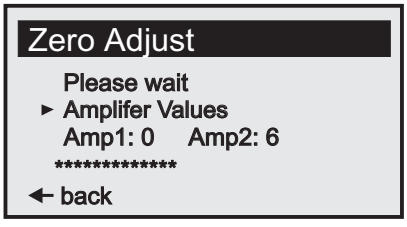
Display	Action	Note
	▶ Select with “**Arrow down**” or “**Arrow up**” ▶ Press “**Enter**”	Device configuration
	▶ Press “**Arrow left**” (back)	Display of device configuration delivered 05221S12 No input possible
	▶ Press “**Arrow left**” (back)	

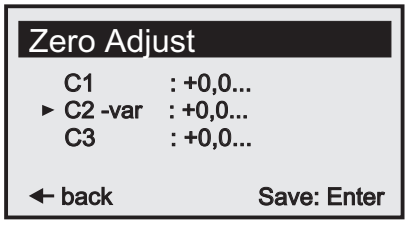
7.2.2 Service

Display	Action	Note
	▶ Select with “**Arrow down**” or “**Arrow up**” ▶ Press “**Enter**”	Sensor calibration parameters **Attention**: Changes lead to measured value deviations
	▶ Press “**Enter**”	These values may only be changed in special cases e.g., after exchanging the receiver!

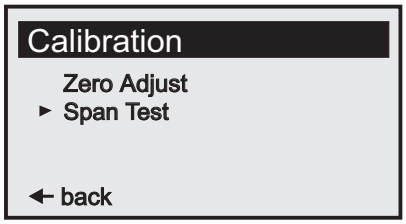
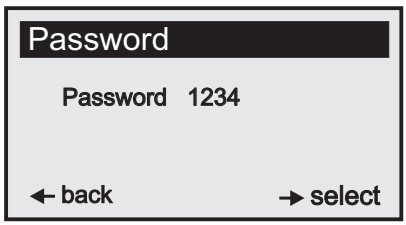
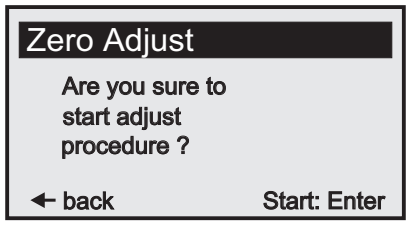
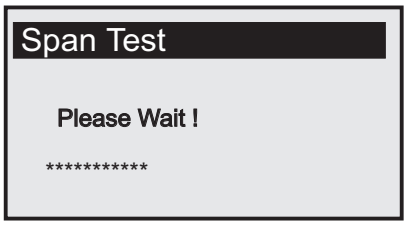
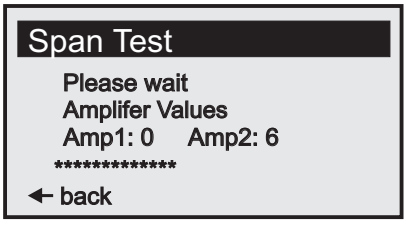
7.3 Calibration

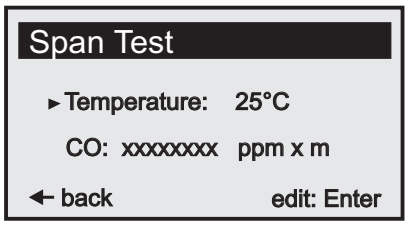
7.3.1 Zero point adjustment

Display	Action	Note
	▸ Press “**CAL**” ▸ Select **“Zero Adjust”** with “**Enter**”	
	▸ Enter password “**1234**”	Prompt only appears when a warning is pending (e.g., device temperature)
	▸ Press “**Enter**” ▸ Cancel with “**Arrow left**” (back)	
		Wait until device temperature is reached Message only appears when the temperature has not yet stabilized
	▸ Press “**Enter**” (for T=60 °C +- 0.5 °C) ▸ Cancel with “**Arrow left**” (back)	No inputs can be made during the calibration procedure
		No inputs can be made during the calibration procedure

Display	Action	Note
	► Press “**Enter**”	Data are saved

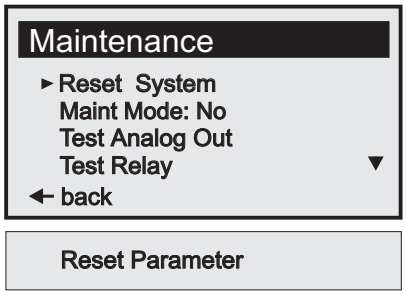
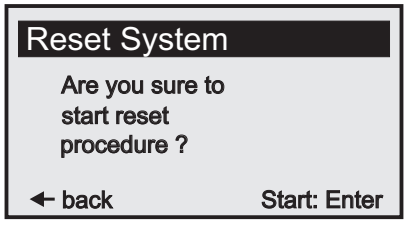
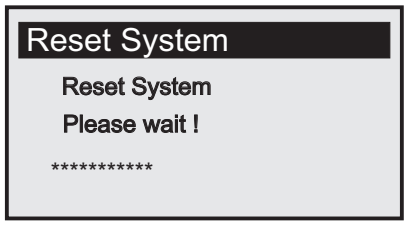
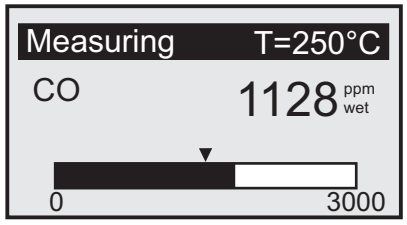
7.3.2 SPAN test

Display	Action	Note
	► Press “**CAL**” ► Select “**SPAN Test**” and confirm with “**Enter**”	
	► Enter password “**1234**”	Prompt only appears when a warning is pending (e.g., device temperature)
	► Press “**Enter**”	Start the zero point adjustment for the Span test
		Zero point adjustment is running No input possible on the device
		Zero point adjustment is running No input possible on the device

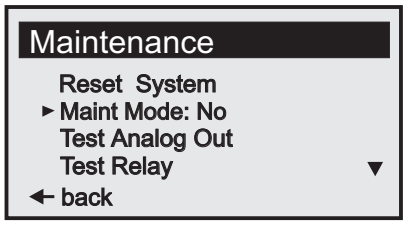
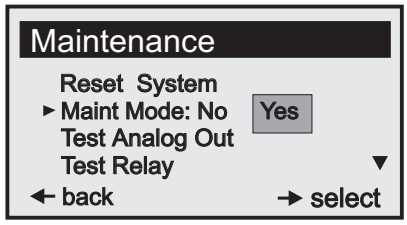
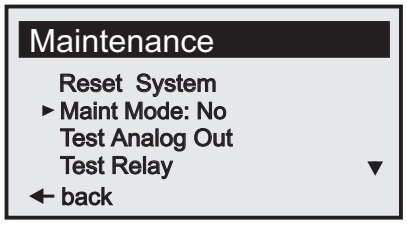
Display	Action	Note
	► Edit ambient temperature ► Insert test cell in the holder	Set the temperature to the current ambient temperature Compare the measured value displayed with the value on the test cell Deviations can be corrected with the SPAN value when necessary (*see "Calibration,", page 56*). The Span factor to be set is calculated from the setpoint value (label on test cell) divided by the displayed measured value. Use "**Back**" to terminate span adjustment.

7.4 Maintenance

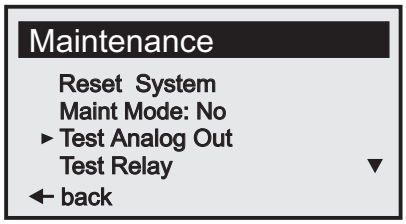
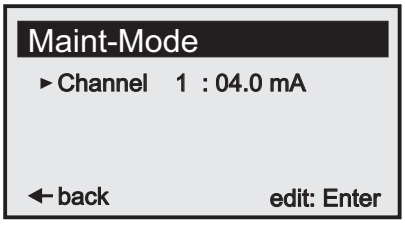
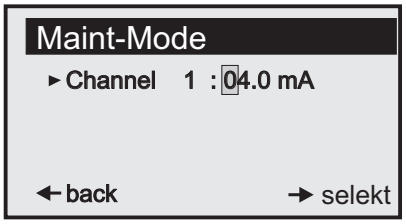
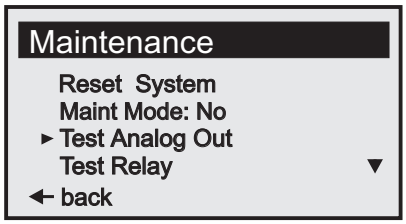
7.4.1 Reset System

Display	Action	Note
	▶ Select with “**Arrow down**” or “**Arrow up**” ▶ Press “**Enter**”	Restart the device
	▶ Press “**Enter**”	
		No input possible on the device
		Device is restarted

7.4.2 Maintenance mode

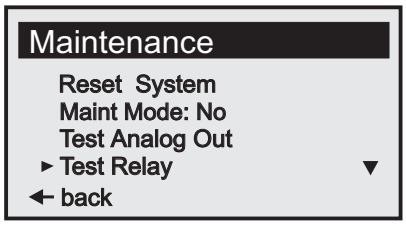
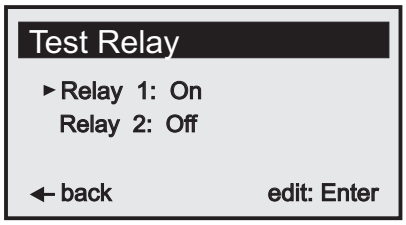
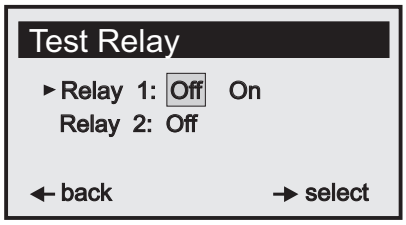
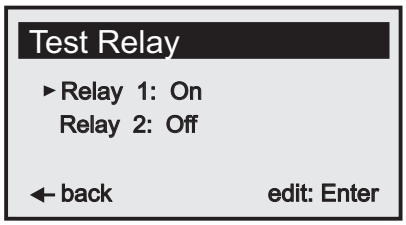
Display	Action	Note
	▸ Select with “**Arrow down**” or “**Arrow up**” ▸ Press “**Enter**”	
	▸ Select with “**Arrow right**” ▸ Press “**Enter**”	Switches display to Maintenance mode when “**Yes**” is selected Output relay drops out Analog output retains last value
		

7.4.3 Test analog output

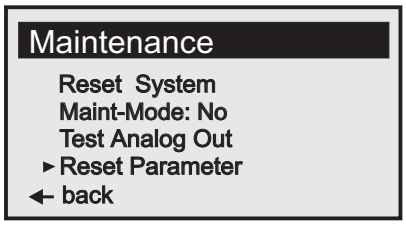
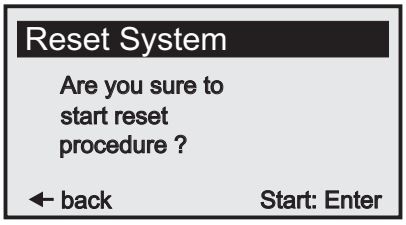
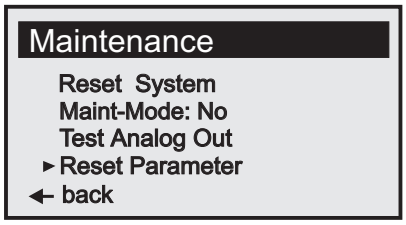
Display	Action	Note
	► Press “**Enter**”	
	► Press “**Enter**”	The set value must be output on the analog output
	► Select with “**Arrow right**” ► Enter new value with “**Arrow down**” or “**Arrow up**” ► Press “**Enter**”	
		

Analog-In can be tested using the displayed sample gas temperature.

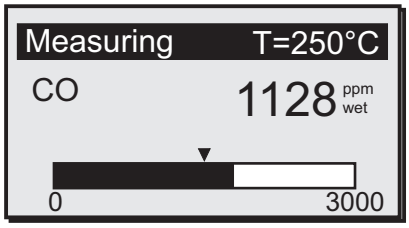
7.4.4 Test relay

Display	Action	Note
	► Select with “**Arrow down**” or “**Arrow up**” ► Press “**Enter**”	Test of relay 1 and relay 2
	► Select with “**Arrow down**” or “**Arrow up**” ► Press “**Enter**”	
	► Select with “**Arrow right**” ► Press “**Enter**”	
		

7.4.5 Reset Parameter

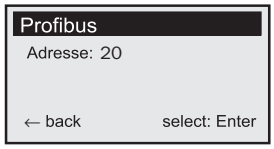
Display	Action	Note
	▸ Press “**Enter**”	
	▸ Press “**Enter**”	**Attention:** All values are reset to default. Calibration data will be lost!
		No input possible on the device

7.5 Measuring mode

Display	Action	Note
		Press “**Meas**” for immediate switching to measuring mode

7.6 Connecting the PROFIBUS during commissioning (if fitted)

▶ Activate Parameter mode (**par**).

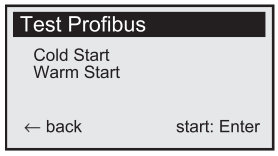


▶ Select PROFIBUS menu and select address.

▶ Use the arrow keys to enter the corresponding 7 bit address and confirm with **Enter**.

Note: Addresses 126 and 127 are reserved and must not be used.

▶ Activate Maintenance mode (**maint**) and select the Profibus menu.



▶ Select menu item **Cold Start**.

This initializes the PROFIBUS software with the new addresses. The device master file (GSD) can now be configured via the PROFIBUS Master for operation of the GM901-S.

▶ Select **Init PBUS Warm**.

This restarts the PROFIBUS stack.

8 Decommissioning

8.1 Safety information

WARNING: Health risk through contact with toxic gases
The GM901-S can contain up to 10 ml of CO, that can escape in case of a defect or leak.
If a leak occurs, the concentrations inside the enclosed device can increase up to 350 ppm.
- ▶ Regularly check the state of the device/module 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 injury from escaping hot, hazardous gases!
Toxic gases can escape from the duct when the sender and receiver are removed from the flange!
- ▶ Take appropriate protective measures

8.2 Disassembling the sender and receiver

It is recommended to disassemble the GM901-S during long periods of plant shutdowns. It is essential to disassemble the GM901-S when the optional purge air unit is also put out of operation.

Procedure

1 Disconnect the device from the power supply.
2 Disconnect the cable plugs on the sender and receiver. Protect the cable plugs against moisture and dirt when not used for a longer period of time.
3 Take the sender and receiver off the purge air attachments (loosen quick-release fasteners).
4 Close off the purge air attachments with an optional dummy flange.

The optical adjustment of the purge air attachments remains intact.

8.3 Uninstallation

Observe safety information according to VDE and national guidelines:
- ▶ During uninstallation, make sure no live lines are accessible unsecured.
- ▶ Always insulate open cable ends with suitable auxiliary means to protect against dirt and moisture.

Secure switches that should not be switched on again for safety reasons with signs and safeguards to prevent unintentional switching.

9 Technical data

9.1 Technical data overview

GM901-S-05 S	
Measuring range	100 ppm to 60,000 ppm
Measuring distance	0.5 m ... 8.0 m (GM901-S-05-S)
Gas temperature	Standard: 250 °C; extended calibration: 430 °C
Linearity	± 5% of full-scale value
Resolution	Approx. 10 ppm
Response time	5 ... 360 s
Ambient temperature	–20 °C ... +55 °C
Degree of protection	IP 65
Supply voltage	115 V / 230 V
Power frequency	50/60 Hz
Max. power input	75 VA

*) Depending on the active measuring distance

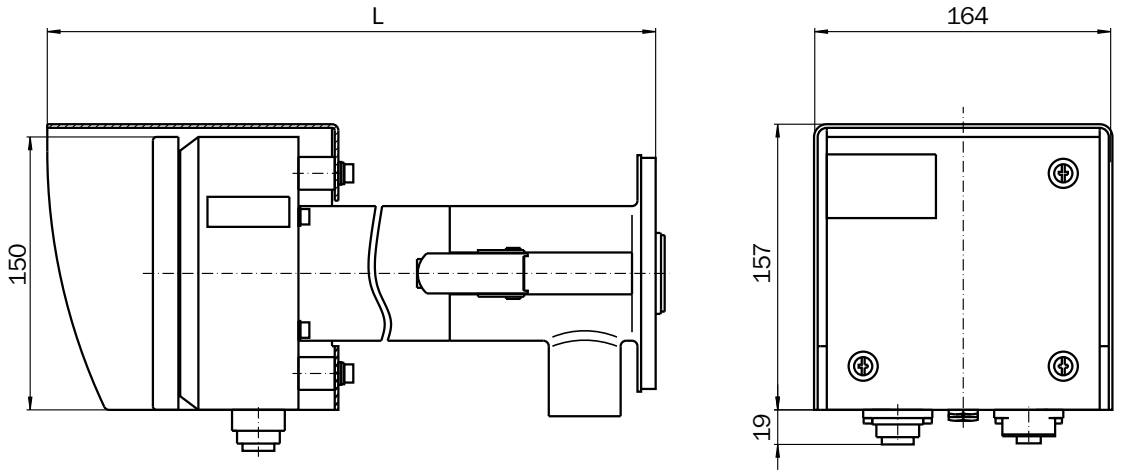
Sender and receiver of GM901-S-05 S	
Dimensions (L x W x H)	462 mm x 164 mm x 164 mm Length including purge air attachment
Weight	3 kg including purge air attachment
Lamp service life	Approx. 20 000 operating hours

Control unit	
Analog input:	0 ... 20 mA; input resistance 100 Ω
Analog output (electrically isolated)	0 ... 20 mA; max. load: 500 Ω
Relay 1, Contact opens in the event of a device malfunction	Potential-free max. switching current: 1 A max. switching voltage: 48 V DC/ DC max. switching capacity: 30 W DC/60 W AC
Relay 2, relay 3 Contact opens when limit value is exceeded	Potential-free max. switching current: 1 A max. switching voltage: 125 V DC/150 V AC max. switching capacity: 30 VA,1 A
Status input for maintenance	Max. contact load 5 V /2 mA
Interfaces	• RS232 for service • PROFIBUS-DP-V1 (if fitted) • CAN Bus (optional)
Dimensions (L x W x H)	200 mm x 90 mm x 300 mm
Weight	4.3 kg

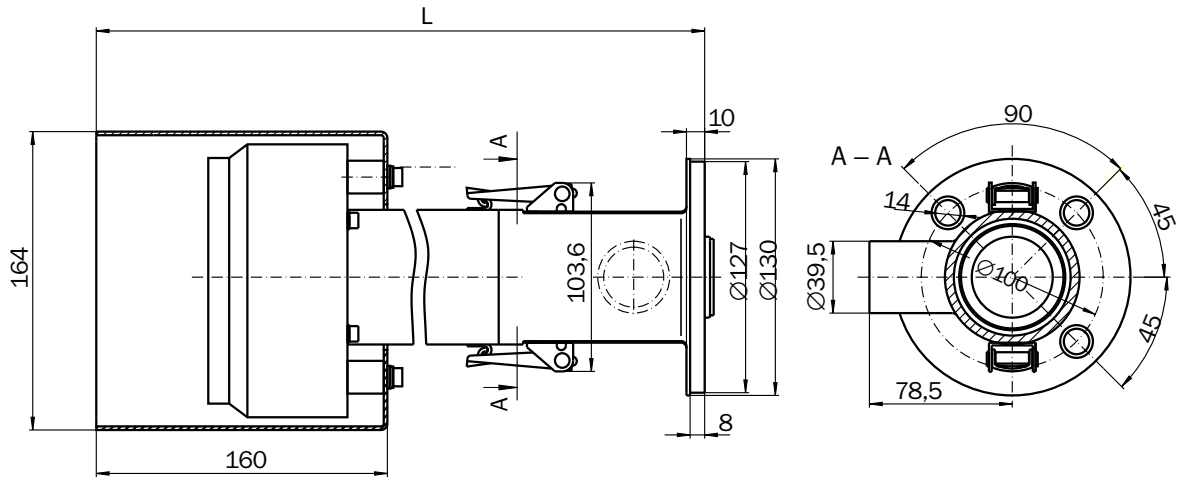
Terminal box (optional)	
Voltage supply input	
Nominal supply voltage	115 V /230 V AC, selectable with bridge
Power frequency	50/60 Hz
Voltage range	● 190 … 260 V AC at 50 Hz ● 95 … 130 V AC at 60 Hz
Max. power input	50 VA
Protection class	IP65
Connection data for output voltage	
Nominal output voltage	24 V ± 0.5 V
Short-circuit proof	Yes
Over-current protection	Yes
Over-temperature protection	Yes

9.2 Dimensions of sender/receiver GM901-S-05

Fig. 30: Dimensions of sender or receiver (in mm)

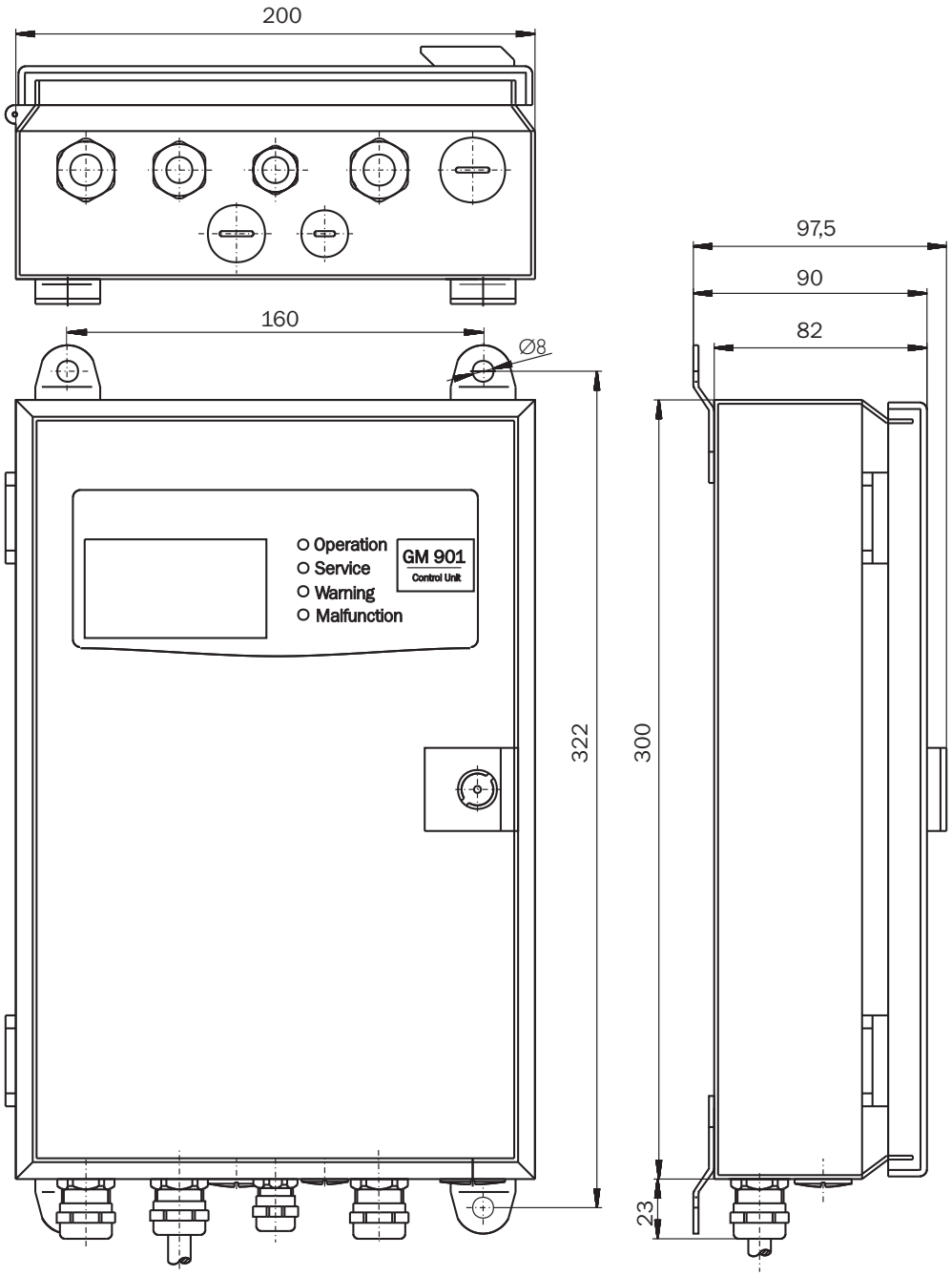


L ... Length (in mm)
Sender 298
Receiver 462



9.3 Dimension drawing of control unit

Fig. 31: Dimension drawing of control unit



10 Warnings and malfunctions

10.1 Warnings

Message	Possible cause	Action
Analog input temperature out of range	• Input signal (0 ... 20 mA) of the temperature measurement is outside the parameterized limits, the system continues running with the substitute temperature value	▶ Check temperature sensor ▶ Check cable connection ▶ Check parameterization (see "Temperature", page 50).
Temperature low, no humidity correction	• Measured gas temperature is so low that it is assumed the plant has been switched off. This means no cross-sensitivity correction is performed for exhaust gas humidity	▶ Check temperature sensor ▶ Check parameterization (see "Temperature", page 50). The switching point is at 70 °C or half the value of the substitute temperature depending on which value is lower ▶ No action required when the plant is switched off
Sensor low signal	• Dust content too high • Fog formation • Optical surfaces of device contaminated • Device not adjusted correctly • Lamp defective	▶ Check device alignment ▶ Clean optical surfaces ▶ Check for free light path through the duct ▶ Check lamp ▶ Still warning message after carrying out the actions ▶ New zero point adjustment
Warming up	• The required operating temperature is not already reached shortly after the device is switched on, the measured values displayed can be outside the tolerance	▶ Wait approx. 30 minutes
Out of range	• The measured value exceeds the specified measuring range by more than 5%	▶ Set the measuring range to a higher value (see "Measuring range", page 47)

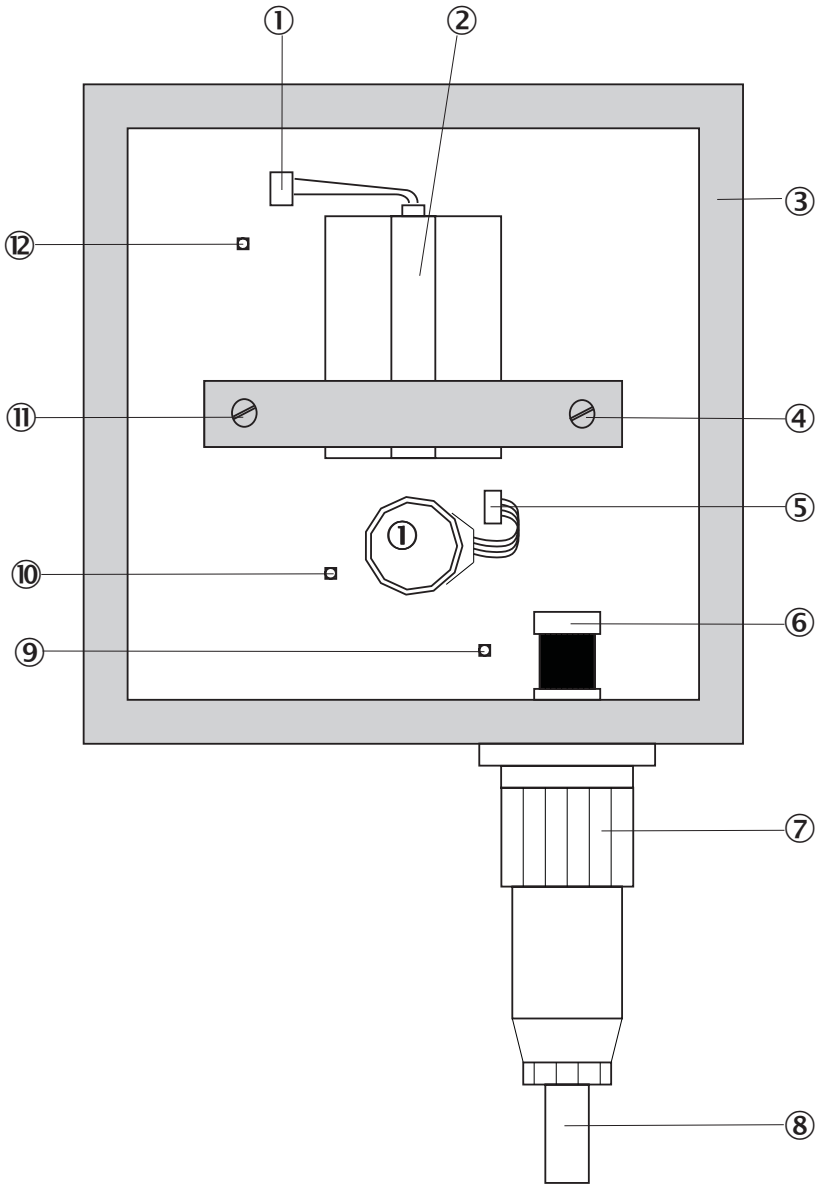
10.2 Malfunctions

Message	Possible cause	Action
EEPROM Parameter	• Invalid parameters • Control unit defective	▶ Reset parameters (see “Reset Parameter”, page 68) ▶ Parameterize again ▶ New zero point adjustment
Sensor communication	• Data communication between receiver unit and control unit interrupted	▶ Check cable connection and correct seat of the plug connection ▶ Further measures see “Further tips on troubleshooting”, page 77
Sensor amplifier has reached maximum value	• Erroneous device adjustment • Optical surfaces contaminated • Light path interrupted	▶ Check device alignment ▶ Clean optical surfaces ▶ Check for free light path
Sensor no signal	• Erroneous device adjustment • Optical surfaces contaminated • Light path interrupted • Receiver unit defective	▶ Check device alignment ▶ Clean optical surfaces ▶ Check for free light path through the duct
Signal too high	• Flange - flange measuring distance smaller than 0.5 m	▶ Correct measuring distance flange - flange
IR source fault	• Infrared lamp defective • Power supply defective	▶ Check lamp plug connection (**Attention**: Lamp very hot in operation) ▶ Exchange sender unit when necessary
Chopper fault	• Chopper in sender unit defective	▶ Check chopper plug connection in sender unit (**Attention**: Lamp very hot in operation) ▶ Exchange sender unit when necessary
Device not ready, warming up	• The required operating temperature is not reached shortly after switching on • Device not ready for measuring	▶ Wait approx. 30 minutes
Motor fault	• Motor in the receiver unit defective	▶ Exchange receiver unit

10.3 Further tips on troubleshooting

10.3.1 Troubleshooting on the sender

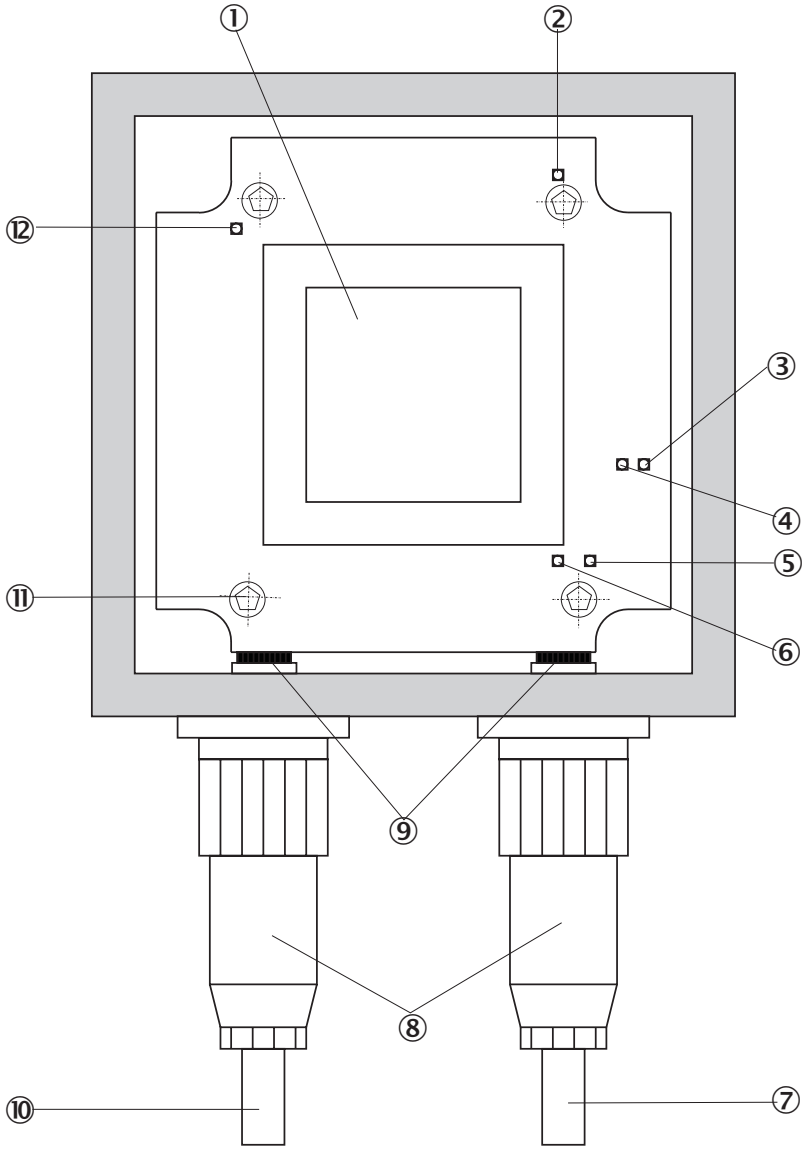
Fig. 32: Troubleshooting on the sender



1	IR source connector	
2	IR source	⚠ Lamp very hot in operation
3	Sender housing	
4	Adjustment screw	⚠ Loosening the 2 adjustment screws causes the sender to be adjusted incorrectly - readjustment only possible at the factory!
5	Connector plug for chopper motor	
6	Internal connector	
7	External connector	
8	Cable to receiver	
9	LED on	when voltage connected for motor and logic module
10	LED on	when voltage for IR source connected
11	Adjustment screw	
12	LED on	when the lamp is on and the chopper disk rotates.

10.3.2 Troubleshooting on receiver

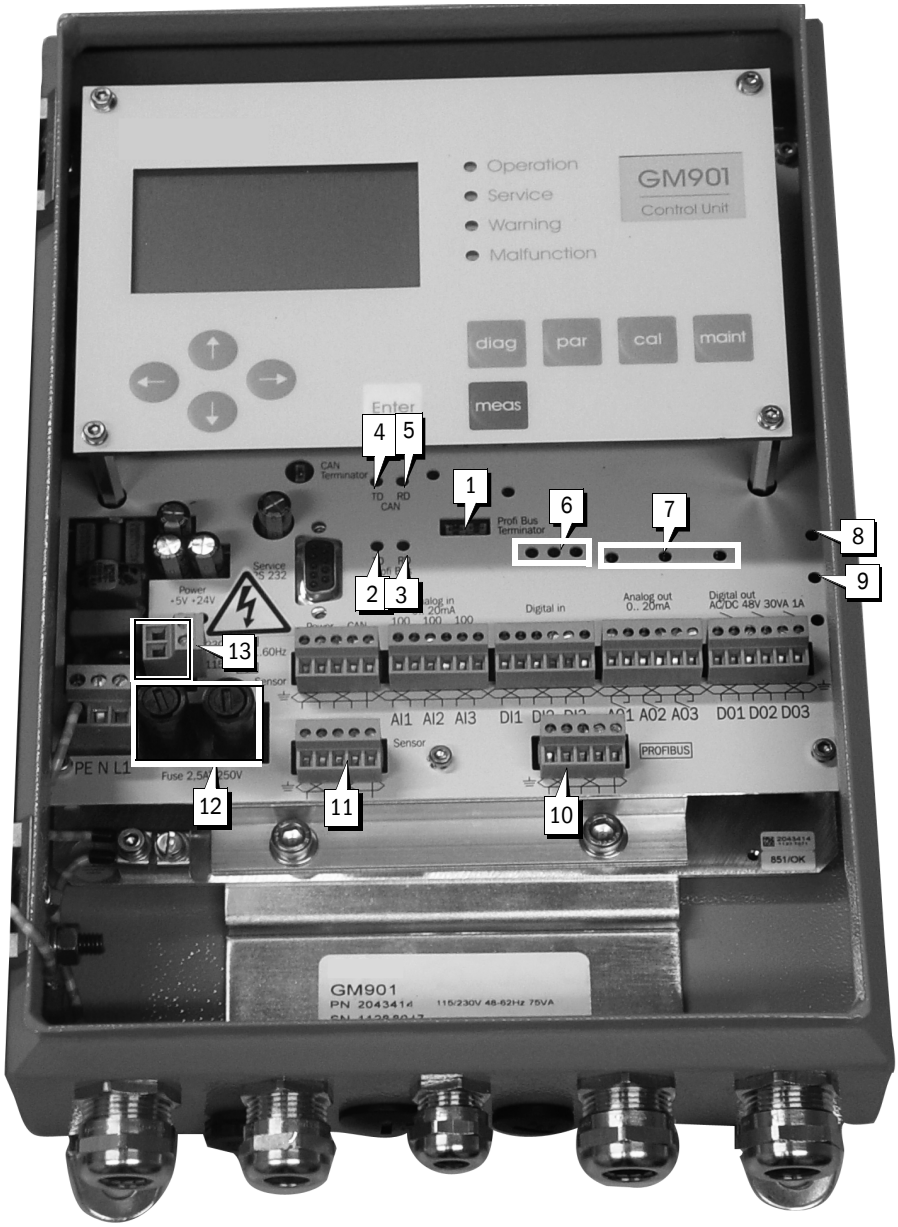
Fig. 33: Troubleshooting on receiver



1	Fan	
2	LED for optic chamber heating	- On continuously: High ambient temperature - Blinks: Normal operation - Off: Very low temperature
3	LED communication TD	Data from receiver to control unit
4	LED communication RD	Data from control unit to receiver
5	Connector plug for chopper motor	Blinks when the cell disk in the receiver rotates and a chopper signal from the sender is present.
6	LED	Blinks when the motor of the cell disk in the receiver rotates
7	Cable to sender	
8	External connector	
9	Internal connectors	
10	Cable to control unit	
11	4 adjustment screws	⚠ Loosening the 4 adjustment screws causes the receiver to be adjusted incorrectly - readjustment only possible at the factory!
12	LED	On when operation is uninterrupted

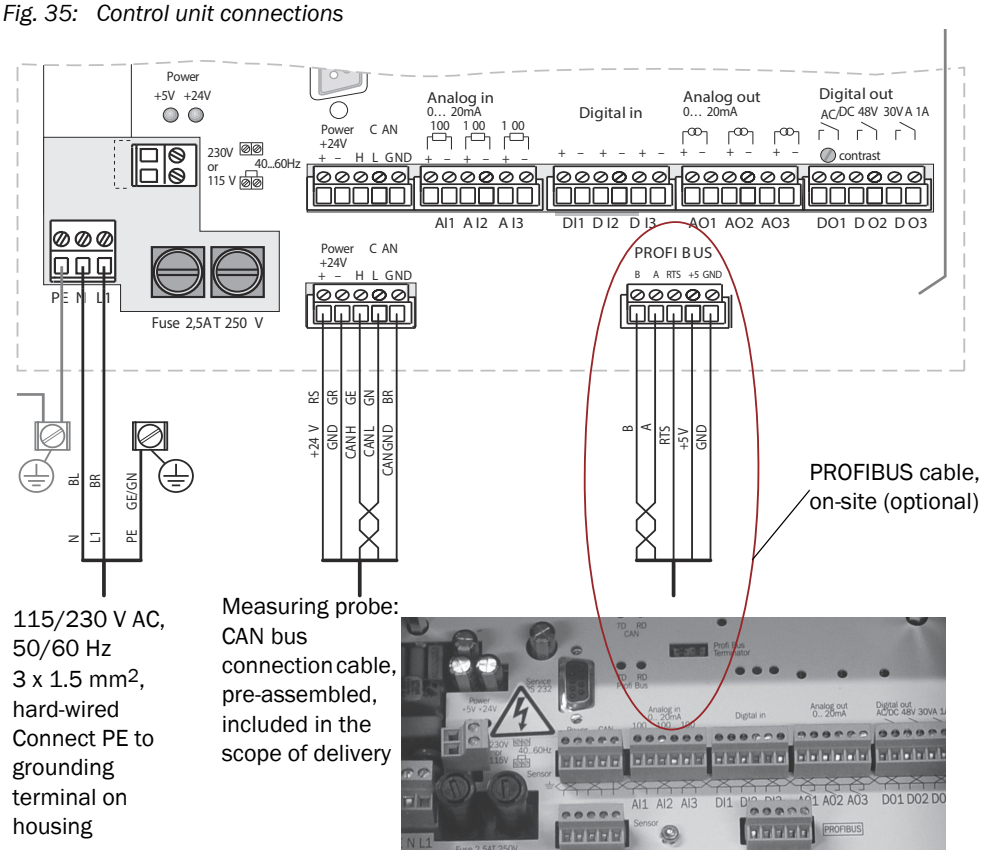
10.3.3 Troubleshooting on the control unit

Fig. 34: Troubleshooting on the control unit - GM901-S version



1 PROFIBUS terminator (if relevant)
2 PROFIBUS data LED: to receiver (TD) (if relevant)
3 PROFIBUS data LED: from receiver (RD) (if relevant)
4 Data LED: to receiver (RD)
5 Data LED: from receiver (TD)
6 Digital input status
7 Analog output: LED on – output current identical to setpoint value
8 Switching state relay 1
9 Switching state relay 2
10 PROFIBUS connection ,see “Control unit connections”, page 80 (if relevant)
11 Sensor connection
12 Fuses, 2.5 AT
13 Operating voltage selection: 230 V AC – no bridge, 115 V AC – bridge

Fig. 35: Control unit connections



Device shows no reaction:

- ▶ Check power supply.
- ▶ Check operating voltage set.
- ▶ Check fuse in control unit.
- ▶ Check indicator for 24 V /5 V supply in the control unit, when doing so, remove the plug-in terminal on the cable to the receiver when necessary.
  Check the cables first when these displays are only on when the connectors are disconnected.

If no error is found, connect the system components one after each other.

1. Only the cable from the control unit to the receiver.
2. Connect the receiver.
3. Lay the cable from the receiver to the sender.
4. Connect the sender.

If the error occurs again, it has been triggered by the last component connected which must then be exchanged.

Communication between control unit and receiver interrupted

Error messages: Sensor communication

The receiver sends data continuously to the control unit, an inquiry is sent automatically when nothing is received there.

Check following connections:

- ▶ Connection between control unit and receiver

- Cable connection on the plug-in terminal in the control unit
- Cable to receiver
- External connectors on receiver
- Internal connectors in receiver

Sensor values

The sensor values shown in the Table are valid for uninterrupted, steady state operation within specified limits.

To view these data, see “Diagnosis”, page 42, or press **diag**.

Unit	Description	Min. Value	Typ. Value	Max.Value
V1	Signal-Value 1	0.5 V	Dependent on current conditions	5.0 V
V2	Signal-Value 2	0.5 V	Dependent on current conditions	5.0 V
DK	Variability of k-Value	0	Dependent on current conditions	
CC	Cooler Current	0 mA	Dependent on current conditions	1200 mA
TE	Temperature of Electronic Unit	20 °C	Dependent on current conditions	80 °C[1]
TO	Temperature of Optic Unit	50 °C	60 °C	80 °C[1]
TD	Detector Temperature	9 °C	10.7 °C	12 °C
AG	Amplifier Gain	00.00	Dependent on measuring distance	31.31

[1] does not show any larger values

If the sensor values of the GM901-S are outside these value ranges, please contact Endress+Hauser Service for remote diagnosis.

10.3.4 Remote diagnosis

Complete the Table with the sensor values momentarily displayed and send to Endress+Hauser Customer Service.

Fig. 36: Diagnosis form (see next page)

Customer: _____**Plant:** _____

Contact person:_____**Tel:**_____

FAX: _____

Diagnosis:

Malfunction messages: _____

_____

Warning messages:_____

_____

Sensor values: V1: _____TE: _____

V2: _____TO: _____

DK: _____TD: _____

CC: _____AG: _____

Parameter: Physical Unit:_____ Normalization: _____

Response Time:_____ s Measuring Range: _____

Limit Value:_____

Measuring Distance: Fl.-Fl.: _____ mm Active: _____ mm

Temperature: Substitute: _____ °C External: _____

Scale Low: _____ °C Scale High: _____ °C

Input Low: _____ mA Input High: _____ mA

Humidity: Substitute: _____ %

Pressure: Substitute:_____ hPa

Analog Out: Live Zero: _____ mA

Calibration SPAN:_____Zero: _____

Parameter Device: Serial Number:_____

Software Revision: Sensor Unit:_____Evaluation Unit: _____

Configuration: _____

Service: C1: _____ C2: _____ C3: _____ C4: _____

C5: _____ C6: _____ C7: _____ C8: _____

Current measuring conditions:

Measured value:_____ _____ / _____ mA

Exhaust gas temperature: _____ °C

Ambient temperature: _____ °C

11 Spare parts and accessories

11.1 Spare parts

Designation	Quantity	Part No.
Sender GM901-S-05 without purge air attachment	1	2032400
SP set receiver without purge air attachment for 0.5 - 8 m, spare part with advanced calibration; checked; exchange part: only available when defective part is returned	1	2050520
SP set receiver without purge air attachment for 0.5 - 8 m, with advanced calibration; checked; spare part, checked, serial no. required	1	2045049
Control unit GM901-S	1	2043414
Terminal box	1	2020440
Receiver connecting cable	1	2020447
Connection cable, length 15 m	1	2020439
PCB module control unit	1	2061631
Membrane keypad control unit GM901-S	1	6020400
Cell disk with motor (serial numbers ≥ 16508000)	1	2091937
Cell disk with motor (serial numbers < 16508000)	1	2091938

11.2 Options, accessories

Designation	Quantity	Part No.
Optical adjustment device	1	2020436
Assembly bracket for zero path	2	2020445
Purge air unit with distributor and 5 m hose	1	1012424
Purge air hose D = 40 m	1	5304683
Connection unit with power supply 230 V / 24 V for sender and receiver	1	2020440
5 m extension cable		2020437
10 m extension cable		2020438
15 m extension cable		2020439
Weather protection hood for purge air unit	1	5306108
Weather protection hood for GM901-S control unit	1	4029146
Protection device, blind flange with seal	2	2020435
Protection device, air filter kit	1	2020442
Purge air attachment for zero point adjustment	2	2020021
Filter element	1	5306091
Test tool kit for SPAN test	1	2019639
Adapter flanges GM910 -> GM901-S	1	2019369

12 General maintenance

12.1 General

Maintenance tasks are principally application-dependent because the influences are also individual. This is why the maintenance interval is typically determined based on experience.

12.2 Maintenance interval of individual components of GM901-S CO systems

GM901-S (sender , receiver, control unit)

Interval	Action
Every 6 months	▶ Check optics and optical equipment for cleanness and clean as required
Annually	▶ Drift check (zero point/adjust and sensitivity check with test cells)

Purge air unit

Interval	Action
Every 6 months	▶ Clean purge air filter and replace when necessary
Annually	▶ Calibration of measuring system with test gas or filter check in cooperation with Endress+Hauser.

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www.addresses.endress.com

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