OPERATING INSTRUCTIONS

GM901-02

CO Measuring Device with Measuring Probe

Installation, Operation, Maintenance

SICK
Sensor Intelligence.

Described product

GM901-02

with measuring probe

Manufacturer

SICK AG
Erwin-Sick-Str. 1
79183 Waldkirch
Germany

Legal information

Original document

This document is an original document of SICK AG.

CE

Contents

1 About this document

1.1 Function of this document

These Operating Instructions describe:

- System components
- Start-up
- Operation
- Maintenance work required for reliable operation
- Troubleshooting

1.2 Scope of application

These Operating Instructions are valid only for the gas in-situ measuring device with the designation GM901 with measuring probe.

They are not valid for the other gas in-situ measuring devices from SICK.

1.3 Target group

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

Operation

The device should only be operated by skilled technicians who, based on their technical training and knowledge as well as knowledge of the relevant regulations, can assess the tasks given and recognize the hazards involved.

Installation and maintenance

Skilled technicians may be required at certain times during installation and maintenance.

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

1.4 Symbols and document conventions

1.4.1 Warning symbols

Symbol	Significance
	Immediate hazard of severe personal injury or death
	Hazard (general)
	Hazard through electrical voltage
	Hauard through toxic substances
	Hazard for the environment/nature/organic life

Table 1: Warning symbols

1.4.2 Warning levels / Signal words

DANGER

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

WARNING

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

CAUTION

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

Notice

Hazard which could result in property damage.

Note

Hints

1.4.3 Information symbols

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

Table 2: Information symbols

2 Safety information

2.1 Basic safety information

ATTENTION
Responsibility of the operator in case of device malfunctions or failure

If the GM901-02 is used as a sensor in combination with control technology, the operator must ensure that a failure or malfunction on the GM901-02 cannot lead to unallowed damage or hazardous operating states.

ATTENTION
Responsibility for system safety

The person setting the system up is responsible for the safety of the system in which the device is integrated.

ATTENTION
Responsibility of the operator for correct usage of the device

Basis of this Manual is the delivery of the device according to the preceding project planning (e.g., based on the SICK application questionnaire) and the relevant delivery state of the device (see delivered system documentation).

- Contact SICK Customer Service if you are not sure whether the device corresponds to the state defined during project planning or to the delivered system documentation.

DANGER
Health risk when safety information is not available

Improper installation or maintenance work can lead to accidents with serious consequences for the health of persons carrying out these tasks.

- Keep these Operating Instructions and the associated instructions available for reference.
- Read and observe these Operating Instructions.
- Observe all safety instructions.
- If anything is not clear: Please contact SICK Customer Service.
- Use the device only as described in "Intended use". The manufacturer bears no responsibility for any other use.
- Carry out the specified maintenance work.
- Do not attempt any work on or repairs to the device unless described in this Manual. Do not remove, add or change any components in or on the device unless such changes are officially allowed and specified by the manufacturer. Failure to observe these precautions could result in:
  - Voiding the manufacturer's warranty.
  - The device becoming dangerous.
- Observe all relevant regulations concerning protective clothing.

Electrical safety

WARNING

Endangerment of electrical safety during installation and maintenance work when the power supply is not switched off

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

WARNING

Endangerment of electrical safety through power cable with incorrect rating

Electrical accidents can occur when the specifications for replacement of 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 cable.

DANGER

Danger of electrical accidents

Incorrect performance of electrical work could result in serious electrical accidents.

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

Grounding the device

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 lines involved is effective in accordance with EN 61010-1.

2.2 Intended use

2.2.1 Purpose of the device

The GM901-02 only serves to monitor CO concentrations of gases in industrial plants.

The GM901-02 measures continuously directly in the gas duct (in-situ).

2.2.2 Responsibility of user

Designated users

see "Target group", page 6.

Correct project planning

- Basis of this Manual is the delivery of the device according to the preceding project planning (e.g., based on the SICK application questionnaire) and the relevant delivery state of the device (see delivered system documentation).
  - ▷ Contact SICK Customer Service if you are not sure whether the device corresponds to the state defined during project planning or to the delivered system documentation.

Correct use

- ▶ Use the device only as described in "Intended use".
  The manufacturer bears no responsibility for any other use.
- ▶ Carry out the specified maintenance work.
- ▶ Do not attempt any work on or repairs to the device unless described in this Manual.
  Do not remove, add or change any components in or on the device unless such changes are officially allowed and specified by the manufacturer.
  Failure to observe these precautions could result in:
  - Voiding the manufacturer's warranty.
  - The device becoming dangerous.

Special local requirements

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

Read the Operating Instructions

- ▶ Read and observe these Operating Instructions.
- ▶ Observe all safety instructions.
- ▶ If anything is not clear: Please contact SICK Customer Service.

Retain documents

These Operating Instructions must be

- ▶ Available for reference.
- ▶ Passed on to new owners.

3 Product description

3.1 Product identification

Product name	GM901-02
Device version	CO measuring device with probe
Manufacturer	SICK AG Erwin-Sick-Str. 1 • D-79183 Waldkirch • Germany
Type plates	• Sender and receiver: Under the optics tube • Measuring probe: On the electronics housing

Table 3: Product identification

3.2 Product features

- The in-situ gas analyzer GM901-02 serves for continuous measurement of gas concentrations in industrial plants.
- The GM901-02 is an in-situ measuring system which means measuring is done directly in the gas carrying duct.
- Measuring components: CO and reference value temperature.
- Measuring principle: Infrared spectroscopic gas filter correlation.

3.3 GM901-02 layout

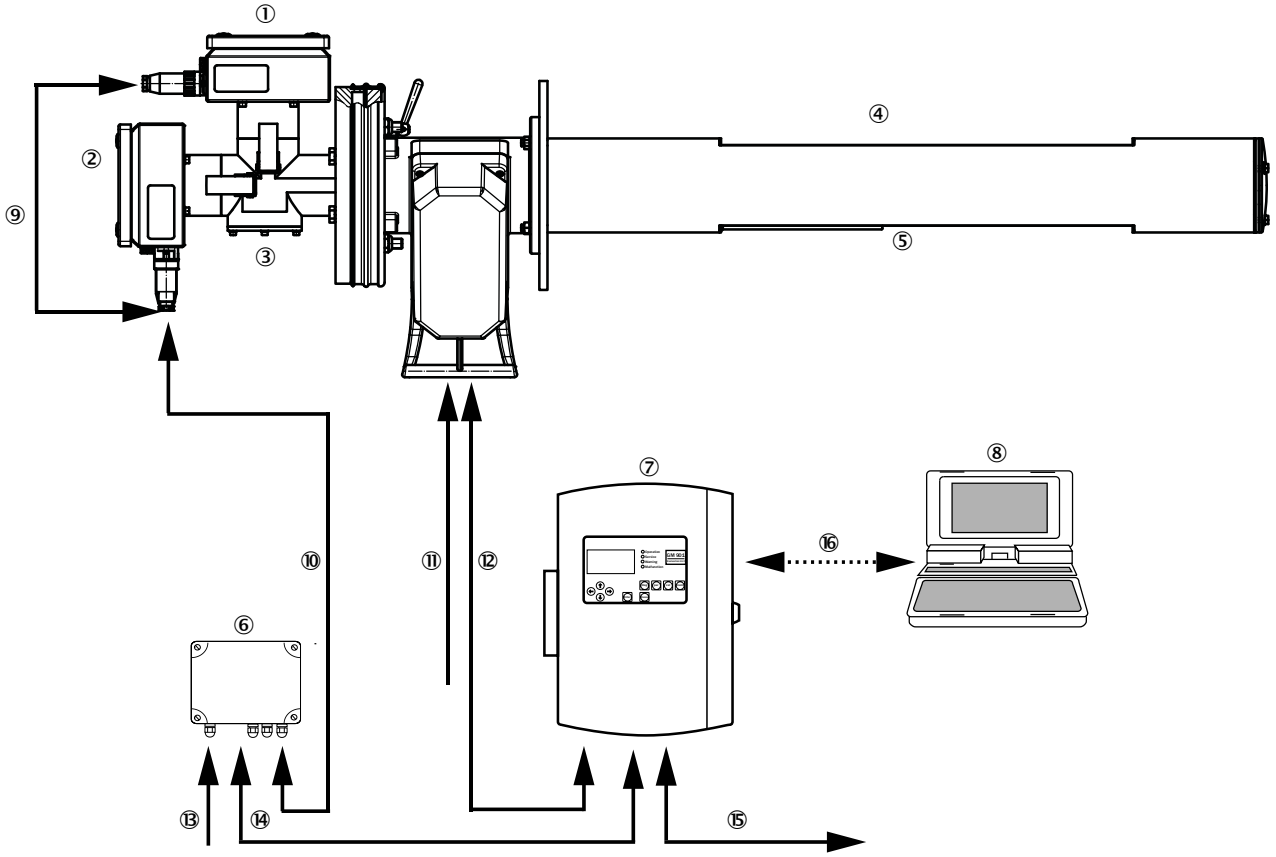


Figure 1: Device component overview

	System components		Line
①	GM901-02 sender	⑨	CAN connection, sender-receiver
②	GM901-02 receiver	⑩	Signal line, GM901 receiver to connection unit
③	T-piece with beam splitter	⑪	Power supply 115 V/230 V AC
④	Measuring probe	⑫	Line to temperature sensor PT1000
⑤	Temperature sensor PT1000	⑬	Power supply 115 V/230 V AC
⑥	Connection unit (optional) for distance analyzer - EvU > 20 m	⑭	Signal cable, max. 1000 m (CAN bus and temperature)
⑦	Evaluation unit	⑮	• Analog output signals: 1 input, 1 output • Status signals: 1 input, 3 outputs
⑧	Service PC	⑯	RS232 interface (Service)

Table 4: GM901-02 layout

NOTE

If the evaluation unit is installed detached, the 20 mA converter must be installed near the device.

3.4 Measuring probes

- **Gas diffusion probe (GPP)**

Figure 2: GPP measuring probe with ceramic filter

Characteristics:

- Suitable for applications with dry process gas
- Measuring probe material:
  - Standard: Stainless steel (1.4571/316 Ti)
  - On request: 1.4539
- No moving parts
- Active elements: Heaters of the optical surfaces and their controls
- Temperature sensor PT1000
- Power supply via a plug
- Filter element for filtering dust particles
  - With ceramic filter: Dust removal for particles > 1 µm
- EPA compliant (EPA Guideline CFR 40, Part 60 or Part 75): The measuring chamber can be filled with known concentrations of test gases
- SPAN and zero point test possible: Usage as "zero path" by purging the measuring chamber with air or N_2 possible
- Pressure-resistant up to 200 mbar differential pressure to duct
- No special flow conditions in duct necessary

- **GMP measuring probe - probe with open measuring gap**

Figure 3: GMP measuring probe with open measuring gap and PT1000 temperature sensor

Characteristics:

- Very short response times
- High temperature stability
- Continuous purge air necessary
- Air outlet in the duct 90° to gas flow
- Temperature sensor PT 1000 for continuous measurement of medium temperatures in the active measuring path of the probe

Gas inlet and outlet with the GMP measuring probe

The GMP probe has a closing device towards the opening for sample gas and is operated using the lever on the probe flange. This ensures a correct purge air function without an analyzer.

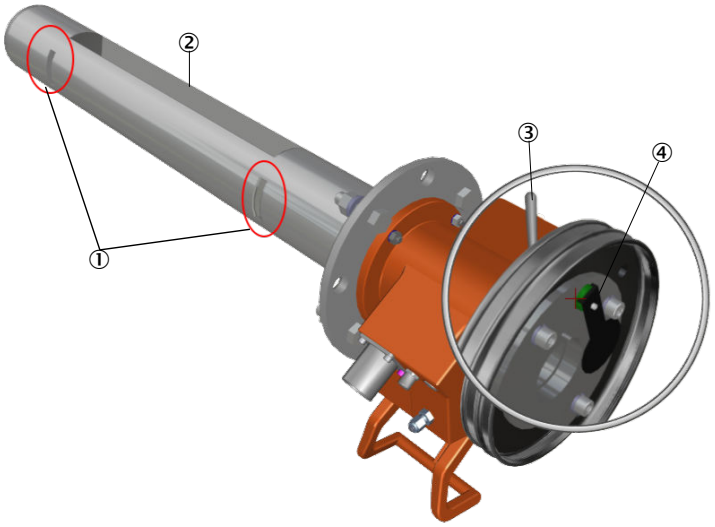


Figure 4: GMP measuring probe closing device

① Purge air outlet
② Open measuring path (measuring gap)
③ Closing device lever
④ Closing device set to position "open"

GM901-02 with GMP probe and purge air unit

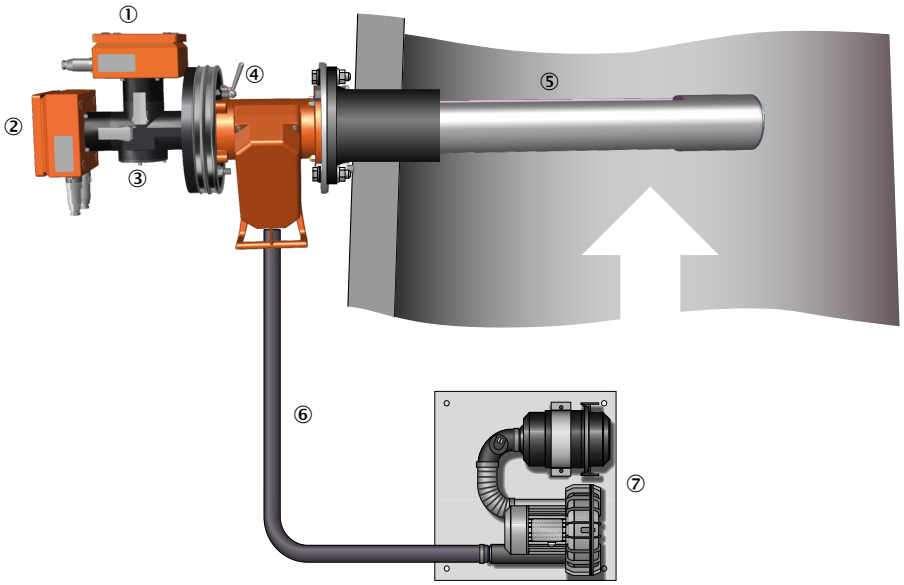


Figure 5: GMP measuring probe with purge air unit on the duct

① GM901-02 sender
② GM901-02 receiver
③ T-piece with beam splitter
④ Lever for closing device of the sample gas opening
⑤ GMP measuring probe
⑥ Purge air hose
⑦ Purge air unit SLV4

Measuring probes in comparison

Measuring probe feature	GMP (open probe)	GPP (dry)
Type	Measuring path open in flow direction; purge air guidance with outlet aligned 90° to gas flow	Gas diffusion probe with ceramic filter, for dry sample gas
Max. gas temperature	430 °C	430 °C
Gas check according to EPA specification possible	-	Yes
Purge air supply required	Yes	No
Heating on optical interfaces in the probe	-	Yes, with integrated control
Flow rate of sample gas	1 ... 40 m/s	< 40 m/s
Suitable for wet sample gas	Yes	No
Maximum duct pressure	±120 hPa, depending on purge air supply	±200 hPa with safety clamps on the device flange seal
Measurable components	CO	
System response time (T90)	≥ 5 s	≥ 120 s
Duct diameter	> 360 mm	> 300 mm

Table 5: GMP and GPP measuring probes in comparison

Measuring probe feature	GMP (open probe)	GPP (dry)
Dust concentration	< 2 g/m3 a.c.	< 30 g/m3 a.c.
Probe lengths available [m]	1.1	1.1
Active measuring paths available [mm]	250/500	

Table 5: GMP and GPP measuring probes in comparison

3.5 Evaluation unit

- **Evaluation unit with connection line (4 m)**

The evaluation unit (EvU) serves in the measuring system as user interface and prepares and outputs the measured values and performs control and monitoring functions. The EvU can be located in the vicinity of the sender/receiver unit. It can also be located up to about 1000 meters from the sampling point, e.g. installed in the switch center or monitoring center, and performs the following functions:

- Output of measured values, computed data and operating states
- Communication with the peripheral equipment
- Output of error messages and other status signals
- Access during service (diagnosis)

3.6 Accessories

- **Connection unit**

– For CAN bus with 24 V power supply
– To extend the distances 19 ... 1000 m between analyzer and evaluation unit

- **Weatherproof cover**

The weatherproof cover is used when the measuring system is operated outdoors. It is available as an accessory.

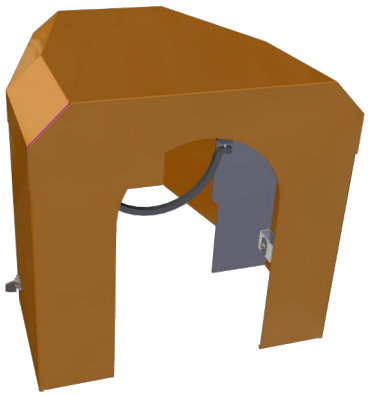


Figure 6: Weatherproof cover

- **Purge air unit**

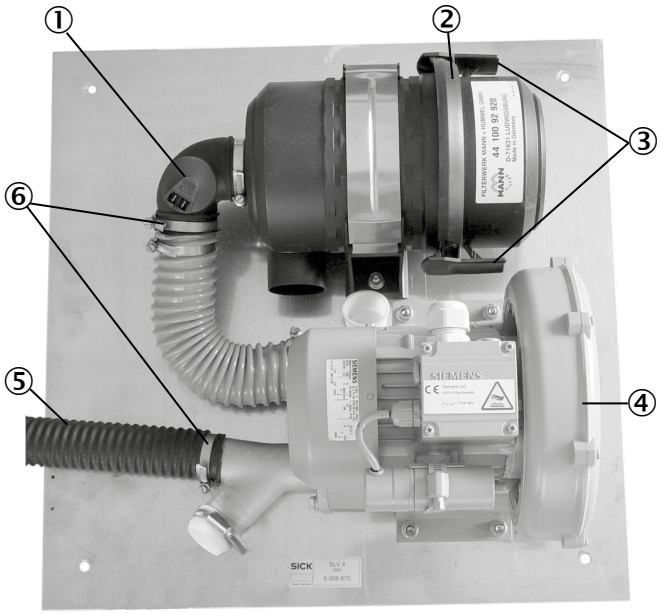


Figure 7: Purge air unit components

① Low-pressure monitor
② Air filter
③ Quick-release clamps
④ Purge air blower
⑤ Purge air hose
⑥ Hose clamps

The purge air unit serves to feed purge air when using the open measuring probe (GMP). It supplies filtered ambient air to the purge air fixture and protects the optical surfaces of the sender and the receiver against contamination.

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

- **Optical adjustment device**
  To align the sender and receiver

Figure 8: Optical adjustment device

- **CO test cells with holder (SPAN test)**

For the yearly drift control (zero point and sensitivity)

Figure 9: CO test cell with holder in transport case

Deliverable test cells

Test cells are available depending on the application-specific measuring ranges, measuring paths and test points (e.g. 70%).

4 Important information on GPP measuring probes

CAUTION

Observe the following information during commissioning of the GPP measuring probe to avoid damage to the measuring system and to achieve stable measurements.

- Check the filter surface visually for damage.
- Warm the probe up for about 30 minutes beforehand so that the temperature of the window and triple reflector is sufficient to prevent condensation on the optical surfaces.
- Gas can escape at the measuring probe during overpressure processes when the 1/4" plug is open or loose. Air is suctioned into the measuring probe during low-pressure processes. The measured value in the chamber then drops depending on the low-pressure in the process, possibly down to zero.
- Do not damage the filter when inserting the probe in the flange.

5 Transport and storage

5.1 Transport safeguards

Check the transport safeguards

▶ Check all transport safeguards for damage.

Remove the transport safeguards from the measuring probe (GMP)

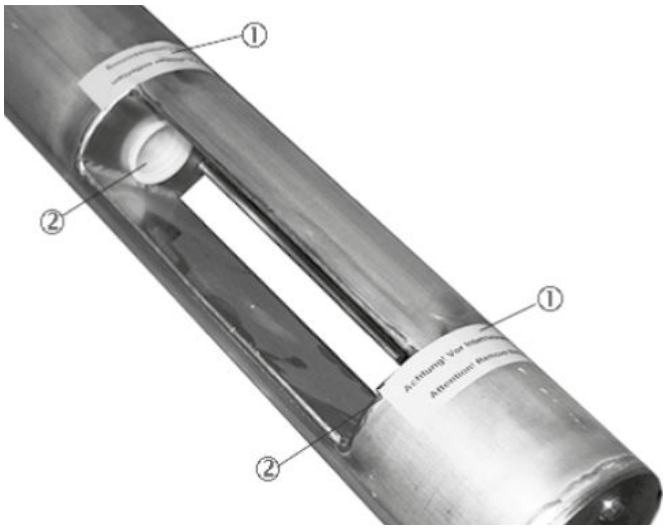


Figure 10: Transport safeguards on the GMP probe

① Protective stickers

② Protective caps

1 Remove the protective stickers.
2 Remove the caps.

6 Mounting

6.1 Information on installing the sender/receiver unit and measuring probe

Information

CAUTION
Damage to device and plant through unsecured parts during installation

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

- Secure all parts with wire.

NOTE
The sender, receiver and measuring probe are first installed on the duct during commissioning because these require an initial adjustment away from the gas-carrying duct. To avoid problems during commissioning, the SR-unit and measuring probe must be stored in a dry place free from dust, preferably at room temperature, until commissioning.

DANGER
Health risk though pressure and hot or toxic gases

Dangerous pressures, hot or toxic gases can escape when opening the duct depending on the process gas characteristics.

- Before installing the sender, receiver and measuring probe, be sure to take all safety measures that prevent gas escaping uncontrolled.

ATTENTION
Damage to the sender, receiver and measuring probe when fitted too early on the measuring duct

Unfavorable ambient conditions or atmosphere in the measuring duct can damage the measuring system which prevents commissioning.

- First fit the sender/receiver unit and measuring probe during commissioning.
- Before fitting, check the process and ambient conditions according to the Technical Data are ensured.

6.2 Overview of the installation steps (duct-side preparation)

Step	Procedure	Reference
1	Install the flange with tube.	see "Installing the flange with tube", page 23.
2	Install the connection unit (for larger distances, up to 1000 m, between sampling point and EvU).	see "Dimension drawing, terminal box", page 95.
6	Install the evaluation unit.	see "Installing the evaluation unit", page 25.

Table 6: Installation steps overview

6.3 Scope of delivery

6.3.1 Check scope of delivery

NOTICE

The data of the final inspection protocol must match the data of the order confirmation.

▶ Check the scope of delivery against the order confirmation and/or delivery note.

Standard scope of delivery

- Sender/receiver unit:
  - Sender
  - Receiver
  - T-piece
- Evaluation unit with connection cable
- Connection cable from sender to receiver
- Measuring probe:
  - GMP: Gas measuring probe with open measuring gap
  - GPP: Gas permeation probe

Optional accessories

- Connection unit: For distances up to 1000 m between sender/receiver unit and evaluation unit
- Purge air unit: To protect the optical surfaces of the sender/receiver unit
- Weatherproof cover for installation outdoors
- Optical adjustment device
- CO test cell with holder (SPAN test)
- Welding neck flange

6.3.2 Checking the delivery state

NOTICE

▶ Check all components have no exterior damage.

▶ Ensure the supply voltages specified on the type plate match the plant conditions.

6.4 Installing the flange with tube

WARNING
Risk of injury through improper assembly work

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

ATTENTION
Risk of temperatures exceeding the limit value through external heat radiation

The ambient temperature must not exceed 55 °C. Heat radiation can cause the surface temperature to be higher than the measured air temperature.

▶ Strengthen the insulation.

ATTENTION
Hazard through overpressure in the system

Overpressure in the duct can lead to leaks at the flange.

▶ Always observe the limit values for gas pressure.

Available flanges with tube:

- Standard delivery: 1 x flange with tube; 240 mm total length and 125 mm inner diameter.
- Custom-made versions available on request.
- On-site ANSI flange.

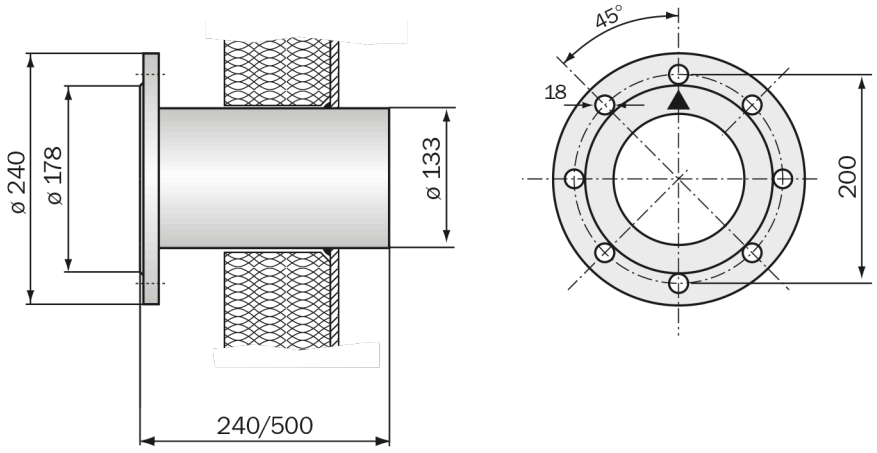


Figure 11: Mounting flange

NOTE
Reinforcement with junction plates recommended

The device has a relatively high weight.

▶ Weld junction plates on on-site for reinforcement of ducts with thin walls or at fitting locations subject to vibrations.

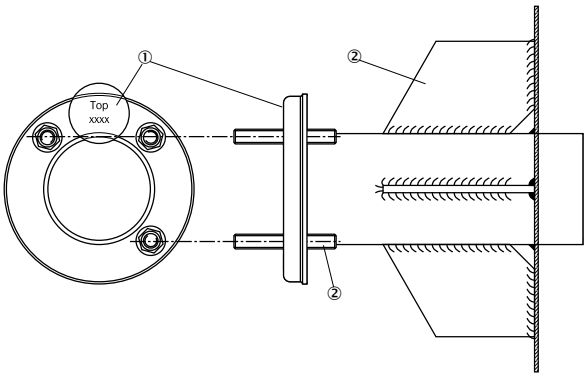


Figure 12: Flange tube with junction plates

① Marking for assembly position

② On-site junction plates

③ The rear side of the threaded bolts serves to fasten the optional weatherproof cover

Installing the flange with tube

1 Remove an area of 1000 mm x 800 mm of the insulation from the duct.
2 Mark the flange center point exactly on the duct wall.
   – On ducts made of stone/concrete: Duct opening approx. 2 cm larger than the flange tube outer diameter ; at the same time, plan a light downward incline of the flange tube by approx. 1° to prevent condensate collecting later between the tube and probe.
   – Provide a suitable retainer plate.
3 Cut an opening matching the flange tube outer diameter (standard Ø = 133 mm) in the duct wall and/or retainer plate.
4 Insert the flange tube so that the marking points exactly upwards (↑). Tilt the tube in the duct or on the retainer plate slightly downwards (approx. 1°).
5 Affix in the fitting position.
   – Weld on junction plates as reinforcement when possible. For ducts made of stone/concrete: Anchor the retainer plate with flange with tube welded on securely to the duct.
6 Weld the flange tube on.

6.5 Installing the evaluation unit

Prerequisite:

- Installation location already determined during project planning.
- The maximum line length of 1000 m for all CAN bus connections has been considered.

NOTE

Recommendation: The shorter the distance between sampling point and evaluation unit, the easier it is to use the system.

Prepare the installation location

1 Dimension drawing, see "Dimension drawing, evaluation unit", page 93.
2 Based on the dimension drawing of the evaluation unit, make sure sufficient space is available at the planned installation location to fit and wire the unit as well as to pivot the housing door.
3 Bore the four holes (Ø 7.2 mm for M8) according to the dimension drawing.

Install the evaluation unit

1 Open the housing cover with a control cabinet key and swivel open.
2 Attach the evaluation unit at the installation location using the four planned mounting holes with suitable screws (M8 x 20).
3 Close and lock the housing cover again.

7 Electrical installation

7.1 Safety information for electrical installation

WARNING
Endangerment of electrical safety during installation and maintenance work when the power supply is not switched off

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

WARNING
Endangerment of electrical safety through power cable with incorrect rating

Electrical accidents can occur when the specifications for replacement of 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 cable.

DANGER
Danger of electrical accidents

Incorrect performance of electrical work could result in serious electrical accidents.

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

CAUTION
Device damage through incorrect or missing grounding

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

WARNING
Endangerment of electrical safety through heat damage to lines

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

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

CAUTION
Device damage through short circuit on the device

The internal electronics can be damaged when signal connections are established and the power supply is switched on. This is also valid for plug connections.

- Disconnect the analyzer and all connected devices from the power supply (switch off).

CAUTION
Hazard of severe damage to electronic subassemblies through electrostatic discharge (ESD)

When touching electronic subassemblies, there is a hazard of severe damage to the subassembly by electric potential equalization.

- ▶ Make sure you have the same electric potential as the subassembly (e.g. by grounding) before touching the subassembly.

7.2 Connection overview

7.2.1 Connection diagram for standard version

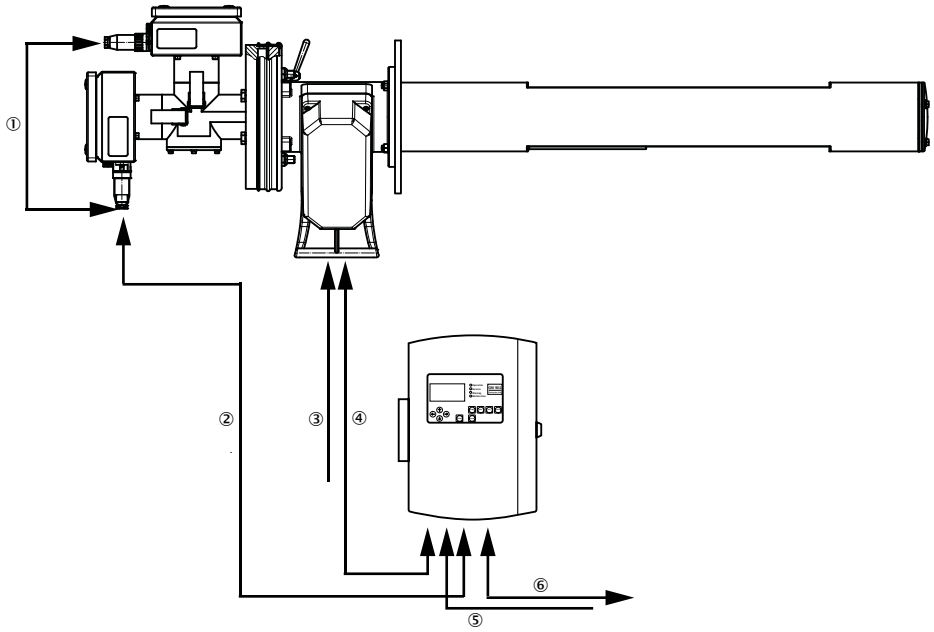


Figure 13: Connection diagram for standard version

① CAN connection, sender-receiver
② CAN connection and power supply, EvU - analyzer (4 m)
③ Power supply, purge air fixture, 115/230 V AC (GPP measuring probe)
④ Signal line, EvU temperature sensor PT1000 at 20 mA
⑤ Power supply EvU: 115/230 V AC
⑥ Signal outputs EvU:
- Analog: 1 input, 1 output
- Digital: 1 input, 3 outputs

7.2.2 Electrical wiring on the evaluation unit

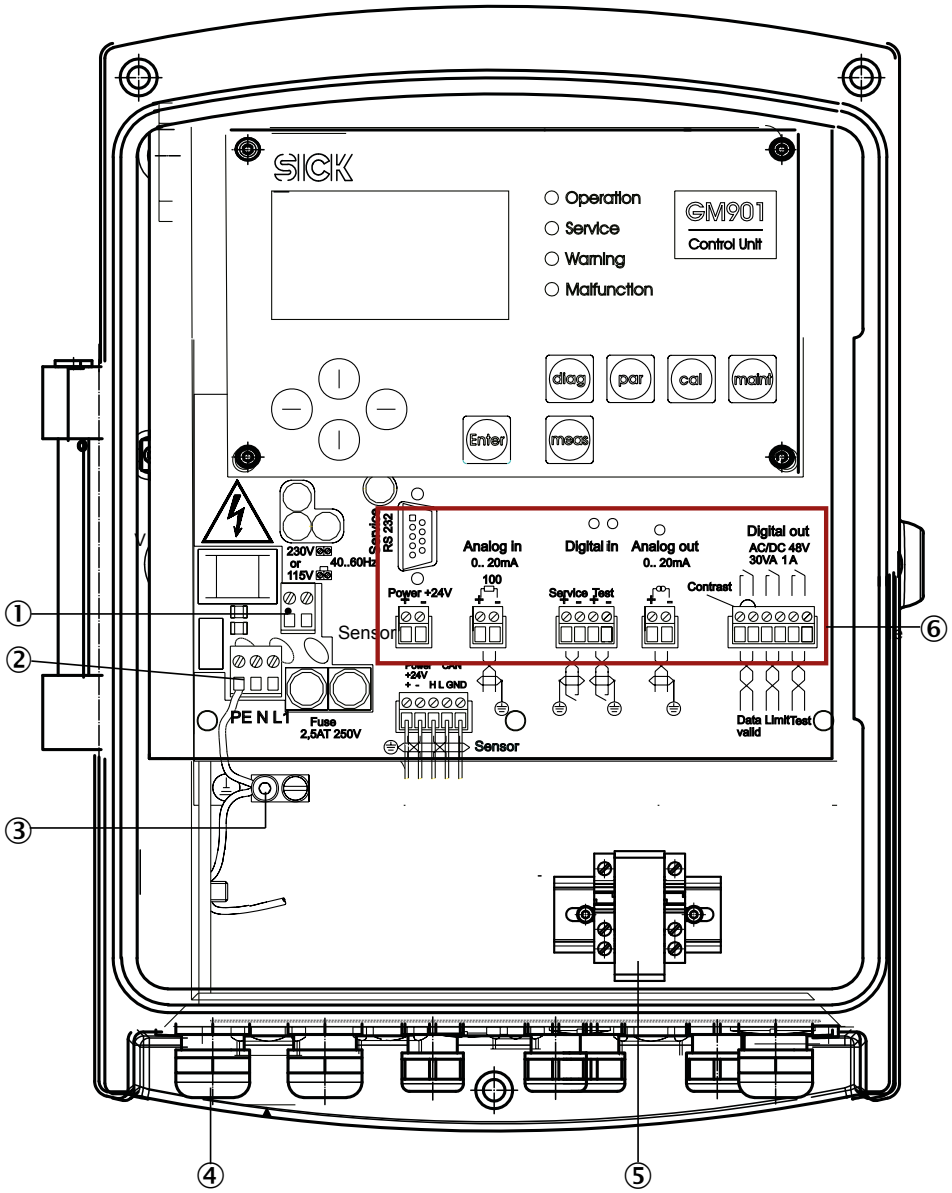


Figure 14: Electrical wiring of the evaluation unit

① Cable bridge: Selection of operating voltage: 115 V or 230 V
② Power supply: 115 V / 230 V
③ Potential equalization connection
④ Screw cap for power supply cable
⑤ Measuring transducer for PT1000 -> 20mA
⑥ Terminals for wiring by customer

7.2.2.1 Evaluation unit wiring by the customer

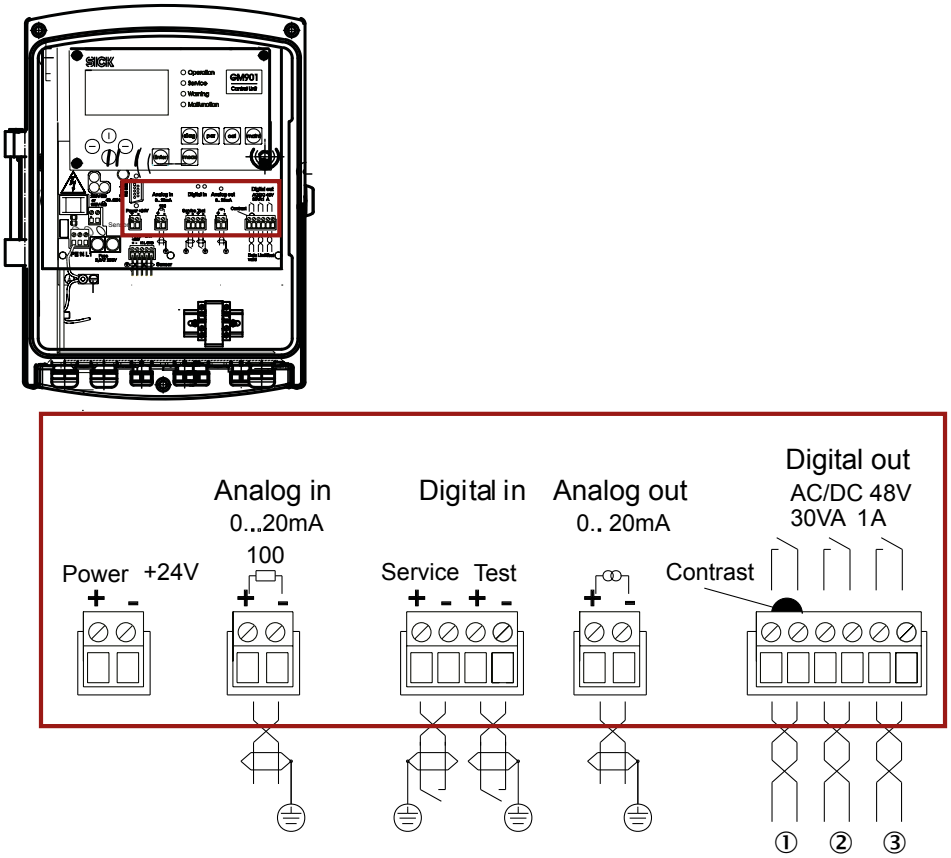


Figure 15: EvU connections for customer wiring

① Digital output error message
② Digital output limit value
③ Not used

NOTE
The display contrast can be set using the rotary potentiometer labeled "Contrast".

7.2.3 Connection diagram with terminal box (detached evaluation unit)

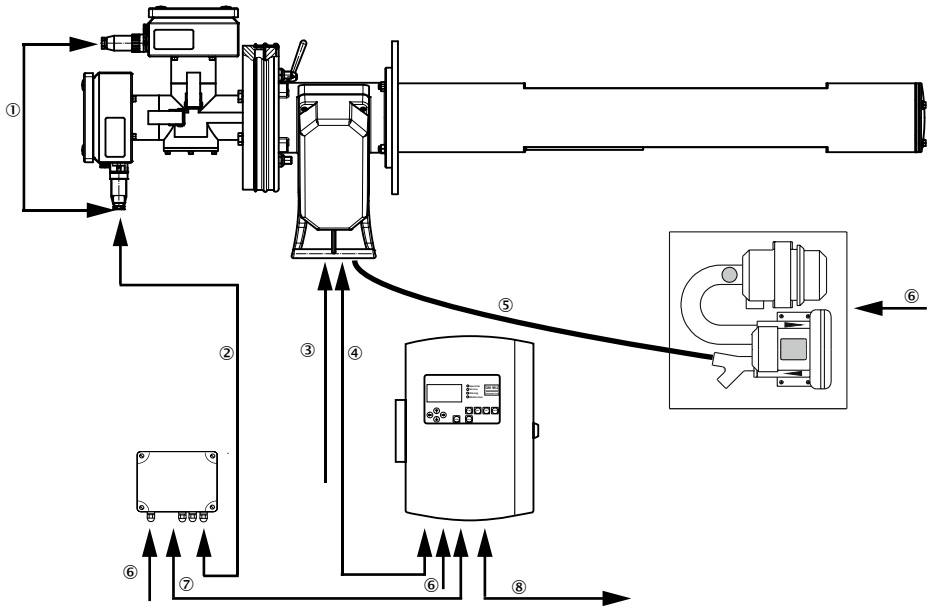


Figure 16: Wiring with terminal box and detached evaluation unit

Lines

① CAN connection, sender-receiver

② CAN connection to connection unit and 24 V supply for sender and receiver

③ Purge air fixture power supply (only when using a GPP probe): 115 V / 230 V AC

④ Signal line, temperature sensor PT1000 on 20 mA converter -> EvU

⑤ Hose for purge air supply (only when using a GMP probe)

⑥ Power supply 115 V / 230 V AC

⑦ CAN bus between terminal box and evaluation unit, up to max. 1000 m

⑧ Analog: 1 input, 1 output

Digital: 1 input, 3 outputs

7.2.3.1 Terminal box customer wiring

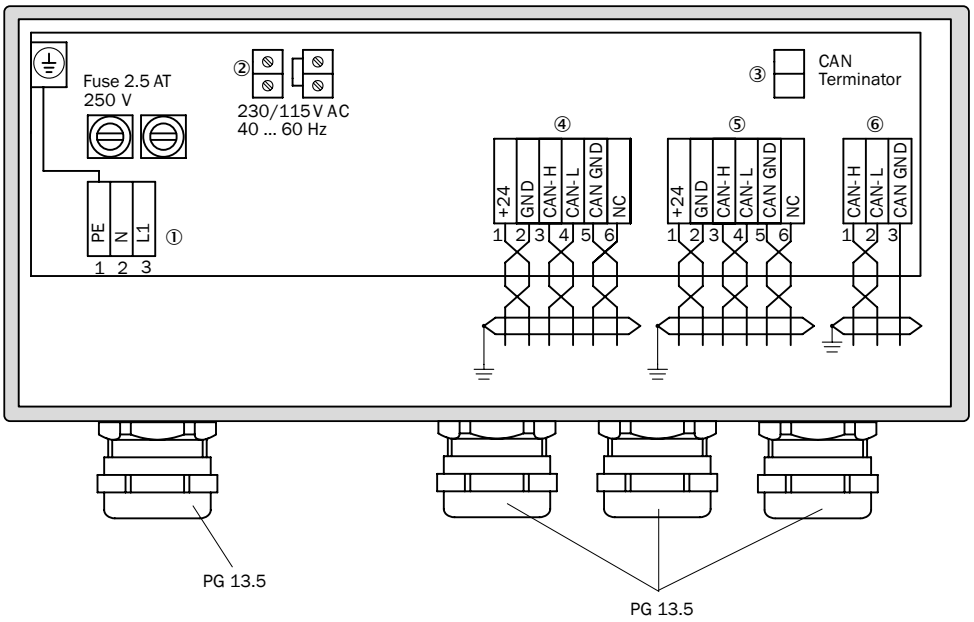


Figure 17: Terminal box customer wiring

① Power supply 115 V / 230 V

② Operating voltage selection: 115 V / 230 V

③ CAN terminator

④ CAN connection 1 *

⑤ CAN connection 2 *

⑥ Terminal strip for evaluation unit connection (cable length max. 1000 m)

* For the GM901-02, only one of the two available CAN connection terminal strips required

Color code for wiring in the evaluation unit

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

NOTE

Cable length between terminal box and evaluation unit is max. 1000 m.

Color code for wiring in the GM901-02 sender/receiver

Wiring	Color code
+24 V	Pink
GND	Grey
CAN-H	Yellow
CAN-L	Green
CAN-GND	Brown

7.2.3.2 Connect the potential equalization to the evaluation unit

The potential equalization must be connected to the evaluation unit. Screw terminal position, see "Electrical wiring on the evaluation unit", page 28.

- Screw the grounding conductor (4 mm²) of the equipment ground tight to the screw terminal.

7.3 Uninstalling the electrical system

DANGER
Electrical accident through bare, live lines

When uninstalling, unsecured, live lines can lead to serious accidents.

- Switch the power supply to the device off before starting uninstallation.
- If power supply is required during uninstallation: Secure all live lines during uninstallation so that nobody can be injured.

CAUTION
Electrical accident through unsecured switches

Switches that should no longer be switched on for safety reasons can lead to serious accidents when switched on accidentally.

- Replace defective switches.
- As long as defective switches have not been replaced: Secure against being switched on accidentally with appropriate signs or safety locks.

NOTICE
Device damage through incorrect storage of electrical cables

Incorrect storage can lead to cable ends becoming damp and soiled. This can lead to device damage when restarting the device.

- Insulate cable ends.
- Protect cable ends against dirt and dampness with suitable auxiliary materials.

8 Commissioning

8.1 Safety information for commissioning

Technical knowledge needed / requirements for commissioning

NOTICE

- You are basically familiar with GM901.
- You are familiar with the local situation, especially the potential hazards caused by gases in the gas duct (hot/noxious). You are capable of recognizing and preventing danger by possibly escaping gases.
- The specifications according to project planning have been complied with (see final inspection record).
- The installation location has been prepared according to the project planning.

If one of these requirements is not met:

▶ Please contact SICK Customer Service or your local representative.

Safety information concerning gas

DANGER

Danger to life by leaking hot/toxic gases

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

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

WARNING

Health risk through contact with toxic gases

The modules and devices contain enclosed potentially dangerous gases that can escape due to a defect or leak. Should a leak occur, the concentrations within the enclosed device can rise to 350 ppm.

- CO : 10 ml max. total volume.

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

Electrical safety

WARNING
Endangerment of electrical safety during installation and maintenance work when the power supply is not switched off

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

WARNING
Endangerment of electrical safety through power cable with incorrect rating

Electrical accidents can occur when the specifications for replacement of 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 cable.

DANGER
Danger of electrical accidents

Incorrect performance of electrical work could result in serious electrical accidents.

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

Grounding

CAUTION
Device damage through incorrect or missing grounding

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

System safety

ATTENTION
Responsibility for the safety of a system

The person setting the system up is responsible for the safety of the system in which the device is integrated.

8.1.1 Important information on GPP measuring probes

CAUTION

Observe the following information during commissioning of the GPP measuring probe to avoid damage to the measuring system and to achieve stable measurements.

- Check the filter surface visually for damage.
- Warm the probe up for about 30 minutes beforehand so that the temperature of the window and triple reflector is sufficient to prevent condensation on the optical surfaces.
- Gas can escape at the measuring probe during overpressure processes when the 1/4" plug is open or loose. Air is suctioned into the measuring probe during low-pressure processes. The measured value in the chamber then drops depending on the low-pressure in the process, possibly down to zero.
- Do not damage the filter when inserting the probe in the flange.

8.2 Overview of commissioning work

Commissioning comprises two main steps:

1 Zero adjust, see "Zero adjust", page 37.
The SR-unit is prepared for operation with the measuring probe in an atmosphere free from sample gas.

2 Installation and commissioning at the sampling point, see "Installing the sender and receiver", page 44.
The purge air unit and the SR-unit are put into operation with the measuring probe. The evaluation unit is then switched on and checked. This can then be configured for individual requirements.

8.3 Material required

Not included in the scope of delivery!

Material required	Part No.	Required for
19 mm open-end wrench		Aligning the flanges.
Optical cleaning cloth without detergents	4003353	Cleaning the window.
Personal protective equipment		For protection when working on the duct or with hot or aggressive sample gases.

Table 7: Material required for commissioning

8.4 Overview of commissioning steps

Step	Procedure	Reference
1	Install the evaluation unit.	see "Installing the evaluation unit", page 25.
2	Wire the evaluation unit.	see "Electrical wiring on the evaluation unit", page 28.
3	Connect the potential equalization to the evaluation unit.	see "Connect the potential equalization to the evaluation unit", page 32.
4	Remove the transport safeguards.	see "Transport safeguards", page 20.
5	Fit the T-piece on the measuring probe (if not already fitted at the factory).	see "Installing the sender and receiver", page 44.
6	Install the sender and receiver.	see "Installing the sender and receiver", page 44.
7	Connect the sender and receiver with a signal cable.	see "Connecting the sender and receiver with a CAN line", page 48.
8	When using a GPP measuring probe: Connect the power supply.	Wait for at least 30 minutes warming up time before pushing the measuring probe into the duct.
9	Align the sender and receiver on the optical axis.	see "Installing the sender and receiver", page 44.
10	Connect the CAN cable and temperature sensor.	see "Connection diagram for standard version", page 27.
11	Check the zero point and adjust when necessary.	see "Zero adjust", page 37.
12	Install the measuring device on the duct.	see "Installing the sender and receiver", page 44.
13	Create connections to customer data system. Configure according to customer specifications.	see "Parameters (settings)", page 56.
14	Fit the weatherproof cover (optional).	see "Installing the weatherproof cover", page 49.

Table 8: Overview of commissioning steps

8.5 Criteria for switching on

The following work must be completed before commissioning:

Electrical installation - completed and checked.	☐
Measuring system fitted and installed on the measuring probe. The SR-unit and purge air fixture are connected on the duct flange later.	☐
Function test (rotation direction of fan) of the optional purge air unit has been carried out.	☐
Measuring system has been aligned.	☐
Sampling point has been checked for free access without hazards.	☐
All specifications are met in accordance with the project planning.	☐

NOTE
Before switching the device on, make sure these requirements have been met.

8.6 Zero adjust

CAUTION
A zero point check or adjustment must be carried out before every initial and new commissioning.

NOTICE
The zero adjust must be carried out in a CO-free environment

- The zero adjust can be carried out directly at the sampling point when the plant is switched off.
- The zero adjust must be carried out outside the duct when the plant is in operation.
- Alternative to zero adjust when using a GPP measuring probe: Purge the measuring probe with N_2.

NOTE
The warming up phase for the measuring system takes 30 minutes. The measuring system is first stable after this period.

- Ensure the optical alignment has been carried out on the measuring probe. Otherwise correct.
- To start zero adjust, press the "cal" button on the operator panel of the evaluation unit, see "Operator panel of the evaluation unit GM901", page 52.
- Menu navigation for zero adjust (select zero adjust), see "Performing zero adjust", page 70.
  Zero Measuring is shown on the evaluation unit display during zero adjust.
- When zero adjust has completed:
  - Refit the measuring probe (GMP) with the measuring system back on the flange or
  - terminate the N_2 purge process (GPP measuring probe).

8.6.1 Manual SPAN test (optional)

Manual SPAN test (optional) for linearity control

NOTE
This test requires the optionally available CO cell and holder, see "Accessories ", page 16.

8.6.1.1 Determining the test values

The test concentration, this means the value of the test cell, is determined with the following formula:

TW [ppm × m] = MB [ppm] × x × S [m]

TW =	Test value
MB =	Upper measuring range value
S =	Measuring path
x =	Test point location

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

Example:

MB = 500 ppm
S = 4 m
Test point at 70% of MBx = 0.7

Test value of test cell: 4200 ppm × m

Calculation:
TW [ppm × m] = MB [ppm] ×x × S [m]
TW [ppm × m] ×= 1500 [ppm] ×0.7 × 4 [m]
TW [ppm × m] ×= 4200 [ppm × m]

NOTE
Available test cell: 4000 ppm × m

8.6.1.2 Carrying out a SPAN test

Prepare the SPAN test, see "Zero adjust", page 37.

SPAN test menu navigation, see "Performing a manual SPAN test", page 71.

1 Attach the test cell holder on the sender.

NOTICE
Do not insert a cell filled with CO yet.

2 To start the SPAN test, press the "cal" button on the operator panel of the evaluation unit, see "Performing a manual SPAN test", page 71.
3 Follow the menu instructions.

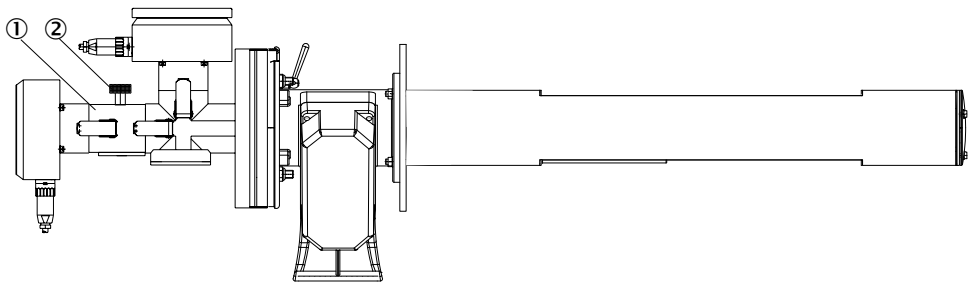


Figure 18: GM901-02 with holder for test cell

① Input compartment for CO cell
② Holder for test cell

8.6.2 Online SPAN test according to EPA Guidelines

Criterion for EPA-compliant SPAN test

- GPP (Gas-Permeation-Probe) with
  - Connection for gas inlet
  - Connection for pressure monitoring in the gas measuring chamber

Filling test or zero gas creates an overpressure in the filter element. As soon as the overpressure is high enough, it presses the exhaust gas out of the filter. This switches the gas flow through the filter element to the opposite direction. This method serves to determine the zero point and various other test points when using suitable test gases.

8.6.2.1 Carrying out a manual EPA SPAN test

Material required	Characteristics
Test gas cylinders according to the applicable EPA Guideline (N2 and test gases)	The concentration depends on the upper measuring range values to be tested
Adjustable pressure regulator for zero gas and SPAN gas	With adjustable pressure valve
1/8" line with Swagelok screw fitting	Length: Approx. 1.5 m
Pressure gauge	• An absolute pressure of 900–1100 mbar (equivalent to the pressure in the duct) • Scale: 0.5 mbar • 1/8" Swagelok connection

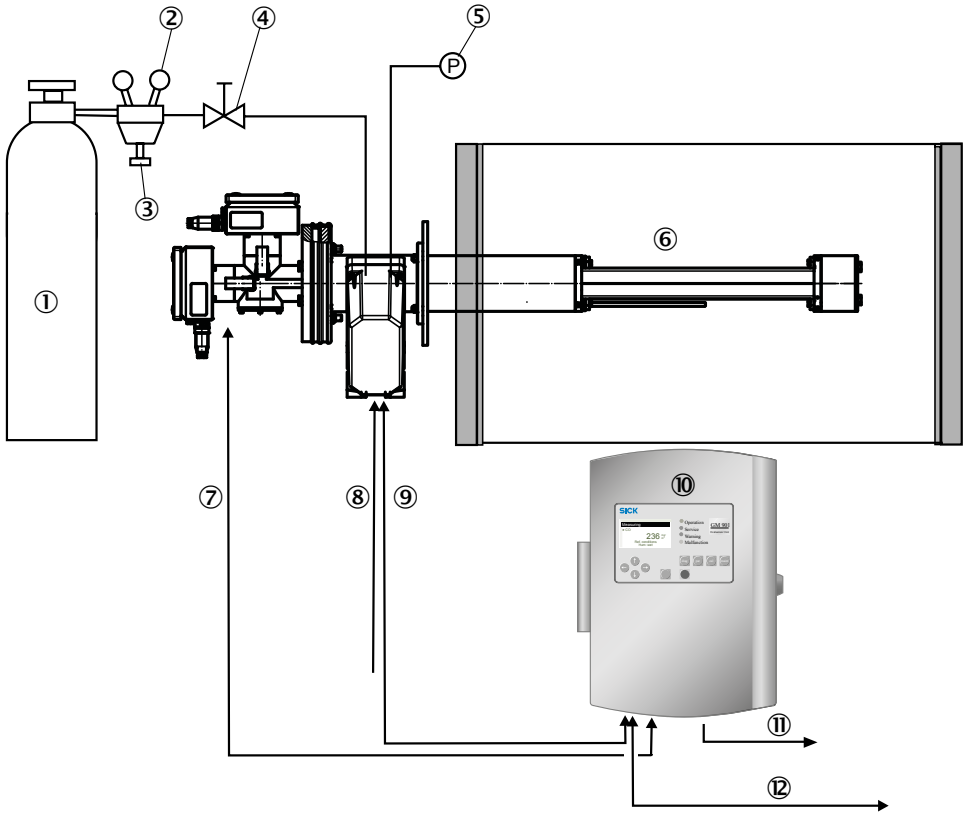


Figure 19: Equipment for the manual SPAN test

① Test gas
② Pressure gauge 1
③ Pressure regulator
④ Shut-off valve

⑤ Pressure gauge 2
⑥ GPP measuring probe
⑦ 2 m line (CAN bus and power supply)
⑧ 115 V / 230 V
⑨ Temperature sensor
⑩ Evaluation unit
⑪ Analog/status signals
⑫ 115/230V

Preparations

1 Connect the pressure regulator and pressure gauges to the gas cylinders, secure the gas cyclinders.
2 Close the shut-off valve.
3 Fit the hose between the pressure regulator and one of the two GPP connections.
4 Set the pressure on the gas cylinders to the calculated primary pressure.

NOTE
Air is suctioned into the partial vacuum channels as soon as the gas connection is opened. The measured values approach zero depending on the partial vacuum present.

5 Connect a pressure gauge to the second gas connection.
6 Read off the current measured values on the evaluation unit display.

Measurement

1 Start the EPA-SPAN test per menu, see "SPAN test according to EPA Guidelines", page 72, or digital input.
2 Set T90 to 10 seconds.
3 Open the shut-off valve fully.
4 Observe the measured values on the display until the value is stable.
5 Read off the pressure on the second pressure gauge to correct measurement when necessary.
6 Close the valve on the pressure reducer and the gas cylinder.
7 Now terminate data recording and start the evaluation.
8 Reset the T90 value.
9 Return to measuring mode.
10 When required, repeat the procedure (preparation and measurement) with further test gases.

8.6.2.2 Carrying out a thermal adjustment

The cold test gas flow withdraws energy from the measuring probe body as it flows through the device. Long purge times can therefore effect a difference between the test gas temperature and the process temperature. The following factors influence the difference:

- Throughflow volumes of the test gas
- Measurement duration
- Gas velocity in the process

This is the reason why it is recommended to determine the SPAN points first and then the zero point because a temperature drop does not influence the zero point measurement. A break between the measurements and the reduction in gas flow reduce this effect.

8.6.2.3 One-off preliminary measurement/determining the basic setting

Each GPP measuring probe has certain production tolerances. The ideal pressure parameters for the test must be determined once before the first measurement. The GPP must be installed in the duct for this test because the length of the measuring chamber and velocity of the exhaust gases in the duct also influence the initial pressure settings.

Carrying out a one-off determination of the basic settings

1 Prepare the gas (e.g. N_2 or air), see "Carrying out a manual EPA SPAN test", page 39.
2 Start the EPA test, see "Carrying out a manual EPA SPAN test", page 39.
3 Set T90 to 10 seconds.
4 Observe the display.
5 Set the pressure regulator on the gas cylinder to 0 bar and observe the measured values.
6 Set the pressure on the pressure regulator to approx. 3 bar and observe the measured values.
7 If zero is not reached within a certain time (depending on the T90 settings of the measuring system), increase the pressure in steps until zero is stable.
8 When zero is stable, reduce the pressure in small steps again and observe the display.
9 Increase the pressure again by 0.5 bar when the display rises above zero again.
10 Note the values on gauges 1 and 2.

NOTE
These values can be used later as prelimiinary pressure settings.

The correct test gas pressure is typically between 4 mbar and 10 mbar above the process pressure.

11 Reset the T90 value.
12 Close the shut-off valve and gas cylinder.
13 Return to measuring mode.

8.6.3 Automatic SPAN test

The calibration test is carried out with different equipment depending on customer requirements.

NOTICE
Valve control as well as triggering a SPAN test must be carried out with an automatic calibration test unit from the customer.

Equipment for an automatic SPAN test

- **Low requirements:**
  1 Determine the pressure settings required before starting the test.
  2 Connect test gas via solenoid valves to the GPP inlet.
  3 Use a gauge to set the preliminary pressure settings on the gas cylinder.

  NOTE
  Changes to the flow resistance in the filter can cause pressure rises or drops that then influence measuring precision (gas law).

- **High requirements:**
  1 Connect test gas via solenoid valves and adjustable pressure regulator to the GPP inlet.

- The pressure regulator serves to keep the pressure in the measuring chamber constant.
- The control signal is generated by comparing the fine pressure measurement in the chamber with a value previously specified.

NOTE

Changes in the filter material influence the time required for purging.

8.7 Basic parameters set

Parameter settings	
Physical unit	mg/Nm³
Normalization	wet
Response time	30 s
Measuring range	1000 mg/Nm³
Limit value	1000 mg/Nm³
Measuring distance	
Active measuring distance	250 or 500 mm
Temperature	
Substitute	150 °C
External	Analog in
Scale low	0 °C
Scale high	250 °C
Input low	4.0 mA
Input high	20.0 mA
Humidity	
Substitute	00.0 % (Vol.)
Pressure	
Substitute	1013 hPa (change the value to the current value when measuring in ppm)
Analog out	
Live zero	4 mA
Calibration	
Span	1.00
Zero	+000
Device parameters	
Serial number	Current software version
Evaluation unit	Current software version
Configuration	Type key of evaluation unit
Service	
C1	Determined during zero adjust
C2	Determined during zero adjust
C3	Data specified at the factory and assigned to the GM901-02 receiver (individual, per device).
C4	
C5	
C6	
C7	
C8	

8.8 Installing the sender and receiver

Step 1: Fit the T-piece on the probe

- Fit the T-piece on the flange attachment of the measuring probe.

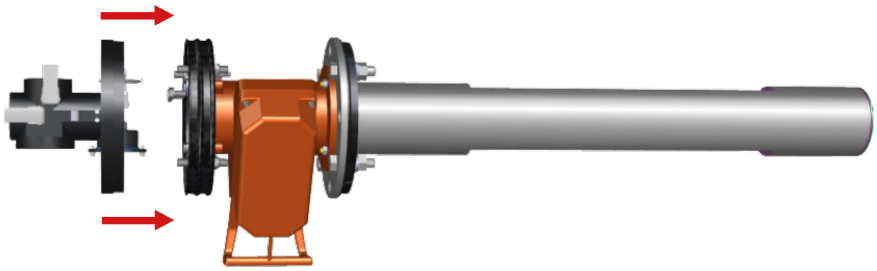


Figure 20: Fitting the T-piece on the measuring probe

NOTE
The probe is normally delivered from the factory already fitted on the T-piece.

Step 2: Align the sender on the optical axis

- The adjustment device, see "Accessories ", page 16, with the lamp must be fitted at the sender position and the adjustment device with the focusing screen at the receiver position.
- On the sender, tighten the two nuts for horizontal adjustment (X) and vertical adjustment (Y) so that the light point shown is positioned centered on the focusing screen of the adjustment tube.

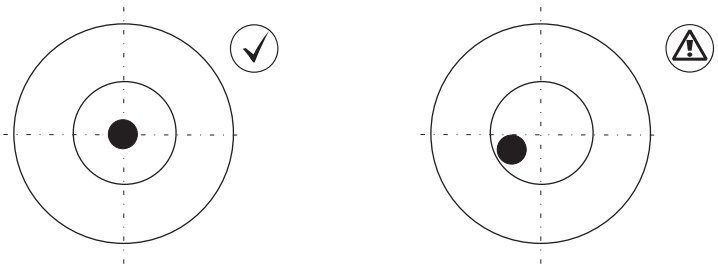


Figure 21: Light point on the focusing screen

Step 3: Align the receiver on the optical axis

- On the receiver, tighten the two nuts for horizontal adjustment (X) and vertical adjustment Y) so that the light point shown is positioned centered on the focusing screen of the adjustment tube.
- Control the adjustment in both directions.

Step 4: Fit the sender and receiver on the T-piece

▶ Fit the sender and receiver on the T-piece and secure both with the quick-release clamps.

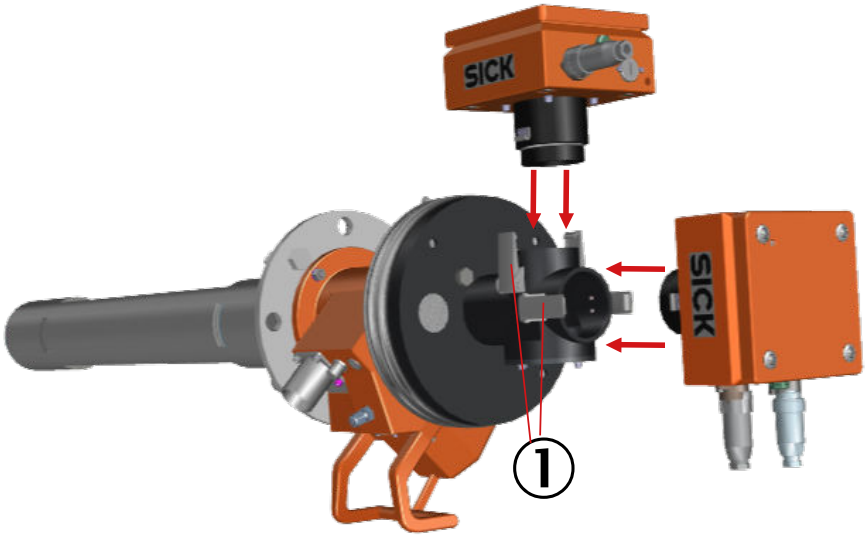


Figure 22: Fitting the sender and receiver on the T-piece

① Quick-release clamps

Step 5: Connect the signal lines and gas-carrying lines

▶ Connect the lines as shown in the diagram, see "Connection diagram for standard version", page 27.

Step 6: Warm the device up

▶ Switch the power supply on and let the device warm up for 30 minutes.

CAUTION
Unstable measured values through shortened warming up time (GPP measuring probe)

If the GPP measuring probe is not warm enough, condensate deposits on the optical surfaces can lead to false measuring results. Time-consuming cleaning of the optical surfaces is then necessary.

▶ Always maintain the 30 minute warming up time.

Step 7: Perform the zero adjust

see "Performing zero adjust", page 70.

Step 8: Install the GM901 measuring device on the duct

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

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

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

CAUTION
Device damage through incorrect/missing insulation of the duct when the measuring channel is hot

- ▶ When the gas duct is hot, insulate the duct and flanges so that the device is protected from high temperatures.

1 If present, remove the cover on the duct-side flange with tube.
2 Insert the measuring probe with mounted SR-unit in the duct-side flange with tube.

NOTICE
A seal must be present between the device flange and the duct flange.

3 Fit the measuring probe with the fastening set delivered on the duct-side flange. The fastening set comprises 4 screws (M16 x 60), each with nut and 2 washers.

CAUTION
Avoid damage to the device

- GMP measuring probe: Ensure uninterrupted purge air feed to the measuring probe!
- GPP probe: Ensure uninterrupted power supply to the measuring probe to heat the optical surfaces!

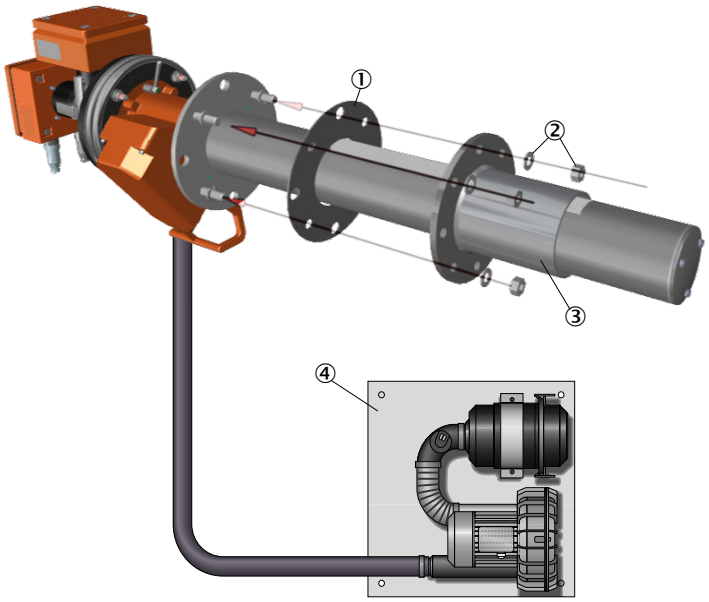


Figure 23: Installing the device on the duct flange

① Seal
② Screws M16x60 with nuts and washers
③ Flange with tube (duct-side)
④ Purge air unit SLV4

NOTE

Electrical connections and alignment control, see "Connection diagram with terminal box (detached evaluation unit)", page 30 and see "Zero adjust", page 37.

8.9 Connecting the sender and receiver with a CAN line

NOTE
The two connection plugs of the CAN cable are configured so that they only fit on the suitable connection. The connection sequence is unimportant.

Figure 24: Connecting the CAN line between sender and receiver

① CAN connection on GM901 sender
② CAN connection on GM901 receiver

8.10 Installing the weatherproof cover

The weatherproof cover is installed in two steps:

1 Fit the installation plate on the flange of the purge air fixture and the measuring probe flange.
2 Place the weatherproof cover on the installation plate.

1 **Fit the installation plate on the flange of the purge air fixture:**
- ▷ Lay the weatherproof cover upside down on the floor.
- ▷ Open and unhinge the locks on both sides.
- ▷ Pull the installation plate upwards and remove it from the cover.

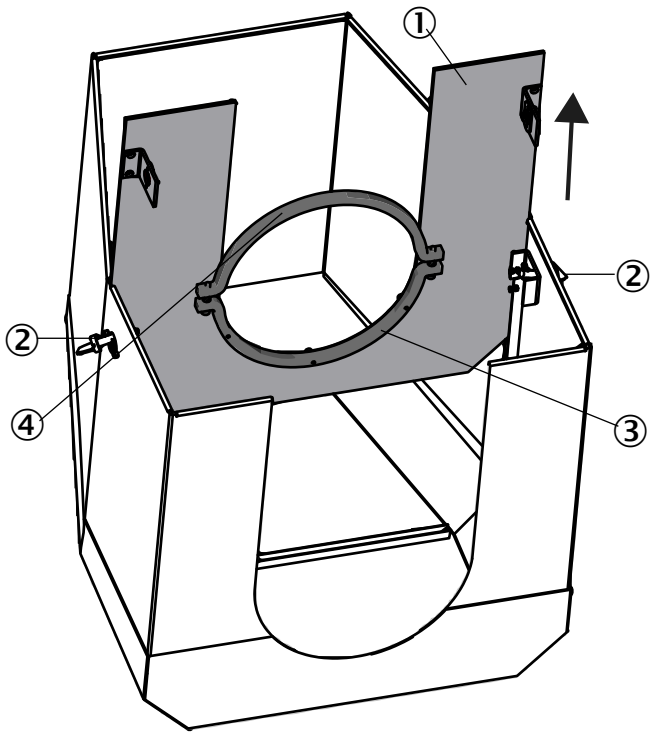


Figure 25: Removing the installation plate

① Installation plate
② Lock
③ Top mounting ring
④ Bottom mounting ring

- ▷ Remove the bottom mounting ring.
- ▷ Place the installation plate on the rubber band of the purge air fixture from the top.
- ▷ Position the mounting ring on the side of the purge air fixture.
- ▷ Screw the bottom mounting ring and the top mounting ring together.

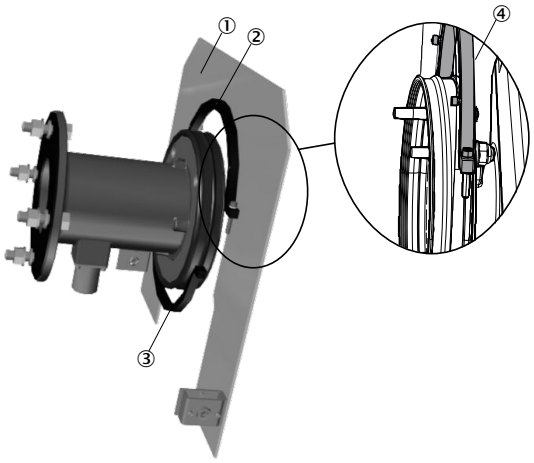


Figure 26: Detail view: Positioning the top mounting ring on the side of the purge air fixture

① Installation plate
② Top mounting ring
③ Bottom mounting ring

2 **Place the weatherproof cover on the installation plate:**
▷ Position the cover on the installation plate from the top.
▷ Engage the locks and close again.

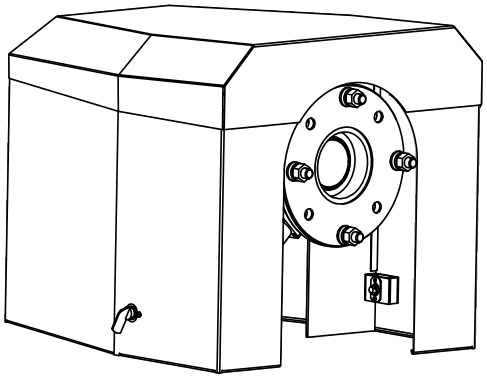


Figure 27: Placing the weatherproof cover on the installation plate

9 Operation

9.1 Safety

WARNING
Danger for persons and system caused by unsafe operation of the measuring system

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

- ▶ Put the device out of operation.
- ▶ Disconnect the device from the main power supply and signal voltage.
- ▶ Prevent unauthorized or unintentional start-up.

9.2 Operating and display elements

9.2.1 LEDs

LED	Significance / possible cause
OPERATION	• Measuring mode • The device is switched on, power voltage is available
SERVICE	• Service mode
Warning	• Warning message • At least one warning message pending • Reading warning messages, see Diagnosis mode (diag)
MALFUNCTION	• Device malfunction • At least one malfunction message pending • Reading malfunction messages, see Diagnosis mode (diag)

Table 9: Significance of LEDs

9.2.2 Operator panel of the evaluation unit GM901

Figure 28: Operator panel GM901-02 EvU

Function buttons		
①	GM901 evaluation unit (cast housing version)	
②	Operator panel of the evaluation unit	
③	Arrow buttons to edit units/digits	
	• Left arrow: – Move cursor to the left – Abort and return button	
	• Right arrow: – Move cursor to the right	
	• Up arrow: – Move cursor upwards – Increase digits	
	• Down arrow: – Move cursor downwards – Decrease digits	
④	Current measured value	
⑤	Measured value of an external temperature sensor or an internal adjustable value	
⑥	Adjustable limit value	
⑦	Measuring range end value, adjustable	
⑧	Measuring range start value, adjustable	
Function buttons and submenus		
⑨	**Diagnosis**	chapter 9.4.2, "Diagnosis"
⑩	**Parameter**	see "Parameters (settings)", page 56
⑪	**Calibration**	see "Calibration (Cal)", page 70
	▪ Zero adjust	Zero adjust
	▪ SPAN test	Manual SPAN test
	▪ EPA SPAN test	SPAN test according to EPA Guideline 40C FR 75
⑫	**Maintenance**	**Maintenance**
	▪ Reset System	Restart system

Function buttons		
	▪ Maint Mode	Maintenance mode
	▪ Test analog output	Check power value on analog output
	▪ Test Relays	Relay test
	▪ Reset Parameter[1)]	Set parameters to basic setting ⚠ Only when instructed to do so by SICK!
⑬	**Enter**	Confirm set value
⑭	**Measurement**	see "Measuring mode", page 55
	Measuring	Press "meas" for immediate return to measuring mode

1 The basic setting parameters are default values. All individual settings, including calibration parameters, are overwritten.

9.2.3 Setting the display contrast

The rotary potentiometer to adjust the display contrast is located above the terminal block "Digital out".

▶ Use a 2 mm precision screwdriver to adjust the display contrast setting.

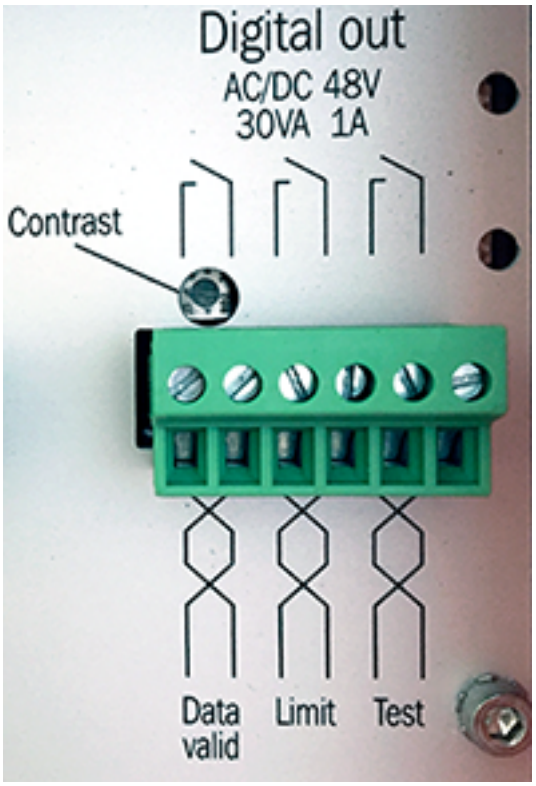


Figure 29: Rotary potentiometer to adjust the display contrast

1) 1

9.3 Entering the password

- The password is always prompted for when a parameter is to be changed.
- The password is "1234".
- The password remains active for 30 minutes.

DANGER

Endangerment of system safety through parameters with incorrect settings

Entering the password allows parameters to be changed. Unauthorized changes to safety-relevant parameters can lead to unsafe operation of the measuring system and can thereby endanger plant safety.

▶ Password entry only by technicians.

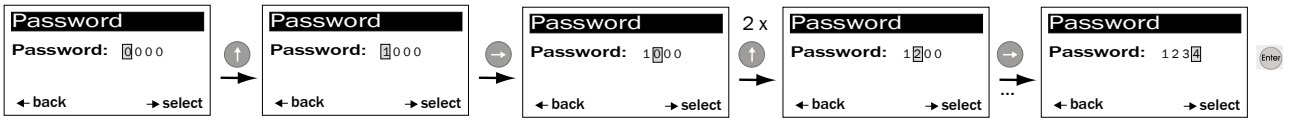


Figure 30: Entering the password

9.4 Menus

9.4.1 Measuring mode

The measuring mode display is shown during active measuring operation. The "Operation" LED is green. Explanations on the measuring mode display, see "Operator panel of the evaluation unit GM901", page 52.

The operator can switch directly to the measuring mode display from every menu item:

▶ Press "meas".

9.4.2 Diagnosis

Menu item "Diagnosis" serves to view the following data:

- Error messages
- Warning messages
- Sensor values

▶ Press "Diag" on the operator panel of the evaluation unit to call up the submenu items.

9.4.2.1 Viewing error messages

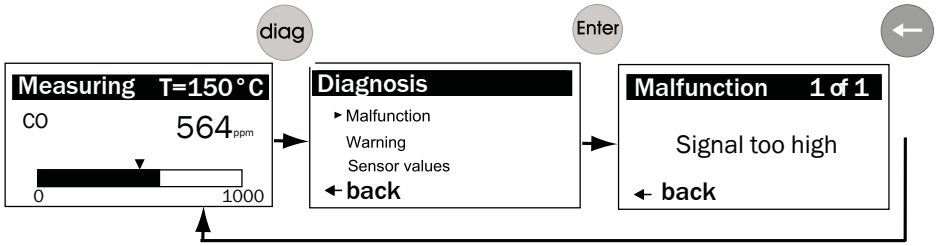


Figure 31: Viewing error messages (example)

NOTE

Table of all error messages, see "Malfunction messages", page 80.

9.4.2.2 Viewing warning messages

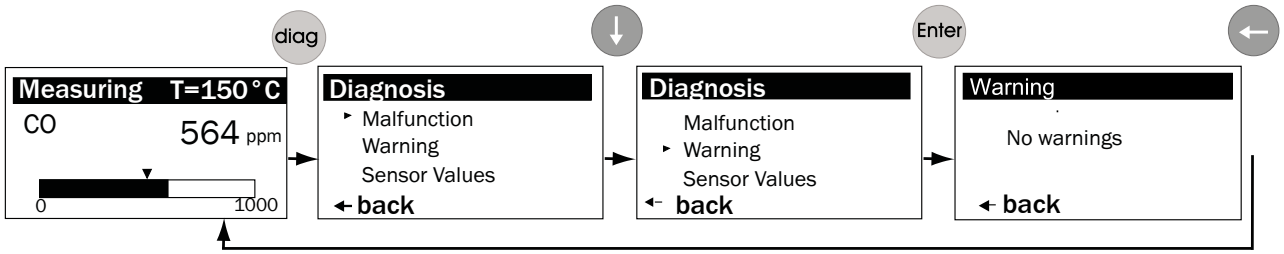


Figure 32: Viewing warning messages (example)

NOTE
Table of all warning messages, see "Warning messages", page 79.

9.4.2.3 Viewing sensor values

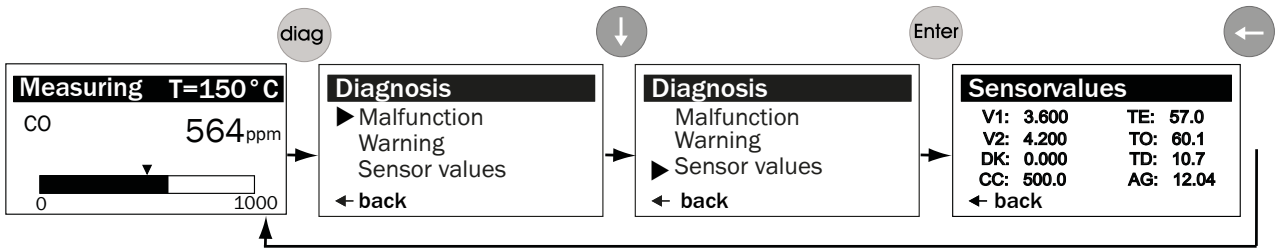


Figure 33: Viewing sensor values (example)

NOTE
Table of standard sensor values, see "Sensor values for trouble-free operation", page 84.

9.4.3 Parameters (settings)

The parameters currently set can be called up and changed in submenu item "Parameter settings".

Calling up parameter settings

The following parameters are available:

1 Physical Unit: see "Changing the physical unit", page 57
2 Normalization: see "Setting the humidity correction", page 58.
3 Response Time: see "Changing the response time", page 58.
4 Measuring Range: see "Changing the measuring range", page 59.
5 Limit Value: see "Changing the limit value", page 60.
6 Active measuring path (Meas.Distance): see "Changing the active measuring path", page 60.
7 Temperature: see "Parameter settings for the external temperature sensor PT1000", page 60.

8 Humidity: see "Setting the humidity content in sample gas", page 64.
9 Pressure: see "Setting the sample gas pressure", page 64.
10 Analog Out: see "Changing the Live Zero value of the analog output (Analog Out)", page 65.
11 Calibration: see "Changing the calibration values", page 65.

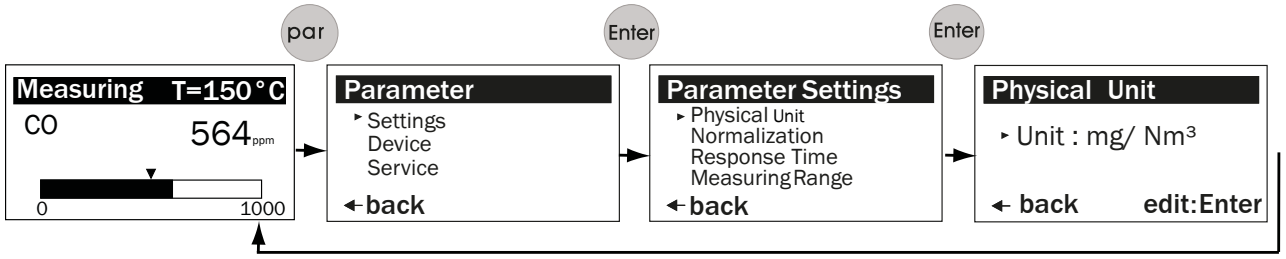


Figure 34: Path from Measuring Screen to change parameters (example)

- ▶ Press "Enter" in the display for current parameter setting.
- ▶ Enter the password, 9.3 "Entering the password", page 54
- ▶ Press "Left arrow" after entering the new value.

Menu "Parameter Settings" is displayed again.

9.4.3.1 Changing the physical unit

Submenu item "Physical Unit" serves to set the physical unit for the CO value output. Available are:

- ppm
- mg/m³N
- mg/m³

1 Follow the menu path as described, see "Parameters (settings)", page 56.
2 Enter the password, see "Entering the password", page 54.
3 Enter the changes.
4 Confirm value with "Enter".
5 Press the "Left arrow" to return to menu item "Parameter Settings".

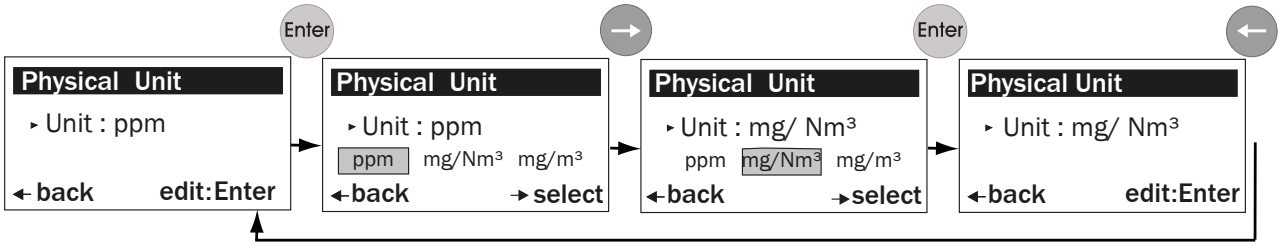


Figure 35: Changing the physical unit

9.4.3.2 Setting the humidity correction

Submenu item "Normalization" serves to set whether the measured value is output calculated as "wet" or "dry". The default value entered for H_2O is used here, see "Setting the humidity content in sample gas", page 64.

The damp correction is activated when "wet" is set. Available are:

- dry
- wet

1 Follow the menu path as described, see "Parameters (settings)", page 56.
2 Enter the password, see "Entering the password", page 54.
3 Enter the changes.
4 Confirm value with "Enter".
5 Press the "Left arrow" to return to menu item "Parameter Settings".

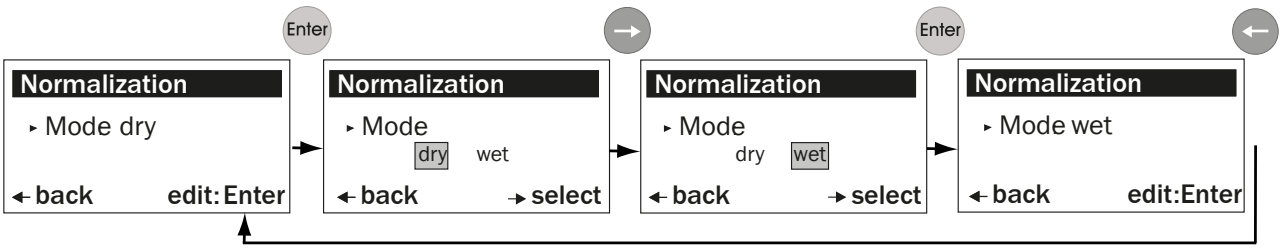


Figure 36: Selecting the humidity correction

9.4.3.3 Changing the response time

Submenu item "Response Time" serves to change the response time.

NOTE
Factory setting: 30 s.
Allowable values: 5 ... 360 s.
Contact SICK Service when you are not sure which response time should be set.

1 Follow the menu path as described, see "Parameters (settings)", page 56.
2 Enter the password, see "Entering the password", page 54.
3 Enter the changes.
4 Confirm value with "Enter".
5 Press the "Left arrow" to return to menu item "Parameter Settings".

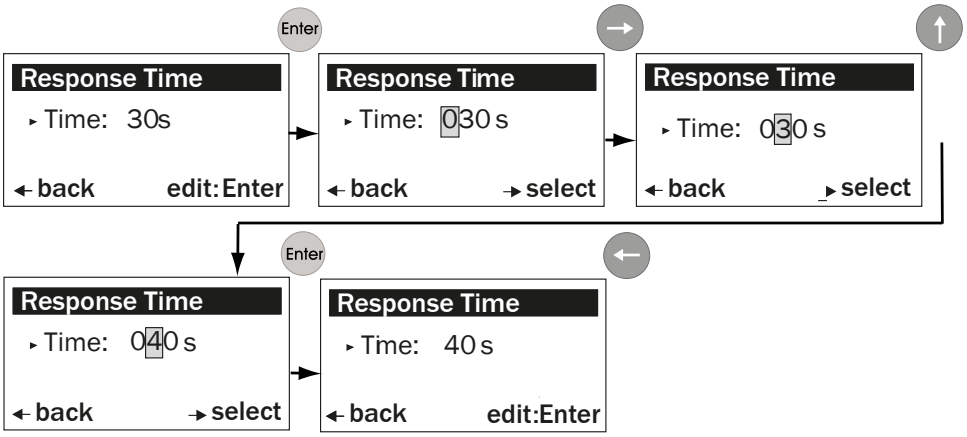


Figure 37: Changing the response time (example)

9.4.3.4 Changing the measuring range

Submenu item "Measuring Range" serves to change the measuring range currently set.

NOTE

Factory setting: 1000 ppm

Allowable values on the device: 100 ... 60 000 ppm

Contact SICK Service when you are not sure which value should be set for your measuring range.

1 Follow the menu path as described, see "Parameters (settings)", page 56.
2 Enter the password, see "Entering the password", page 54.
3 Enter the changes.
4 Confirm value with "Enter".
5 Press the "Left arrow" to return to menu item "Parameter Settings".

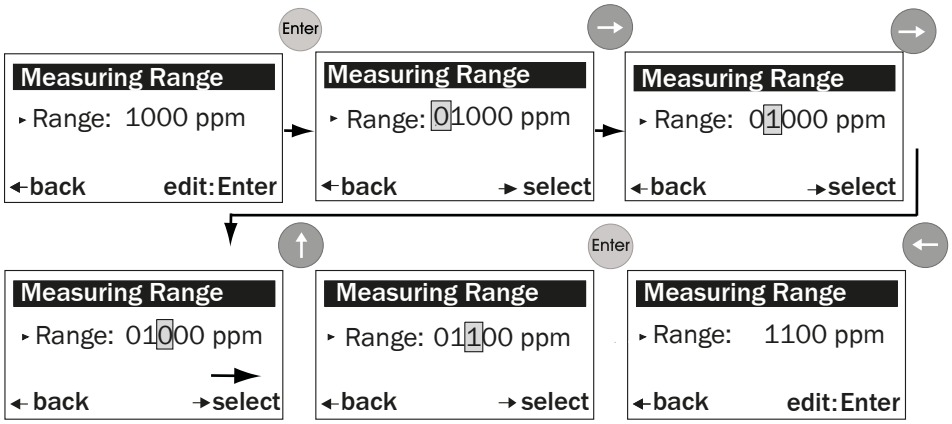


Figure 38: Changing the measuring range (example)

9.4.3.5 Changing the limit value

Submenu item "Limit Value" serves to change the limit value currently set.

NOTE

Factory setting: 1000 ppm.

Attention: The value must be within the selected measuring range.

Contact SICK Service when you are not sure which value should be set for your measuring range.

1 Follow the menu path as described, see "Parameters (settings)", page 56.
2 Enter the password, see "Entering the password", page 54.
3 Enter the changes.
4 Confirm value with "Enter".
5 Press the "Left arrow" to return to menu item "Parameter Settings".

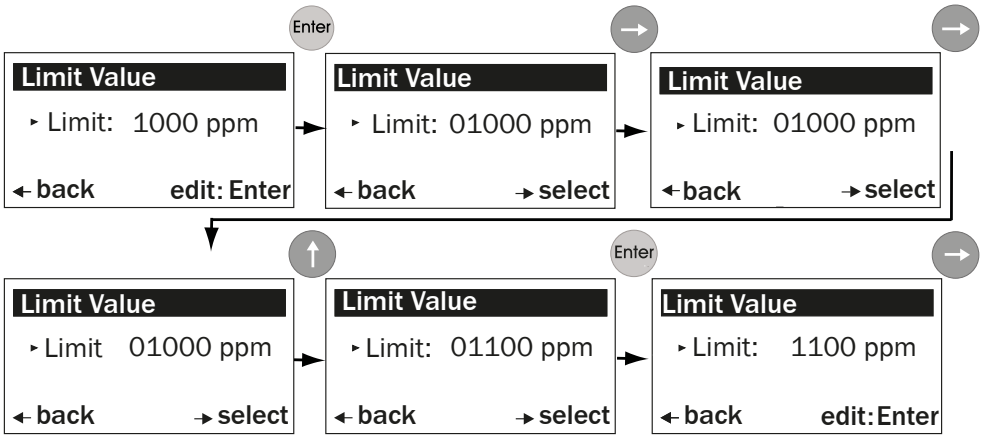


Figure 39: Setting the limit value (example)

9.4.3.6 Changing the active measuring path

Submenu item "Meas.Distance" serves to enter or change the value for the active measuring path.

WARNING

Adjusting the value for the active measuring path can lead to incorrect measuring results

The value set at the factory corresponds to the measuring path of the delivered measuring probe.

▶ Contact SICK Service when you want to change the values.

9.4.3.7 Parameter settings for the external temperature sensor PT1000

Submenu item "Temperature Input" serves to check and change the following settings.

- Substitute: Default temperature value when the temperature sensor fails
- External: Using an external temperature sensor
- Scale Low: Lower limit value for the sample gas temperature
- Scale High: Upper limit value for the sample gas temperature
- Input Low: mA signal for the lower limit value of the sample gas temperature
- Input High: mA signal for the upper limit value of the sample gas temperature

NOTE
The values are preset in the 20 mA converter.

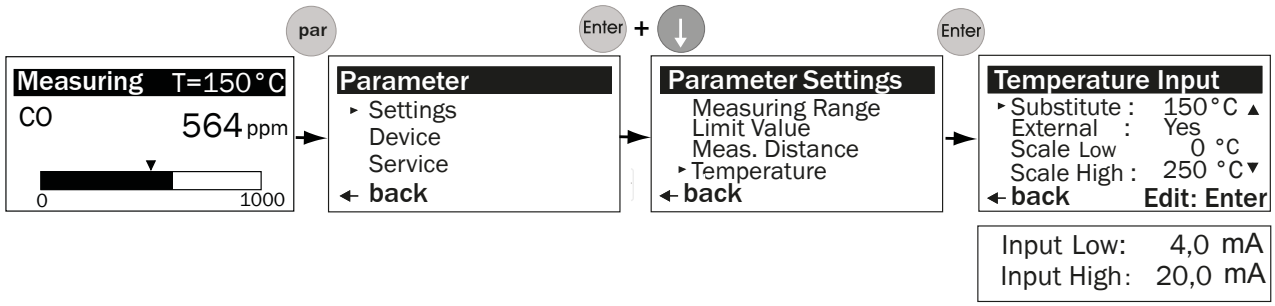


Figure 40: Setting the parameters for the temperature sensor PT1000

9.4.3.7.1 Changing the default temperature value

Submenu item "Substitute" serves to enter the default temperature value. The measuring system uses this value as temperature value when:

- The external temperature sensor fails.
- The temperature measurement is outside the configured upper limit value. The device outputs a warning message in this case.

NOTE
Factory setting: 150 °C
Allowable values: ? ... 430 °C
Contact SICK Service when you are not sure which temperature value should be set.

1 Follow the menu path as described, see "Parameter settings for the external temperature sensor PT1000", page 60.
2 Enter the password, see "Entering the password", page 54.
3 Enter the changes.
4 Confirm value with "Enter".
5 Press the "Left arrow" to return to menu item "Parameter Settings".

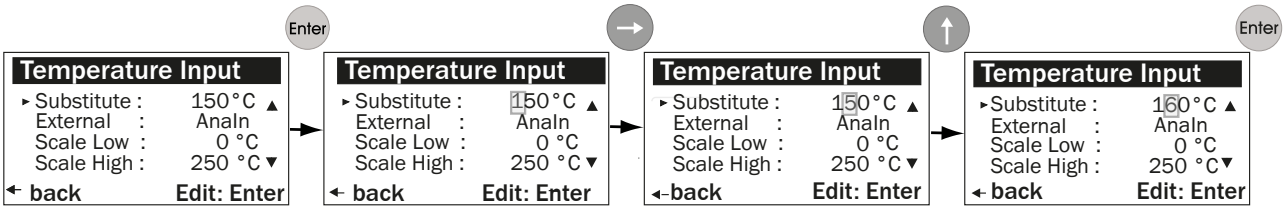


Figure 41: Setting the default temperature setting (example)

9.4.3.7.2 Setting the use of an external temperature sensor

Submenu item "External" serves to set a "Yes"/"No" switch as to whether an external temperature sensor (PT1000) is used. The signal runs via an analog input. "AnaIn" is shown when the switch is set to "Yes".

1 Follow the menu path as described, see "Parameter settings for the external temperature sensor PT1000", page 60.
2 Enter the password, see "Entering the password", page 54.
3 Enter the changes.

4 Confirm value with "Enter".
5 Press the "Left arrow" to return to menu item "Parameter Settings".

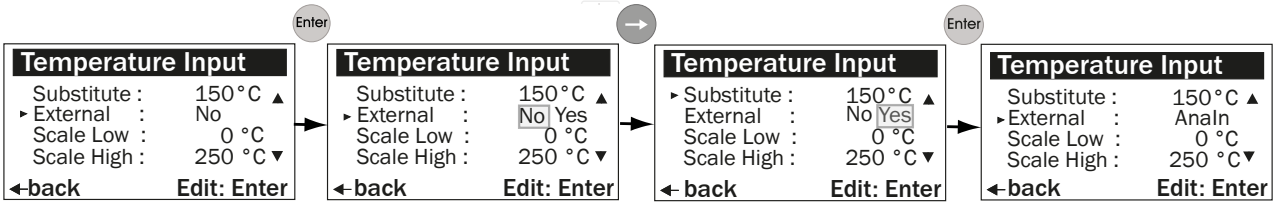


Figure 42: Activating the use of an external temperature sensor

9.4.3.7.3 Setting the temperature range: Lower limit value

Submenu item "Scale Low" serves to set the lower limit value for the sample gas temperature. The lower limit value corresponds to Live Zero.

NOTE
Factory setting: 0 °C
Allowable values: See Technical Data
Contact SICK Service when you are not sure which limit value should be set.

1 Follow the menu path as described, see "Parameter settings for the external temperature sensor PT1000", page 60.
2 Enter the password, see "Entering the password", page 54.
3 Enter the changes.
4 Confirm value with "Enter".
5 Press the "Left arrow" to return to menu item "Parameter Settings".

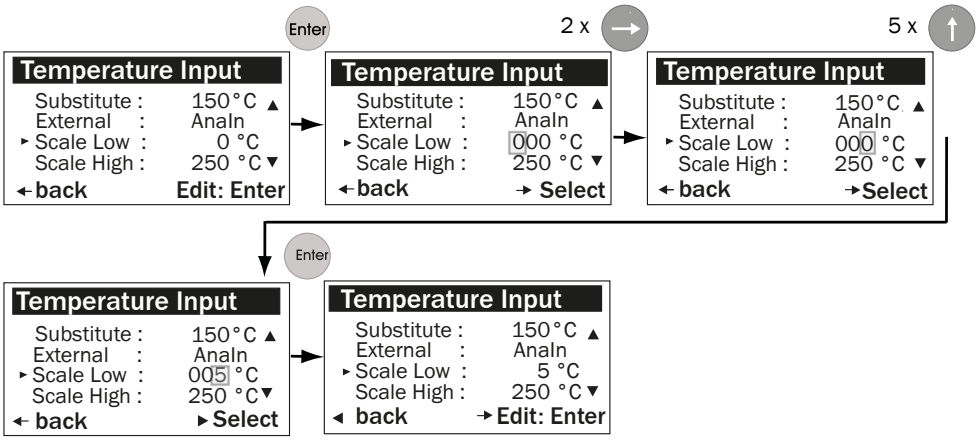


Figure 43: Setting the lower limit value for the temperature range (example) (corresponds to Live Zero)

9.4.3.7.4 Setting the temperature range: Upper limit value (20 mA)

Submenu item "Scale High" serves to set the upper limit value for the sample gas temperature.

NOTE
Factory setting: 250 °C
Allowable values: Max. 500 °C
Contact SICK Service when you are not sure which limit value should be set.

1 Follow the menu path as described, see "Parameter settings for the external temperature sensor PT1000", page 60.
2 Enter the password, see "Entering the password", page 54.
3 Enter the changes.
4 Confirm value with "Enter".
5 Press the "Left arrow" to return to menu item "Parameter Settings".

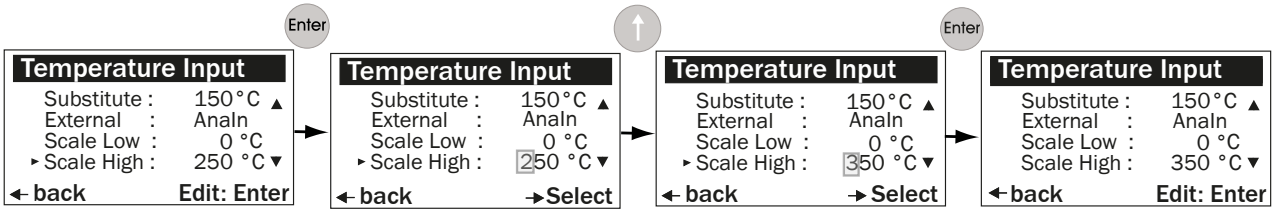


Figure 44: Setting the upper limit value for the temperature range (example)

9.4.3.7.5 Setting the signal: Live Zero

Submenu item "Input Low" serves to set the signal strength for the lower measuring range value (Live Zero).

NOTE
Factory setting: 4.0 mA

1 Follow the menu path as described, see "Parameter settings for the external temperature sensor PT1000", page 60.
2 Enter the password, see "Entering the password", page 54.
3 Enter the changes.
4 Confirm value with "Enter".
5 Press the "Left arrow" to return to menu item "Parameter Settings".

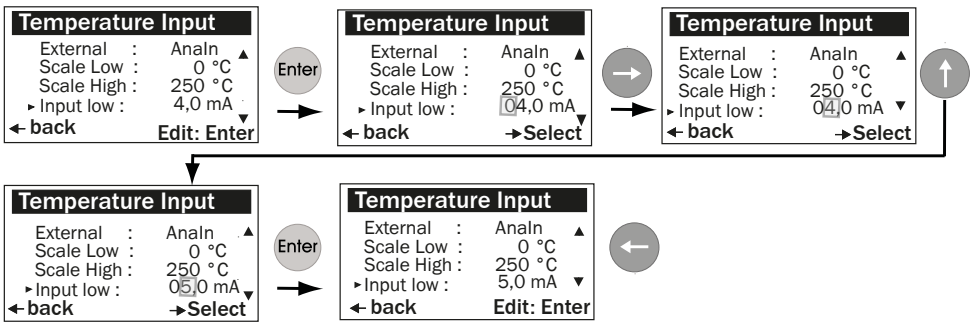


Figure 45: Setting the lower measuring range value (Live Zero) (example)

9.4.3.7.6 Setting the signal: Upper output value

Submenu item "Input High" serves to set the signal strength for the upper measuring range value.

NOTE
Factory setting: 20.0 mA

1 Follow the menu path as described, see "Parameter settings for the external temperature sensor PT1000", page 60.
2 Enter the password, see "Entering the password", page 54.
3 Enter the changes.

4 Confirm value with "Enter".
5 Press the "Left arrow" to return to menu item "Parameter Settings".

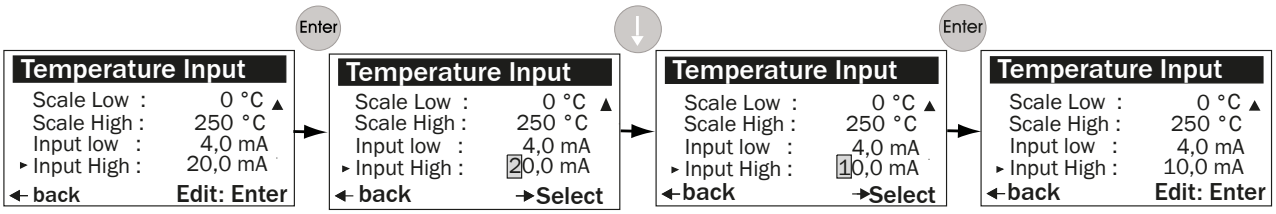


Figure 46: Changing the value for the upper output value (example)

9.4.3.8 Setting the humidity content in sample gas

Submenu item "Humidity" serves to set the value for the humidity content in the sample gas as default value.

NOTE

Factory basic setting: 0.0 %.

This value is used to perform a gas dryness correction.

Max. possible value: 99 %.

1 Follow the menu path as described, see "Parameters (settings)", page 56.
2 Enter the password, see "Entering the password", page 54.
3 Enter the changes.
4 Confirm value with "Enter".
5 Press the "Left arrow" to return to menu item "Parameter Settings".

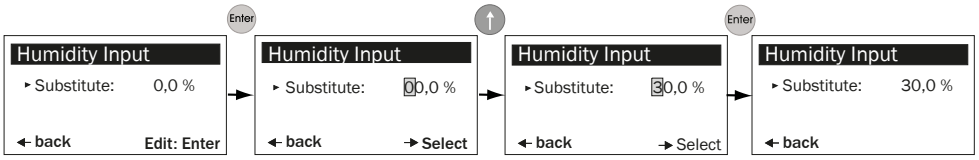


Figure 47: Entering the default value for humidity content in sample gas (example)

9.4.3.9 Setting the sample gas pressure

Submenu item "Pressure" serves to set the default value for the sample gas pressure. The measuring system uses this value for correction.

The pressure correction is made in ppm or Norm in the display.

NOTE

Factory setting: 1013 hPa

Min. value: 800 hPa

Max. value: 1200

1 Follow the menu path as described, see "Parameters (settings)", page 56.
2 Enter the password, see "Entering the password", page 54.
3 Enter the changes.
4 Confirm value with "Enter".
5 Press the "Left arrow" to return to menu item "Parameter Settings".

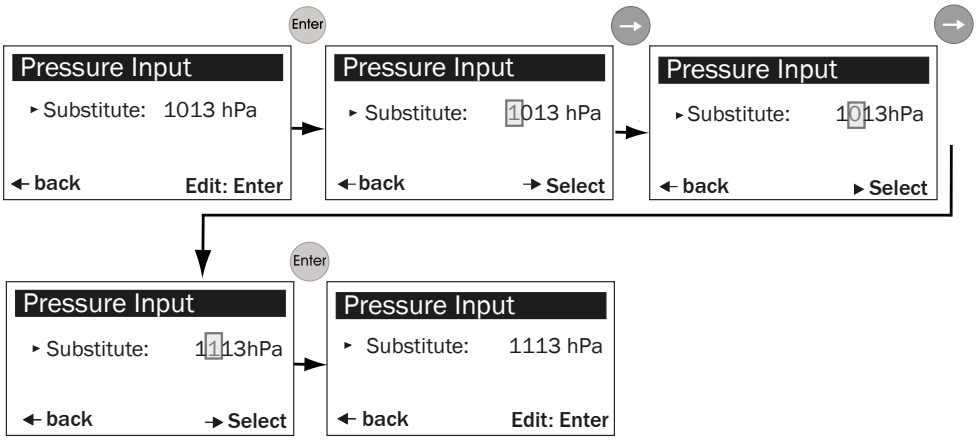


Figure 48: Entering the default value for the sample gas pressure (example)

9.4.3.10 Changing the Live Zero value of the analog output (Analog Out)

Submenu item "Analog Out" serves to change the Live Zero value.

NOTE
Factory setting: 4 mA
Min. value: 0 mA
Max. value: 4 mA

1 Follow the menu path as described, see "Parameters (settings)", page 56.
2 Enter the password, see "Entering the password", page 54.
3 Enter the changes.
4 Confirm value with "Enter".
5 Press the "Left arrow" to return to menu item "Parameter Settings".

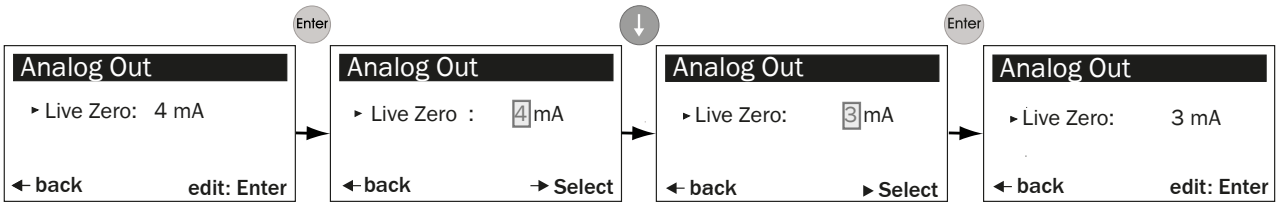


Figure 49: Changing the Live Zero value (example)

9.4.3.11 Changing the calibration values

Submenu item "Calibration" serves to change the characteristic gradient after a span test and the offset correction for the zero point after a reference measurement during on-site calibration.

1 Follow the menu path as described, see "Parameters (settings)", page 56.
2 Enter the password, see "Entering the password", page 54.
3 Enter the changes.
4 Confirm value with "Enter".
5 Press the "Left arrow" to return to menu item "Parameter Settings".

SPAN value

Submenu item "Span" serves to adapt the setting for the SPAN after completing the SPAN test.

Factory setting: 1.00

Possible setting range: 0 ... 1,99

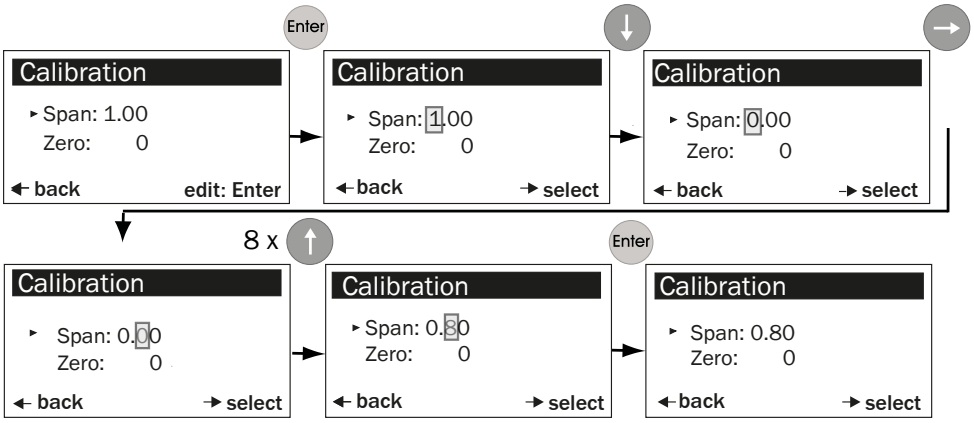


Figure 50: Changing the SPAN value (example)

Offset correction after zero point measurement

Submenu item "Zero" serves to perform an offset correction after a reference measurement.

- Factory setting: 0

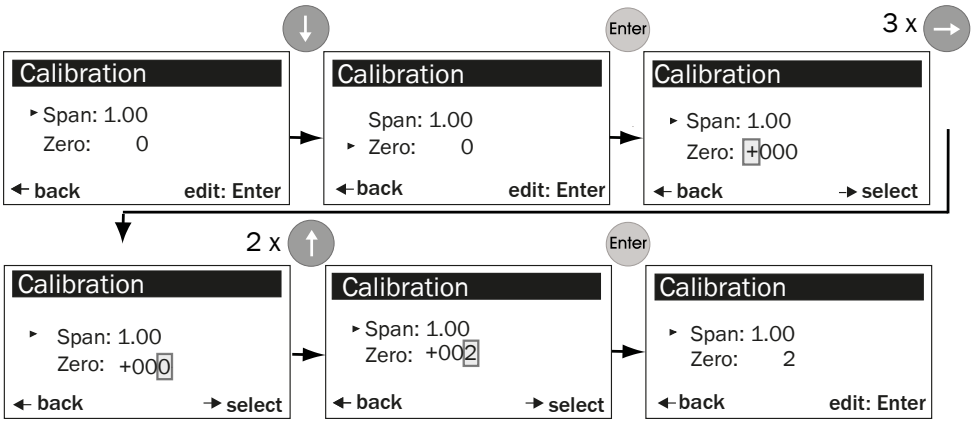


Figure 51: Changing the zero point value (example)

9.4.3.12 Device characteristic data (Device)

Menu item "Device" serves to view the device characteristic data entered at the factory.

The following characteristic data are available:

1 Serial Number
2 Software Revision
3 Configuration

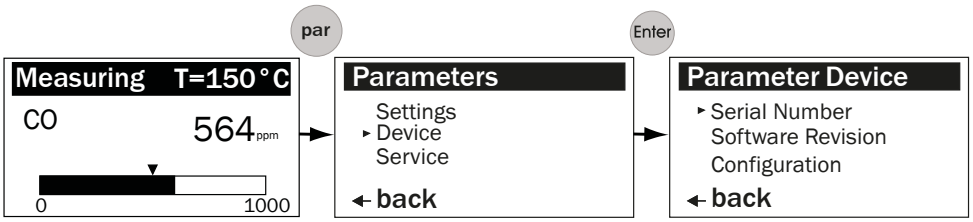


Figure 52: Path from Measuring Screen to Device Characteristic Data

9.4.3.12.1 Calling up the serial number

Submenu item "Serial Number" serves to retrieve the serial numbers of the measuring device and evaluation unit.

NOTE

The respective 8-character serial numbers of the evaluation unit and measuring device must match the serial numbers on the type plates.

Changing the serial numbers can lead to SICK Service no longer being able to provide technical support.

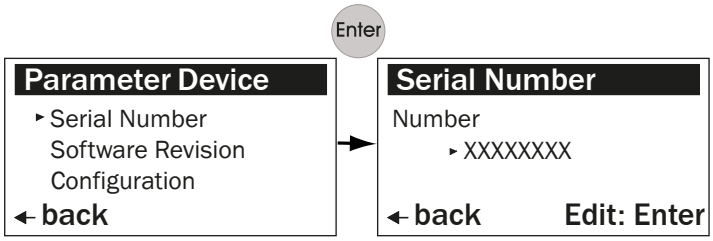


Figure 53: Calling up the serial number

9.4.3.12.2 Calling up the software version

Submenu item "Software Revision" serves to retrieve the software version of the measuring device and evaluation unit.

NOTE

This value is updated automatically when Service updates the software. The customer cannot change this entry.

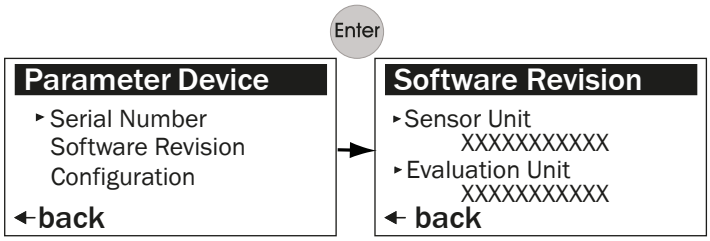


Figure 54: Calling up the current software version

9.4.3.12.3 Viewing the device configuration

Submenu item "Configuration" serves to retrieve the code for the device configuration.

NOTE
The standard display for the device configuration delivered is 0212.

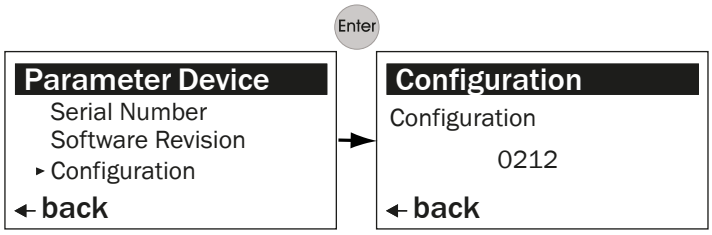


Figure 55: Viewing the device configuration

9.4.3.13 Service

Menu item "Service" serves to retrieve and change the device calibration data set.

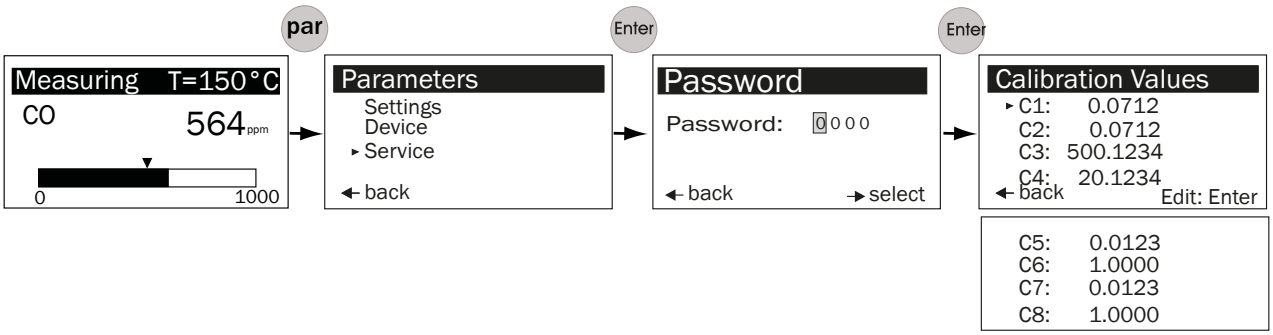


Figure 56: Calling up the device calibration data

9.4.3.13.1 Changing the device calibration parameters

WARNING

Endangerment of system safety through calibration parameters with incorrect settings

The calibration values can be changed after the password has been entered. This is only necessary in special cases, e.g., exchanging the receiver. Changing the calibration values without the necessary technical knowledge can lead to measured value deviations that can endanger safe operation of the plant.

- ▶ Only change the calibration parameters when you have sufficient technical knowledge of the device calibration.
- ▶ Only pass the password on to authorized persons.

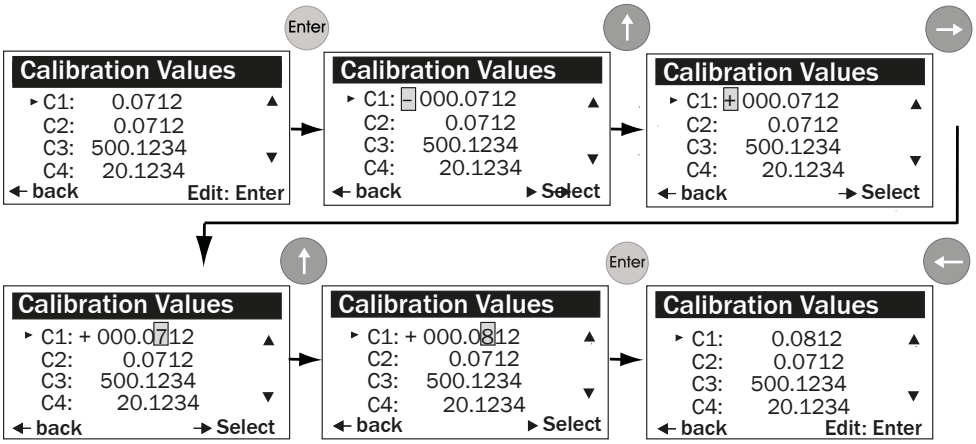


Figure 57: Changing device calibration data

9.4.4 Calibration (Cal)

Menu "Calibration" contains the submenu items for zero adjust, manual SPAN test and SPAN test with EPA conformity.

9.4.4.1 Performing zero adjust

Submenu item "Zero Adjust" serves to perform the zero adjust.

NOTE

- The adjust process is started when the prompt "Are you sure to start adjust procedure" is confirmed with "Enter". Making entries during the process or aborting are not possible.
- The adjust first starts when the device temperature stabilizes at 60 °C (± 0.5 °C). Warming up time depending on ambient conditions; 30 - 60 minutes.
- Press "Enter" to save the data when the zero adjust has completed.

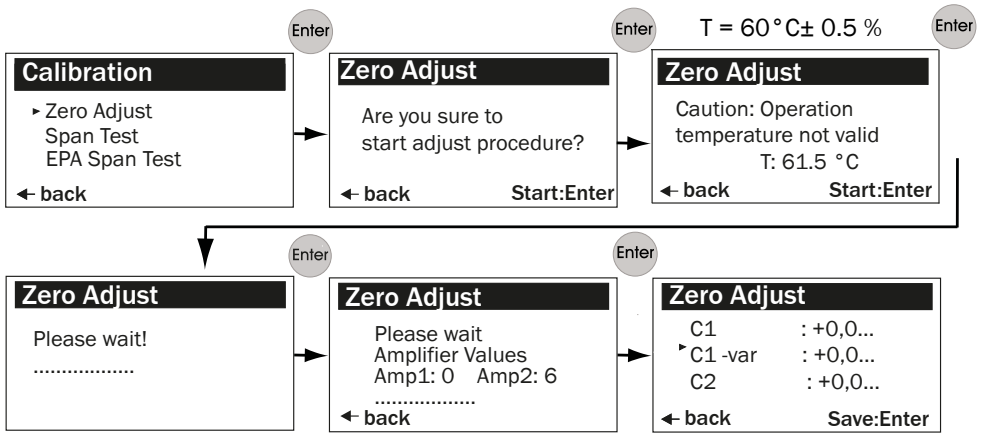


Figure 58: Performing zero adjust

9.4.4.2 Performing a manual SPAN test

Submenu item "SPAN Test" serves to perform the zero adjust and the sensitivity tests

NOTICE

The SPAN test must be performed in a "Zero Path" duct.

Zero Path: Duct with a CO concentration = 0.

- The adjust process for the SPAN test is started when the prompt "Are you sure to start adjust procedure" is confirmed with "Enter". Making entries during the process or aborting are not possible.
- The adjust first starts when the device temperature stabilizes at 60 °C (± 0.5 °C). Warming up time depending on ambient conditions; 30 - 60 minutes.
- Press "Enter" to save the data when the zero adjust has completed.
- The temperature is set to the standard value. Enter the current ambient temperature.
- Compare the measured value displayed for CO with that on the test cell (setpoint value). Correct deviations:
  - ▷ The SPAN value to be set = measured value displayed : setpoint value.
  - ▷ Enter the SPAN value under menu item ???

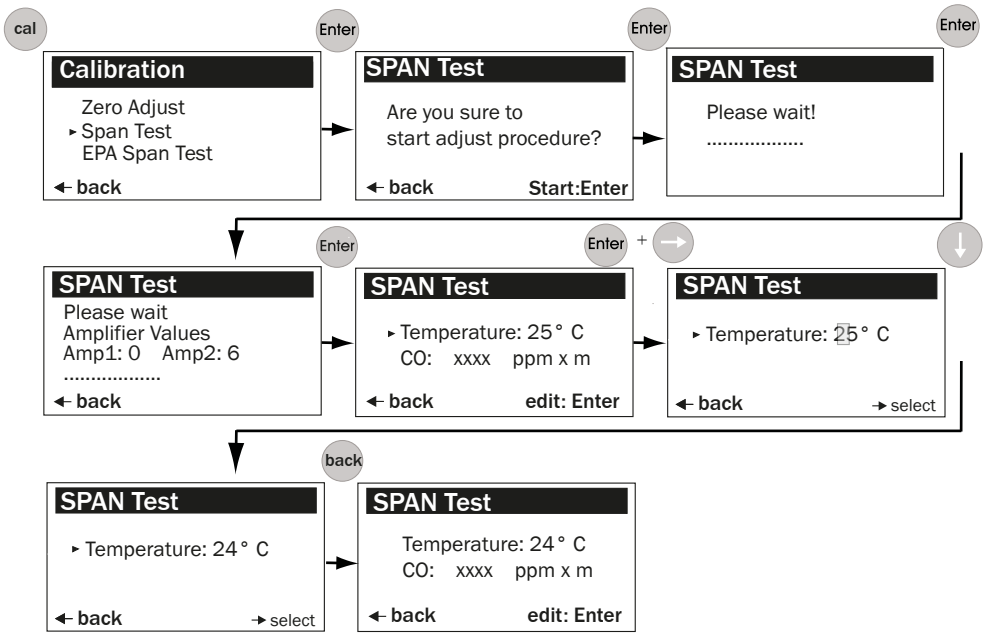


Figure 59: Performing a manual SPAN test

9.4.4.3 SPAN test according to EPA Guidelines

Submenu item "SPAN Test" serves to perform the zero adjust and the sensitivity test according to the EPA Guidlines.

NOTICE
This SPAN test is only possible with a GPP measuring probe.

NOTICE
The SPAN test must be performed in a "Zero Path" duct.
Zero Path: Duct with a CO concentration = 0.

1 The test is activated by pressing "Enter" in menu item "EPA Span Test". It can also be started with a binary signal. Making entries during the process or aborting are not possible.
2 The display switches to the measuring mode screen. The status indicator is "Span Test".
3 The test relay is activated.
4 The humidity correction is deactivated because the test gases do not contain any humidity.
5 Deviations of the SPAN test value against the expected value can be adjusted in submenu item "SPAN Parameter", see "Changing the calibration values", page 65.
6 Calculating the SPAN value to be set:
   ▷ Actual value (test gas concentration) : value displayed.
7 If the SPAN parameter is already set to value 1, the SPAN value to be set must be calculated differently:
   ▷ Actual value (test gas concentration) x value displayed.
8 Deviations of the zero point can be adjusted in submenu item "ZERO", see "Changing the calibration values", page 65.
9 **Recommendation: Perform zero adjust.**
10 The EPA SPAN test is terminated using the "Left arrow" or "meas" button.

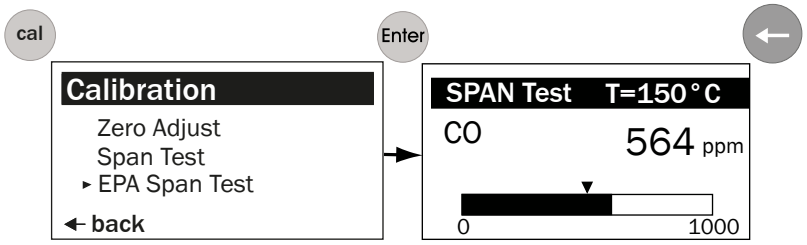


Figure 60: Performing a manual SPAN test

9.4.5 Service menu "Maint"

The service area has the following submenu items:

1 Restart the system : Reset System
2 Set maintenance mode: Maint Mode
3 Analog output test: Test Analog Out
4 Relay test: Test Relay
5 Reset parameters: Reset Parameter

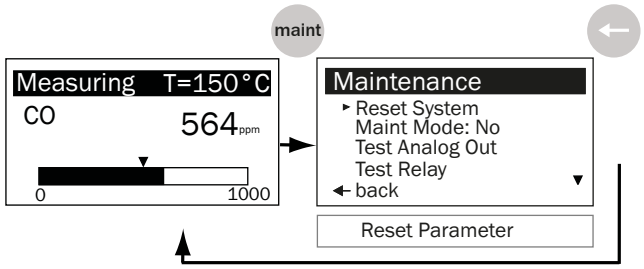


Figure 61: Path from Measuring Screen to change parameters (example)

9.4.5.1 Measuring system restart

Submenu item "Reset System" serves to restart the system.

▶ Switch to the Service menu with "maint", see "Service menu "Maint"", page 73.

NOTE

- A restart cannot be interrupted or terminated.
- The restart takes a few seconds.
- An input is not possible.

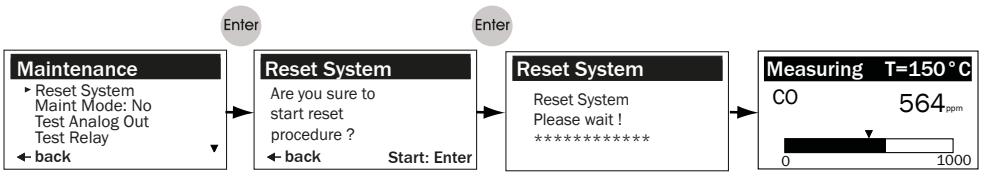


Figure 62: Restarting the system

9.4.5.2 Activating/deactivating maintenance mode

When maintenance mode is active, the output relay drops off and the analog output holds the last value.

NOTE

Select "Yes" and press "Enter" to activate maintenance mode.

The "Service" LED is on as long as maintenance mode is activated.

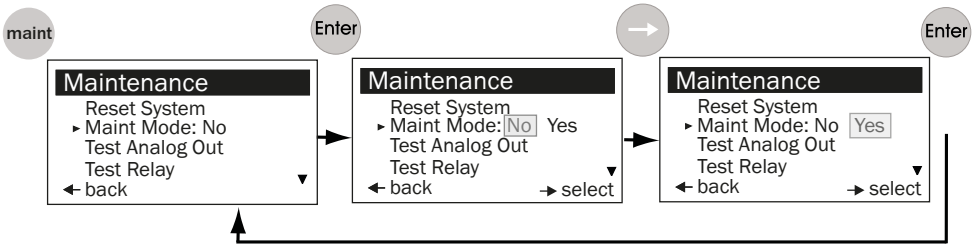


Figure 63: Activating/deactivating maintenance mode

9.4.5.3 Setting the test analog output

DANGER

The device switches to maintenance mode as soon as submenu item "Test Analog Out" is activated. The “Service” LED goes on. The device switches back to measuring mode as soon as the right arrow button for "back" is pressed in the submenu.

Submenu "Test Analog Out" serves to change the mA value for the analog output and then check the value output.

NOTE

- Zero Point: see "Setting the signal: Live Zero", page 63.
- Upper output value: see "Setting the signal: Upper output value", page 63.

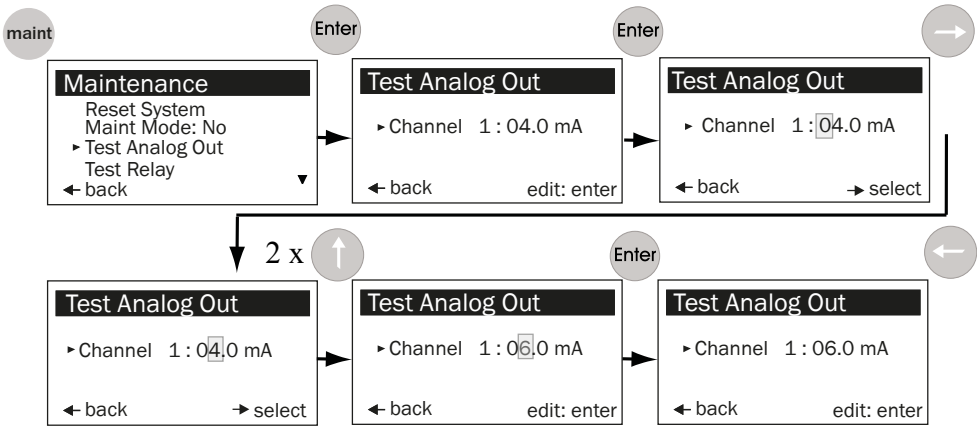


Figure 64: Setting the analog value

9.4.5.4 Test relay

Submenu "Test Relay" serves to test relays 1, 2 and 3.

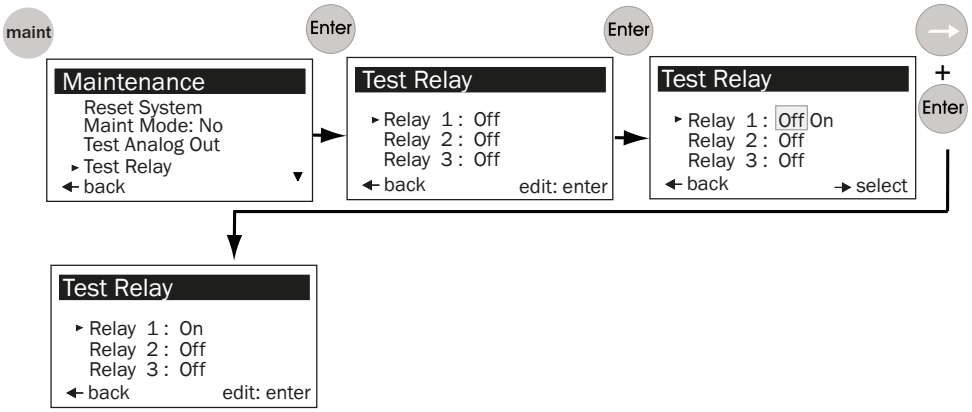


Figure 65: Testing relays 1, 2 and 3

9.4.5.5 Reset Parameter

Submenu "Reset Parameter" serves to reset all parameters to the factory settings.

NOTE
The password is necessary to reset the parameters to the factory settings. The device switches to maintenance mode. The “Service” LED lights up.

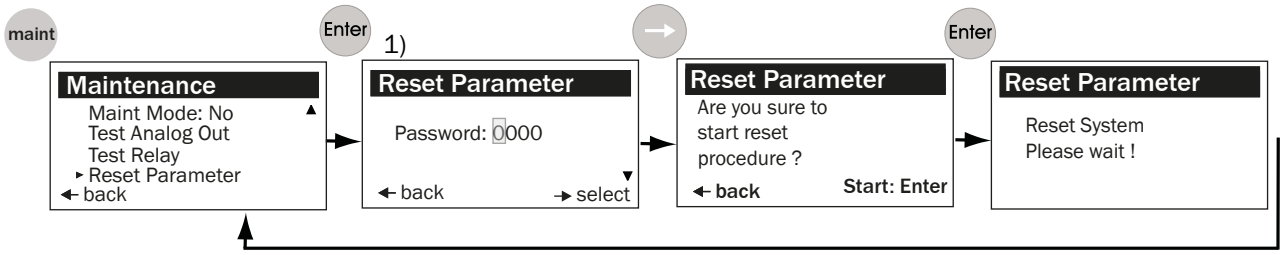


Figure 66: Resetting parameters to the factory settings

Entering the password, see "Entering the password", page 54.

NOTE
Factory settings for parameters, see "Basic parameters set", page 43.

10 Maintenance

10.1 Safety

Electricity

WARNING
Endangerment of electrical safety during installation and maintenance work when the power supply is not switched off

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

Noxious gas

WARNING
Health risk through contact with toxic gases

The modules and devices contain enclosed potentially dangerous gases that can escape due to a defect or leak. Should a leak occur, the concentrations within the enclosed device can rise to 350 ppm.

- CO : 10 ml max. total volume.

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

When using a purge air unit

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

If the purge air is switched off when the SR-unit or the reflector is still in the gas duct, hot and contaminated gas can cause device damage.

- ▶ Do not switch the purge air unit off as long as the SR-unit or the reflector is still on the gas duct.

CAUTION
Risk of device damage caused by switching off the purge air too soon

If the purge air is switched off when the SR-unit is still in the gas duct, hot and contaminated gas can cause device damage.

- ▶ Switch off the purge air unit only after removal of the SR-unit from the gas duct.

CAUTION
Risk of device damage caused by switching off the purge air too soon
If the purge air is switched off when the measuring device is still in the gas duct, hot and contaminated gas can cause device damage.

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

10.2 Preparatory work

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

- ▶ Activate Maintenance mode before starting work, see "Activating/deactivating maintenance mode", page 73.

NOTE

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

NOTE
A zero path must be available for zero adjust.

10.3 Visual inspection

Interval	Visual inspection	Remarks
Daily	Check active malfunction and warning messages.	
Monthly	Check ambient conditions.	
Half-yearly	Check measured values for plausibility.	
Half-yearly	Check device for damage.	• Check all hose fittings for tight seat. • Check the housings of the sender and receiver of the evaluation unit for mechanical damage. • Check flanges and screw fittings for tight seat.
Half-yearly	Check electrical connections and cables.	• Check all cables for damage. Pay attention to chafe marks and kinks on cable ducts. • Check all electric connections for freedom from corrosion and tight seat. • Check grounding conductors are free from corrosion.

Table 10: Visual inspection

10.4 Maintenance plan

Table with Maintenance plan for users

Table with Maintenance plan for Service

10.4.1 Maintenance Table for sender/receiver unit

Interval	Maintenance work	Remarks
Half-yearly	Check device for damage and contamination.	Clean the respective housings if contaminated.
	Clean optical surfaces.	
	Exchange wearing parts as necessary.	
	Perform zero point check.	
	Check optical alignment.	
	Check condition of weatherproof cover when used.	Remove contamination.

Table 11: Maintenance intervals for sender/receiver unit

10.4.2 Maintenance Table for GPP measuring probe

Interval	Maintenance work	Remarks
Half-yearly	Clean outer surfaces of measuring probe.	
	Clean optical surfaces.	
As required	Exchange the sinter filter.	
	Exchange the heaters.	
	Exchange the optical parts.	

Table 12: Maintenance intervals for GPP measuring probe

10.4.3 Maintenance Table for purge air unit

Interval	Maintenance work	Remarks
Application-dependent (see maintenance request)	Exchange filter element.	Part No. for filter element and task description, see Operating Instructions SLV4.
	Check the hose and hose clamp.	Task description, see Operating Instructions SLV4.
	Exchange the purge air filter.	
	Check fan motor noise.	
	Check the purge air heater (optional).	
	Check the function of the filter and differential pressure sensor (optional).	

Table 13: Maintenance intervals for purge air unit

10.4.4 Maintenance Table for GMP measuring probe

Interval	Maintenance work	Remarks
Half-yearly	Clean outer surfaces of measuring probe.	
	Clean optical surfaces.	
As required	Exchange the optical parts.	

Table 14: Maintenance intervals for GMP measuring probe

10.4.5 Final maintenance work

NOTE
Record all maintenance work done in a Maintenance Manual.

11 Troubleshooting

11.1 Warning messages

Message	Possible causes	Measures
Analog input temperature out of range	Input signal (0 ... 20 mA) of the temperature measurement is outside the configured limits, the system continues running with the default temperature value.	Check the temperature sensor.
		Check the cable connection.
		Check the parameter settings: see "Setting the signal: Live Zero", page 63, see "Setting the signal: Upper output value", page 63.
Temperature low, no humidity correction	Measured gas temperature is so low that it is assumed the plant has been switched off. This means the cross-sensitivity correction for exhaust gas humidity is not performed.	No measures required when the plant is switched off
		Check the parameter settings: see "Setting the signal: Live Zero", page 63, see "Setting the signal: Upper output value", page 63.
		The switching point is at 70 °C or half the value of the default temperature depending on which value is lower.
		Check the temperature sensor.
Sensor low signal	Dust content too high (outside the calibration data from project planning).	Observe the ambient conditions in the technical data.
	Fog formation.	
	Optical surfaces contaminated.	Clean the optical interfaces.
	Device disadjusted.	Check device alignment.
	Lamp defective.	Check lamp, exchange when necessary.
		Check for free light path through the duct.
		If warning messages still occur after carrying out the measures: New zero adjust.
Warming up	The required operating temperature is not reached shortly after switching on. Displayed measured values could be outside the tolerance.	Observe warming up time of approx. 30 minutes.

Table 15: Warning messages in the Diagnosis menu

11.2 Malfunction messages

Message	Possible causes	Measures
EEPROM Parameter	Invalid parameter.	Perform reset parameter: see "Reset Parameter", page 75.
		Reconfigure.
		New zero adjust.
	Evaluation unit defective.	Contact SICK Service.
Sensor communication	Data communication between receiver unit and evaluation unit interrupted.	Check cable connection and correct seating of the plug connector.
		Further measures, see "Communication fault between evaluation unit and receiver", page 84.
Sensor amplifier has reached maximum value	Erroneous device adjustment.	Check device alignment, realign when necessary.
	Optical surfaces contaminated.	Clean the optical interfaces.
	Light path interrupted.	Check for free light path through the duct.
Sensor no signal	Erroneous device adjustment.	Check device alignment, realign when necessary.
	Optical surfaces contaminated.	Clean the optical interfaces.
		Check for free light path through the duct.
	Receiver unit defective.	Exchange receiver unit.
IR source fault	Infrared module defective.	Check lamp plug connector.  Risk of burns! Lamp is very hot when in operation. ▶ Let the device cool down before checking. ▶ Wear protective gloves.
		Check sender/receiver unit, exchage when necessary.
Chopper fault	Chopper in sender unit defective.	Check lamp plug connector.  Risk of burns! Lamp is very hot when in operation. ▶ Let the device cool down before checking. ▶ Wear protective gloves.
		Check sender/receiver unit, exchange when necessary.
Device not ready, warming up	The required operational temperature is not reached shortly after switching on.	Observe warming up time of approx. 30 minutes.
	Device is not capable of measuring.	
Motor fault	Motor in receiver unit defective.	Exchange receiver unit.

Table 16: Malfunction message for Diagnosis menu

11.3 Troubleshooting on the sender

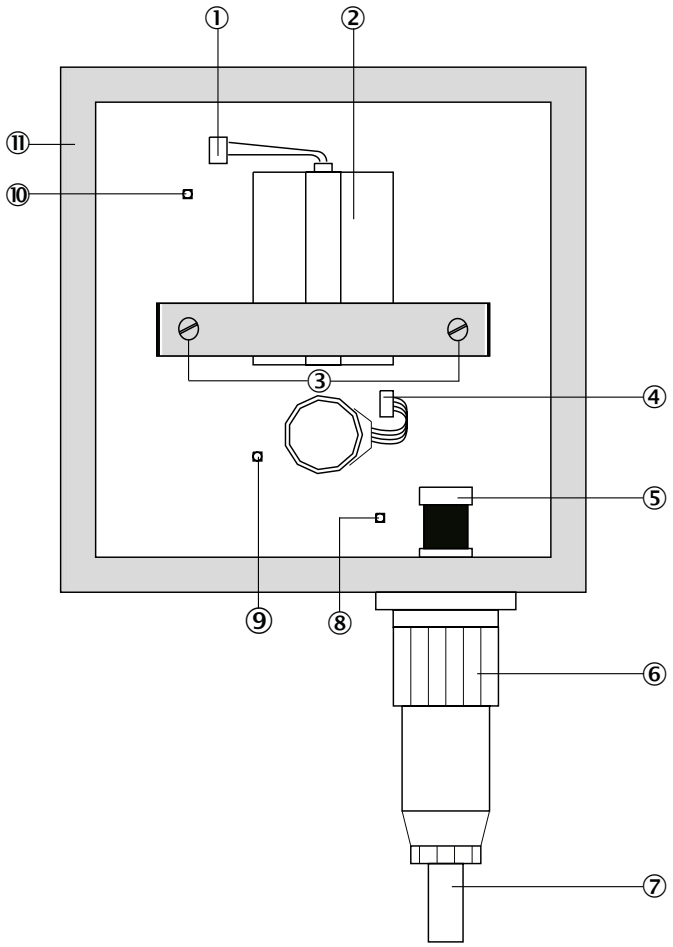


Figure 67: Sender

① IR source: Plug connection
② IR source

Risk of burns!
The infrared lamp becomes extremely hot during operation!
③ Adjustment screws: 4 x

Disadjustment through adjusting the adjustment screws!
Readjustment is only possible at the factory
④ Chopper motor plug
⑤ Internal plug
⑥ External plug
⑦ Receiver cable
⑧ LED: On when voltage connected for motor and logic module
⑨ LED: On when voltage for IR source connected
⑩ LED: On when the lamp is on and the chopper disk rotates
⑪ Sender housing

11.4 Troubleshooting on receiver

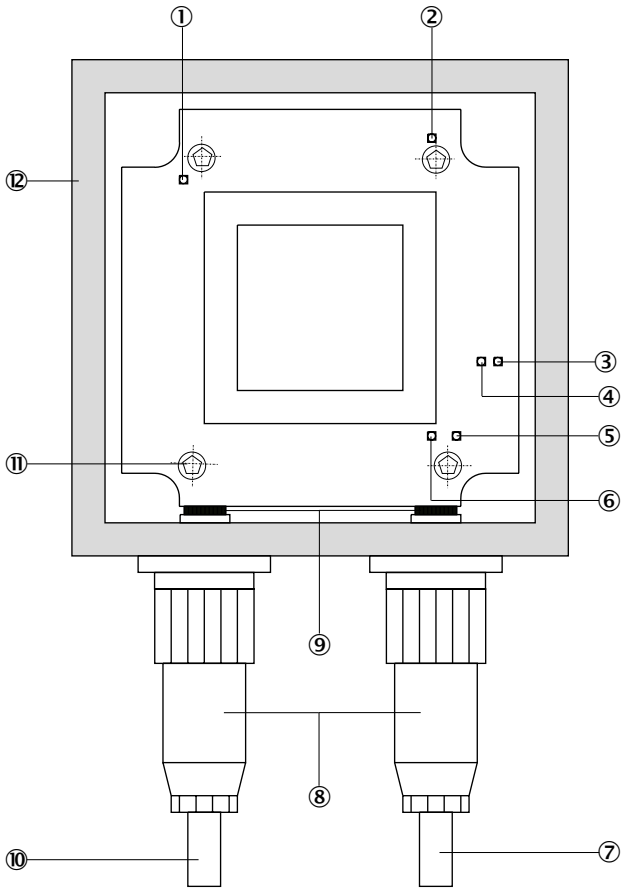


Figure 68: Receiver

① LED: On when operation is uninterrupted
② LED as status indicator for optics heating:

- On continuously: Ambient temperature too high
- Blinks: Normal operation
- Off: Ambient temperature too low

③ LED: Communication to evaluation unit (TD)
④ LED: Communication from evaluation unit (RD)
⑤ LED: Blinks when the cell disk in the receiver rotates and receives chopper signal.
⑥ LED: Blinks when the motor of the cell disk rotates
⑦ Line to sender
⑧ Outer plug-in connector
⑨ Inner plug-in connector
⑩ Line to evaluation unit
⑪ Adjustment screws: 4 x

Disadjustment through adjusting the adjustment screws!
Readjustment is only possible at the factory.

⑫ Receiver housing

11.5 Troubleshooting on the evaluation unit

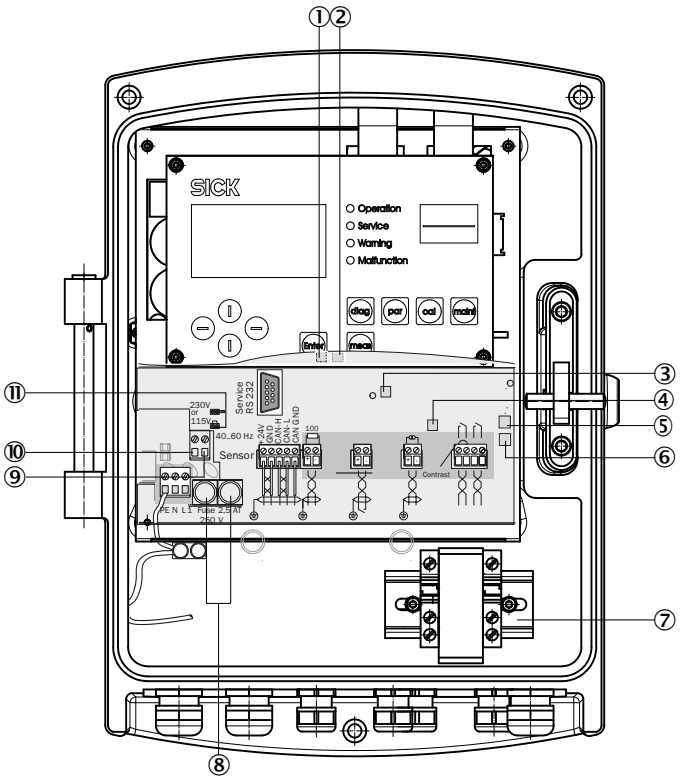


Figure 69: Sender

① Data to receiver (TD)
② Data from receiver (RD)
③ Digital input status indicator
④ Analog output status indicator: LED on when output power is the same as the setpoint value
⑤ Relay 1 switching state
⑥ Relay 2 switching state
⑦ Receiver connection
⑧ Fuses, 2.5 AT
⑨ LED: On when 24 V power supply present
⑩ LED: On when 5 V power supply for internal logic present
⑪ Operating voltage selection

Check
Check voltage supply
Check fuses in evaluation unit
Check indicator for 24 V /5 V supply in evaluation unit. To do this, disconnect the cable to the receiver
If the indicators are only on when the plug-in connector is disconnected, check the cabling of the components. Observe the following sequence when connecting: 1 Cable from evaluation unit -> receiver 2 Receiver 3 Cable from receiver -> sender 4 Sender If the fault occurs, it is caused by the last component connected. Exchange this component

Table 17: Checks when the device shows no reaction

11.6 Communication fault between evaluation unit and receiver

Error message: "Sensor Communication"

The receiver sends a constant stream of data to the evaluation unit; if this is not received, an error message is output automatically.

Check following connections:

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

11.6.1 Sensor values for trouble-free operation

All values refer to a warmed up device in operation withing the specific limits.

Calling up the sensor values: see "Viewing sensor values", page 56.

Unit	Description	Min. value	Typical value	Max. value
V1	Signal voltage 1	0.5 V	Depending on the current conditions	<5.0
V2	Signal voltage 2	0.5 V	Depending on the current conditions	<5.0
DK	Variation k-value	0	Depending on the current conditions	
CC	Peltier current	0 mA	Dependent on the ambient temperature	1200 mA
TE	Temperature electronics	20°C	Dependent on the ambient temperature	80 °C
TO	Temperatur optics	50 °C	60 °C	80 °C
TD	Detector temperature	9 °C	10.7 °C	12 °C
A	Amplifier setting	00.00	Dependent on the measuring path	31.31

Table 18: Sensor values

NOTE

Please contact SICK Service for remote diagnosis should the sensor values of the GM901-02 be outside these value ranges.

▶ Use the form, see "Remote Diagnosis, GM901 Sensor Values", page 85.

11.6.2 Remote Diagnosis, GM901 Sensor Values

Company:	**Date:**
Contact person:	**Plant:**
Email:	**Telefon:**

Malfunction messages
Malfunction message 1: _____
Malfunction message 2: _____
Warning messages
Warning message 1: _____
Warning message 2: _____
Sensor values
V1: _____ CC:_____ TD: _____
V2:_____ TE:_____ AG:_____
DK: _____ TO:_____
Parameters
- Physical Unit: _____
- Normalization: _____
- Response time: _____
- Measuring range:
- Measuring distance Fl.-Fl.: _____ Active:_____
- Temperature Substitute: _____ External: _____
  Scale Low: _____ Scale High:_____
  Scale High: _____ Input High: _____
- Humidity Substitute: _____
- Pressure Substitute: _____
- Analog Out: Active Zero: _____
- Calibration SPAN: _____ Zero: _____

Device
- Serial Number: _____
- Software Revision Sensor Unit: _____ Evaluation Unit: _____
- Configuration No: _____

Service
C1: _____ C2: _____
C3: _____ C4: _____
C5: _____ C6: _____
C7: _____ C8: _____

Current measuring conditions
Measured value: _____
Exhaust gas temperature: _____
Ambient temperature: _____

11.7 Measures after purge air failure (when using the GMP measuring probe)

Failure of the purge air supply can cause the following damage:

- Damage/destruction of the sender/receiver unit through hot and corrosive gas.
- With overpressure, gas can penetrate the purge air compressor and filter via the purge air hose and damage these system parts.

Measures:

1 Open the quick-release fasteners on the sender/receiver unit and remove the device.
2 As protective measure, especially with overpressure, close off the flange opening with heat-resistant material (blind flange, optional).
3 Clear the failure cause (see Operating Instructions for purge air supply) or exchange the purge air supply.
4 Connect the purge air supply.
5 Refit the units and switch on again.

12 Decommissioning

12.1 Safety information on shutting down

DANGER

Health risk though pressure and hot or toxic gases

Dangerous pressures, hot or toxic gases can escape when opening the duct depending on the process gas characteristics.

- Before installing the sender, receiver and measuring probe, be sure to take all safety measures that prevent gas escaping uncontrolled.

DANGER

Risk to health through contaminated measuring device

Toxic residues may be present in acidic process gas on the measuring device after operation.

- Always wear the specified protective clothing.

DANGER

Risk to health through contaminated measuring probe

Depending on the composition of the gas in the measuring channel, the measuring probe could be contaminated with substances which could result in serious health damage.

- Decontaminate the measuring probe before storage.
- Wear the specified protective clothing for all work with a contaminated measuring probe.

12.2 Materials and tools required

Materials and tools required	Required for
Insulated screwdriver set	Electrical connections
TORX screwdriver, size 10	GPP probe
Allen key	Connections
19 mm open-ended spanner or ring spanner	Flange screw fitting
2 x 24 mm open-ended spanners or ring spanners	
Cleaning cloths	Cleaning the housing
Personal protective equipment	Protection when working on the stack
Flange cover	Closing off the stack
SICK original transport safeguards and packaging	Storing the measuring device

Table 19: Materials and tools required for shutting down

12.3 Disassembling the sender and receiver

Disassembling the measuring device is recommended for longer plant standstills.

NOTE

The analyzer must be removed from the gas duct when:

- The optional purge air unit is taken out of operation on device versions with GMP measuring probe.
- The heating is no longer in operation on device versions with GPP measuring probe.

Procedure

1 Disconnect the device from the power supply.
2 Disconnect the cable plug on the sender/receiver unit. For longer storage: Protect the cable plug against damp and dirt.
3 Take the sender and receiver off the T-piece:
   ▷ Undo the quick-release fasteners
   ▷ Take the sender or receiver off
4 Remove the probe.
5 Close off the opening on the T-piece with an optional blind flange.

NOTE

The optical adjustment remains intact.

12.4 Storage

WARNING

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

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

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

1 Clean the outside of all housings, the measuring probe and all other components with slightly moistened cleaning cloths. A mild cleaning agent can be used.
2 Protect the openings on the SR-unit and measuring probe against atmospheric conditions. Refit transport safeguards.
3 Pack the device for storage or transport (preferably in the original packing).
4 Store the device and all belonging components in a dry, clean room.

12.5 Disposal

The device can easily be disassembled into its components which can then be sent to the respective raw material recycling facilities.

NOTE

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

- Electronics: Capacitors, rechargeable batteries, batteries.
- Display: Liquid of LC display.
- Sample gas filter and measuring probe could be contaminated by pollutants.
  ▷ Decontaminate the measuring probe and filter before disposal.

13 Technical data

13.1 Technical data

NOTE
The technical data depend to some extent on the individual equipment of your device.

▶ See the enclosed System Description for the configuration of your device.

13.1.1 Operating data

Operating data

System GM901 with measuring probe	
Description	GM901 with measuring probe
Measured variable	CO
Maximum number of measured variables	1
Measuring principles	Gas filter correlation
Measuring ranges CO	500 ... 20 000 ppm (depending on the active measuring path and gas temperature)
Precision	± 5 % of the upper measuring range value
Process temperature	• With extended calibration (recommended for process temperatures : ≤ +430 °C)
Process gas humidity	Non-condensing
Ambient temperature	–20 °C ... +55 °C
Conformities	• TÜV Type Approval • GPP measuring probe: U.S. EPA compliant
Electrical safety	EC
Degree of protection	IP 65 /NEMA 4
Dimensions (W x H x D)	367 mm x 418 mm x 1,414 mm (details see dimension drawings)
Installation	Fitting location on duct
Power supply	
Supply voltage	115 V / 230 V
Power frequency	50 / 60 Hz
Max. power input	≤ 60 VA
Control functions	Manual span point test with gas-filled cell

Table 20: Operating data GM901 with measuring probe

Sender/receiver unit

Sender/receiver unit	
Dimensions	see "Dimension drawing, sender/receiver unit with GMP measuring probe", page 92
Weight	6 kg
Lamp service life	Approx. 20 000 operating hours

Evaluation unit

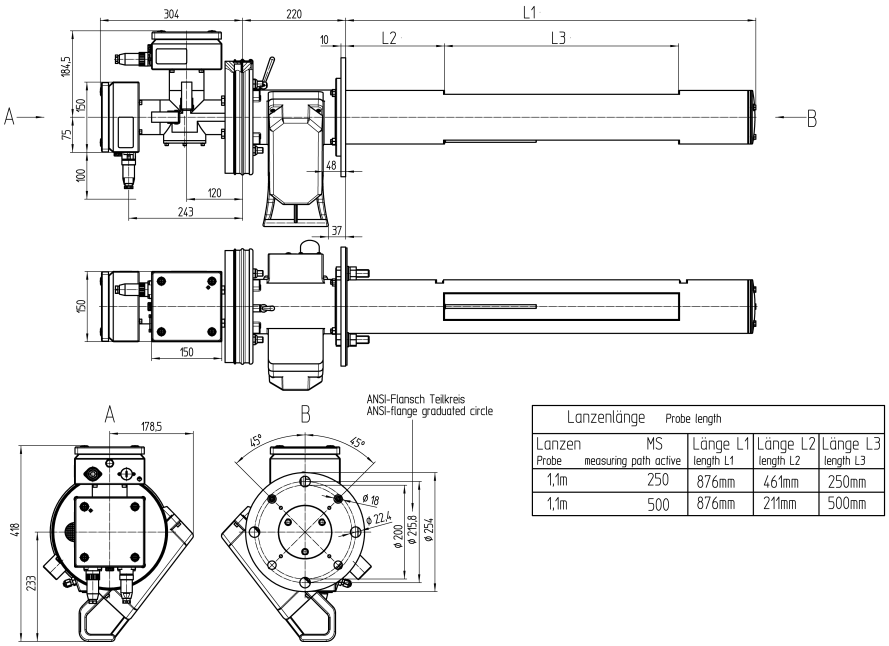
Evaluation unit	
Analog input	• 0 ... 20 mA • Input resistance 100 Ω
Analog output, electrically isolated	• 0 ... 20 mA • Max. load 500 Ω
Relay 1	• Break contact for device malfunction, potential-free, NO contact • NO contact, 125 V, 1 A, 150 VA DC • NC contact for malfunction
Relay 2	• Front contact for limit value overflow, potential-free, NO contact • NO contact 125 V, 1 A, 150 VA DC • NO contact for limit value violation
Relay 3	Not used
Status input	• Status input for maintenance and test, max. contact load 5 V / 2 mA • RS-232 for Service
Dimensions	200 mm x 90 mm x 300 mm (L x W x H)
Weight	4.3 kg

13.1.2 Technical Data - Measuring Probes

	GMP	GPP
Design	• Measuring path in flow direction open • Purge air supply required	• Gas diffusion measuring probe • Suitable for dry gas
Integrated sensors	Sample gas temperature	
Data transfer	CAN bus, electrically isolated	
Heating optical interfaces	-	With built-in heating control
Power supply	-	Separate supply: 115/230 V AC; 50/60 Hz, power input max. 150 VA
Dimensions and active measuring paths	see "Dimension drawing, sender/receiver unit with GMP measuring probe", page 92	see "Dimension drawing, sender/receiver unit with GPP measuring probe", page 92
Weight	Approx. 15 kg	Approx. 20 kg
Material	Stainless steel 1.4571 (USA 326Ti)	
Filter	-	• Material: Silicon carbide SiC • Pore size: 1 µm
Gas exchange (at 10 m/s gas velocity) T_{90}	< 5 s	< 120 s
Power supply		< 150 W
Warming up time	-	Approx. 30 min
Process pressure	± 120 hPa, dependent on purge air	± 200 hPa

13.2 Dimension drawings

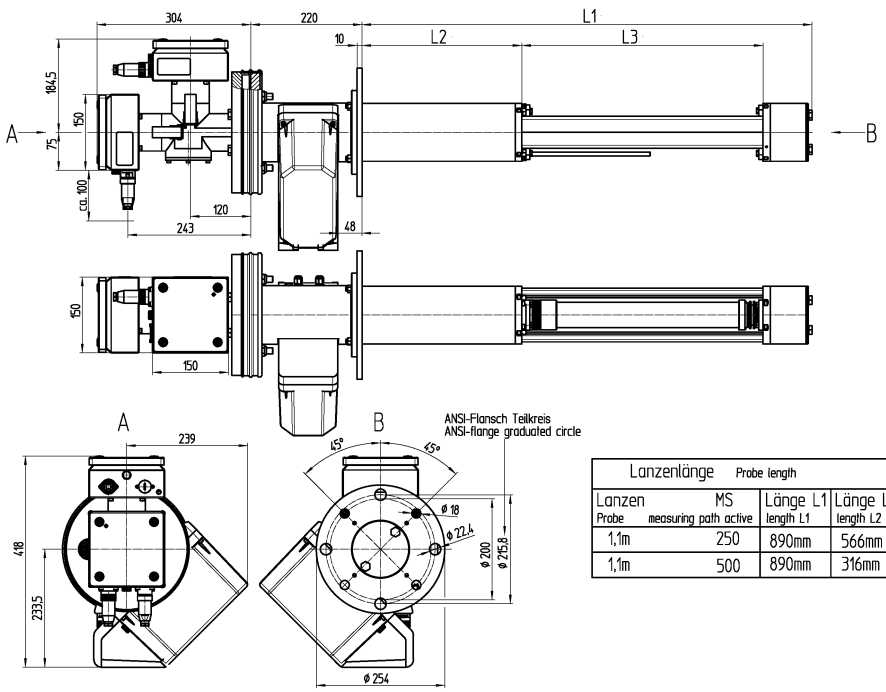
13.2.1 Dimension drawing, sender/receiver unit with GMP measuring probe



Lanzenlänge Probe length				
Lanzen Probe	MS measuring path active	Länge L1 length L1	Länge L2 length L2	Länge L3 length L3
1,1m	250	876mm	461mm	250mm
1,1m	500	876mm	211mm	500mm

Figure 70: Dimensions, GM901-02 sender/receiver unit with GMP probe (all specifications in mm)

13.2.2 Dimension drawing, sender/receiver unit with GPP measuring probe



Lanzenlänge Probe length				
Lanzen Probe	MS measuring path active	Länge L1 length L1	Länge L2 length L2	Länge L3 length L3
1,1m	250	890mm	566mm	227mm
1,1m	500	890mm	316mm	477mm

Figure 71: Dimensions, GM901-02 sender/receiver unit with GPP probe (all specifications in mm)

13.2.3 Dimension drawing, evaluation unit

Evaluation unit, cast metal housing

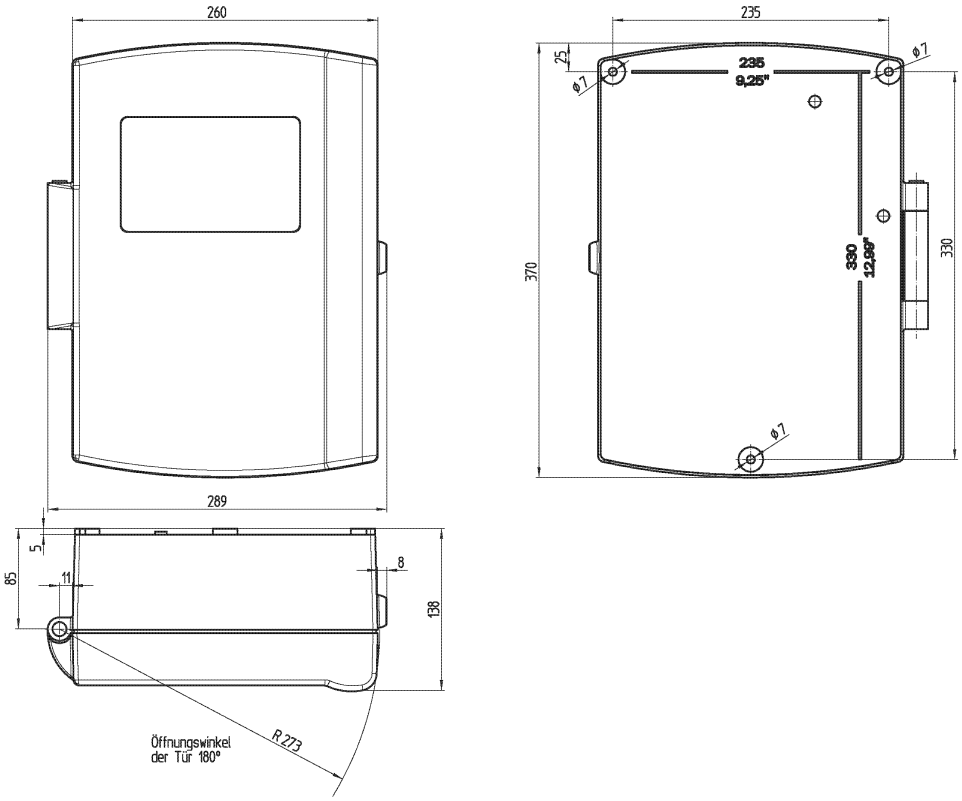


Figure 72: Evaluation unit, cast metal housing

13.2.4 Dimension drawings, accessories

13.2.4.1 Dimension drawing, purge air unit

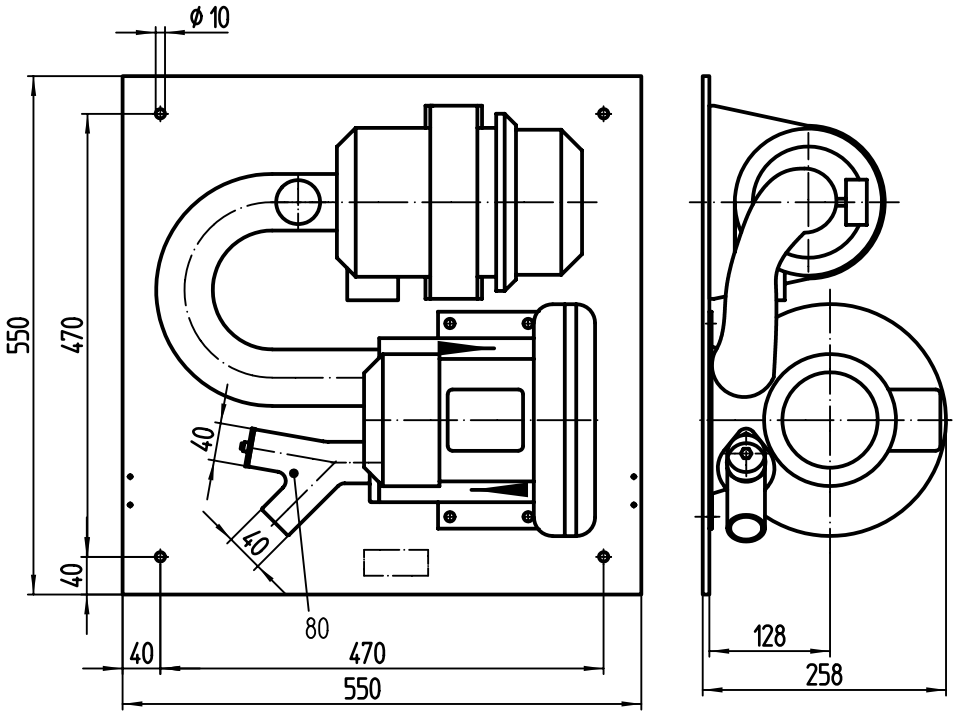


Figure 73: Dimensions, evaluation unit (all specifications in mm)

13.2.4.2 Dimension drawing, terminal box

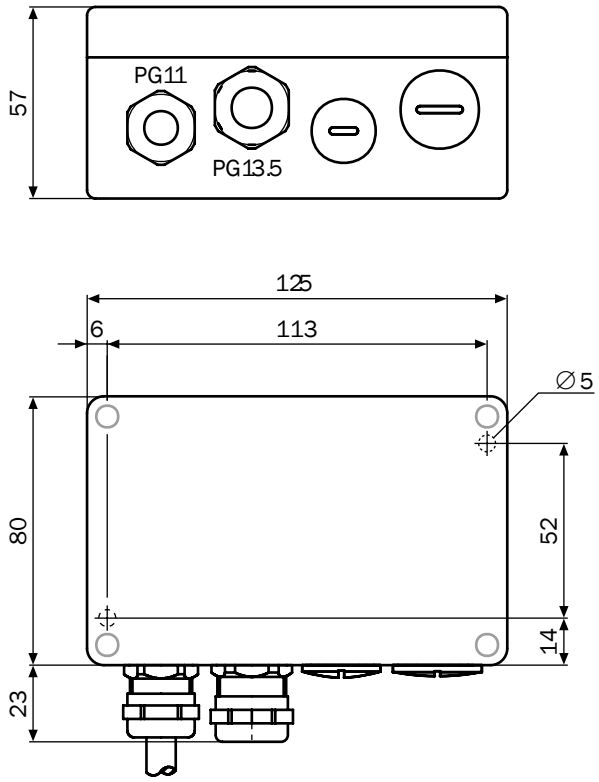


Figure 74: Dimensions, terminal box (all specifications in mm)

13.2.4.3 Weatherproof cover

Weatherproof cover for sender/receiver unit

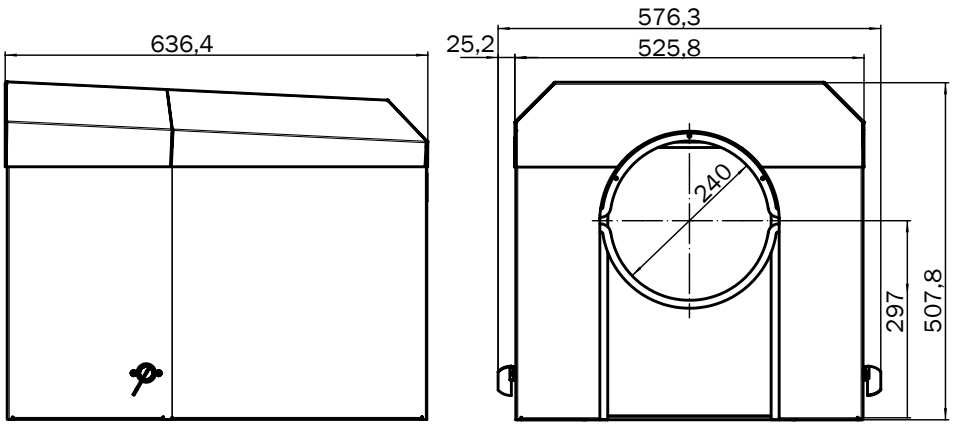


Figure 75: Weatherproof cover for sender/receiver unit

14 Ordering information

14.1 Spare parts

Designation	Quantity	Part No.
Sender GM901 without purge air fixture	1	2019650
Receiver GM901 without purge air fixture	1	2019651
Evaluation unit GM901	1	1052190
Receiver connection cable	1	2020447
Connection cable, length 15 m	1	2020439
Membrane keyboard, evaluation unit GM901	1	6020400
PT1000/20 m converter	1	6021161

Table 21: Spare parts numbers

14.2 Accessories

Designation	Quantity	Part No.
Optical adjustment device	1	2020436
Purge air unit with distributor and 5 m hose (only for GMP measuring probe)	1	1012424
Purge air hose	Per meter	5304683
Connection unit with power supply 230 V / 24 V for sender and receiver	1	2020440
Weatherproof cover for purge air unit	1	5306108
Weatherproof cover for GM901 sender / receiver	2	2702407
Weatherproof cover for GM901 evaluation unit	1	4029146
Operating Instructions, English	1	8008250
Filter element	1	5306091
Test case for SPAN test with holder and up to 3 cells	1	2019639

Table 22: Accessory part numbers

15 List of tables

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