OPERATING INSTRUCTIONS

GM35

Gas Analyzer for CO, N_2O, CO_2 and H_2O
Cross-Duct Version

Installation, Operation, Maintenance

SICK
Sensor Intelligence.

Described Product
Product name: GM35
Variants: Cross Duct

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Legal Information

Original document
This document is an original document of SICK AG.

CE

1 Safety Information

The following information and guidelines apply to the Gas Analyzer GM35 described in this “Operating Instructions” document, and are valid for all user groups performing any work on or using the analyzer.

1.1 Permissible users

All planning, assembly, installation, start-up, maintenance and repair work must be carried out by adequately instructed personnel only and checked by skilled persons.

Persons responsible for safety must ensure the following:

- All safety-relevant work is carried out by qualified personnel only.
- Qualified persons are those who, based on their training, experience or instruction as well as their knowledge of relevant standards, regulations, accident prevention rules and plant conditions, are authorized by those responsible for safety for personnel and the plant to carry out such work. It is decisive that these persons can recognize and avoid possible hazards in a timely manner. Skilled persons are persons according to DIN VDE 0105 or IEC 364 or directly comparable standards such as DIN 0832.
- These persons have access to the documentation supplied with the system as well as the relevant technical documentation for all work carried out, and these persons adhere to the information in this documentation in order to prevent danger or damage.

1.2 Correct handling

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

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

1.3 Safety

WARNING: Risk through incorrect use

Equipment-internal protection devices can be impaired when the device is not used as defined.

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

NOTICE: Responsibility for the safety of a system

The safety of the system in which the equipment is integrated is the responsibility of the person setting up the system.

Basic measures to prevent property damage and injury to persons

Improper usage or improper handling of the Gas Analyzer GM35 can damage health or material.

▶ Therefore, in order to prevent damage, the relevant safety information and valid safety regulations must be observed.

If the GM35 is used as a sensor in combination with a control system, the operator must ensure that a failure or malfunction on the GM35 cannot lead to unallowed hazardous operating states or damage.

Protection against hazards through electrical equipment

GM35 system components include electrical equipment designed for use in industrial high-voltage plants where the relevant standards and regulations must be observed.

▶ Disconnect mains lines before working on mains connections or live parts.

Protection against hazards through gases

▶ Wear suitable protective clothing and mask when using hot and/or aggressive sample gases resp. with high dust loads.
▶ Never open the enclosure or switch off the purge air feed without taking appropriate protective measures when the duct is pressurized.

Troubleshooting precautions

The operator must ensure that:

- Maintenance personnel can be alerted immediately and at any time.
- Maintenance personnel are trained to be able to respond to malfunctions on the GM35 and correctly clear the operational malfunction involved.
- Suitable protective equipment, tools and auxiliary means are available at all times.
- Malfunctions are analyzed by qualified personnel, faults corrected, and operation optimized to prevent similar malfunctions in the future.

1.4 Behavior during purge air failure

GM35 measuring system configurations demand immediate measures to protect the measuring system should the purge air supply fail.

▶ Measures for purge air supply failure, see “Purge air failure”, page 105.

2 Product Overview

2.1 Use and proper application

The GM35 in-situ gas analyzer continuously measures the concentration of CO_2, H_2O and CO or N_2O, and in gas ducts – as single or simultaneous measurement depending on the device variant. As in-situ measuring system, the GM35 determines the measured values directly in the duct carrying gas without extracting any samples.

- **Emission monitoring**

The GM35 determines and quantifies pollutants and reference values in gases reliably, quickly and precisely.

- **Process analysis and control**

The reliability, precision, and short response time of the GM35 are decisive advantages in the efficiency of control circuits in all processes creating CO,N_2O, and CO_2. Incinerating and drying plants are reliably monitored and efficiently controlled.

2.1.1 Conformities and certifications

Many areas of application require conformity with certain specifications. The Gas Analyzer GM35 complies with the following requirements:

- Guidelines regarding qualification tests for measuring equipment intended for continuous emission measurements
- Conformity in accordance with EN 14181 and suitability for emission measurement in plants pursuant to the 17th BImSchV and the TI AIR for components CO, CO_2 and H_2O (Cross-Duct and GMP-measuring probe versions)
- Conformity with the GOST regulation, Certificate No. DE.C.31.001.A No. 11933
- Conformity with the U.S. EPA regulation CFR 40, Parts 60, 75 and 29 CFR 1310
- EMC conformity in accordance with EN 50081-1/EN 50082-2
  CE certification in accordance with EC Directive EMC 89/336/EEC
- The manufacturer SICK AG is certified according to ISO 9001
- EC Directive LVD 2006/95/EC
- EU Directive EMC 2004/108/EC
- Applied EN standards:
- EN 61010-1, Safety requirements for electrical equipment for measurement, control and laboratory use
- EN 61326, Electrical equipment for measurement, control and laboratory use - EMC requirements

2.1.2 Overview of standard components

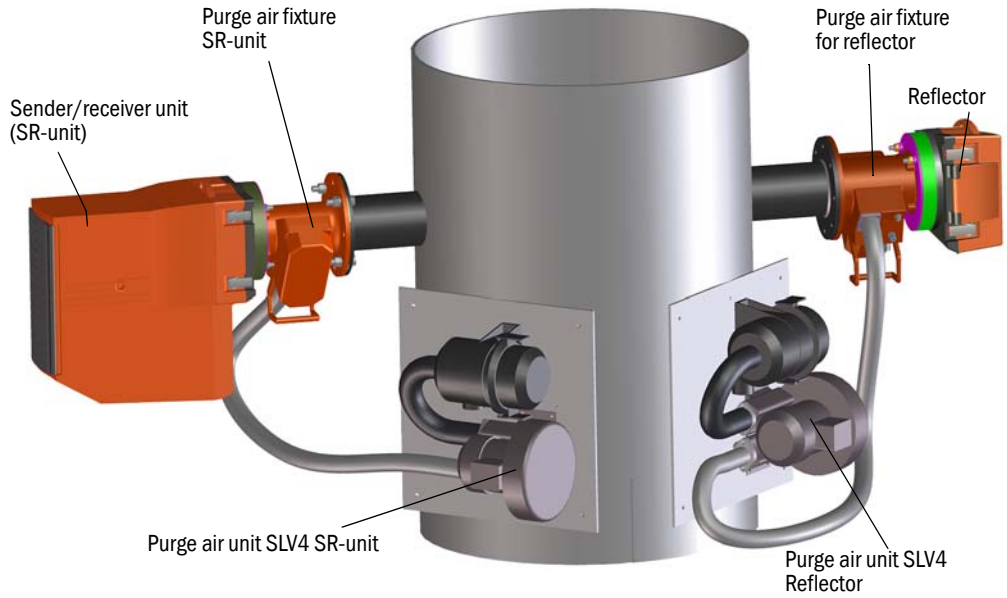


Fig. 1: GM35 system overview

- **Sender/receiver unit (SR-unit)**

  Contains the main optical and electronic subassemblies of the measuring system. The gas concentration is recorded here and the measured value determined. Components CO or N_2O, CO_2 and H_2O are measured, both singly and simultaneously in combinations.

- Measurement reflector

  Version with a gold-plated hollow triple for the following distances (flange on SR side to flange on reflector side):
  0.5 to 1 m, 1 to 2.3 m, 2.3 to 4 m, 4 to 6 m, > 10 m

- 2 purge air units

  Provide purge air for the SR-unit and the reflector and therefore protect against contamination and high gas temperatures. The blower types for the SR-unit resp. reflector are designed differently depending on the application.

- Purge air fixtures for the SR-unit and reflector

  To fit the SR-unit and reflector on the mounting flanges. These include the purge air connections to connect the purge air hoses from the purge air unit and sockets for the connection cable as well as to connect external sensors (purge air unit filter monitor, temperature sensor PT1000, on the SR side)

- **Evaluation unit**

  The evaluation unit in the GM35 measuring system serves as user interface and prepares and outputs the measured values and performs control and monitoring functions. The EvU can be installed near the SR-unit; if necessary, however, it can also be installed up to 1000 m from the measuring point, e.g. in a central control/monitoring room in an industrial plant.

  The evaluation unit carries out the following tasks, for example:

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

Cable type	Part No.
Cable*) (CAN bus), SR-unit – purge air fixture, length 0.8 m Connection cable[1], 5, 10, 12, 15 or 24 m available as accessory.	2023704
Cable[2] (CAN bus), SR-unit – evaluation unit, length 4 m	Scope of delivery
Cable*), purge air fixture SR-unit – filter monitor for purge air unit, length 5 m;	2032143
2 cables*), purge air fixture SR-unit – filter monitor for purge air unit, length 2 m as extension;	6025923
Cable, purge air fixture SR-unit – filter monitor for purge air unit, length 3 m as extension	6028663

[1] One length included in scope of delivery
[2] Included in scope of delivery

• **Flanges with tube**

To install the SR-unit and reflector on the gas duct. The purge air fixtures onto which the SR-unit and reflector are later mounted are secured to the flanges. Dimension drawing and order data, see page 118. ANSI or DIN flanges provided by the customer can be used alternatively to the flanges supplied.

2.2 Device components

Fig. 2: Standard GM35 components

2.2.1 GM35 options and accessories

- Cover plate for purge air fixture of the sender/receiver unit
  to maintain purge air supply in cases where this must remain in operation at the measuring location when the SR-unit is dismounted.
- Weatherproof covers for SR-unit and purge air unit
  required for outdoor installation – dimension drawings, see “Dimension drawings”, page 116.
- Chart recorder, single or multi-channel
  for measured value recording. Protocol(s) can of course be produced using customer systems.
- Air heater for purge air supply
  for special application conditions to prevent condensate. An air heater is required when the difference between gas temperature and dew point temperature is too low. The following practical rule of thumb serves as guideline:

  An air heater is required when

  gas temperature [°C] – dew point temperature[°C] < abs. humidity [%].

  Values are compared without considering the units of measure.

  A Data Sheet for the fan heater is also available under Part No. 8 008 330.

2.3 Functional principle

2.3.1 Opto-electronic in-situ measuring principle

The Gas Analyzer GM35 is based on the in-situ technique using opto-electronic direct measurement. Measured values are recorded through no-contact measurement directly in the gas flow across the entire duct cross-section (cross-duct). The GM35 SR-unit determines the concentration of the respective gas component based on wavelength-specific light absorption by the gas mixture in the active measuring path.

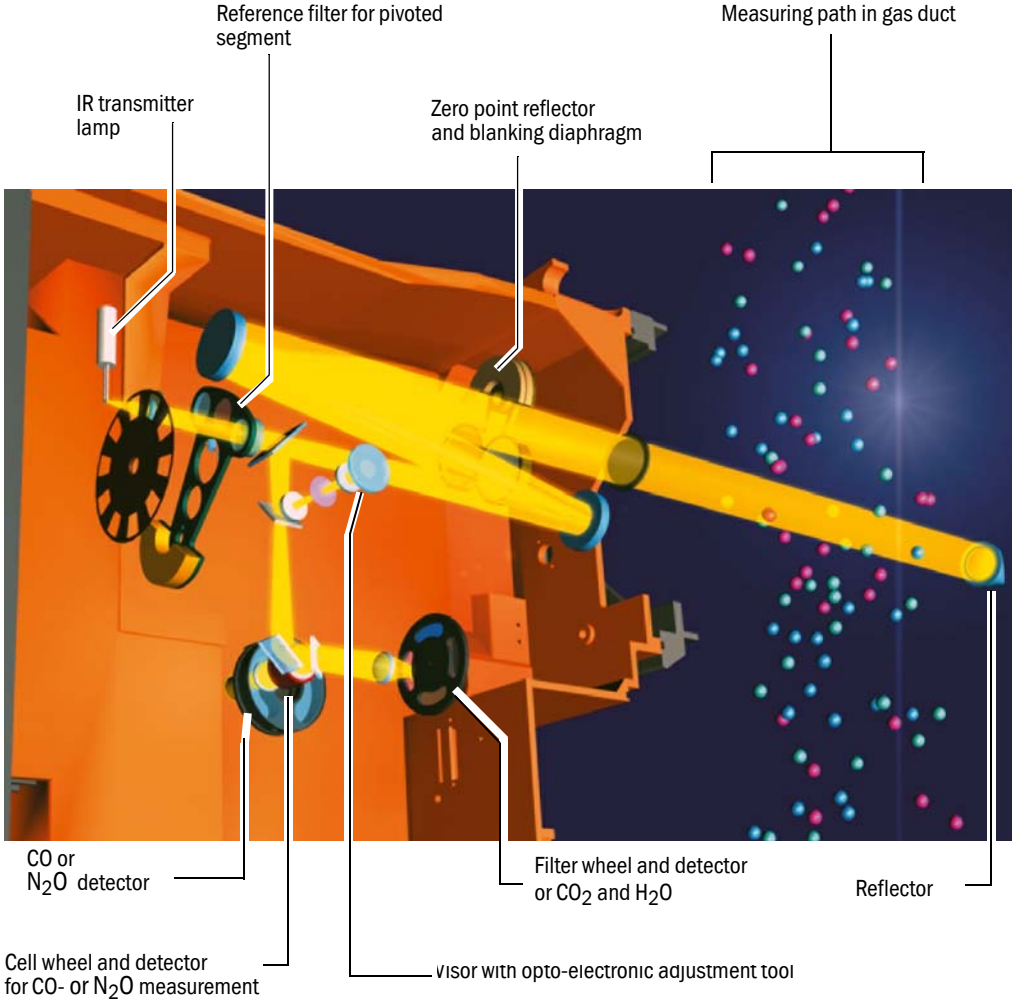
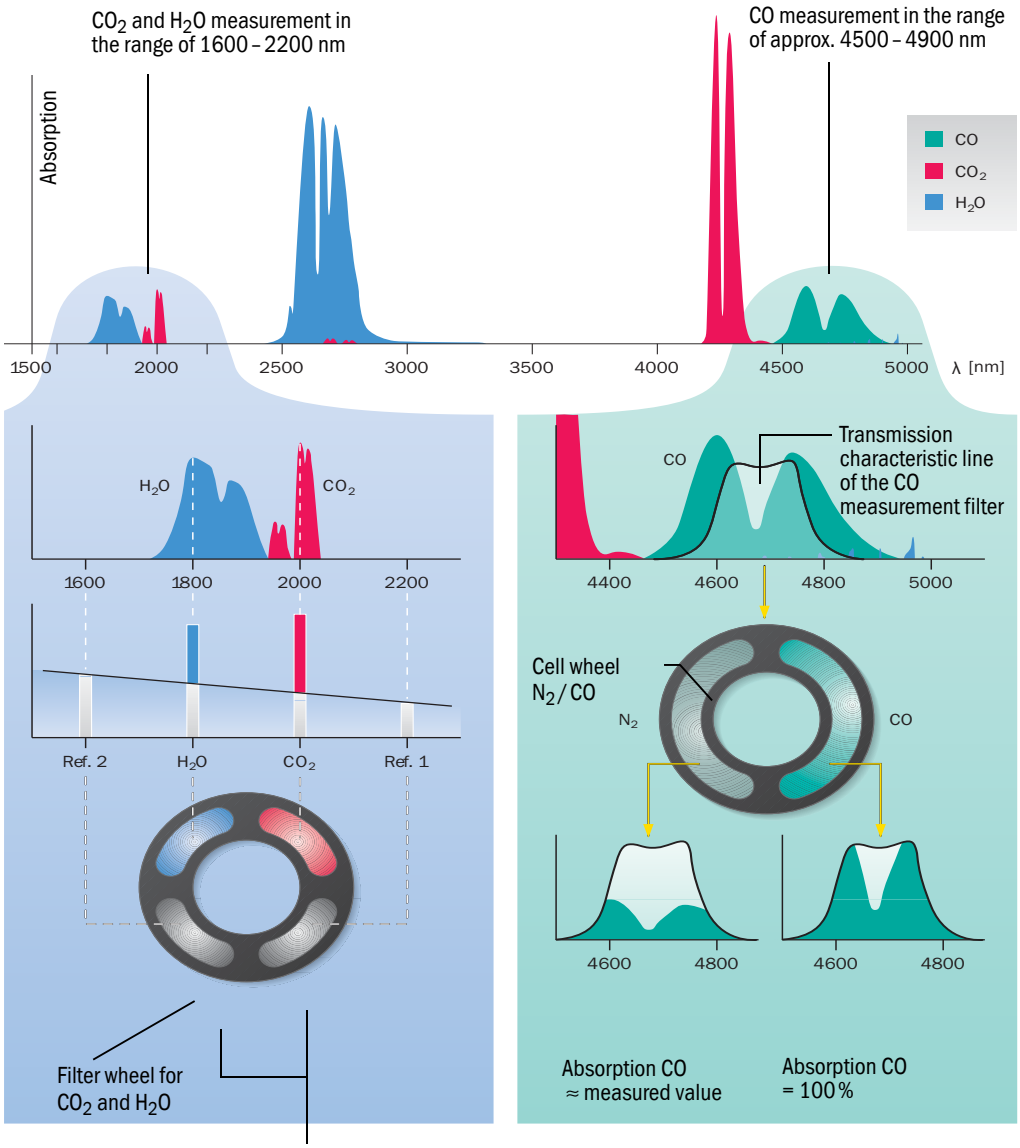


Fig. 3: Optics layout for the GM35

The beam from the sender/receiver unit (SR-unit) passes lengthwise through the active measuring path (see see “Fitting recommendation for the mounting flange (duct diameter not representative)”, page 20) and is reflected by the reflector at the other end. The reflected light from the beam splitter then passes through a filter or cell wheel to detectors configured optionally to measure CO, N_2O as well as CO_2 and H_2O. By filtering the light received into its spectral components, the receiver elements record the absorption of the gas molecules at characteristic points of the spectrum in the IR range of 1.6 to 4.9 µm. Cross-sensitivities with gases other than those to be measured are avoided by selecting these evaluation ranges within the IR spectrum in conjunction with the evaluation algorithms used (see “Signal evaluation”, page 15).

2.3.2 Signal evaluation

The optimized algorithms of the GM35 evaluation electronics process the measurement signals of the receiver elements together with the associated parameters in accordance with the correlation procedure with optical filters for CO_2 and H_2O and with cells filled with CO or N_2O.



Reference filter for determining the background absorption, free of cross-sensitivities with other gas components

The CO or N_2O measured values are determined from the signals at the detector with absorption by the sample gas and with a cell filled with the component to be measured. Interference is eliminated.

Fig. 4: Evaluation of absorption spectrums for sample gases with the GM35

2.3.3 Automatic check cycles

To ensure a consistently high level of measuring precision, the GM35 SR-unit performs a regular automatic check cycle in an adjustable interval (standard: Every 2 hours). In this check cycle, the zero point is first determined by swiveling a zero point reflector into the

beam path. Reference filters are then moved into position to control the check point. The spectral properties of the device are checked using a test gas cell. If a check cycle reveals that the system is not functioning in accordance with the operation specifications, the GM35 measuring system outputs appropriate error or warning messages.

Triggering options

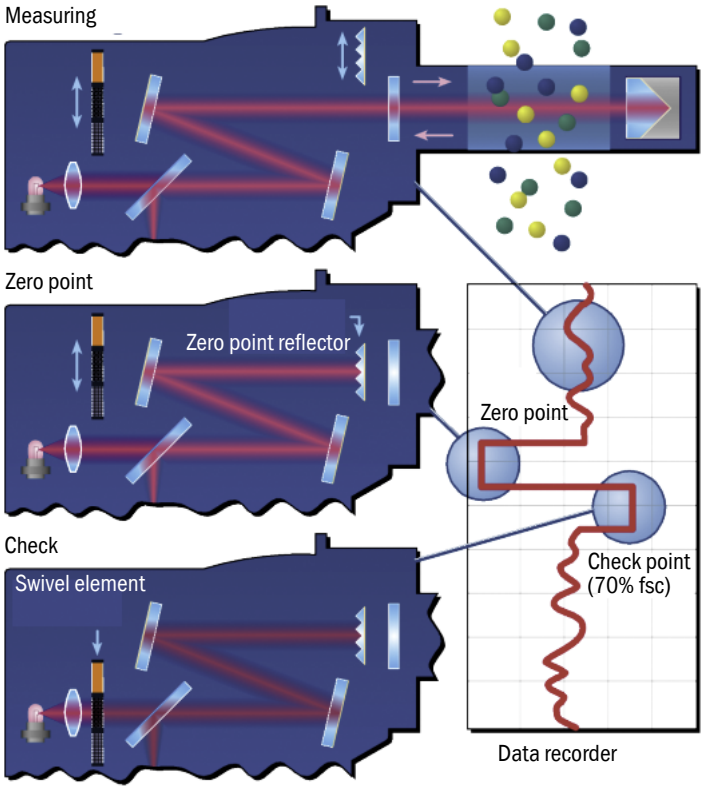
1 Di 1 (falling edge): The check cycle can also be suppressed with this function.
2 Time interval, adjustable via the menu of the EvU.

Sequence

1 Check cycle is started.
2 Internal reference measurement is executed. Signal: Relay 3 (function check)
3 The zero point and check point are output on the EvU display and the assigned analog outputs for 90 seconds each.Relay 3 remains active.

Observe the following for connecting to an emission computer: Measure the time from the start to the output to compensate differences in the device settings.

Fig. 5: Determining the check point



3 Project Planning Information

3.1 Work steps from system selection to start-up

Application changes

If the information regarding your application submitted with your purchase order has changed, or if a device is to be used for an application other than the one that was originally
intended, please contact your local sales representative or our project planning department to determine whether the device(s) can be used under the new conditions, and whether readjustment or reparametrization is necessary.

The following steps are generally carried out before the measuring system is started up:

- Project planning

  See planning checklist below

- Initial onsite installation

  The following preparations, usually carried out by the customer, are described in “Initial onsite installation”, page 20.

- Flange assembly, see “Installing the flanges with tube”, page 21.
- Preparations for installing the purge air unit, see “Installation preparation for the purge air unit”, page 24.
- Laying the signal and power supply cables to the measuring point, see “Duct insulation”, page 24.
- Preparations for installing the EvU, see “Installation preparation for the evaluation unit”, page 25.
- If necessary, preparing the signal cables for the interfaces to the peripheral equipment, see “Preparations for electrical installation”, page 25.
- Device installation

  To allow speedy start-up, the following components are normally installed ready for operation before the start-up date; see also “Installation”, page 30.

- Purge air unit
- Evaluation unit
- Start-up

  The actual start-up procedure is carried out by trained personnel or SICK Customer Service. This work is described on page 69. The main activities are adjustment tasks on the GM35 system related to the application.

3.2 Project Planning Checklist

Project planning, step by step

Technical data and dimensional drawings of system components, see “Technical Data, Consumables and Spare Parts”, page 113 and following.

Topic	Task	Measure/determination
Determining the measuring point Observe national regulations such as VDI 3950.	Provide for unhindered inlet and outlet paths: ▶ For round duct cross-sections: 3 times the duct diameter ▶ For rectangular cross-sections: Hydraulic diameter $D = \frac{4F\ (Cross\text{-}sectional\ area)}{U\ (Circumference)}$ ▶ If these specifications cannot be met: Inlet path > outlet path, e.g. $^2/_3$: $^1/_3$; uniform concentration spread whenever possible	
	Emission measuring point	▶ Obtain official approval for emission measuring point. ▶ Provide for calibration openings at easily accessible places. ▶ Ensure the GM35 and calibration probe do not influence each other; the calibration gland should be located at a minimum distance of 0.5 m upstream of the measuring device.
	Application conditions	▶ Observe Technical Data for duct/ambient conditions! ▶ Gas temperature above/below dew point (dry/wet)
	Pressure conditions at the measuring point	▶ A fitting location with partial vacuum in the duct is ideal. ▶ For duct pressures > 10 hPa/mbar, please contact SICK to select the correct purge air blower type.
SR-unit, reflector see “Assembly preparation at the measuring point”, page 20.	Select suitable flange with tube	• The flange is designed to be installed in steel ducts; suitable flanges with tube are usually supplied with the GM35. • Stone stacks or ducts with thick walls demand an onsite retaining plate and, possibly, a longer version of the flange with tube; see “Installing the flanges with tube”, page 21. • If some of the components have not yet been delivered, you may need to arrange an advance delivery of the flanges with tube so that you can mount these as part of the preparations for installation onsite.Alternatively, you can use a suitable flange prepared onsite (or ANSI flange, check the Technical Data, see see “Technical Data, Consumables and Spare Parts”, page 113).
	Select stack opening	▶ Provide an opening of suitable size for the flange tube. ▶ Provide for adequate clearance for installation and maintenance activities for the duct insulation cutout. ▶ Plan clearances for handling the SR-unit, reflector. ▶ Ensure the ambient temperature for the SR-unit and reflector is between –20 and +55 °C (–40 °C during continuous operation). ▶ For installation outdoors, plan a weatherproof cover
	Tools for start-up and maintenance	• When working on the zero path; prerequisites: Clean ambient atmosphere free from sample gas; weatherproof: Plan the zero path or order from SICK.

Table 1: Project planning checklist

Topic	Task	Measure/determination
Purge air unit see “Installation preparation for the purge air unit”, page 24	Fitting location selection	▶ Plan installation location on the duct in immediate vicinity (5 m) of the GM35 SR-unit. ▶ Keep purge air hoses to the respective purge air fixture (SR-unit, reflector) as short as possible (pressure drop per meter, approx. 1.2 hPa/1.2 mbar). ▶ Ensure secure cable laying. ▶ Ensure dry and, whenever possible, dust-free intake air on the purge air unit, use a preliminary filter when necessary. ▶ The intake air temperature should be between 0 and 55 °C. Heat the purge air when T < 0 °C; see air heater option. ▶ For installation outdoors, plan a weatherproof cover.
Evaluation unit see “Installation preparation for the evaluation unit”, page 25	Determine the fitting location	▶ Install the evaluation unit at an easily accessible location, preferably at the measuring point. If necessary, install it at a distance from the measuring point, whereby the total length of all the CAN bus connections in the GM35 measuring system must not exceed 1000 m. • Ambient temperature between –20 °C and +55 °C. • During continuous operation –40 °C.
	Options for CAN bus wiring	▶ Is the 4 m CAN bus cable sufficient for the connection between EvU and SR-unit at the selected installation location? If not, select a suitable cable (see see page 11): ▶ If the distance is less than 19 m: Plan a 15 m prefabricated CAN bus cable with plug-in connectors. ▶ For larger distances: Use CAN bus terminal boxes and a cable provided by the customer.
Assembly platform	Specify the assembly platform	▶ Provide a suitable working platform for installation on the outside of a duct/stack. ▶ The fitting location of the GM35 SR-unit should be about 1.3 to 1.5 m above the platform. ▶ The platform must be large enough, secured and positioned so that all device parts can be accessed without danger. This is especially important when inserting and removing the SR-unit or reflector.
Accident prevention	Applicable (national) regulations on accident prevention must be observed. Always observe and follow the relevant safety information provided for the corresponding texts in these Instructions.	

Table 1: Project planning checklist

3.3 Initial onsite installation

The following work can be carried out by the customer's technicians. Requirement: The project planning checklist has been processed beforehand.

3.3.1 Assembly preparation at the measuring point

This Section describes the welding work on the duct including making fixing elements onsite.

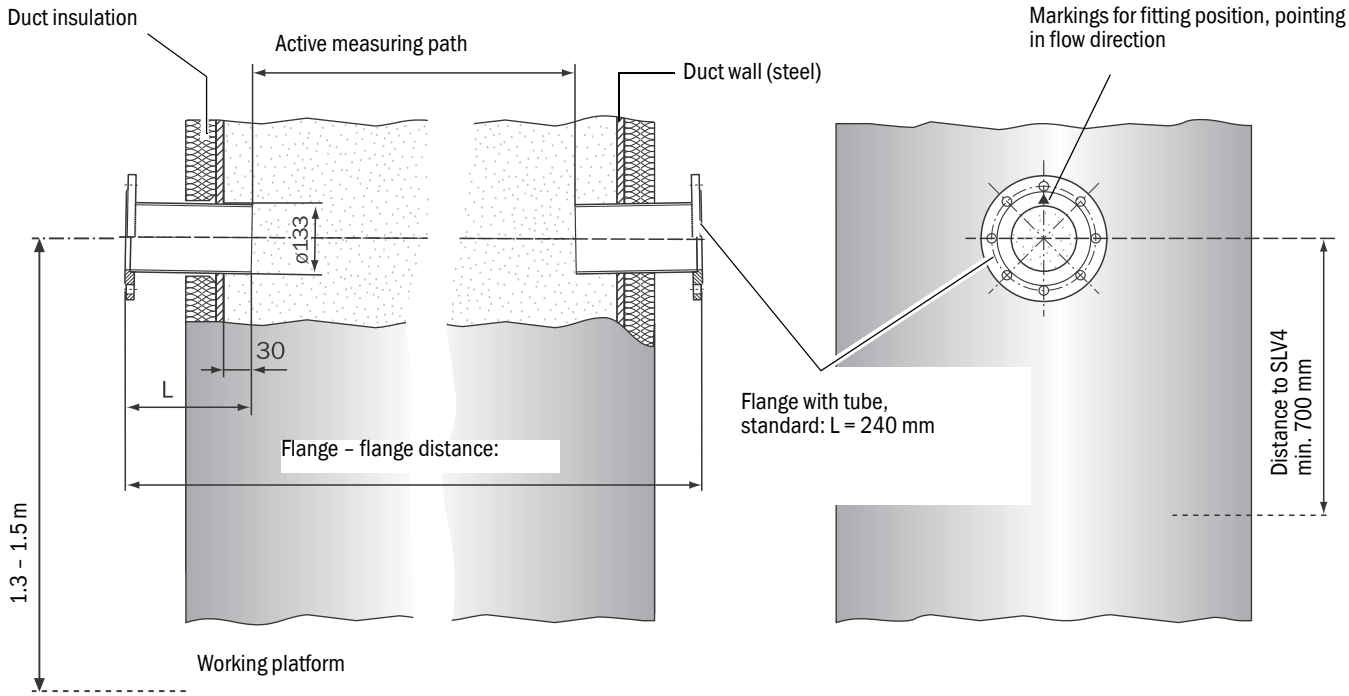


Fig. 6: Fitting recommendation for the mounting flange (duct diameter not representative)

CAUTION: Protective measures at the measuring point

- Always shut down the installation before any work on the duct!
- Secure parts to be separated with, for example, wire binding, to prevent damage by falling objects.
- Take appropriate protective measures against hot, explosive gases or toxic gases that could possibly escape from the duct.
- If necessary, seal off the mounting flange with a cover securely until device assembly (e.g. for overpressure in duct).

3.3.2 Uncovering the duct

- If necessary, remove approx. 800 x 1500 mm (W x H) of the duct insulation to be able to access the duct during subsequent work.
- Keep the insulation material removed for later refitting resp. provide new suitable insulation material.

3.3.3 Installing the flanges with tube

- Standard flanges
  SICK delivers two flanges with tube with 240 mm total length and 125 mm inner diameter as standard. A version with 500 mm total length is available for installation locations with thicker insulation or for stone stacks. Special versions can be manufactured on request. Onsite flanges, including ANSI flanges, can also be used.

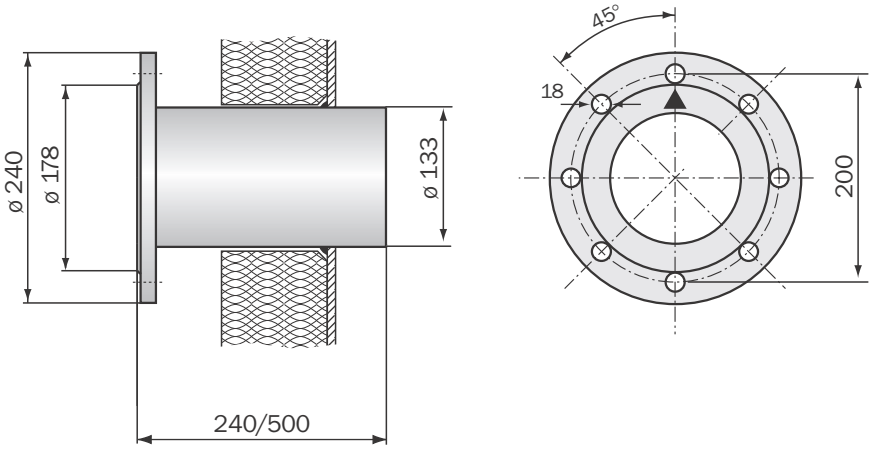


Fig. 7: Standard flange with tube

- Reinforcement with junction plates recommended
  Due to the weight of the sender/receiver unit, it is recommended to reinforce the flange tube onsite with junction plates.

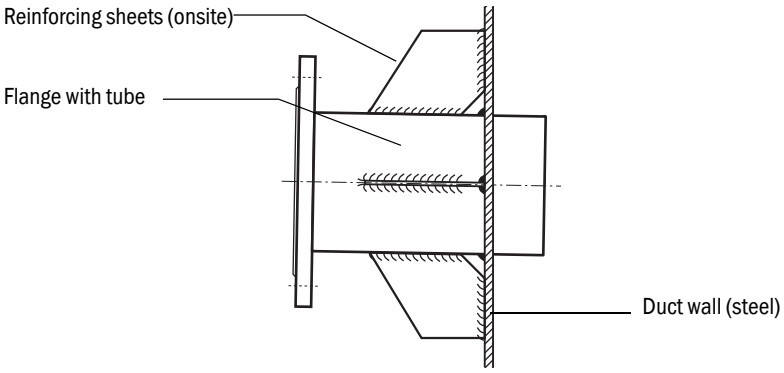


Fig. 8: Reinforcing with junction plates

- Gas-carrying duct made of stone/concrete
  An additional retaining plate with suitable opening can be manufactured for ducts not made of steel and in which the flange with tube can be welded.

Installation steps for fitting the flange with tube

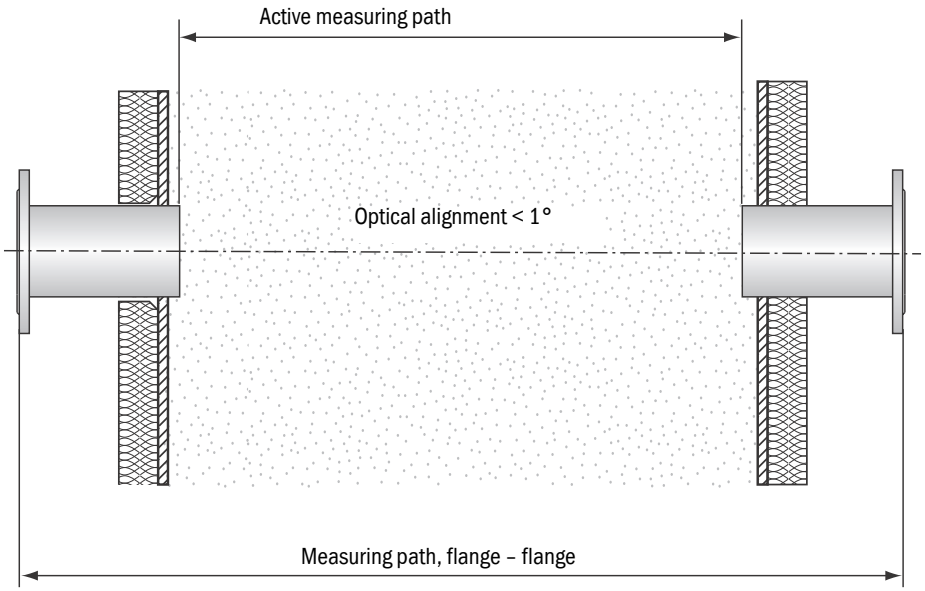


Fig. 9: Flange installation – determining the measuring path

1 Mark the exact flange center points on the duct wall (SR-unit and reflector sides).

Note **Optical alignment:** When possible, the tube axis on the SR-unit side should be exactly flush with the tube axis on the reflector side (< ± 1°).

2 For brick/concrete ducts: Cut the duct opening approx. 2 cm larger than the flange tube outer diameter.
3 Cut an opening matching the outer flange tube diameter (standard $Ø_a$ = 133 mm) out of the duct wall resp. retainer plate.
4 Position the flange tube so that marking ▶ points exactly in gas flow direction.
5 Affix in the fitting position.

Optical alignment of the flange

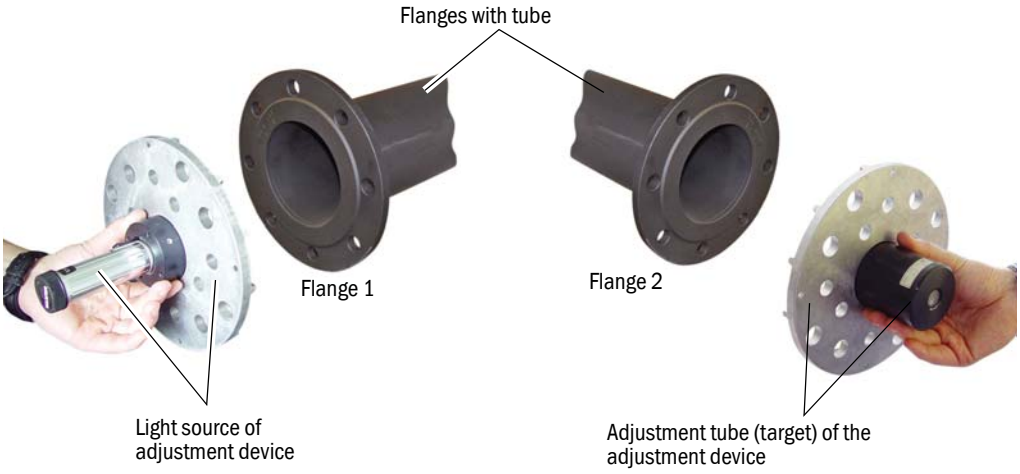


Fig. 10: Adjustment device for flange alignment

6 Fit the adjustment device (light source, e.g. SR side, adjustment tube on reflector side) on the flange.
7 Align flange tube 1 so that the light spot from the light source is at the center of the target on the adjustment tube.

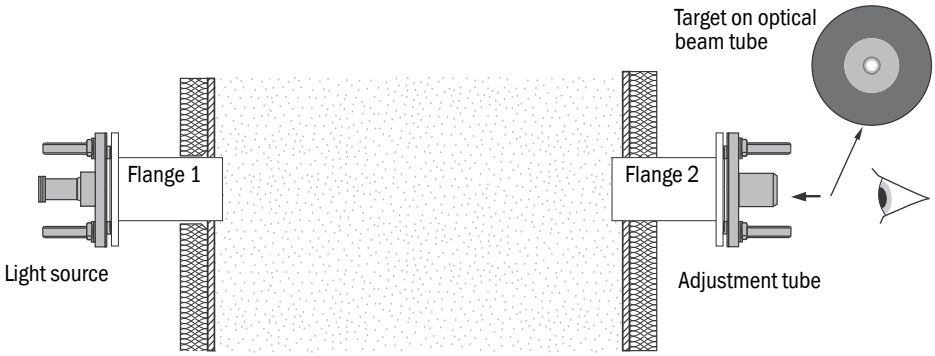


Fig. 11: Aligning the flange with tube using the adjustment device

8 Tack-weld flange 1.
9 Reposition the adjustment device (e.g. light source on reflector side and adjustment tube on SR side) and align and tack-weld flange tube 2.
10 Weld flange tubes on.
11 Weld on with junction plates as reinforcement when possible; see “Reinforcing with junction plates”, page 21.
12 Brick/concrete ducts: Anchor the holding plate with the welded flange with tube to the duct as shown in *Fig. 9:, page 22*.

Note During welding and alignment work, make sure the planned flange-to-flange measuring path is observed exactly when a zero path has already been ordered or delivered. Otherwise the zero path must be adapted, see “Preparing a zero path”, page 72.

3.3.4 Installation preparation for the purge air unit

1 Make brackets from steel pipes (e.g. 50 x 5) with flanges (e.g. FL 60 x 8 x 60) for the four fixing points of the purge air unit ; bore M10 threads in the mounting holes.
2 Weld the brackets on as shown when using steel ducts.
3 For stone stacks, fit retainer plates to each steel pipe or use a different, suitable mounting for the purge air unit.

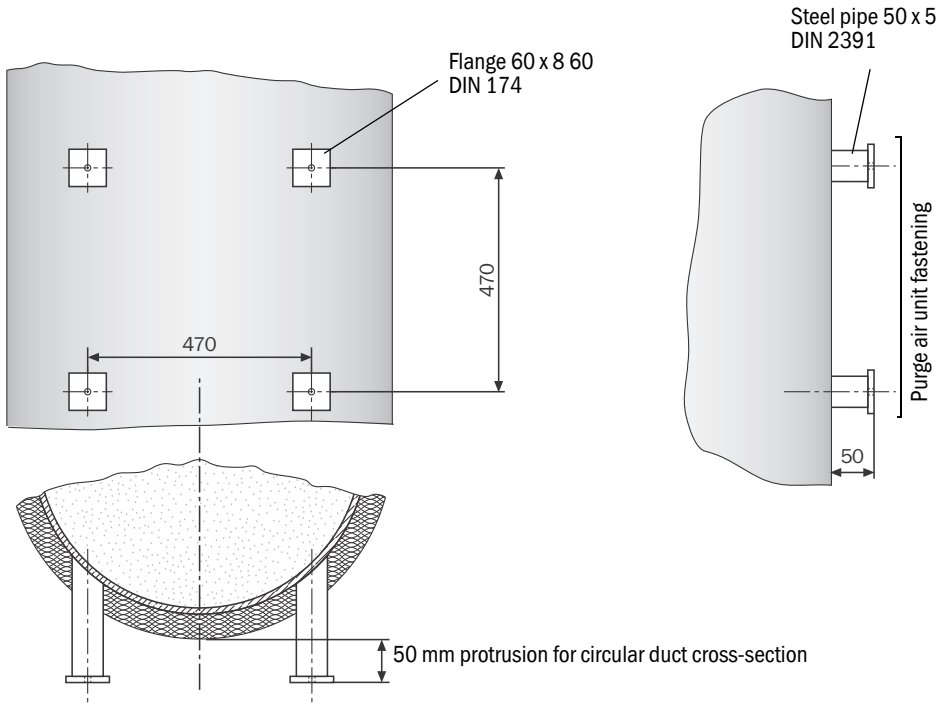


Fig. 12: Fitting recommendation for purge air units (duct diameter not representative)

See "Technical Data, Consumables and Spare Parts", page 113 for the dimension drawing for the purge air unit.

3.3.5 Duct insulation

▶ Refit the thermal duct insulation; reinforce the insulation when necessary.

CAUTION: Device failure due to high ambient temperatures
The SR-unit of the GM35 is designed for a maximum ambient temperature of +55 °C. Radiant heat on the enclosure surface can, under certain circumstances, lead to temperatures higher than the measured air temperature.

▶ Therefore, design insulation and radiation shielding so that temperature limits are reliably maintained.

3.3.6 Installation preparation for the evaluation unit

Requirements

The installation location for evaluation unit was defined within the project planning framework (see “Project Planning Checklist”, page 18). The maximum total cable length of all CAN bus connections in the GM35 measuring system of 1000 m was taken into account, bearing in mind that the closer the device is to the measuring point, the easier it is to use.

Installation location preparation

The evaluation unit has mounting holes in the enclosure that allow it to be easily secured with 3 screws.

- Based on the dimension drawing of the EvU according to “Fitting the evaluation unit (cast enclosure)”, page 34, make sure sufficient space is available at the planned installation location to fit and wire the enclosure as well as to swing the enclosure door open.
- Drill suitable openings as assembly points as required.

3.4 Preparations for electrical installation

The onsite supply and signal cables are laid beforehand to facilitate subsequent installation and start-up of the GM35 system components. Suitable cable ducts resp. empty conduits are installed for cables already prefabricated and delivered with the GM35 system. The prepared cables are connected to the devices during installation or start-up by suitably qualified personnel or by SICK Customer Service.

3.4.1 Electrical installation safety information

WARNING: Hazard by voltage.

- Only allow an authorized electrician to work on the electric system.
- Observe the relevant safety regulations during all installation work.
- Take suitable protective measures against local risks and those arising from the plant.

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

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

- Before starting the work, ensure the power supply can be switched off using a power isolating switch/circuit breaker in accordance with DIN EN 61010.
- Make sure the disconnector switch is easily accessible.
- An additional disconnecting device is mandatory when the power isolating switch is difficult to access or cannot be accessed when connecting the equipment after installation.
- The power supply may only be activated again after 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

When a removable power cable is used, electrical accidents can occur when the specifications are not fully observed.

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

CAUTION: Device damage through incorrect or missing grounding.

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

NOTICE: Responsibility for the safety of a system

The safety of the system in which the equipment is integrated is the responsibility of the person setting up the system.

WARNING: Risk of fire due to hot gas escaping in installations with overpressure conditions

On installations with overpressure, the purge air hose can be severely damaged by escaping hot gas and can catch fire depending on the temperature.

On plants with overpressure as well as gas temperatures over 200 °C:

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

WARNING: Endangerment of electrical safety through heat damage to lines

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

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

3.5 Electrical protection

Evaluation units of GM35, Power Supply 24 V; SCU I/O

- Insulation: Protection class 1 in accordance with EN 61140
- Insulation coordination: Overvoltage category II in accordance with EN61010-1
- Contamination: Degree of contamination II in accordance with DIN EN 61010-1

3.6 Specifications on electric isolation of the EvU

Connections SCU I/O	
Relay contact <-> PE	860 V AC
Relay contact <-> relay contact	860 V AC
Relay contact <-> actuation	1376 V AC

Table 2: Characteristic data for electric isolation

3.7 Laying connection lines

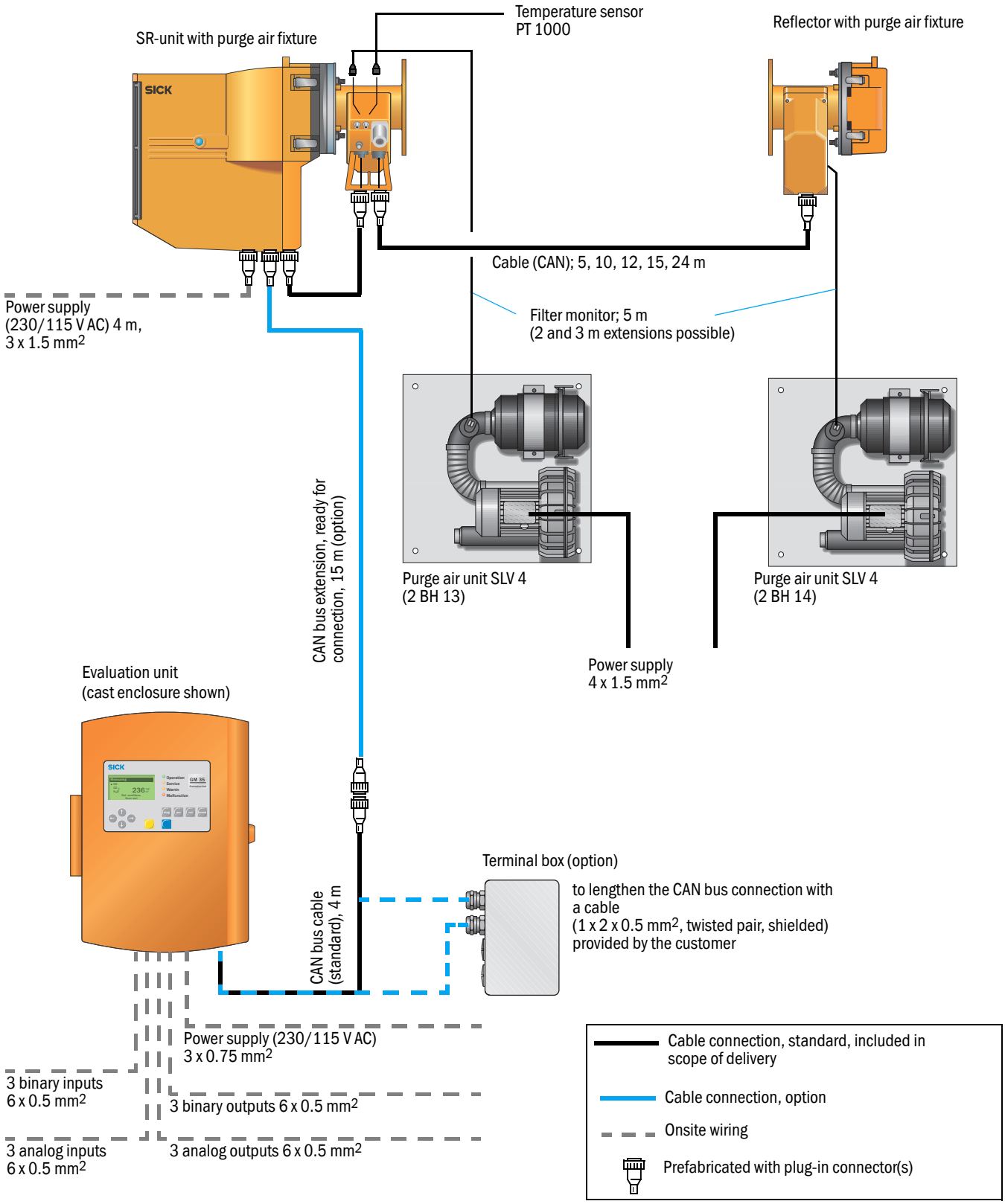


Fig. 13: Cable routing diagram

3.7.1 CAN bus wiring

Standard cables

An installation location in the vicinity of the measuring point is generally selected for the EvU so that the 4 m CAN bus cable delivered is sufficient for cabling without additional installation effort. CAN bus extensions, ready for connection with plug-in connectors, are also available in various lengths (see “Connection cables”).

Installation away from the evaluation unit

A 6-pole terminal box can be supplied when the EvU is to be located some distance from the SR-unit. This is then connected to the SR-unit using the 4 m CAN bus cable delivered with the measuring system. A customer cable suitable for CAN bus applications, 6-pole cable (twisted pair wires and shielded), then leads to the EvU. The total length of the CAN bus connections, including the one to the reflector, may be up to 1000 meters. When performing maintenance or service, it must be possible to deinstall the EvU temporarily and connect it directly to the SR-unit at the measuring point.

Laying the cables

- ▶ Provide adequate cable lengths at the connection points.
- ▶ Whenever possible, do not lay power supply cables immediately next to signal cables.
- ▶ Protect open ends of preinstalled cables against weather effects until device installation.
- ▶ Install separate power supply cables and circuit breakers for:
- – GM35 SR-unit (via connection unit or terminal strip in control cabinet)
- – Purge air units; additional motor circuit breakers and optional protective phase failure switches.
- – Evaluation unit

CAUTION: Risk of device damage due to switching off the voltage supply unintentionally

The purge air supply may not be switched off while the measuring system is on the gas duct.

- ▶ Attach clearly visible warnings against accidental switching-off to all switching devices where the purge air supply can be switched off.

WARNING: Risk of fire through hot gas escaping in installations with overpressure conditions

On installations with overpressure, the purge air hose can be severely damaged by escaping hot gas and can catch fire depending on the temperature.

On plants with overpressure as well as gas temperatures over 200 °C:

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

- ▶ Install easily accessible cable ducts see “Cable routing diagram”, page 28 or empty tubes for prefabricated cables or cables delivered with the system (marked with one or two plug-in connectors). Approx. 2 m cable lengths each should be available at the measuring point for later maintenance work on the measuring system when dismounted from the duct.
- ▶ Lay cables provided by the customer (shown without plug-in connectors) according to see “Cable routing diagram”, page 28.
- – The specifications for the lead cross-sections are recommendations whereby cables for analog and binary signals may differ slightly from these (but not the CAN bus connections or the power supply cables).
- – Start with the system internal connections of the GM35.

Status and signal cables from the EvU to the connection terminals of the customer's status/signaling equipment can be connected later if necessary.

4 Installation

This Section describes assembling and installing the GM35 measuring system prior to the actual start-up. Completion of the onsite preinstallation according to "Project Planning Information", page 17 is assumed.

4.1 Preparations

4.1.1 Checking the scope of delivery

- Check the delivery against the associated delivery note and make sure the complete measuring system has been delivered as ordered. The typical scope of delivery contains the components described in "Device components", page 12.
- Check the specifications on mains voltage and frequency on the type plates of the GM35 components match the installation conditions, delivery note and the order.

4.1.2 Installation prerequisites

The following prerequisites are applicable for the work described in the following:

- Plan safe usage/application within the limits defined in "Technical Data, Consumables and Spare Parts", page 113.
- Compliance with the specifications made during project planning (according to "Project Planning Checklist", page 18) and correct performance of onsite preinstallation according to "Initial onsite installation", page 20.

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

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

- Before starting the work, ensure the power supply can be switched off using a power isolating switch/circuit breaker in accordance with DIN EN 61010.
- Make sure the disconnector switch is easily accessible.
- An additional disconnecting device is mandatory when the power isolating switch is difficult to access or cannot be accessed when connecting the equipment after installation.

WARNING: The power supply may only be activated again after the work or for test purposes by personnel carrying out the work under consideration of valid safety regulations.

4.2 Fitting system components

4.2.1 Information on installing the SR-unit and reflector

The SR-unit and reflector (and, if used, purge air fixtures) are installed in the duct as part of the start-up procedure because these components require an initial zero adjust outside the gas-carrying duct. To avoid problems during start-up, the SR-unit and reflector must be stored in a dry place free from dust, preferably at room temperature, until start-up.

CAUTION: Damage to the measuring system due to assembly of the SR-unit and/or reflector before start-up
Unfavorable ambient conditions or atmosphere in the measuring duct can damage the measuring system which prevents start-up. Apart from that, there is a health risk when opening the duct depending on the pressure, gas temperature and composition in the sample gas duct.

4.2.2 Installing the purge air unit

Note A dimension drawing can be seen in “Purge air unit dimensions”, page 119. Brackets should have M8 threadholes or M8 separator bolts for fastening to the base plate.

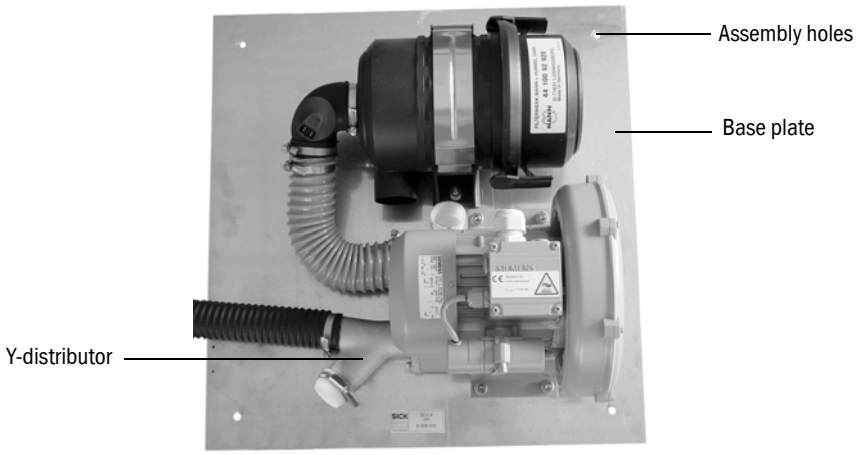


Fig. 14: Installing the purge air unit

1 Secure the base plate for the purge air unit using 4 M10 x 45 screws on the brackets provided by the customer.
2 Cut the purge air hose to a suitable length for the respective purge air fixture, attach it to the open outlet of the Y-distributor and secure it with a hose clamp.
3 Close off the hose ends when the purge air unit is not going to be used for a longer period.

If the purge air unit is not connected electrically immediately:

4 For outdoor installations, fit the weatherproof cover planned during project planning (optional in scope of delivery).
5 Protect the open end of the purge air hose from humidity or contamination until SR-unit start-up.

4.2.3 Terminal box (option)

- ▶ Install the terminal box in the vicinity of the measuring point.
- – Secure the enclosure on the two mounting holes (∅ 5 mm).
- ▶ The cable length available from the terminal box to the SR-unit is 4 m.Take the empty conduits laid for the prefabricated cables during onsite preinstallation into account.

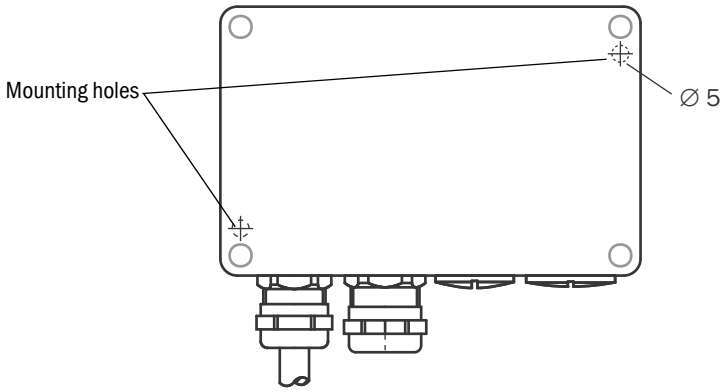


Fig. 15: Fitting the terminal box

4.3 Installing the evaluation unit

The installation location for the evaluation unit was defined during project planning (see “Project Planning Checklist”, page 18) and, where necessary, prepared as part of the initial installation work carried out by the customer.

- Make sure the CAN bus connection to the SR-unit selected during project planning is usable at the planned installation location. The CAN bus connection cable delivered as standard is 4 m long and serves to connect the evaluation unit directly at the measuring point.
- Ensure easy access without problems. In particular, make sure the swivel door of the evaluation unit can be opened without hindrance after fitting.

4.3.1 Installing the evaluation unit – sheet metal enclosure version

- Make ∅7.2 mm (for M8) mounting holes at the installation location according to the Drilling plan.
- Attach the evaluation unit at the installation location using the 4 planned fastening brackets with suitable screws.

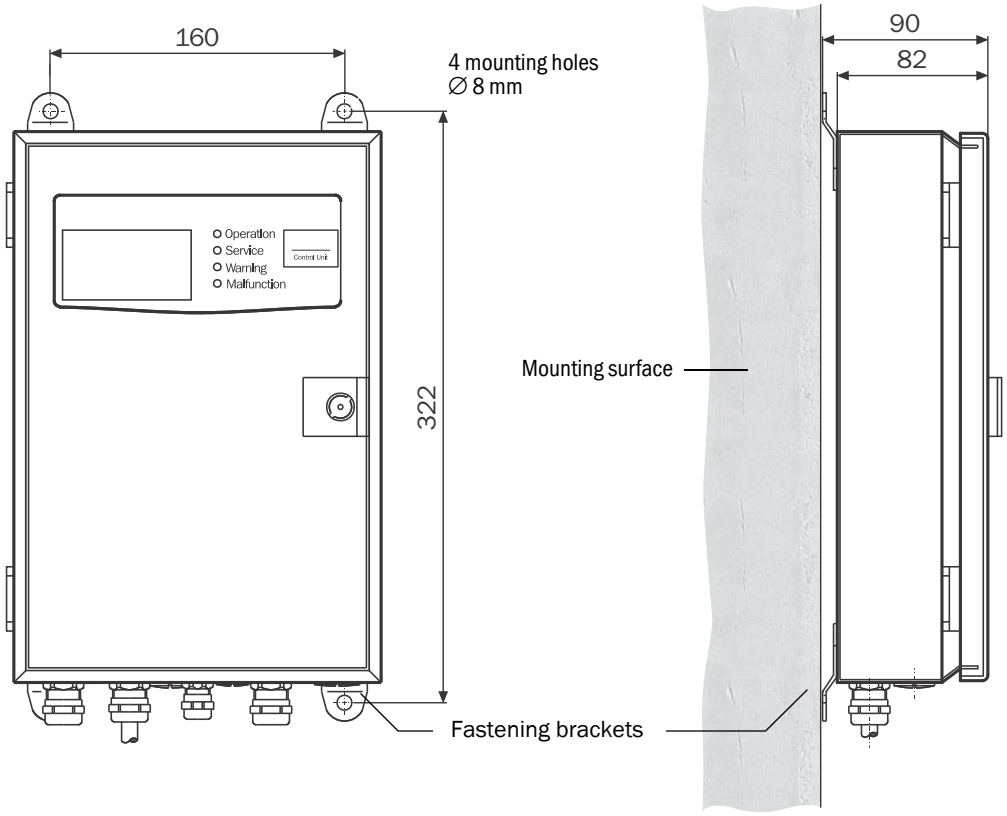


Fig. 16: Installing the evaluation unit (sheet metal enclosure version)

4.3.2 Installing the evaluation unit – cast enclosure version

1 Make ∅7.2 mm (for M8) mounting holes at the installation location according to the Drilling plan.

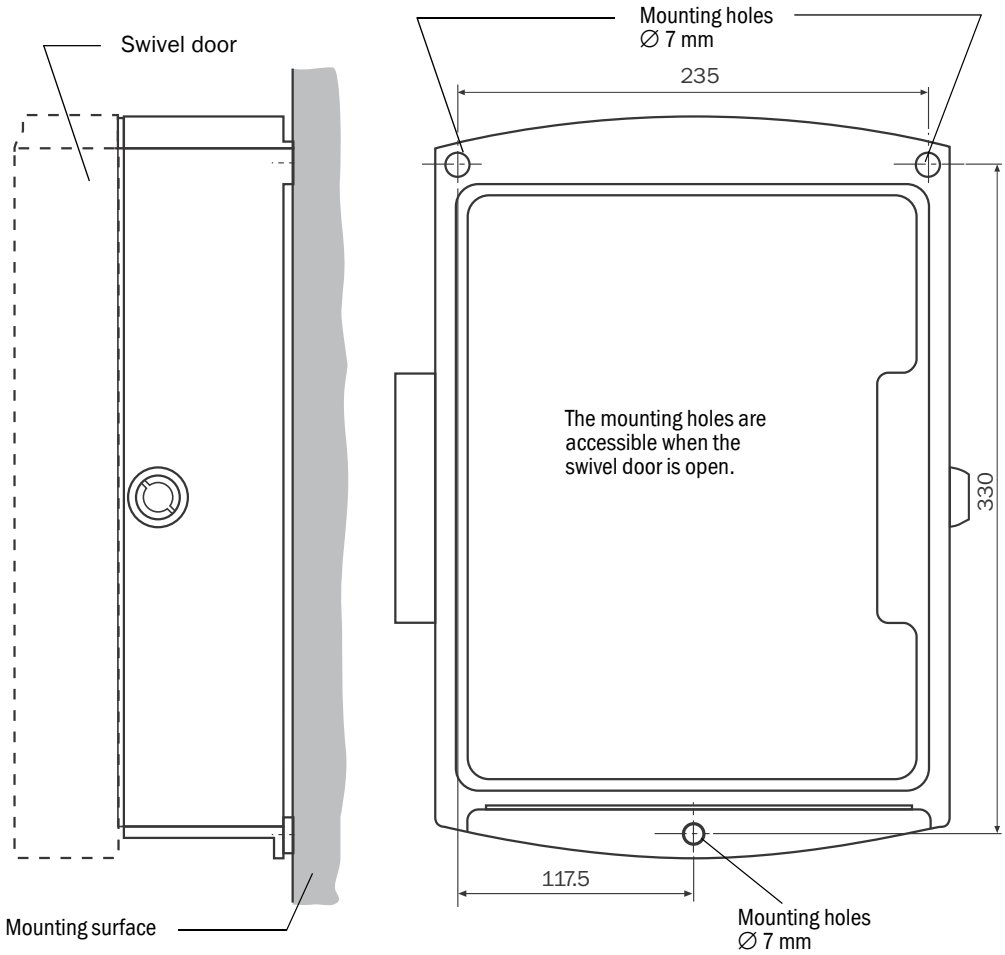


Fig. 17: Mounting holes layout (Drilling plan) to fit the EvU (cast enclosure)

2 Open the enclosure door with a control cabinet key and swivel open.
3 Attach the evaluation unit at the installation location using the 3 planned mounting holes with suitable screws (M8 x 20).

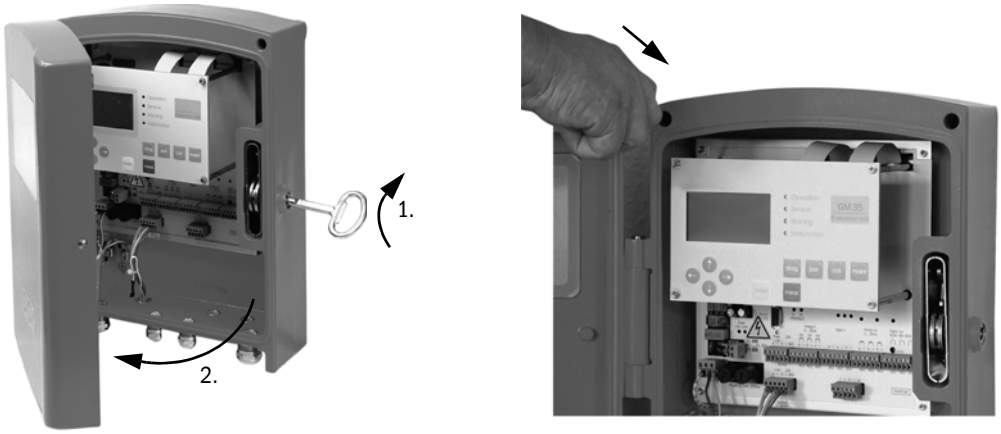


Fig. 18: Fitting the evaluation unit (cast enclosure)

4 Close and lock the door again.

4.4 Electrical connection of system components

Onsite preparation for electrical installation has been described in "Preparations for electrical installation", page 25. The cables laid as described there are now connected to the system components.

WARNING: Observe safety information as well as relevant safety regulations!
During all work on electrical equipment, disconnect such equipment from the mains, check that the equipment is potential free and make sure no third person can switch the equipment back on again without authorization.

4.4.1 Electrical connection for the purge air unit

The technical data of the standard purge air unit are contained in "Technical Data, Consumables and Spare Parts", page 113.

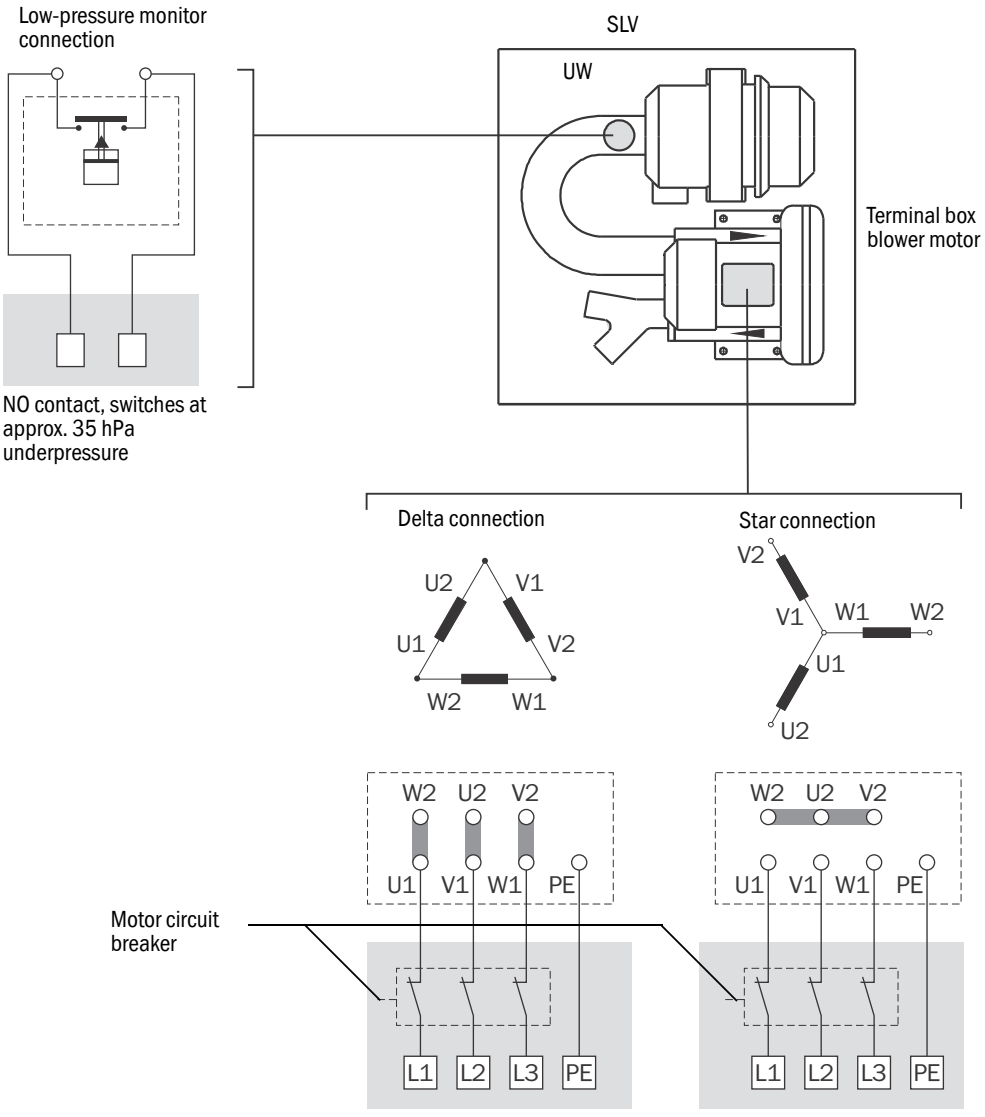


Fig. 19: Purge air unit: Electrical connections for blower motor and low-pressure monitor

1 Check the type plate to determine whether the connection values of the purge air unit delivered match the plant conditions.
2 Connect the power supply cable in the terminal box of the purge air unit as shown in “Purge air unit: Electrical connections for blower motor and low-pressure monitor“. Note that any differing connection diagrams supplied with the terminal box are valid.
3 Remove the seal at the end of the purge air hose (if present) to check whether the hose functions correctly.
4 Switch the power supply on.
5 Does the motor rotation direction match the following attributes?
– Arrow marking on the motor cover
– Arrows on the pump housing
– A strong airstream must flow out of the purge air hose.
6 If the rotation direction is wrong:
▶ Switch the power supply off.
▶ Switch two phased wires in the supply line in the terminal box (e.g. between U1 and V1).
▶ Switch the power supply back on.
▶ Make sure the rotation direction is now correct.

CAUTION: Possible damage when the purge air blower rotates in the wrong direction
Rotation in the wrong direction suctions sample gas out of the duct when the measuring system is installed. The following damage can incur when this is not prevented quickly:
▶ Contamination and overheating of the measuring system and the purge air unit
▶ Health risks for persons in the vicinity of the purge air unit (depending on sample gas composition and/or temperature)

7 Set the motor circuit breakers in accordance with the connected loads of the purge air blower and check for correct function.
8 Connect the low-pressure monitor for filter monitoring to the signal line prepared onsite.

Note The switching signal of the low-pressure monitor is evaluated by the customer.

▶ Check the low-pressure monitor function and the connected signal function:
Cover the suction opening partially for a short time when the purge air unit is running. Use wide cardboard strips or something similar that cannot be sucked in or contaminate the filter.
▶ Switch the purge air unit power supply off until measuring system start-up.

For installations outdoors or in unprotected conditions:

▶ Protect the opening of the purge air hose against moisture and contamination until the measuring system is put into operation; refit any dummy plugs removed beforehand.
▶ Fit the weatherproof cover.

4.4.2 CAN bus wiring options

As already described in the project planning on page 25, the following options are available for wiring the CAN bus connection between SR-unit and evaluation unit:

- Standard cable, 4 m, prefabricated
- Standard cable, 4 m, as well as additional prefabricated 15 m CAN bus extension cable
- Terminal box with prefabricated 4 m long cable to SR-unit; a cable provided by the customer is used to connect to the evaluation unit.

Information on selecting a suitable type of wiring can be found under “Options for CAN bus wiring”, page 19.

Wiring in terminal box

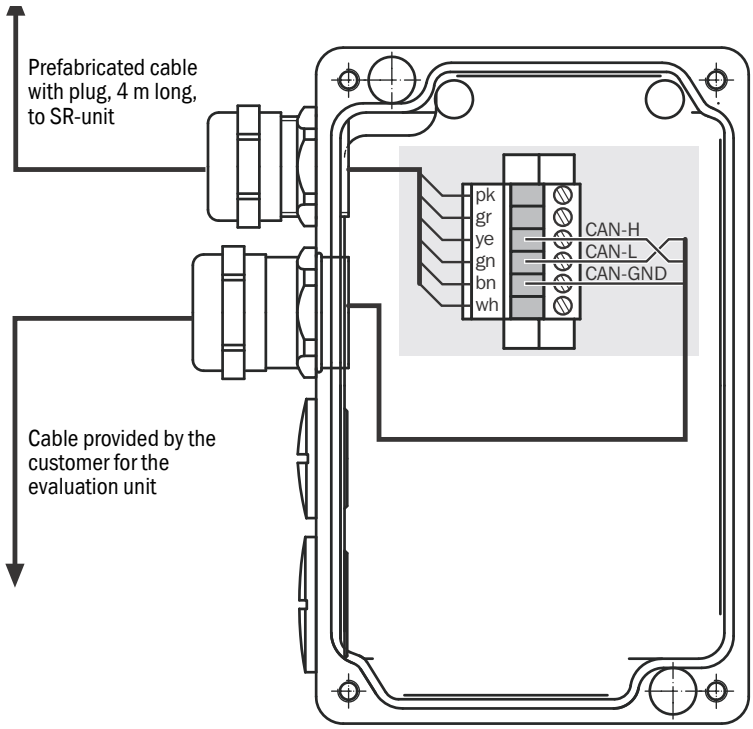


Fig. 20: Terminal box for CAN bus connection with a cable length between SR-unit and evaluation unit longer than 19 m

Wiring the connections in the terminal box

1 Lead the CAN bus cable provided by the customer through the free screw fitting of the terminal box.
2 Connect the shield on the screw fitting to the enclosure of the terminal box.
3 Connect the wires to the terminal strip as shown on page 37; make sure a twisted wire pair is used for CAN-H and CAN-L.

4.4.3 Electrical connection in the evaluation unit EvU

Laying cables to the evaluation unit and the cable specifications have already been described in "Preparations for electrical installation", page 25, in particular in "Cable routing diagram", page 28.

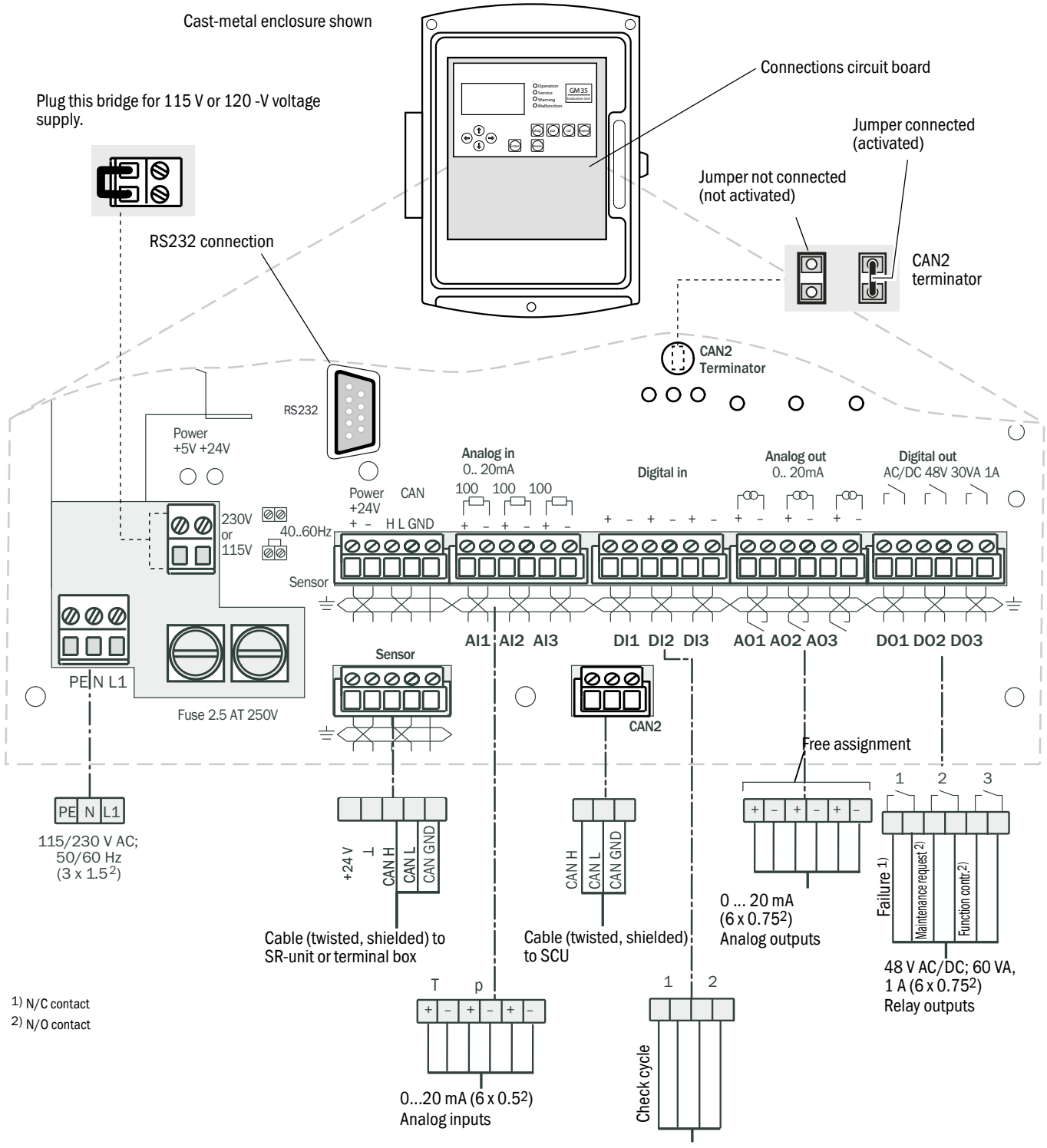


Fig. 21: Connections on the evaluation unit (cabling provided by the customer)

Make connections

1 Open enclosure door of evaluation unit.
2 Lead the signal cable for inputs and outputs through the PG screw fittings on the EvU enclosure floor and wire according to “Connections on the evaluation unit (cabling provided by the customer)”, page 38.

Observe connection values for power supply!
The evaluation unit is configured to 230 V AC on delivery.
- ▶ Plug the respective bridges for 115 resp. 120 V AC as shown on the connection plate of the evaluation unit.
- ▶ Make sure the power supply has been installed (“Electrical connection in the evaluation unit EvU“) in accordance with the specifications (observe national specifications) and that the power is switched off.

Fig. 22: EvU power connection

GM35 SR-unit or terminal box connection:

- ▶ If the customer supplied CAN cable is used, connect the wires to terminal strip “Sensor”, see page 38. Do not connect +24 V and GND (earth).

Connection to the SCU (System Control Unit):

- ▶ If the customer supplied CAN cable is used, connect the wires to terminal strip “CAN2”, see page 38.
- ▶ Activate the terminating resistor of the CAN bus when the EvU is connected to the start or end of the CAN bus, see page 38:
  - ▶ **Connect the jumper for the CAN2 terminator.**
- ▶ Deactivate the terminating resistor for the CAN bus when the EvU is not connected to the start or the end of the CAN bus, see page 38:
  - ▶ **No jumper may be connected to the CAN2 terminator.**

See steps 1 to 4 below.

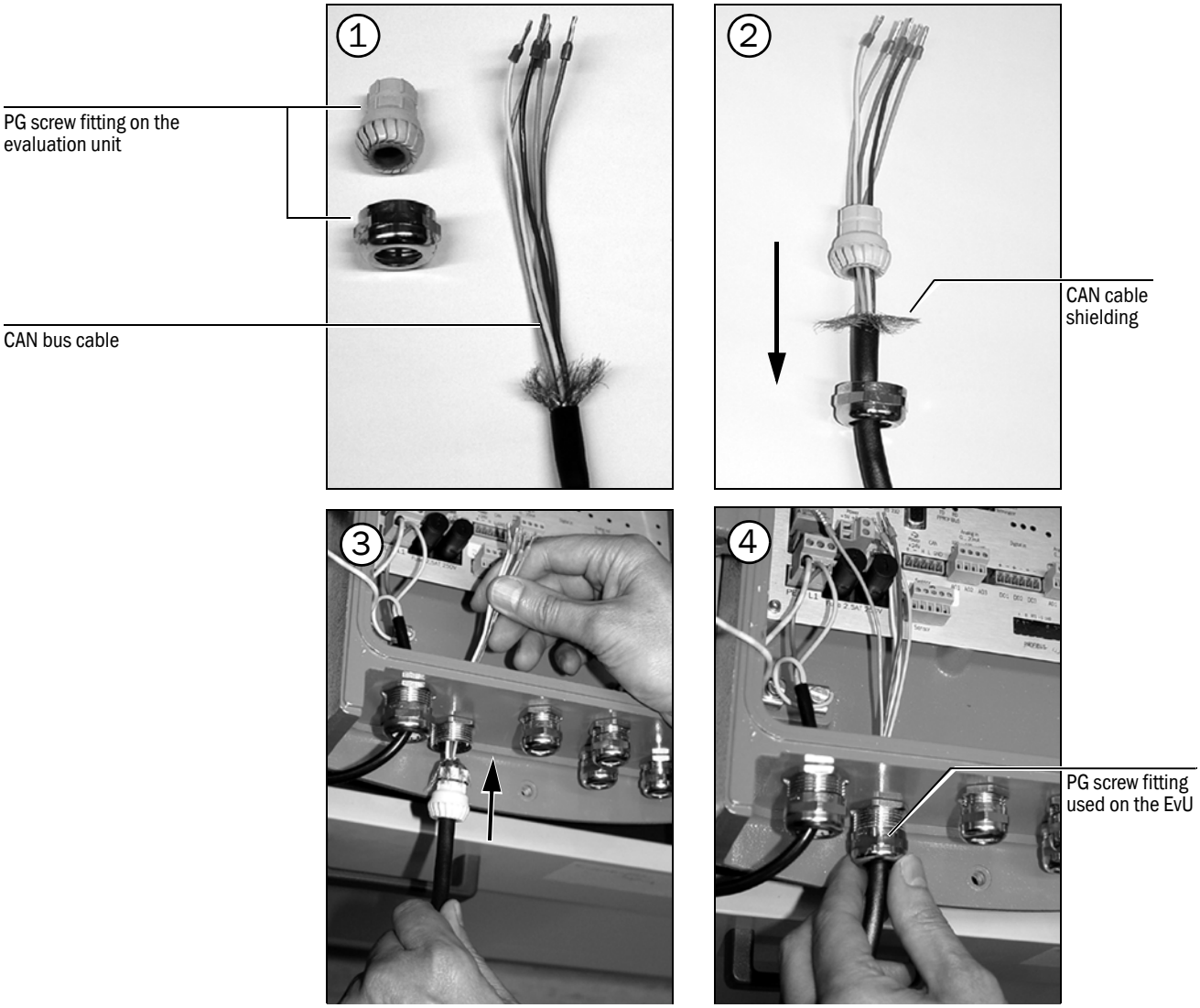


Fig. 23: Attaching the CAN bus cable to the evaluation unit

5 Handling the Evaluation Unit

5.1 User qualifications

This Section describes how to operate the GM35 measuring system with the evaluation unit (EvU). The evaluation unit is available with either a sheet metal enclosure (protection class IP 65) or a cast enclosure (protection class IP 67). The work described in this Section can be carried out by qualified customer operating personnel. Setting parameters does however demand comprehensive knowledge of the measuring system, measuring technology and specific measuring task.

5.2 Operating elements

The evaluation unit of the analysis system serves to display, enter and set parameters and control functions on the system. The operator panel with the display, status indicators and key pad is accessible when the enclosure door is opened.

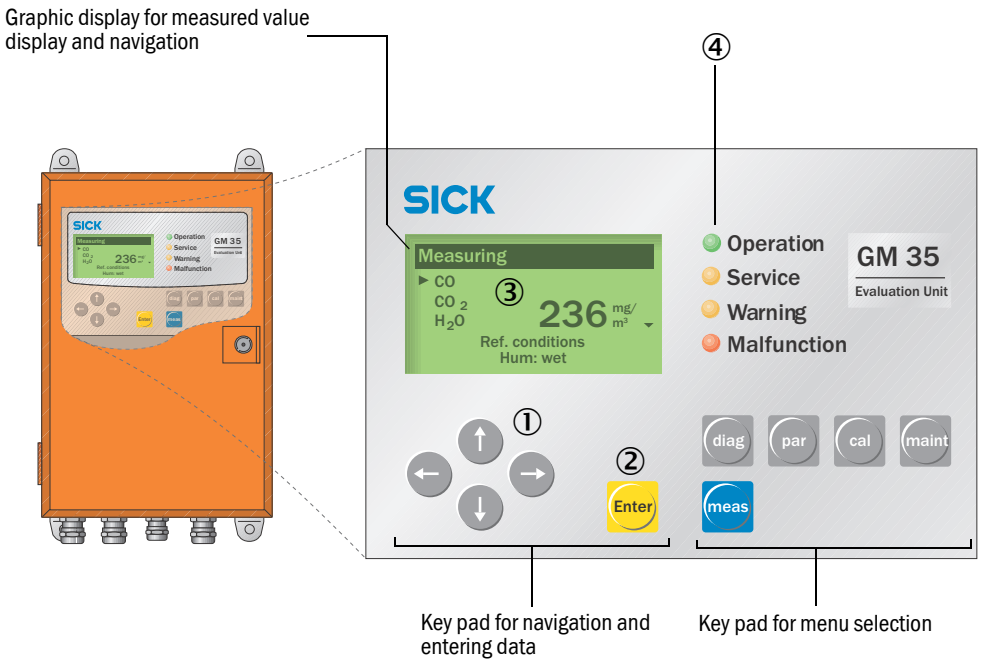


Fig. 24: Display and operating elements on the evaluation unit

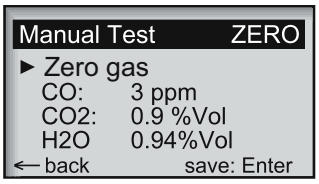
①	**Arrow buttons**	Navigate, select, scroll or edit menu items, variables, units or digits.
②	**Enter**	Executes the selected menu contents or commands.
③	**Display in Measuring mode**	Displays all current measured values (temperature values or CO concentration); Displays all calculated values, e.g. CO_2 dry.
④	**LEDs** • Operation • Service • Warning • Malfunction	Measuring Service mode Warning messages, see Diagnosis mode (diag) Device malfunction, error message, see Diagnosis mode (diag)

5.2.1 Function buttons and menu overview

meas	**Measuring**	
	• CO2875 ppm	Current measured value of the selected measured variable; the display shows the measured values of the current measured variables such as CO_2, H_2O, temperature and pressure when selected
	• Reference conditions	Shows the parameterized reference conditions (humidity, temperature and pressure)
diag	**Diagnosis**	
	• Malfunction	Current error messages (plain-text)
	• Warning	Current warning messages (plain-text)
	• Sensor Values	Displays diagnosis values
	• Check values	Displays check values of the measured component (CO or N_2O, CO_2, H_2O)
	• Optical alignment	Displays the optical alignment
par	**Parameters**	
	• Parametrization	Sets/displays system component parameters
	• Device	Displays the serial number (evaluation unit) and software version (system components)
	• Service	Displays calibration coefficients of the measuring components
cal	**Calibration**	
	• Check cycle	For test purposes, e.g., after maintenance work on the analyzer
	• Zero Adjust	Zero point determination, e,g,, for startup procedures
	• Box Measuring	Starts filter box measurement (control filter, test gas)
	• Manual Test	Manual test by feeding test gases
	• Press. sensor adjust.	Starts the adjustment procedure for the pressure sensor
	• Temp. sensor adjust.	Starts the adjustment procedure for the temperature sensor
maint	**Maintenance**	
	• Maintenance mode	Activates maintenance mode
	• Optical alignment	Optical alignment of the SR-unit and reflector
	• Tests	Tests analog and relay outputs
	• Reset System	System cold start
	• Reset Parameter	Resets parameters to the factory settings

Table 3: Function buttons and menu overview

5.2.2 Display contents



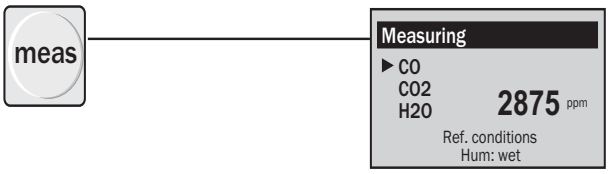
- The header line shows the selected operating mode (e.g. parameter settings) or the menu items just selected during navigation.
- Four lines for submenus, plain-text messages or settings (values)
- Function line:

← back:	To return to a higher level menu, use the **Arrow** ← button
save:	EnterTo activate menu items or confirm entries, use the **Enter** button
select:	To select a value, use the **Enter** button
↑ (↓)	When selecting a variable for which a number is to be entered, use the **Arrow** ↑ (↓) buttons to select the value for each digit
Password:	When prompted for the password, enter **1 2 3 4** with ↑ (↓).

5.2.3 Menu structure

5.2.3.1 *Menu structure Measuring Mode*

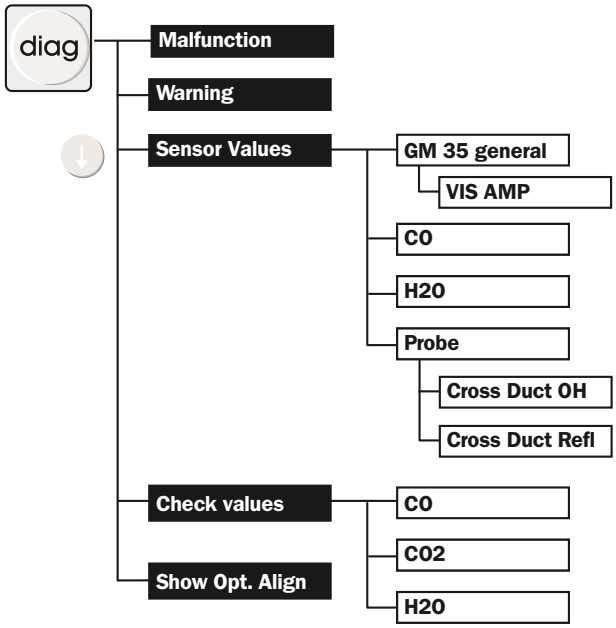
Fig. 25: Menu Operation



Measuring

5.2.3.2 *Menu structure Diagnosis*

Fig. 26: Menu Diagnosis



Diagnosis
Plain-text messages, see page 108.
Plain-text messages, see page 110.
Current monitoring values of the sensors (amplifier settings, internal temperature controls, etc.)

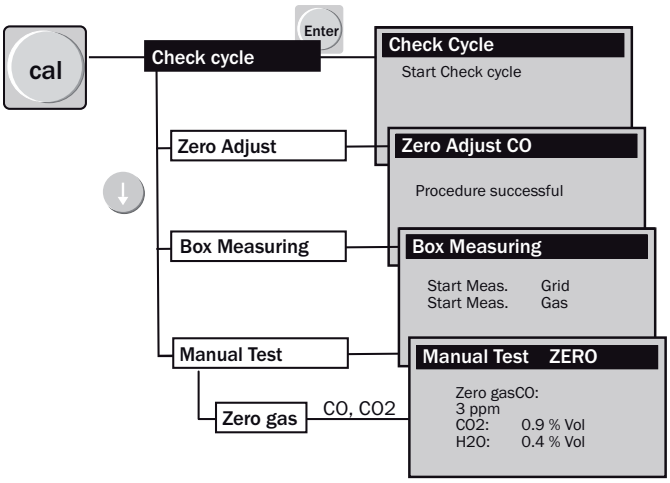
Cross-Duct version:
- Sender/receiver unit (OH)
- Reflector

Check values

Displays the optical alignment of the SR-unit and reflector in Measuring mode.

5.2.3.3 *Menu structure Calibration*

Fig. 27: Menu Calibration



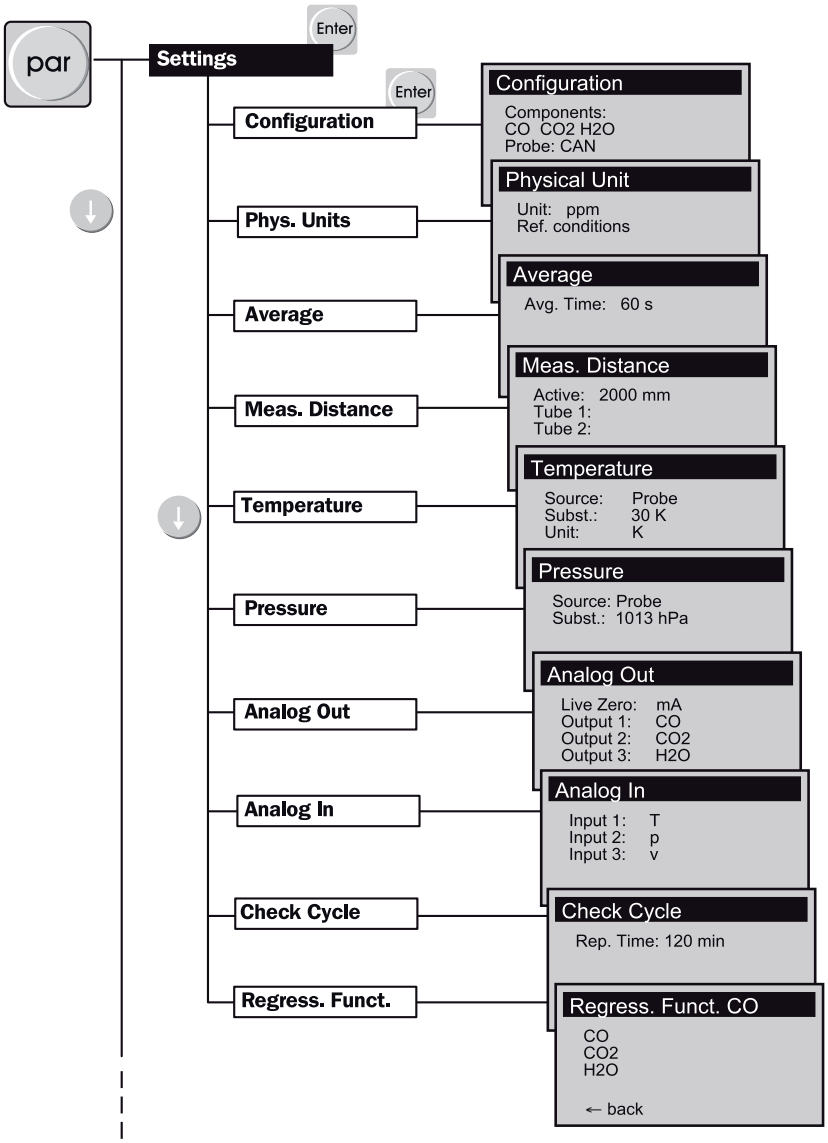
Calibration
Check cycle for test purposes, for example, after maintenance work

Zero adjust with ambient air, e.g., during start-up

Filter box measurement for
- control filter (H2O channel, CO2 for high concentrations).
– test gas (CO, N2O, up to 15 Vol% CO2).
Manual test (CO, N2O, CO2, H2O),
e.g. with zero gas
Adjustment of device-internal pressure and temperature measurement to reference measurements

5.2.3.4 *Menu structure Configuration*

Table 4: Menu Configuration/Settings



Parametrization

Configuration:

Measuring components:

- CO or N2O, CO2, H2O
- CAN connection (probe or cross-duct)

Physical Unit:

Unit and reference value settings for individual gases

Average:

Averaging time settings for the system

Meas.Distance:

Averaging time settings for the system

Temperature:

Temperature setting: Source (probe/replacement/AI1) and unit (K, °C, °F)

Pressure:

Pressure setting: Source (probe/replacement/AI2)

Analog Out:

Analog output settings: Live-zero, comp. (CO or N_2O, CO_2, H_2O, O_2, T, p - -) -display range, cycle output

Analog In:

Analog input settings: e.g., AI1 unit (K, °C, °F), live-zero (0, 2, 4 mA, read-in range)

Check Cycle:

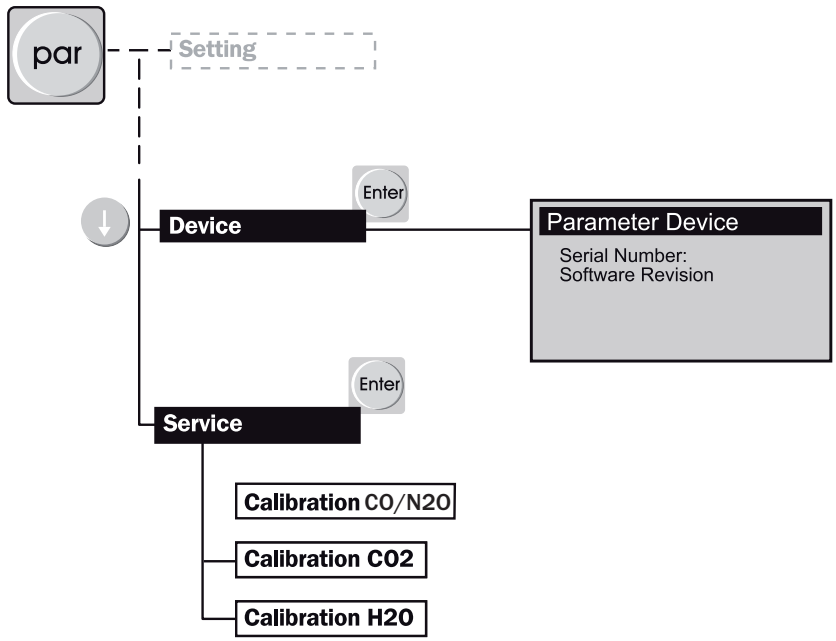
Check cycle interval setting: 0...1440 min

Regress. Funct. CO:

Regression function comp.: CO2/H2O

Span: 0.50...1.99,

Zero: 0...±9999.9



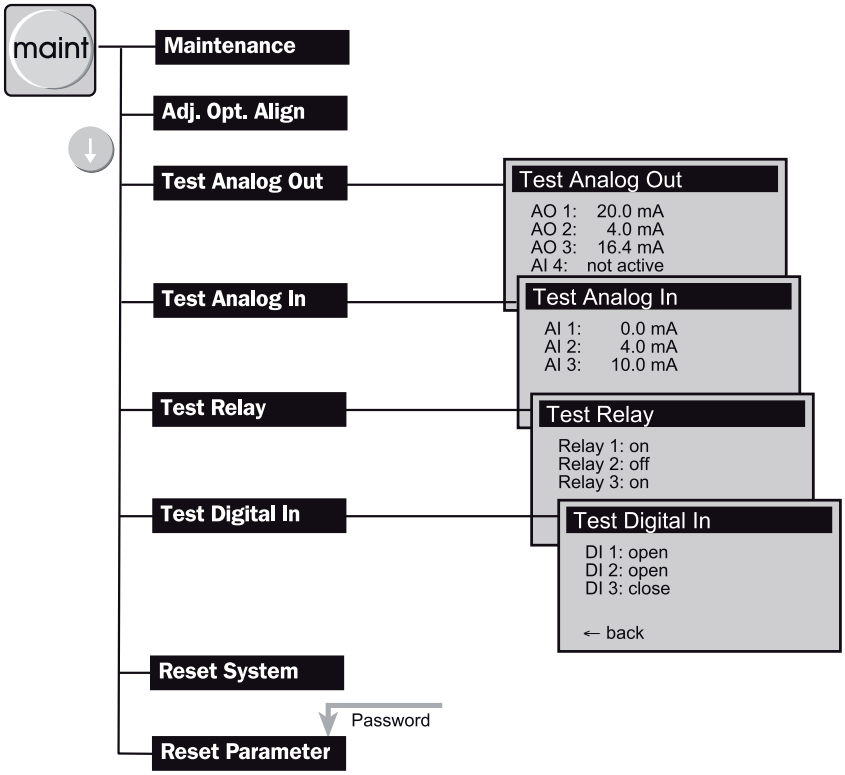
Configuration, continued:

Device:
Parameter Device: Retrieving the device information:
- Serial numbers
- Software version

Service area
- Calibration CO/N_2O
- Calibration CO_2
- Calibration H_2O

5.2.3.5 *Menu structure Maintenance Mode (Maint)*

Table 5: Menu Maintenance



Maintenance mode
Maintenance switch: On/off
Adj.Opt.Align:
- Function for optical alignment of the SR-unit and reflector

Test analog outputs

Test of analog inputs

Test of relay outputs

Test of digital inputs

System restart

Reset:
Default parameter settings active

6 Connecting the System Control Unit - SCU

As an option, the GM35 can be operated and configured via an SCU. The SCU is a control unit for comfortable, powerful analyzer control. The following actions can be performed on the GM35 via the SCU:

- Control, parameter setting and display.
- Processing and saving measured values.
- Remote diagnosis.

The SCU is connected to the GM35 evaluation unit via a system bus and is operated via a touchscreen or a PC with SOPAS software installed.

Further information on the SCU → “SCU” Operating Instructions.

6.1 SCU connection to the GM35

CAUTION: Higher malfunction susceptibility when used in unspecified ambient conditions

- ▶ Take all measures possible to protect equipment/module against dampness, liquids or contamination.
- ▶ Protect the equipment/module against mechanical or thermal stress.

6.1.1 Electrical connection of the SCU to the GM35

The electrical connection of the SCU to the GM35 is described in Section “Electrical connection in the evaluation unit EvU“ under “Connection to the SCU (System Control Unit):”, page 39.

6.1.2 Configuring and operating using SOPAS

Operator menus and measured value displays are also available on an external PC via Ethernet for user comfort (with the engineering tool SOPAS ET).

The ***S***ICK ***O***pen ***P***ortal for ***A***pplications and ***S***ystems (SOPAS) is a software for communication with analyzers and sensors.

Access to the GM35 is possible via:

- a direct serial connection (RS232) to the evaluation unit.
- an Ethernet connection via an SCU operating unit to the evaluation unit.

- PC with SOPAS ET software (Section page 49).

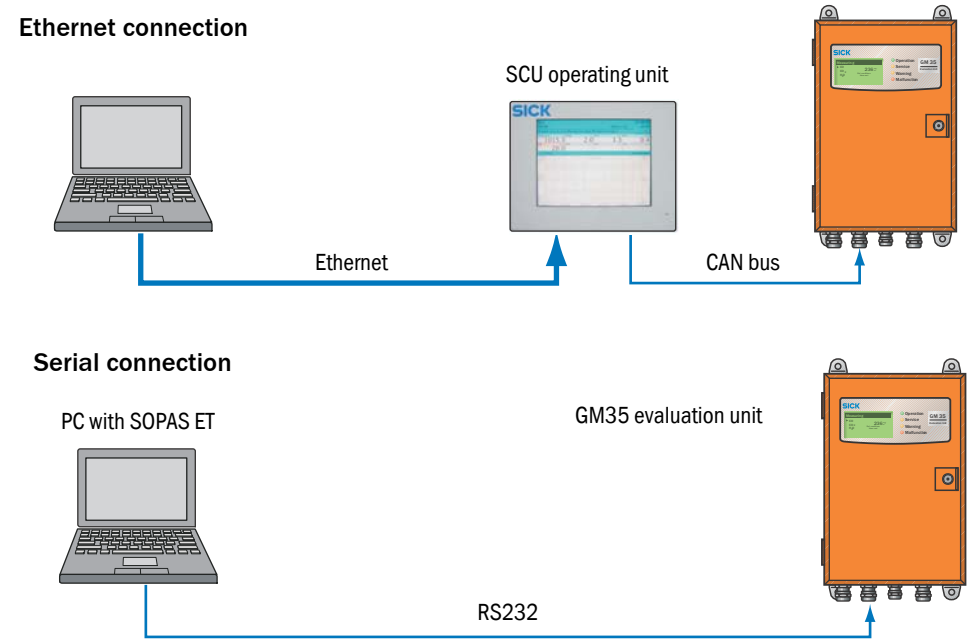


Fig. 28: GM35 connection options

The menu structure and presentation are principally identical on the SCU or on the PC with SOPAS ET. The presentation on the SCU is adapted to the smaller monitor.

For more information on the SOPAS concept, see the Help menu of SOPAS ET.

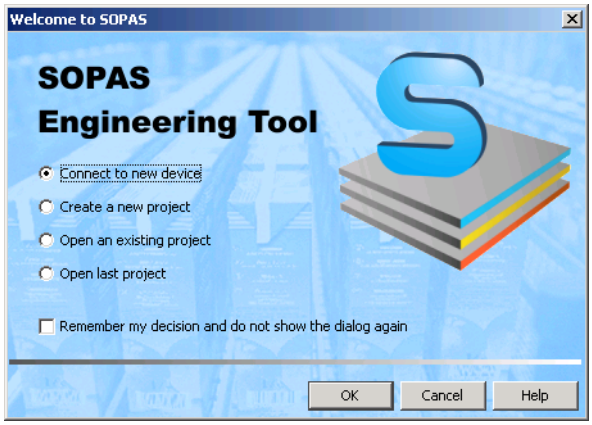
6.1.3 Connecting the GM35 evaluation unit via the SCU operating unit

The IP address of the SCU is required to connect to the SCU operating unit and then to the GM35. When necessary, contact the responsible Network administrator and request the required IP address.

Connection options

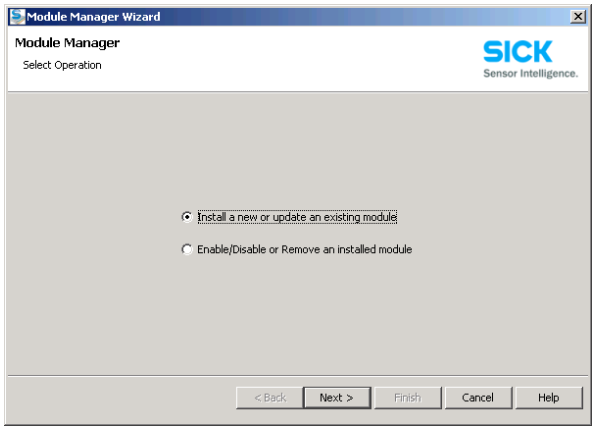
- First connection (initial installation): Install the device description file (SDD; jar), see “Connect to the SCU operating unit:”, page 49.
- Reconnect: Without a saved project, see “Perform a network scan:”, page 50.
- Reconnect: Open a saved project, see “Load the device parameters:”, page 50.

1. Start SOPAS ET.
2. Connect to the SCU operating unit:
   - ▶ Confirm the selection *“Connect to new device”* in the *“Welcome to SOPAS”* with **OK**. Follow the instructions of the Connection Wizard.



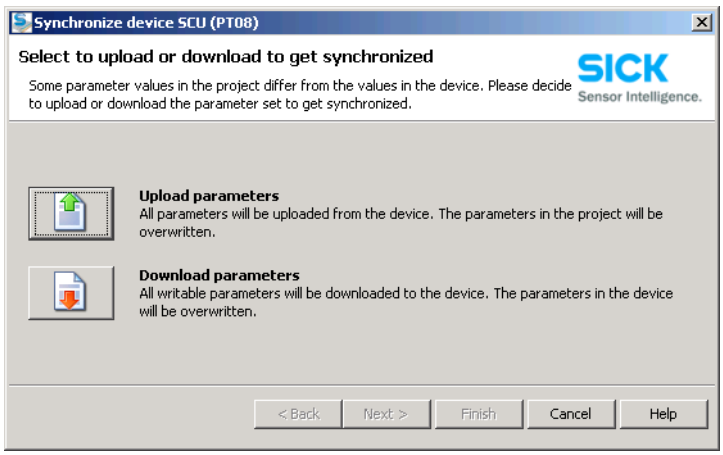
   - ▶ In the *Connection Wizard*, select **SCU** under *“Connect to specific device”* and continue with **Next**.
   - ▶ Under *“Detected devices”*, select the desired SCU with the appropriate IP address and continue with **Next**.

     The selected SCU is added to the project tree.
3. Install the GM35 device description file (SDD; jar) during the initial installation (no longer necessary afterwards):
   - ▶ Call up the **Module Manager** in the **Tools** menu. At the same time, save the project just generated before closing; acknowledge the message with YES.
   - ▶ In the Module Manager Wizard, select *“Install new module”* and continue with **Next**.

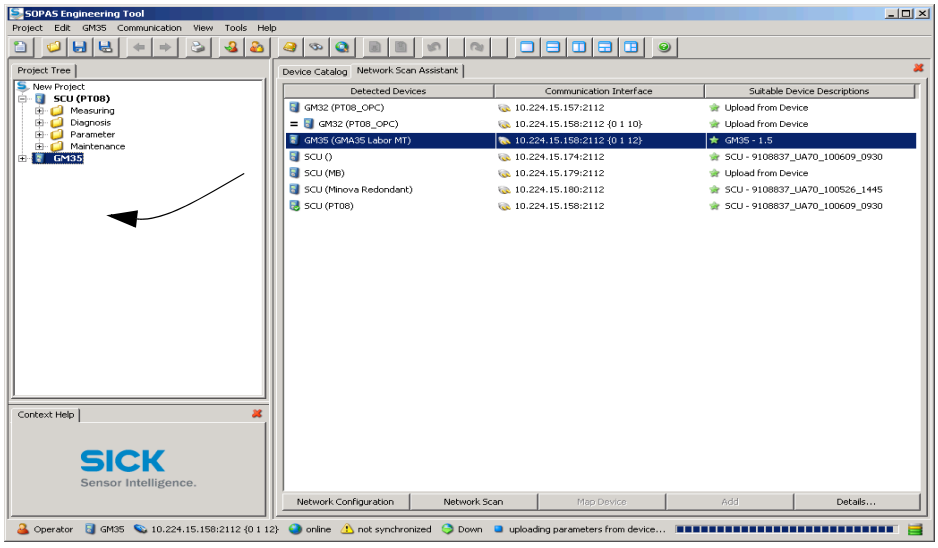


   - ▶ Load the GM35 device description file (e.g., from the device CD).

4. Load the device parameters:
   - ▶ Reopen the project previously saved.
   - ▶ Click the Upload parameters button in “Synchronize device SCU”



5. Perform a network scan:
   - ▶ Click the Network button in the Network Wizard window and then continue with **OK** as soon as the scan process has finished.
   - ▶ If the Network Wizard window is not displayed, call up the Network Wizard in the “View” menu or click the telescope symbol.
   - ▶ After the network scan, click the desired GM35 in the list shown (using the device name or IP address for identification) and then *“Insert”* it in the project tree. To do this, drag the GM35 symbol (e.g., GM35 - 1.5) of the device catalog in the menu tree. Double-clicking the desired device in the device catalog has the same effect.

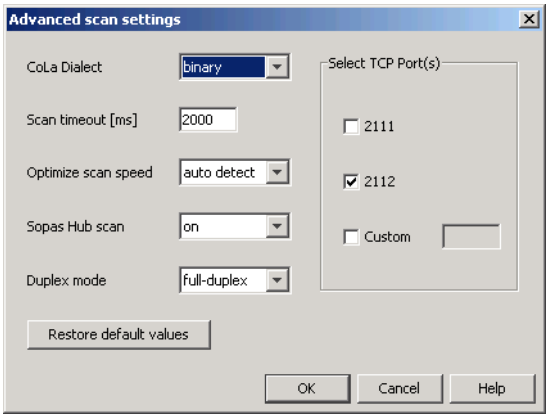


   - ▶ Project tree with connected SCU and GM35

If an error occurs, e.g.:

- *“No sensor found at address ... “*:
  - ▶ Switch the sensor on or check the connection, e.g. the Ethernet connection.
- Perform a network scan, see “Perform a network scan:”, page 50.

- Devices have been found; the connected GM35 is shown in the device list but is marked with a red warning symbol “not available”. The device description file has not been installed.
  - ▶ see “Load the device parameters:”, page 50.
  - ▶ Start a new project and then perform step “Perform a network scan:“.
  - ▶ If this is not successful, check the network configuration and set the following standard values.
  - ▶ To do this, click the “Network Configuration” button and then the “Advanced” button in the window that appears, and then enter the parameters as shown.



  - ▶ Perform a new network scan and follow the instructions from step “Perform a network scan:“.

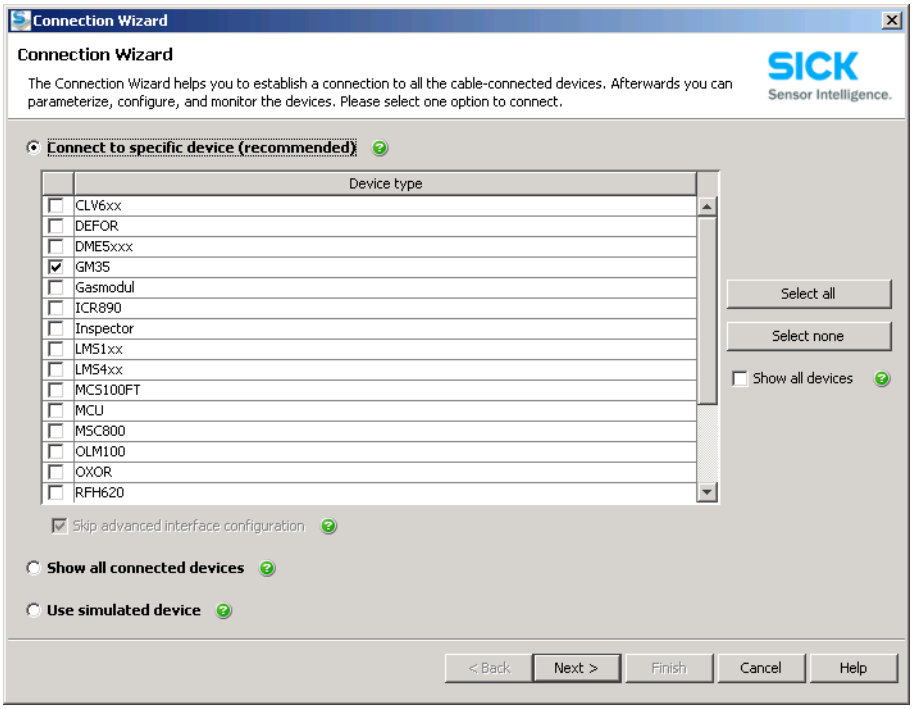
6.1.4 Direct serial connection to the GM35 evaluation unit

Use a serial interface cable (RS232) with a plug (Sub-D, 9-pole) and a socket to connect the GM35 evaluation unit to a PC/laptop.

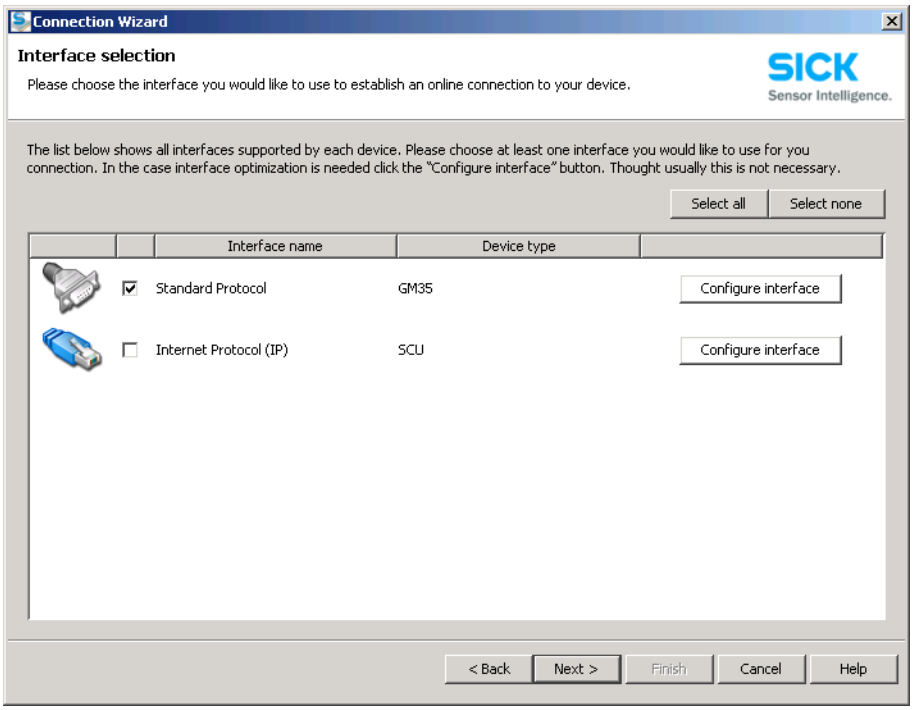
- ▶ Connecting the PC with SOPAS ET directly to the GM35 evaluation unit via a serial interface cable:
  - ▶ Connect the interface cable to the Sub-D socket of the EvU (“Connections on the evaluation unit (cabling provided by the customer)”, page 38) and to the Sub-D plug of the PC.
- ▶ Use the connection options according to “Connecting the GM35 evaluation unit via the SCU operating unit”, page 49 onwards:

1. Start SOPAS
2. Connect to the device
   - ▶ Confirm the selection *“Connect to new device”* in the *“Welcome to SOPAS”* with **OK**. Follow the instructions of the Connection Wizard.

- In the *Connection Wizard*, select **GM35** under *"Connect to specific device"* and continue with **Next**

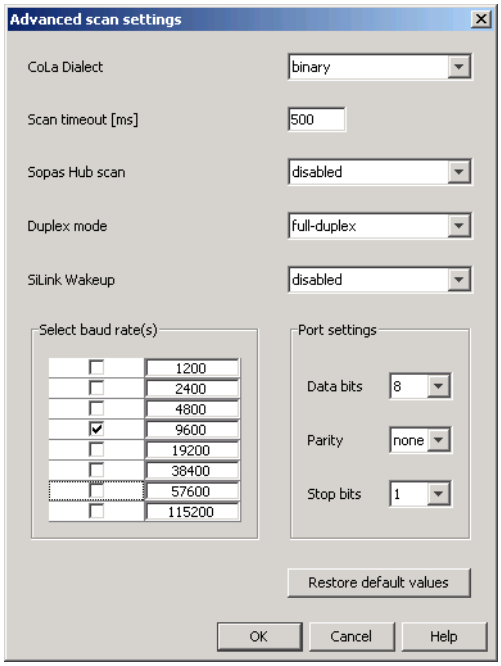


- Select the GM35 under *"Devices found"* and continue with **Next**.
- Select "Standard Protocol" under interface selection.



- Check the protocol settings and adapt when necessary:

– Click on “Configure interface” and check the following settings, and adapt when necessary.



– Continue with “OK”.

▶ Continue the Connection Wizard with **Next**

The selected GM35 is added to the project tree.

If an error occurs, see page 50.

6.1.5 Changing the user level

1. Menu: */Tools/Login*
2. In *UserLevel* dialog window: Click *Authorized Client*.

Fig. 29: User level

3. Enter password:

User level	Password
Authorized Client	HIDE[1]
Service	GM35SERVICE*)

[1] Upper case mandatory

4. “*Login*”

The current user level in SOPAS ET is shown in the bottom left corner.

6.1.6 Menu overview (menu tree)

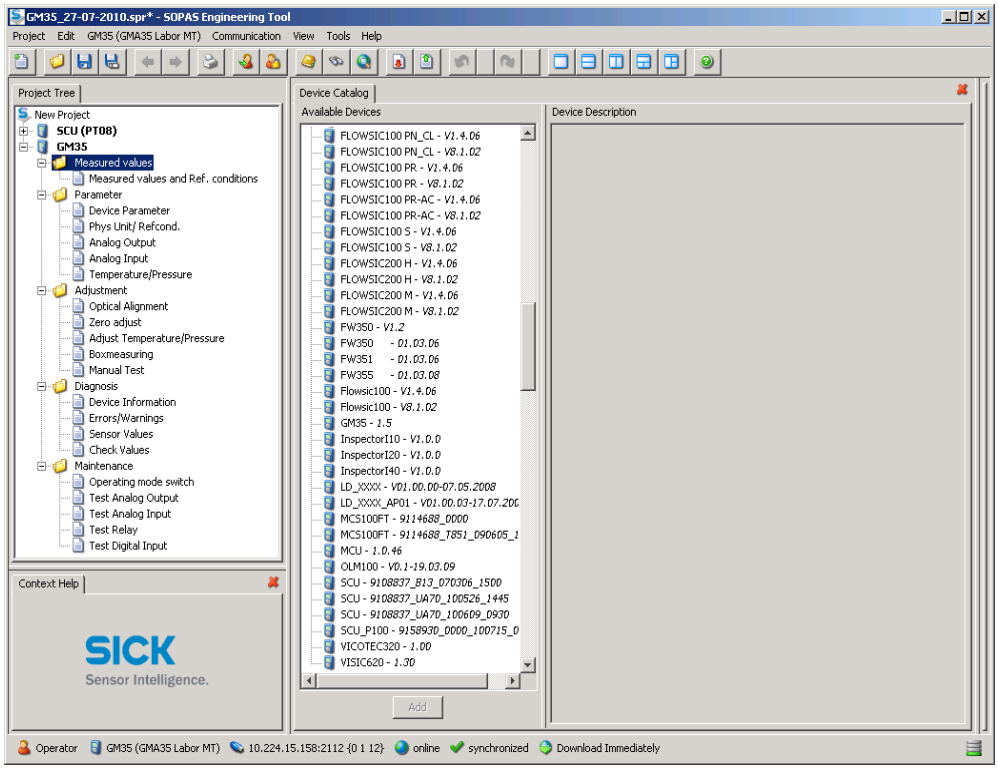


Fig. 30: GM35 menu tree

6.1.7 Measured values

Menu GM35/Measured values

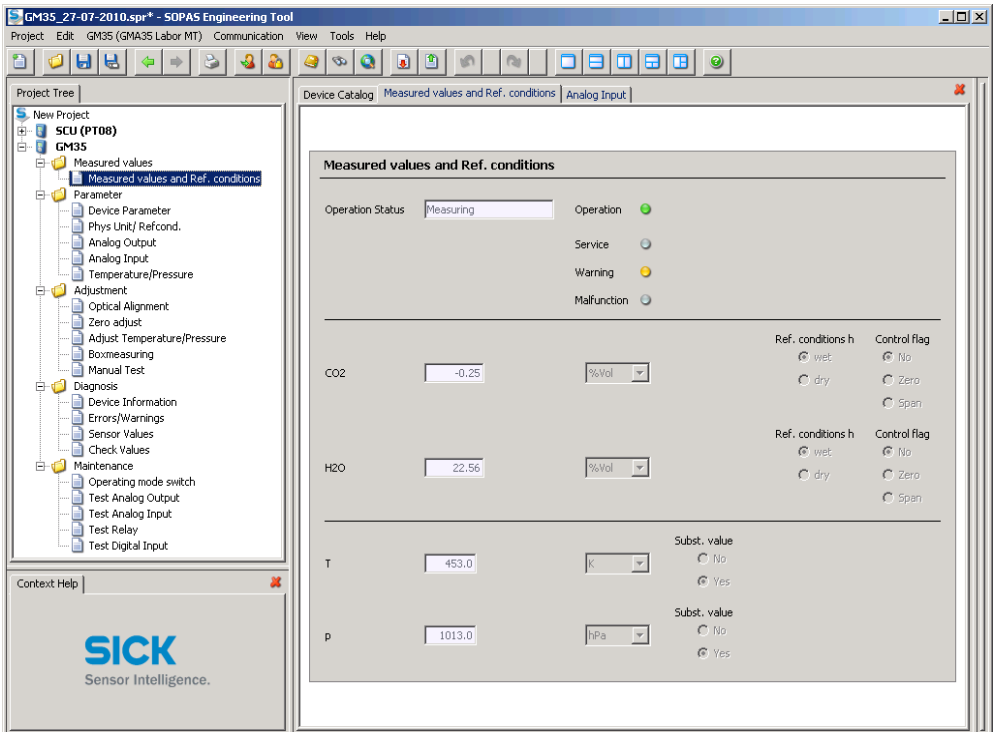


Fig. 31: Menu: Measured values and Ref. conditions

This menu shows:

- Measuring operation of the analyzer
- Current measured values and reference conditions

6.1.8 Menu Parameter

Menu GM35/Parameter/Device Parameter

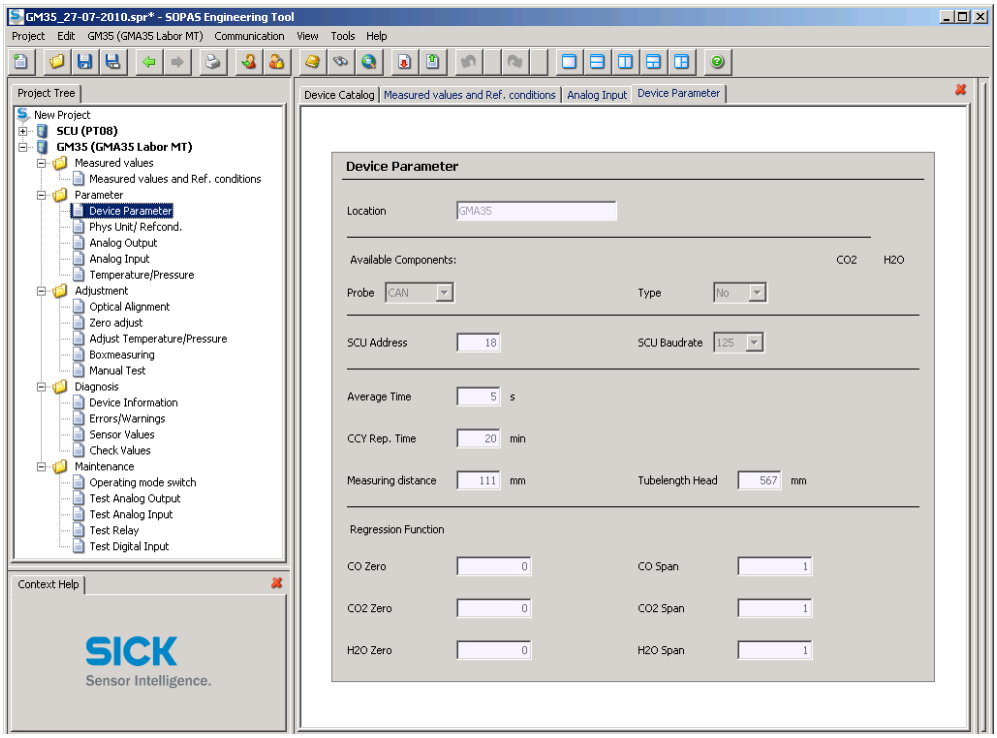


Fig. 32: Menu: Device Parameter

This menu serves to make the following settings:

- Available measuring components (CO, CO_2, H_2O)
- Connected device components (CAN connection: Probe, type or cross-duct)
- Network connection (SCU/GM35 address, baud rate)
- Average time
- Control cycle interval (CCY Rep. Time)
- Active measuring path (Measuring distance)
- Regression function of the measuring components (zero point, span point)

Physical units and reference values (Menu GM35/Parameter/Phys. Unit/Refcond.)

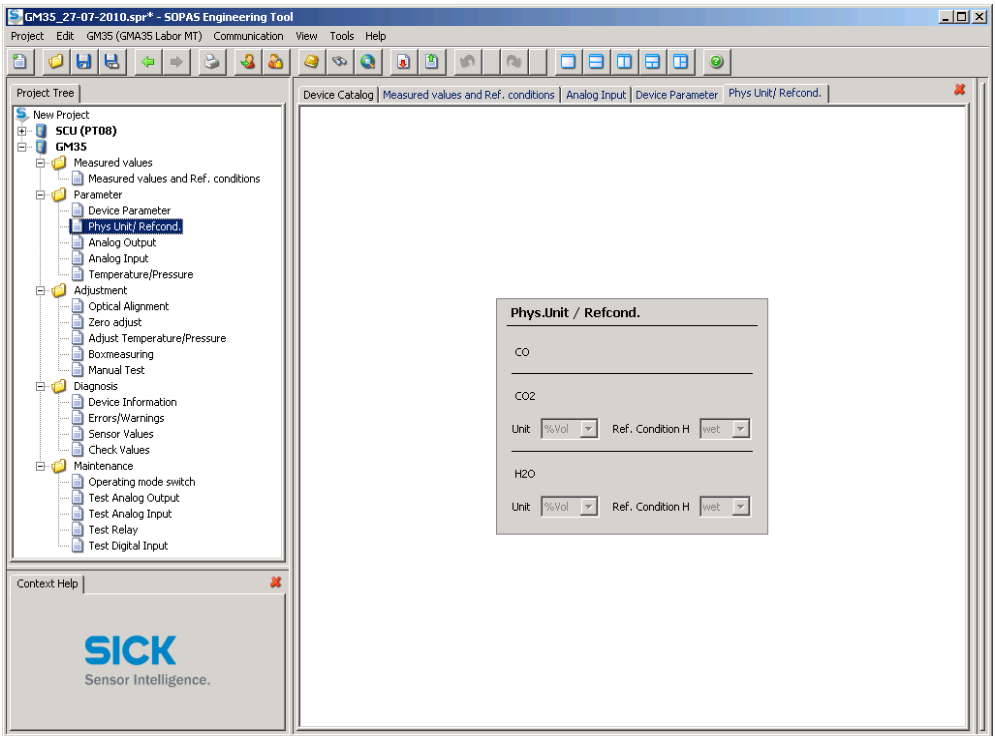


Fig. 33: Menu: Phys. Units and Ref cond.

This menu serves to make the following settings:

- Physical units (**mg/m**^{3}, % by vol., ppm)
- Reference values (temperature, pressure)

Analog outputs (Menu GM35/Parameter/Analog Output)

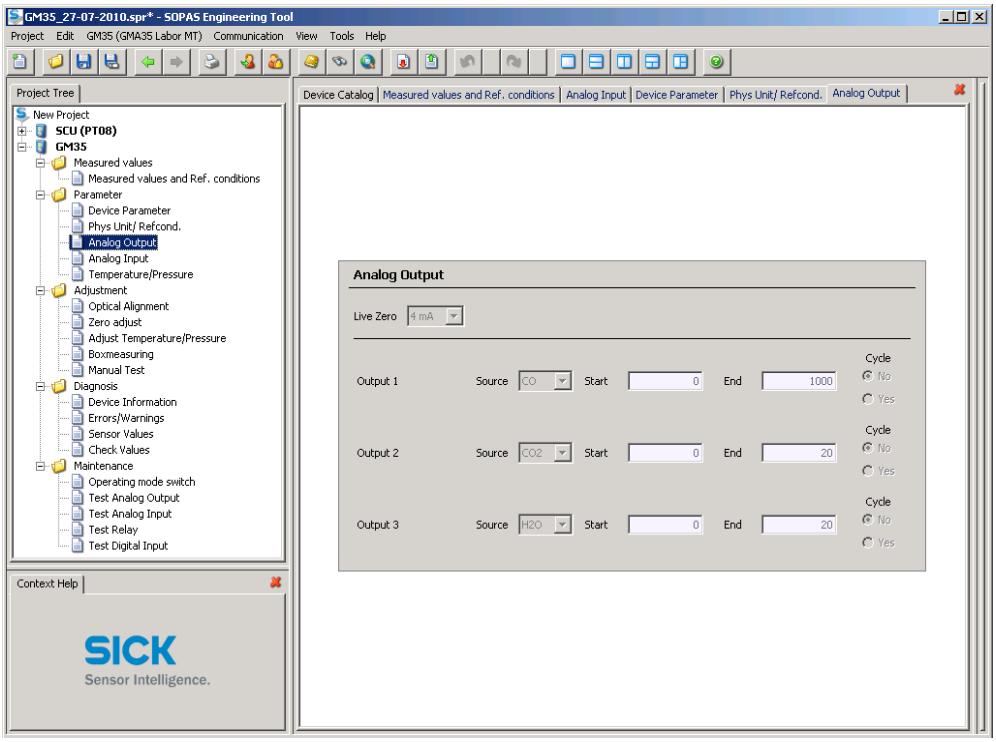


Fig. 34: Menu: Analog Output

This menu serves to set the following for 3 analog outputs:

- Live Zero (0, **4** mA)
- Allocation of the outputs to a parameter (**CO** or N_2O, **CO_2**, **H_2O**, T, p) with start and end values for the display range as well as setting the check cycle (yes, no).

Analog inputs (Menu GM35/Parameter/Analog Input)

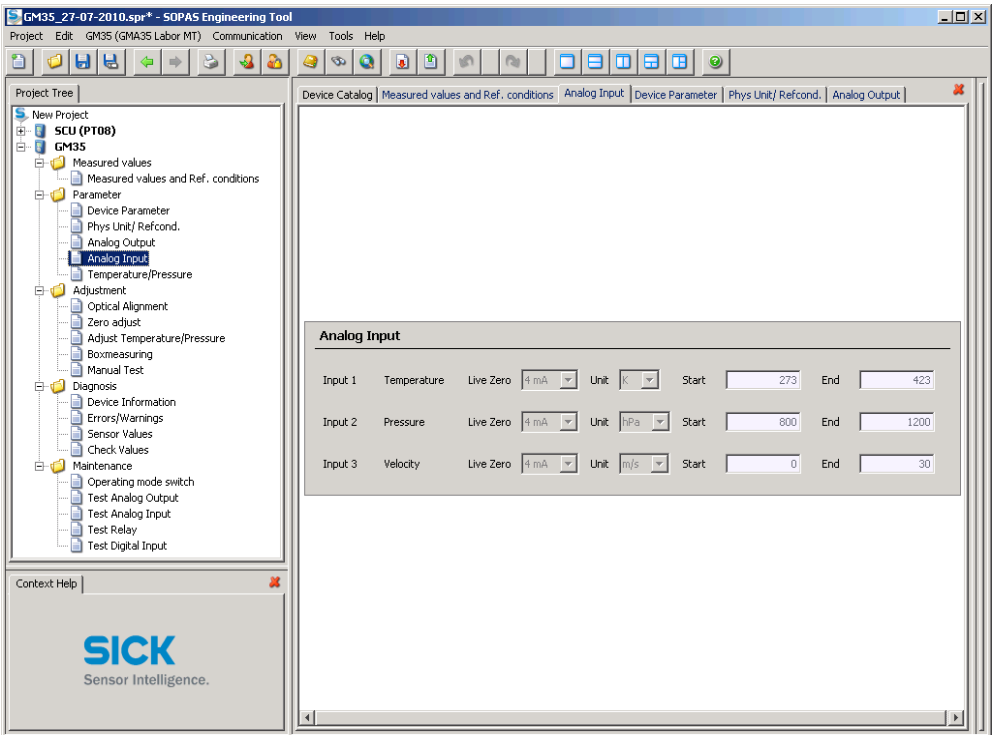


Fig. 35: Menu: Analog Input

This menu serves to set the following for 3 analog inputs:

- Analog input 1: Temperature: Live Zero (0, 2, **4** mA), unit assignment (**K**, °C, °F), start and end values for the read-in range.
- Analog input 2: Pressure: Live Zero (0, 2, **4** mA), unit assignment (hPa), start and end values for the read-in range.
- Analog input 3: Unused.

Temperature/pressure (Menu GM35/Parameter/Temperature/Pressure)

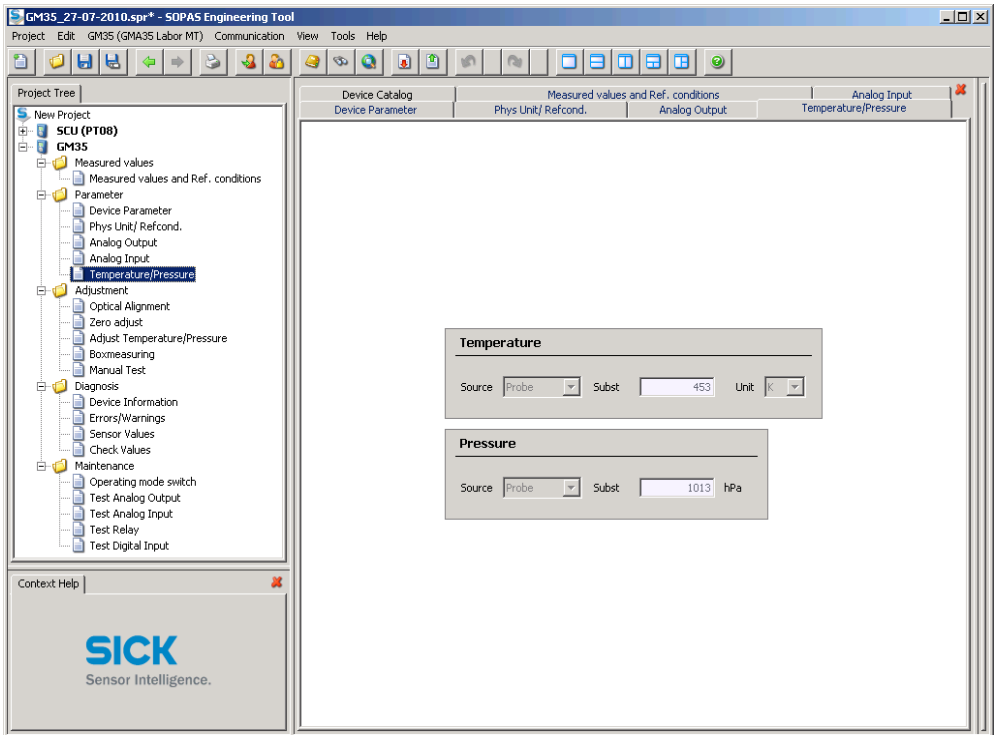


Fig. 36: Menu: Temperature/Pressure

This menu serves to set the reference values for temperature and pressure:

- Temperature: Source (**Probe**, Analog In, Subst.(default value)) and unit.
- Pressure: Live Zero source (**Probe**, Analog In, Subst.(default value)).

6.1.9 Menu Adjustment

Menu GM35/Adjustment/Optical Alignment

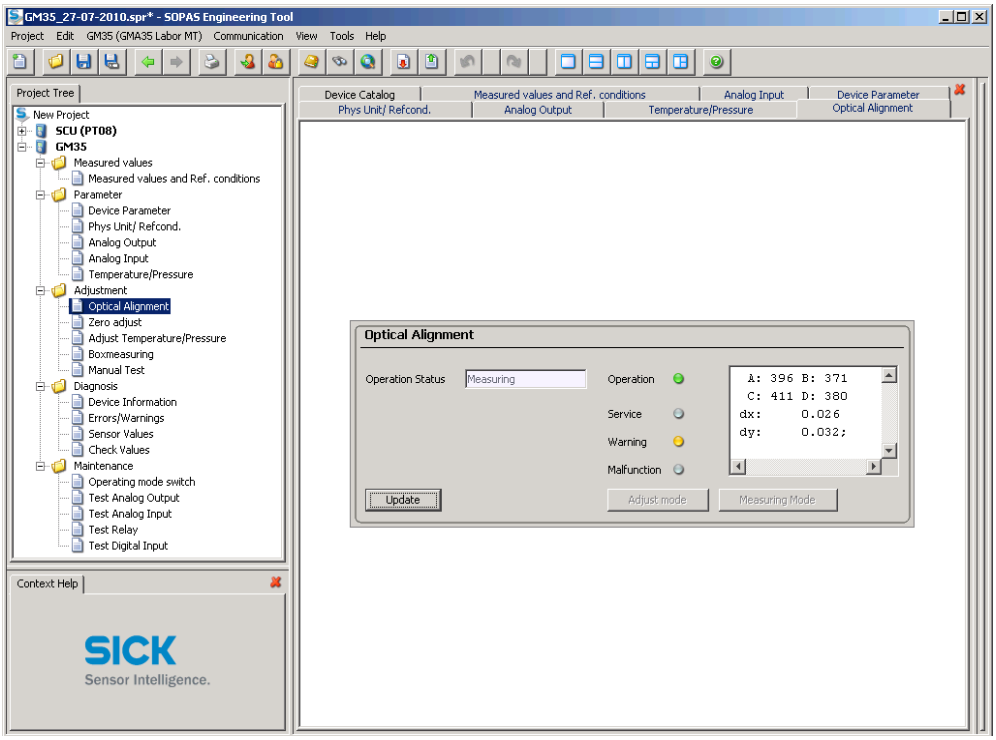


Fig. 37: Menu: Optical Alignment

This menu serves to check the GM35 optical alignment:

- **Update**: Displays the current alignment.
- **Adjust mode**: Moves the mirror to the reference position on devices with mirror tracking.
- **Measuring Mode**: Switches to Measuring mode, e.g. after using Adjust mode. Mirror tracking is active again and therefore current measured values are displayed.

Menu GM35/Adjustment/Zero adjust

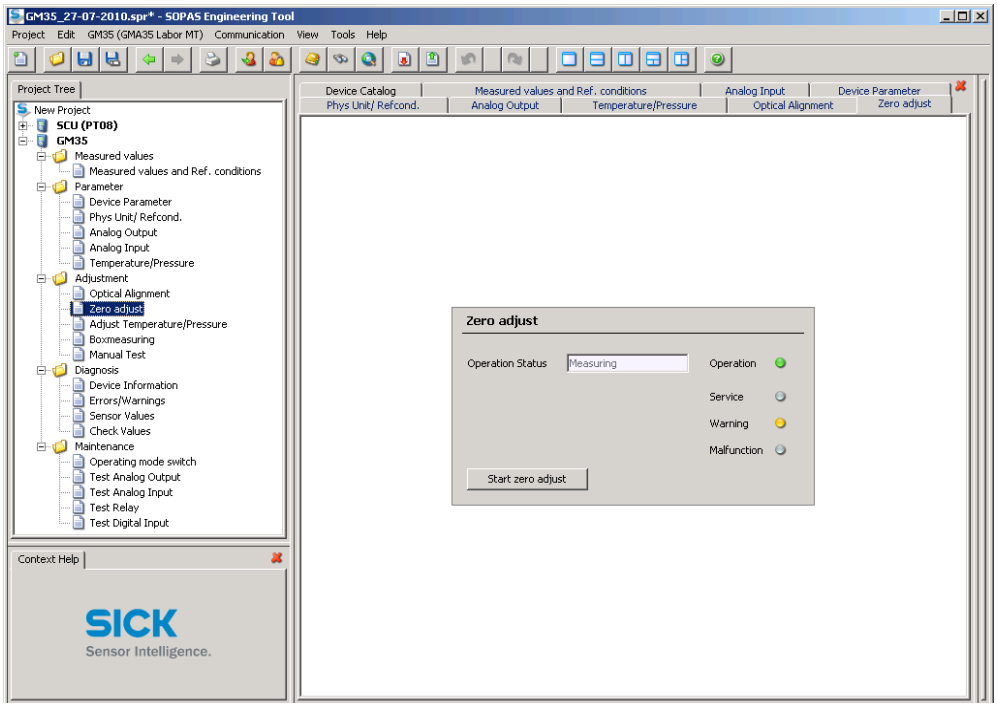


Fig. 38: Menu: Zero adjust

This menu serves to perform a zero adjust with ambient air, for example during start-up.

Menu GM35/Adjustment/Adjust Temperature/Pressure

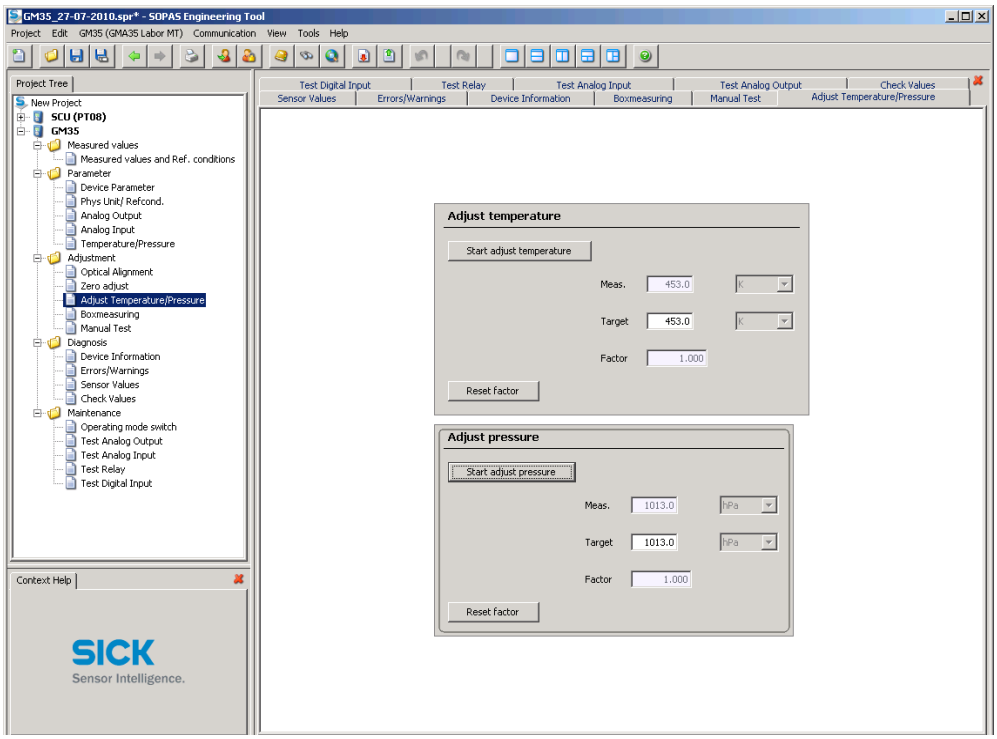


Fig. 39: Menu: Adjust Temperature/Pressure

This menu serves to recalibrate the system's own pressure and temperature sensors.

Menu GM35/Adjustment/Boxmeasuring

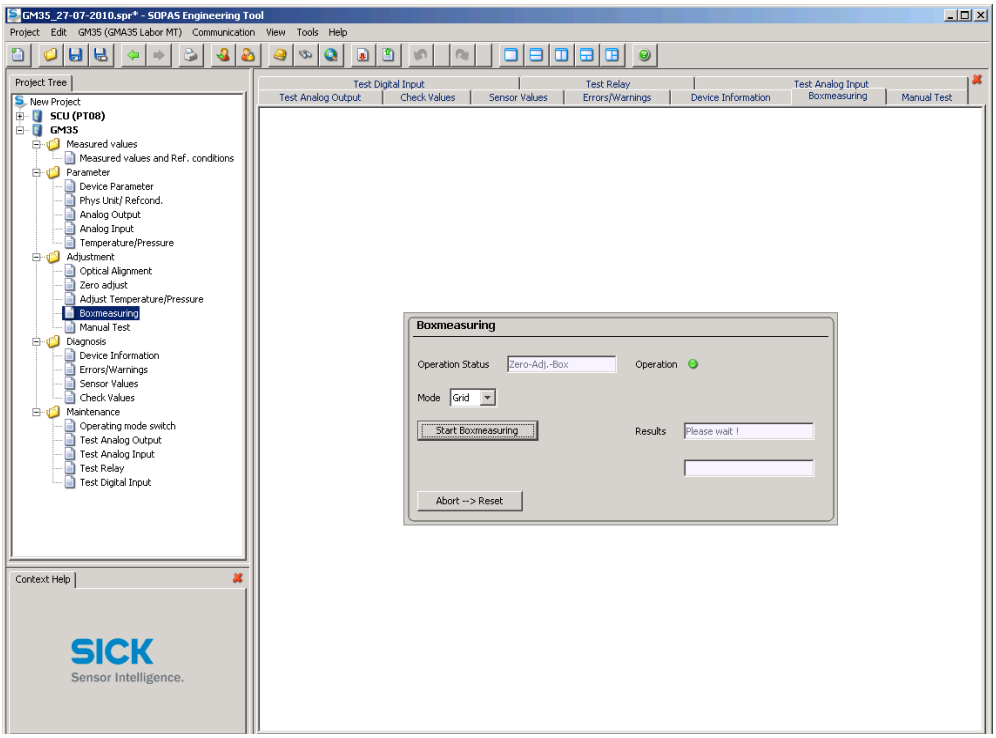


Fig. 40: Menu: Boxmeasuring

This menu serves to perform filter box measurement:

- **Mode**: Selection of measuring method.
- Control filter (Grid) for H_2O and CO_2 for high concentrations.
- **Start Boxmeasuring**: Starts filter box measurement.
- **Abort –> Reset**: Stops filter box measurement and discards the results.

Menu GM35/Adjustment/Manual Test

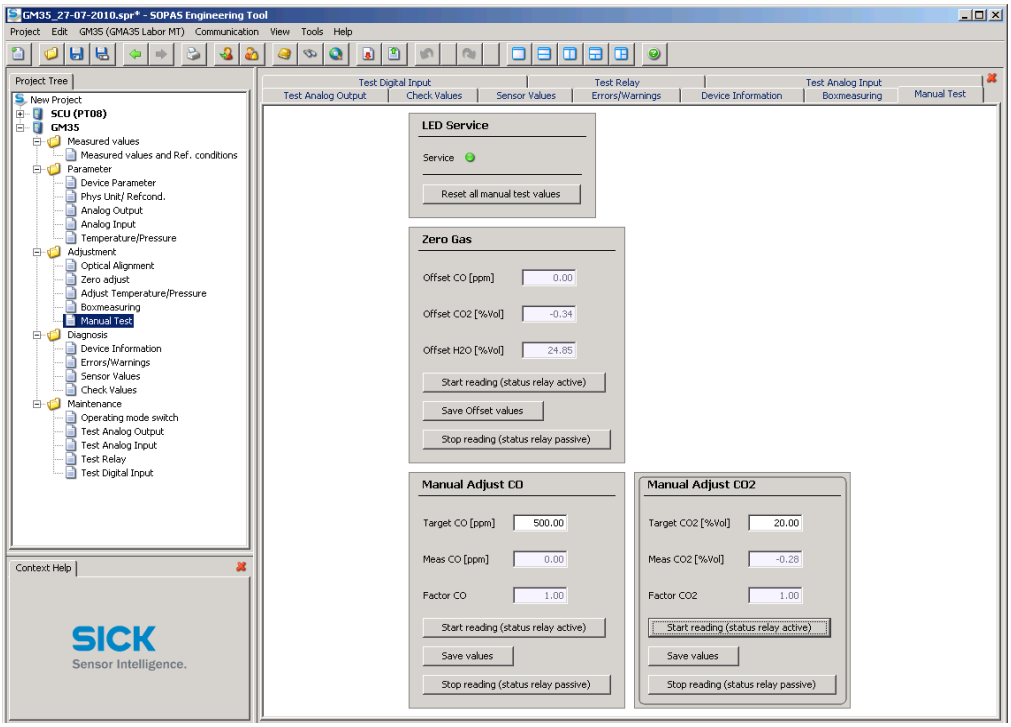


Fig. 41: Menu: Manual Test

This menu serves to perform a manual test of the measuring components, e.g., with zero gas:

- Zero Gas
- Manual Adjust CO, N_2O
- Manual Adjust CO_2

6.1.10 Menu Diagnosis

Menu GM35/Diagnosis/Device Information

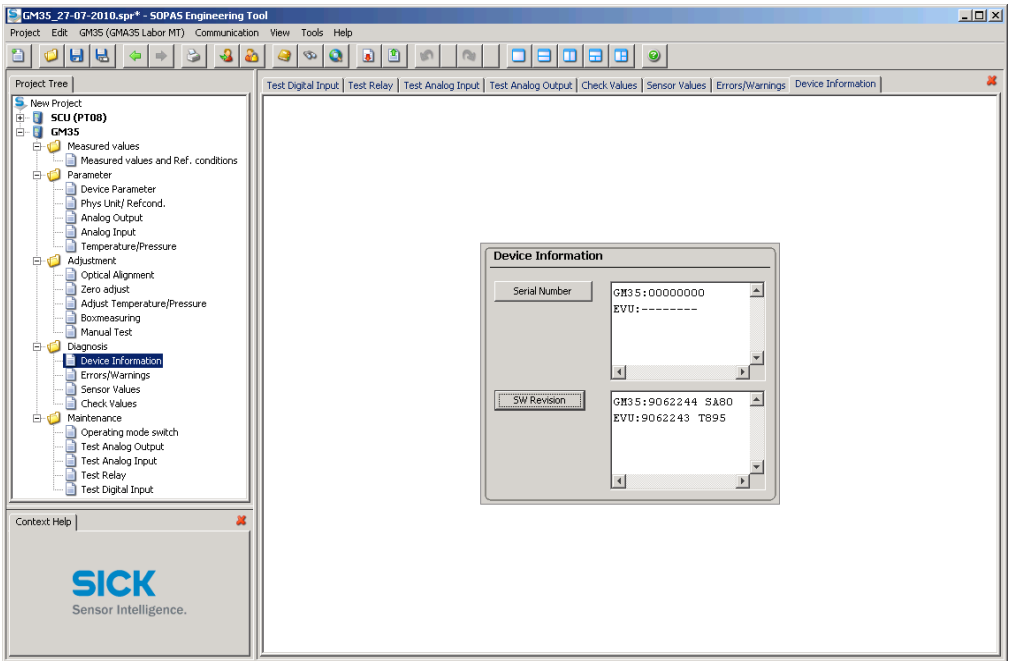


Fig. 42: Menu: Device Information

This menu serves to read out device information:

- Serial No.
- Software revision (SW Revision)

Menu GM35/Diagnosis/Errors/Warnings

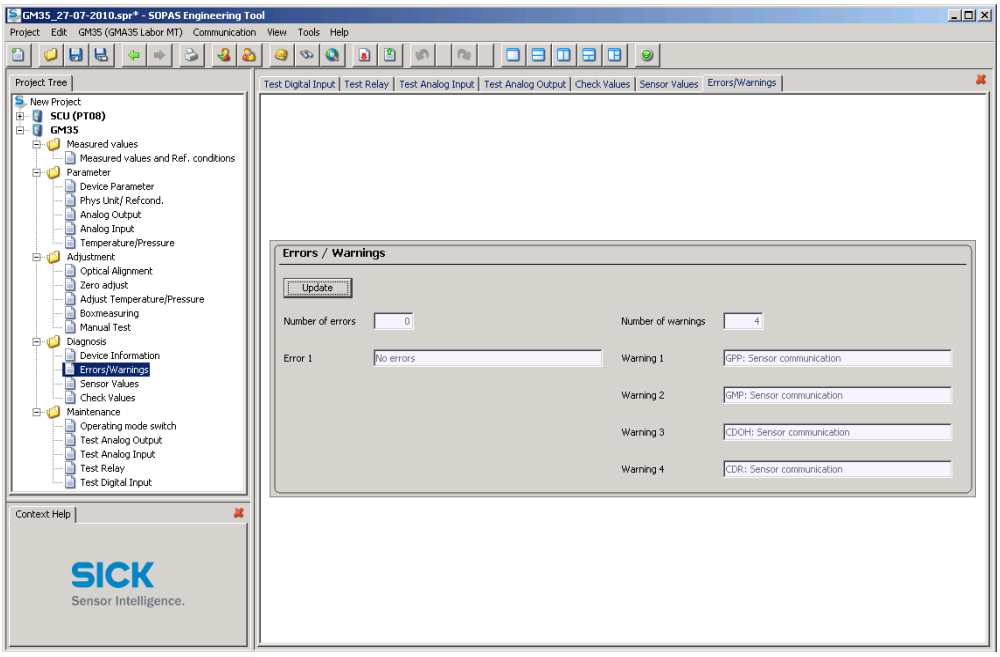


Fig. 43: Menu: Errors/Warnings

This menu displays the error messages and warnings as soon as **Update** is clicked.

Menu GM35/Diagnosis/Sensor Values

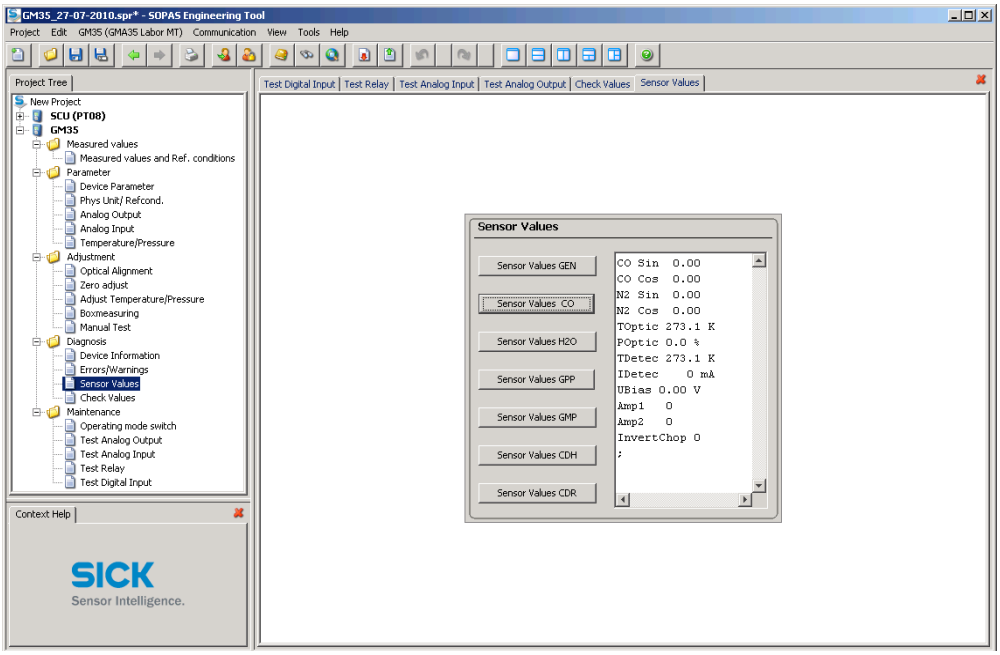


Fig. 44: Menu: Sensor Values

This menu serves to inquire the internal diagnosis values of sensors and device components.

Menu GM35/Diagnosis/Check Values

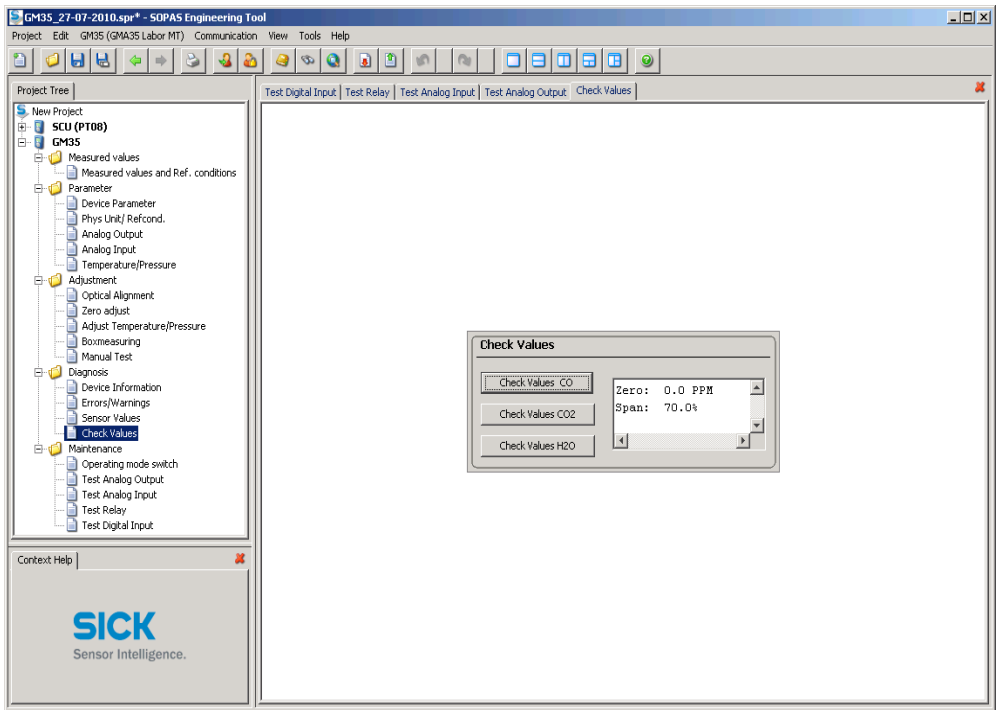


Fig. 45: Menu: Check Values

This menu serves to inquire the control values for the measuring components.

6.1.11 Menu Maintenance

Menu GM35/Maintenance/Operating mode switch

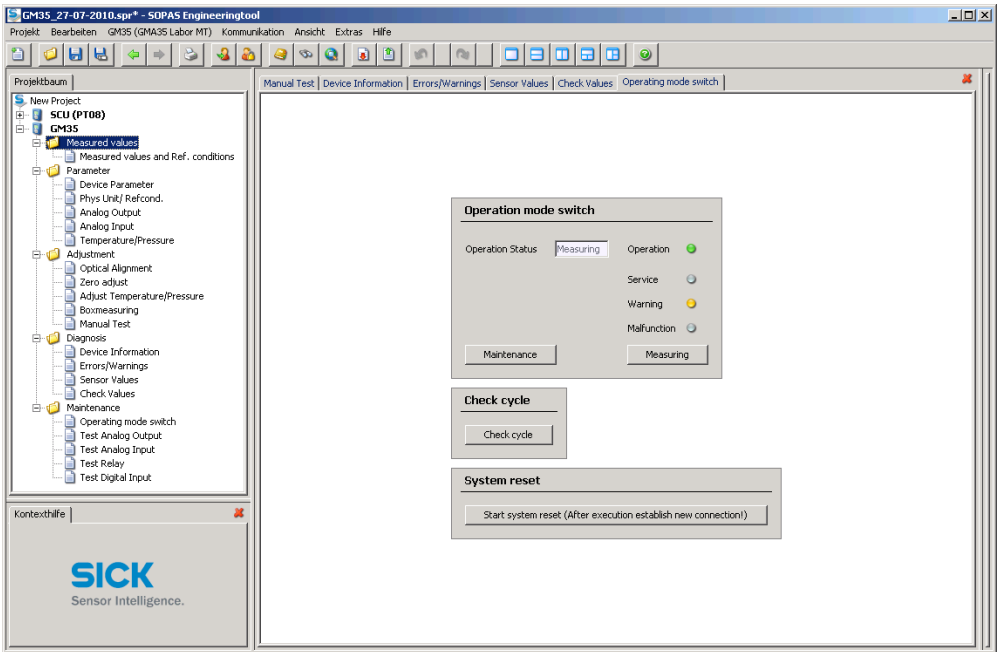


Fig. 46: Menu: Operating mode switch

This menu serves to switch between Measuring mode and Maintenance mode:

- Switch between measuring and maintenance.
- Trigger check cycle.
- Restart system (System reset).

Menu GM35/Maintenance/Test Analog Output

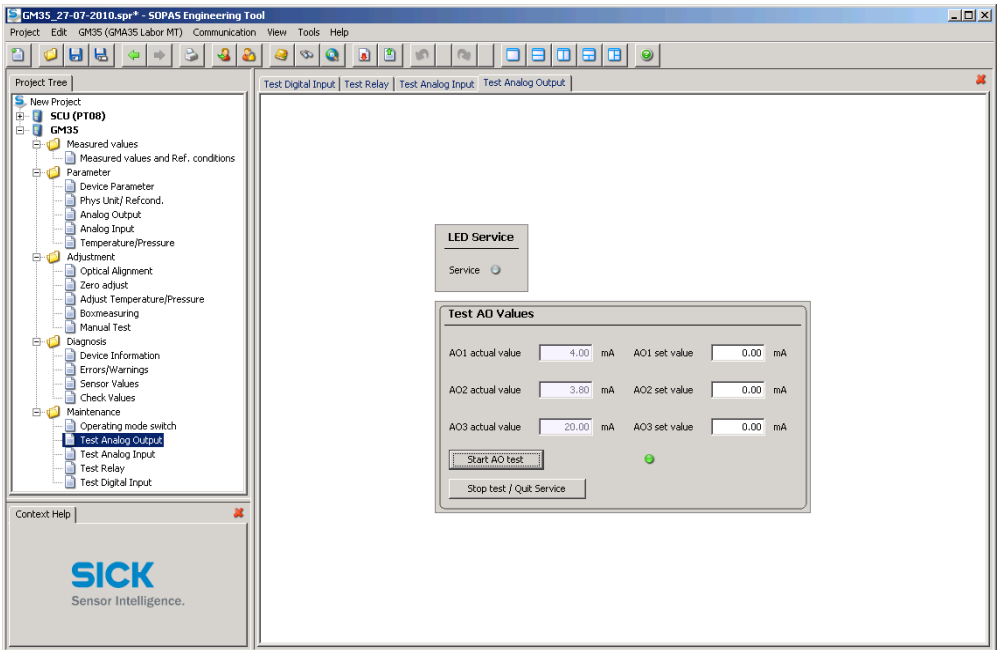


Fig. 47: Menu: Test Analog Output

This menu serves to test the 3 analog outputs:

- Test analog outputs

Menu GM35/Maintenance/Test Analog Input

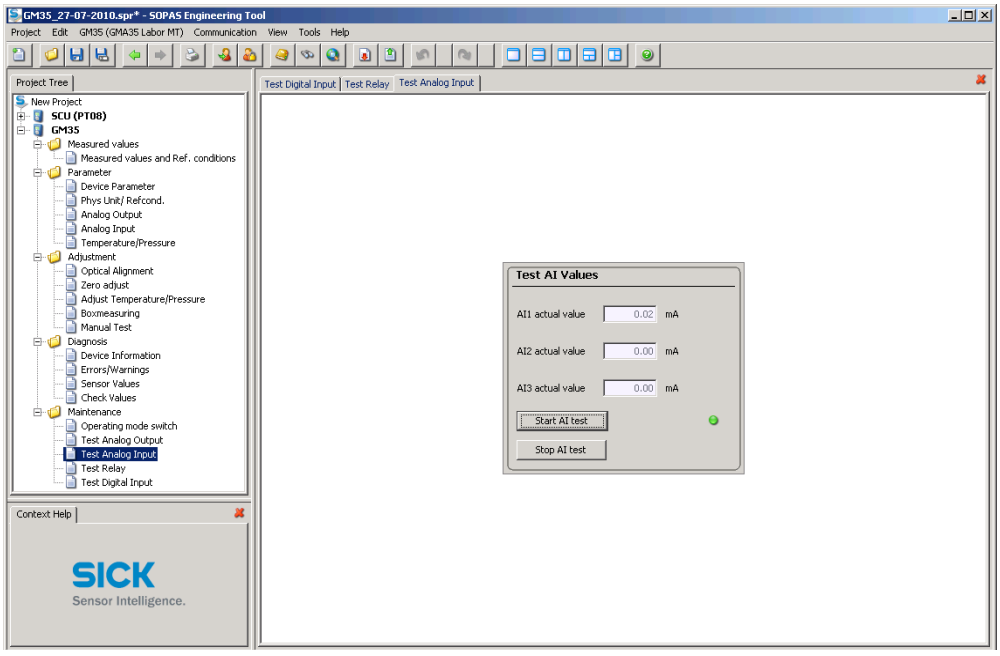


Fig. 48: Menu: Test Analog Input

This menu serves to test the 3 analog inputs.

Menu GM35/Maintenance/Test Relay

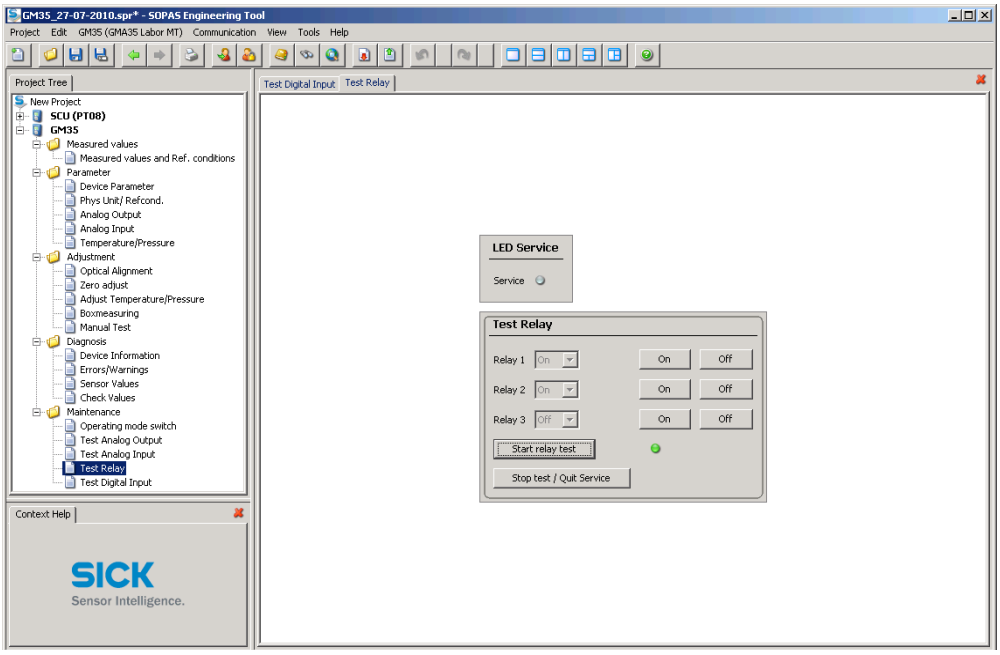


Fig. 49: Menu: Test Analog Output

This menu serves to test the 3 relay outputs.

- Test relay outputs.

Menu GM35/Maintenance/Test Digital Input

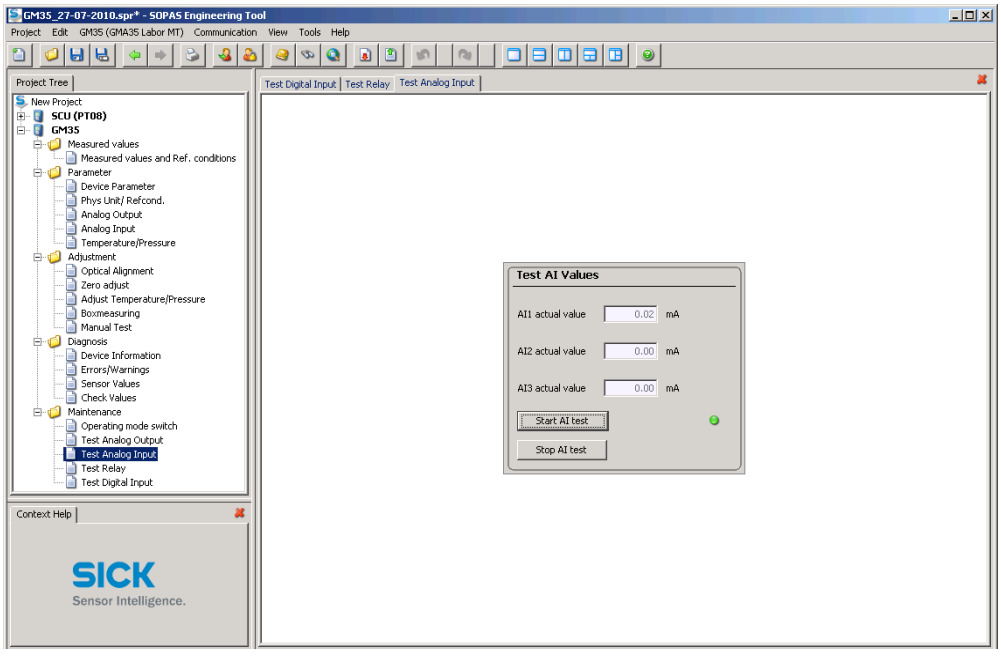


Fig. 50: Menu: Test Digital Input

This menu serves to test the 3 digital inputs.

7 Start-up

This Section describes the standard start-up at the end of which the Gas Analyzer GM35 starts measuring operation.

7.1 Preparations

7.1.1 Required qualifications and further prerequisites

Previous training by SICK AG or a qualified sales partner is recommend for technicians and engineers performing start-up. This training provides knowledge so that participants can recognize and handle situations that demand measures going beyond the standard procedures described here. Apart from the start-up itself, employees of SICK AG or trained sales partners are also able to make recommendations for the actual measuring operation as well as to define the maintenance interval based on the specific plant conditions.

Standard start-up

Each single measuring system is already configured to the individual application at the factory and therefore the standard start-up procedure described in this Section can however usually be performed by qualified engineers or measurement technicians without requiring special training. Prerequisites are:

- Exact adherence to the application requirements specified in the order
- The possibility to consult a trained specialist of SICK AG or the respective sales partner should special questions arise during start-up that go beyond the scope of the standard procedures described here.

7.1.2 Start-up procedure overview

Once the general preparatory measures have been taken, which mainly involve checking that the previous work has been carried out properly, a zero adjust on a gas-free measuring path (the zero path) must be carried out for the measuring system. This can be done either at the measuring point or another location, e.g. in a closed room. At the measuring point itself, the purge air unit, SR-unit and reflector are then put into operation in succession. Finally, the evaluation unit is switched on and checked; the EvU parameters can then be set for individual demands.

7.2 Start-up steps overview

Prerequisites for successful start-up:

- Installation conditions match the requirements for the measuring system (temperature, pressure).
- Measuring point must be accessible without danger or problems.
- The flanges with tube have been properly installed on the device and reflector side and precisely aligned.
- All power supply and signal cables are installed and connected.
- The system, apart from the SR-unit, reflector and purge air fixtures which are attached to the duct flanges later, must be fully installed and wired.
- The purge air supply must be ready to function.

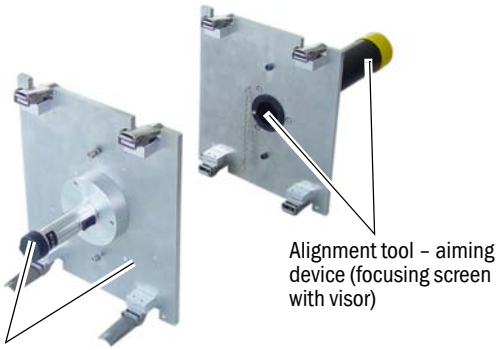
- Provide a zero path (with the purge air fixtures as necessary) with exactly the same length as the flange-to-flange distance, see “Preparing a zero path”, page 72.
- Measuring point technical data must be known:
– Measuring range
– Limit values
– Flange – flange distance
– Inputs and outputs to be used

Start-up runs in two main steps:

- **1st main step:** Zero adjust on the measuring path free from sample gas, see “Zero adjust”, page 79.
- **2nd main step:** Installation and start-up at the measuring point, see “Starting measuring operation”, page 81.

Tools and equipment

▶ Provide the following tools and equipment:
– Optical adjustment device
– Personal protective equipment as required, e.g. for hot resp. aggressive sample gases
– 2 x 24 mm open-ended spanners or ring spanners
– 1 x 19 mm open-ended spanner or ring spanner
– Allen key set
– Insulated screwdriver set for electrical connection work etc.



- Fastening parts included in the GM35 measuring system scope of delivery:
– 4 each M16 x 60 screws with washers and self-locking nuts to fasten the purge air fixtures on the duct-side flange with tube
– For each purge air fixture:
3 nuts with washers and 10 cup springs each for securing the purge air fixtures on the SR-unit or reflector
– Seal for sealing the connection between the SR-unit, reflector and purge air fixture
- Optical cleaning cloth without detergents, e.g. SICK Part No. 4 003 353
- If a weatherproof cover is used, an adhesive is required to attach the fixing bolts on the SR-unit. A quick-drying epoxy resin adhesive is recommended here.
- If the adjustment is carried out at a different location, an additional power supply cable with a suitable device connector for the SR-unit (and possibly EvU) is required.

7.3 Mechanical preparations for the SR-unit and reflector

WARNING: Avoid hazards through sample gases!

To avoid health hazards, the following work step may not be carried out during the preparation described in this Section but first within the scope of the respective descriptions in the following Sections.

- Connecting the power supply to the SR-unit
- Fitting an angle flange or the measuring probe on the sample gas duct

7.3.1 Checking the scope of delivery

- ▶ Check the exterior of the SR-unit and reflector to ensure they are not damaged.
- ▶ Make sure the supply voltages on the type plates of the GM35 components comply with the plant conditions.

The supply voltage of the GM35 components can be changed between 115 V and 230 V on site by the SICK service personnel when necessary.

7.3.2 Transport safety devices

- ▶ Remove the transport safety devices as well as any protective stickers, marked as such, depending on the device version.

  The front cover of the SR-unit is clamped between the flange fixture and enclosure. To remove:

- Open the 4 quick-release fasteners and swivel the flange fixture open. Keep the transport safety devices for future use.

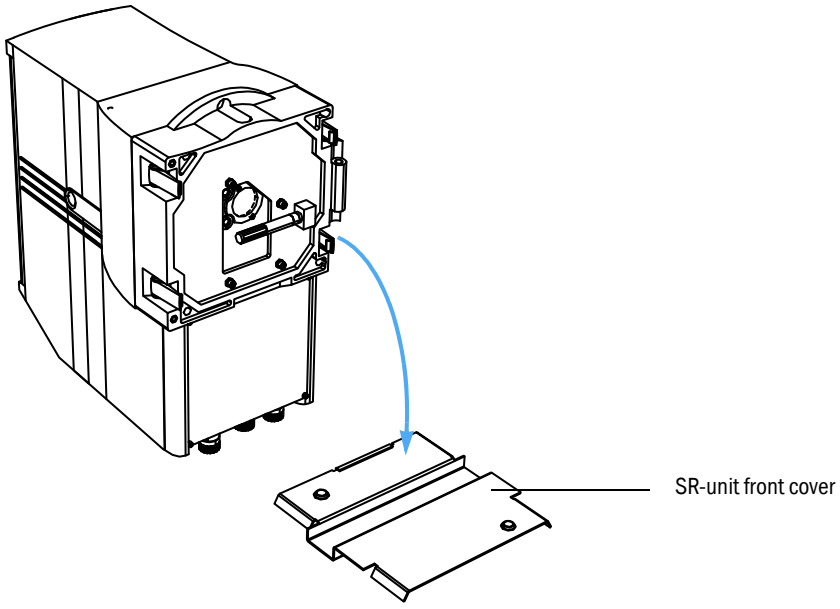


Fig. 51: Transport safety device to be removed from the SR-unit

7.3.3 Cleaning optical interfaces

▶ Check the optical interfaces of the SR-unit (the front window) and the reflector for soiling and clean with an optical cleaning cloth when necessary, see “Cleaning the optical interface (window) on the SR-unit”, page 90.

NOTICE: Do not use detergents because their residues, not visible to the naked eye, will falsify measurement results. If necessary, use distilled water.

7.3.4 Information on fitting the SR-unit and reflector

NOTICE: SICK recommends installing the SR-unit and the reflector first during start-up because these must first be adjusted on a zero path.
Installation before start-up is only possible with the purge air supply in operation.

7.4 Measuring path free from sample gas - zero path

The GM35 must always be adjusted in an atmosphere free from sample gas and dust, i.e. not when the system is fitted on the duct. The device does however automatically consider normal ambient humidity. This means a zero path must be prepared. The only exception to this are newly assembled installation environments that have not been put into operation yet, whereby it can be ensured that the sample gas duct remains flooded with ambient air free from sample gas and dust while the work described below is being carried out. In this case, flanges with tube already installed can be used as brackets on the (currently unused) sample gas duct during adjustment work. A zero path must be available for subsequent maintenance work.

7.4.1 Preparing a zero path

The zero path is a copy, free from sample gas, of the measuring path. Whenever possible, the zero path should be located at the measuring point so that the adjustment can be carried out on site.

Observe the following when preparing the zero path:

- The exact length of the flange - flange measuring path must be known.
- Make a tube piece with ∅ 200 mm (use several pieces when necessary) with flanges with exactly the same length as the flange - flange measuring path:

– The interior of new tubes must be painted in matt black; rusty surfaces of older tubes do not need to be treated.
– Support the pipe against sagging.
– When not in use, seal the tube to ensure that dust cannot enter it.

Note

The zero path must have exactly the same length (± 2%) as the flange - flange distance on the duct plus 446 mm (both purge air fixtures).

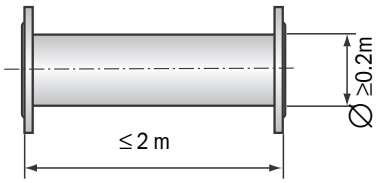
Set the gap between device flange and purge air fixture to approx. 5 mm so that the cup springs have sufficient pre-loading strength.

An additional set of device fixture flanges that remain on the tube is useful when the tests are made frequently or made for several devices. This means much less assembly work and one-off alignment.

- Assemble the zero path in the proximity of the SR-unit.

Note Flange dimensions, see “Flange with tube dimensions”, page 118

Flange - flange distance up to 2 m



Flange - flange distance up to max. 7.5 m

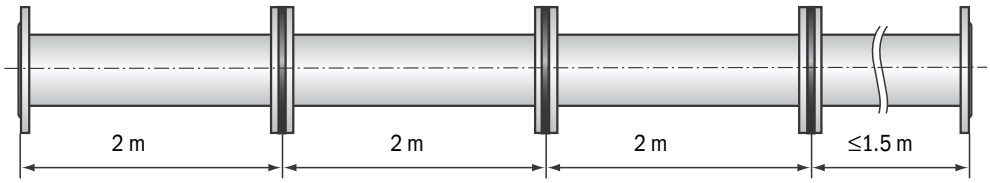


Fig. 52: Zero path

7.4.2 Installing the GM35 system components

1. Fitting the purge air fixtures:

Fit the purge air fixtures on the flange with tube or zero path

SR-unit:

- ▶ Use the 4 M16 screws to fit the purge air fixture with device flange to the flange with tube.

Reflector side:

- ▶ Use the 4 M16 screws to fit the purge air fixture with reflector on the flange with tube.

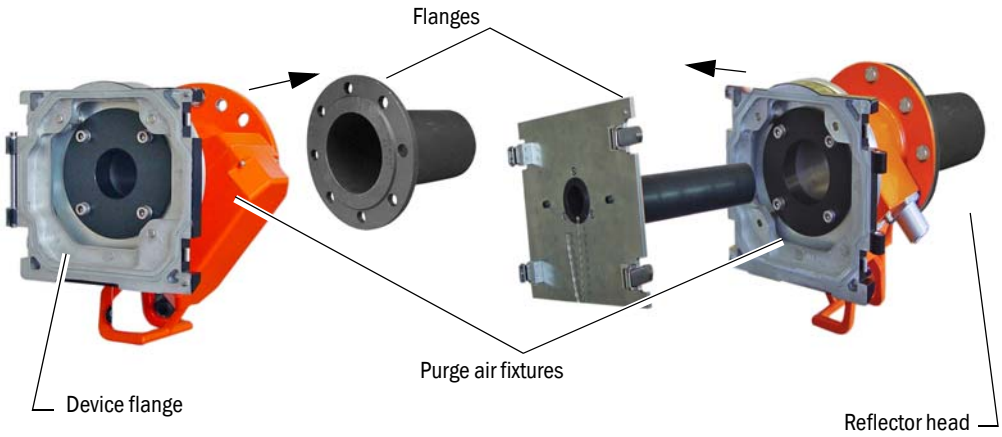


Fig. 53: Fitting the purge air fixtures on the flange with tube

2. Installing the adjustment device:

SR-unit:

- ▶ Position the light source of the adjustment device in the device flange and secure using the quick-release fasteners.

Reflector side:

- Remove the reflector head from the reflector flange; keep the Allen screws for the head in a safe place because you will need them later when reinstalling the head.
- Insert the adjustment device telescope and secure with the screws.

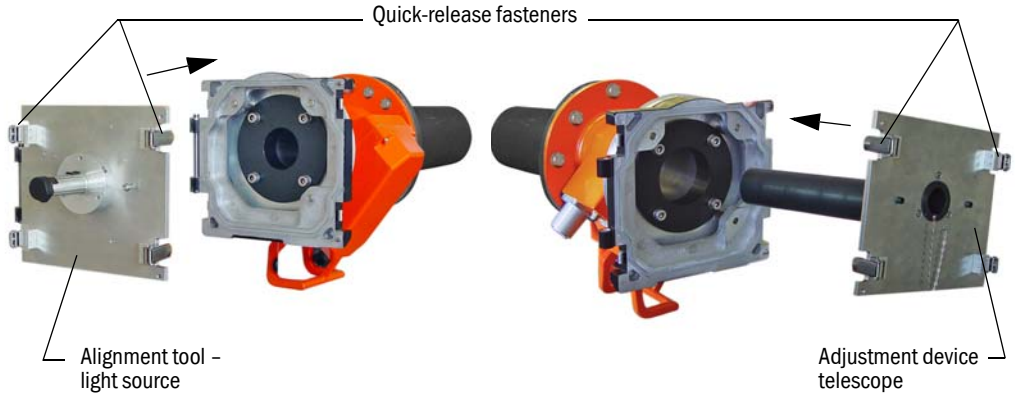


Fig. 54: Securing the adjustment device

3. Aligning the purge air fixtures:

Reflector side:

- Adjust the two screws of the L adjustment until the light spot in the telescope of the alignment tool appears in the center of the target (see “Optical alignment – shown on telescope”, page 75, left).

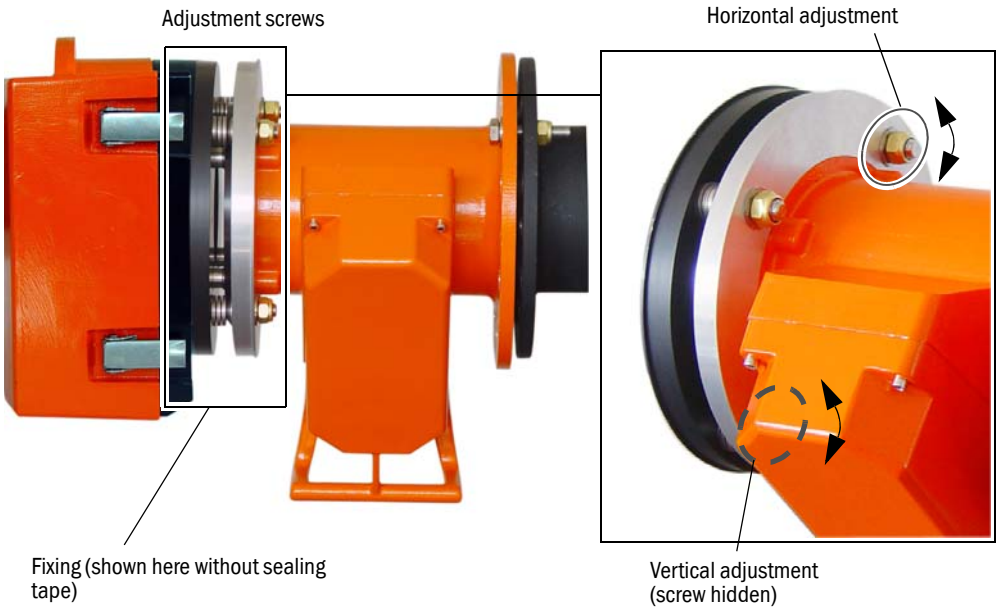


Fig. 55: L adjustment to align the flange - purge air fixture (example: reflector flange)

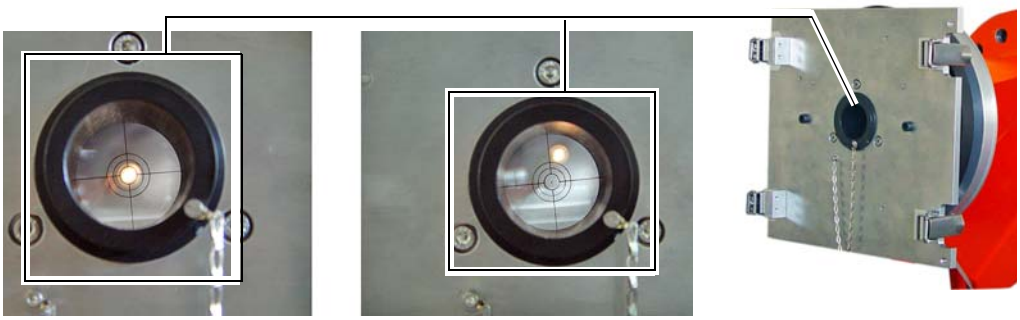


Fig. 56: Optical alignment – shown on telescope

4. Checking optical alignment

- ▶ Swap the adjustment device components on the purge air fixtures around, that is, attach the light source to the reflector flange and the telescope to the device flange.
- ▶ Note the optical alignment on the telescope.
- ▶ If the light point is not centered, adjust the screws of the L alignment accordingly until it is centered.

5. Installing the SR-unit

- ▶ Attach the SR-unit to the device flange:
- – Assemble the hinge and insert the bolt
- ▶ Swivel the SR-unit closed and secure the enclosure using the quick-release fasteners.

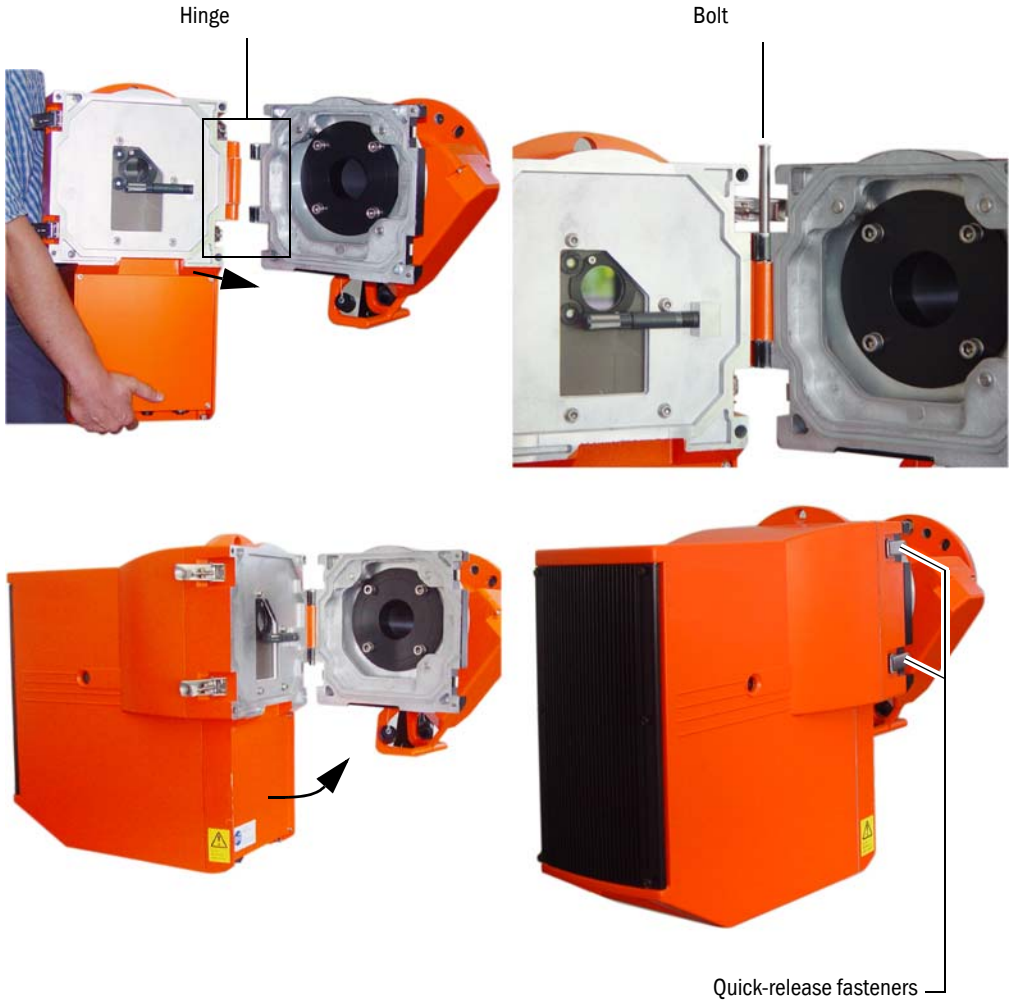


Fig. 57: Assembly steps for installing the sender/receiver unit

6. Installing the reflector head

- ▶ Attach the reflector head to the device flange:
- – Assemble the hinge and insert the bolt
- ▶ Swivel the reflector head closed when necessary and secure the enclosure with the quick-release fasteners.

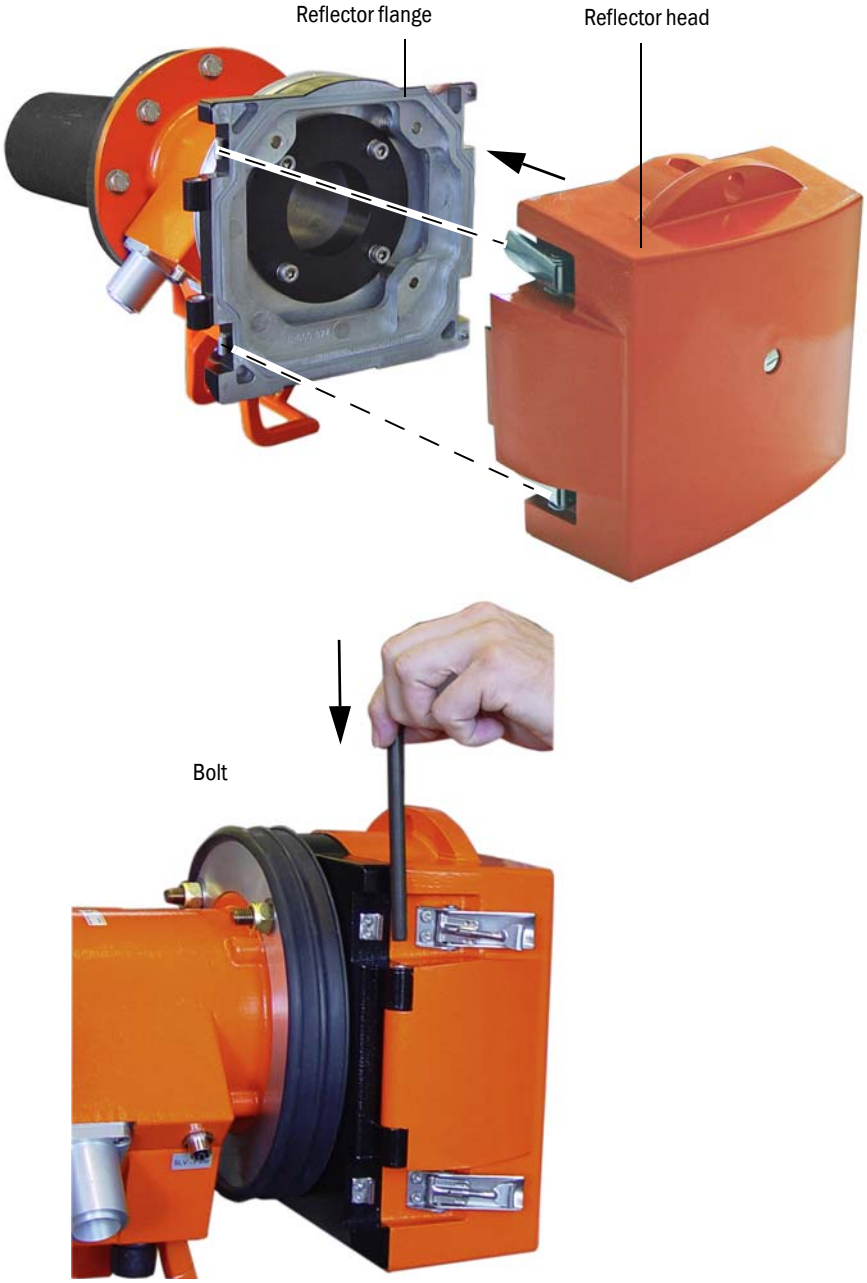


Fig. 58: Installing the reflector head

7.4.3 Electrical connections

SR-unit with purge air fixture

▶ Connect cables accordingly:
– Connect and secure the power supply cable to the underside of the SR-unit.
– Connect and secure CAN bus cable to EvU.
– Connect and secure the cable to reflector.
▶ Switch on the power supply for the SR-unit and the EvU.

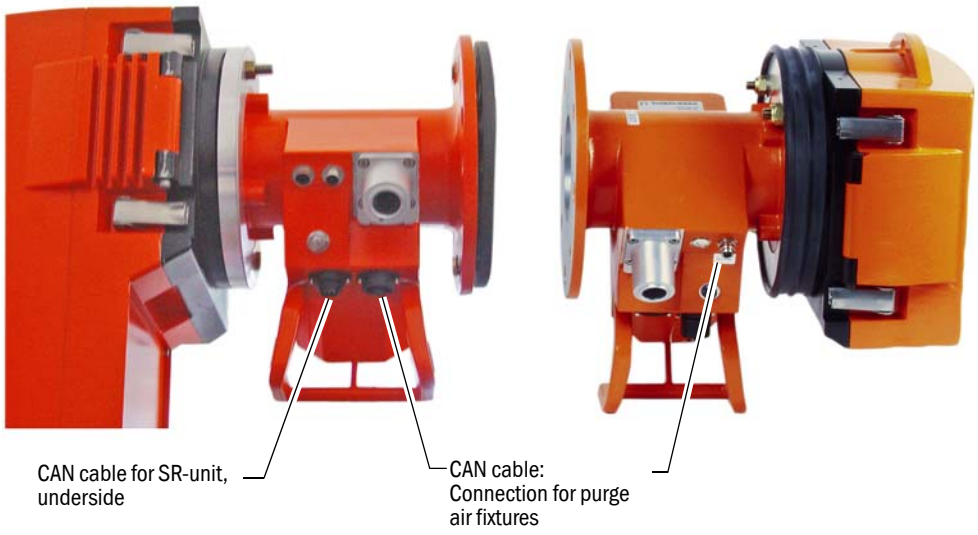


Fig. 59: Cable connections on the purge air fixtures

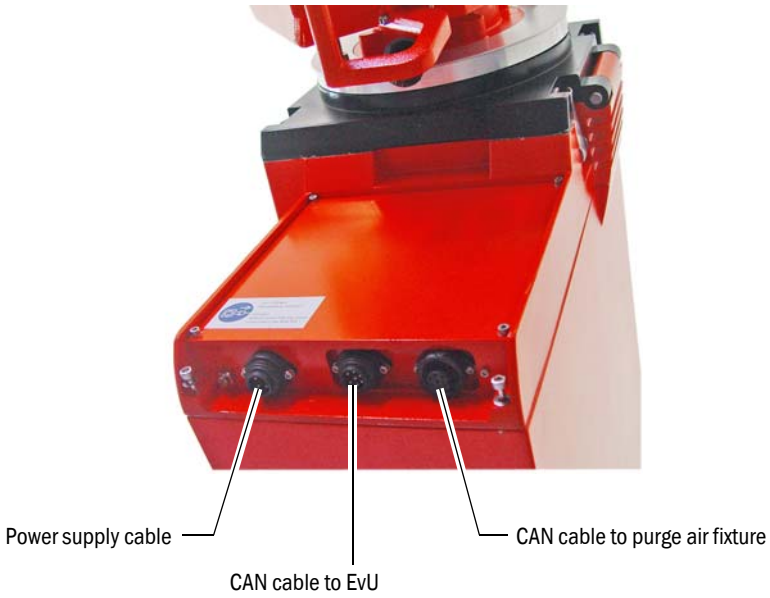


Fig. 60: Cable connections on the SR-unit (underside)

7.5 Zero adjust

Note When is it necessary to carry out the zero adjust:

- Initial start-up.
- Maintenance or function check.
- After installing a new emitter.

7.5.1 Preparing the system for zero adjust

At the measuring point

▶ Measure resp. determine the active measuring path, see “Fitting recommendation for the mounting flange (duct diameter not representative)” and see “Adjustment device for flange alignment”, page 22.
▶ Measure/determine the length of the flange tubes (SR side and reflector side), e.g., see “Standard flange with tube”, page 21.

Input on the evaluation unit

▶ Press the **par** button and call up the **Settings**/**Meas. Distance** menu.
▶ Enter the value for the active measuring path.
▶ Enter the length of the paths purged with air (SR side, reflector side):
– Enter value for **Tube 1** (SR)
(length on SR side = length of flange tube + 265 mm)
– Enter value for **Tube 2** (reflector)
(length on reflector side = length of flange tube + 260 mm)

7.5.2 Fine adjustment on the optical axis on the SR-unit

To ensure measurements are carried out properly, the optical axis of the reflector must be precisely aligned with the light beam from the SR-unit. To do this, adjust the 2 screws on the device flange, see “Aligning the optical axis”, page 92 below.

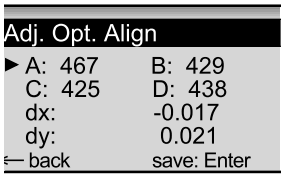
The GM35 features an automatic beam tracking function which, in standard Measuring mode, ensures the SR-unit and reflector are optimally aligned at all times, even under variable plant conditions. For basic alignment of the system when it is installed on the zero path or duct, tracking must be adjusted to the optical/mechanical zero point and the automatic function deactivated. To do this, activate the function **ADJ. OPT. ALIGN** in menu **maint**.
Alignment of the optical axis in the XY direction can be checked as follows – after activating the menu **ADJ. OPT. ALIGN**:

- On the evaluation unit display
- While carrying out diagnostic measures on the visor on the right-hand side of the SR-unit enclosure, see “Aligning the optical axis”, page 92.

Evaluation unit

Before starting:

▶ Press the **maint** button, select menu item **ADJ. OPT. ALIGN** and call up with **Enter**



- ▶ Check the display:
- ▶ Adjust the two screws on the device flange, see “Aligning the optical axis”, page 92, until the values
- – dx and dy on the display are less than or equal to ±0.1
  (dx...value for horizontal position or adjustment)
  (dy...value for vertical position or adjustment).

  Values A, B, C and D are values of device-internal parameters. They should be in the range 450...650.
- ▶ If the valid range for A to D cannot be reached even after adjusting the screws several times and the values for dx and dy are ≤ 0.1, check the warning and error messages in Diagnosis mode, (see “Menu structure”, page 43), and take the appropriate maintenance or servicing measures. See Section see “Maintenance”, page 88.

- ▶ Switch to Measuring mode:
  - ▶ Press **meas**.

7.5.3 Performing zero adjust

After the GM35 SR-unit and evaluation unit have been connected to the power supply, a warming up time of approx. 2.5 - 5 hours (depending on ambient conditions) is required before the zero adjust.

- ▶ Allow the warming up phase (approx. 2.5 hours) to elapse after the SR-unit has been connected to the power supply.
- ▶ After the warming up phase, align the optical axis as described in “Fine adjustment on the optical axis on the SR-unit”, page 79.

The following menu item is available in menu **cal**:

- **Zero Adjust** – zero adjust (measuring path free from sample gas)

- ▶ Activate Calibration mode (button “cal”), select menu item **Zero Adjust** and trigger with **Enter**.
- ▶ Enter the ambient temperature as prompted (accuracy ±2 °C).
- ▶ Confirm the prompt. Zero adjust runs and **Please wait** is displayed.

When zero adjust has completed, either a positive confirmation or an error message is displayed.

Adjustment successful

- ▶ Switch to Measuring mode or define further parameter settings.

Adjustment not possible

An error message indicates that a malfunction occurred during the adjustment procedure. The flashing “Malfunction” LED indicates that one or more error messages are pending.

- ▶ Switch to Diagnosis mode and rectify the problem, see “Troubleshooting and Clearing Malfunctions”, page 104.

7.6 Starting measuring operation

This Section describes the final preparations at the measuring point at which the Gas Analyzer GM35 starts measuring operation. The SR-unit and reflector with fitted purge air fixture must already be installed at the measuring point.

7.6.1 Installing the purge air fixtures

CAUTION: Follow the work sequence
To prevent damage to health and the measuring system, carry out the steps described in the following in the specified sequence. Always observe the relevant safety information.

Fit the purge air fixtures on the flange with tube or zero path

SR-unit:

- Use the 4 M16 screws to fit the purge air fixture with device flange to the flange with tube.

Reflector side:

- Use the 4 M16 screws to fit the purge air fixture with reflector on the flange with tube.
- Align the purge air fixture using the adjustment device as described in “Installing the GM35 system components”, page 73.

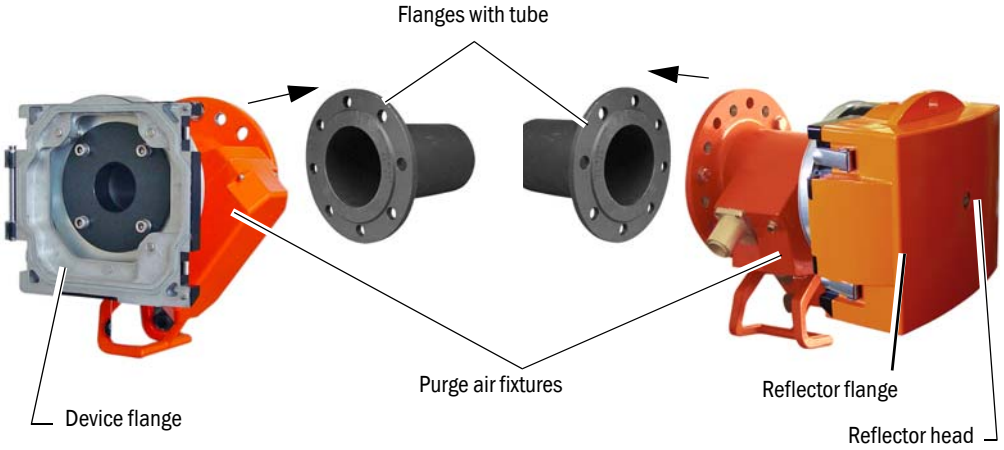


Fig. 61: Fitting the purge air fixtures on the flange with tube

Note Position the SR-unit and reflector in the immediate vicinity of the sample gas duct so that the purge air hoses can be connected and the measuring system fitted while the purge air units are running.

7.6.2 Purge air units start-up

Installation and electrical connections for purge air units have already been described during installation, see “Preparations for electrical installation”, page 25 to “CAN bus wiring options”, page 36.

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

On each of the SR and reflector sides

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

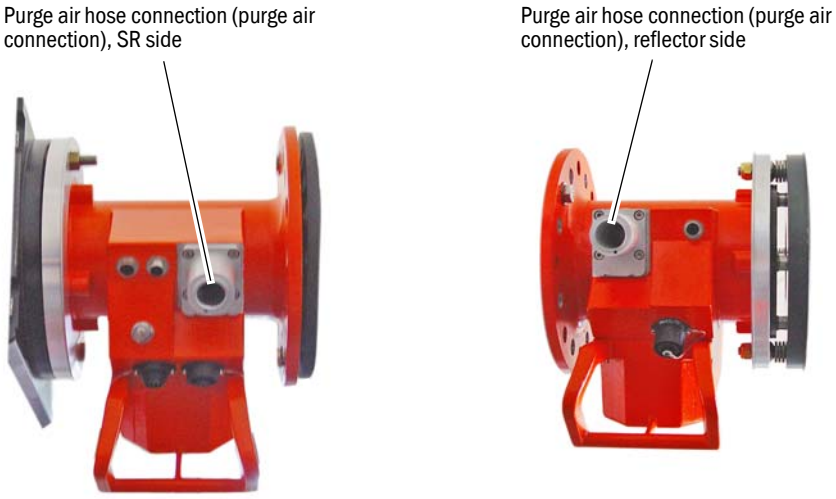


Fig. 62: Connections for the purge air hoses on the purge air fixtures

Purge air supply is now activated and protects the measuring system against contamination and overheating. Purge air feed must never be switched off when the SR-unit and reflector are on the sample gas duct.

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

7.6.3 Sender/receiver unit and reflector start-up

WARNING: Protection against hazards through hot resp. aggressive gases

- ▶ Wear suitable protective clothing (mask, gloves, working clothing and other) to avoid health risks and other hazards when opening the sample gas duct.

  If the protective clothing does not allow safe working on the open sample gas duct under the current conditions or if the sample gas duct is in operation and cannot be opened as this would allow gas to escape or air to enter the duct:

  Contact the persons responsible to have the sample gas duct shut down for the duration of the installation procedure and, when possible, have the duct flushed with ambient air to ensure safe installation.

- ▶ Attach the SR-unit and reflector to the purge air fixtures as described on page 73, and especially as from page 75.
- ▶ Connect the cable connections as described on "Electrical connections", page 78 and "Cable routing diagram", page 28 and switch the power supply for the sender/receiver unit and reflector unit on.
- ▶ Connect the functional earth cable to the screw terminal provided.

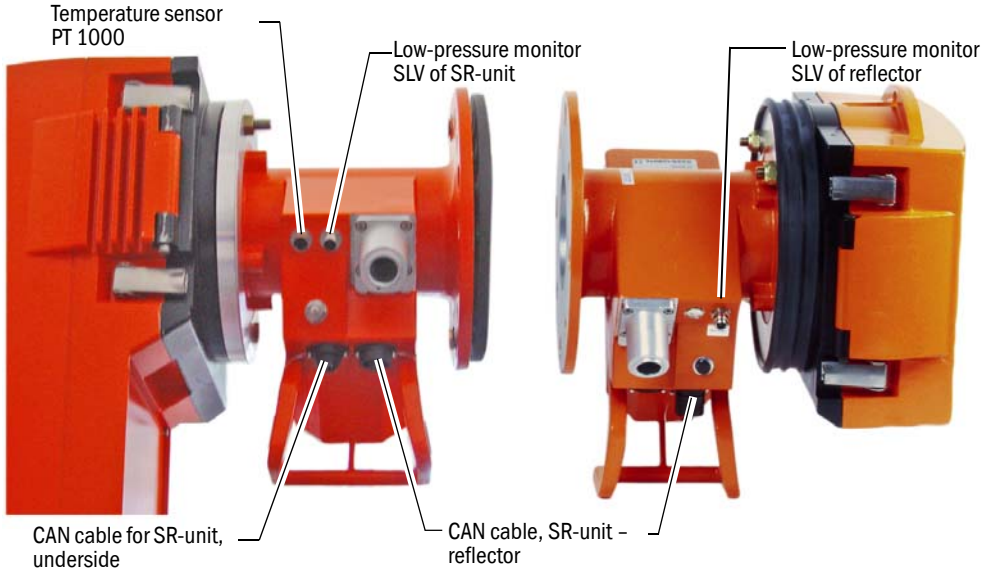


Fig. 63: Cable connections on the purge air fixtures

Fig. 64: Cable connections on the SR-unit (underside)

- Switch on the power supply for the SR-unit and the evaluation unit.
- Carry out fine alignment according to "Fine adjustment on the optical axis on the SR-unit", page 79.
- Check once again that optical alignment is correct, preferably after having waited approx. 30 minutes for the system to reach operating temperature.
  - To do this, call up menu **Adjust Probe** on the EvU and check the values displayed. See page 79.
- Reactivate Measuring mode:
  - Press **meas**

Regular measuring operation now starts.

7.6.4 Installing the weatherproof cover for the SR-unit

The weatherproof cover is used when the measuring system is operated outdoors.

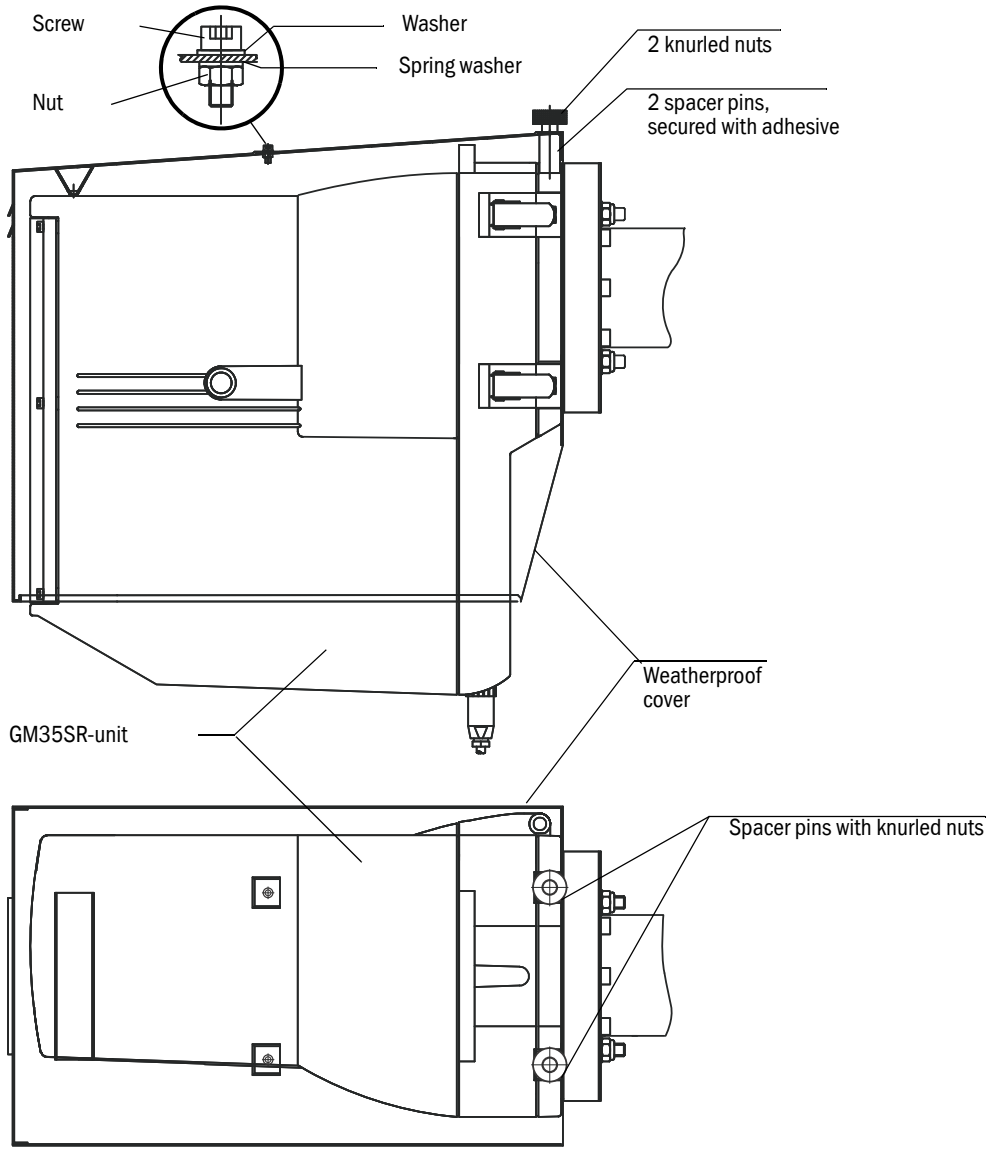


Fig. 65: Fitting the weatherproof cover for the GM35 SR-unit

See page 84

1 Bond the two spacer pins supplied centered on the flange fixture of the SR-unit at a distance of 170 mm to each other, i.e. so that each pin is 85 mm from the center. Use a quick-drying epoxy resin adhesive.
2 Seal the two unused mounting holes in the center of the weatherproof cover with dummy screws.
3 Position the weatherproof cover on the SR-unit. The threads of the spacer pins now protrude through the front fixing holes of the weatherproof cover.
4 Secure the weatherproof cover in position with the two knurled nuts.

7.6.5 Installing the weatherproof cover for the purge air units

The weatherproof cover for the purge air unit is available as an accessory. It comprises a cover and a lock set.

- Screw the lock pieces from the lock set to the base plate with the screws.
- Position the hood from the top.
- Insert the side holding catches into the counterpieces, twist and lock in.
- Fit the locking bracket on the base plate of the purge air unit.
- Attach the weatherproof cover and fix into place.

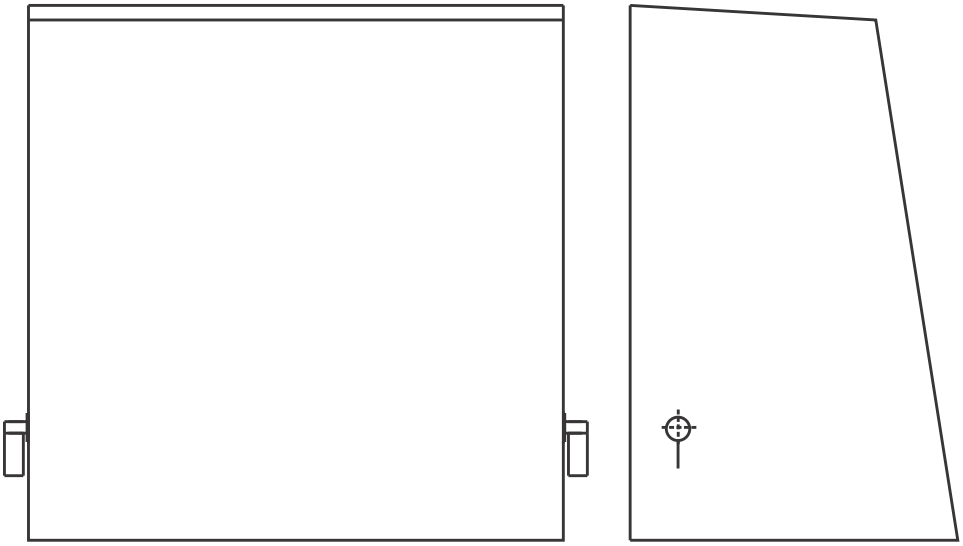


Fig. 66: Assembling the weatherproof cover for a purge air unit

7.6.6 Evaluation unit start-up

The evaluation unit is configured with a standard parameter set at the factory and, therefore, is ready to start measurement operation immediately. With the exception of the following steps, therefore, no additional measures are required for start-up for standard applications:

- Based on the operator information in "Handling the Evaluation Unit", page 41, check whether the measured values are output correctly on the LCD.

  If error or warning messages are displayed:

  - Use the operator information in "Handling the Evaluation Unit" as well as the display of error and warning messages in "Troubleshooting and Clearing Malfunctions", page 104 to locate and rectify the error cause.

    If the cause of the fault cannot be rectified with this information, contact the SICK AG Service Dept. or the responsible sales partner for further coordination

- If necessary, parameterize the evaluation unit in accordance with the requirements of the measuring task and the installation environment. See "Handling the Evaluation Unit", page 41.

7.6.7 Setting up the SCU System Control Unit

Basic procedure and further information on the SCU
→ Operating Instructions “SCU”.

The following index values serve to access the GM35 measured values and parameters.

Mapping Table

Measured values on SCU – Measured value (MV)

Index	Measured value
MV01	H2O (g/m3, % by vol. [1]
MV02	CO or N_2O (mg/m3, ppm) 1)
MV03	CO2 (mg/m3, ppm)1)
MV04	T (K)
MV05	P (hPa)

[1] Unit set during parametrization

Control values on SCU – Monitor values (MO)

Index	Measured value
M001	H2O_Zero (g/m3, % by vol.) [1]
M002	H2O_Span (%) [2]
M003	CO_Zero or N_2O (mg/m3, ppm) 1)
M004	CO_Span or N_2O (%) 2)
M005	CO2_Zero (g/m3, % by vol.) 1)
M006	CO2_Span (%) 2)

[1] Unit set during parametrization
[2] Percentage deviation.

Operating state of the GM35 – State (S)

Index	Operating state
S02	Measuring
S04	Maintenance
S04	RCycle
S05	CCycle

Diagnosis Table – DiagFlags (F01-F32, M01-M32)

Index	Diagnosis message (F ... Failure, M ... Maintenance)
F01	Sensor communication
F02	Incompatible device
F03	H2O EEPROM
F04	CO (N_2O) EEPROM
F05	CO(N_2O) com.
F06	Zero com.
F07	CO (N_2O) CUVETTE com.
F08	H2O CUVETTE com.
F09	Filter com.
F010	VISOR com.
F011	CO (N_2O) temp. detec.
F012	H2O temp. detec.
F013	CO (N_2O) div. Zero
F014	H2O div. Zero
F015	VISOR fault

Index	Diagnosis message (F ... Failure, M ... Maintenance)
F016	VISOR init.
F017	H2O Motor fault
F018	CO (N_2O) Motor fault
F019	H2O Ampl. Max
F020	CO (N_2O) Ampl. Max
F021	H2O not ready
F022	CO (N_2O) not ready
F023	H2O Sig. High
F024	CO (N_2O) Sig. High
F025	H2O No signal
F026	CO (N_2O) No signal
F027	VISOR No signal
F028	Mirror com.
F029	Mirror adj. End
F030	CO (N_2O) CUEVETTE range
F031	Flag_031 = Reserve
F032	Flag_032 = Reserve
M01	AI T overrun
M02	AI p overrun
M03	AI v overrun
M04	AO0 ZEROPT.
M05	AO1 ZEROPT.
M06	AO2 ZEROPT.
M07	AO3 ZEROPT.
M08	AO4 ZEROPT.
M09	AO5 ZEROPT.
M10	AO6 ZEROPT.
M11	AO7 ZEROPT.
M12	AO8 ZEROPT.
M13	Flag_045
M14	Flag_046
M15	Flag_047
M16	Flag_048
M17	MR Adjustment
M18	Chopper freq.
M19	HYGRO com.
M20	H2O Low signal
M21	CO (N_2O) Low signal
M22	HYGRO internal
M23	MIRROR adj.
M24	H2O Reference
M25	CO2 Reference
M26	CO (N_2O) Reference
M27	VISOR amplifier
M28	Software version
M29	CO (N_2O) CUEVETTE range
M30	Flag_062
M31	Probe message
M32	Probe com.

8 Maintenance

The Gas Analyzer GM35 requires very little maintenance. This Section describes regular maintenance work to be carried out on the GM35 measuring system.

Qualification

Inspection and maintenance tasks described in this Section can be carried out by Service technicians familiar with the device based on the information in these Operating Instructions and having in-depth knowledge of the relevant safety regulations.

Maintenance intervals

Maintenance intervals depend on individual application conditions and should be clarified with SICK Service resp. with a trained engineer or technician at the local sales partner.

If no other specifications have been made, the following recommendation is applicable:

- Maintenance interval – 6 weeks

Maintenance protocol

Recommendation

Keep a log of maintenance work done. A simple notebook recording maintenance dates, work done, special observations, and required consumables and spare parts is adequate.

8.1 Safety

Important safety information for all service work

Always observe the following information when carrying out service work to avoid injury or damage to the measuring system:

- Wear suitable protective clothing and a protective mask when the sample gas is hot and/or aggressive or has a high dust load, or when the sample gas duct is pressurized. Never open the enclosure or disengage the quick-release fasteners without first taking suitable protective measures.
- If the conditions in the sample gas duct are particularly problematic and hinder or prevent work on the open duct, despite the use of protective equipment, the maintenance work must be carried out when the sample gas duct is out of service or after it has been flooded with ambient air.
- The purge air supply must operate constantly, and the SR-unit must not be opened or swiveled up as long as it is attached directly on the measuring duct.
- If visual inspection of the power supply cable reveals damage to the insulation or strain-relief clamp, switch off the power supply to the cable in question immediately. The work must be performed in the specified sequence, with the result that the measuring system must be removed before the cables on the purge air unit are checked.

WARNING: Health risk through contact with toxic gases

The device contains enclosed potentially dangerous gases that can escape due to a defect or leak.

If a leak occurs, the concentrations inside the enclosed device can increase up to the following concentration.

CO and N_2O: max. total volume 10 ml

Max. concentration inside the device with a leak (defect): 350 ppm

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

8.2 Preparation and general preparatory work

- ▶ Have the following equipment available for service work:
- – At least the following tools: 2 x 24 mm open-end or box wrenches, 1 x 19 mm open-end or box wrench, Allen key set, insulated screwdriver set for electrical connection work
- – Optical cleaning cloth without detergents, e.g. Part No. 4 003 353
- – Distilled water, clean cloths and, if necessary, a dusting brush
- – Replacement parts and consumables:
  Replacement filter for purge air units, Part No. 5 306 091, replacement sealing rings (if necessary) to seal the connection between the SR-unit, reflector and purge air fixture; if a weatherproof cover is used, a quick-drying epoxy resin adhesive may be necessary to refix the securing pins.
- – If the duct is pressurized, a suitable cover is required for the duct-side flange with tube to prevent gases from escaping from the duct when the SR-unit is opened.

8.3 Maintenance work on SR-unit and reflector

8.3.1 Visual inspection and enclosure cleaning

- ▶ Check the enclosure of the SR-unit for damage such as cracks.
- ▶ If a weatherproof cover is used, check its condition and whether the securing pins on the top of the SR-unit are secure. If necessary, apply new epoxy resin adhesive.
- ▶ Clean the entire enclosure of the SR-unit when contaminated.
- ▶ Inspect cables thoroughly for damage and pay particular attention to any signs of abrasion or bending at cable ducts. Prefabricated cables are available as spare parts.

8.3.2 Cleaning the optical interface (window) on the SR-unit

WARNING: Take care when the duct is pressurized!

- If the duct is pressurized, appropriate protective measures must be taken, in particular wear a protective mask.
- Prepare a suitable cover for the opening on the device flange of the SR-unit and keep it available.
- Once the SR-unit has been opened, place the cover on the opening of the device flange immediately.

- Unlock and open the SR-unit enclosure by releasing the quick-release fasteners.
- Check the optical interface (window) on the SR-unit for contamination and, if necessary, clean using an optical cleaning cloth. Do not use any detergents because these leave invisible residues that could falsify the measuring result. The cleaning cloths can be moistened with distilled water if necessary.
- Close and lock the enclosure again to protect the cleaned optical interface against humidity or dust.

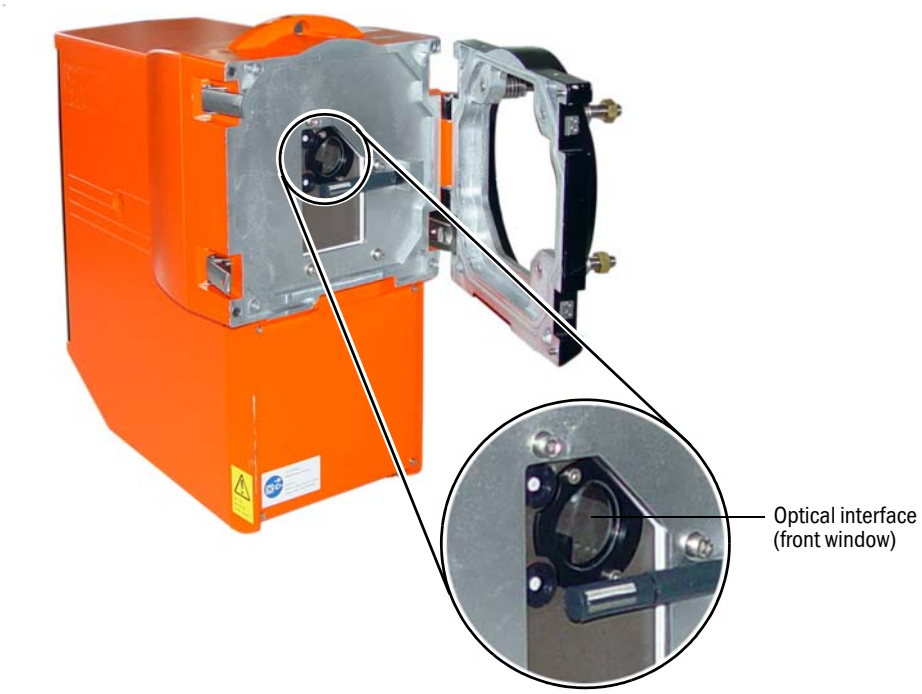


Fig. 67: Optical interface (window) on the SR-unit

8.3.3 Cleaning the optical interface (window) on the reflector

- Open the quick-release fasteners on the reflector head and open the reflector
- Check the optical interface (window) on the reflector for contamination and, if necessary, clean using an optical cleaning cloth. Do not use any detergents because these leave invisible residues that could falsify the measuring result. The cleaning cloths can be moistened with distilled water if necessary.
- Swivel the reflector head in again and close the quick-release fasteners.

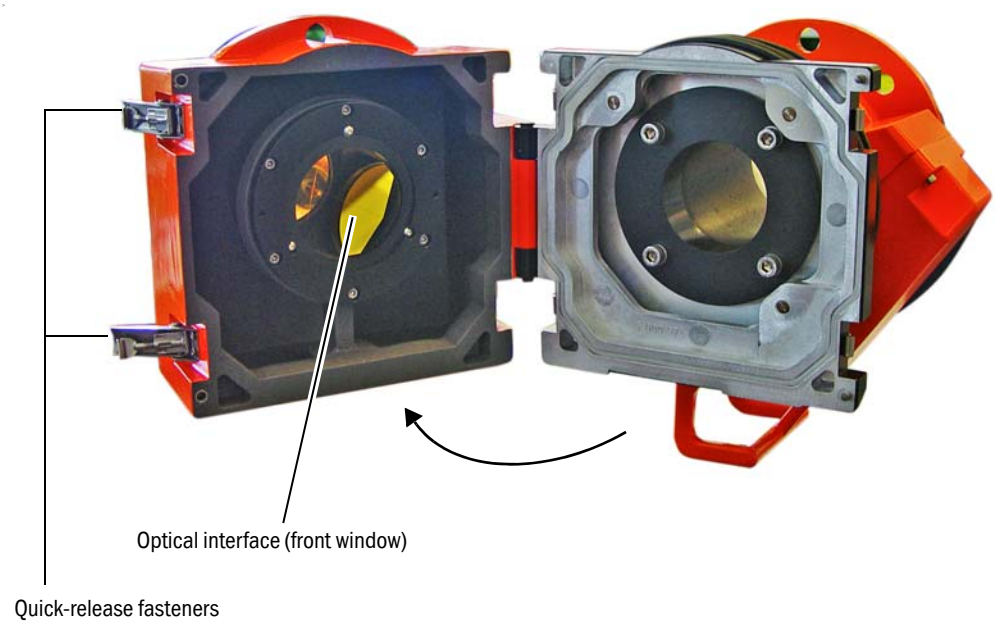


Fig. 68: Optical interface (window) on the reflector

- Check the zero point setting, see “Performing zero adjust”, page 80.

8.3.4 Checking the zero point

The zero point of the GM35 can also be checked on a measuring path or zero path free from sample gas. This can be carried out directly in the duct when it is ensured that no more sample gas is present in the duct, e.g. the plant has been shut down. In this case, observe the measured values on the EvU display and carry out zero adjust, see below.

Note Zero path, “Measuring path free from sample gas - zero path”, page 72.

- Put the GM35 components (SR-unit with purge air fixture[1], reflector with purge air fixture, possibly an EvU) out of operation (disconnect the power supply) and remove.
- Install the GM35 components on the measuring path free from sample gas and make all connections, see “Installing the GM35 system components”, page 73.
- Observe the measured values on the EvU display and carry out zero adjust, see “Performing zero adjust”, page 80.
- Once zero adjust has completed successfully, install the GM35 components (SR-unit with purge air fixture, reflector with purge air fixture, EvU) at the measuring location and start measuring operation again, see “Starting measuring operation”, page 81.

[1] Depending on the existing zero path

8.3.5 Checking optical alignment

Evaluation unit Before deactivating automatic beam tracking

▶ Press the **maint** button, select menu item **ADJ. OPT. ALIGN** and call up with **Enter**

Checking through the visor

Check the alignment of the optical axis using the visor on the right-hand side of the SR-unit enclosure and by making adjustments on the device flange.

Visor The visor indicates the alignment of the optical axis between the SR-unit and the reflector using a 5 x 5 LED matrix. The LEDs light up to represent the position of the light beam on the reflector. The crosshairs show three fields for alignment purposes.

▶ Adjust the optical alignment (as shown in “Aligning the optical axis“) by adjusting both screws on the device flange (L alignment) and observe the light position of the LEDs.

Horizontal adjustment causes the light spot to shift horizontally on the visor and vertical adjustment causes a vertical shift. Alignment is correct when the lit LED is located within the valid field within the cross hairs, or is completely within the inner ring marking of the cross hairs.

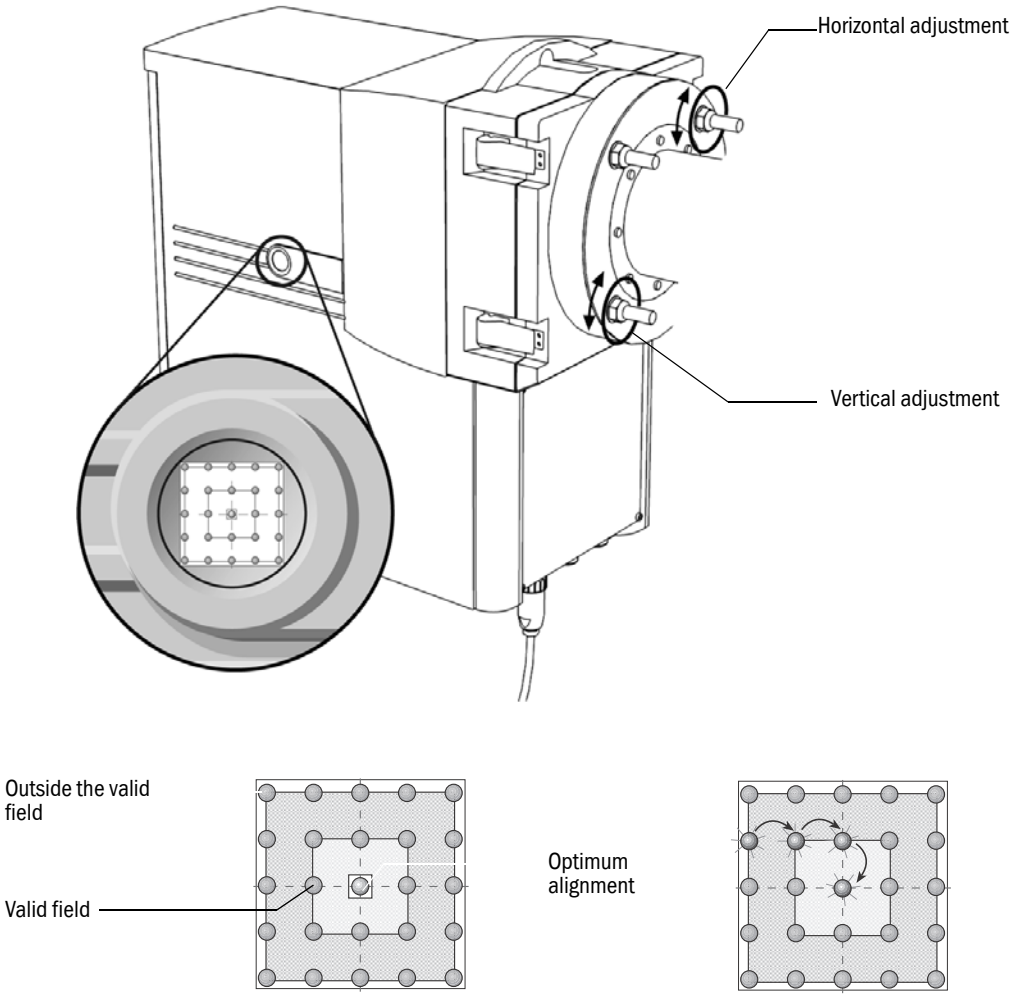


Fig. 69: Aligning the optical axis

Display in the LED matrix	Meaning
LED in the middle lights up	Optimum analyzer alignment
A LED in the inner quadrant lights up	Alignment within half the tolerance
A LED in the outer quadrant lights up	Alignment at tolerance limits, correction required
A LED in the outer quadrant blinks	Alignment outside tolerance limits, correction required
LED in the middle blinks	No signal, reflector not “seen” by the SR-unit because, for example, the alignment is completely wrong, no reflector is installed, reflector strongly contaminated.
LEDs in middle row light up sequentially	No alignment possible during warming up phase, check cycle or reference cycle.

- If the SR-unit was equipped with a weatherproof cover, refit it accordingly, see “Installing the weatherproof cover for the SR-unit”, page 84.

8.3.6 Checking the IR source

- Call up menu **DIAG**
  - Call up menu **Sensor Values/GM35 general/VIS AMP MR**.

Maximum amplification value is 255.

- A zero adjust must be carried out after installing a new IR source, see “Performing zero adjust”, page 80.

8.4 Maintenance work on the purge air supply

Hot gases in ambient conditions with overpressure

WARNING: Risk of fire through hot gas escaping in installations with overpressure conditions
On installations with overpressure, the purge air hose can be severely damaged by escaping hot gas and can catch fire depending on the temperature.
On plants with overpressure as well as gas temperatures over 200 °C:
- ▶ Ensure reverse flow is prevented by fitting a (trip) flap or a valve.
- ▶ Regularly check the functionality of the reverse flow safeguard.

The reliability of the purge air supply system is essential for ensuring the availability of the measuring system. Maintenance of the purge air supply is straightforward, but should be carried out extremely carefully.

Prerequisites for purge air supply maintenance:

- If the sample gas duct contains a partial vacuum that is sufficient to flush it adequately with ambient air when the purge air supply is removed, the SR-unit and reflector can remain inside the duct while maintenance is being done on the purge air unit.
- The SR-unit is fully open on the flange fixture so that any dust blown through the purge air hose during maintenance is not deposited on the optical interfaces of the SR-unit and reflector. In addition, the purge air hose should also be disconnected during purge air fixture maintenance as described below.

8.4.1 Preparation and general inspection

- ▶ With the purge air unit switched on, remove the purge air hose from the purge air inlet on the respective purge air fixture.
- ▶ Switch off the power supply (three phase) for the purge air unit and attach a suitable warning to prevent it from being switched on again inadvertently during maintenance.
- ▶ Remove the weatherproof cover, if fitted, from the purge air unit.
- ▶ If there are noticeable external signs of contamination, clean the enclosure of the purge air unit and, if possible, locate the cause of the contamination. The frequency with which a filter change is necessary primarily depends on the dust content of the ambient air.
- ▶ Make sure cables are not damaged along the whole length and connections are not loose, and check cables for corrosion and humidity. Repair accordingly when necessary.
- ▶ Check the purge air hose carefully for damage. Pay special attention to points subjected to mechanical strain, such as on the hose clamps.
- ▶ Check all the remaining hose clamps on the purge air hose and purge air unit to ensure that these are secure; tighten when necessary.
- ▶ Make sure the dummy plug for the Y-distributor on the purge air unit is secure.

8.4.2 Checking and replacing the purge air filter

The frequency with which the purge air filter has to be replaced depends on the dust content or contamination of the ambient air. Replacement is necessary at the latest when the low-pressure monitor at the filter outlet trips and signals a filter change is necessary. In newly installed measuring systems, it is recommended to remove the filter element during the very first maintenance to check the level of contamination. This result helps to determine the filter replacement frequency.

Note Correct handling during filter maintenance

- ▶ Avoid creating dust clouds to prevent any contamination penetrating the measuring system.
- ▶ Do not use any detergents because deposits will falsify measurement results. Always use clean cloths that can be moistened with water only when necessary.
- ▶ Prepare the new filter element.
- ▶ Remove the filter housing cover by releasing the two snap locks on the side.
- ▶ Pull the filter element – turn counterclockwise – out of the filter housing.
- ▶ Clean the inside of the filter housing using a cloth and brush. Only use water to moisten the cloths, no detergents.

If it is still uncertain whether the filter element is to be replaced:

- – Check the filter element for deposits, without creating any dust clouds.
- – If the filter element is not contaminated significantly, it can be reinstalled instead of a new filter.
- ▶ To install the new (or previous, uncontaminated) filter element, secure it to the spindle in the filter housing by turning/pressing it counterclockwise.
- ▶ Fit the filter housing cover and align it with the filter housing so that the two snap locks on the side click into position.

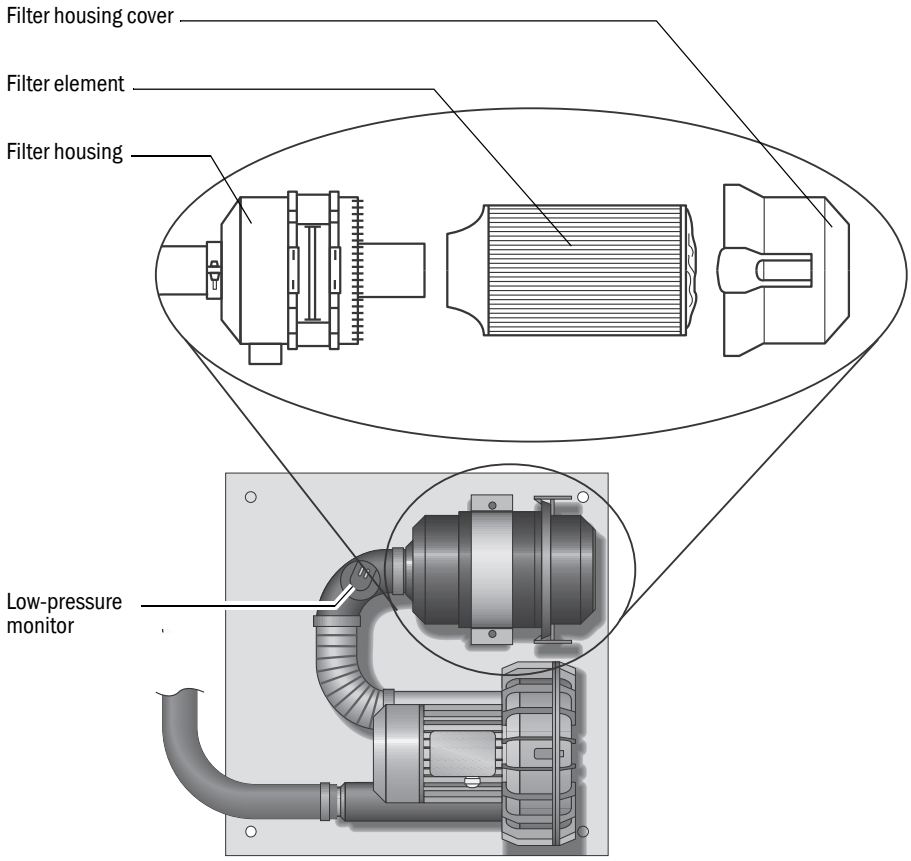


Fig. 70: Replacing the purge air filter element

8.4.3 Restarting and checking the purge air unit

- ▶ Make sure that any dust possibly escaping from the open end of the purge air hose when the purge air unit is switched on again cannot be deposited on the measuring system:
- ▶ Switch on the power supply to the purge air unit briefly (for approx. 2 min.) to remove any loose dust. The purge air hose is not yet connected to the purge air fixture. When connecting, knock the filter housing lightly to remove any dust particles.
- ▶ With the purge air unit switched on, check whether
- – a uniform air current is created at the open end of the purge air hose
- – the blower is operating quietly, without any noticeable vibrations or irregular noises.
- ▶ While the purge air unit is switched on, reconnect the purge air hose to the purge air inlet on the purge air fixture. Make sure the hose clamp is secure.
- ▶ Test whether the low-pressure monitor to monitor the filter and the connected signal unit are functioning correctly:
- – Partly cover the extraction aperture of the air filter briefly using a piece of cardboard or similar object (must not be sucked in or contaminate the filter).
- – On the EvU: (menu **diag**, error message) determine whether the low-pressure monitor responds by signaling that a filter change is necessary.
- ▶ Carefully reattach the purge air hose to the corresponding purge air connection on the fixture and secure.

8.5 Evaluation unit (EvU)

The evaluation unit is designed for maintenance-free operation over the entire service life of the measuring system. If the evaluation unit is mounted outdoors, the following simple checks should be carried out regularly due to the load resulting from changing weather conditions:

- Visual inspection
  - Is the enclosure undamaged and the fitting intact?
  - Does the enclosure front door open and close easily?
  - Is the enclosure window free from moisture?
  - Does the illuminated LC display on the evaluation unit function correctly?

DANGER

Exposed electrical connections

The electrical connections are exposed when the evaluation unit door is open. Observe the relevant safety regulations.

- Open the evaluation unit door and check the following:
  - Are the cable connections OK?
  - Is the enclosure dry inside?
- If any one of these points is negative, clarify the cause when possible.
- Carry out the necessary repairs.

If the evaluation unit is damaged (e.g. LC display failure):

- Contact SICK AG Service or the local sales representative.

8.6 Box Measuring

The gas filter box serves to check the CO-/ N_2O- and CO_2 measuring duct of the GM35 with test gases; for CO_2 up to a concentration-measuring path product of 15 % by vol. • m.

Requirements

Components required:

- Reflector enclosure with gold-plated hollow triple reflector;
  Part No. 2 030 206
- Filter box adapter plate with cutout section for the humidity sensor (front of the SR-unit)

Note CO or N_2O measured values are displayed on the EvU in **mg/m³ • m** (operation),

CO_2 measured values are displayed in **g/m³ • m** (operation).

8.6.1 Determining the necessary test gas concentration

1. General calculation:

$$\text{Test gas conc. [ppm or \% by vol.]} = \frac{\text{Meas. range [ppm or \% by vol.]} \bullet \text{aActual meas. path [m]}}{\text{0.15 m max. filter box length}}$$

2. Calculation forsetpoint values for all 6 chamber lengths

$$CO_{nom.} = \text{Test gas conc. [ppm]} \bullet 1.25 \bullet \frac{273}{353} \bullet \frac{\text{Act. air pressure [hPa]}}{1013} \bullet L\,[mm]_{chamber} \bullet 0.001$$

$$N_2O_{nom.} = \text{Test gas conc. [ppm]} \bullet 1.963 \bullet \frac{273}{353} \bullet \frac{\text{Act. air pressure [hPa]}}{1013} \bullet L\,[mm]_{chamber} \bullet 0.001$$

$$CO_{2nom.} = \text{Test gas conc. [\% by vol.]} \bullet 1.963 \bullet \frac{273}{353} \bullet \frac{\text{Act. air pressure [hPa]}}{1013} \bullet L\,[mm]_{chamber} \bullet 0.001$$

Comp.	Required test gas concentration					
	Filter chamber lengths					
	25 mm	50 mm	75 mm	100 mm	125 mm	150 mm
CO						
CO_2						

8.6.2 Carrying out measurement

- ▶ Open the SR-unit and swivel to the side.
- ▶ Attach the filter box with the adapter plate to the SR-unit and secure using quick-release fasteners. Take care not to damage the humidity sensor of the SR-unit!
- ▶ Fit the reflector for the GM35.

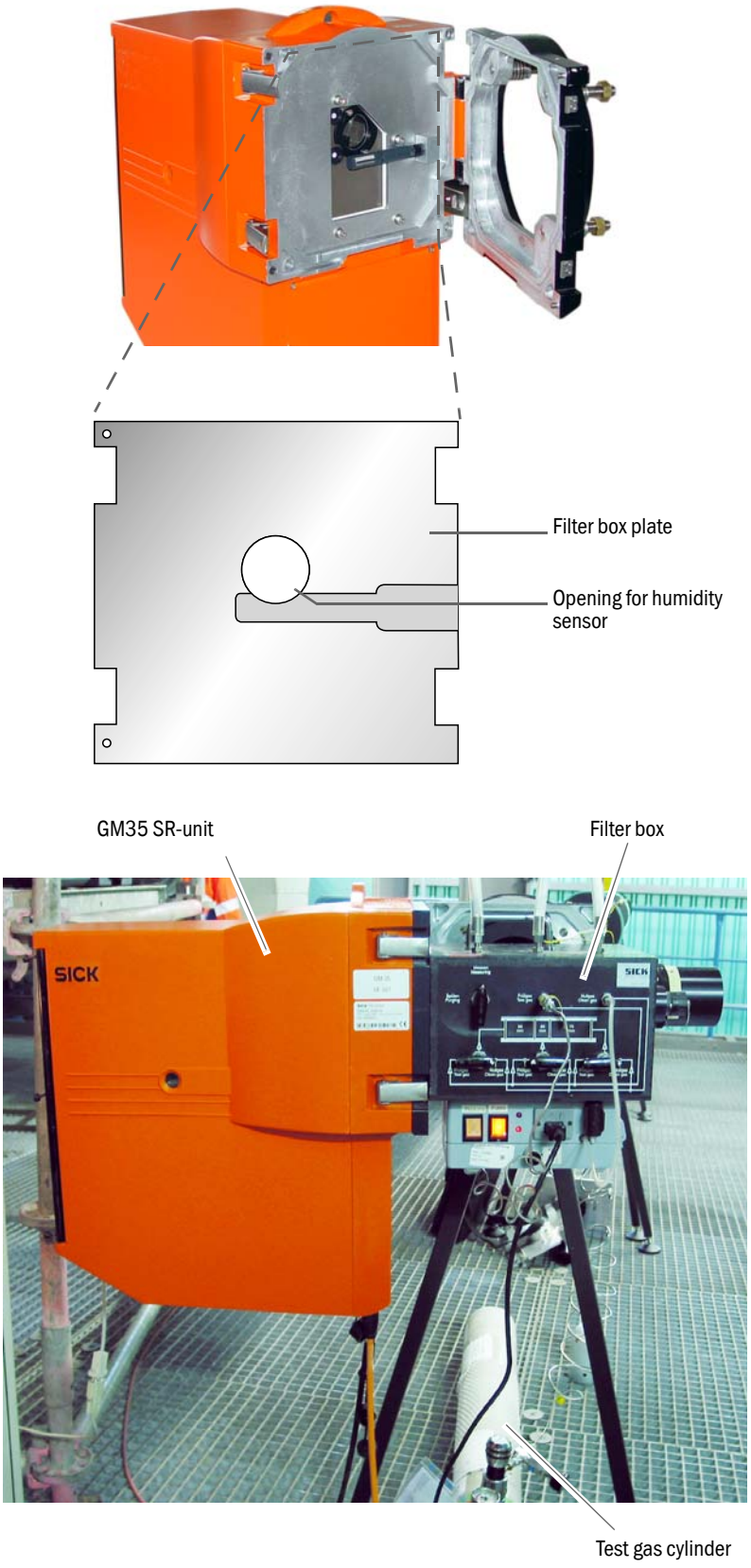


Fig. 71: Installing the filter box

- ▶ Switch the filter box on; the warming up phase takes about 2.5 hours.
- ▶ Switch on the zero gas pump or connect a different zero gas.
- ▶ Switch all chamber valves to “Zero gas” and switch the **Measuring**/**Purging** valve to “Purging”.

On the EvU:

- ▶ After about 3 minutes, select menu **Box measuring** in menu **cal** (**cal** button), then option “**gas**”.
- ▶ Enter password “**1 2 3 4**”.

  The measuring device carries out a zero adjust and then switches to operating mode “**Box measuring**”.

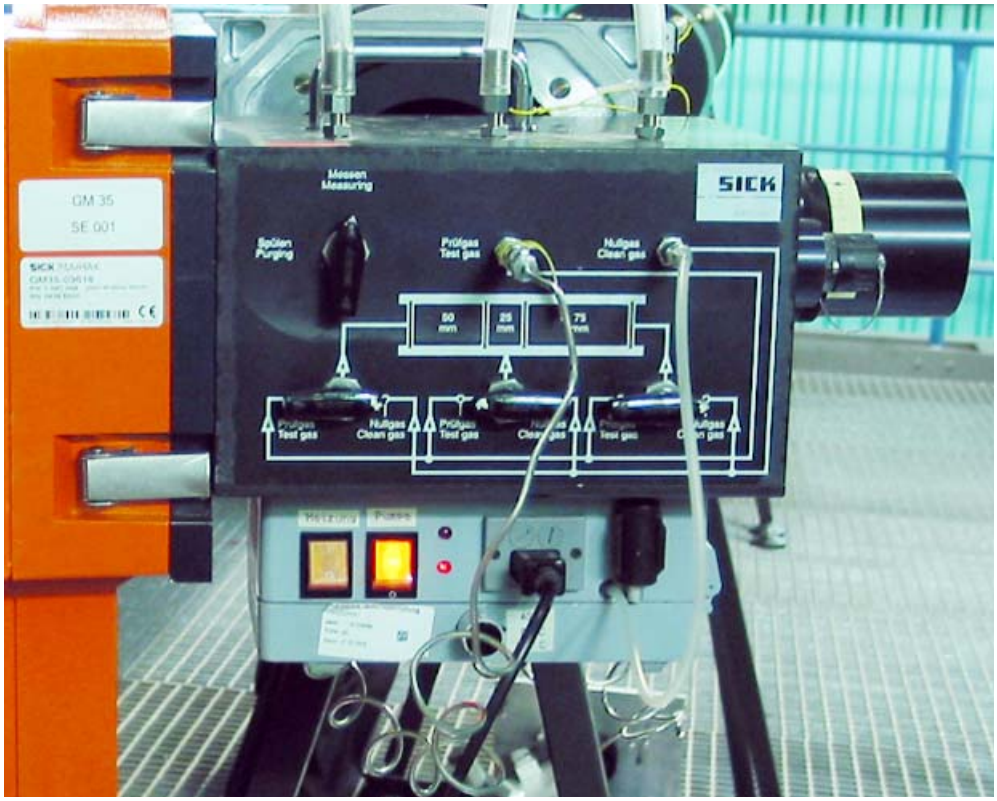


Fig. 72: Control elements on the filter box

- ▶ Connect test gas; set the primary pressure to approx. 1000 hPa (1 bar).
- ▶ Note the diameters of the individual chambers/chamber combinations in the filter box and the concentration values; see “Determining the necessary test gas concentration”, page 98.
  - ▶ When doing so, set the valves for the relevant filter chambers to “**Test gas**”.
  - ▶ Switch the **Measuring**/**Purging** valve to “Purging” for 2 to 3 minutes (until the measured value has stabilized) and then to “Measuring”.

    The overpressure from the purge phase now dissipates.
  - ▶ When the measured value has stabilized again, read off and note the value.

8.6.3 Restart Measuring mode

- ▶ Purge the filter box with zero gas

On the EvU:

- ▶ Exit operating mode “**Box measuring**” by pressing **back**.
- ▶ Disassemble the filter box with plate and reflector from the SR-unit and store safely
- ▶ Refit the SR-unit back onto the measuring point in the correct position.

8.7 Filter box measurement for checking the measuring ducts of H_2O and CO_2

The grid filter box serves for checking the H_2O and CO_2 measuring duct (for products with very high concentration measuring paths) of the GM35. Filter box measurement is based on light absorption of grid filters (output of measured extinction).

Requirements

Components required:

- Grid filter box RMF.
- Filter box adapter plate with threaded holes to attach the grid filter box.

Note Measured value are displayed as extinction for both measuring channels (H_2O, CO_2).

8.7.1 Setpoint values

The RMF grid filters are calibrated. The setpoint values for the individual filters are shown on the label on the enclosure. Filters with extinction values up to 0.8, suitable for the application range of the GM35, are used. Higher extinction values exceed the warning or malfunction threshold for not sufficient signal level.

8.7.2 Carrying out measurement

- Open the SR-unit and swivel to the side.
- Attach the RMF filter box with the adapter plate to the SR-unit and secure using the quick-release fasteners: Take care not to damage the humidity sensor of the SR-unit!
- Install the reflector and set the operating lever to “**GM35**”.

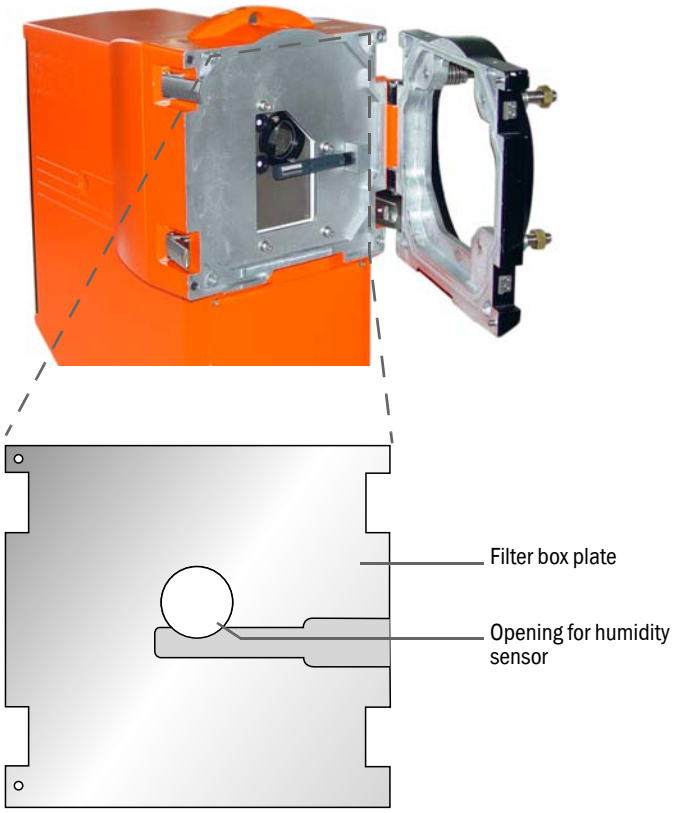


Fig. 73: Installing the filter box

- Insert the push rod for filter selection completely; at the same time, make sure the filter is swiveled out.

On the EvU:

- Select filter box mode “**Grid**”
- Enter the password “**1 2 3 4**” and wait for scaling to complete.

Measurement can start as soon as the display shows the extinction values for H_2O and CO_2.

- Select the different positions of the push rod sequentially and swivel the appropriate filter in
- When the measured value has stabilized again, read off and note the value.

Fig. 74: Measured value display on the EvU

8.7.3 Restart Measuring mode

On the EvU:

- Exit operating mode “**Box measuring**” by pressing **back**.
- Disassemble the filter box with plate and reflector from the SR-unit and store safely.
- Refit the SR-unit back onto the measuring point in the correct position.

9 Troubleshooting and Clearing Malfunctions

This Section explains how to detect, diagnose and clear malfunctions on the Gas Analyzer GM35. It is primarily aimed at the operating personnel responsible for the current operation of the measuring system as well as maintenance technicians responsible for clearing malfunctions.

9.1 Malfunction categories/possible effects

Malfunctions on the GM35 are categorized according to their anticipated effects:

Damage to the measuring system itself

Depending on the installation conditions and measuring system version, a purge air failure could cause damage to the GM35. “Purge air failure”, page 105 describes the necessary emergency and protective measures.

9.2 Purge air failure

Failure of the purge air supply demands measures to be taken immediately or within a short time, depending on the installation conditions, to protect the measuring system. A purge air failure, however, rarely occurs in practice. It is still however wise to be prepared for such an occurrence to prevent damage to the measuring system.

Indications of a potential purge air failure

- Error message on systems that are equipped with a pressure difference sensor
- Purge air unit power supply failure
- Increase in the enclosure temperature of the GM35 SR-unit
- Rapid increase in contamination on the optical interface of the SR-unit
- Hose for the purge air supply to the purge air fixture is visibly loose or damaged.

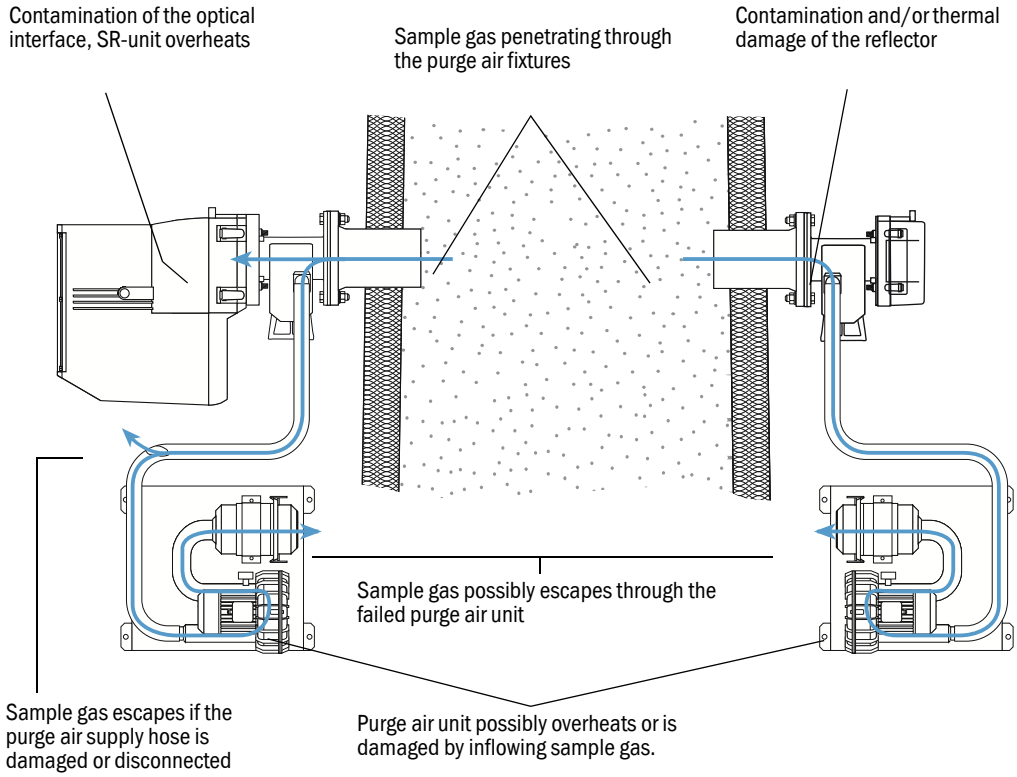


Fig. 75: Possible consequences of a purge air failure

Tools for troubleshooting

- Suitable protective equipment (protective clothing, protective gloves, etc.) that enable the gas duct to be opened safely and the SR-unit and reflector removed under the given installation conditions (hot/corrosive/noxious/dusty sample gases, overpressure in the duct).
- 2 wrenches to remove the SR-unit and reflector and, possibly, other tools required to restore the power supply.
- Flange cover to seal off the flange opening when the measuring system is removed.

9.3 Integrated monitoring and diagnosis system

The GM35 is equipped with an integrated system that constantly monitors the operating state of the SR-unit and evaluation unit. Appropriate messages are generated and logged in the devices for subsequent evaluation should any deviations from normal operating states occur.

Messages for the two system components are categorized into error messages and warning messages depending on the anticipated effects:

- Warning messages are generated if the measurement results are not (yet) directly affected by the change in the system state. Nevertheless, it is important that the cause(s) be investigated and corrected, e.g. by means of maintenance measures, to avoid further malfunctions and damage to the device in particular.
- Error messages are generated when measuring operation is no longer possible or no longer reliable.

These warning and error messages are stored in the integrated message memory of the evaluation unit.

Message signaling and retrieval on the evaluation unit

Operation
Service
Warning
Malfunction

Component/Tool	Signal	Remark
Front panel Evaluation unit	**Warning LED** goes on	Functional impairment on system that will not directly lead to corrupt measured values.
	Malfunction LED blinks	Functional impairment on system that can lead to system failure or restricted function.
Diagnosis mode Error memory	▶ Call up menu **Error**	Plain-text message(s) for errors that have occurred to localize and clear the problem. See “Troubleshooting Table”.
Warning memory	▶ Call up menu **Warning**	Plain-text message(s) for pending warnings
Output for serious problems (malfunction, error message)	Relay 1 inactive*	Group malfunction

diag

Diagnosis
▶ Malfunction
Warning
Sensor values
Check values
← back

* The relay is active during normal operation (no malfunction), i.e. the contact is closed.

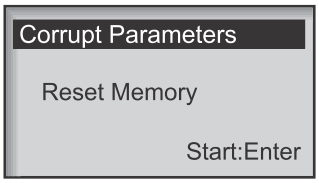
Procedure

Troubleshooting Table

If a warning or malfunction is signaled, first call up pending error messages in the Error menu. Then localize the possible cause and clear the malfunction; see Troubleshooting Table.

Error indication	Possible cause	Clearance
• **LED Malfunction** blinks; (**LED Warning** could go on) • Relay 1: **Group malfunction**	Plain-text error messages indicate possible causes	▶ Start **Diagnosis mode (diag)**: – Call up menu **Error** (or **Warning**) – Check and clear the specified malfunction.

9.3.1 Troubleshooting and clearing malfunctions, evaluation unit

Error description/message	Component/possible cause	Clearance
Evaluation unit not responding	Evaluation unit: • Evaluation unit power supply defective	▶ Check power supply on all system components: – If necessary, provide power supply on site – If necessary, check/reconnect connections on the system components
	Evaluation unit: • Incorrect operating voltage	▶ Check operating voltage set on the evaluation unit: – If necessary, change setting
	Evaluation unit: • Defective fuse	▶ Check fuse in the evaluation unit: – If necessary, replace fuse
	Evaluation unit: • No defect localized yet	▶ Disconnect all system components from the power supply and reconnect one at a time – Check the CAN bus cable from the evaluation unit to the SR-unit resp. terminal box
	Evaluation unit: • Error occurs again	▶ Replace the last component connected, contact Service
	Evaluation unit: • 24V/5V supply defective	▶ Check 24V/5V supply, replace evaluation unit resp. electronic board module; contact Service
	Evaluation unit: • Inconsistent data detected in parameter memory	▶ Press Enter to restart the system; the factory parameter settings are then active; ▶ If necessary, reconfigure the parameters ▶ If the same error message occurs again, replace the EvU and contact Service

9.3.2 Error messages

The following error messages, which can be displayed on the evaluation unit, refer to the GM35 SR-unit and the purge air fixtures.

Error message	Component/possible causes	Clearance
CDOH: No communication SLV	CAN connection EvU – purge air fixture SR interrupted	▶ Check CAN connection; disconnect and reconnect plug, repair if necessary.
CDR: No communication SLV	CAN connection EvU – purge air fixture reflector interrupted	▶ Check CAN connection; disconnect and reconnect plug, repair if necessary.
CO Ampl. Max **N_2O Ampl. max**	CO (N_2O) -measurement amplifier above dynamic range	▶ Check alignment; see page 92. ▶ Clean optical surfaces, page 90/page 91. ▶ Contact Service.
CO com. (**N_2O** com)	No connection between CO_2/H_2O module with CO (N_2O) module	▶ Check cable connection is secure with correct seat; repair it in the GM35 when necessary. ▶ If the error cannot be cleared: Contact Service.
CO CUVETTE com. **N2O CUVETTE com**	No connection of CO (N_2O) module with CO (N_2O) cell motor	▶ Contact Service.
CO CUVETTE range **N2O CUVETTE range**	• CO (N_2O) duct in reference cycle outside expected range • CO (N_2O) cell may be leaking	▶ Exchange the measurement module or contact Service.
CO div. Zero **N_2O div. zero**	CO (N_2O) module adjustment data invalid	▶ Contact Service.
CO EEPROM **N_2O EEPROM**	Invalid parameter set for CO (N_2O) module	▶ Carry out zero adjust on GM35; see page 79. ▶ Contact Service.
CO Motor fault **N_2O Motor fault**	Motor fault on CO (N_2O) filter wheel	▶ Contact Service.
CO No signal **N2O No signal**	• CO(N_2O)- signals too low; measurement not possible • Dust content too high • CO(N_2O) detector or IR source defective H_2O-, CO_2 measuring ducts continue to run	▶ Check contamination; clean optical interfaces (see page 90f). ▶ Check optical alignment, see page 92. ▶ Exchange IR source or measurement module, or contact Service.
CO Sig. High **N2O Sig. High**	CO(N_2O) signals distorted, H_2O, CO_2 measuring ducts continue to run	▶ Carry out zero adjust, see page 80.
CO temp. detec. **N2O temp. detec.**	CO(N_2O) detector temperature outside tolerance	▶ Contact Service.
EI too hot SLV	Electronics too hot	▶ Improve SR-unit cooling system.
Filter com.	No connection between CO_2/H_2O module and motor of check filter	▶ Contact Service.
H2O Ampl. Max	CO_2/H_2O measurement amplifier above dynamic range	▶ Check alignment; see page 92. ▶ Clean optical surfaces, see page 90/page 91. ▶ Contact Service.

Error message	Component/possible causes	Clearance
H2O CUVETTE com.	No connection between CO_2/H_2O module and motor of cell	▶ Contact Service.
H2O div. Zero	CO_2/H_2O module adjustment data invalid	▶ Carry out zero adjust, see page 80. ▶ Contact Service.
H2O EEPROM	Invalid parameter set for CO_2/H_2O module	▶ Carry out zero adjust on GM35; see page 79. ▶ Contact Service.
H2O Motor fault	Motor fault on CO_2/H_2O filter wheel	▶ Contact Service.
H2O No signal	• H_2O signals too low; measurement not possible • Dust content too high • H_2O detector or IR source defective CO (N_2O) measuring duct continues to run	▶ Check contamination; clean optical interfaces (see page 90f). ▶ Check optical alignment, page 92. ▶ Exchange IR source or measurement module, or contact Service.
H2O Sig. High	CO_2/H_2O measurement signal distorted	▶ Readjustment necessary, see page 80. ▶ Contact Service if necessary.
H2O temp. detec.	CO_2/H_2O detector temperature outside tolerance	▶ Contact Service.
Mirror adj. End	Automatic beam tracking at end stop, further tracking not possible	▶ Check alignment; see page 92. ▶ Contact Service.
Mirror com.	No communication with automatic beam tracking; measurement continues to run	▶ Contact Service.
Sensor communication	No connection between EvU and GM35	▶ Check CAN connection, repair if necessary.
VISOR com.	No connection between CO_2/H_2O module and visor unit	▶ Check cable connection is secure with correct seat; repair if necessary. ▶ If the error cannot be cleared: Contact Service.
VISOR fault	Visor unit data invalid or signals distorted	▶ Check alignment; see page 92. ▶ If no display seen in visor during alignment or if message remains despite correct alignment, contact Service.
VISOR init.	Visor default setting invalid	▶ Contact Service.
VISOR No signal	• Visor signals too low • Dust content too high • IR source defective Measurement continues to run	▶ Check contamination; clean optical interfaces (see page 90f). ▶ Check optical alignment, page 92. ▶ Exchange IR source or contact Service ▶ Carry out zero adjust after replacement, page 80.
Zero com.	No connection between CO_2/H_2O module and motor of zero point reflector	▶ Check cable connection is secure with correct seat; repair if necessary. ▶ If the error cannot be cleared: Contact Service.

9.3.3 Warning messages for the GM35 SR-unit

Warning message	Component/possible causes	Clearance
Air purge low SLV	Volume flow is below the set threshold.	▶ Check purge air supply (blower, hoses), exchange filter on purge air blower when necessary, see “Checking and replacing the purge air filter”, page 95.
Chopper freq.	Chopper disk frequency outside tolerance.	▶ Exchange lamp module; contact Service.
CD: Filter watch SLV	Low-pressure monitor of purge air unit switches on binary input.	▶ Check purge air supply (blower, hoses), exchange filter on purge air blower when necessary, see “Checking and replacing the purge air filter”, page 95.
CD: P No Signal SLV	No signal from pressure sensor.	▶ Check connection and cable connection of pressure sensor on purge air fixture and repair if necessary.
CD: P out of range SLV	Sample gas pressure < 500 or > 1200 hPa/mbar.	▶ Check resp. replace pressure sensor.
CD: T Air Sign. SLV	Broken sensor resp. no temperature sensor (purge air temperature) connected.	▶ Check connection and cable connection of temperature sensor (purge air temperature) on purge air fixture and repair if necessary.
CD: [t] No Signal SLV	Broken sensor resp. no temperature sensor (exhaust gas temperature) connected.	▶ Check connection and cable connection of temperature sensor (exhaust gas temperature) on purge air fixture and repair if necessary.
CO/N_2OLow sig.	• CO(N_2O) measuring channel contaminated. • Dust content too high. • IR source aged.	▶ Check contamination; clean optical interfaces (see page 90f). ▶ Check optical alignment, page 92. ▶ Exchange IR source or contact Service.
CO/N_2O not ready	• CO (N_2O) measurement not ready. • Signal distorted. • Warming up phase.	▶ Wait approx. 30 minutes until the operating temperature is reached. ▶ Contact Service if necessary.
CO2 Reference	Deviation of control value measurement too high.	▶ Carry out zero adjust on GM35; see page 79. ▶ Perform maintenance, see “Maintenance”, page 88. ▶ Contact Service if necessary.
H2O Low sig.	• H_2O measuring duct contaminated. • Dust content too high. • IR source aged.	▶ Check contamination; clean optical interfaces (see page 90f). ▶ Check optical alignment, page 92. ▶ Exchange IR source or contact Service.
H2O not ready	• CO_2/H_2O measurement not yet ready. • Signal distorted. • Warming up phase.	▶ Wait approx. 30 minutes until the operating temperature is reached. ▶ Contact Service if necessary.

Warning message	Component/possible causes	Clearance
H2O Reference	Deviation of control value measurement too high.	▶ Carry out zero adjust on GM35; see page 79. ▶ Perform maintenance, see “Maintenance”, page 88. ▶ Contact Service if necessary.
HYGRO com	No connection between CO_2/H_2O module and humidity sensor.	▶ Check cable connection is secure with correct seat; repair if necessary. ▶ Switch to default value. ▶ If the error cannot be cleared: Contact Service.
HYGRO internal	No communication with internal humidity sensor. • Sensor defective/cable broken.	▶ Check cable connections. ▶ Exchange sensor.
MIRROR adj.	Automatic beam tracking: Deviation of optical axis is greater than area that can be tracked.	▶ Realign optical axis between SR-unit and reflector, page 92.
MR Adjustment	Visor unit shows deviation (> 0.5 of setpoint position).	▶ Realign optical axis between SR-unit and reflector-; page 92.
Software version	EvU and SR-unit incompatible.	▶ Install compatible (current) software for EvU and SR-unit. ▶ Contact Service if necessary.
VISOR amplifier	Amplifier in visor at limit. Amplifier regulation made in check cycle; max. value 255.	▶ Check contamination; clean optical interfaces (see page 90f). ▶ Exchange IR source or contact Service ▶ Call up menu **DIAG/Sensor Values/VIS AMP MS** and check value,see “Checking the IR source”, page 93.

9.3.4 Further tips on troubleshooting

Troubleshooting on the evaluation unit

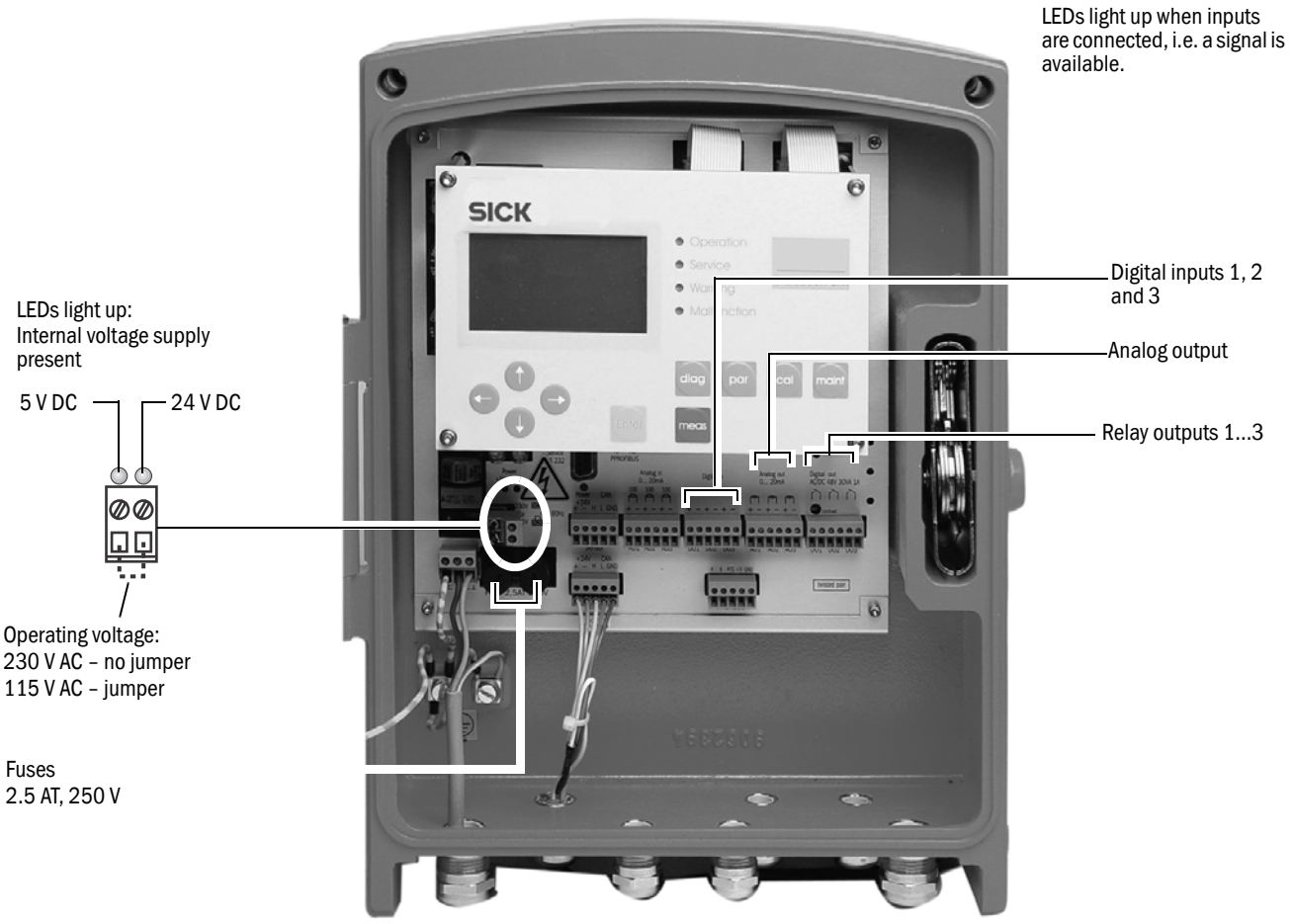


Fig. 76: LED displays, signals and fuses on the evaluation unit

Evaluation unit not responding

- Check power supply to GM35, check operating voltage setting
- Check the fuse in the evaluation unit; check the 24 V/5 V supply indicator in the evaluation unit, when doing so, remove the plug-in terminal on the cable to the receiver.
- If these indicators only light up when the plug-in connector has been removed, check the cabling first.

Communication fault between evaluation unit and GM35 SR-unit

Error message: **Sensor Communication???**

The SR-unit sends a constant stream of data to the evaluation unit; if this is not received, a prompt is output automatically. Check following connections:

- Connection between evaluation unit and SR-unit.
- Cable connection on the plug-in terminal in the evaluation unit.
- Cable to SR-unit.
- Outer plug-in connectors on SR-unit.
- Inner plug-in connectors in SR-unit.

10 Technical Data, Consumables and Spare Parts

All the technical data are provisional specifications for GM35 applications. The GM35 analyzer is calibrated for specific applications once all the technical details have been clarified.

10.1 Measuring components and accuracy

The minimum measuring range end values for the measuring components available with the different device version are specified for a 1 m measuring gap. The maximum measuring range end value for 1 m measuring gap is for

- CO: 25.000 mg/m³
- N_2O: 5.000 mg/m³
- H_2O and CO_2: 100 % by vol.

All the data refer to devices calibrated at the factory.

Measured Data	
Measuring path	Adaptable flange – flange distance 0.7...7.5 m Larger distances on request
Measuring ranges	For 1 m actual measuring path • CO: 0...225 mg/m³ • N_2O: 0 ... 120 mg/m³ • CO_2: 0...22.5 % by vol. • H_2O: 0...25 % by vol.
Accuracy	Stability relative to measuring range end value • Zero point: ± 2% • Sensitivity: ± 2% (in maintenance interval)
Suitability test	EN 2001/80/EC and /EN 2000/76/EC[1]

[1] Cross-Duct and GMP version for CO,CO_2 and H_2O

Combining measuring components

Minimum and maximum measuring range end values only apply to individual components. Extremely small or large end values for different components cannot be combined in all cases.

10.1.1 GM35 system component

GM35 Sender/receiver unit	
Measuring principle	In-situ, IR filter or gas correlation
Light source	IR source
Detectors	PbS and PbSe
Response time (t_{90})	≥ 5 s
Averaging	Can be parameterized as floating integral over 5 to 300 seconds
Interfaces	CAN bus (electrically isolated) for transferring data within the GM35 measuring system RS232 (Service interface)
Indicators	• Status LED (operation: green, maintenance: yellow, malfunction/ failure: red) • Displays the optical alignment
Protection class	IP 65 / NEMA 4x
Sample gas temperature	• 430 °C max. • N_2O: 180 °C max.
Ambient temperature	• –20 to +55 °C; other temperatures on request (tested for suitability according to minimum requirement –20 ... 50 °C)–40 °C during continuous operation
Temperature change	Max. 10 °C/h
Ambient humidity	Max. 96 % rF
Humidity condensation	Humidity condensation on optical interfaces not allowed
Shock and vibration	As defined in EN 61010-1
Storage temperature	–30 to +55 °C
Power supply	115/230 V AC ±10%, 48 – 62 Hz
Power input	350 VA max.
Dimensions (WxHxD)	291 x 530 x 570 mm
Weight	29 kg

Table 6:

GM35 Reflector unit	
Reflector material	Gold-coated hollow triple
Protection class	IP 65 / NEMA 4x
Dimensions (L x ∅)	140 x 133 mm
Weight	1.5 kg

GM35 Purge air fixtures	
Integrated sensors	• Flow monitor to monitor purge air feed • Temperature sensor (purge air) • Pressure sensor
Data transfer	CAN bus (electrically isolated)
Dimensions (L x ∅)	220 x 240 mm
Weight	7 kg

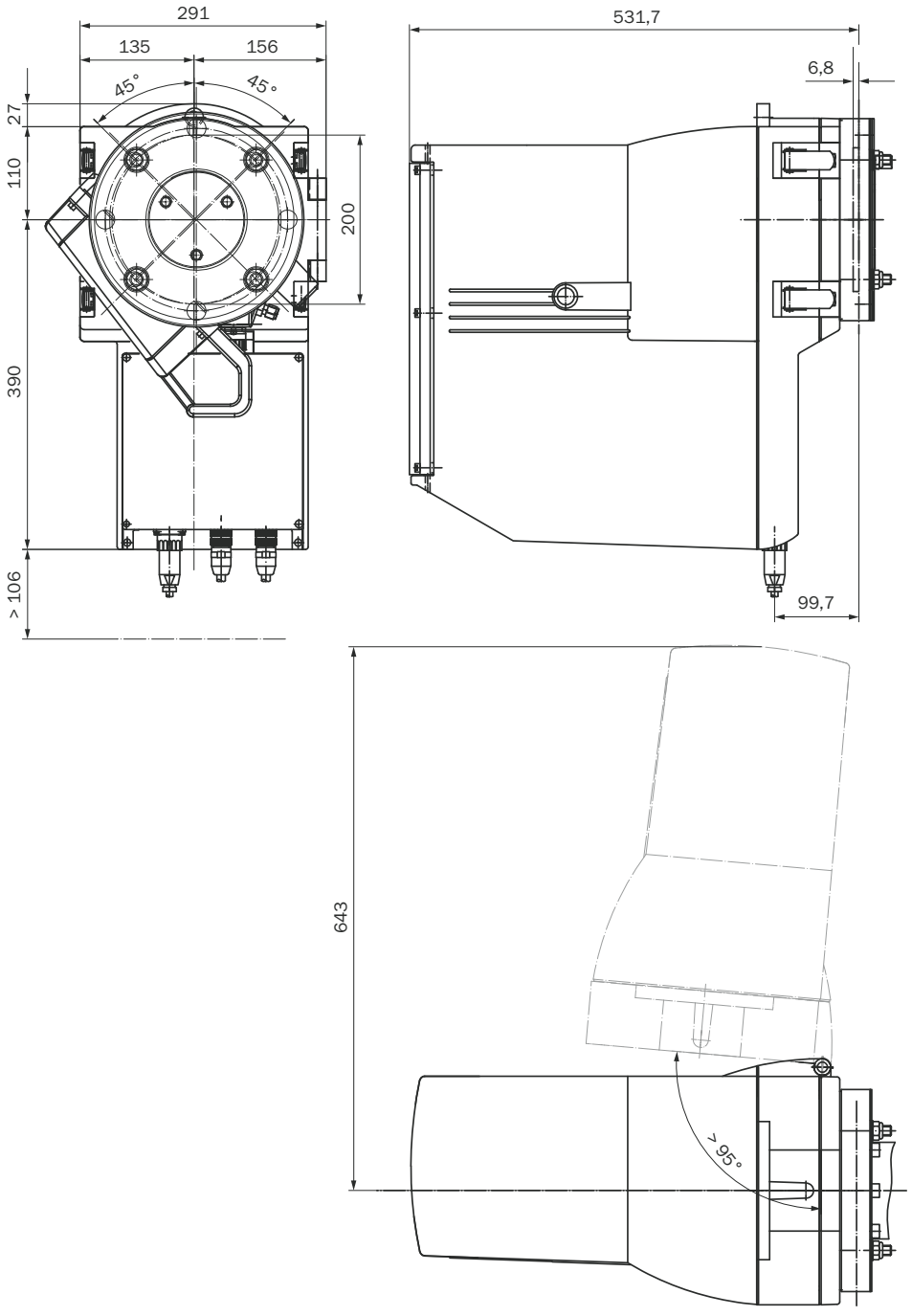
Purge air unit	
Power supply (three-phase)	Δ 200–240 V, Y 345–415 V at 50 Hz Δ 220–275 V, Y 380–480 V at 60 Hz
Rated current	Δ 2.6 A / Y 1.5 A at 50 Hz Δ 2.3 A / Y 1.3 A at 60 Hz
Motor rating	0.35 kW at 50 Hz 0.45 kW at 60 Hz
Flow rate	Min. 40 m^3/h
Dimensions (WxHxD)	550 x 550 x 270 mm
Weight	14 kg

GM35 Evaluation unit (EvU)		
Connections/interfaces		
Data transmission within the GM35 measuring system		CAN bus • Max. line length 1000 m • Electrically isolated • Connects the EvU to the SR-unit
Service interface for PC		RS 232 • Connection via 9-pole Sub-D socket
Analog outputs	3 pcs	Output range: 0–20 mA, max. 500 Ω, electrically isolated, live zero adjustable to 4 mA
	A1–A3	Measured values; assignment can be set individually
Analog input		0 ... 20 mA, 100 Ω
Status outputs	3 pcs	Relays DC max. 30 W, 48 V, 1 A AC max. 60 VA, 48 V, 1 A
	R1	Failure (NC contact)
	R2	Maintenance request (NO contact)
	R3	Function control (NO contact)
Status inputs	3 pcs	Inputs for connecting potential-free contacts (loadable with 24 V; supplied by GM35 evaluation unit)
	E1	Check cycle
	E2	Autocal in preparation
Power supply		
Voltage/frequency		115/230 V AC ±10%; 50/60 Hz
Power input		50 VA max.
Dimensions, weight, protection class		
Protection class		IP 65 / NEMA 4x
Dimensions		see dimension drawing from page 118

10.2 Dimension drawings

10.2.1 GM35 SR-unit dimensions

Fig. 77: GM35 SR-unit dimensions



10.2.2 Purge air fixtures dimensions

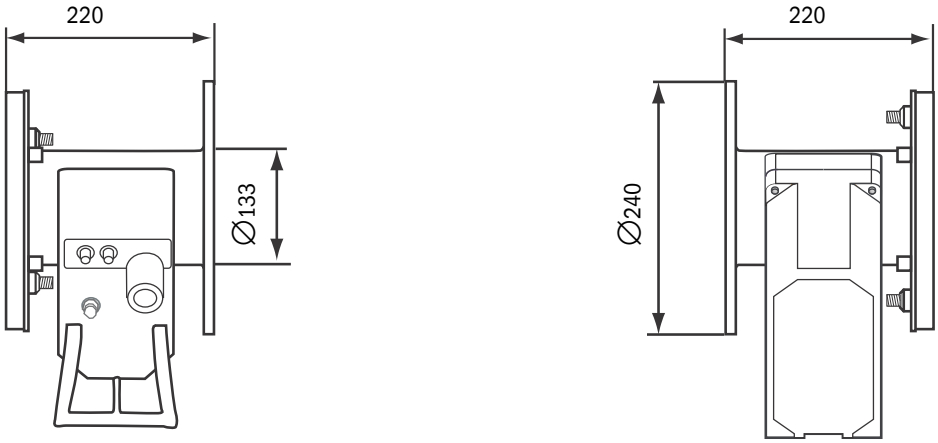
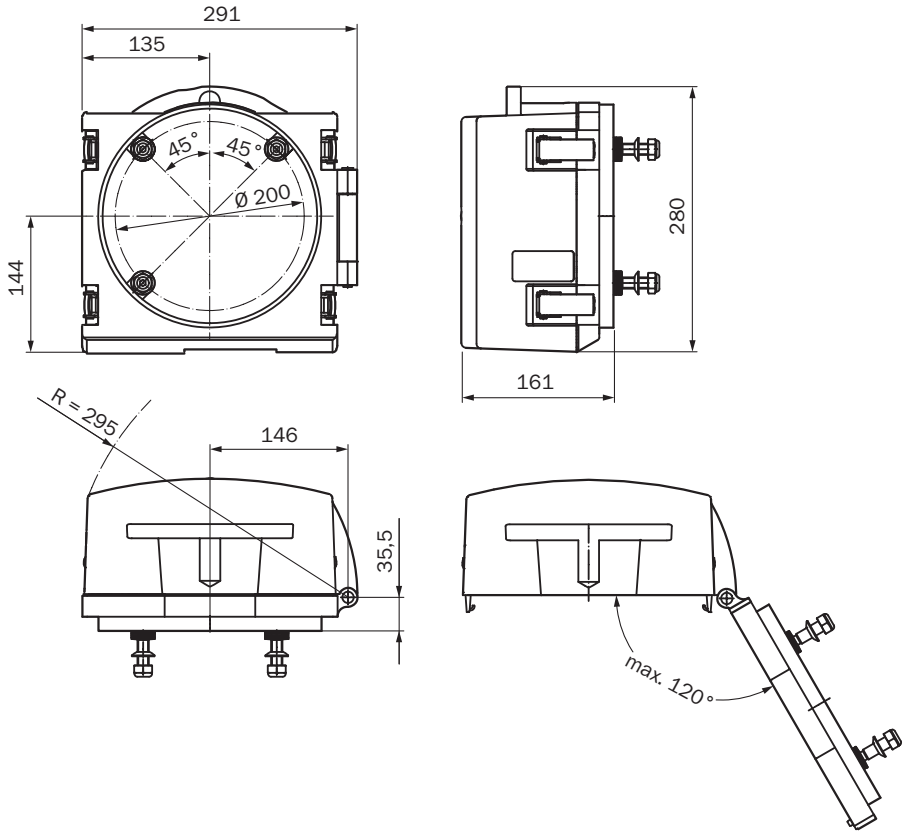


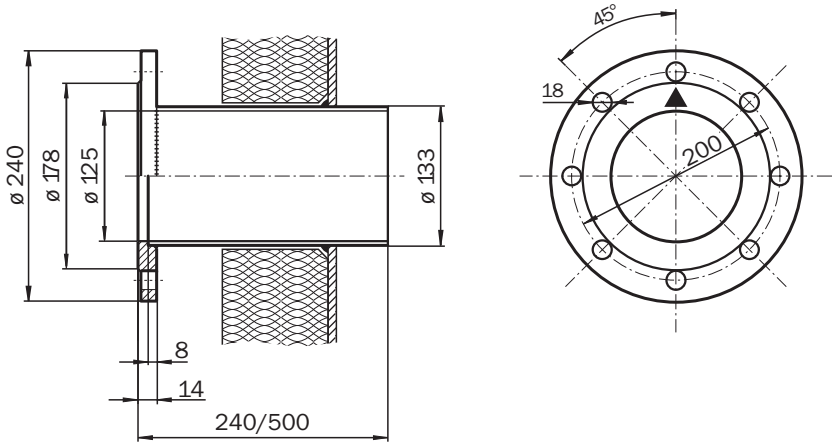
Fig. 78: Purge air fixtures for SR-unit and reflector dimensions

10.2.3 GM35 reflector dimensions

Fig. 79: Reflector dimensions



10.2.4 Flange with tube dimensions



Versions deliverable from stock

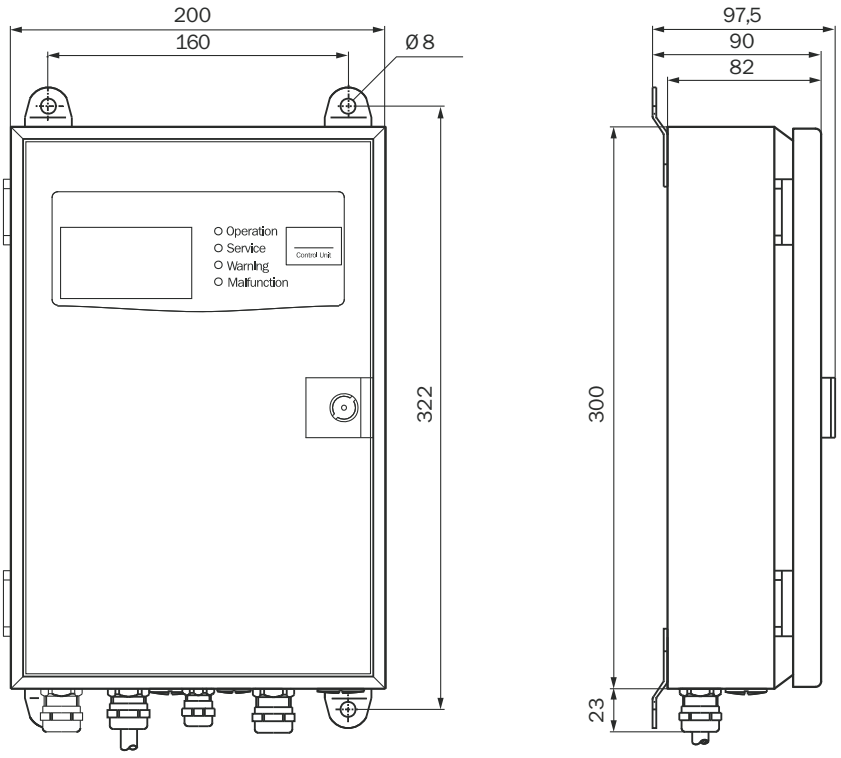
Part No.	Material	Length [mm]
2016807	ST37	240
2016808	1.4571	240
2017785	ST37	500
2017786	1.4571	500

Alternatively, an ANSI flange provided by the customer can be used.

Fig. 80: Flange with tube for installing the GM35 SR-unit on the duct

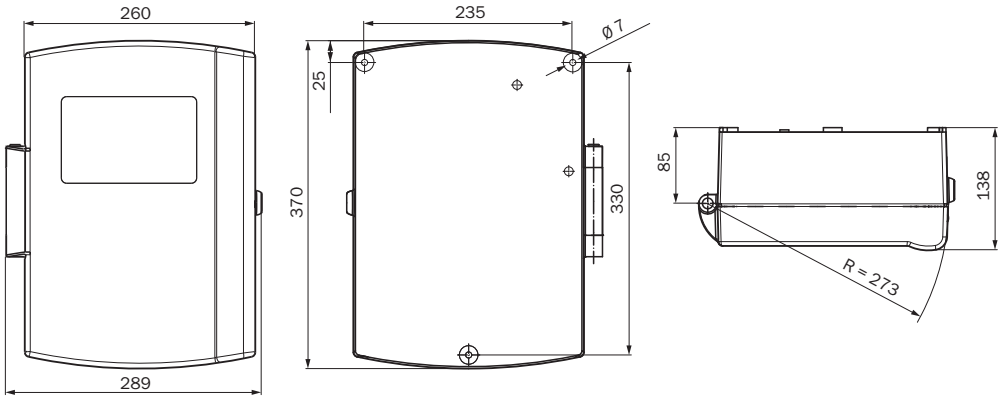
10.2.5 Dimension drawing of GM35 evaluation unit, sheet metal enclosure

Fig. 81: Dimensions of GM35 evaluation unit, sheet metal version



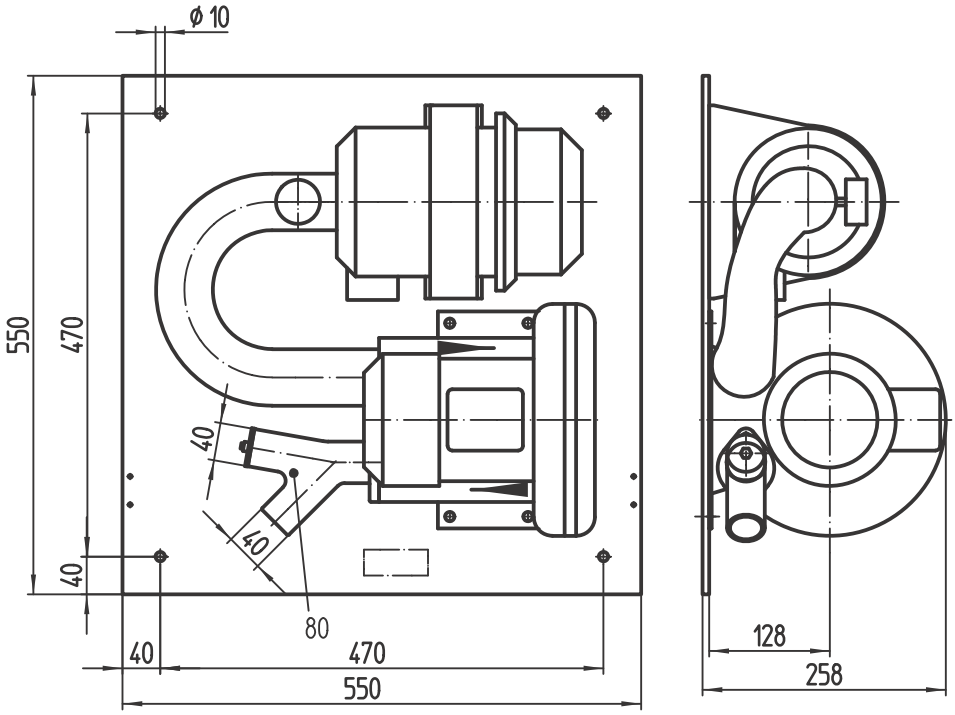
10.2.6 Dimension drawing for GM35 evaluation unit, cast metal enclosure

Fig. 82: Dimensions of GM35 evaluation unit, cast metal enclosure version



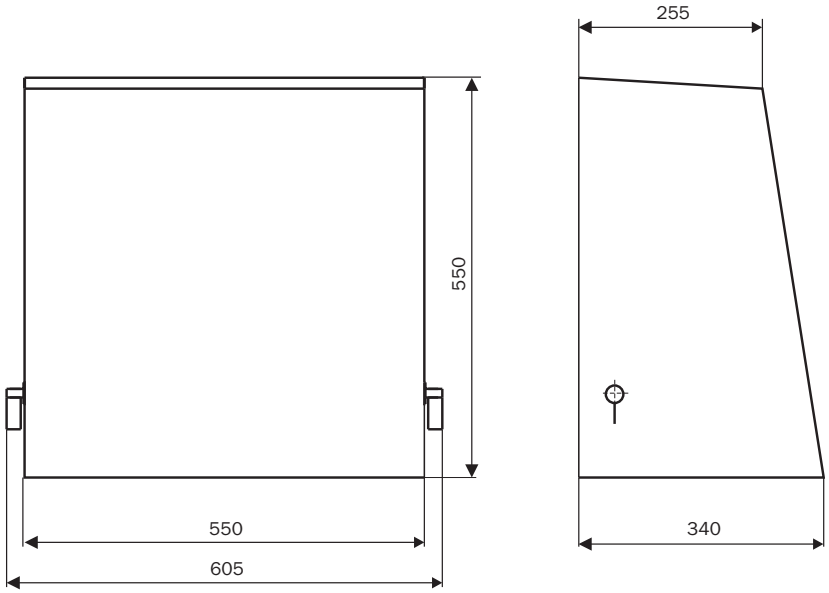
10.2.7 Purge air unit dimensions

Fig. 83: SLV4 dimensions



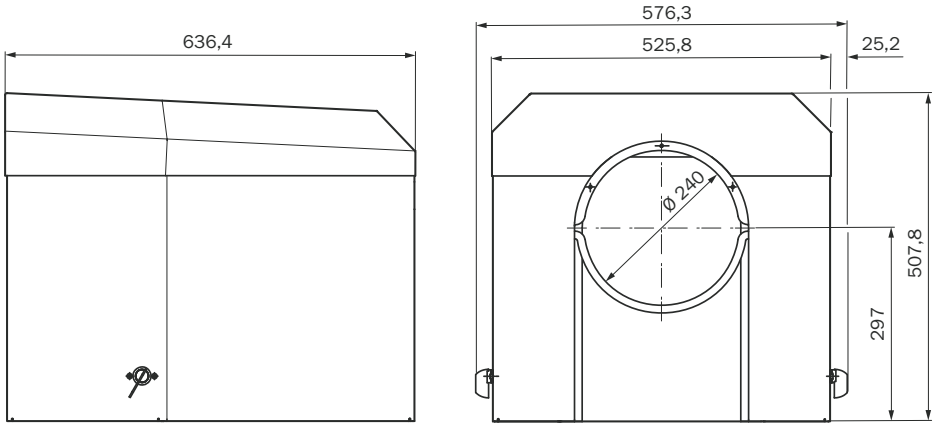
10.2.8 Weatherproof cover for purge air unit(s) dimensions

Fig. 84: Weatherproof cover for purge air unit



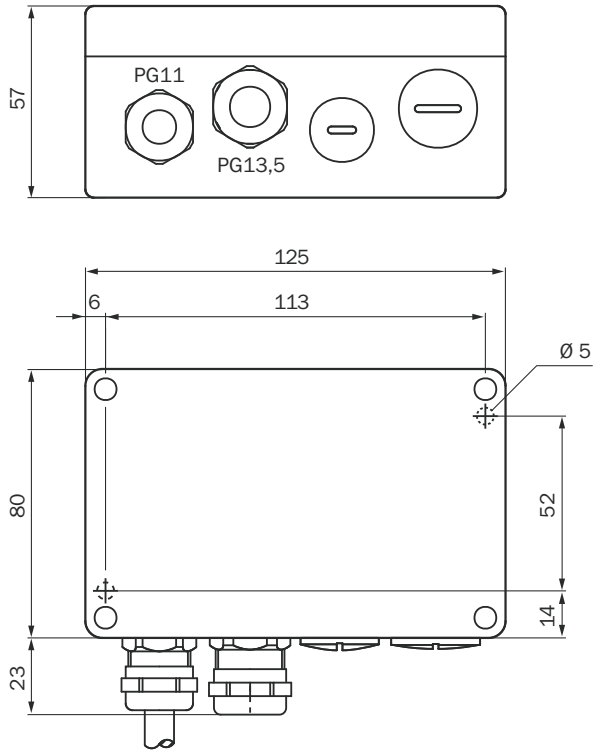
10.2.9 Weatherproof cover for SR-unit dimensions

Fig. 85: Weatherproof cover for GM35 SR-unit



10.2.10 Terminal box for CAN bus connection dimensions

Fig. 86: Terminal box for CAN bus (option) dimensions; Part No. 2031677



10.3 Accessories, expendable and spare parts

Please contact your local sales partner for order data for further spare parts as well as prices and packing units.

10.3.1 Consumable parts for 2-years operation

Table 7: Consumable parts for 2-years operation

Part No.	Name
4003353	Optical cleaning cloth
5306091	Filter element Micro-Topelement C11 100
5306091	Filter element, Micro-Top-Element
6010378	Lithium battery 3.00 V CR2032
2008475	Drying agent cartridge, reflector unit

10.3.2 Spare parts for the sender/receiver unit

Fig. 87: Position of spare parts for the SR-unit

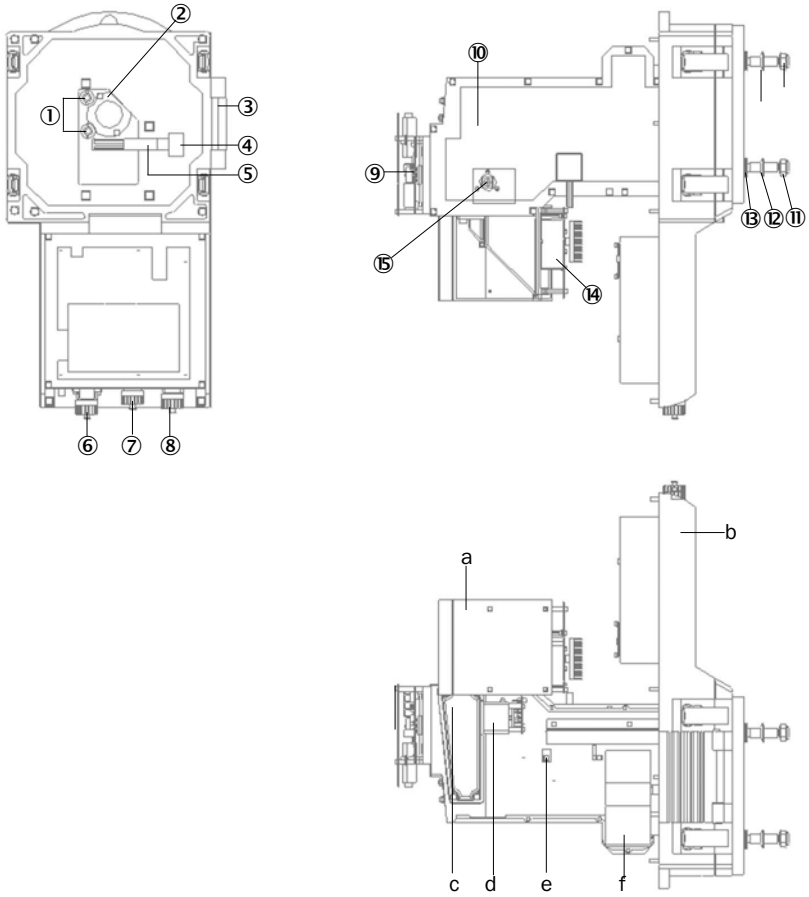


Table 8: Spare parts for the SR-unit

Part No.	Spare part
2061616	N_2O measuring module, calibrated
2060797	CO measuring module, calibrated (available precalibrated for certain applications)
2060801	H_2O/CO_2 measuring module, calibrated (available precalibrated for certain applications)
2043952	IR source module and chopper
2030344	Power supply module
2030345	VIS visor module
2058773	Sensor for ambient humidity, hygroclip, spare parts set
2058671	Plug, wired, hygroclip connection
2023518	Pivoted segment, control filter, CO
2064480	Pivoted segment, control filter, N_2O
2017325	Pivoted segment, zero point reflector (NPR)
2023515	Motor with electronic board, zero point reflector (NPR)
2023516	Frame for front window
2023448	Motor with electronic board (control filter segment)
2017339	Optics cover with visor and heating
2017334	Cover, SR enclosure
2023527	Plug, mains connection
2020020	CAN connection, SR-unit, plug

Part No.	Spare part
2020432	CAN connection, SR-unit, socket
2024027	Cable harness
2023799	Temperature sensor, heating control, SR enclosure
2029931	Pressure equalization element (SR-unit)
2023687	CAN connection cable, 4 m in length
2023688	Power cable, SR-unit or reflector 3 x 1.5, 4 m
2023 704	CAN bus cable, reflector – SR-unit 3 x 2 x 0.74, 0.6 m
2 027404	Transport protection
2040863	Spare parts set, filter wheel housing with motor and lens H_2O
2032125	Spare parts set, cell wheel housing with motor and lens CO, N_2O
2031569	Spare parts set, automatic beam tracking R1090 FD4M5–7M5, 4.5...7.5 m
2031570	Spare parts set, automatic beam tracking R1000 FD2M3–4M0, 2.3...4.0 m
2031571	Spare parts set, automatic beam tracking R960 FD1M5–2M3, 1.5...2.3 m
2031572	Spare parts set, automatic beam tracking R878 FD0M5–1M5, 0.7...1.5 m

10.3.3 Spare parts for the reflector unit

Table 9: Spare parts for the reflector unit

Part No.	Spare part
2032759	Hollow triple, lens, seal; 0.9 m
2032760	Hollow triple, lens, seal; 1.5 m
2032761	Hollow triple, lens, seal; 2.0 m
2032762	Hollow triple, lens, seal; 2.5 m
2032763	Triple R520, Suprasil 300; 0.9 m
2032 64	Triple R878, Suprasil 300; 1.5 m
2032765	Triple R1090, Suprasil 300; 2.0 m
2032766	Triple R1250, Suprasil 300; 2.5 m

10.3.4 Spare parts for purge air fixture – SR side

Fig. 88: Position of spare parts for the purge air fixture, SR side

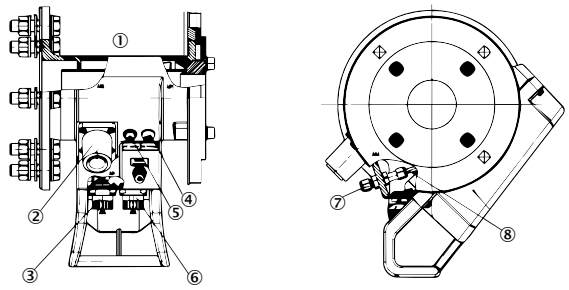


Table 10: Spare parts purge air fixture, SR-unit

	Part No.	Spare part
①	2031895	Electronic board
②	2031228	Purge air nozzle, 90 m3
	5308390	O-ring, 42 x 2
	5 04299	O-ring, 8 x 2
	5303806	Screw, M5 x 12
③	2020020	CAN connector (male)
	6007488	Protection cap
④	2032031	Plug, purge air unit

	Part No.	Spare part
⑤	2 031 202	Plug, PT 1000
	2 020 432	CAN connector (female)
⑥	6 007 489	Protection cap
⑦	5 309 133	Swagelok union
	5 309 134	1/4" plug
⑧	5 312 915	Hose, 6.4/4.3 mm
	5 311 127	Gasket, 12/15.5 x 1.5
	5 309 138	Hose inlet support

10.3.5 Spare parts for purge air fixture - reflector side

Fig. 89: Position of spare parts for the purge air fixture, reflector side

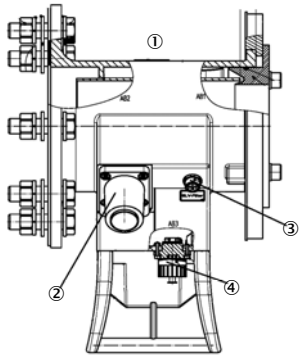


Table 11: Spare parts for purge air fixture, reflector

	Part No.	Spare part
①	2031895	Electronic board
②	2031228	Purge air nozzle, 90 m3
	5308390	O-ring, 42 x 2
	5 04299	O-ring, 8 x 2
	5303806	Screw, M5 x 12
③	2032031	Plug, purge air unit
④	2020020	CAN connector (male)
	6007488	Protection cap

10.3.6 Spare parts for the evaluation unit

Part No.	Name
2 021 795	PCB system control
6 021 782	Fuse 250 V, D8.5 x 8
6 020 125	Locking cap, fuse D5 x 20
6 007 328	Jumper, pluggable
6 020 400	Membrane keyboard
2 017 329	Hinge pin
6 010 378	Lithium battery 3.00 V CR2032

10.3.7 Spare parts for purge air unit

Part No.	Name
5 306 090	Air filter, complete, Europiclon
5 306 091	Filter element, Micro-Top-Element
4 708 971	Distributor, 2xDN40
4 022 766	Purge air hose, DN40, length 5 m
5 700 520	Hose clamp, DN40-60x12

10.3.8 Fixing accessories

Fixing accessories for purge air fixture - flange

Part No.	Name
5 700 457	Screw, 6 Kt M16x60-A2
5 700 482	Washer, A17-A2
5 700 471	Nut, 6 Kt M16 A2
5 700 480	Lock washer, A16

Fixing accessories for SR-unit

Part No.	Name
5 700 484	Cup springs A25
5 700 472	Nut, SSI M12
5 700 494	Spherical washer
2 017 329	Hinge pin for GM35 flange fixture
4 023 743	Sealing tape

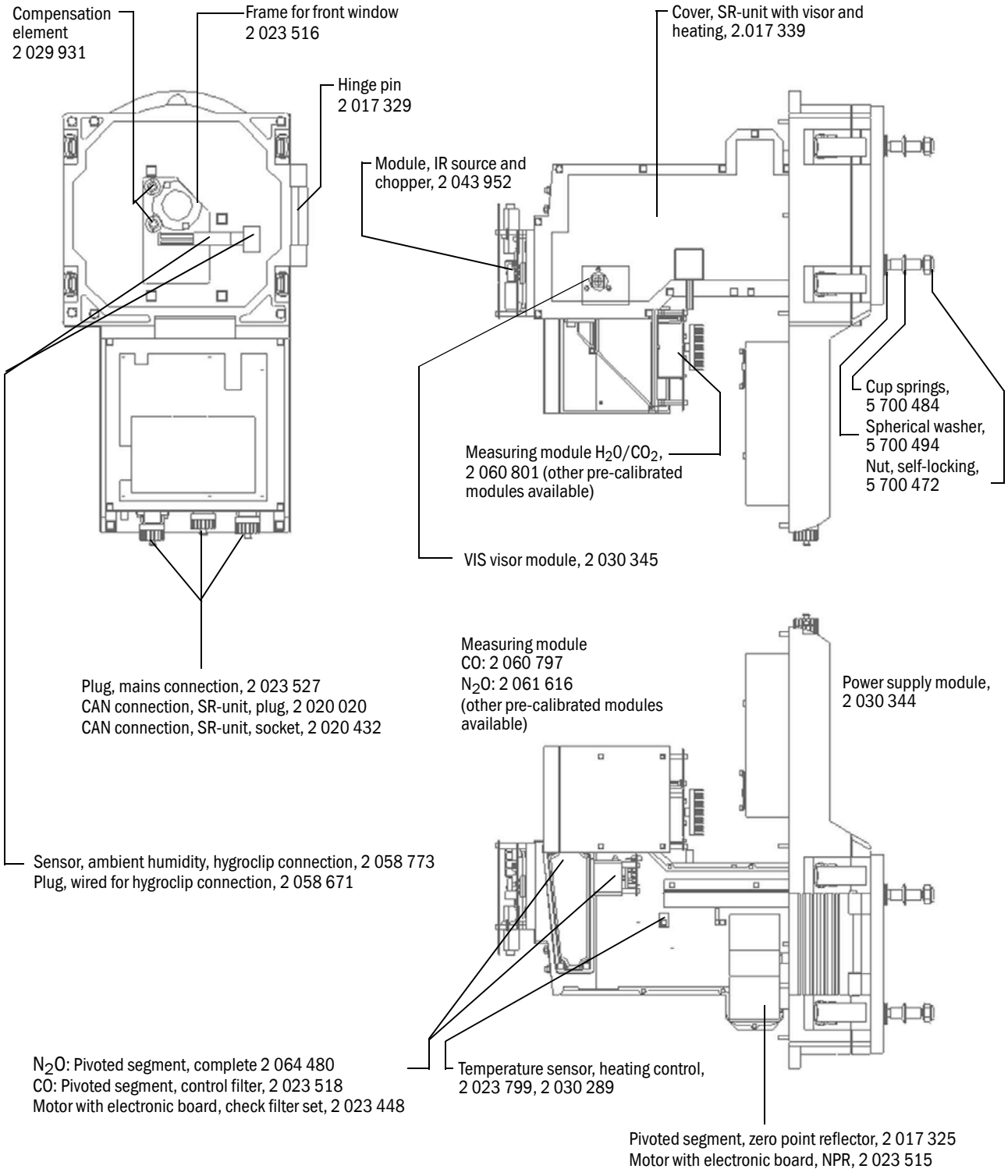
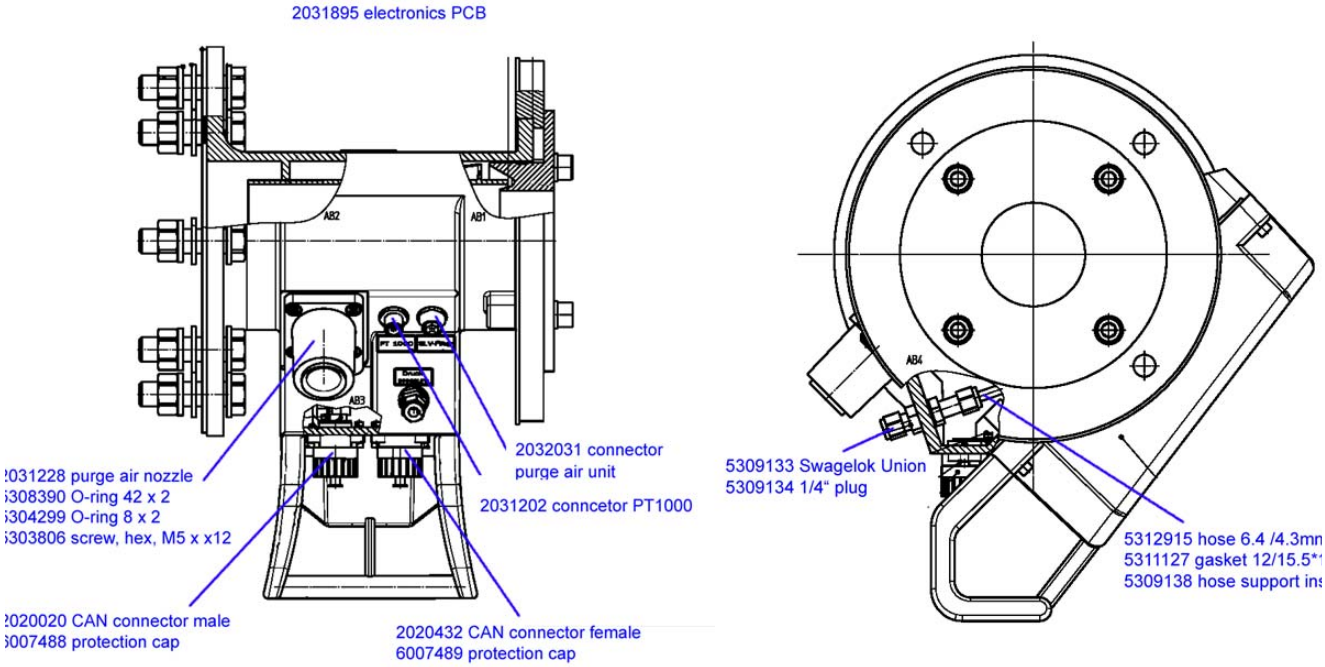


Fig. 90: Spare parts assignment for GM35 SR-unit

Purge air fixture, SR side



Purge air fixture, reflector side

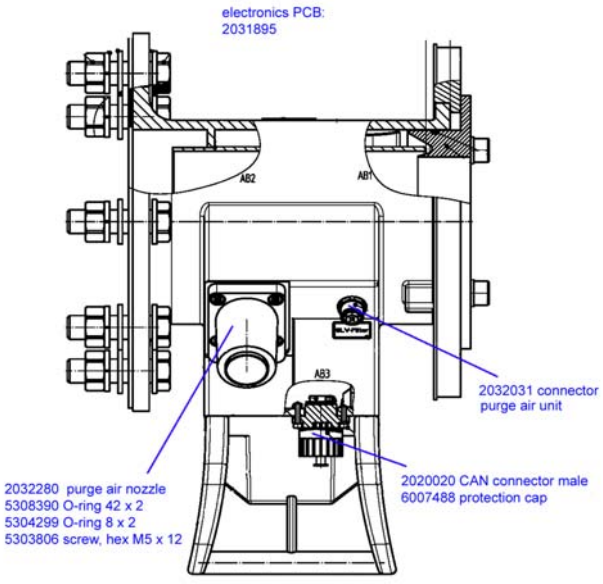


Fig. 91: Spare parts assignment for GM35 purge air fixtures

8009441/YN36/2015-08

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