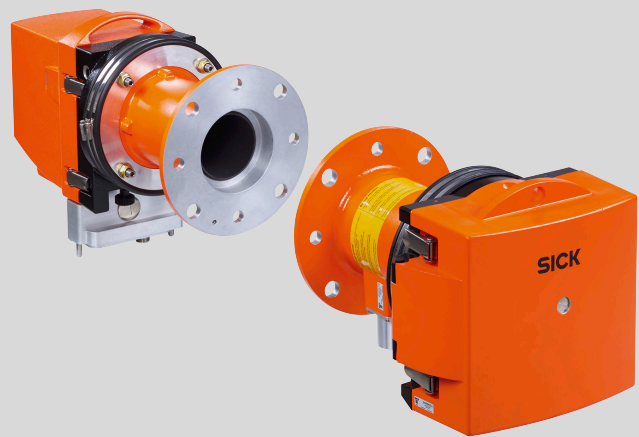


GM700 Ex

Gas Analyzer,
Cross-Duct Version

SICK
Sensor Intelligence.



Described product

GM700 Ex

Cross Duct version

Version GM700-05, GM700-09

Manufacturer

SICK AG

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Production location

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1 About this document

1.1 Function of this document

These Operating Instructions describe:

- Device components
- Installation
- Operation
- Maintenance work required for reliable operation

1.2 Scope of application

These Operating Instructions are only applicable for the measuring device described in the product identification.

They are not applicable for other SICK measuring devices.

The standards referred to in these Operating Instructions are to be observed in the respective valid version.

1.3 Target groups

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

Operation

The device may only be operated by qualified persons who, based on their device-specific training and knowledge as well as knowledge of the relevant regulations, can assess the tasks given and recognize the hazards involved.

Installation and maintenance

Installation and maintenance may only be carried out by trained specialists familiar with the installation conditions.

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

1.4 Further information

- Operating Instructions of the purge air supply
- Final inspection record
- Operating Instructions of test tool GMK10
- Operating Instructions, filter box

3G / Zone 2

- Manual, Pressurized enclosure FS840 and purge medium valve



NOTE

- ▶ Observe all documents provided.
-

1.5 Data integrity

SICK AG uses standardized data interfaces such as, for example, standard IP technology, in its products. The focus here is on product availability and features.

SICK AG always assumes that the customer is responsible for the integrity and confidentiality of data and rights involved in connection with using the products.

In all cases, the customer is responsible for the implementation of safety measures suitable for the respective situation, e.g., network separation, firewalls, virus protection and patch management.

1.6 Symbols and document conventions

1.6.1 Warning symbols

Table 1: Warning symbols

Symbol	Meaning
	Hazard (general)
	Hazard by voltage
	Hazard by explosive substances
	Hazard by inflammable substances
	Hazard by oxidizing substances
	Hazard by laser radiation
	Hazard by toxic substances
	Hazard of suffocation due to harmful substances
	Hazard by high temperature
	Hazard for the environment/nature/organic life

1.6.2 Warning levels / Signal words

DANGER

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

WARNING

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

CAUTION

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

Notice




Hazard which could result in property damage.

Note

Hints

1.6.3 Information symbols

Table 2: Information symbols

Symbol	Significance
	Information on consistency of the product relative to Guideline 2014/34/EU (ATEX)
	Important technical information for this product
	Important information on electric or electronic functions

2 Safety information

2.1 Main operating information

Work on the device



WARNING

Risk of explosion

Work on the device assumes an Ex free zone at the installation location otherwise there is an explosion risk.

- ▶ Ensure the work area is Ex free when working on the device.
-



CAUTION

Risk of injury through incorrect lifting and carrying the device

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

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



NOTICE

Risk for system safety through work on the device not described in these Operating Instructions

Work on the device not described in these Operating Instructions or associated documents can lead to unsafe operation of the measuring system and therefore endanger plant safety.

- ▶ Only carry out the work described in these Operating Instructions or the corresponding documents on the device.
-



DANGER

Risk of explosion through incorrect performance of maintenance work

Incorrect performance of maintenance work in potentially explosive atmospheres can cause serious injuries to people and damage during operation.

- Maintenance and commissioning tasks as well as checks should only be carried out by experienced/trained personnel with knowledge of the rules and regulations for potentially explosive atmospheres, especially:
 - Ignition protection types
 - Installation procedures
 - Zone classification
 - Standards to be applied:
 - IEC 60079-14, Annex F: Knowledge, expertise and competence of responsible persons, craftsmen and designers
 - IEC 60079-17: Electrical installations inspection and maintenance
 - IEC 60079-19: Equipment repair, overhaul and reclamation
-

Laser radiation

**WARNING****Eye injuries through laser radiation**

The invisible laser beam is not accessible when the sender/receiver unit is closed. Observe the following when the sender/receiver unit of the device is swiveled open during installation work for test purposes and the laser beam is activated:

- ▶ Before working on the sender/receiver unit, take appropriate safety measures to protect uninvolved persons from the laser beam.
 - ▶ Never look directly into the laser aperture when opening the sender/receiver unit.
 - ▶ Laser protection class 1: Wear laser protection glasses despite low radiation.
 - ▶ Observe national valid limit values and relevant standards for industrial safety.
 - ▶ The laser beam can be made visible with a suitable detector card.
-

Escaping hot gas

**DANGER****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 installations with overpressure and gas temperatures over 200 °C at the same time:

- ▶ Regularly check the functionality of the reverse flow safeguard in the purge air fixtures.
-

**DANGER****Danger to life by leaking hot and toxic gases**

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

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

Electrical safety

**WARNING****Endangerment of electrical safety during installation and maintenance work when the voltage 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 power isolating 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 disconnecter switch is easily accessible.
 - ▶ An additional disconnecting device is mandatory when the disconnecter switch is difficult to access or cannot be accessed when connecting the equipment after installation.
 - ▶ The voltage supply may only be switched on again after work completion or for test purposes by the persons carrying out the work under consideration of the valid safety regulations.
-



DANGER

Endangerment of electrical safety through missing power isolating switch

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

- ▶ Ensure the power supply can be switched off using a power isolating switch/circuit breaker in accordance with DIN EN 61010-1:2010.
 - ▶ An additional disconnecting device is mandatory when the disconnecter switch is difficult to access or cannot be accessed when connecting the equipment after installation.
-



WARNING

Endangerment of electrical safety through power cables with incorrect rating

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

- ▶ Always observe the exact specifications in the Operating Instructions (Technical Data Chapter) when replacing a removable power line.
-

Contamination caused by purge air failure



NOTICE

A faulty purge air supply can damage the measuring system

The measuring system can no longer be protected from contaminated sample gas and is damaged.

- ▶ When the purge air supply appears faulty, immediately perform all actions described in these Operating Instructions.
-

Responsibility for system safety



NOTICE

Responsibility for system safety

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

2.2 Warning information on the device

Sender/receiver unit

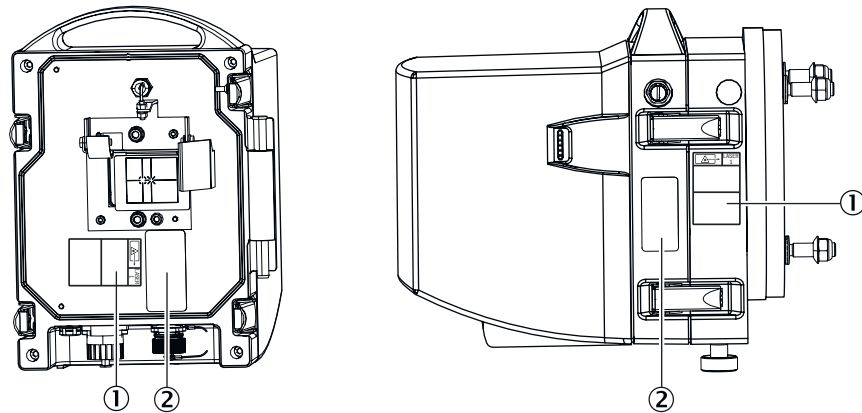


Figure 1: Warning information on the sender/receiver unit

- ① Laser radiation danger sign
- ② Type plate

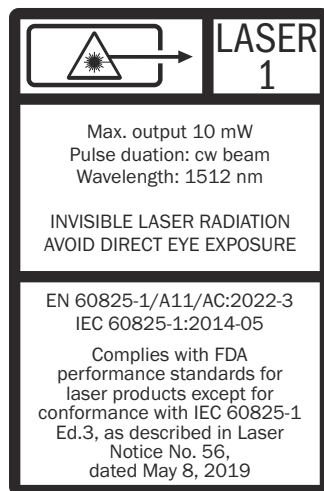


Figure 2: Laser warning sign on device

GM700 Ex evaluation unit

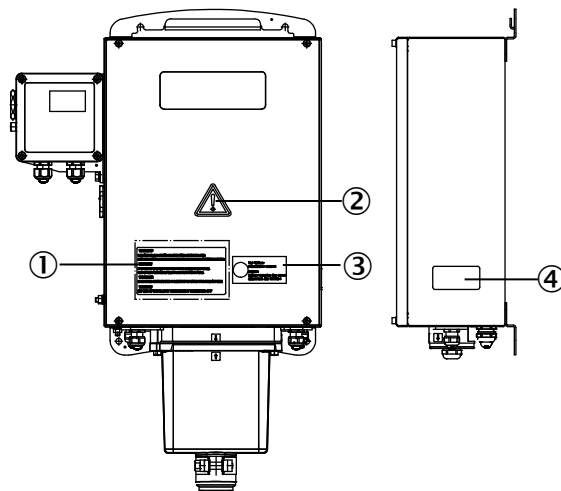


Figure 3: Warning information on the EvU GMA700 front and right sides

- ① Protective gas warning
 - Protective gas outlet
 - Risk of suffocation when using inert gases
 - 20 minutes waiting time before opening the enclosure
- ② General warning: Warning of danger area
- ③ Warning sign: Pull power plug before opening the device
- ④ Type plate

2.3 Intended use

2.3.1 Purpose of the device

The device serves exclusively for emission and process monitoring of gases in industrial plants.

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

2.4 Responsibility of user



NOTICE

Responsibility for the safety of a system

The plant operator may not make any technical changes to the GM700 system. Every change voids the EU type approval.

Intended users

see "Target groups", page 7.

Correct project planning

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

Special local conditions

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

Read the Operating Instructions

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

Document retention

These Operating Instructions:

- ▶ Must be kept for reference.
- ▶ Must be passed on to new owners.

3 Product description

3.1 Product identification

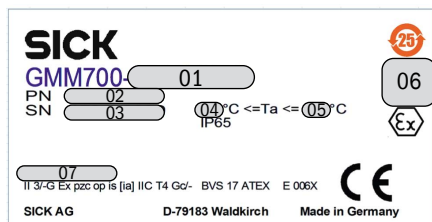
Product name	GM700 Ex
Device version	Cross-Duct version
Manufacturer	SICK AG Erwin-Sick-Str. 1 · D-79183 Waldkirch · Germany
Type plates	Cross-Duct version <ul style="list-style-type: none"> • Sender/receiver unit: On right side • Control unit: On right side • On purge air attachment: On tube • On reflector unit: On right side

3.2 Product characteristics

- The device serves for continuous measurement of the gas concentrations in industrial plants.
- The device is an in-situ measuring device which means measuring is done directly in the gas carrying duct.
- Measuring components: NH₃, NH₃ + H₂O
- Measuring principle: Diode laser spectroscopy (TDLS)

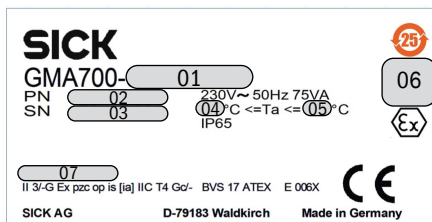
3.3 Type plate

Sender/receiver unit



No.	Variable
01	Type code
02	Material number
03	Serial number
04	Min. gas temperature
05	Max. gas temperature
06	QR code
07	Month/year

Evaluation unit and connection unit



No.	Variable
01	Type code
02	Material number
03	Serial number
04	Min. gas temperature
05	Max. gas temperature
06	QR code
07	Month/year

3.4 Device variants

Sender/receiver unit

Table 3: Type code identification

Variants	Measured components
• Ex zone 2: GMM700-0513EX3G	NH ₃
• Ex zone 2: GMM700-0913EX3G	NH ₃ / H ₂ O

Connection unit

Table 4: Type code identification

Version
• Ex zone 2: GMA700-035X EX3G

3.5 Pressure and temperature sensor

A p/T sensor serves to measure pressure and temperature, see "Installation example", page 26 and "Connection overview", page 38.

3.6 Options

- Cover plate for purge air fixture of the sender/receiver unit
- Weatherproof cover
- Purge air unit

3.7 Layout and function

Layout

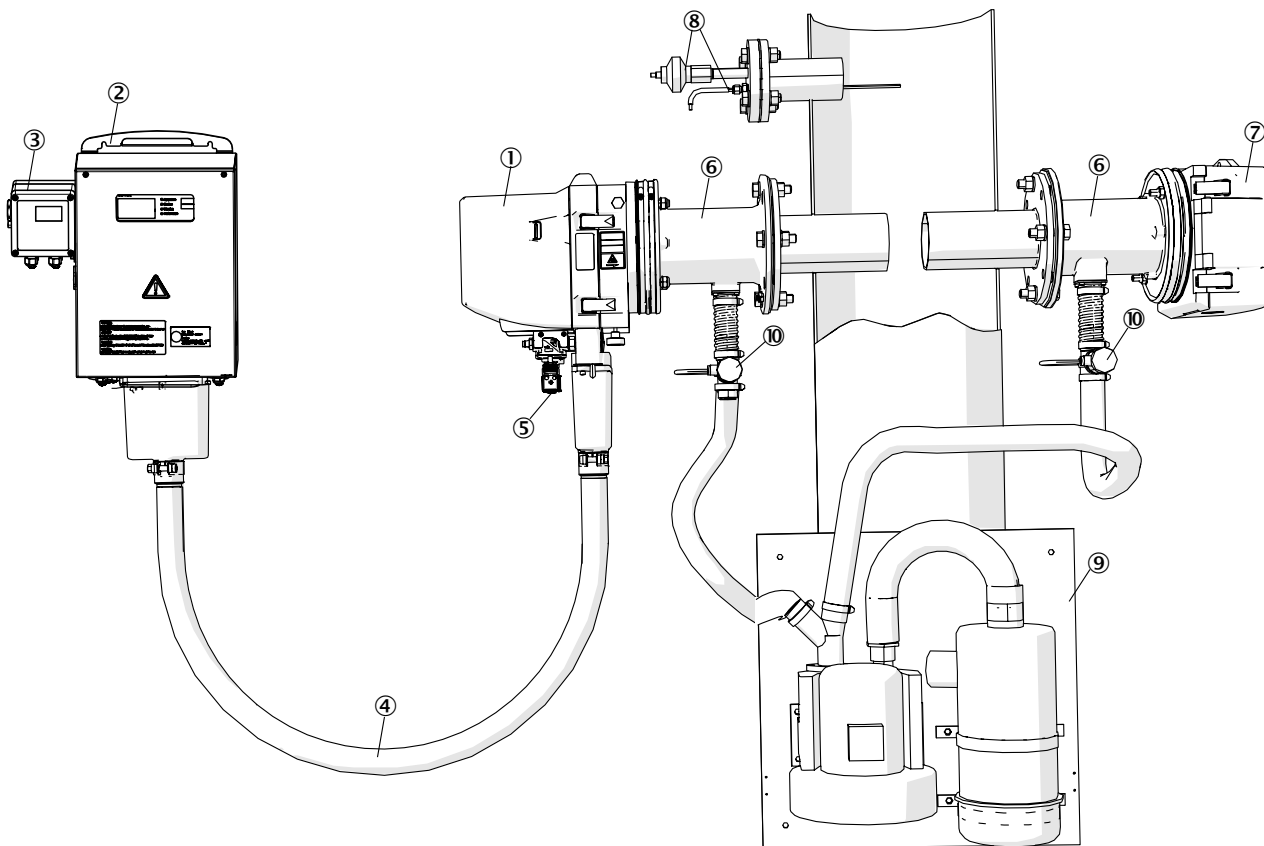


Figure 4: GM700 Ex 3G layout and function

- ① Sender / receiver unit GM700-0xxEX3G (SR-unit)
- ② Evaluation unit GM700-035xEX3G
- ③ Ex-p control FS840
- ④ Metallic connecting hose between sender/receiver unit and evaluation unit
- ⑤ Digital purge medium valve, 230V, G3/8", 2 mm, Ex-p
- ⑥ Purge air fixture (without electronics)
- ⑦ Reflector unit (without electronics)
- ⑧ Temperature and pressure measurement
- ⑨ Purge air supply
- ⑩ Pressure switch for purge air monitoring

Function

- The device serves for continuous measurement of gas concentrations in industrial plants
- The device is an in-situ measuring system which means measuring is done directly in the gas carrying duct
- Measuring components: NH_3 , $\text{NH}_3 + \text{H}_2\text{O}$ as well as reference values temperature and pressure
- Measuring principle: Diode laser spectroscopy (TDLs) (laser protection class 1)
- To maintain measuring reliability, a permanent air flow (optics purge air) protects and keeps the optics free from soot and dust particles as well as condensate and moisture condensation
- Ignition protection type "pressurized enclosure" is effective when using the GM700 Ex in Zone 2 potentially explosive atmospheres. All relevant enclosures of the sender/receiver unit and connection unit connected together via a pressure-proof metal hose are purged with a protective gas. The protective gas can be air suctioned in from the non-potentially explosive atmosphere or an inert gas.

3.7.1 Function of the pressurized enclosure

Purpose of the pressurized enclosure

The pressurized enclosure ensures Ex atmosphere cannot enter the device from outside. To this purpose, the gas analyzer enclosure is filled with a protective gas. Apart from that, it is ensured that the gas pressure inside the gas analyzer enclosure is higher than the surrounding air pressure.

Functionality during operation

The pressurized enclosure system functions in “leakage compensation” mode: An overpressure is generated in the device in relation to the atmosphere after pre-purging has completed. If the protective gas pressure sinks below the minimum pressure set, protective gas feed is activated until the selected overpressure is reached again.

Safety functions

If the maximum permitted overpressure is exceeded or the maximum permitted underpressure underrun, the Ex control unit switches an alarm contact which must be permanently evaluated (responsibility of plant operator, see FS840 Pressurized Enclosure Manual).

3.8 Purge air unit

- The purge air unit must be in an Ex-free area and suction Ex-free purge air
- The purge air unit supplies filtered ambient air to the purge air fixtures
- Protects the window of the SR-unit and the reflector against contamination and high gas temperatures
- One purge air unit each for SR-unit and reflector unit
- The purge air is blown into the gas duct through the “flange with tube”



NOTE

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

3.9 Check cycle

Cyclic check cycle for zero and sensitivity checks

Start a check cycle via

- Timer trigger: Configurable 0 ... 1440 minutes (= 1 day), see menu “Settings / Check Cycle”
- External digital input signal (Di 1)

Purpose of check cycle

- Checking the zero point and span point without feeding span gases.

Check cycle procedure

The measuring sequence to determine the zero and check point is performed. The digital input uses a falling edge for triggering, i.e. performance of a check cycle is suppressed as long as the signal is high (e.g., for control purposes).

Signaling

“Function control” (relay 3) is signaled per digital output during output of the zero and check point.

Output

The output runs for 90 seconds each for the zero point followed by the check point.

- Unit and scaling for the current zero point according to the settings.
- Check or span point is displayed as percentage scaled to 70% of the measuring range.

The same calculation method is used for the deviation as for the gas concentration with the exception of correction factors which result from a gas adjustment as well as customer correction factors from menu PAR/SETTINGS / REGRESS. FUNCT. During the check cycle output, the zero and span point are displayed in the lower display line parallel to the analog output. These can be viewed in menu DIAG/CHECK VALUES/<GAS> for subsequent checks. Prerequisite is that the output has already been made via an analog output.

Deviations

A warning message is output, e.g., "AO1 NH3 ZEROPoint" when the zero or check point deviation is above 2% of the upper display limit of an analog output.

The warning message remains until the next check cycle output is within the tolerance.


3.10 Explosion protection in accordance with ATEX

3.10.1 Operation in potentially explosive atmosphere



3G / Zone 2: Connection unit and sender/receiver unit

The GM700 Ex complies with ATEX Directive 2014/34/EU with the following characteristics:

-  II 3/-G Ex pzc op is [ia] IIC T4 Gc/-
- Special conditions (X identification):
 - A measuring function for explosion protection is not part of the EC type approval
- Explosion protection relating to optical radiation in the measuring channel

The explosion protection relating to optical radiation in the measuring channel is satisfied in accordance with the temperature range (-20° ... +60 °C) specified by ATX/IECEX. The plant operator must evaluate Ex atmospheres possibly present for exhaust gas temperatures exceeding this range separately and take suitable protective measures!

- ▶ Location of Ex relevant subassemblies, see Chapter "Design and Function".
- ▶ Do not remove, add or modify any components to or on the device unless described and specified in the official manufacturer information. Otherwise the approval for the device for use in potentially explosive atmospheres becomes void.
- ▶ Adhere to the maintenance intervals, see Chapter "Maintenance plan".
- ▶ After switching off the main power supply: Wait 20 minutes before opening the enclosure.

3.10.2 Zone of use of GM700 Ex 3G components

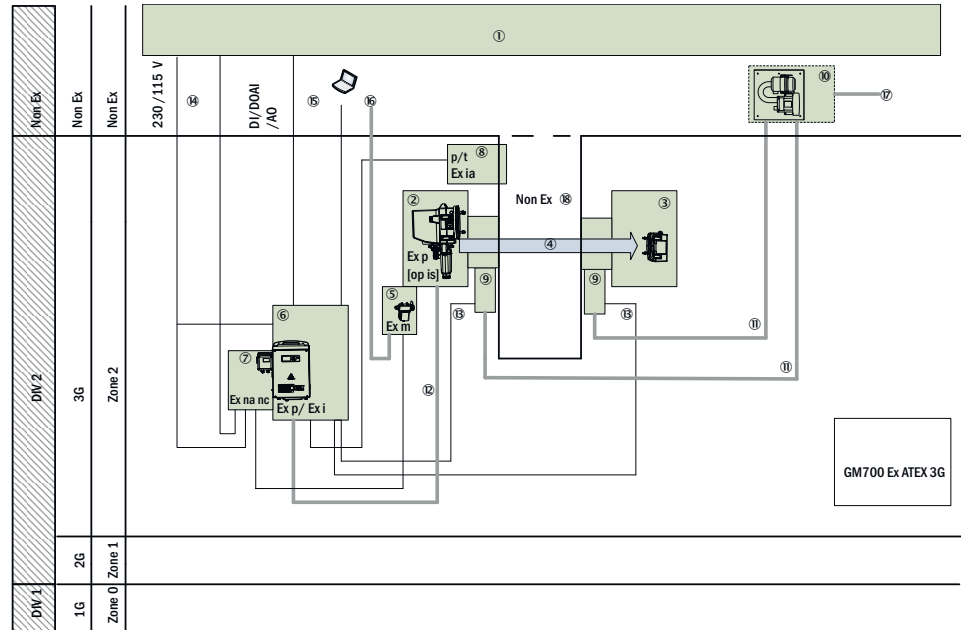


Figure 5: Zone of use of GM700 Ex 3G components

Components

- ① Control station / measuring station
- ② Sender/receiver unit
- ③ Reflector unit
- ④ Measuring beam
- ⑤ Ex-p valve
- ⑥ Evaluation unit
- ⑦ Overpressure control
- ⑧ p/T sensor
- ⑨ p sensor for purge air unit
- ⑩ Pressure controller for optics purge air as selected by the plant operator

Lines

- ⑪ Purge air hose, optics
- ⑫ Connecting hose, Ex-p
- ⑬ Pressure controller, optics purge air Ex i nA
- ⑭ Ex-p error case signal
- ⑮ Service interface
- ⑯ Ex-p protective gas feed, from operator
- ⑰ Feed, optics purge air

Measuring channel

- ⑱ Measuring channel, Ex-free

3.10.3 Pressurized enclosure system

Ignition protection type, pressurized enclosure for Zone 2

Purging

All relevant enclosures of the sender/receiver unit and connection unit connected together via a pressure-proof metal hose are purged with a protective gas. Purging before starting the device safely removes any possible ignitable mix.

Controlling the overpressure in the enclosure

Control by the purge medium valve SVD.L.2.-AI00 G3/8"-300L Ex-p of the FS840 ensures that the complete enclosure is always kept at an overpressure of at least 0.8 mbar against the atmosphere after pre-purging; this prevents an ignitable gas mix penetrating the device.

Protective gas types

- Instrument air suctioned in from the area outside the potentially explosive atmosphere
- Inert gas



NOTE

The temperature of the protective gas must not be higher than 50 °C.

More information, see ["Technical data for Protective gas", page 98](#), and Pressurized Enclosure Operating Instructions.

3.10.3.1 Safety functions

Alarm signal of pressurized enclosure in case of malfunction

Ex control unit FS840 for Category 3G:

The Ex control unit FS840 provides a falling edge when the pressurized enclosure is not in the correct operating state (malfunction).



WARNING

Risk of explosion through incorrect parameter settings

Incorrect parameter setting can cause an explosion with fatal consequences.

- ▶ Only authorized persons are allowed to change the parameters.
-



NOTICE

The operating company is responsible for the evaluation of the alarm signal. See the Pressurized Enclosure System Manual.

3.11 Sender/receiver unit - evaluation unit connecting hose

The following is applicable for the connecting hose between sender/receiver unit and evaluation unit:

- It is part of the pressurized enclosure
- It contains electrical connection lines
- It is under overpressure
- It must be connected to the potential equalization system
- To ensure potential equalization, the mechanical screw fittings of the hose attachment on GMM700 and GMA700 are secured additionally with sprocket discs. These sprocket discs may not be removed.

4 Transport and storage

4.1 Remove the transport safety device

- 1 Open the lock and swivel the flange fixture open.
- 2 Check the transport safety device for damage.
- 3 Remove the transport safety devices (see Figure).
- 4 Store the transport safety device.

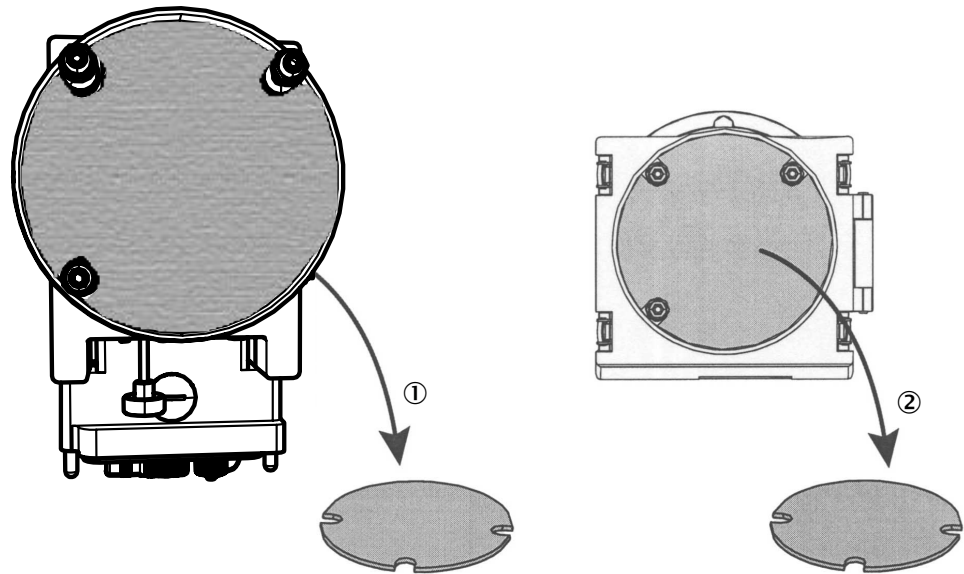


Figure 6: Remove the transport safety device on the sender/receiver unit and the reflector unit

- ① Removing the transport safety device on the sender/receiver unit.
- ② Remove the transport safety device on the reflector.

4.2 Storage

- ▶ Clean all components of the measuring device (not the optical surfaces) with slightly moistened cleaning cloths. Use a mild cleaning agent here.
- ▶ Protect the openings of the sender/receiver unit from atmospheric influences, preferably with the original transport safety devices.
- ▶ Pack all components for storage or transport. Preferably use the original packing.
- ▶ Store all components of the measuring device in a dry, clean area.

5 Mounting

5.1 Information on installation in potentially explosive atmospheres

Project planning for measuring channel

**NOTICE**

Observe information in Chapter “Main operating information”.

**NOTICE**

Hazard when exceeding the temperature classes for hot gas ducts

Temperature class T4 (max. 135 °C), for which the explosion protection of this device is designed, can be exceeded on hot gas ducts.

- ▶ Plan appropriate thermal insulation of the duct and the flanges during project planning/assembly.
 - ▶ When necessary, ensure adequate ventilation or cooling.
-

Correct installation

**DANGER****Risk for system safety through work on the device not described in these Operating Instructions**

Carrying out work on the device not described in these Operating Instructions or associated documents can lead to unsafe operation of the measuring system and therefore endanger plant safety.

- ▶ Only carry out the work on the device described in these Operating Instructions and associated documents.
-

**DANGER****Risk of explosion through incorrect installation**

Incorrect assessment of the installation location as well as all further installation work in potentially explosive atmospheres can cause serious injuries to people and damage during operation.

- Installation, commissioning, maintenance and inspection may only be carried out by skilled persons having knowledge of the relevant rules and regulations for potentially explosive atmospheres, especially:
 - Ignition protection types
 - Installation regulations
 - Zone classification
 - Standards to be applied:
 - IEC 60079-14, Annex F: Knowledge, skills and competencies of responsible persons, operatives and designers
 - IEC 60079-17: Electrical installations inspection and maintenance
 - IEC 60079-19: Equipment repair, overhaul and reclamation
 - Local work safety regulations must be observed
-

**WARNING****Risk of injury when the device drops down**

The weight of the device can cause it to drop down and cause injuries during the work described in this Section.

- ▶ Carry out assembly work on parts of the device together with another person when necessary.

Purge air**DANGER****Risk of explosion through suctioning optics purge air from an Ex zone**

Zone separation is no longer ensured when the purge air supply to purge the optics is suctioned in from an Ex zone. This can lead to an explosion.

- ▶ Always make sure the air for the purge air supply is suctioned in from an Ex-free zone and ensure sufficient tightness of the purge air path when it passes through an Ex atmosphere.

5.2 Tools required

Tools	Part No.	Required for
Adjustment device	2034121	Alignment of "flanges with tube"
19 mm jaw wrench		Flange screw fitting
Screwdriver		Connections
Allen key		Connections

5.3 Material required

Material	Required for
Personal protective equipment	Protection when working at the sampling point
Tubes for protective gas	Protective gas feed line, see "Connecting the protective gas on the SR-unit", page 56.

5.4 Preparing the sampling point**The operator is responsible for preparing the sampling point****NOTICE**

Basis for determining the sampling point:

- Preceding project planning (e.g., based on the SICK application questionnaire)
- Regulations of the local authorities

Responsibility of the operator

- Determine sampling point
- Preparing the sampling point
- Feed and drain for protective gas



DANGER

Risk of explosion through suctioning optics purge air from an Ex zone

Zone separation is no longer ensured when the purge air supply to purge the optics is suctioned in from an Ex zone. This can lead to an explosion.

- ▶ Always make sure the air for the purge air supply is suctioned in from an Ex-free zone and ensure sufficient tightness of the purge air path when it passes through an Ex atmosphere.
-



NOTICE

Observe zone separation, [see "Zone of use of GM700 Ex 3G components", page 21.](#)

5.5 GM700 Ex scope of delivery

Check the scope of delivery according to the order confirmation.

5.6 Installation sequence

5.6.1 Installation example

Carry out assembly according to the project planning and the Inspection protocol. The dimensions specified in the drawings are guidelines and can deviate from project planning.

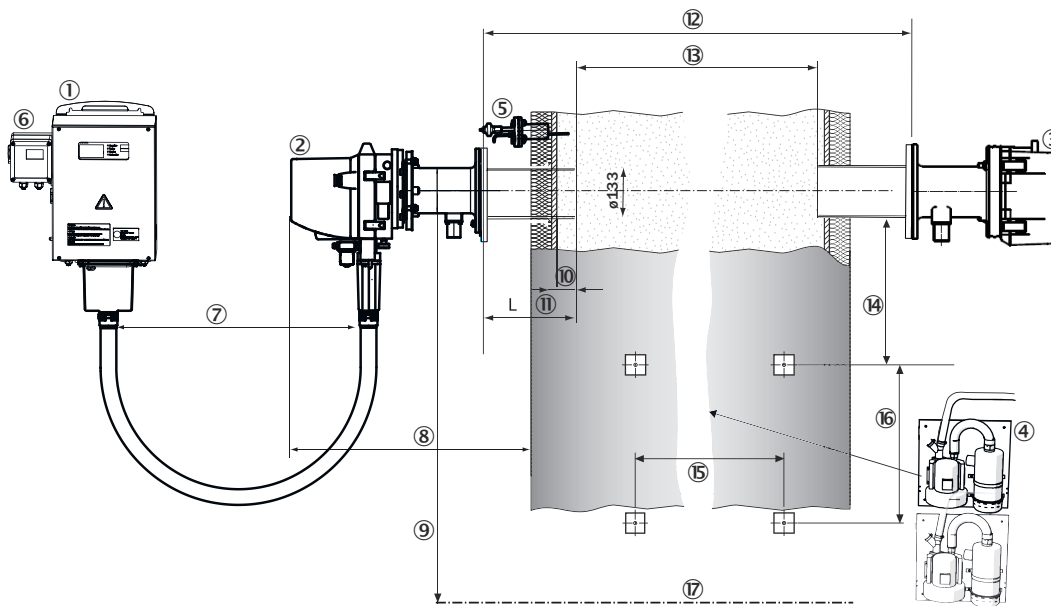


Figure 7: Assembly example, all dimensions in mm

Components

- ① Evaluation unit with Ex-p control FS840
- ② GM700 Ex sender/receiver unit
- ③ Reflector unit
- ④ 1 or 2 x purge air units in accordance with the project planning

Hose length: 5 m, ⚠ Attention: Make sure the purge air supply hoses have the same length when using one purge air unit.

- ⑤ Pressure sensor and temperature sensor
- ⑥ Ex-p control FS840

Dimensions

- ⑦ Max. distance SR-unit - EvU: 4 m, 8 m, depending on hose length
- ⑧ Duct wall - SR-unit: depending on flange with tube length
- ⑨ Minimum clearance (center) - working platform: 1300 - 1500 mm
- ⑩ Min. flange length in gas duct: 20 mm
- ⑪ L = flange with tube length: Standard 240 mm
- ⑫ Measuring path - flange (according to Test protocol)
- ⑬ Active measuring path (according to Test protocol). ⚠ Always measure active measuring path again.
- ⑭ Minimum clearance flange (center) to purge air supply: > 700 mm
- ⑮ Horizontal clearance fastening drill holes - purge air supply assembly plate: 470 mm
- ⑯ Vertical clearance fastening drill holes - purge air supply assembly plate: 470 mm

Miscellaneous

- ⑰ Working platform

5.6.2 Overview of installation steps (duct-side preparation)

Step	Procedure	Reference
1	Fit flange with tube.	see "Installing the flange with tube", page 28
2	Install evaluation unit.	see "Install the evaluation unit", page 32.
3	Fit purge air unit or units.	see "Installing the purge air unit", page 34.

Step	Procedure	Reference
4	Observe protective gas outlet (evaluation unit).	see "Install the FS840", page 32.
5	Connect pressure, temperature and purge air monitor.	see "Connecting pressure, temperature and purge air monitor ", page 42.
6	Connect protective gas feed to sender/receiver unit.	see "Connecting the protective gas on the SR-unit", page 56.

5.6.3 Installing the flange with tube

Prerequisite

- Installation location was determined during the project planning.
- Stability of the duct wall has been checked.



DANGER

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

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

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



NOTICE

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

- ▶ When the measuring channel is hot, plan the duct and flange insulation so that the device is protected against high temperatures.



NOTE

- Flange with tube dimensions: see "Dimension drawing, flange with tube, DN125", page 104

Arrangement of the flanges with tube on the gas duct

- ▶ Determine flange - flange distance and measuring distance.

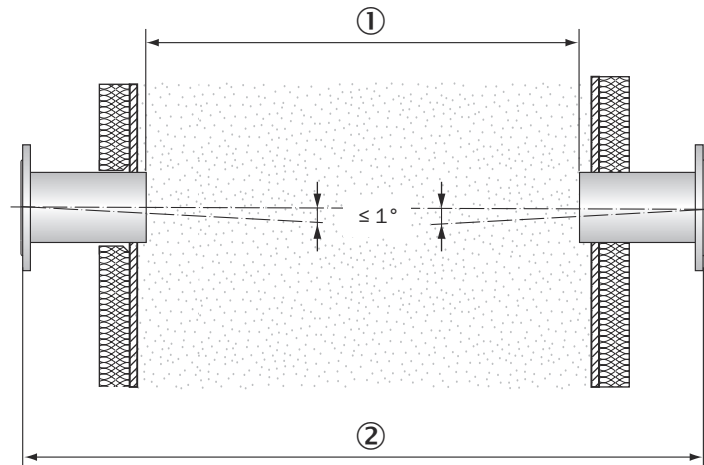


Figure 8: Flanges with tube – determining the measuring distance

- ① Measuring distance
- ② Flange - flange distance



NOTE

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

Installing the flange with tube

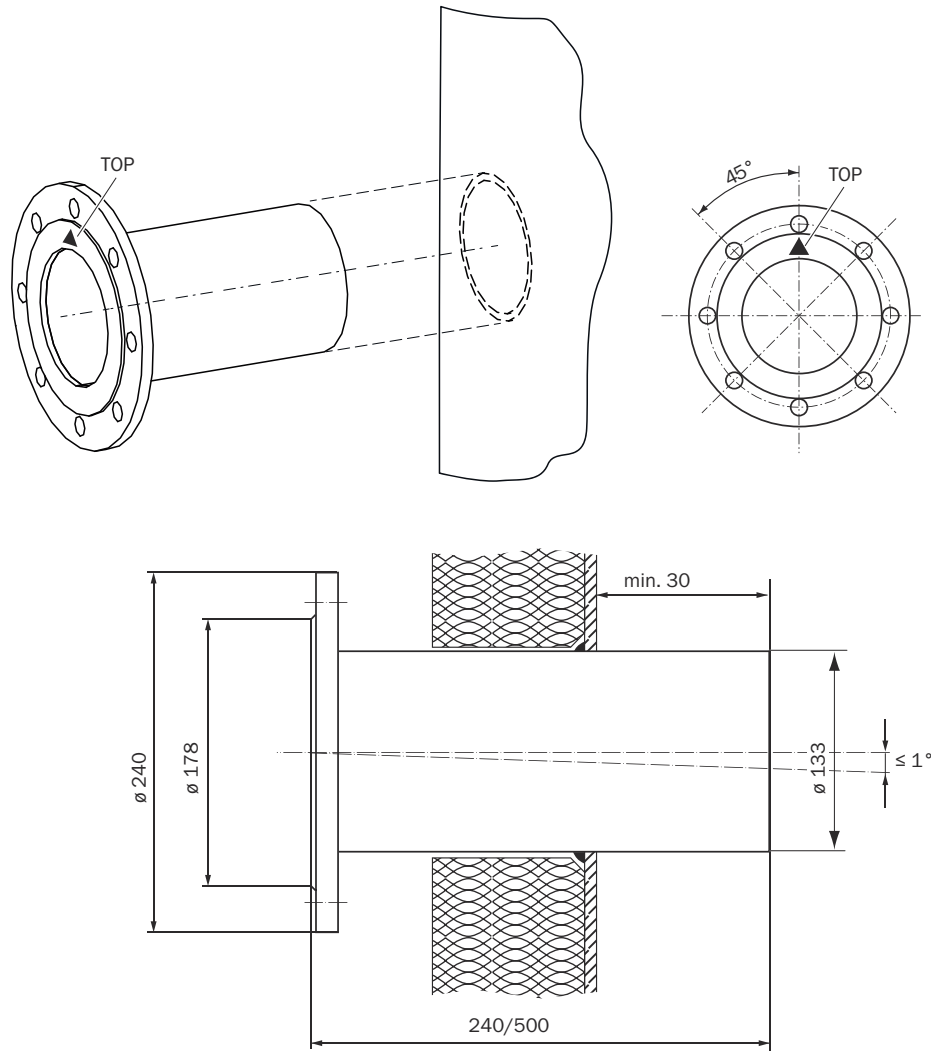


Figure 9: Flange with tube incl. orientation "TOP"

Steps

1. Cut openings on the gas duct for the flange with tube.
2. Position the flange with tube. Make sure:
 - Marking "TOP" must point vertically upwards independent of the gas duct angle.
 - The tube must project at least 30 mm into the gas duct.
 - Tube axis deviations between sender/receiver unit and reflector unit: Max. 1°
3. Attach the flange with tube.



NOTE

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

Optical alignment of the flanges with tube

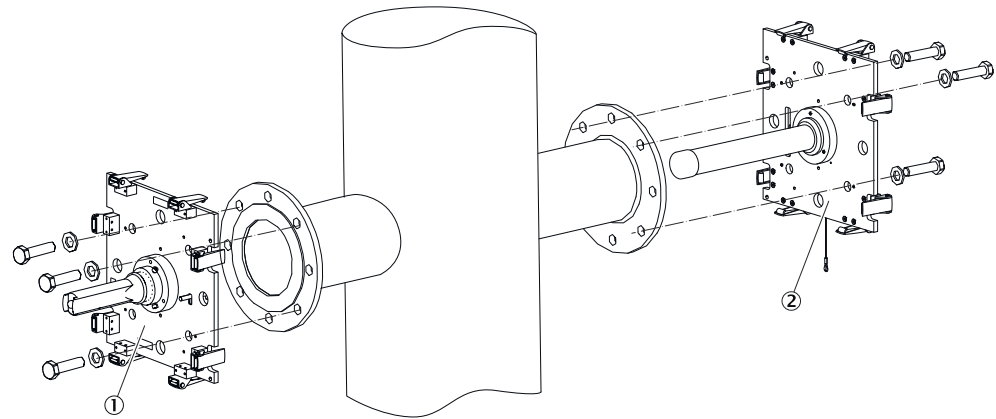


Figure 10: Fitting the alignment tool

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

Fit the alignment tools

Steps

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

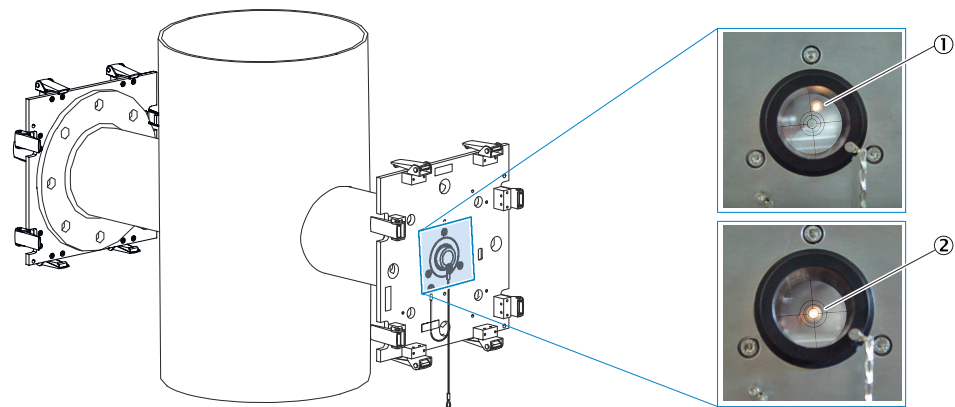


Figure 11: Checking the alignment

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

Check the alignment

Steps

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

Check the alignment on the other flange with tube

Steps

1. Fit the adjustment devices to the other flange with tube.
2. Check the alignment as described above.
3. Remove the alignment tools after successfully checking the alignment.

Permanently fasten the flanges with tube

Steps

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

5.6.4 Install the evaluation unit

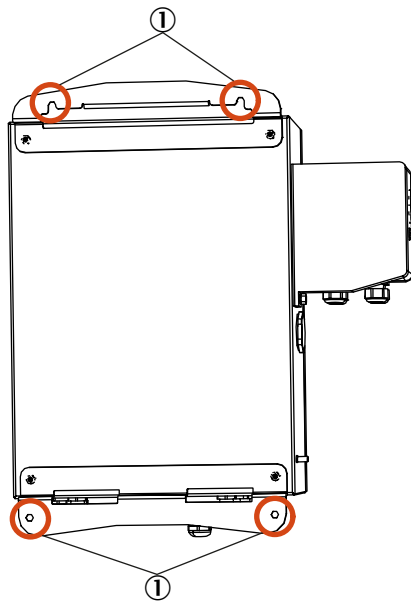


Figure 12: Assembly brackets GMA700 Ex 3G

- ① Brackets
 - Drill holes: Ø 8 mm
 - Screws: M6

- ▶ Fasten the connection unit with 4 M6 screws as shown in the dimension drawing.
- ▶ Refer to the dimension drawings for the dimensions.

[see figure 48, page 104](#)



NOTICE

Do not yet connect the evaluation unit electrically.

5.6.4.1 Install the FS840

Assembly information

When setting up outdoors, it is recommended to protect the explosion-proof device against direct atmospheric influences, e.g., with a protective roof.

Ensure the protective gas inlet and outlet are in a horizontal axis.

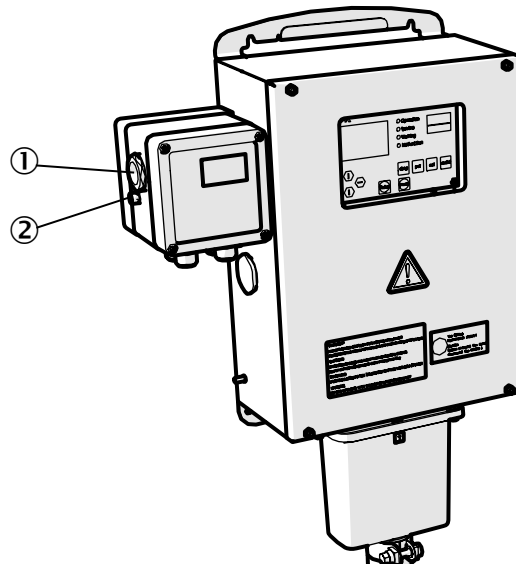


Figure 13: Protective gas outlet

- ① Protective gas outlet: Thread G1"
- ② Reference opening (M5 inner thread)

Protective gas quality

- Instrument air or inert gas
- Compressed air, class 533 according to ISO 8573-1
- Solid matter 40 μm (class 1)
- Pressure dew point ≤ 20 °C (class 3)
- Oil quality ≤ 0.01 mg/m³ (class 1)

The air quality may possibly have to be better depending on the requirements of the devices fitted in the pressurized enclosure.

Protective gas outlet

It is important that protective gas can flow out of the protective gas outlet against the atmospheric pressure.

- ▶ Ensure the unhindered flow of the protective gas.

Reference opening

The reference opening must be located in the Ex area.

- ▶ Make sure the opening is always clear.

Line lengths for protective gas supply

Large pressure losses occur during the purge phase (high purge medium throughput) depending on the supply line diameter. Consider this when dimensioning the supply line:

Reference values: With 4 mm line diameter (inner diameter), a pressure loss of 500 mbar per meter must be calculated during purging with 2 l/s.

The pressure losses are noticeable when the purge medium flow rate is too low so that the device is possibly not completely pre-purged.

**NOTE**

More information on protective gas,

- see ["Technical data for Protective gas", page 98.](#)
-

5.6.5 Installing the purge air unit

**NOTE**

Purge air hose to the device according to project planning.

**NOTE**

For information on installing the purge air unit, see the Operating Instructions of the purge air unit.

6 Electrical installation

6.1 Electrical installation safety information

**NOTICE**

Observe information in Chapter “Main operating information”.

Electrical safety

**DANGER****Danger to life through electric shock**

There is a risk of electric shock when working on the device with the voltage supply switched on.

- ▶ Before starting work on the device, ensure the voltage supply can be switched off in accordance with the valid Standard using a power isolating switch/circuit breaker.
- ▶ Make sure the disconnecter switch is easily accessible.
- ▶ An additional disconnecting device is mandatory when the power disconnecter switch cannot be accessed or only with difficulty after installation of the device connection.
- ▶ Switch off the voltage supply before starting any work on the device.
- ▶ After completion of the work or for test purposes, calibration of the power supply may only be activated again by authorized personnel complying with the safety regulations.

**WARNING****Endangerment of electrical safety through power supply line with incorrect rating**

Electrical accidents can occur when the specifications for installation of a power supply line have not been adequately observed.

- ▶ Always observe the exact specifications in the Operating Instructions (see ["Technical data", page 96](#)) for installation of a power supply line.

**DANGER****Electrical accident due to improper performance of the electrical work**

The electrical work described in these Operating Instructions requires specialist knowledge. Electrical work can lead to serious electrical accidents if not carried out properly.

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

**NOTICE****Risk of device damage**

Electronic components are accessible when the enclosure is open. The circuit board can be severely damaged when a contact is not grounded when the power supply is switched on.

- ▶ First switch the power supply on when the sender/receiver unit and the control unit are closed.



NOTICE

Device damage through short circuit on the device

When power supply is available, signal short circuits can occur and damage the internal electronics. This is also valid for plug connections.

- ▶ Clean work is required. Do not leave any metal cuttings in the device.
-

Ex information



DANGER

Risk of explosion through incorrect performance of maintenance work

Incorrect performance of maintenance work in potentially explosive atmospheres can cause serious injuries to people and damage during operation.

- Maintenance and commissioning tasks as well as checks should only be carried out by experienced/trained personnel with knowledge of the rules and regulations for potentially explosive atmospheres, especially:
 - Ignition protection types
 - Installation procedures
 - Zone classification
 - Standards to be applied:
 - IEC 60079-14, Annex F: Knowledge, expertise and competence of responsible persons, craftsmen and designers
 - IEC 60079-17: Electrical installations inspection and maintenance
 - IEC 60079-19: Equipment repair, overhaul and reclamation
-



DANGER

The Ex certification becomes void when line inlets and plugs without approval are used

The line inlets and plugs are part of the Ex protection and therefore require approval.

- ▶ Do not replace line inlets or plugs with other types.
 - ▶ Line inlet dimensions, see ["Dimension drawings, evaluation unit with pressurized enclosure system FS840"](#), page 104.
-



DANGER

Risk of explosion through non-Ex conform installation of the lines to the device

Incorrect installation of the supply lines (power supply, signal and communication lines) through Ex zones can lead to an electrostatic charge. This creates an increased risk of explosion.

- ▶ Install all lines in accordance with EN61010-1 and EN60079-14.
 - ▶ Protect cables against electrostatic charges.
-



WARNING

Risk of explosion through incorrect or non-existing grounding

To avoid an explosion due to electrostatic discharge, a correctly connected potential equalization is mandatory on all system components with external ground connections in all operating conditions.

- ▶ Connect a potential equalization on all planned points on the device components.
 - ▶ Ensure the potential equalization is connected during all work on the device described in these Operating Instructions.
-

**DANGER****Risk of explosion through incorrect connection of the external sensors**

The explosion protection is endangered when the external sensors p/T (in the stack) as well as the optics purge air monitor (on the purge air fixture) are not connected to the intrinsically safe terminals provided in the connection unit.

- ▶ Always connect the external sensors p/T (in the stack) as well as the optics purge air monitor (on the purge air fixture) to the intrinsically safe terminals specified in the connection unit for this purpose.
- ▶ Observe the intrinsically safe connection values for the Ex barriers fitted in the evaluation unit in the Operating Instructions delivered.

**DANGER****Risk of explosion through unsuitable screw fittings and lines**

- ▶ Only use lines (according to EN60079-14) with suitable outer diameters.
- ▶ Close off cable inlets “vapor-proof” (virtually gas-tight).
- ▶ Protect lines against electrostatic charges.
- ▶ Only open those cable inlets to be used for installing cables. Keep the plugs. Refit the original plug when a cable inlet must be closed again afterwards.

Electromagnetic compatibility**NOTE**

This is a Class A product. This device can cause radio interference in household environments and therefore the user must take suitable measures when necessary.

6.2 Connection overview

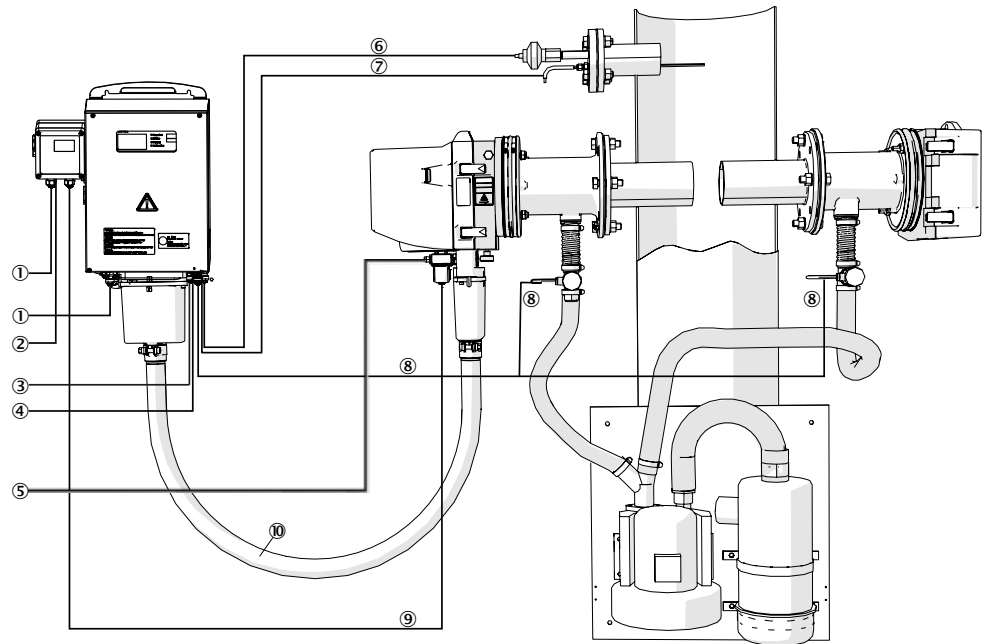


Figure 14: Overview of electrical connections GM700 Ex 3G / Zone 2

- ① Power supply
- ② Warning signal, Ex-p control FS840
- ③ Service interface
- ④ I/O signal lines
- ⑤ Protective gas supply
- ⑥ Connection line, pressure sensor
- ⑦ Connection line, temperature sensor
- ⑧ Connection line, purge air monitor, pressure switch
- ⑨ Connection line, purge medium valve SVD.L.2.-AI00 G 3/8"-300L Ex-p
- ⑩ Metallic connecting hose between sender/receiver unit and evaluation unit

6.2.1 Lines

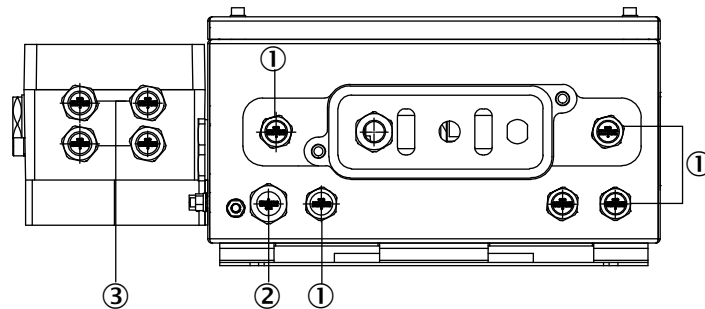


Figure 15: Evaluation unit, version 3G

No.	Line opening size	Line diameter (clamping range)	Tightening torque	Qty.
①	M16 x 1.5	5 - 11 mm	6 Nm	5
②	M20 x 1.5	10 - 14 mm	10 Nm	1
③	M16 x 1.5	5 - 10 mm	6 Nm	4

Table 5: Technical data, lines

Lines	Remark
Power supply	From customer: 3 x 1.5 mm ²
Evaluation unit power supply	From customer: 3 x 1.5 mm ²
Evaluation unit - sender/receiver unit with connecting hose	In accordance with project planning <ul style="list-style-type: none"> • 5 m • 10 m
Differential pressure sensor (SR-unit and reflector unit) - evaluation unit	From customer, intrinsically safe I/O connection
Pressure/temperature input	From customer, intrinsically safe I/O connection
Service interface	From customer, RS232
Inputs/outputs	From customer: Terminal connections: 6 x 0,75 mm ²
Evaluation unit - temperature sensor	From customer
Evaluation unit - pressure sensor	From customer

Table 6: Technical data, M screw fittings

Outer thread	M20 x 1.5	M16 x 1.5
Thread length	6 mm	
Height	23 mm	
Cable diameter	10 ... 14 mm	6 ... 10 mm
Key width	24 mm	20 mm
Continuous service temperature	-20 ... 95 °C	
Material	Nickel-plated brass	

6.3 Connecting interfaces

6.3.1 Connect I/O interfaces



CAUTION

Never lay power supply cables directly next to signal cables.



DANGER

Risk of explosion through non-Ex conform installation of the lines to the device

Incorrect installation of the supply lines (power supply, signal and communication lines) through Ex zones can lead to an electrostatic charge. This creates an increased risk of explosion.

- ▶ Install all lines in accordance with EN61010-1 and EN60079-14.
- ▶ Protect cables against electrostatic charges.

Steps

1. Route the data lines through the M screw fittings.
2. Connect the data line.



NOTE

The analog input assignment shown in the following Chapter is the default setting and may not be modified.

6.3.1.1 Connection diagram for variant 3G

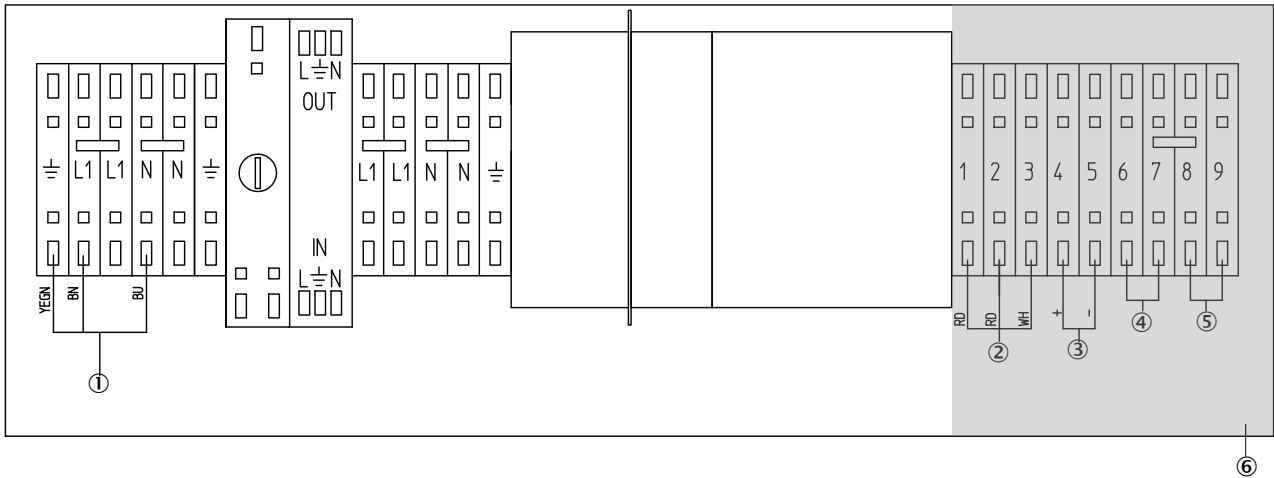


Figure 16: Connection diagram of connection unit for variant 3G / Ex zone 2

- ① Power supply
- ② Connections of temperature sensor (3-wire circuit): Pins , 1,2 and 3
- ③ Connections of pressure sensor: Pins 4 and 5
- ④ Pressure controller for purge air monitor, sender: Pins 6 and 7
- ⑤ Pressure controller for purge air monitor, reflector: Pins 8 and 9
- ⑥ Connection area for intrinsically safe components

Ex NOTICE PAY CLOSE ATTENTION TO THE CONNECTION VALUES ON TERMINALS 1-9
 In area ⑥ , the intrinsically safe connections for temperature ②, pressure ③ and two digital inputs ④ + ⑤ to connect the pressure controller are provided. Only connect intrinsically safe simple operating means with suitable connection data to these terminals in accordance with the Table below. Otherwise the explosion protection of the connected sensors is not ensured.

► Only connect intrinsically safe devices with appropriate connection data to these terminals.

Table 7: Connection data for intrinsically safe connections

Terminal	Inlet sizes	Gas group	Uo	Io	Po	Ui	Ci ¹	Li	Co ³	Lo ⁴	μH/ Ω
1	Inlet, temperature sensor PT100, 3-wire circuit RMA42	IIC	≤ 27.3 V	≤ 22.1 mA	151 mW	k.A.	8 nF	75 μH	≤ 85 nF	≤ 500 μH	k.A.
2		IIB							≤ 360 nF	≤ 2 mH	k.A.
3		IIB							≤ 530 nF	≤ 5 mH	k.A.
4	Analog input, pressure sensor 4-20 mA RMA42	IIC	≤ 27.3 V	≤ 96.5 mA	659 mW	k.A.	8 nF	75 μH	≤ 88 nF	≤ 4 mH	k.A.
5		IIB							≤ 683 nF	≤ 17 mH	k.A.
		IIA							≤ 2 280 nF	≤ 34 mH	k.A.
6	Digital input, pressure switch 1 KCD2-SR-Ex	IIC	10.5V	17.1mA	45mW	12 V	0	0	2.41 μF	≤ 121.5 mH	801
7		IIB							≤ 16.8 μF	≤ 486.3 mH	1628
		IIA							≤ 75 μF	≤ 972.7 mH	1628
8	Digital input, pressure switch 2 KCD2-SR-Ex	IIC	10.5V	17.1mA	45mW	12 V	0	0	≤ 2.41 μF	≤ 121.5 mH	801
9		IIB							≤ 16.8 μF	≤ 486.3 mH	1628
		IIA							≤ 75 μF	≤ 972.7 mH	1628

- 1 Max. inner capacity
- 2 Max. inner inductivity
- 3 Max. outer capacity
- 4 Max. outer inductivity
- 5 L/R ratio (inductivity/resistance)

6.3.1.2 Electrical connection of the evaluation unit EvU

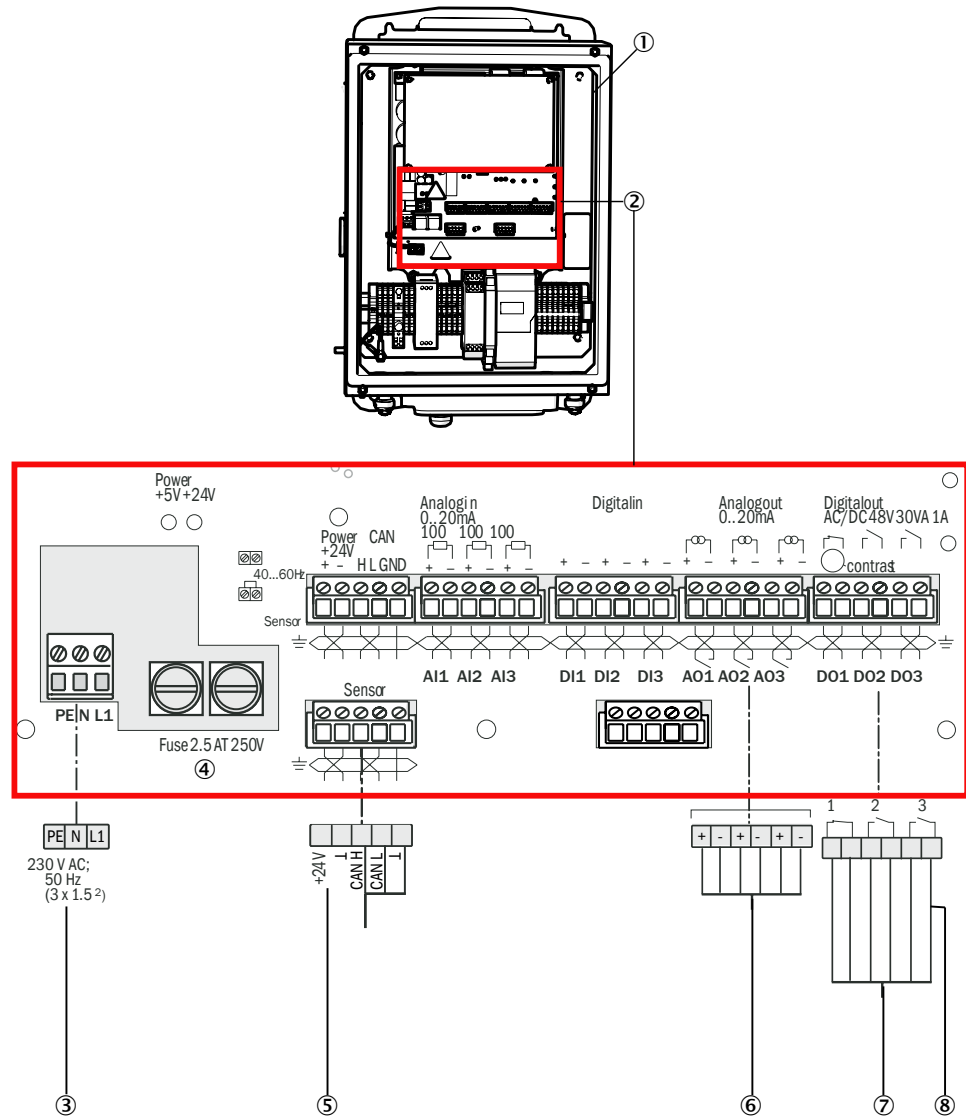


Figure 17: Electrical connection of the evaluation unit

- ① GM700 Ex evaluation unit
- ② Connections on circuit board
- ③ Power supply GM700
- ④ Fuse, 2.5 2,5 AT, 250 V
- ⑤ CAN GM700
- ⑥ Analog outputs: 0 ... 20 mA (6 x 0.75 mm²)
- ⑦ Digital outputs 48 V AC/DC; 60 VA, 1 A (6 x 0.75 mm²)
- ⑧ 1 = digital output (NC contact) for malfunction
2 = digital output (NO contact) for maintenance request
3 = digital output (NO contact) for function check

6.4 Connecting the connecting hose to the SR-unit on the EvU



NOTICE

The connecting hose between the SR-unit and the evaluation unit is part of the pressurized enclosure. It is under overpressure.

- ▶ Protect the connecting hose against possible damage.

- 1 Lead the cable through the M screw fittings, see Figure below.
- 2 Connect the cable in the connection unit.
- 3 Tighten screws on the terminal strip.
- 4 Push on the connector housing and screw tight.

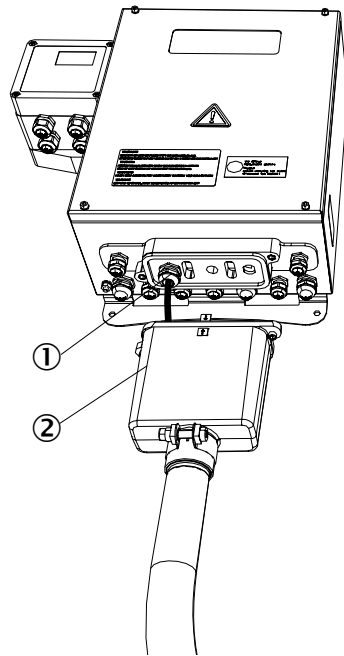


Figure 18: SR-unit - evaluation unit connecting hose

- ① M screw fitting
- ② Connector housing

6.5 Connecting pressure, temperature and purge air monitor



NOTE

Purge air monitor - pressure controller for purge air monitoring

- Wiring layout, see ["Connection overview"](#), page 38
- Terminal assignment, see ["Connection diagram for variant 3G"](#), page 40
- Observe the Operating Instructions of the sensors and purge air monitoring

6.6 Preparing the power supply

- 1 Check that the connection lines meet the requirements:
 - Cross-section: 3 x 1.5 mm²
- 2 Plan a disconnecting device for
 - Evaluation unit (see ["Evaluation unit Ex version"](#), page 97).
 - Optics purge air units (see technical data of the optics purge air unit).
 - Mark the disconnecting device as disconnecting device for the GM700 Ex.

- 3 Connect power cable and lines:
 - ▶ Route the power cable through the M screw fitting.
 - ▶ Connect the lines in the connection unit.
- 4 Tighten the M screw fitting.

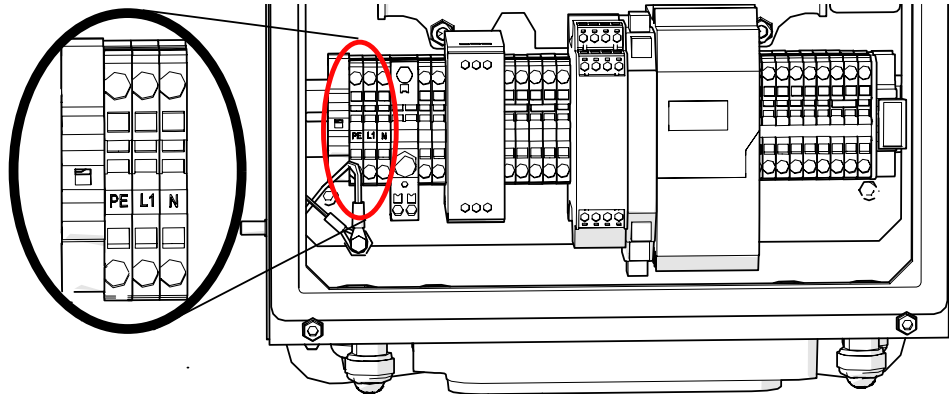


Figure 19: Power connection in the evaluation unit, power supply 230V / 50 Hz



NOTICE

The PE connection must always be connected to the protective ground of the system.

6.7 Connecting the FS840 Ex overpressure control

Electrical safety

The local electrical installation regulations must be observed.

Risk of explosion



DANGER

Risk of explosion through incorrect settings for the pressurized enclosure

The pressurized enclosure is a central safety element of the device. All work is described in this Manual and the relevant specified documents. If work is performed which is not described in this Manual, the risk of explosion of the measuring system increases and the ATEX certification for the device becomes void.

- ▶ Carry out all work skillfully and in accordance with the delivered documentation.

Unsafe measuring operation



CAUTION

Risk of unsafe measuring operation through loss of degree of protection IP65

Ineffective seals of the connection unit and insufficient closed openings for unused line inlets can lead to loss of degree of protection IP65. Penetration by dust or moisture can lead to unsafe operation of the FS840.

- ▶ Close off unused openings for line inlets with impact resistant sealing plugs that have been checked against self-loosening and turning.
- ▶ Check the seals on the Ex-e enclosure for damage and replace as necessary.
- ▶ Tighten the terminals, especially in the Ex-e area.
- ▶ Check the terminals for discoloration. This could indicate increased temperatures.
- ▶ Check the gland screw fittings, sealing plugs and flanges for leak tightness and tight seat.

Terminal assignment



Figure 20: Connecting the Ex overpressure control

① Terminals

Table 8: Terminal assignment

Terminals	Designation
1, 2	Signal contact 1
3, 4	Signal contact 1
5, 6	Connection for purge medium valve
7, 8	- power supply (feed)
9, 10	+ power supply (feed)

Table 9: Terminals with higher safety in the FS840

Tightening torques	Wire cross-sections rigid / flexible
Min. 0.3 Nm	Min. 0.3 mm ²
Max. 0.4 Nm	Max. 2.5 mm ²



NOTICE

Always maintain the limit values on the respective terminals. Refer to the Technical Data or the Test Certificate for the limit values. The fitted valve fuse must correspond to the specified fuse value of the purge medium valve used.

Limit values, see "Limit values for terminal assignment FS840", page 98.



NOTE

Further information on the pressurized enclosure system, see "Pressurized enclosure system settings", page 98 and FS840 Operating Instructions.

6.8 Electrical connection of SR-unit



NOTICE

The connecting hose between the SR-unit and the evaluation unit is part of the pressurized enclosure. It is under overpressure.

- ▶ Protect the connecting hose against possible damage.

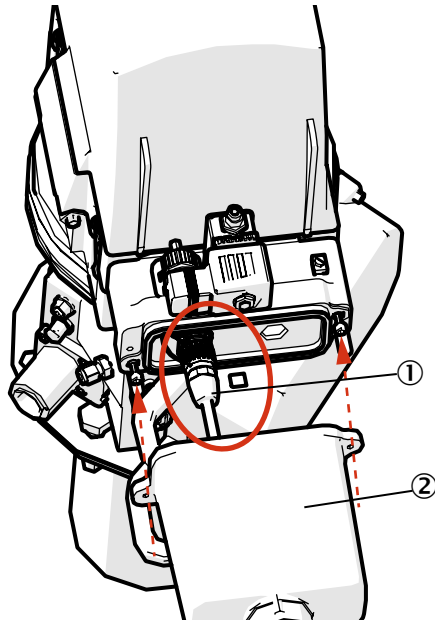


Figure 21: Connection of connecting hose with the SR-unit

Connect the connecting hose to the SR-unit:

- 1 Connect the connecting hose plug on the SR-unit.
- 2 Push on the cover and screw tight.

6.9 Connecting the potential equalization



NOTICE

A potential equalization not connected properly or missing can lead to malfunctions in device operation.

6.9.1 Connecting the potential equalization on the SR-unit

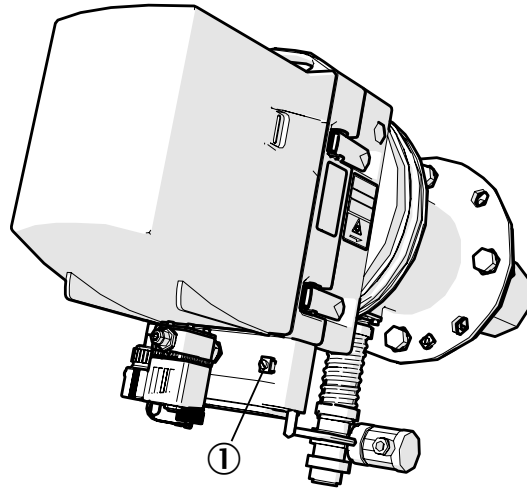


Figure 22: Connecting the potential equalization on the SR-unit

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

6.9.2 Connecting the potential equalization on the purge air fixture

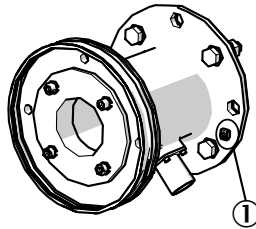


Figure 23: Potential equalization on the purge air fixture

- ① Connection of potential equalization
- ▶ Screw the grounding conductor tight on the screw terminal.

6.9.3 Potential equalization - evaluation unit and Ex control unit

Connecting the grounding conductor on the control unit

Steps

1. Lead the potential equalization (4 mm²) of the plant ground with one eyelet over the bolt.
2. Position and tighten the M6 nut.

Connect the grounding conductor on the Ex control unit FS840

1. Screw the potential equalization (4 mm²) of the plant ground tight to the screw terminal.

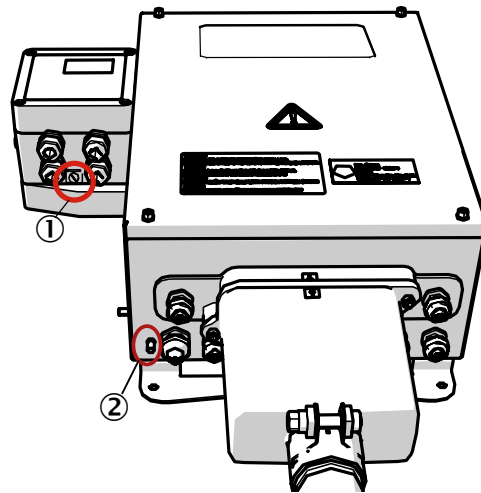


Figure 24: Potential equalization on Ex control unit and evaluation unit

- ① Potential equalization connection on Ex control unit
- ② Potential equalization connection on evaluation unit

7 Commissioning

7.1 Safety information on commissioning



NOTICE

Observe information in Chapter “Main operating information”.

Technical knowledge needed / requirements for commissioning



NOTICE

- You have fundamental knowledge of the GM700
- You are familiar with national and local requirements regarding setting up and operating devices in potentially explosive atmospheres.
- You are familiar with conditions at the installation location, especially possible hazards through the gases in the gas duct (hot/dangerous to health). You are capable of recognizing and preventing danger by possibly escaping gases.

If one of these requirements is not met:

- ▶ Contact SICK Customer Service or your local SICK representative.
-

Laser radiation



WARNING

Eye injuries through laser radiation

The invisible laser beam is not accessible when the sender/receiver unit is closed. Observe the following when the sender/receiver unit of the device is swiveled open during installation work for test purposes and the laser beam is activated:

- ▶ Before working on the sender/receiver unit, take appropriate safety measures to protect uninvolved persons from the laser beam.
 - ▶ Never look directly into the laser aperture when opening the sender/receiver unit.
 - ▶ Laser protection class 1: Wear laser protection glasses despite low radiation.
 - ▶ Observe national valid limit values and relevant standards for industrial safety.
 - ▶ The laser beam can be made visible with a suitable detector card.
-

Grounding



NOTICE

Device damage through incorrect or missing grounding

It must be ensured during installation and maintenance work that the protective grounding of the device or lines involved is established in accordance with EN 61010-1:2010.

System safety



NOTICE

Responsibility for system safety

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

7.2 Prerequisites for successful commissioning

Required Operating Instructions:

- Operating Instructions, measuring system GM700 Ex
- Operating Instructions, purge air supply
- Gönzheimer Pressurized Enclosure FS840 and Purge Medium Valve Manual
- Final inspection protocol

Table 10: Prerequisites for successful commissioning

All specifications are met in accordance with the project planning. Inspection based on the Final inspection protocol carried out.	<input type="checkbox"/>
Electrical installation - completed and checked.	<input type="checkbox"/>
The measuring system is installed and electrically connected. SR-unit, reflector and purge air fixtures are first fitted and connected electrically during commissioning.	<input type="checkbox"/>
Function test (blower rotation direction) of the purge air unit has been carried out. A zero path, possibly with purge air fixtures, is available.	<input type="checkbox"/>
Sampling point has been checked for free access without hazards.	<input type="checkbox"/>
The optical interfaces of the device have been cleaned.	<input type="checkbox"/>

Technical data of the measuring point (customer's notes)

Table 11: Technical data of the measuring point

Measuring range	
Limit values	
Inputs and outputs to be used	

7.3 Material required

Not contained in the scope of delivery

- Optical alignment tool
- 19 mm open-end wrench
- Insulated screwdriver set
- Allen key set
- Optical cleaning cloth without cleaner
- Personal protective equipment
 - Hot surfaces on device
 - In accordance with local regulations

7.4 Overview of commissioning steps

Table 12: Commissioning steps

Step	Procedure	Reference
1	Remove the transport safety devices.	see "Remove the transport safety device" , page 23.
2	Electrical connection of SR-unit.	see "Electrical connection of SR-unit" , page 45
2	Carry out zero adjust.	see "Zero adjust on the measuring path free from sample gas" , page 51.
3	Fit the purge air fixtures on the flanges with tube.	see "Fitting the purge air fixtures on the flange with tube" , page 53.

Step	Procedure	Reference
4	Fit the device flanges on the purge air fixture(s).	see "Fitting the device flange on the purge air fixture", page 54
5	Align the device flanges and purge air fixture(s).	see "Aligning device flanges and purge air fixtures", page 52
6	Connect the protective gas.	see "Connecting the protective gas on the SR-unit", page 56
7	Connect the potential equalization.	see "Connecting the potential equalization on the SR-unit", page 46
8	Put the purge air supply into operation.	see "Installing the purge air unit", page 34
9	Fit the SR-unit on the device flange.	see "Fitting the sender/receiver unit and reflector unit on the device flange", page 57
10	Switch the measuring system on.	see "Optical fine alignment of the sender/receiver unit ", page 58 see "Starting measuring operation", page 61
11	Optional: Fit the weatherproof cover.	see "Fitting the weather hood (option)", page 59

7.5 Assembly drawing

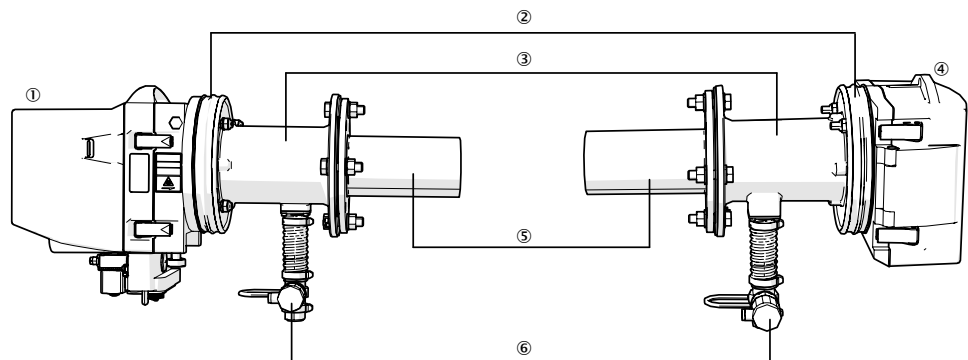


Figure 25: Assembly drawing GM700 Ex with differential pressure sensor

- ① SR-unit
- ② Device flange
- ③ Purge air fixture
- ④ Reflector
- ⑤ Flange with tube
- ⑥ Differential pressure sensor

7.6 Zero adjust on the measuring path free from sample gas

7.6.1 Setting up the zero path

Prerequisite

- Clean ambient atmosphere, free from sample gas, protected against weather.
- When possible, the zero path should be created near the measuring path.
- The flange-flange measuring path must be known.
Make a tube
- Dimensions: \varnothing 70 mm.
- Length: Corresponding to the flange-flange path.
- Paint inside matt black. Slightly rusty surfaces are OK.
- Support tube against sagging.



NOTE

Close tube off dust-tight when not in use.



NOTE

Set the gap between device flange and purge air fixture to approx. 5 mm so that the cup springs have initial tension.

7.6.2 Fit the purge air fixtures

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

- 1 Fit the respective purge air fixture with device flange on the flange with tube with the 4 M16 screws.

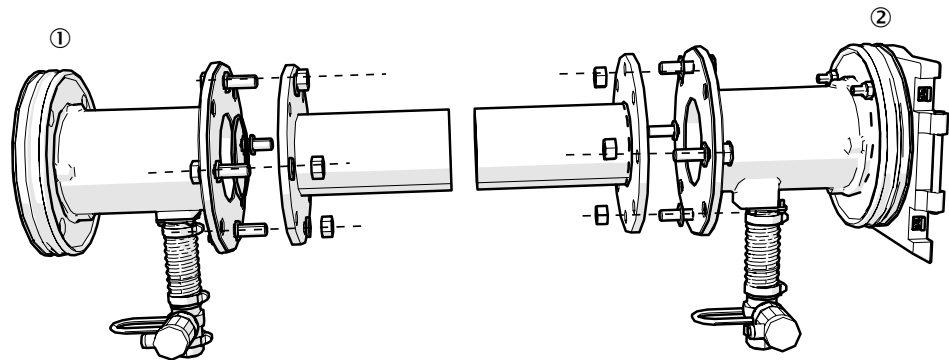


Figure 26: Fitting the purge air fixtures

- ① Device flange, sender/receiver unit
- ② Device flange, reflector unit

7.6.3 Aligning device flanges and purge air fixtures

Adjustment device

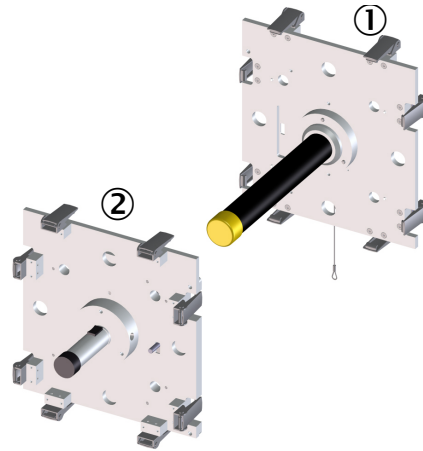


Figure 27: Adjustment device

- ① Adjustment device, aiming unit (focusing screen with visor)
- ② Adjustment device, light source



CAUTION

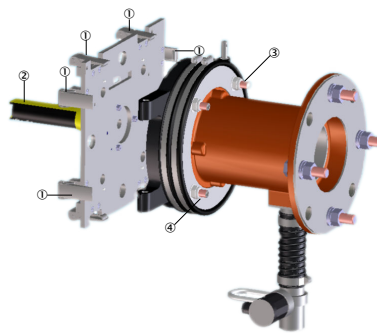
Risk of explosion when using a light source not suitable for Ex for adjustment in Ex zone 2

If the adjustment device is set up within Ex zone 2, the LED light with identification DEMKO 13 ATEX1302999 X EX II 1 G Ex ia UC T4 must be used.

- ▶ Order the LED lamp set from SICK, Part No.: 2042835

Install the adjustment device with light source at the side of the receiver unit

- 1 Place the adjustment device with light source on the device flange of the SR-unit.
- 2 Fasten with quick-release fasteners.



- ① Quick-release fastener
- ② Adjustment tube
- ③ Screw for horizontal adjustment of light spot
- ④ Screw for vertical adjustment of light spot

Installing the adjustment device with adjustment tube on the side of the reflector unit

- 1 Remove the protective cap from the adjustment tube.
- 2 Insert the adjustment device with tube into the device flange.

- 3 Fasten with quick-release fasteners.

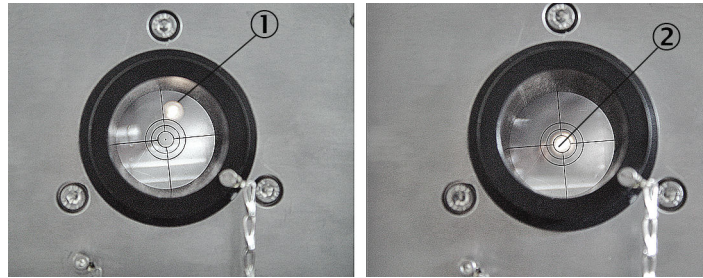
**NOTE**

Both pins of the device flange must fit into the respective drilled holes of the adjustment device.

Adjusting

The alignment is performed on the device flange which contains the adjustment tube:

- 1 Align with the screws for the horizontal and vertical adjustment until the light spot is at the center of the target on the adjustment tube.
- 2 Interchange the adjustment device with light source and the adjustment tube.
- 3 Align the flange with adjustment tube again until the light spot is shown centrally in the target of the adjustment tube.



① Light spot not correctly aligned

② Light spot correctly aligned

- 4 Remove the adjustment device again.
- 5 Attach the protective cap and pack free from dust and humidity for storage.

**NOTE**

If centering is not possible: Unscrew the device flanges from the “flange with tube” and check the optical alignment of the “flange with tube”.

7.7 Fitting the purge air fixtures on the flange with tube

**NOTE**

Installation of the purge air fixtures on the SR-unit and on the reflector is identical.

- ▶ Install the purge air fixture according to the Figure.

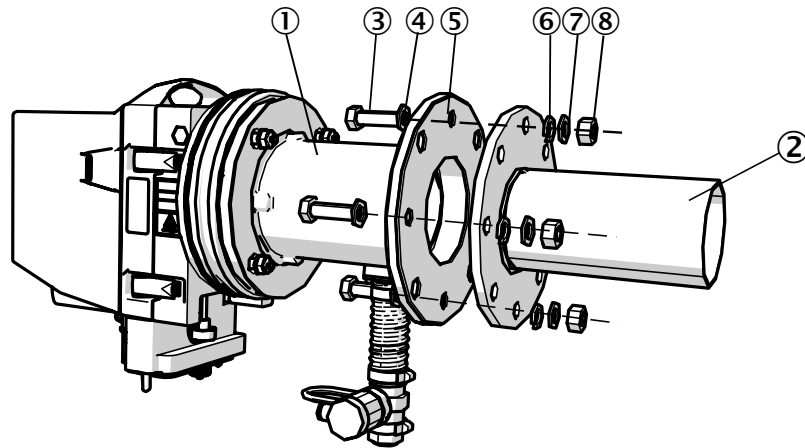


Figure 28: Fitting the purge air fixture on the flange with tube

- ① Purge air fixture
- ② Flange with tube
- ③ Screws
- ④ Washer
- ⑤ Flange seal
- ⑥ Washer
- ⑦ Spring washer
- ⑧ Nut

7.8 Fitting the device flange on the purge air fixture



NOTE

Installation of the purge air fixtures on the device flange of the sender/receiver unit and on the reflector unit is identical.



NOTE

Fitting is easier when the sender/receiver is taken off the device flange beforehand, see ["Removing the SR-unit resp. reflector unit", page 76.](#)

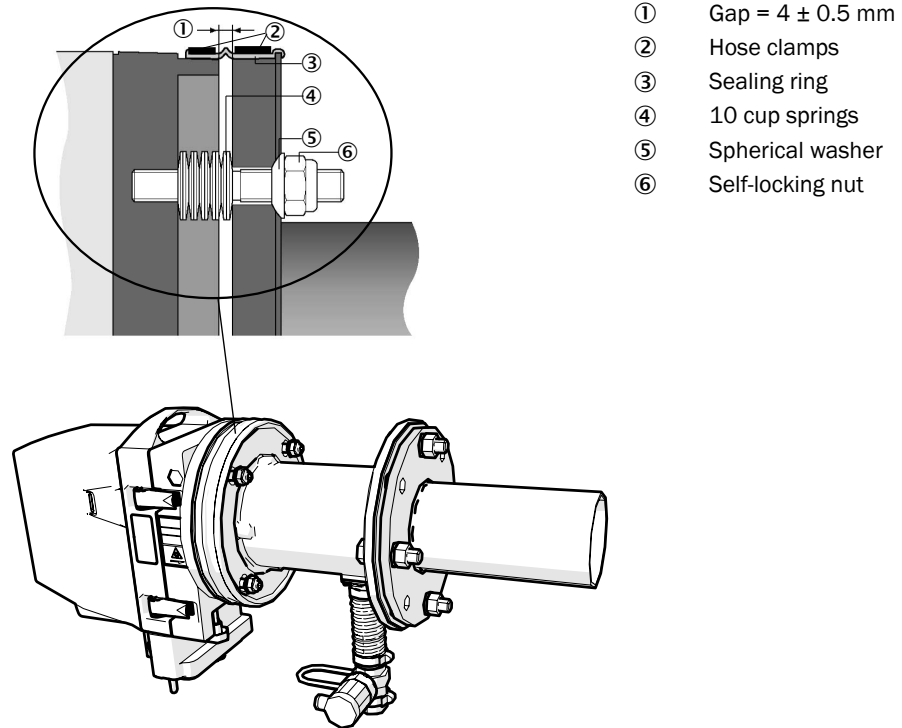


Figure 29: Device flange fitted on the purge air fixture

Place 10 cup springs, individually directed against each other, on each of the three threaded bolts on the device flange.

Pull the sealing ring over the flange of the purge air attachment and hang it loosely over the purge air unit.

Pull the sealing ring over the flange of the measuring probe and hang it loosely over the purge air unit.

Push the device flange onto the purge air attachment.

Push the device flange onto the measuring probe.

Position the centering discs.



NOTICE

Observe the direction of the centering disc: The convex side must fit into the groove on the purge air attachment.

Tighten the self-locking nuts with a wrench (19 mm) so that the cup springs are slightly compressed and an even gap of approx. 4 mm remains.

Fit the sealing ring over the gap.

Push the two hose clamps over the sealing ring and screw tight.

7.9 Feeding protective gas



NOTICE

The pressurized enclosure requires a permanent supply of protective gas to ensure the Ex protection function.

- ▶ Feed the protective gas via the protective gas connection. Further information concerning protective gas:
 - Requirements for protective gas, see ["Technical data for Protective gas", page 98](#).
 - Protective gas outlet: see ["Install the FS840", page 32](#).

7.9.1 Connecting the protective gas on the SR-unit

The protective gas connection is located underneath the enclosure of the sender/receiver unit.

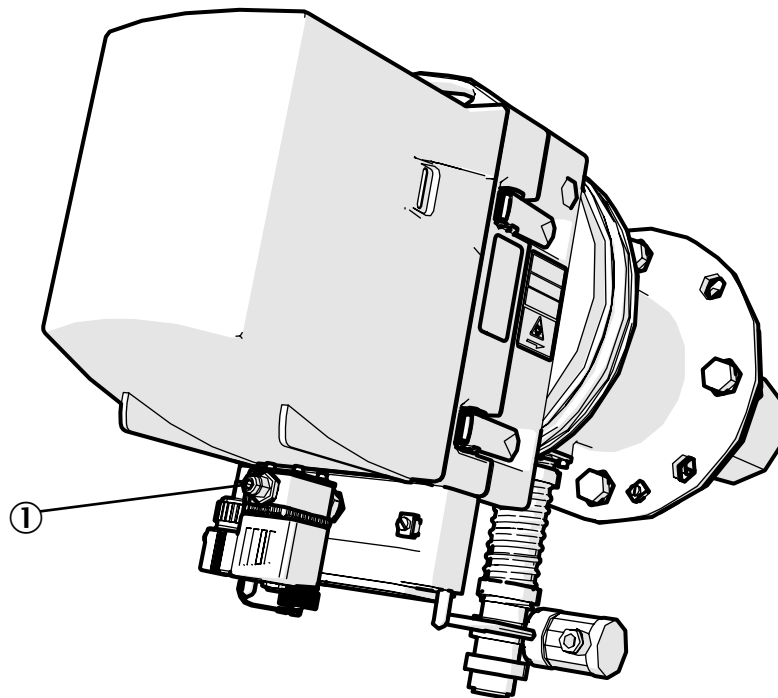


Figure 30: Connection for protective gas on GM700 Ex

- ① Protective gas inlet:
 - Thread G3/8" or
 - hose connection for 8 mm diameter



NOTICE

Only use protective gas corresponding to the specifications, see ["Technical data for Protective gas", page 98](#).

7.9.2 Switch the pressurized enclosure on

- 1 Switch the main power supply of the pressurized enclosure system on (at an external source).
- 2 The pressurized enclosure system starts pre-purging the enclosure with protective gas. The Ex control unit signals the end of the pre-purge phase.
- 3 Switch the main power supply of the measuring system on (at an external source).

7.10 Fitting the sender/receiver unit and reflector unit on the device flange



WARNING

Risk of injury when the device drops down

The weight of the device can cause it to drop down and cause injuries during the work described in this chapter.

- ▶ Carry out assembly work on parts of the device together with another person when necessary.

1st step: Separate the sender/receiver unit and the intermediate enclosure

- 1 Loosen the quick-release fasteners.
- 2 Pull the hinge pin upwards.

2nd step: Fit the sender/receiver unit on the intermediate enclosure

- 4 Insert the SR-unit in the hinge.
- 5 Insert the pin from the top downwards through the hinge.
- 6 Close the quick-release fasteners.

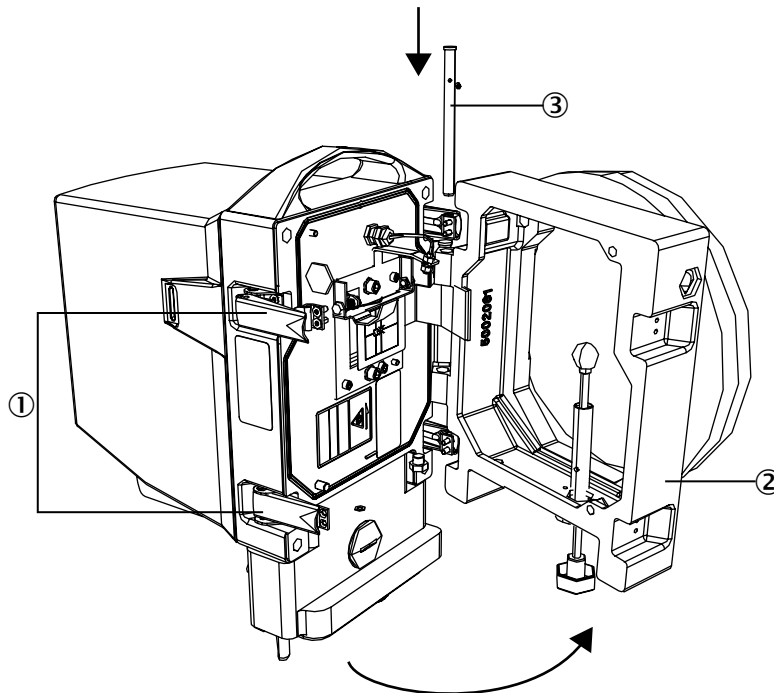


Figure 31: Fitting the GM700 Ex sender/receiver unit on the intermediate enclosure

- ① Quick-release fasteners of the sender/receiver unit
- ② Intermediate enclosure
- ③ Hinge pin

**NOTE**

Fitting the reflector unit is identical.

7.11 Optical fine alignment of the sender/receiver unit

**CAUTION****Hazard by laser radiation**

Device with a laser with protection class 1.

- ▶ Do not hold any reflecting objects or objects that bundle the laser beam in the laser beam.
- ▶ During installation or maintenance: Disconnect the power supply before opening the device.

Prerequisite

- The power supply of the evaluation unit is switched on.
- The device is in Maintenance mode.

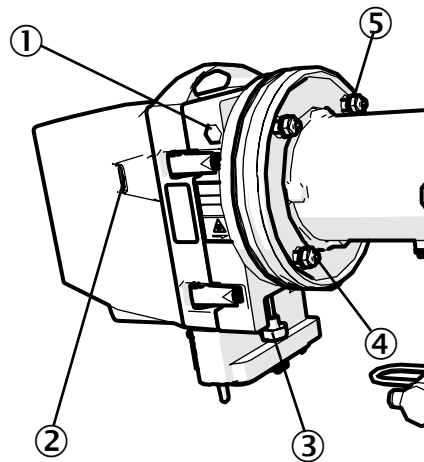
Components of the alignment tool on the GM700

Figure 32: Components of the alignment tool on the SR-unit

- ① Visor of the optical alignment tool
- ② LED display for rough optical alignment
- ③ Alignment tool lever
- ④ Y-alignment: Vertical
- ⑤ X-alignment: Horizontal

Carry out optical fine alignment of the SR-unit

- 1 First turn the lever of the built-in alignment tool (3) and then pull it down to bring it to the adjustment position, (see Figure above).
- 2 Look through visor (1) on the right enclosure side diagonally from above to the mirror with the target.
- 3 Align the position of the red light spot. To do this, adjust the nuts for the X and Y alignment on the device flange so that the light spot is positioned in the center of the target, see "Optical fine alignment of the sender/receiver unit", page 58.
- 4 After successful alignment, push the lever of the alignment tool back to its original position and secure it with a quarter turn.

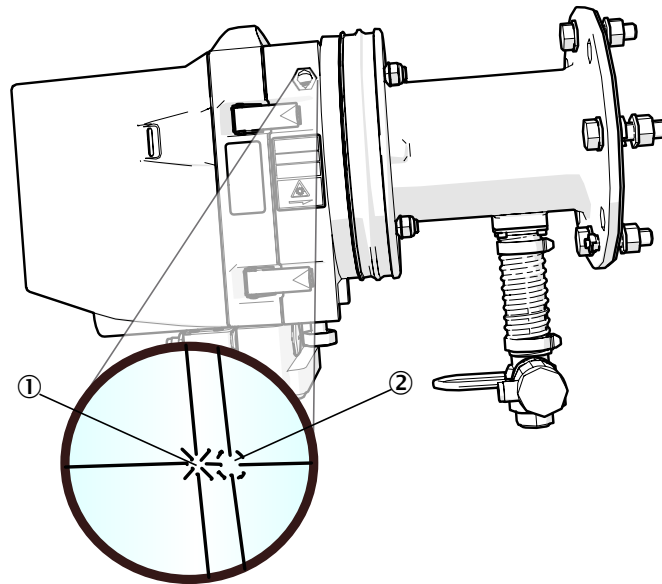


Figure 33: Point for correct fine adjustment

- ① Target for the alignment tool for the Cross-Duct version
- ② Target for the alignment tool for the probe version

7.12 Fitting the weather hood (option)

Weather hood installation preparation

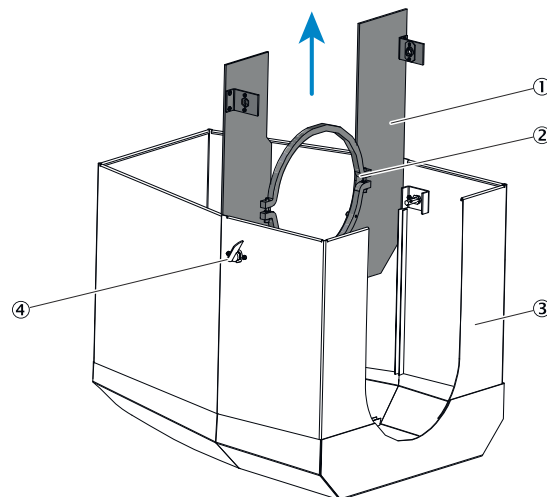


Figure 34: Weather hood installation preparation, sender/receiver unit

- ① Installation plate
- ② Mounting ring
- ③ Hood
- ④ Bayonet lock with lock

Steps

1. Place the weather hood on the floor with the opening facing upwards.
2. Open and unhinge the bayonet locks on both sides.
3. Pull the installation plate upwards and remove it from the hood.
4. Remove the bottom mounting ring.

Fit the installation plate on the flange of the purge air attachment.

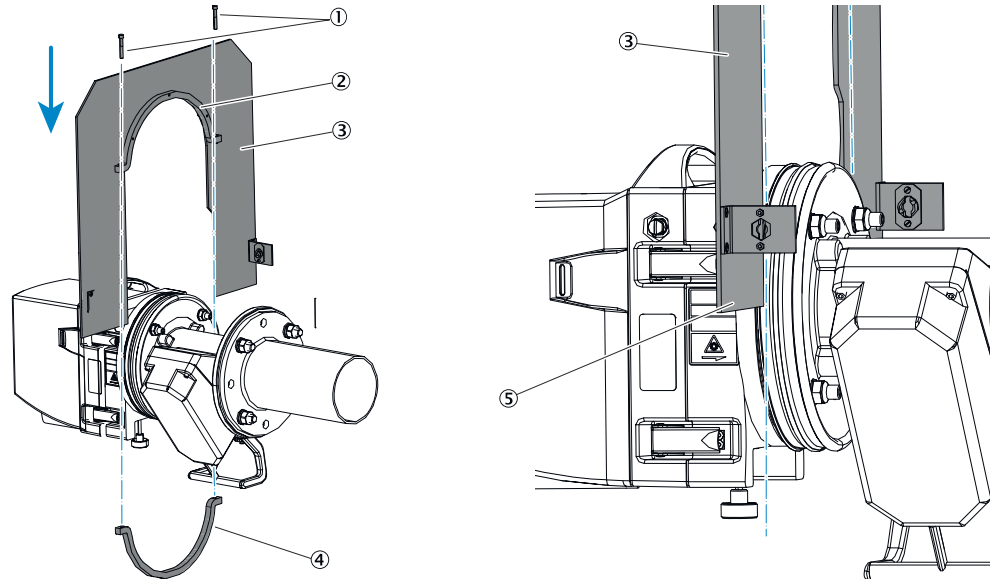


Figure 35: Fitting the mounting plate.

- ① Screws
- ② Upper mounting ring
- ③ Installation plate
- ④ Lower mounting ring
- ⑤ Detail: Placing the mounting plate on the rubber band

Steps

1. Place the installation plate from the top on the rubber band of the purge air attachment
2. Screw the lower mounting ring to the upper mounting ring.

Placing the weather hood on the mounting plate.

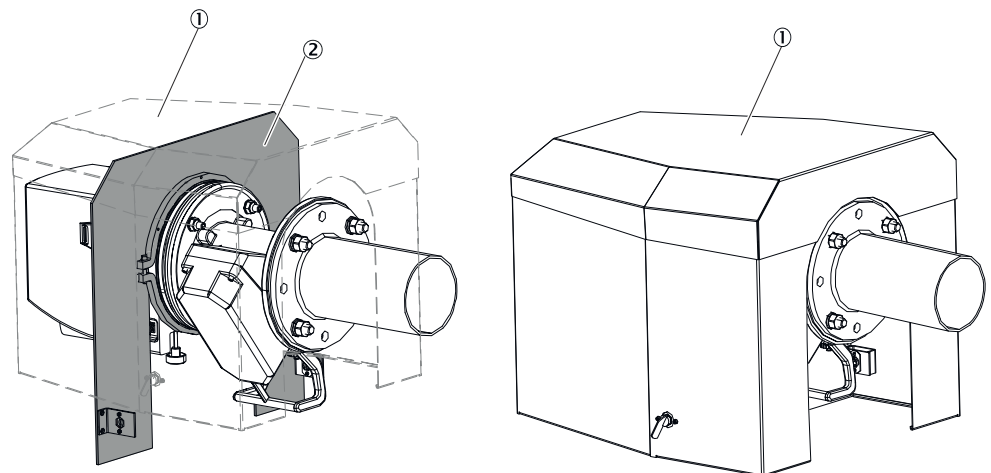


Figure 36: Fitting weather hood.

- ① Hood
- ② Installation plate

Steps

1. Place the hood from above on the installation plate.
2. Engage the bayonet lock.



NOTE

The weather hoods for the reflector unit and control unit are mounted in the same manner.

7.13 Starting measuring operation

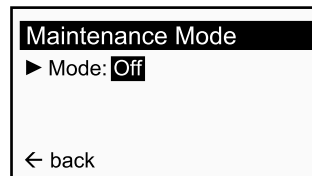


NOTE

The device is delivered from the factory with the parameter settings specified by the customer when ordering. When these parameter specifications match the parameters during commissioning, measuring operation can be started after fine optical alignment by pressing the “meas” button. The device can be configured to meet the plant conditions when required.

Start Operating mode:

- 1 Switch Maintenance mode off, menu path: [see "Menu tree Maintenance", page 68](#).



- 2 Set Mode to “Off”.
- 3 Press “Meas”.

Checking status LEDs, error and warning messages



NOTE

Quick check of Measuring screens on the LC display of the evaluation unit:

- ▶ Using the Operating Instructions, [see "Operating and display elements \(evaluation unit\)", page 63](#).

When error or warning messages are present:

- ▶ Determine and clear the error cause using the Operating Instructions, [see "Serial interface commands - Diag", page 70](#), and the Error and Warning Message Tables, [see "Error messages", page 88](#) and [see "Warning messages", page 90](#).
If the error cause cannot be cleared:
- ▶ Contact SICK Service.

7.13.1 Operating states

Message on EvU display	Meaning
INIT	Initializing the evaluation unit
INITIALISATION	Initializing the SR-unit
SIGNAL_ADJUST	Adjusting amplification to changed transmission
MEASURING	Measuring operation

Message on EvU display	Meaning
MEASURING LL	Measuring operation with active tracking of the laser beam length (line locking)
MEASURING LD	Measuring operation; beam length tracked (line locking done)
MAINTENANCE	Maintenance mode (no measurement)
DOWNLOAD	Download new software (for Service purposes only)

7.13.2 Select the ambient temperature range



NOTICE

Temperature stabilization: 30 minutes

The device stabilizes the temperature after the temperature is modified.

- Warning message “DEV TEMP” is output during temperature stabilization.
-

- 1 Activate Parameter mode.
- 2 Menu path: Setting -> Ambient Temp.
- 3 Select the temperature range from the Table that matches the ambient conditions best at the measuring location, [see "Possible ambient temperatures", page 106](#).

8 Operation

8.1 Safety

**WARNING**

Hazard for persons and plant through unsafe operation of the measuring system

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

- ▶ Put the device out of operation.
- ▶ Disconnect the device from the main supply voltage and signal voltage.
- ▶ Secure the device against unallowed or unintentional start-up.

**NOTE**

More information concerning the detection of unsafe operating states, see Chapter "Visual check".

8.1.1 Check before start-up

Before every start-up

- ▶ Check all enclosures are closed
 - Enclosure cover
 - Cable inlets
 - Enclosure openings

**NOTICE**

Permanent feed of protective gas must be ensured, see "[Feeding protective gas](#)", page 56.

8.2 Operating and display elements (evaluation unit)

**DANGER**

Risk of explosion through releasing the Ex protection

The operating elements of the evaluation unit GMA700 can only be used when the evaluation unit is opened. The zone separation is no longer ensured when the evaluation unit is opened in the Ex zone during operation. This creates an explosion risk.

The Ex-p system generates a warning signal that the Ex protection is not effective.

To operate the measuring system via the operating elements:

- ▶ Ensure an Ex-free atmosphere exists when opening the GMA700.

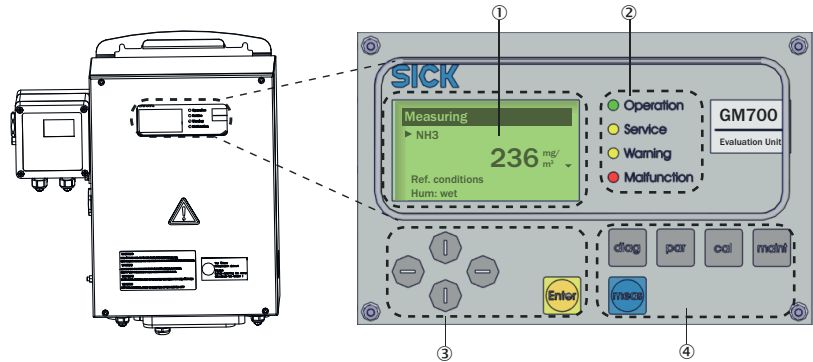






Figure 37: GM700 operator panel

- ① Display
 - All current measured values
 - Computed values
 - Menu navigation
- ② Status LEDs to signal operating and malfunction states
- ③ Function buttons for menu navigation and input
- ④ Function buttons for menu selection

LEDs

Table 13: Significance of Status LEDs

LED	Significance
 OPERATION	<ul style="list-style-type: none"> • Measuring mode • Device is switched on. Power voltage available.
 SERVICE	<ul style="list-style-type: none"> • Service mode
 Warning	<ul style="list-style-type: none"> • Warning message • At least one warning message pending. • Read the warning message, see Diagnosis mode (diag)
 MALFUNCTION	<ul style="list-style-type: none"> • Device malfunction • At least one malfunction message pending. • Read the malfunction message, see Diagnosis mode (diag)

8.2.1 Function buttons

Button	Function
MEAS	Back to the Measuring screen from any menu. All inputs that have not been terminated with Save are discarded.

The current function of the function buttons is shown on the display.

Display	Function
Back	Returns to next higher level menu.

Display	Function
Diag	To display warning and/or error messages (plain text) and retrieve sensor values: Press this button.
Enter	Call up/start/confirm selected menu function.
Select	Select function/character.
Start	Start procedure.
↑	In a selection list: Move cursor upwards. During input: Next character.
↓	Move cursor downwards.
←	Move cursor to the left.
→	Move cursor to the right.

8.3 Menu tree of the evaluation unit



NOTE
Menu texts are shown in **English**.

8.3.1 Menu tree, Measuring



Menu level	Explanation
Measuring	Measure <ul style="list-style-type: none"> • Current measured values: Depending on device version • Reference variables (wet, dry)

8.3.2 Menu tree Diagnosis



Menu level	Explanation
Diagnosis	Diagnosis
Malfunction	Current error messages (plain text)
Warning	Current warning messages (plain text)
Sensor values	Displays diagnostic values and control values
GM700	Current monitored sensor values (amplification setting, internal temperature control, control values, etc.)
	Cross-Duct: OH Cross-Duct: Reflector

8.3.3 Menu tree Parameter



Menu level			Explanation	
Parameters			Parameter	
Settings			Parameter settings/display of system components	
Physical Unit	Component	Unit	mg/m3, ppm	
		Ref. condition	<ul style="list-style-type: none"> t: actual, 25 °C, 20 °C, 0 °C p: actual, 1013 mbar Hum.: wet, dry 	
	Average	Avg. Time	0 ... 300 s	
	Meas. Distance	Active	200 ... 8000 mm	
	Gas temperature	Source	Probe, Subst. Analog In	
		Subst.	-100 ... 2000 °C	
	Pressure	Source	Probe, Subst. Analog In	
		Subst.	600 ... 15000 hPa	
	Humidity	Subst.	Subst.: 0 ... 93.0 percent by volume	
	Analog Out	Live Zero		0, 4 mA
		Output 1		Component: e.g.. NH ₃ , -, p, T
				Range low: 0 ... 999999
				Range high: 0 ... 999999
				Cycle Out: No, Yes
		Output 2		Component: e. g. NH ₃ , -, p, T
			Range low: 0 ... 999999	
			Range high: 0 ... 999999	
			Cycle Out: No, Yes	
Output 3			Component: e. g. NH ₃ , -, p, T	
			Range low: 0 ... 999999	
			Range high: 0 ... 999999	
		Cycle Out: No, Yes		

Menu level		Explanation	
	Analog In	Input 1 T	Unit: °C, K, °F
			Live Zero: 0, 2, 4 mA
			Range low: 0 ... 15000
			Range high: 0 ... 15000
		Input 2 p	Unit: hPa
			Range low: 0 ... 15000 Range high: 0 ... 15000
	Regress Funct.	Span	0.50 ... 1.99
		Zero	±999
	Ambient Temp.	Range	<ul style="list-style-type: none"> • 0 ... 50 °C • -10 ... 40 °C • -20 ... 30 °C • -30 ... 20 °C ^[1] • -40 ... 10 °C ^[1]
			<div style="border: 1px solid black; padding: 2px; display: inline-block; margin-right: 5px;">EX</div> NOTICE ^[1] These temperature ranges are not allowed for Ex applications.
	t (Feed Test Gas)	Period	0 ... 3666 d (t = days), only when permanent cell is included
	Check cycle	Period	0 ... 24 h
	Zero Adjust	Enable	Yes, No
Repet.		0 ... 24 h (only GPP)	
t (purge)		0 ... 900 s; purge time until the process gas concentration is zero	
t (delay)		0 ... 1800 s; delay until gas enters again	
Delta T		0 ... 999 °C; temperature difference at which a zero adjust is carried out	
Device	Serial Number	Head	-----
		Laser	-----
		EvU	-----
	Software Revision		<ul style="list-style-type: none"> ■ GMM700-X ■ XXXXXXX XXXX ■ GMM700/DSP ■ XXXXXXX XXXX
Service			Not defined

8.3.4 Menu tree Calibration



Menu level			Explanation
Calibration			Calibration
Check cycle	Start CCY (Check Cycle)		Check cycle for test purposes, e.g. after maintenance (preliminary)
Zero Adjust	Start ZeroAdjust	Password (1234)	Zero point determination, e.g., during commissioning or maintenance tasks based on the zero path
Zero Adj. Stack	Start ZeroAdjust		Only GPP probe: Zero point determination with measuring device on gas duct ⚠ Do not use on GM700 Ex! This causes erroneous zero point determination.
Box measuring	Start Meas.		Check of measuring components with test gas via a filter box
Check cycle	Check CycleStart CCY (Check Cycle)		Check cycle for test purposes, e.g., after maintenance

8.3.5 Menu tree Maintenance



Menu level			Explanation
Maintenance			Maintenance
Maint. Mode	Mode: Off, On		Maintenance operation: On, Off
Adj. Opt. Align.	Opt. Alignment		Optical alignment function for the sender/receiver unit and reflector unit
Test Analog Out	AO 1: 4 mA		Tests the analog outputs
	AO 2: 4 mA		
	AO 3: 12.5 mA		
Test Analog In	AI 1: 0 mA		Tests the analog inputs
	AI 2: 0 mA		
	AI 3: 0 mA		
Test Relay	Relay 1: On (Off)		Tests the relay outputs
	Relay 2: On (Off)		
	Relay 3 Off (On)		
Test Digital In	DI 1: Open		Tests the digital inputs
	DI 2: Open		
	DI 3: Open		
Push Diag	RS-232		Output of the complete parameter set via the RS-232 Service interface

Menu level			Explanation
Reset System			Restarts the measuring system
Reset Parameter			Resets parameters to factory settings ⚠ All settings are overwritten!

8.4 Operating using the serial interface



NOTE

Menu texts are shown in **English**.



NOTICE

Operating is only possible via the serial interface during operation in Ex area. Local operating via the evaluation unit is possible when the Ex protection is not effective.

8.4.1 Significance of command line elements

Table 14: Significance of command line elements

Element	Meaning	Text style used
SAMPLE	Shows the name of the command or utility program.	CAPITAL LETTERS
{variable}	Shows several options from which the user must select one, more or all.	Small letters in {round brackets}
[option]	Shows optional elements.	Small letters in [square brackets]
.,:;	Punctuation marks are part of the command and to be inserted as such.	Small letters
<cr>	Stands for pressing Enter (on the computer keyboard).	Small letters

8.4.2 Setting for serial interfaces

Table 15: Standard setting for serial interface

Parameter	Description / value
Baudrate	9600 Baud
Data bits	7
Parity	Even parity
Stop bits	1
Protocol	No protocol
Interface line	1:1
Connection	2-2 / 3-3 / 5-5

8.4.3 Serial interface command - MEAS

Start measuring operation/switch to measuring operation

Syntax:
GM700<<GOTO MEAS

8.4.4 Serial interface commands - Diag

The serial interface is only used when fast access to the menu in the EvU is not possible due to Ex protection. The following Chapters explain a selection of commands the user will need to analyze a problem when errors occur.

8.4.4.1 Table with warning messages

Call up the Table of warning messages.

```
Syntax:  
GM700<<DIS WTBL
```

8.4.4.2 Call up the Table with error messages

Call up the Table with error messages

```
Syntax:  
GM700<<DIS MTBL
```

8.4.4.3 View the device configuration

Call up the list of the device configuration

```
Syntax:  
GM700<<DIS CONFIG
```

8.4.4.4 Check the system state and configuration

Output of the current system state and configuration

```
Syntax:  
DIS DEV PARA
```

8.4.4.5 Call up diagnostic data

Command “DIS MERB” calls up the diagnostic data.

```
Syntax:  
GM700<<DIS MERB
```

8.5 Setting the display contrast

The rotary potentiometer for setting the display contrast is located above the “Digital Out” terminal block.

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

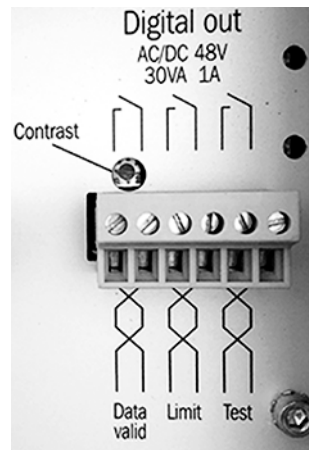


Figure 38: Rotary potentiometer for display contrast

9 Maintenance

9.1 Safety

Ex safety



WARNING

Risk of explosion

Some of the work described in this Chapter assumes an Ex free zone.

- ▶ Wait 20 minutes after switching off the main power supply before opening the enclosure.
-
-



DANGER

Risk of explosion through incorrect performance of maintenance work

Incorrect performance of maintenance work in potentially explosive atmospheres can cause serious injuries to people and damage during operation.

- Maintenance and commissioning tasks as well as checks should only be carried out by experienced/trained personnel with knowledge of the rules and regulations for potentially explosive atmospheres, especially:
 - Ignition protection types
 - Installation procedures
 - Zone classification
 - Standards to be applied:
 - IEC 60079-14, Annex F: Knowledge, expertise and competence of responsible persons, craftsmen and designers
 - IEC 60079-17: Electrical installations inspection and maintenance
 - IEC 60079-19: Equipment repair, overhaul and reclamation
-
-



DANGER

Risk of explosion when using spare and wearing parts not approved for the Ex zone

All spare parts and expendable parts for the in-situ gas measuring device have been checked by SICK for ATEX suitability. The use of different spare parts and expendable parts increases the risk of an explosion and the ignition protection can no longer be ensured.

- ▶ Use only original spare parts and expendable parts from SICK.
-
-



DANGER

Risk of explosion through residual voltages and hot surfaces in the device

When the device is switched off, residual voltages and hot surfaces represent an increased risk of explosion when the device is open.

- ▶ Wait 20 minutes after switching off the main power supply before opening the enclosure.
-
-

**DANGER****Hazard for health through contact with inert protective gas**

Inert protective gas can emerge uncontrolled when the device is opened directly after switching off. Direct contact with inert protective gas is a high health risk, including risk of suffocation.

- ▶ Interrupt the inert gas feed before opening the device so that only the volume of inert gas in the device can escape.
- ▶ Ensure good ventilation and air exchange.
- ▶ Never open the device when the room is too small.

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

If the optics purge air is switched off when the sender/receiver unit and the reflector unit are still in the gas duct, hot and contaminated gas can cause device damage.

- ▶ Do not switch off the purge air unit as long as the sender/receiver unit or the reflector unit are still in the gas duct.

**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 power isolating 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 power isolating switch is easily accessible.
- ▶ An additional separation device is mandatory when the power isolating switch cannot be accessed or only with difficulty after installation of the device connection.
- ▶ The power supply may only be switched on again after work completion or for test purposes by the persons carrying out the work under consideration of the valid safety regulations.

**DANGER****Endangerment of electrical safety through missing power isolating switch**

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

- ▶ Ensure the power supply can be switched off using a power isolating switch/circuit breaker in accordance with DIN EN 61010-1:2010.
- ▶ An additional disconnecting device is mandatory when the disconnecting switch is difficult to access or cannot be accessed when connecting the equipment after installation.



WARNING

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

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

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



WARNING

Risk of injury through uncontrolled escape of process gas when the gas duct is opened when under overpressure

Swiveling the sender/receiver unit or reflector unit (on Cross-Duct version) open can lead to contact with toxic and/or hot gases with overpressure in the duct.

- ▶ All persons at the gas duct during opening of the device must follow the protective measures mandatory in operation. Pay special attention to protective masks and protective gloves.
- ▶ Prepare a suitable cover for the opening on the device flange of the sender/receiver unit and keep it available.
- ▶ Immediately place the cover on the opening of the device flange once the sender/receiver unit has been opened.

9.2 Maintenance plan

Table 16: Maintenance intervals

Interval ¹	Maintenance work	Reference
1W	Check that measured values in the control area are plausible	see "Call up diagnostic data", page 70
1M	Visual inspection of system	see "Visual check of the sender/receiver unit and evaluation unit", page 77
	Clean window	.see "Cleaning the optical interfaces", page 78
	Check purge air unit	See purge air supply Operating Instructions
	Check optical alignment	see "Optical fine alignment of the sender/receiver unit", page 58
	Check ambient temperature range	see "System: GM700 Ex version 3G / Zone 2", page 96
	Check purge air unit	See Operating Instructions of purge air unit
6M	Check measured and check values (zero / test point)	see "Filter box measurement to check the measuring channels (for dry gases)", page 79
	Check the pressurized enclosure system	see "Function test of the pressurized enclosure system", page 75
	Protective gas: Condition, availability, pressures	see "Maintenance work on the FS840", page 76

Interval ¹	Maintenance work	Reference
1Y	Check zero path with GMK10 and with Etalon tool	see "Checking the gas analyzer with test cell GMK10", page 82 see "Etalon tool", page 79

¹ 1W = Weekly, 1M = Monthly, 3M = Every 3 months, 6M = Every 6 months, Y = Yearly

9.2.1 Expendable, wearing and spare parts

Recommendation for two years operation

Table 17: Expendable and spare parts for two years operation

Part	Qty.	Part number
Pressure compensation element	1	5312881
Optics cleaning cloth	8	4003353
Filter insert for purge air unit	8	5328662

9.3 Preparatory work



NOTE

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

- ▶ Activate Maintenance mode before starting the work.



NOTE

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



NOTE

A zero path must be available for zero adjust.

9.4 Function test of the pressurized enclosure system

All maintenance work for the pressurized enclosure system is described in the Pressurized Enclosure Manual.



DANGER

Risk of injury through electric voltage

Switch the power supply off before working on terminals and laying lines.

- ▶ Observe the installation regulations according to VDE DIN 57 165 and Test Certificates BVS 15 ATEX E 048 X and IECEx BVS 15.0037 X.



WARNING

Risk of explosion through unauthorized parameter changes

The parameters for the pressurized enclosure system are protected with a parameter password and cannot be changed. Unauthorized changing of parameters can cause an explosion with fatal consequences.

- ▶ Never change parameters without authorization.



DANGER

Risk of explosion when the maintenance of the pressurized enclosure is incorrect

The pressurized enclosure is a central part of the ATEX certification of the device. All maintenance work is described in the Pressurized Enclosure Manual. If work is performed which is not described in this Manual, the risk of explosion of the measuring system increases and the ATEX certification becomes void.

- ▶ Also observe the maintenance instructions in the Pressurized Enclosure Manual.
-



DANGER

Risk of explosion through incorrect settings for the pressurized enclosure

The pressurized enclosure is a central safety element of the device. All work is described in this Manual and the relevant specified documents. If work is performed which is not described in this Manual, the risk of explosion of the measuring system increases and the ATEX certification for the device becomes void.

- ▶ Carry out all work skillfully and in accordance with the delivered documentation.
-

Checking the protective gas feed



NOTE

Keep the device in operation during the check.

- 1 Interrupt protective gas feed to the device.
The Ex control unit should signal an error state after a few minutes.
- 2 Start protective gas feed again.
The Ex control unit should now reset the error state and start the pre-purge phase.

9.4.1 Maintenance work on the FS840

Maintenance FS840

- ▶ Inspect the inlet and outlet of the FS840 regularly for contamination / corrosion.
- ▶ Correct cleaning in good time by Gönzheimer Elektronik GmbH as a precautionary measure against failure of a control unit.

9.4.2 Repair work on the FS840



NOTE

Repairs on the FS840 as well as accessories may only be carried out by Gönzheimer Elektronik GmbH.

9.5 Removing the SR-unit resp. reflector unit



DANGER

Hazard for health through contact with inert protective gas

Inert protective gas can emerge uncontrolled when the device is opened directly after switching off. Direct contact with inert protective gas is a high health risk, including risk of suffocation.

- ▶ Interrupt the inert gas feed before opening the device so that only the volume of inert gas in the device can escape.
 - ▶ Ensure good ventilation and air exchange.
 - ▶ Never open the device when the room is too small.
-

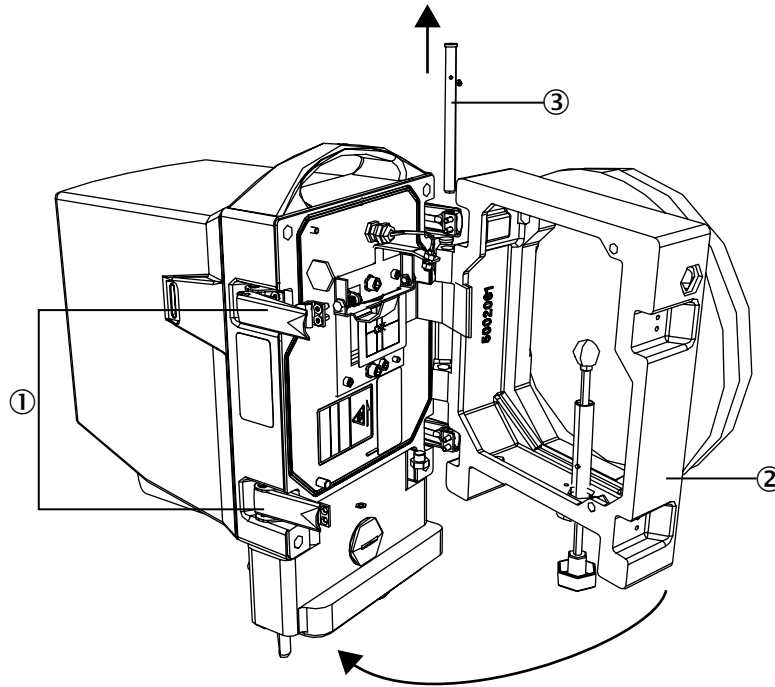


Figure 39: Opening the GM700 Ex sender/receiver unit and removing the intermediate enclosure

- ① Quick-release fasteners of the sender/receiver unit
- ② Intermediate enclosure
- ③ Hinge pin

- 1 Switch device off.
- 2 Open the SR-unit enclosure by releasing the quick-release fasteners.
- 3 Immediately attach the cover on the device flange opening.



NOTE

Opening the reflector unit is identical.

Remove the intermediate housing

- ▶ Hold the unit tight.
- ▶ Pull out the hinge pin.
- ▶ Take off the SR unit or reflector unit.

9.6 Visual check of the sender/receiver unit and evaluation unit

- ▶ Inspect the enclosures of the sender/receiver unit and evaluation unit for mechanical damage.
- ▶ Clean the respective enclosures if contaminated.
- ▶ Check all cables for damage. Pay attention to chafe marks and kinks on cable ducts.
- ▶ Check all hose fittings for tight seat.
- ▶ Check all electrical connections are free from corrosion and have a tight seat.
- ▶ Check grounding conductors are free from corrosion.
- ▶ Check flanges and screw fittings for tight seat.

9.7 Cleaning the optical interfaces



DANGER

Risk of explosion through residual voltages and hot surfaces in the device

When the device is switched off, residual voltages and hot surfaces represent an increased risk of explosion when the device is open.

- ▶ Wait 20 minutes after switching off the main power supply before opening the enclosure.

Material required	Part number
Optics cleaning cloth	4003353
Demineralized water	

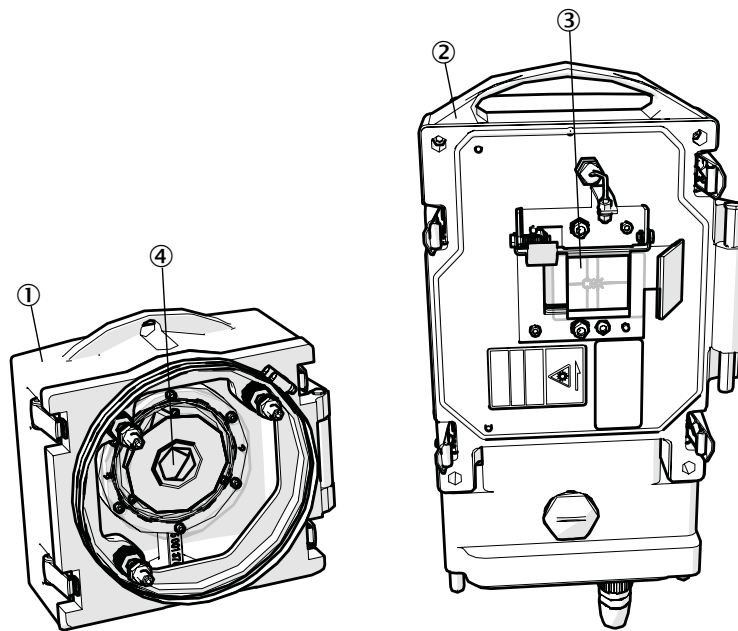


Figure 40: Windows of the reflector and SR-unit

- ① Reflector
- ② Sender/receiver unit
- ③ Laser aperture
- ④ Target

- 1 Switch the device off and swivel the SR-unit away from the intermediate enclosure.
- 2 Flap the target upwards and check the SR-unit window underneath for contamination.

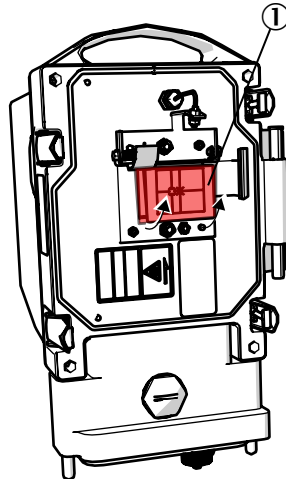


Figure 41: Flap the target holder upwards

① Target holder

3 When necessary: Clean the window with an optics cloth and demineralized water.



NOTICE

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

4 Close the enclosure immediately after cleaning to protect the cleaned optical interfaces against moisture and dust.

9.8 Etalon tool

The laser beam must be readjusted once a year.

Prerequisite:

- Etalon maintenance tool, Part No. 2049984
- Adjustment software
- Training by SICK

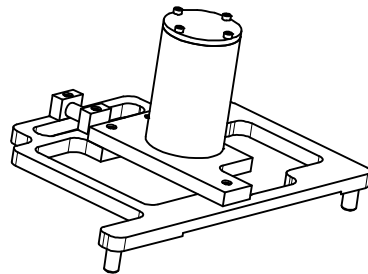


Figure 42: Etalon tool

9.9 Filter box measurement to check the measuring channels (for dry gases)



WARNING

Risk of explosion during filter box measurement in the Ex zone

The filter box is not designed for operation in the Ex zone.

- ▶ Filter box measurement may only be carried out in an Ex-free environment.
- ▶ Observe the relevant Operating Instructions when using the filter box.

Components required

Table 18: Components required for filter box measurement

Components required	Part number
Reflector enclosure with built-in gold-coated hollow triple	2030206
Filter box with adapter plate for the GM700	
Zero gas	

Determining the necessary test gas concentration

- 1 General calculation:

$$\text{Test gas conc. [ppm o. vol. \%]} = \frac{\text{Meas. range [ppm o. vol. \%]} \times \text{active meas. path [m]}}{0.15 \text{ m max. filter chamber length}}$$

- 2 Calculating setpoint values for all 6 chamber lengths:

$$\text{NH}_3 \text{ Desired} = \text{test gas conc. [ppm]} \times 0.769 \times \frac{273}{353} \times \frac{\text{act. air pressure [hpa]}}{1013} \times L [\text{mm}]_{\text{chamber}} \times 0.001$$

Table 19: Test gas concentration for NH₃ of the respective filter chamber length

Test gas concentration						
Filter chamber lengths	25 mm	50 mm	75 mm	100 mm	125 mm	150 mm
NH ₃						

Installing the filter box

- 1 Provide the filter box with adapter plate and reflector enclosure.
- 2 Remove the intermediate enclosure from the sender/receiver unit:
 - ▶ Swivel the intermediate enclosure of the device open.
 - ▶ Remove pin.
 - ▶ Remove the intermediate enclosure.
 - ▶ Store the intermediate enclosure dry and clean during the filter box measurement.
- 3 Fit the filter box in the device:
 - ▶ Insert the filter box in the SR-unit hinge.
 - ▶ Insert and fasten the hinge.
 - ▶ Swivel the filter box on the SR-unit in and lock with the locking device
- 4 Attach the reflector for the device on the filter box:
 - ▶ Fasten the reflector enclosure to the filter box with 4 screws.

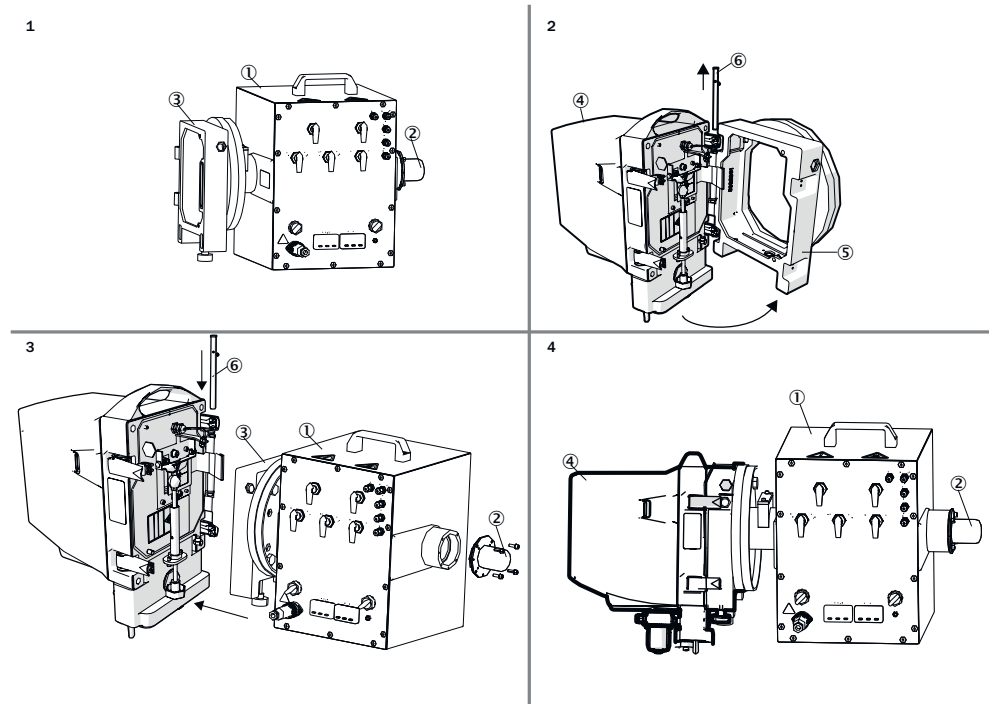


Figure 43: Fit the filter box on the measuring device

- ① Gas filter box
- ② Reflector enclosure
- ③ Adapter plate for SR-unit
- ④ Sender/receiver unit
- ⑤ Intermediate enclosure
- ⑥ Pin

Carry out filter box measurement

- 1 Switch filter box on.



NOTE

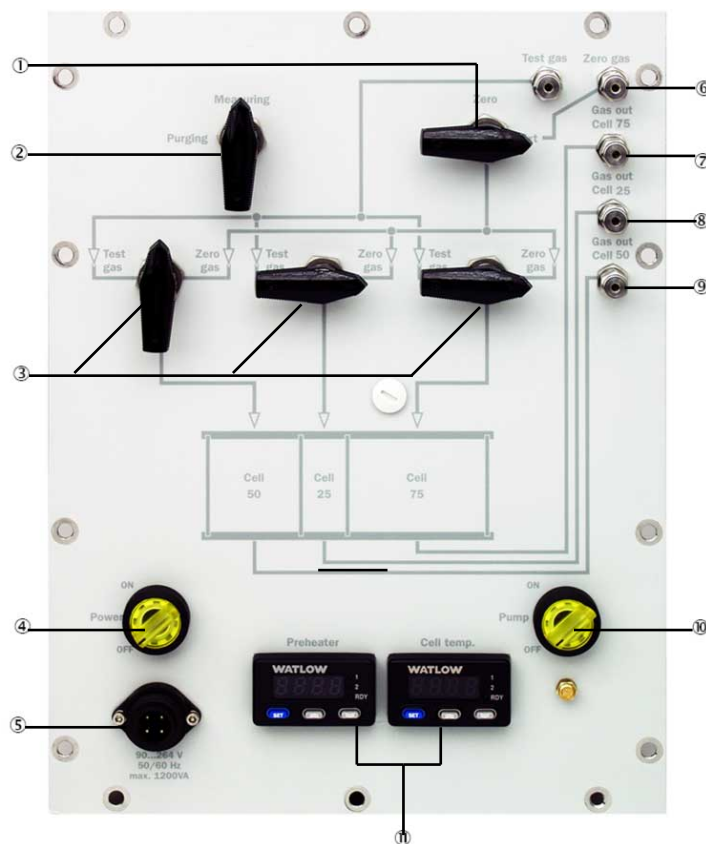
The warming-up phase takes about 2.5 hours.

- 2 Make the settings on the filter box:
 - ▶ Set the sample gas chamber to “Zero gas”.
 - ▶ Set the “Measuring/Purging” valve to “Purging”.
- 3 Make the settings on the EvU:
 - ▶ Switch to Calibration mode with button “cal”.
 - ▶ Select menu “Box measuring” -> “gas”.
 - ▶ Enter password “1 2 3 4”.

The measuring device starts a zero adjust and then switches to operating mode “Box measuring”.
- 4 Connect the test gas on the filter box.
 - ▶ Set the primary pressure to approx. 1000 hPa (1 bar)
- 5 Measure the individual chambers and/or chamber combinations of the filter box
 - ▶ Set the valves for the respective filter chambers to “Test gas”
 - ▶ Set the valve measure/purge to “Purging” for 2 to 3 minutes (until the measured value has stabilized to a level).
 - ▶ Then set the valve to “Measuring”.

The overpressure from the purge phase now dissipates.

 - ▶ When the measured value has stabilized again, read off and note the value.
- 6 Leave operating mode “Box measuring” on the EvU with the return button.



- ① Valve “Zero” for zero gas
- ② Valve “Measuring/ Purging” for purging and measuring operation
- ③ Valve “Test gas” for switching the single measuring chambers
- ④ On/Off switch
- ⑤ Power supply connection
- ⑥ Gas connection “Zero gas”
- ⑦ Gas connection: Measuring chamber 75 mm
- ⑧ Gas connection: Measuring chamber 50 mm
- ⑨ Gas connection: Measuring chamber 25 mm
- ⑩ Pump ON/OFF switch
- ⑪ Temperature displays “Preheater” and “Cell temp.”

- 1 Disassemble the filter box with plate and reflector from the SR-unit and store safely.
- 2 Fit the SR-unit back on measuring point properly again.

9.10 Checking the gas analyzer with test cell GMK10



WARNING

Risk of explosion when checking with the GMK10 test cell in the Ex zone

The GMK10 test cell is not designed for operation in the Ex zone.

- ▶ The check with the GMK10 test cell may only be carried out in an Ex-free environment.
- ▶ Observe the relevant Operating Instructions when using the GMK10 test cell.

Carrying out the check is described in the GMK10 Operating Instructions.

9.11 Checking the evaluation unit



NOTICE

Observe safety information, see "Safety information on commissioning", page 48.



DANGER

Risk of explosion through residual voltages and hot surfaces in the device

When the device is switched off, residual voltages and hot surfaces represent an increased risk of explosion when the device is open.

- ▶ Wait 20 minutes after switching off the main power supply before opening the enclosure.

The control unit must be checked regularly depending on ambient conditions:

- Visual check of surfaces:
 - Enclosure and fastening
 - Opening and closing the front door
 - Clean the inspection window
 - Check for moisture outside and inside the enclosure
 - Electrical check:
 - LED
 - Tight seat of line connections
- If the control unit is damaged (e.g. LC display failure):
- ▶ Contact SICK Service.

9.12 Cleaning the purge air unit

Materials required	Part No.
Filter element, micro, top element for SLV unit (4 pcs.)	5306091



NOTICE

Contaminated purge air can damage the measuring system

Inadequate cleaning of the purge air supply can cause hoses or filters to become blocked. The measuring system can therefore no longer be protected from contaminated sample gas and will be damaged.

- ▶ Check and clean the purge air supply regularly.



NOTE

For more information on maintenance and cleaning, see the Data Sheet of the purge air unit.



NOTE

The filter of the purge air unit must be exchanged at the latest when the low-pressure monitor on the filter outlet triggers.

Preparation

- For long-time maintenance work on the purge air supply: Remove the SR-unit and reflector unit from the gas duct.
- For short-time maintenance work on the purge air supply: Swivel out the SR-unit and reflector unit from the gas duct.

Cleaning the purge air unit:

- 1 Put the purge air unit out of operation and completely remove the purge air hoses.
- 2 Replace the air filter in the purge air unit and clean the inside of the purge air unit.
- 3 Fully swivel out the SR-unit and the reflector so that any dust blown through the purge air hose is not deposited on the windows.
- 4 Put the purge air unit back into operation.

10 Troubleshooting

10.1 Safety

Prerequisites



DANGER

Risk of explosion through residual voltages and hot surfaces in the device

When the device is switched off, residual voltages and hot surfaces represent an increased risk of explosion when the device is open.

- ▶ Wait 20 minutes after switching off the main power supply before opening the enclosure.
-



WARNING

Risk of explosion

Some of the work described in this Chapter assumes an Ex free zone.

- ▶ Wait 20 minutes after switching off the main power supply before opening the enclosure.
-



DANGER

Risk of explosion through incorrect performance of maintenance work

Incorrect performance of maintenance work in potentially explosive atmospheres can cause serious injuries to people and damage during operation.

- Maintenance and commissioning tasks as well as checks should only be carried out by experienced/trained personnel with knowledge of the rules and regulations for potentially explosive atmospheres, especially:
 - Ignition protection types
 - Installation procedures
 - Zone classification
 - Standards to be applied:
 - IEC 60079-14, Annex F: Knowledge, expertise and competence of responsible persons, craftsmen and designers
 - IEC 60079-17: Electrical installations inspection and maintenance
 - IEC 60079-19: Equipment repair, overhaul and reclamation
-



NOTICE

Device damage through short circuit on the device

When power supply is available, signal short circuits can occur and damage the internal electronics. This is also valid for plug connections.

- ▶ Clean work is required. Do not leave any metal cuttings in the device.
-

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

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

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

Electrical safety

**DANGER****Electrical accident through bare, live lines**

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

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

**DANGER****Hazard by voltage**

Lines in the subassemblies of the measuring system are live and can cause serious injuries through electric shock when touched.

- ▶ Disconnect the subassemblies or lines involved from the power supply during installation, maintenance and repair work.
-

10.2 Monitoring and diagnostic system

The device has an integrated system that continually checks the operating state of the SR-unit and the evaluation unit. Corresponding messages are displayed for deviations from the normal state and recorded in the devices for later evaluation. Messages for the two system components are categorized into error messages and warning messages depending on the anticipated effects:

Significance of warning messages

- Measuring results are not (yet) directly influenced by a deviating system state.
- Observance and clearance of the cause(s), e.g., through maintenance measures, are necessary to prevent subsequent errors or device damage

Significance of malfunction messages

- Measuring operation is no longer possible or no longer reliable.
-

**NOTE**

Warning and error messages are stored in the built-in message memory of the evaluation unit.

10.3 Device not functioning

Table 20: Device not functioning

Possible cause	Action
Power supply not connected.	1 Check power cable and connections.
Main power supply has failed.	► Check power supply (e.g. socket, external disconnecting device).
Internal operating temperatures are incorrect.	1 Check whether error messages exist.
Internal software not functioning.	Can only occur with complex internal malfunctions or after strong external influences (e.g., strong electromagnetic interfering pulse). 1 Switch device off and then back on again after a few seconds.
Ex control unit does not switch on.	1 Protective gas feed interrupted or too low. 2 Ex control unit displays an error (see Pressurized Enclosure Manual).

10.4 Evaluation unit not functioning



WARNING
Risk of explosion

Some of the work described in this Chapter assumes an Ex free zone.

- Wait 20 minutes after switching off the main power supply before opening the enclosure.

Table 21: Device not functioning

Error indication	Possible cause	Action
Malfunction LED blinks, (Warning LED possibly on)	Plain-text error messages indicate possible causes.	1 Trigger Diagnostic mode by pressing the “diag” button. 2 Call menu Malfunction (and/or Warning). 3 Check and clear the specified malfunction.
Evaluation unit not responding	Operating voltage not set correctly.	1 Check operating voltage set. 2 If necessary, replace fuse.
	Power supply on evaluation unit incorrect.	1 Provide power supply from plant. 2 Check/reconnect connections on the system components
	Defective fuse.	1 Check fuses in the evaluation unit. 2 Exchange when necessary.
	Cause cannot be determined.	1 Disconnect all system components from the power supply and reconnect one at a time. 2 Check the CAN bus cable from the evaluation unit to the SR-unit resp. terminal box.
	Error occurs again.	► Replace the last component connected, contact Service.
	24V/5V supply defective.	1 Check 24V/5V supply. 2 Exchange evaluation unit and/or electronics board module. 3 Contact Service.
Display output: Corrupt Parameters: Reset Memory	Inconsistent data detected in parameter memory	1 Press Enter. A system restart is carried out. This resets the parameters to the factory settings. 2 If necessary, reconfigure the parameters. If the error message appears again: 3 Exchange the evaluation unit. 4 Contact SICK Service.

10.4.1 Communication fault between evaluation unit and receiver

Error message: "Sensor Communication"

The receiver sends data continually to the evaluation unit, an error message is generated automatically when no data is received there.

Check following connections:

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

10.5 Ex operation malfunction

An Ex control device malfunction causes an alarm signal to be displayed for the GM700 Ex Category 3G. There is no automatic switch-off.

Possible cause	Action
Protective gas feed interrupted	Check protective gas feed
Enclosure of sender/receiver unit or enclosure of evaluation unit is leaky	Check screw fittings and seals



NOTE

Clearing pressurized enclosure malfunctions, see Manual FS840 and purge medium valve.

10.6 Error messages

10.6.1 Error messages



WARNING

Risk of explosion

Some of the work described in this Chapter assumes an Ex free zone.

- ▶ Wait 20 minutes after switching off the main power supply before opening the enclosure.

Table 22: Error Table: Malfunction messages

Error message	Description	Possible cause / clearance
System		
DSP: BOOT ERROR DSP...Digital Signal Processor	Error during start process	<ul style="list-style-type: none"> ▶ ⚠ Observe safety information for Ex-free zone! ▶ Restart device. <ul style="list-style-type: none"> - Press maint button to activate maintenance. - Trigger menu Reset System or switch device off and on again. ▶ If not successful, contact Service.
DSP: INV PARA	Incompatible software (SR-unit) Invalid values entered.	<ul style="list-style-type: none"> ▶ Check software version, contact Service if necessary. ▶ Correct erroneous values.
DSP: NO RESP	Electronics communication problem (SR-unit).	<ul style="list-style-type: none"> ▶ Restart device; see above. ▶ If not successful, contact Service.
EEPROM: CONTROL	Invalid microcontroller parameters (SR-unit).	<ul style="list-style-type: none"> ▶ Restart device; see above. ▶ If not successful, contact Service.
EEPROM: LASER	Invalid laser parameters.	<ul style="list-style-type: none"> ▶ Restart device; see above. ▶ If not successful, contact Service.

Error message	Description	Possible cause / clearance
FIT: DIV BY 0	Error during signal evaluation: <ul style="list-style-type: none"> • Incorrect parameter values. • Hardware defect. 	<ul style="list-style-type: none"> ▶ Check measuring distance, substitute for temperature and pressure parameters, correct when necessary. ▶ Restart device; see above. ▶ If not successful, contact Service.
FIT: NO CONV	Error during signal evaluation: <ul style="list-style-type: none"> • Incorrect parameter values. • Hardware defect. 	<ul style="list-style-type: none"> ▶ Check measuring distance, substitute for temperature and pressure parameters. ▶ Increase Average parameter <ul style="list-style-type: none"> ⚠ Attention, these parameters may only be modified by trained personnel. ▶ Restart device; see above. ▶ If not successful, contact Service.
FIT: S MATRIX	Error during signal evaluation: <ul style="list-style-type: none"> • Incorrect parameter values. • Hardware defect. 	<ul style="list-style-type: none"> ▶ Check measuring distance, substitute for temperature and pressure parameters, correct when necessary. ▶ Restart device; see above. ▶ If not successful, contact Service.
Incompatible device	Incompatible software (SR-unit).	<ul style="list-style-type: none"> ▶ Check software version. ▶ Contact Service.
INIT: NO LINE	Incompatible software (SR-unit).	<ul style="list-style-type: none"> ▶ Restart device; see above. ▶ If not successful, contact Service.
LD: PELT ERROR LD...laser diode	Temperature measurement on Peltier element defective: <ul style="list-style-type: none"> ▶ Possible hardware defect. 	<ul style="list-style-type: none"> ▶ Restart device; see above. ▶ If not successful, contact Service.
LD: TEMP ERROR	Laser wavelength adjustment outside allowed range. <ul style="list-style-type: none"> ▶ Absorption line "lost". ▶ Laser diode defective. 	<ul style="list-style-type: none"> ▶ Restart device; see above. ▶ If not successful, contact Service.
MEAS: M PLAUS	Measuring results from measuring channel not plausible: <ul style="list-style-type: none"> ▶ Incorrect parameter values. ▶ Strong signal interference. ▶ Hardware defect. 	<ul style="list-style-type: none"> ▶ Check measuring distance, substitute for temperature and pressure parameters. ▶ Increase Average parameter. <ul style="list-style-type: none"> ⚠ Attention, these parameters may only be modified by trained personnel. ▶ Restart device; see above. ▶ If not successful, contact Service.
MEAS: R PLAUS	Measuring results from measuring channel not plausible: <ul style="list-style-type: none"> ▶ Incorrect parameter values. ▶ Strong signal interference. ▶ Hardware defect. 	<ul style="list-style-type: none"> ▶ Restart device; see above. ▶ If not successful, contact Service.
MEAS: REF CONC (only for device with closed cell)	Gas concentration in reference cell too low.	<ul style="list-style-type: none"> ▶ ⚠ Observe safety information for Ex-free zone! ▶ Exchange reference cell. ▶ Contact Service.
Sensor communication	SR-unit not connected correctly.	▶ Check CAN connection and repair if necessary.
SIG: DARK VALUE	Dark values of receiver element too high: <ul style="list-style-type: none"> ▶ Possible hardware defect. 	▶ Contact Service.
SIG: K HIGH	Monitoring channel signal too high.	▶ Contact Service.
SIG: K LOW	Monitoring channel signal too low.	▶ Contact Service.
SIG: M HIGH	Measuring channel signal too high.	▶ Contact Service.
SIG: M LOW	Measuring channel signal too low: <ul style="list-style-type: none"> ▶ Optical interfaces (front window) of SR-unit or reflector contaminated. ▶ Optical axes alignment too inaccurate. ▶ Hardware defect. 	<ul style="list-style-type: none"> ▶ Clean front window, section 9.7. ▶ Check optical alignment and correct if necessary, section 7.11. ▶ If not successful, contact Service.
SIG: R HIGH	Reference channel signal too high.	▶ Contact Service.
SIG: R LOW	Reference channel signal too low.	▶ Contact Service.
Zero gas measurement for NH ₃		

Error message	Description	Possible cause / clearance
Z MEAS: RANGE	Unallowed results during zero gas measurement: <ul style="list-style-type: none"> ▶ Zero gas missing. ▶ Optical interfaces (front window) of SR-unit or reflector contaminated. ▶ Optical axes alignment too inaccurate. 	<ul style="list-style-type: none"> ▶ Check zero gas supply and repair if necessary. ▶ Clean front window, section 9.7. ▶ Check optical alignment and correct if necessary, section 7.11.
Sensor Communication???	Communication fault between evaluation unit and GM700 SR-unit	Check connections: <ul style="list-style-type: none"> ▶ Observe safety information for Ex-free zone! ▶ Evaluation unit - SR-unit. ▶ Lines to SR-unit. ▶ Outer plug-in connectors on SR-unit. ▶ Inner plug-in connectors in SR-unit.

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

10.6.2 Warning messages

WARNING
Risk of explosion

Some of the work described in this Chapter assumes an Ex free zone.

- ▶ Wait 20 minutes after switching off the main power supply before opening the enclosure.

Table 23: Warning messages

Warning message	Description	Possible cause / clearance
Feed Test Gas	No detectable sample gas concentration (see Interval).	▶ Feed span gas. (GMK)
FIT: LINEPOS	Deviation of absorption line position: <ul style="list-style-type: none"> ▶ Line during start process not aligned properly. 	<ul style="list-style-type: none"> ▶ Wait until the warning message disappears after a few minutes. ▶ Restart device <ul style="list-style-type: none"> - Activate Maintenance mode with maint button. - Trigger menu item Reset System or switch device off and on again. ▶ If not successful, contact Service.
MEAS: REF CONC (only for device with closed cell)	Gas concentration in reference cell too low; measurement still possible.	▶ Plan and prepare reference cell replacement.
DEV: TEMP	Optic of SR-unit out of allowed temperature range: <ul style="list-style-type: none"> ▶ Warm-up phase after switching on. ▶ Ambient temperature too high. 	<ul style="list-style-type: none"> ▶ Wait until the temperature has stabilized. ▶ Select different ambient temperature range. ▶ Cool device.

10.7 Repairing inadequate purge air supply

WARNING
Risk of explosion

Some of the work described in this Chapter assumes an Ex free zone.

- ▶ Wait 20 minutes after switching off the main power supply before opening the enclosure.

**NOTICE****A faulty purge air supply can damage the measuring system**

The measuring system can no longer be protected from contaminated sample gas and is damaged.

- ▶ When the purge air supply appears faulty, immediately perform all actions described in these Operating Instructions.

Indications of insufficient purge air supply

- Unusual noises from the area of the purge air supply
- On systems with pressure difference sensor: An appropriate error message occurs
- Rise in enclosure temperature
- Unusually rapid contamination of the window of the measuring device

Information for fast correction of faults

- Air filter of purge air unit clogged?
- Purge air hose slipped off or broken?
- Power supply of the purge air unit failed?

Check the purge air unit

- ▶ Pull the purge air hose on the sender/receiver unit: A strong air flow must be noticeable.
- ▶ Reinstall the purge air hose immediately.

Measures for insufficient purge air supply

- If the purge air unit is not immediately functional:
 - ▶ Remove the SR-unit and reflector unit from the gas duct.
- For a short malfunction:
 - ▶ Swiveling out the SR-unit and reflector unit is sufficient.
- Bring the purge air unit back to correct operation immediately
- Replace provisionally with a different purge air supply with at least the same purge air throughput

10.8 Corrosion on flange

Table 24: Corrosion on flange

Possible errors	Possible causes	Action
Corrosion on flange.	Unsuitable materials	▶ Check project planning.

11 Decommissioning

11.1 Safety information for decommissioning



WARNING

Risk of explosion

Some of the work described in this Chapter assumes an Ex free zone.

- ▶ Wait 20 minutes after switching off the main power supply before opening the enclosure.
-

Technical knowledge needed / requirements for decommissioning



NOTICE

- You have fundamental knowledge of the GM700
- You have fundamental knowledge of the ATEX regulations
- You are familiar with conditions at the installation location, especially possible hazards through the gases in the gas duct (hot/dangerous to health)
- You are capable of recognizing and preventing danger by possibly escaping gases

If one of these requirements is not met:

- ▶ Contact SICK Customer Service or your local SICK representative.
-

Risk of explosion



DANGER

Risk of explosion through residual voltages and hot surfaces in the device

When the device is switched off, residual voltages and hot surfaces represent an increased risk of explosion when the device is open.

- ▶ Wait 20 minutes after switching off the main power supply before opening the enclosure.
-

Gas



WARNING

Risk to health through contact with protective gas

Residual amounts of protective gas could emerge uncontrolled when the device is opened directly after switching off. This means that the device represents an increased health risk and a risk of suffocation when using inert protective gases.

- ▶ Wait 20 minutes after switching off the main power supply before opening the enclosure.
-



DANGER

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

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

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



DANGER

Danger to life by leaking hot and toxic gases

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

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

Electricity

Observe all safety information in Chapters Commissioning and Electrical Installation.

see "Safety information on commissioning", page 48 and see "Electrical installation safety information", page 35.

Device damage



NOTICE

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

Hot and contaminated gas can cause device damage when the purge air is switched off when the measuring device is still fitted in the gas duct.

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

11.2 Decommissioning Ex-relevant subassemblies

- 1 Disconnect the GM700 Ex from the main power supply.
- 2 Wait 20 minutes before opening the device.
- 3 Disconnect the Ex control unit from the power.



NOTE

The analyzer can remain on the gas duct as long as the purge air supply is in operation.



CAUTION

Device damaged caused by unnoticed purge air failure

After the GM700 Ex has been disconnected from the power, there is no message via the analyzer for a purge air failure.

- ▶ Install suitable monitoring
or
- ▶ remove the respective subassemblies.

11.3 Removing the device

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

Removing the measuring system

- 1 Disconnect all connection lines between connection unit and SR-unit and/or reflector unit.
- 2 Remove the SR-unit and/or reflector unit, see ["Removing the SR-unit resp. reflector unit"](#), page 76



CAUTION

- Observe the information concerning removal of the SR-unit, see ["Removing the SR-unit resp. reflector unit"](#), page 76.

- 3 When necessary, unscrew and remove device flanges.
- 4 When necessary, unscrew and remove purge air fixtures on the flanges.
- 5 Switch purge air supply off and remove purge air hoses on device flanges.
- 6 Close the flanges on the gas duct with a lid.

Information on storage, see ["Storage"](#), page 23

11.4 Preparing the device ready for shipping

Before shipping:

- ▶ Contact your local SICK representative. The addresses are on the back cover of the Operating Instructions.
- ▶ Your SICK representative can advise you whether the defective device can be repaired locally or whether it would more advantageous for you to return the device for repair.
- ▶ Observe the following when returning the device to SICK:
 - Flat rates for repairs (concerning duration and costs)
 - Safety protection for the transport
 - Replacement devices or putting the device back into operation by SICK Service



NOTICE

Correct device preparation for return delivery

- ▶ Clean all device components.
- ▶ Use the original packaging for the transport.
- ▶ Complete the Non-Risk Declaration (NRD) and lay these clearly visible in the packaging.

Without the Non-Risk Declaration, the device will either be cleaned by a third-party company at the customer's expense or the package will not be accepted.

Clean the device before returning

Prerequisite: Switch device free from voltage

Clean surfaces and parts with media contact:

- ▶ Remove loose contamination with compressed air
- ▶ Remove adhering contamination with a mild soap solution and a soft cloth



NOTICE

Close the enclosure before cleaning so that no fluid can penetrate.

Cleaning the optical interfaces, see ["Cleaning the optical interfaces"](#), page 78.

11.5 Environmentally compatible disposal

The device should be disposed as industrial waste.



NOTICE

- ▶ Observe relevant local conditions for disposal of industrial waste.
-



WARNING


Disposal of subassemblies containing residual substances which are harmful to the environment

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

- Electronics: Capacitors, rechargeable batteries, batteries
 - Display: Liquid of LC-Display
-

12 Technical data

12.1 System: GM700 Ex version 3G / Zone 2

Measured variable	NH ₃ , NH ₃ / H ₂ O
Measuring principle	Diode laser spectroscopy (TDLS)
Measuring path length	0.5 ... 6 m, depending on the application
Measuring ranges	<ul style="list-style-type: none"> NH₃: 0 ... 25 ppm / 0 ... 4,000 ppm H₂O: 0 ... 5 ppm / 0 ... 40 Vol% <p>Measuring ranges refer to 1 m measuring path Measuring ranges dependent on the application and device version</p>
Response time	1 s ... 360 s, adjustable
Accuracy	<ul style="list-style-type: none"> Zero point: $\leq \pm 2\%$, relative to upper measuring range value Sensitivity: $\leq \pm 2\%$, in maintenance interval (6 months), relative to upper measuring range value
Process gas pressure	Max. 1,100 mbar absolute
Process gas temperature	-20 °C ... +200 °C, depending on device version
Ambient temperature	-20 °C ... +50 °C, depending on device configuration, see " Ambient temperature ranges ", page 106; temperature change maximum ± 10 °C/h
Storage temperature	-20 °C ... +50 °C
Ambient humidity	$\leq 85\%$ relative humidity; non-condensing
Compliances	CE
Guidelines / standards	<p>2014/34/EU ATEX</p> <ul style="list-style-type: none"> EN 60079-0:2012 EN 60079-2:2014 EN 60079-11:2012 EN 60079-28:2015 <p>2014/30/EU EMC</p> <ul style="list-style-type: none"> EN 61326-1:2013 emitted interference/interference resistance: Industrial environment (Class A) <p>2014/35/EU Low Voltage Directive</p> <ul style="list-style-type: none"> EN 61010-1:2010
Ex certifications	<ul style="list-style-type: none"> Connection unit and sender/receiver unit: 3G / Zone 2 Process gas: Ex-free ATEX :  II 3/-G Ex pzc op is [ia] IIC T4 Gc/-
Control functions	<ul style="list-style-type: none"> Automatic check cycle for zero and reference point

12.2 Sender/receiver unit

Description	Analyzer unit of measuring system
Degree of protection	IP 65
Dimensions (W x H x D)	239 mm x 401 mm x 338 mm
Weight	14 kg
Power supply	Supply via evaluation unit: 24 V DC
Connections for auxiliary substances	<ul style="list-style-type: none"> Test gas: Swagelok 1/4" Purge gas: Swagelok 1/4"

12.3 Reflector unit GM700

Description	Reflector unit with hollow triple reflector
Process temperature	≤ +200 °C
Degree of protection	IP 65
Dimensions	291 mm x 280 mm x 161 mm
Weight	7 kg

12.4 Purge air fixture

Description	Flange fixture with connections for purge air and purge air monitoring.
Dimensions	see "Dimension drawings, purge air fixtures, without electronics", page 102
Weight	≤ 7 kg
Connections for auxiliary substances	Purge air

12.5 Evaluation unit Ex version

Description	Serves to connect the power supply and the data and signal cables at the customer location.
Enclosure rating	<ul style="list-style-type: none"> IP 65
Analog outputs	3 outputs: 0/4 ... 20 mA, 500 Ω Electrically isolated
Analog inputs	2 inputs: 0 ... 20 mA, 100 Ω For gas temperature and gas pressure
Digital outputs	3 relay contacts: 48 V AC, 1 A, 60 W / 48 V DC, 1 A, 30 W
Digital inputs	3 inputs: 24 V
Interfaces and bus protocol	
	RS-232 Proprietary Service interface
Display	LC-Display Status LEDs:"Operation", "Service", "Warning" and "Malfunction"
Input	Arrow buttons
Material	Sheet steel enclosure
Dimensions (W x H x D)	<ul style="list-style-type: none"> Evaluation unit: 300 mm x 483 mm x 138 mm Pressurized enclosure FS840: 129 mm x 122 mm x 120 mm
Weight	≤ 16 kg
Voltage supply	<ul style="list-style-type: none"> Voltage: 230 V Frequency: 50 Hz Power input: ≤ 75 VA
Battery	<ul style="list-style-type: none"> Type: Button cell 3V CR2032 Chemical system: Lithium-Ion (Li-Ion)

12.6 Technical data for pressurized enclosure system

12.6.1 Technical data energy supply

Voltage	230 V
Frequency	50 Hz

12.6.2 Limit values for terminal assignment FS840

Terminal	Voltage	Current	Output	Remark
1, 2	U _m = 250 V AC	I _m = 5 A at AC1	P _m = 1500 VA	Signal contact 1
	U _m = 250 V AC	I _m = 1.2 A at AC15	P _m = 300 VA	
	U _m = 30 V DC	I _m = 5 A at DC1	P _m = 150 W	
3, 4	U _m = 250 V AC	I _m = 5 A at AC1	P _m = 1500 VA	Signal contact 2
	U _m = 250 V AC	I _m = 1.2 A at AC15	P _m = 300 W	
	U _m = 30 V DC	I _m = 4 A at DC1	P _m = 150 W	
5, 6				Connection for purge medium valve
7/8, 9/10	U _m = 250 V AC			Power supply

12.6.3 Technical data for Protective gas

Protective gas

Protective gas	Instrument air or inert gas in accordance with ISO8573-1 Solid particles: Class 1 Water: Class 3 (pressure dew point-20 °C) Oil content: Class 1 (≤0.01 mg/m ³)
Connections	
• Inlet	Thread G 3/8" or hose connection for 8 mm diameter
• Outlet	Thread G 1"
• Consumption	Typ. 0.2 l/min
Inlet temperature	-20 ... +50 °C (-4 ... +122 °F)
Primary pressure	
• Max.:	2,500 hPa (2.5 bar) (36 psi) (relative)
• Min.:	2,000 hPa (2 bar) (30 psi) (relative)

12.6.4 Technical data for enclosure

Free volume:	33 l (2014 in ³)
Minimum overpressure:	80 Pa (0.8 mbar) (0.012 psi) (relative)
Maximum overpressure:	1,800 Pa (18 mbar) (0.26 psi) (relative)

Pre-purging during commissioning

Typical pre-purge time:	Approx. 6 minutes
-------------------------	-------------------

12.6.5 Pressurized enclosure system settings



WARNING

Risk of explosion through incorrect parameter settings

Incorrect parameter setting can cause an explosion with fatal consequences.

- ▶ Only authorized persons are allowed to change the parameters.

Enclosure pressurization system used: Gönzheimer FS840 for use in Ex zone 2.

FS840 parameters	Setting
Valve control	Digital valve
Operating mode	Constant purge flow
Purge volume, pre-purge	165 l (10 068 in ³)
Nominal purge pressure	10 mbar (0.145 psi) (relative)
Minimum pressure in enclosure	0.8 mbar (0.012 psi) (relative)
Maximum pressure in enclosure	18 mbar (0.26 psi) (relative)
Nominal pressure in enclosure	2 mbar (0.03 psi) (relative)
Signal pressure	1.5 mbar (0.022 psi) (relative)

12.7 Dimension drawings: Sender/receiver unit

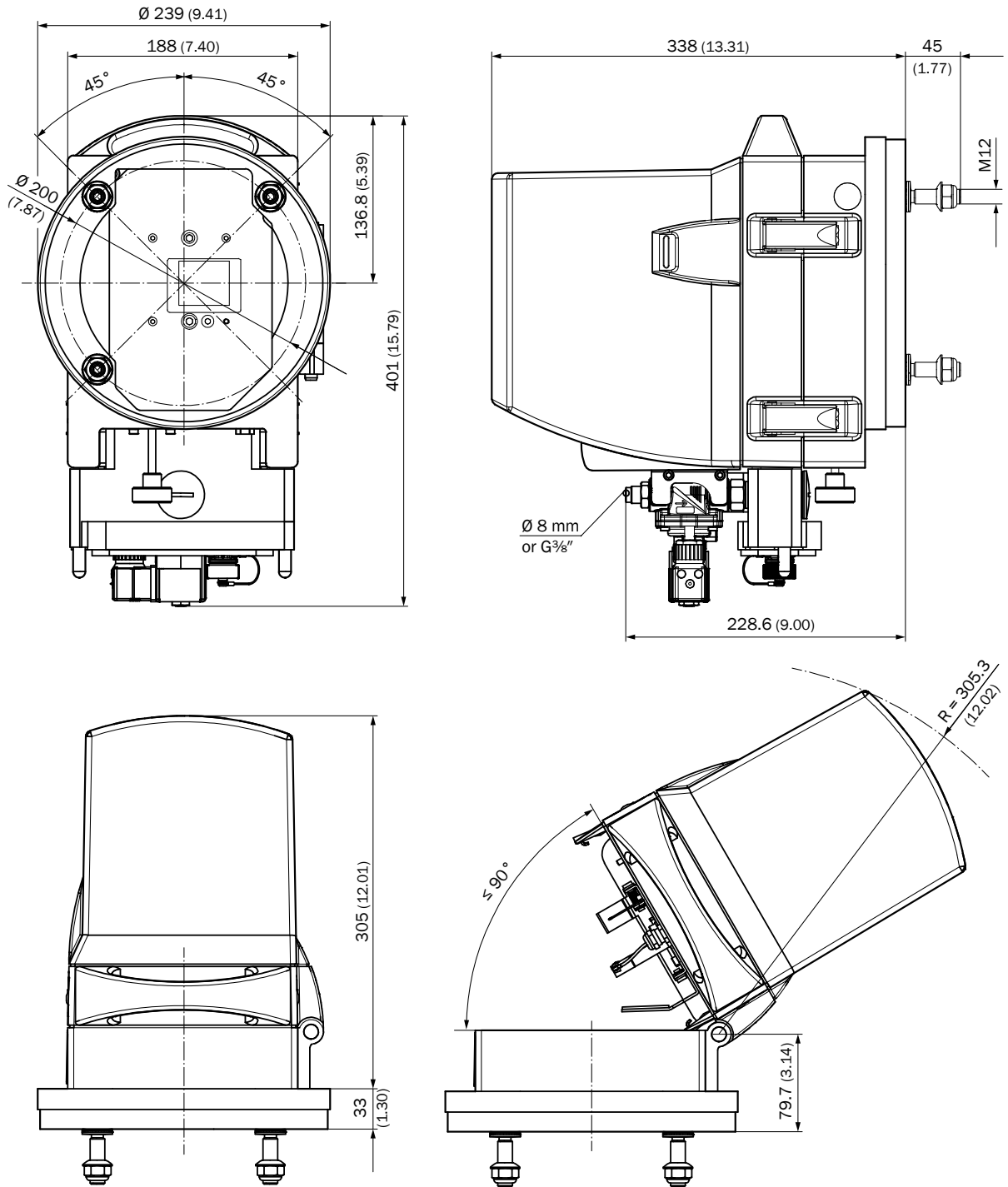


Figure 44: GM700 Ex 3G sender/receiver unit (all dimensions in mm)

12.8 Dimension drawing, reflector unit

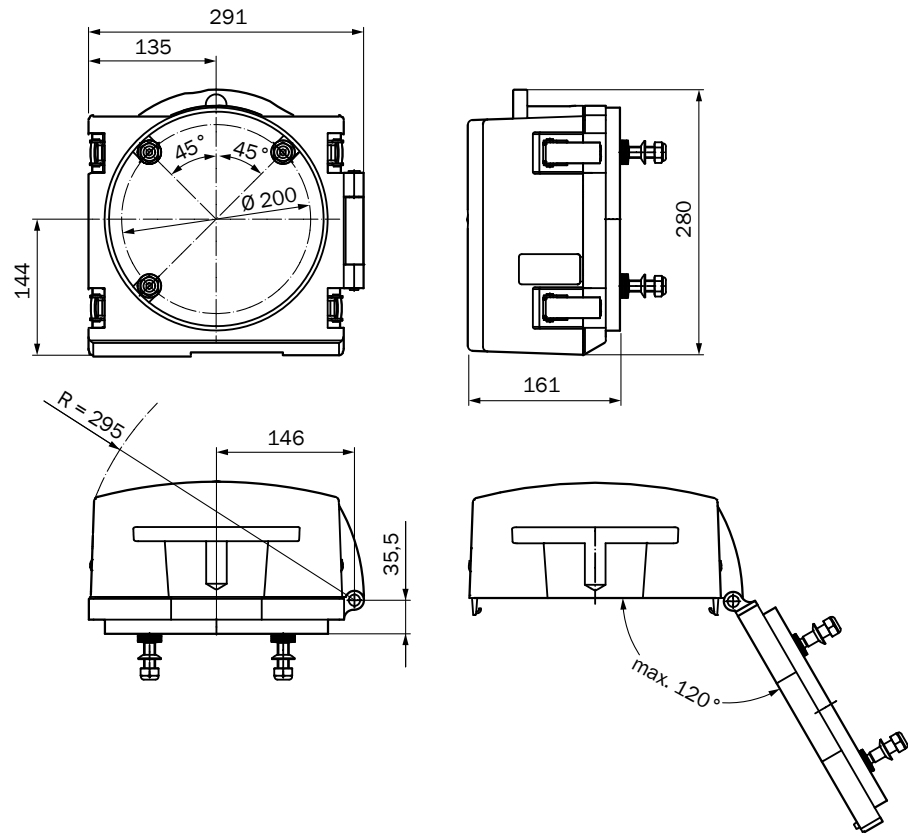


Figure 45: Reflector unit (dimensions in mm)

12.9 Dimension drawings, purge air fixtures, without electronics

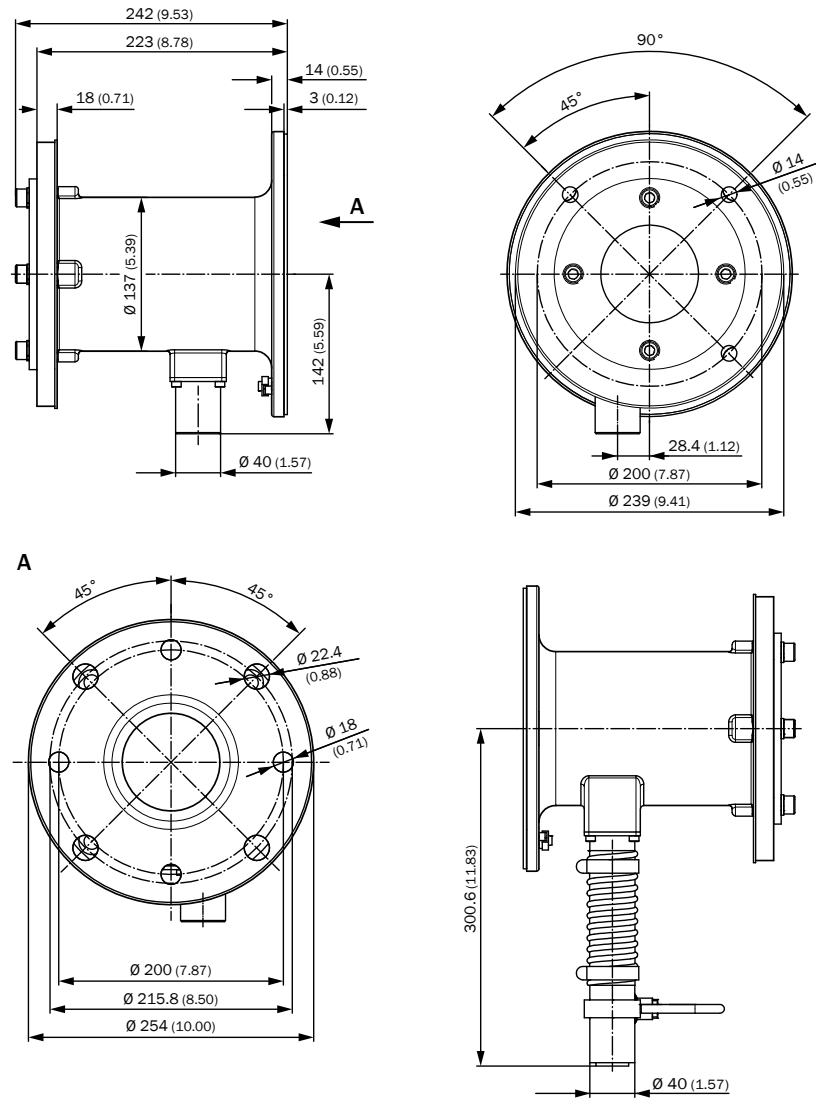


Figure 46: GM700-Ex purge air fixtures, without electronics (all dimensions in mm)

12.10 Dimension drawing, purge air unit

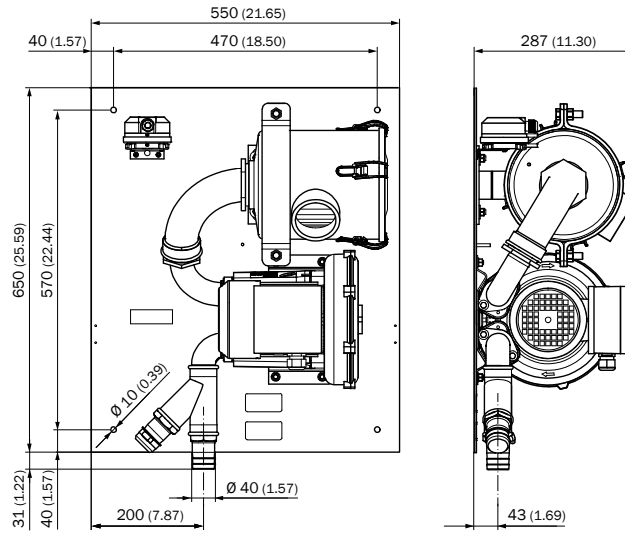


Figure 47: Dimensions, purge air unit (all dimensions in mm (inch))

12.11 Dimension drawings, evaluation unit with pressurized enclosure system FS840

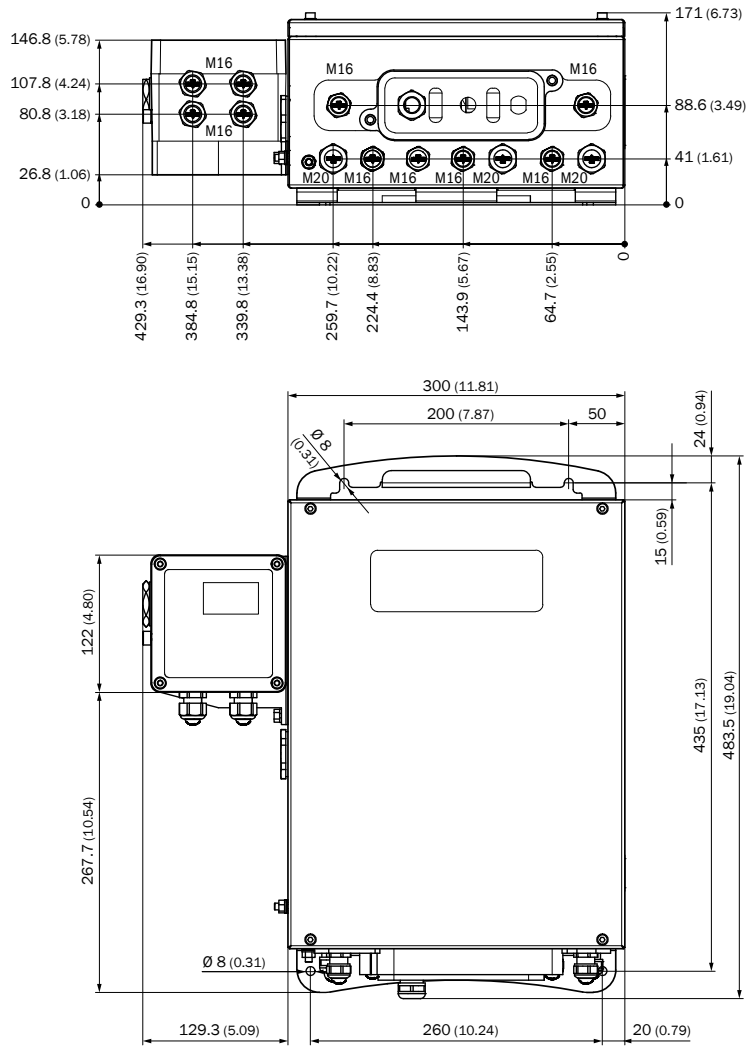


Figure 48: Evaluation unit (all dimensions in mm)

12.12 Dimension drawing, flange with tube, DN125

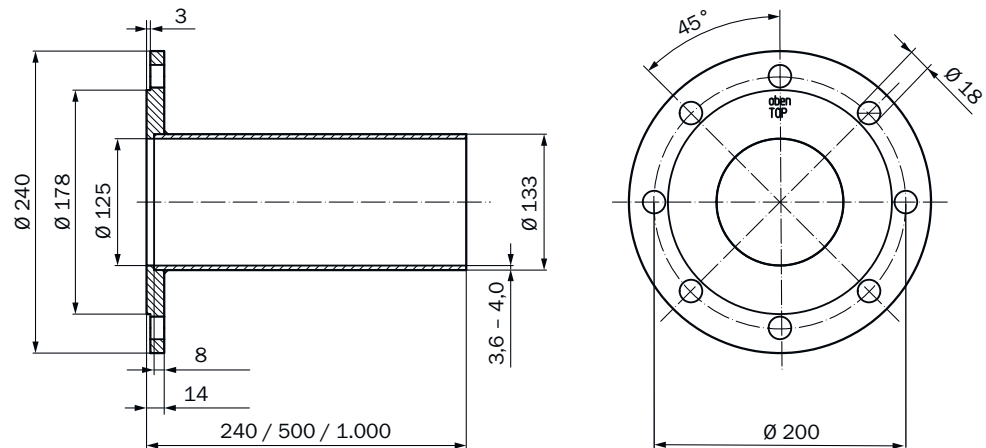


Figure 49: Flange with tube, DN125 (dimensions in mm)

12.13 Dimension drawing, weather hoods

Weatherproof cover for sender/receiver unit

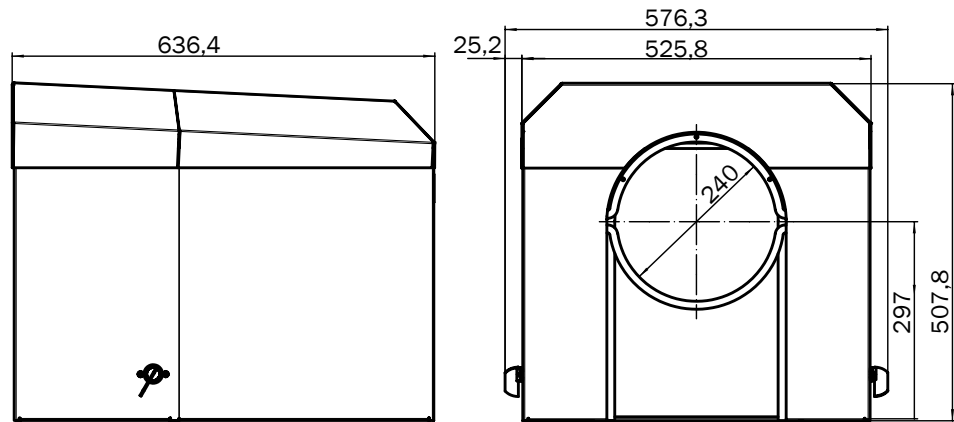


Figure 50: Weather hood for sender/receiver unit (dimensions in mm)

Weather hood for reflector unit

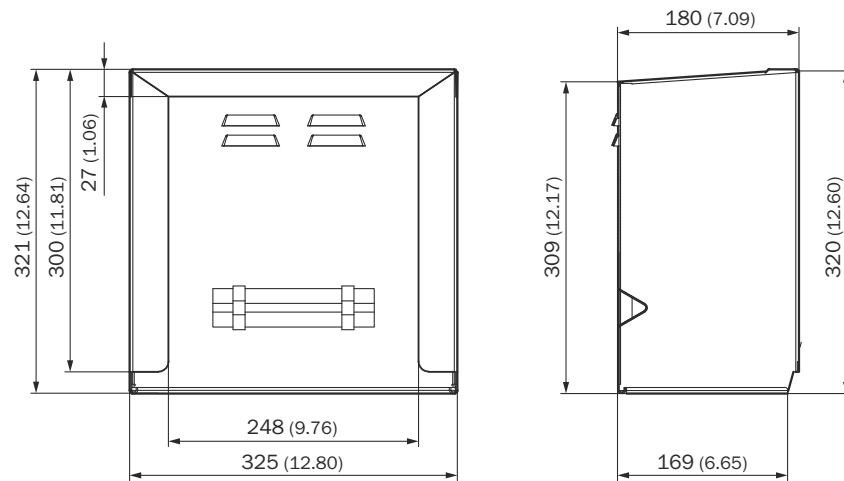


Figure 51: Weather hood for reflector unit (dimensions in mm)

13 Annex

13.1 Conformities

Table 25: Ex-relevant directives and standards

Directive	Harmonized standard	Application
2014/34/EU ATEX	EN 60079-0:2012	General requirements
	EN 60079-2:2014	Pressurized enclosure Ex-p
	EN 60079-11:2012	Protection by intrinsic safety Ex i
	EN 60079-28:2015	Optical radiation op is
2014/30/EU EMC	EN 61326-1:2013 emitted interference/interference resistance: Industrial environment (Class A)	EMC for electrical measuring devices
2014/35/EU Low Voltage Directive	EN 61010-1:2010	Electrical safety for measuring, control and laboratory equipment
	EN 60529:1991+ A1:2000 + A2:2013	Degrees of protection provided by enclosure (IP code)

13.2 Electrical protection

- Device corresponds to protection class 1 and requires a protective grounding (PE) in accordance with EN 61140
- Overvoltage protection in accordance with EN 61010-1
- Contamination: The control unit operates safely in an environment up to contamination level 2 in accordance with EN 61010-1 (usual, non-conductive contamination and temporary conductivity by occasional moisture condensation)

13.3 Ex certifications



3G / Zone 2: Connection unit and sender/receiver unit

- Ex II 3/-G Ex pzc op is [ia] IIC T4 Gc/-

Special conditions (X identification)

- A measuring function for explosion protection is not part of the EC type approval

13.4 Possible ambient temperatures

13.4.1 Ambient temperature ranges

Table 26: Possible ambient temperature ranges

Possible ambient temperature ranges		
Degrees Centigrade (°C)	Kelvin (K)	Degrees Fahrenheit (°F)
-40 ... 10 ¹	233 ... 283	-40 ... 50
-30 ... 20 ¹	243 ... 293	-22 ... 68
-20 ... 30	253 ... 303	-4 ... 86
-10 ... 40	263 ... 313	14 ... 104

Possible ambient temperature ranges		
0 ... 50	273 ... 323	32 ... 122

¹ ⚠ Attention: These ranges may not be used for Ex applications!

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