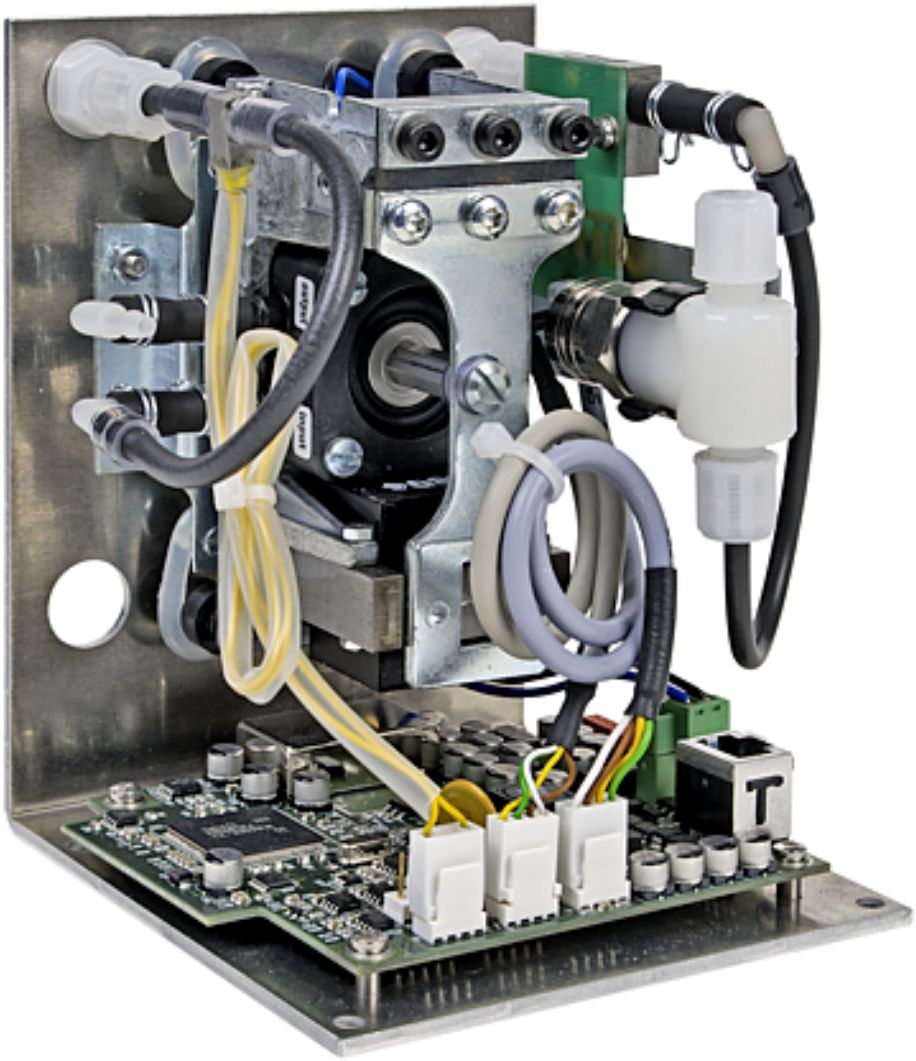
# Operating Instructions
# **Gas Module**

for Series GMS800



Endress+Hauser
People for Process Automation

**Described product**
Product name: Gas Module
Basic device: Series GMS800 gas analyzers

**Manufacturer**
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**Legal information**


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

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## Glossary

| | |
|---|---|
| **PC** | Personal Computer |
| **PVDF** | Polyvinylidene fluoride |
| **SOPAS** | SICK Open Portal for Applications and Systems: Family of computer programs to set parameters, capture and calculate data. |
| **SOPAS ET** | SOPAS Engineering Tool: PC application program to configure modular system components. |

## Warning symbols

Hazard (general)

Hazard by toxic substances

## Warning levels / signal words

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

**CAUTION**
Hazard or unsafe practice which *could* result in personal injury or property damage.

***NOTICE***
Hazard which *could* result in property damage.

## Information symbols

Important technical information for this product

Supplementary information

Link to information at another place

# Gas Module

# 1 Important information

Main safety information
Additional information

## 1.1 Main safety information

***NOTICE:*** **Gas analyzer systems are incompatible with liquids**

The gas analyzer is usually unusable when liquids penetrate the internal analyzer gas paths. Liquids can be produced by condensation.

► Prevent condensation in the sample gas path of the gas analyzer.

*If the sample gas contains condensable components:*

► Only operate the gas analyzer with an appropriate sample gas conditioning system.

► Before shutting the analyzer down, always purge its internal gas path with a neutral gas which does not contain condensable components.

**WARNING: Mortal/health danger as a result of gas path leakage**

*When the gas analyzer processes noxious gases:* Escaping gas can be an acute danger for persons.

*Before opening the gas path:*

► Flush gas paths with a neutral gas until the dangerous gases have been completely purged.

► Take breathing protection precautions as necessary for safety.

## 1.2 Main operating information

**Start-up**

► Observe permissible operating values for gas pressure and volume flow.

► Pay attention to gas leak tightness (external gas lines, filters, valves etc.).

► Prevent condensation in the sample gas path of the gas analyzer.

**Shutdown**

► *Before shutting down:* Purge the sample gas path with a dry neutral gas to prevent condensation in the measuring system.

## 1.3 Additional documentation/information

This document supplements the Operating Instructions for GMS800 gas analyzers. It extends the “GMS800“ Operating Instructions with technical information on the Gas Module.

► Observe the Operating Instructions delivered with the “GMS800”.

The “GMS800” Operating Instructions also specify all further documents belonging to the individual device.

***NOTICE:***

► Pay primary attention to any individual information provided.

► *When the OXOR-E Analyzer module is fitted to the gas analyzer*: Observe the Supplementary Operating Instructions “Series GMS800 – OXOR-E Analyzer module”.

# Gas Module

# 2 Product description

Intended use
Components
Functions
Integration

## 2.1 Intended use

The Gas Module is an installation module for GMS800 series gas analyzers.

## 2.2 Product variants

**Gas paths**

- Version with internal hosing
- Version with internal piping

**Gas connections**

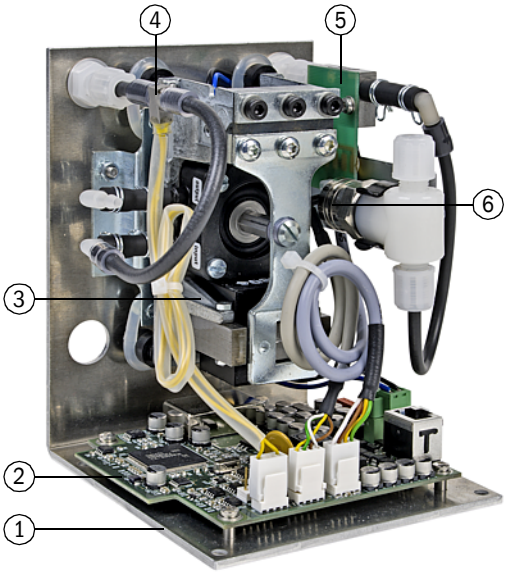
- Plastic screw fittings (PVDF) for hose connection
- Stainless steel screw fittings (Swagelok) for pipe connection

**Optional equipment**

- Gas pump
- Gas humidity sensor
- Gas pressure sensor
- Gas flow sensor

## 2.3 Product components

Fig. 1 Gas module components




1 Chassis
2 Electronic board
3 Gas pump [1]
4 Gas humidity sensor [1]
5 Gas flow sensor [1]
6 Gas pressure sensor [1]

[1] Option

## 2.4 Function description

**Gas pump**

Oscillating diaphragm pump.

››› Independent sample gas suction.

**Gas humidity sensor**

Generates a malfunction message when conductive liquids penetrate the sample gas path. The gas pump of the Gas module is then switched off automatically.

››› Protects the gas pump and measuring system against liquids.

**Gas pressure sensor**

Measures the sample gas pressure or ambient pressure (depending on the module configuration). The measured value serves to compensate the physical influences of gas pressure.

››› High measuring precision with fluctuating pressure.

**Gas flow sensor**

Measures the sample gas volume flow. Limit value for malfunction message is adjustable.

››› Automatic monitoring of sample gas volume flow.

*Gas pump + Gas humidity sensor:* Automatic safety switch-off possible.

## 2.5 Electronic functions

### 2.5.1 Sensor data output

Identification data and actual operating data of the Gas module are transferred automatically to the operating unit or SOPAS ET. The values can be displayed and evaluated there.

### 2.5.2 Automatic gas pump safety switch-off

The gas pump will automatically remain switched off

- when a gas analyzer has not yet reached its operating temperature
- when the condensate sensor triggers (when fitted)
- during adjustment gas feed [1]
- when a control input for the gas pump is available in the I/O module and has status “gas pump off”.[1]

### 2.5.3 Connecting the OXOR-E Analyzer module

The Gas module can manage electronic connection of the OXOR-E Analyzer module. In this case, the OXOR-E Analyzer module is connected to the Gas module electronics board and the OXOR-E module menu functions are shown in the Gas module menu branch (→ p. 12, §3.1).

[1] Only when this function is installed

# Gas Module

# 3 Functions in SOPAS ET

Operating functions in the PC program “SOPAS ET”
Menu tree
Explanations

- Instructions for SOPAS ET → User Information for the program
- Exemplary menu representations → Technical Information “Basic Control Unit (BCU)” (contains information for operating with SOPAS ET)

## 3.1 Menu tree in SOPAS ET

| User level: | O | Operator (standard) | A | Authorized operator |
|---|---|---|---|---|
| Access rights: | ○ | Viewing | ● | Setting up/starting |

| Directory | Menu contents | O | A | Explanation |
|---|---|---|---|---|
| **Gas Module** | | ○ | ○ | |
| **Measured value display** | | ○ | ○ | |
| Gas pressure [1] | Component | ○ | ○ | → p. 14 [1] |
| | Measured value | ○ | ○ | → p. 14 [2] |
| | Unit | ○ | ○ | → p. 14 [3] |
| Gas flow [1][2] | | ○ | ○ | |
| Gas humidity [1] [2] | | ○ | ○ | |
| Oxygen [2][3] | | ○ | ○ | |
| **Diagnosis** | | ○ | ○ | |
| Module state | Failure | ○ | ○ | |
| | Maintenance request | ○ | ○ | → p. 14 [4] |
| | Function(s) active | ○ | ○ | |
| | Uncertain state | ○ | ○ | |
| Logbook | Pos. \| Date \| Source \| ... | – | ○ | → p. 18, § 4.1.1 |
| Operating hours | h | – | ○ | → p. 14 [5] |
| Gas pressure [1] | | ○ | ○ | |
| Name / unit | Component | ○ | ● | → p. 14 [1] |
| | Unit | ○ | ○ | → p. 14 [2] |
| State | Failure | ○ | ○ | |
| | Maintenance request | ○ | ○ | → p. 14 [4] |
| | Function(s) active | ○ | ○ | |
| | Uncertain state | ○ | ○ | |
| Gas flow [1] [2] | | ○ | ○ | |
| Gas humidity [1] [2] | | ○ | ○ | |
| Oxygen [3] | | ○ | ○ | |
| Name / unit | Component | ○ | ● | → p. 14 [1] |
| | Unit | ○ | ○ | → p. 14 [2] |
| State | Failure | ○ | ○ | |
| | Maintenance request | ○ | ○ | → p. 14 [4] |
| | Function(s) active | ○ | ○ | |
| | Uncertain state | ○ | ○ | |
| Validation measurement (QAL3) | Zero point | ○ | ○ | |
| | Reference point | ○ | ○ | |
| **Parameter** | | ○ | ○ | |
| Sampling point | Description | – | ● | → p. 14 [6] |
| RS485 interface | Module address | – | ● | → p. 14 [7] |
| | Baud rate | – | ● | |
| | Data bits | – | ● | → p. 14 [8] |
| | Stop bits | – | ● | |
| | Parity | – | ● | |
| Gas pressure [1] | | ○ | ○ | |
| Physical meas. range | Component | ○ | ● | → p. 14 [1] |
| | Unit | ○ | ○ | → p. 14 [3] |
| | Start value | ○ | ○ | → p. 14 [9] |
| | End value | ○ | ○ | → p. 14 [10] |
| | Base value | ○ | ○ | → p. 14 [11] |
| | Measuring channel | ○ | ○ | → p. 14 [12] |
| Damping | | – | ● | |
| Damping (el. T90%) | Time constant [s] | – | ● | → p. 19, § 4.2.1 |
| Gas flow [1] [2] | | ○ | ○ | |
| Gas humidity [1] [2] | | ○ | ○ | |
| Oxygen [2] [3] | | ○ | ○ | |

| Directory | Menu contents | O | A | Explanation |
|---|---|---|---|---|
| **Adjustment** [3] | | ○ | ○ | |
| Oxygen [3] | | ○ | ○ | |
| Drift limit value | Zero point | – | ○ | → p. 19, § 4.2.2 |
| | Reference point | – | ○ | |
| Adjustment results | | ○ | ○ | |
| Adjustment result | Zero point | ○ | ○ | |
| | Reference point | ○ | ○ | |
| Drift values | Zero point | ○ | ○ | → p. 14 [13] |
| | Reference point | ○ | ○ | |
| Delete results | [Delete] | – | ● | → [4] |
| **Maintenance** | | – | ○ | |
| Maintenance flag | [On]/[Off] | – | ● | → p. 14 [14] |
| Configuration | | – | ○ | |
| User settings | [Backup] | – | ● | |
| | [Restore user settings] | – | ● | → p. 14 [15] |
| | [Restore next to last user settings] | – | ● | |
| Factory settings | [Restore] | – | ● | → p. 14 [16] |
| **Factory settings** | | ○ | ○ | |
| Identification | | ○ | ○ | |
| ID numbers | Serial number | ○ | ○ | |
| | Material number | ○ | ○ | |
| | Hardware version | ○ | ○ | → p. 15 [17] |
| | Software version | ○ | ○ | |
| | Software date | ○ | ○ | |
| Production release | Year | – | ○ | |
| | Month | – | ○ | → p. 15 [18] |
| | Day | – | ○ | |

[1] Only displayed when the associated sensor is fitted in the Gas module
[2] Subordinate menu function as for “Gas pressure”
[3] Only displayed when the OXOR-E Analyzer module is connected to the Gas module
[4] See Supplementary Operating Instructions “Analyzer Module OXOR-E”.

## 3.2 Explanation of the menus in SOPAS ET

| No. | Description | Explanation |
|---|---|---|
| 1 | Component | Name of measuring component |
| 2 | Measured value | Actual measured value of measuring component |
| 3 | Unit | Physical unit of measured value |
| 4 | Failure | LED symbol<br>● *Significance:* Module not ready for operation<br>● *Possible causes:* Malfunction, defect |
| | Maintenance request | LED symbol<br>● *Significance:* Advance warning before internal technical limits reached.<br>● *Possible causes:* Drift limit, operating hours, lamp intensity |
| | Function(s) active | LED symbol<br>● *Significance:* At least one internal function active that impairs or hinders normal module measuring function.<br>● *Possible causes:* Adjustment procedure running, validation measurement running |
| | Uncertain state | LED symbol<br>● *Significance:* Actual measured values are unreliable.<br>● *Possible causes:* Heating up phase, internal over/under temperature, adjustment procedure programming not plausible |
| 5 | Operating hours | Number of operating hours of Analyzer module OXOR-E (option) |
| 6 | Description | Freely selectable text for module name |
| 7 | Module address | Internal CAN bus address of module (defined by hardware setting in module) |
| 8 | Baud rate | Transfer speed (standard: 9600) |
| | Data bits | Number of data bits (standard: 8)<br>The GMS800 only uses the 7-bit range (ASCII code 0 ... 127) but can also communicate in 8-bit format. |
| | Stop bits | Number of stop bits (1 or 2; standard: 2) |
| | Parity | Additional identification for automatic monitoring of character transfers; [Even], [Odd], [None] – standard: None |
| 9 | Start value | Start value of physical measuring range |
| 10 | End value | End value of physical measuring range |
| 11 | Base value | Internal physical base value of measuring range |
| 12 | Measuring channel | Internal measuring channel for measuring component |
| 13 | Drift values | ● Last = since last adjustment<br>● Total = since last drift calculation initialization |
| 14 | Maintenance flag | [On] = Status “Maintenance” is activated (here as signal for active maintenance work) |
| 15 | User settings | ● Backup = Save a copy of the actual module settings.<br>● Restore = Overwrite the actual module settings with a saved copy. [1] |
| 16 | Factory settings | Overwrite the actual module settings with the original settings from the factory.[1]<br>► *Recommendation:* Save the current module settings first (→ “User settings”). |

| No. | Description | Explanation |
|---|---|---|
| 17 | Serial number | Individual module serial number |
| | Material number | Identification number of module version |
| | Hardware version | Module electronics version number |
| | Software version | Module software version number |
| | Software date | Module software revision |
| 18 | Production release | Module date of manufacture |

[1] A warm start is then done automatically.

## 3.3 Menu functions explanations

### 3.3.1 Upload (data synchronization)

*Only applicable when the "SOPAS ET" PC software is used. Not applicable for systems without control unit (special versions).*

The new data are not transferred automatically to "SOPAS ET" after settings for a module have been changed with the menu functions of the control unit. "SOPAS ET" continues using the previous data.

► *To transfer the current data of a module to "SOPAS ET":* Start the "Upload all parameters from device" function in "SOPAS ET" once.

## 3.4 Possible function expansions

Programmed formulas can be used to set logical and mathematical function links. Possible uses include:

- Flow monitoring with the gas flow sensor using the gas flow limit value.
- Gas volume flow regulation (through combination of gas flow measured value and pump capacity control)

Formula information → Technical Information "Basic Control Unit (BCU)"

# Gas Module

# 4 Explanation of functions

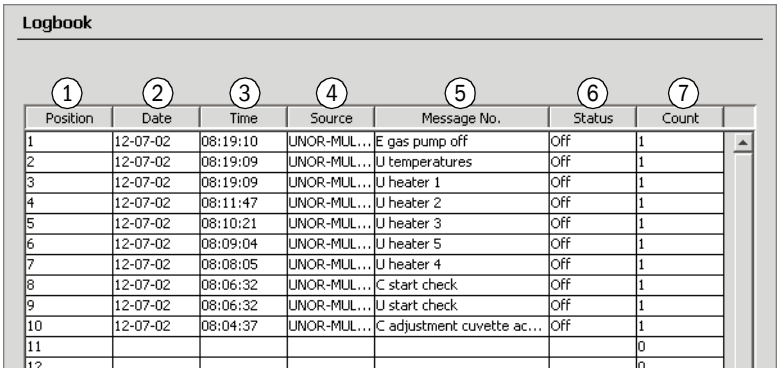
Logbook
Upload
Measured value damping
Drift limit values
Adjustment

# 4.1 Software administration

## 4.1.1 Logbook in SOPAS ET

The Logbook Table shows the last 20 internal messages.

Fig. 2 Menu *"[Module name]*/Diagnosis/Logbook" in PC program "SOPAS-ET" (example)




| Position | Date | Time | Source | Message No. | Status | Count |
|---|---|---|---|---|---|---|
| 1 | 12-07-02 | 08:19:10 | UNOR-MUL... | E gas pump off | Off | 1 |
| 2 | 12-07-02 | 08:19:09 | UNOR-MUL... | U temperatures | Off | 1 |
| 3 | 12-07-02 | 08:19:09 | UNOR-MUL... | U heater 1 | Off | 1 |
| 4 | 12-07-02 | 08:11:47 | UNOR-MUL... | U heater 2 | Off | 1 |
| 5 | 12-07-02 | 08:10:21 | UNOR-MUL... | U heater 3 | Off | 1 |
| 6 | 12-07-02 | 08:09:04 | UNOR-MUL... | U heater 5 | Off | 1 |
| 7 | 12-07-02 | 08:08:05 | UNOR-MUL... | U heater 4 | Off | 1 |
| 8 | 12-07-02 | 08:06:32 | UNOR-MUL... | C start check | Off | 1 |
| 9 | 12-07-02 | 08:06:32 | UNOR-MUL... | U start check | Off | 1 |
| 10 | 12-07-02 | 08:04:37 | UNOR-MUL... | C adjustment cuvette ac... | Off | 1 |
| 11 | | | | | | 0 |
| 12 | | | | | | 0 |

| Column | Meaning |
|---|---|
| 1 | Sequential number in Logbook |
| 2 | Time of last message change |
| 3 | |
| 4 | "System" = measuring system (hardware)<br>"MV" = measuring component (measurement) |
| 5 | Short message text, e.g. "F measured value".<br>The character prefix classifies the message:<br>F = Failure<br>C = Check (adjustment/validation)<br>U = Uncertain (extra information)<br>M = Maintenance<br>E = Extended (status message) |
| 6 | Current message status |
| 7 | Total count of activations |

## 4.1.2 Upload (data synchronization)

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► *To transfer the current data of a module to "SOPAS ET":* Start the "Upload all parameters from device" function in "SOPAS ET" once.

## 4.2 Measured value functions

### 4.2.1 Damping

When “damping” has been programmed, the average value from the actual measured value and the previous measured values (rolling averaging) are displayed instead of the actual measured value.

Possible uses include:

– Damping metrological measured value fluctuations (noise)
– Smoothing fluctuating measured values when only the average value is relevant

Damping is done in the Gas module and therefore affects all measured value displays and outputs. It is also active during an adjustment procedure.

- Increasing damping normally increases the reaction time (90% time) of the gas analysis system accordingly.
- Reducing damping can possibly increase the measurement signal “noise” (measuring turbulence).
- Time constant = 0 s means: No damping.

**CAUTION: Risk of incorrect adjustment**

The “Measuring time, test gas” must be at least 150% of the set damping time constant during adjustments.

► *When damping has been set up anew or increased:* Check whether adjustment settings need to be adapted.

### 4.2.2 Drift limit values

**Purpose**

Analyzer module drifts are caused, for example, by contamination, mechanical changes or aging effects. The total drift (i.e. the deviation from original state) increases gradually. It is not practical to keep compensating an ever increasing total drift through computation. Inspect and reset the Analyzer module when total drift has become very large.

Drift limit values monitor total drift automatically. These also protect against erroneous adjustments.

**Functionality**

After every adjustment, an Analyzer module compares the calculated total drift with the drift limit value. Drift limit value violation is reported in two stages:

- Status “M” (Maintenance request) is activated when the total drift reaches 100 ... 120% of the drift limit value.
- Status “F” (Failure) is activated when the total drift reaches more than 120% of the drift limit value.
- When an adjustment procedure shows that a calculated drift has reached more than 150% of the drift limit value, the result from this adjustment procedure is ignored and the previous adjustment remains valid.

- The drift limit values are set in the factory (standard value: 10%).
- A Service function is available to reset all drift values to “0” (Drift reset). This is useful after Analyzer module maintenance when this has established a new original state.

# Gas Module

# 5 Maintenance

Maintenance plan

## 5.1 Maintenance plan

| Maintenance interval[1] | | | | Maintenance work | Note |
|---|---|---|---|---|---|
| 6M | 1Y | 2Y | 10Y | | |
| □ | □ | □ | □ | ► Check/service fitted gas pump [2] | a |
| □ | □ | □ | □ | ► Check gas flow sensor function [3] | a |
| | □ | □ | □ | ► Check gas paths for leak tightness | |

[1] M = month(s), Y = year(s)
[2] Only for Gas module with gas pump
[3] Only for Gas module with gas flow sensor

| Note | Explanation |
|---|---|
| a | Maintenance interval depends on the individual application |

## 5.2 Adjustment (information)

► Information on adjusting the oxygen sensor → Supplementary Operating Instructions “OXOR-E Analyzer module“

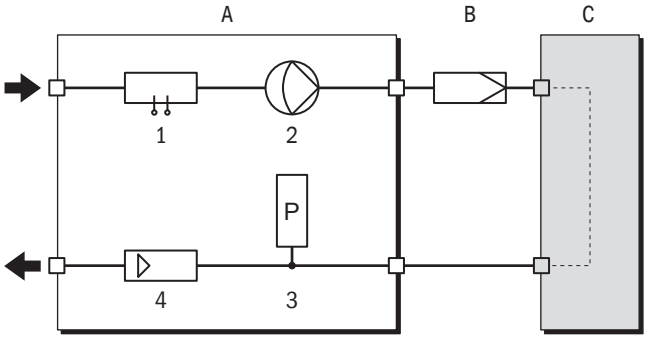
# Gas Module

# 6 Technical data

Internal gas flow
Dimensions
Component specifications

## 6.1 Gas flow plan

Fig. 3 Gas flow GMS800 with Gas module



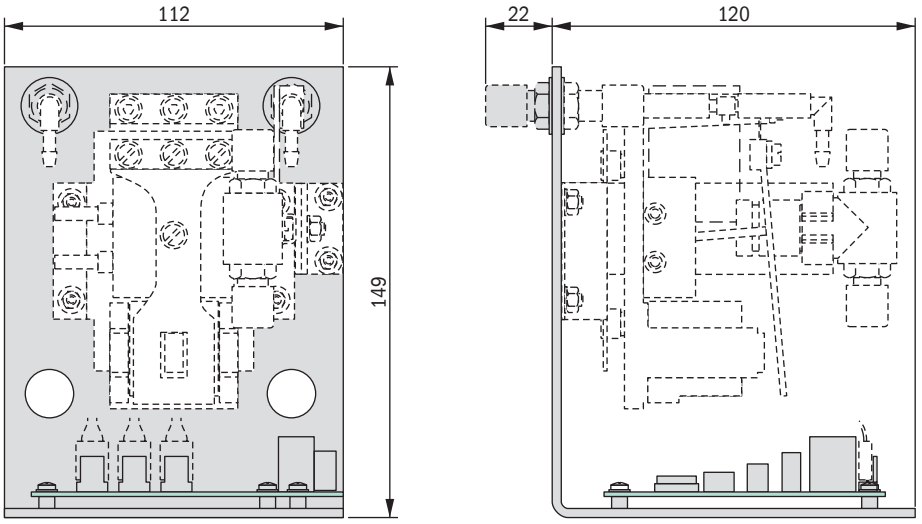

A Gas Module
B Safety filter
C Analyzer module

1 Gas humidity sensor [1]
2 Gas pump [1]
3 Gas pressure sensor [1]
4 Gas flow sensor [1]

[1] Option

## 6.2 Dimensions

Fig. 4 Dimensions



## 6.3 Gas connections

| Version | Material | Suitable for |
|---|---|---|
| Plastic clamping ring screw connection | PVDF | Hose 6x1 mm |
| Swagelok 6 mm | Stainless steel | Metal tube with 6 mm outer Ø |
| Swagelok ¼“ | Stainless steel | Metal tube with ¼“ outer Ø |

Technical gas specifications (pressure, volume flow etc.) → Supplementary Operating Instructions for the Analyzer modules fitted

## 6.4 Module components specifications

| **Gas pressure sensor** | |
|---|---|
| Measuring range: | 500 ... 1500 hPa (±1 %) |
| Materials with sample gas contact: | |
| – T-connection: | Stainless steel 1.4571 |
| – Diaphragm: | Stainless steel |

| **Gas flow sensor** | |
|---|---|
| Measuring range: | 0 ... 100 l/h (±20 %) |
| Monitoring the internal gas pump: | – Actual value < 90% of setpoint value of pump capacity<br>– Setpoint value - actual value > 2 l/h |
| Materials with sample gas contact: | |
| – Housing: | Stainless steel 1.4571 |
| – Sensors: | Glass (coating of the Pt100 resistors) |
| – Adhesive: | Adhesive: 2-component special adhesive |

| **Gas humidity sensor** | |
|---|---|
| Materials with sample gas contact: | |
| – Housing: | Stainless steel 1.4571 |
| – Sensors: | Platinum, chemically pure |
| – Adhesive: | Adhesive: 2-component special adhesive |

| **Gas pump** | |
|---|---|
| Design: | Oscillating diaphragm pump |
| Flow rate: | 0 ... 60 l/h at 100 kPa partial vacuum |
| Materials with sample gas contact: | |
| – Pump body: | PVDF |
| – Diaphragm, valves, seal | Fluorocarbon rubber “Viton” |

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