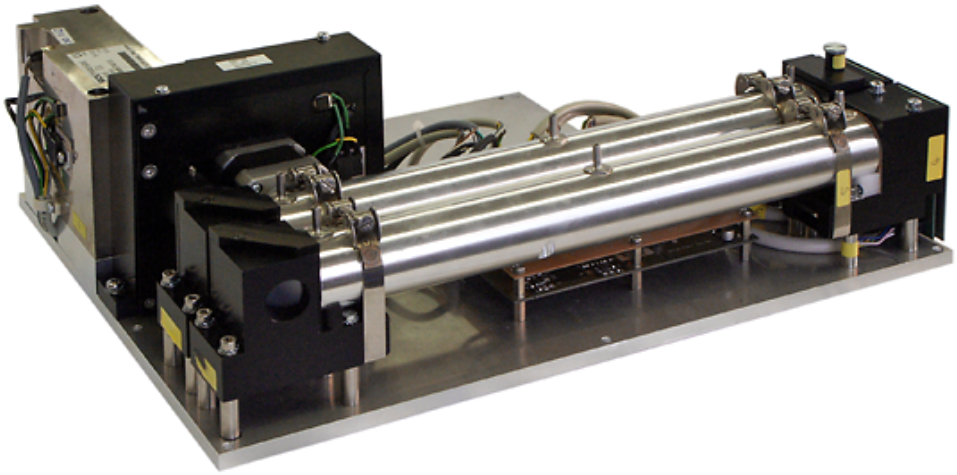
Operating Instructions
Analyzer Module DEFOR

for Series GMS800



Endress+Hauser
People for Process Automation

Described product
Product name: Analyzer Module DEFOR
Basic device: Series GMS800 gas analyzers

Manufacturer
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Legal information

Original document
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Glossary

Cl_2	Chlorine (gaseous)
H_2S	Hydrogen sulfide
IFC	Interference Filter Correlation: Optical measurement method using two wavelength ranges.
NH_3	Ammonia (gaseous)
NO	Nitrogen monoxide
NO_2	Nitrogen dioxide
SO_2	Sulphur dioxide
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.
PC	Personal Computer
PTFE	Polytetrafluorethylene
PVDF	Polyvinylidene fluoride

Warning symbols


Hazard (general)


Hazard by corrosive substances


Hazard by high temperature or hot surfaces

Signal words

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


Nice to know


Supplementary information


Link to information at another place

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1 Important information

Operating information
Application limitations
Additional documentation

1.1 Main operating information

1.1.1 Noises

- Rhythmic noises are normal during operation.
- Specific noises can occur for several minutes after start-up.

1.1.2 UV lamp service life

The Analyzer module DEFOR uses a UV lamp as light source. The UV lamp has a limited service life and probably needs to be replaced several times during the overall operating time.

Status messages of increasing importance are activated automatically when the light intensity of the UV lamp weakens (→ p. 16 [7]).

- UV lamp service life → p. 26, § 5.7
- Display of the operating hours with the PC software “SOPAS ET” → p. 14, § 4.1

1.2 Application limitations

It is possible that another gas component contained in the sample gas can influence the analysis of the desired measuring component (cross-sensitivity).

In such a case, a constant concentration of the “interfering gas” creates a constant deviation from the true measured value every time (constant characteristic curve offset). The deviation varies accordingly when the interfering gas concentration fluctuates.

- Cross-sensitivity against a certain gas is minimized automatically when the DEFOR also measures the concentration of this gas.
- The cross-sensitivity can be minimized through computation in the control unit when the interfering gas concentration is measured with a different Analyzer module in the GMS800.

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 DEFOR.

► Observe the delivered “GMS800” Operating Instructions.

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

NOTICE:

► Pay primary attention to any individual information provided.

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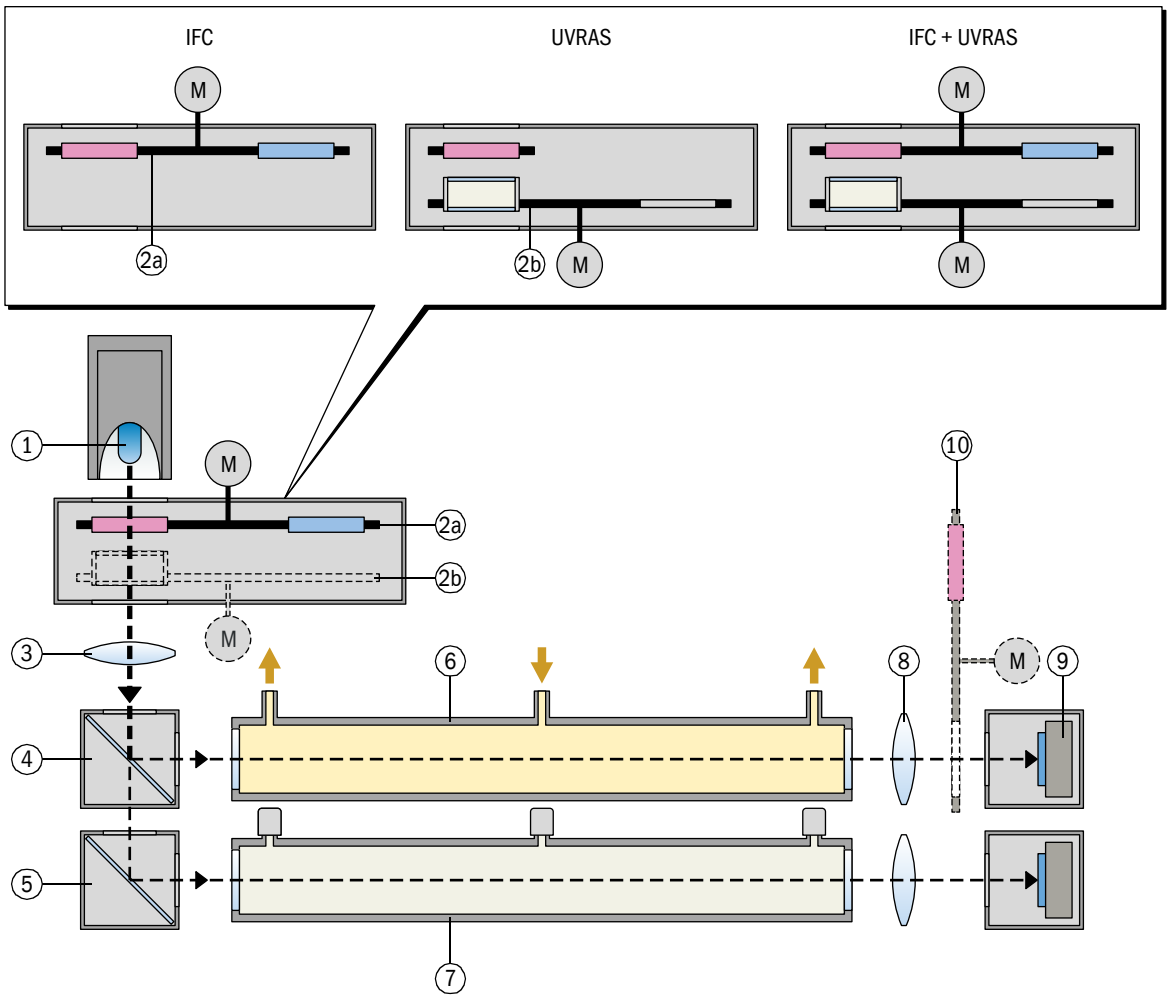
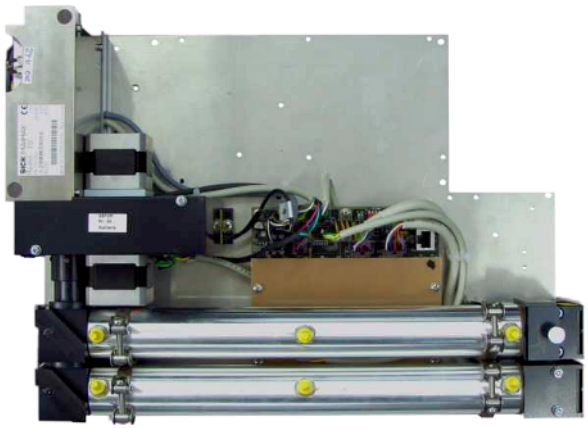
2 Product description

Measuring principle
Measuring ranges

Fig. 1 Measuring principle



1 UV lamp
2 Filter wheel unit
2a Filter wheel 1
2b Filter wheel 2
3 Collimator lens
4 Beam splitter
5 Mirror
6 Sample cuvette [1]
7 Reference cuvette [1]
8 Converging lens
9 Detector
10 Adjustment unit
M Motor



[1] Length = 0.4/1.5/5.6/21/80/300 mm, depending on the measuring range

2.1 Measuring system

Measuring principle

The Analyzer module DEFOR uses the fact that some gases have a specific absorption characteristic in the ultraviolet light range. For this purpose, UV light is radiated through the sample gas. The concentration of a gas component in a gas mixture can be determined through suitable selection of the light wavelength and selective absorption measurement. The Analyzer module DEFOR can, in this way, analyze the concentration of the gases Cl_2, H_2S, NO, NO_2, NH_3, SO_2 and further gases.

The Analyzer module DEFOR can simultaneously measure up to 3 gas components.

Measuring method

- The Analyzer module DEFOR uses interference filter correlation (IFC) for most gas components. Measuring and reference radiation are created alternately by swiveling two different interference filters into the beam path (filter wheel [2a]).
- Gas filter correlation (UVRAS) is used for NO. This method creates the reference radiation by swiveling a gas filter filled with the relevant gas into the beam path (filter wheel [2b]).
- Both measuring methods are combined for joint measurement of NO and other gases (both filter wheels [2a]+[2b] are used).
- The physical state of the measuring system is captured and compensated using a reference beam path through a reference cuvette.

Analyzer module layout

– Beam source is a special UV gas discharge lamp (→ p. 8, Fig. 1 [1]) that emits both broadband as well as NO-specific radiation components.
– Thermostat-controlled filter wheel unit [2] keeps the optic filters at a constant temperature. This minimizes the influence of external temperature changes.
– Lenses [3][8], beam splitter [4] and mirror [5] direct the beam path.
– Sample gas flows through sample cuvette [6]. Reference cuvette [7] is either filled with a neutral gas or has span gas flowing through (option).
– Detectors [9] capture the radiation intensity created with the various filters.
– Measurement signals are amplified electronically and digitally evaluated. The structure symmetry compensates proportional and symmetric signal drifts in the best possible way.
– The measuring system can be fitted with an adjustment unit ([10] → p. 10, § 2.2.1).

The specific properties of the desired measuring components and the desired physical measuring range each demand an individual metrological concept for the Analyzer module.

2.2 Options

2.2.1 Adjustment unit

The adjustment unit simplifies and accelerates routine adjustments.

Zero gas flows through the Analyzer module during an adjustment procedure with an adjustment unit. The first step is a zero point adjustment. An optical filter is swiveled automatically into the beam path of the sample cuvette for the subsequent reference point adjustment – and thus simulates the presence of a span gas in the sample cuvette. The nominal values of this simulation are determined at the manufacturer's factory.

This means only a zero gas is required for an adjustment procedure with adjustment unit; a span gas for reference point adjustment is not necessary. The procedure can be started manually or can run automatically (requires automated zero gas feed).

The adjustment unit should be checked and readjusted in larger intervals during operation (recommendation: Every 6 months). For this purpose, the Analyzer module must be adjusted with real test gases beforehand.

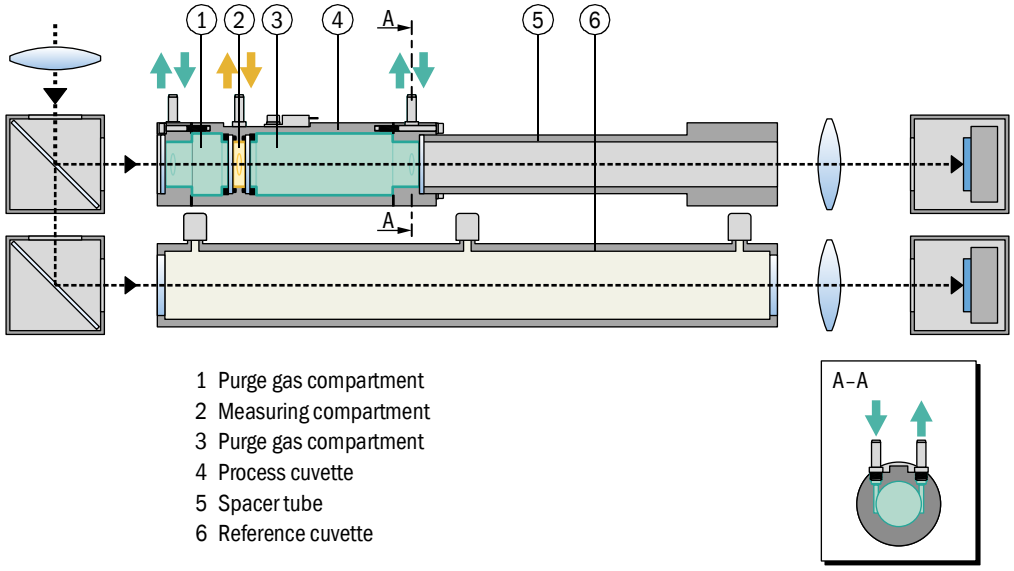
2.2.2 Process cuvette

The versions with process cuvette are intended for applications with dangerous sample gases where it must be ensured the sample gas does not flow into the gas analyzer when a window of the sample cuvette becomes leaky.

In the process cuvette, the measuring compartment is flanked by purge gas compartments through which purge gas flows continuously (→ Fig. 2). When a measuring compartment window is leaky, the emerging sample gas flows into the purge gas compartment and from there out of the gas analyzer with the purge gas.

The GMS800 therefore requires continuous purge gas for versions with a process cuvette (→ p. 12, § 3.2).

Fig. 2 Process cuvette



1 Purge gas compartment
2 Measuring compartment
3 Purge gas compartment
4 Process cuvette
5 Spacer tube
6 Reference cuvette

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3 Installation information

Sample gas feed
Purge gas feed for process cuvette

3.1 Sample gas feed

► Observe the information on sample gas feed in the “Series GMS800” Operating Instructions.

3.2 Purge gas feed for process cuvette

Only valid for versions with process cuvette (option → p. 10, § 2.2.2)

In versions with process cuvette, the GMS800 enclosure has additional “purge gas inlet” und “purge gas outlet” gas connections.

Gas connections type and version → Supplementary Operating Instructions for Enclosure

1 Install an external continuous purge gas supply for GMS800.
Suitable purge gas: Chemically neutral gas (inert gas) or gas mixture suitable for diluting and transporting the measured gas without danger.

2 Feed the purge gas through the “purge gas inlet“ gas connection on the enclosure.
Allowable pressure and volume flow: → p. 25, § 5.3.2

3 Install a gas line on the “purge gas outlet” through which the purge gas and emerged sample gas are reliably discharged.
   ► Lead the gas line to a safe position where emerged sample gas cannot create any danger.
   ► *Recommendation:* Attach appropriate warning signs to the gas line or gas outlet informing about the hazardousness of the sample gas.

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4 Functions in SOPAS ET

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

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

4.1 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
S800_DEFOR		○	○	
Measured value display		○	○	
Measuring component 1	Component	○	○	→ p. 16 [1]
	Measured value	○	○	→ p. 16 [2]
	Unit	○	○	→ p. 16 [3]
Measuring component 2 [1]		○	○	
↓				
Measuring component 10 [1]		○	○	
Diagnosis		○	○	
Module state	Failure	○	○	
	Maintenance request	○	○	→ p. 16 [4]
	Function(s) active	○	○	
	Uncertain state	○	○	
Logbook	Pos. | Date | Source | ...	–	○	→ p. 18, §4.3.1
Operating hours		–	○	
Lamp	h	–	○	→ p. 16 [5]
Measuring component 1		○	○	
Name / unit	Component	○	●	→ p. 16 [1]
	Unit	○	○	→ p. 16 [2]
State	Failure	○	○	
	Maintenance request	○	○	→ p. 16 [4]
	Function(s) active	○	○	
	Uncertain state	○	○	
Validation measurement (QAL3)	Zero point	○	○	
	Reference point	○	○	
Measuring component 2 [1]		○	○	
↓				
Measuring component 10 [1]		○	○	
UV lamp		–	○	
Physical component 1	Intensity ...%	–	○	→ p. 16 [6]
	Failure	–	○	
	Uncertain	–	○	→ p. 16 [7]
	Maintenance	–	○	
	OK	–	○	
Physical component 2 [1]		–	○	
Physical component 3 [1]		–	○	
Parameter		○	○	
Sampling point	Description	–	●	→ p. 16 [8]
RS485 interface	Module address	–	○	→ p. 16 [9]
	Baud rate	–	●	
	Data bits	–	●	→ p. 16 [10]
	Stop bits	–	●	
	Parity	–	●	
Operating mode	Actual	–	○	→ p. 16 [11]
	Target	–	○	→ p. 16 [12]
Measuring component 1		○	○	
Physical meas. range	Component	○	●	→ p. 16 [1]
	Unit	○	○	→ p. 16 [3]
	Start value	○	○	→ p. 16 [13]
	End value	○	○	→ p. 16 [14]
	Base value	○	○	→ p. 16 [15]
	Measuring channel	○	○	→ p. 16 [16]
	Precision	○	○	→ p. 17 [17]

Directory	Menu contents	O	A	Explanation
Damping		–	●	
Damping (el. T90%)	Time constant [s]	–	●	→ p. 19, § 4.3.3
Dynamic damping	Status [On/Off]	–	●	
	Time constant [s]	–	●	
	Threshold	–	●	
Measuring component 2 [1]		○	○	
↓				
Measuring component 10 [1]		○	○	
Adjustment		○	○	
Measuring component 1		○	○	
Drift limit value	Zero point	–	○	→ p. 20, § 4.3.4
	Reference point	–	○	
Adjustment results		○	○	
Adjustment result	Zero point	○	○	
	Reference point	○	○	
Drifts	Zero point	○	○	→ p. 17 [18]
	Reference point	○	○	
Delete results	[Delete]	–	●	→ p. 20, § 4.3.5
Measuring component 2 [1]		○	○	
↓				
Measuring component 10 [1]		○	○	
Maintenance		–	○	
Maintenance flag	[On]/[Off]	–	●	→ p. 17 [20]
Settings		–	○	
User settings	[Backup]	–	●	
	[Restore last user settings]	–	●	→ p. 17 [21]
	[Restore next to last user settings]	–	●	
Factory settings	[Restore]	–	●	→ p. 17 [22]
Factory settings		○	○	
Identification		○	○	
ID numbers	Serial number	○	○	
	Material No.	○	○	
	Hardware version	○	○	→ p. 17 [23]
	Software version	○	○	
	Software date	○	○	
Production release	Year | Month | Day	–	○	→ p. 17 [24]

[1] If fitted.

4.2 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 ● *Significance:* Module not ready for operation ● *Possible causes:* Malfunction, defect
	Maintenance request	LED symbol ● *Significance:* Advance warning before internal technical limits reached. ● *Possible causes:* Drift limit, operating hours, lamp intensity
	Function(s) active	LED symbol ● *Significance:* At least one internal function active that impairs or hinders normal module measuring function. ● *Possible causes:* Adjustment procedure running, validation measurement running
	Uncertain state	LED symbol ● *Significance:* Actual measured values are unreliable. ● *Possible causes:* Heating up phase, internal over/under temperature, adjustment procedure programming not plausible
5	Operating hours	Number of operating hours of the UV lamp fitted
6	Intensity ...%	Actual light intensity in the reference beam path for the associated measured component (with the specific optical filter in the beam path) relative to the new condition of the UV lamp; evaluated automatically (→ [7]; UV lamp service life → p. 26, 5.7)
7	Failure	UV lamp status (evaluation of intensity); “OK” = full intensity, “Maintenance” = UV lamp replacement recommended; “Uncertain” = correct measuring function questionable; “Failure” = measurement no longer possible. The module status flags are activated accordingly (→ [4]).
	Uncertain	
	Maintenance	
	OK	
8	Description	Freely selectable text for module name
9	Module address	Internal CAN bus address of module (defined by hardware setting in module)
10	Baud rate	Transfer speed (standard: 9600)
	Data bits	Number of data bits (standard: 8) 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
11	Actual	Internal operating module state: ● [Heating] = heating up phase (measured values unreliable) ● [Measuring] = measuring operation (normal operating mode) ● [Halt] = stopped electronically (not ready for operation)
12	Target	Default operating mode through entry or software function; should become actual operating mode after a certain time (can take up to 1 hour during the heating up time after start-up).
13	Start value	Start value of physical measuring range
14	End value	End value of physical measuring range
15	Base value	Internal physical base value of measuring range
16	Measuring channel	Internal measuring channel for measuring component

No.	Description	Explanation
17	Precision	[On] = higher measuring precision is available for measuring range 2 (effective in range 0 ... 20% of physical measuring range)
18	Drifts	● Last = since last adjustment ● Total = since last drift calculation initialization
19	Delete results	[Delete] = Set all drift values to “0”.
20	Maintenance flag	[On] = Status “Maintenance” is activated (here as signal for active maintenance work)
21	User settings	● Backup = save a copy of the actual module settings. ● Restore = overwrite the actual module settings with the saved copy. [1]
22	Factory settings	Overwrite the actual module settings with the original settings from the factory.[1] ► *Recommendation:* Save the current module settings first (→ “User settings”).
23	Serial number	Individual module serial number
	Material No.	Identification number of module version
	Hardware version	Module electronics version number
	Software version	Module software version number
	Software date	Module software revision
24	Production release	Module date of manufacture

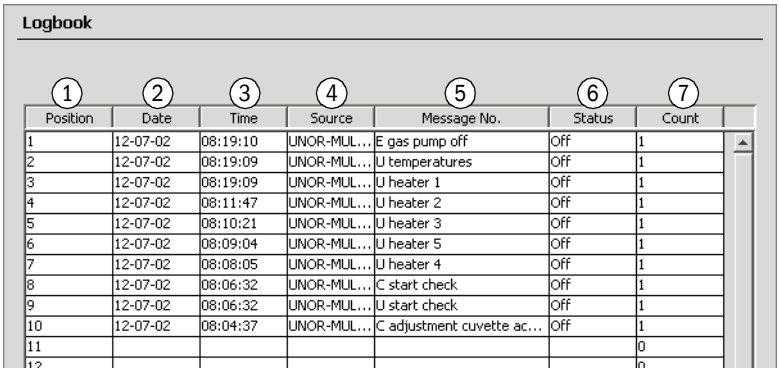
[1] A warm start is then done automatically.

4.3 Explanation of functions

4.3.1 Logbook in SOPAS ET

The Logbook Table shows the last 20 internal messages.

Fig. 3 Menu *"[Module name]*/Diagnosis/Logbook" in PC program "SOPAS-ET" (example)



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

4.3.2 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.

4.3.3 Damping

Constant damping

When “damping” has been programmed, the average value from the current measured value and the previous measured values (floating averaging) are displayed instead of the current 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 Analyzer 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 reset or increased:* Check whether adjustment settings need to be adapted.

Dynamic damping

“Dynamic damping” serves to compensate measured value fluctuations without significantly increasing the reaction time. Dynamic damping is automatically deactivated when the measured value changes rapidly and strongly as against “normal” damping. This allows “smoothing” continuous minor measured value fluctuations but rapid measured value changes are still displayed without delay. Dynamic behavior is determined with the “Threshold” parameter:

- When the measured values change only slowly, dynamic damping functions as constant damping.
- When the difference of successive measured values is greater than the set limit, dynamic damping is terminated automatically and remains disabled as long as the measured values continue to change rapidly.
- Dynamic damping is active again when measured value differences are below the limit again (which means measured values changes remain slight).

Dynamic damping also affects all measured value displays and outputs.

4.3.4 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.

4.3.5 Deleting adjustment results

The “Delete results” function deletes all determined drift values of a measuring component. Drift limit values then refer to new drift values.

The data of the previous adjustment which was performed before are then no longer displayed. Test gas settings (e. g. nominal value) are not changed.

CAUTION: Risk of incorrect adjustment

If very large drift values are displayed after a manual adjustment procedure (→ Operating Instructions “Basic Control Unit (BCU)”), a test gas used probably did not match the relevant test gas setting or gas feed was interrupted – and the adjustment result was still accepted.

► Do not delete incorrect adjustment results, but repeat the adjustment carefully.

► Do not use the deletion of adjustment results to nullify large drift values caused by extensive physical changes of an Analyzer module. Instead, clean the Analyzer module or perform an adjustment.[1]

► *After an Analyzer module has been cleaned, altered or exchanged:* Delete the relevant adjustment results and perform an adjustment.

[1] By the manufacturer's Customer Service or authorized skilled persons with appropriate training.

4.4 Adjustment Information

The control unit controls the adjustments.

- Individual adjustment of each shown measuring component and each measuring range.
- Information concerning purpose, prerequisites and frequency of adjustments → Operating Instructions “Series GMS800”
- Programming of the adjustment parameters for each measuring component of the GMS800 → Technical Information “Basic Control Unit (BCU)”
- Manual start of an adjustment procedure → Operating Instructions of the control unit

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5 Technical data

Ambient conditions
Sample gas specifications
Metrological specifications

5.1 Installation location requirements

Geographic height at installation location:	≤ 2500 m altitude [1]
Ambient air pressure:	700 ... 1200 hPa
Allowable oscillations/jolts – Displacement: – Activation acceleration amplitude:	 0.035 mm (in range 5 ... 59 Hz) 5 $m \cdot s^{-2}$ (in range 59 ... 160 Hz)
Usage position:	Max. ±15° tilt to every spatial axis [2]

[1] Higher altitudes can be realized (option); compensation for height influence.
[2] Allowable surface tilt during operation; keep constant during operation; readjust after changing the tilt.

5.2 Metrological specifications

Measured variable:	Volume concentration of a gas component [1]
Measuring ranges:	See specification for individual device [2]
Detection limit (2σ): [3] – Standard measuring ranges: – Small measuring ranges: [4]	 < 0.5% of measurement span < 1% of measurement span
Linearity deviation:	< 1% of measurement span
Zero point drift – Standard measuring ranges: – Small measuring ranges: [4] – Measured components NO, NO_2, SO_2:	 < 1% of measurement span per week < 2% of measurement span per week < 1% of measurement span per day
Reference point drift:	< 1% of measurement span per week
Ambient temperature influence: – Standard measuring ranges: – Small measuring ranges: [4]	 < 1%[5] / 10 K < 2%[5] / 10 K
Setting time (t_{90}):	4 s [6]
Run-in time:	< 60 minutes

[1] → p. 26, § 5.5
[2] Possible measuring ranges → p. 26, § 5.5.
[3] Values valid with constant damping $T_{90, el.}$ = 10 s; for measuring component NO: With constant damping $T_{90, el.}$ = 10 s + dynamic damping $T_{90, dyn.}$ = 60 s.
[4] Valid for measuring ranges < 2x smallest measuring range.
[5] Of respective measuring range.
[6] Typical value for sample gas volume flow = 60 l/h and $T_{90, el.}$ = 1 s; depending on cuvette length and sample gas volume flow.

If not specified otherwise, the metrological specifications in relation to the physical measuring range are applicable (see order documents). The physical measuring range is usually identical with the largest measuring range. The same values apply for all other measuring ranges.

If, however, the Analyzer module was manufactured with “higher measuring precision” (option), measuring precision is increased in range 0 ... 20% of the physical measuring range. The measurement specifications in this range are then applicable in relation to 20% of the physical measuring range.

5.3 Technical gas specifications

5.3.1 Sample gas

Allowable sample gas temperature: [1]	
– Minimum:	5 °C (41 °F) [2]
– Maximum:	55 °C (131 °F) [3]
Allowable sample gas dew point:	Below ambient temperature
Particles in the sample gas:	Sample gas should be free from dust and aerosols [4]
Allowable sample gas pressure [5]	–200 ... +300 hPa (–0.2 ... +0.3 bar)
Sample gas volume flow [1]	
– Minimum:	20 l/h (333 cm^3/min)
– Maximum:	120 l/h (2000 cm^3/min)
– Recommended:	30 ... 60 l/h (500 ... 1000 cm^3/min)
– Standard:	30 l/h (500 cm^3/min)

[1] On the sample gas inlet. Keep constant during operation.
[2] When a sample gas cooler is used: Always above the cooler temperature (dew point).
[3] With "heated sample gas path" option: Up to +80 °C, depending on the temperature set.
[4] On the sample gas inlet.
[5] Relative to the ambient/atmospheric air pressure.

5.3.2 Purge gas

Only valid for version with process cuvette (→ p. 10, § 2.2.2)

Suitable purge gas:	Dry inert gas (chemically neutral gas/gas mixture without condensable components)
Allowable purge gas pressure [1]	15 ... _30 hPa
Purge gas volume flow	
– Minimum:	20 l/h (333 cm^3/min)
– Maximum:	100 l/h (167 cm^3/min)
– Recommended:	20 ... 60 l/h (333 ... 1000 cm^3/min)
– Standard:	30 l/h (500 cm^3/min)

[1] Relative to the ambient/atmospheric air pressure.

5.4 Materials with sample gas contact

Component	Material
Cuvette:	Aluminium or stainless steel [1]
Optical window:	CaF_2 or quartz [1]
Synthetics:	Viton B, PVDF, PTFE [1]

[1] Depending on version.

5.5 Measuring ranges

Measuring component	Smallest measuring range			Largest measuring range
	Technical		Performance-tested[1]	
	ppm	mg/m³	ppm	% by vol.
Cl_2	125	400	–	100
COS	250	670	–	100
CS_2	50	170	–	30
H_2S	25	40	–	100
NH_3	50	40	–	100
NO	10	15	50	100
NO_2	50 (10)[2]	105 (20)[2]	50	100
SO_2	25 (10)[2]	75 (30)[2]	75	100

[1] Approvals→ p. 26, §5.6.
[2] For operation in air-conditioned environment (±2 °C temperature deviation) and daily zero point adjustment.

- Conversion from ppm to mg/m³ relative to 20°C, 1013 hPa.
- All specifications valid for a mixture of the measuring components and N_2.

5.6 Approvals

Conformities	DEFOR
EN 15267-3	●
EN 14181	●
2000/76/EC (17th BImSchV)	●
2001/80/EC (13th BImSchV)	●
27th BImSchV	●

5.7 UV lamp

Design:	Electrode-less discharge lamp, EDL
Service life:	Approx. 2 years (= 17500 hours)

5.8 Auxiliary power supply for the module

Voltage supply:	24 VDC
Power input:	≤ 134 W

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