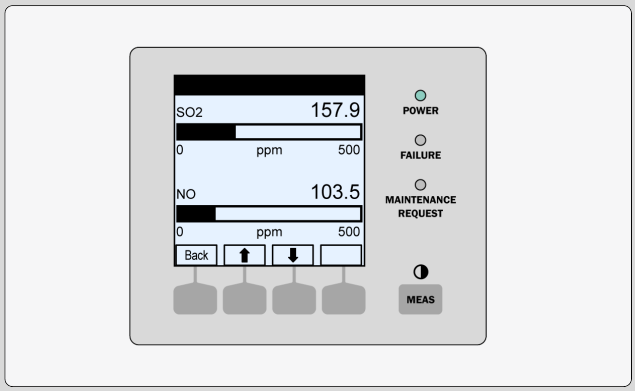
ADDENDUM TO OPERATING INSTRUCTIONS

BCU Basic Control Unit

GMS800 Series

Operation, Function, Configuration

SICK
Sensor Intelligence.



Described product

BCU Basic Control Unit

Manufacturer

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Legal information

Original document

This document is an original document of SICK AG.

CE

Contents

1 About this document

1.1 Warning symbols

Symbol	Significance
	Hazard (general)

Table 1: Warning symbols

1.2 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

1.3 Information symbols

Symbol	Significance
	Important technical information for this product

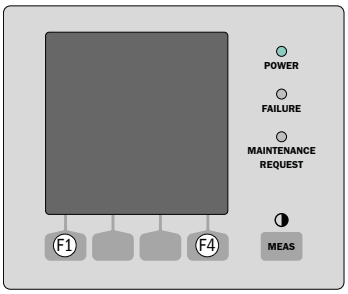
Table 2: Information symbols

2 Important information

2.1 Display lighting

It is possible that the display lighting switches off automatically.

- ▶ When the display is dark: Press the left or right function button.
- ▶ If this does not work: Check whether the device is on (POWER lights) or if power voltage is available.



F1 Left function button
F4 Right function button

Figure 1: Reactivating function buttons for automatic light-off

2.2 Internal clock buffer time

When sequences exist that are started by the internal clock (e.g., automatic adjustments):

- ▶ If the device has been out of operation for more than 3 ... 5 days: Set the internal clock again after start-up, see "Setting the internal clock", page 81

2.3 Additional documentation/information

This document supplements the Operating Instructions for GMS800 series gas analyzers. It extends the "GMS800" Operating Instructions with technical information on the BCU.

- ▶ Observe the Operating Instructions delivered with the "GMS800".

NOTE
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 GMS800 is connected to a PC on which “SOPAS ET” is installed: Refer to the Technical Information “BCU Basic Control Unit”.

3 Product description

3.1 Basic features

Purpose

The BCU (Basic Control Unit) is a control unit for use in GMS800 series gas analyzers.

Interface

- Sensor buttons
- Context-sensitive button functions (see "Function buttons", page 12)
- Display protected by glass plate

3.2 Main functions

Displays

- Various measuring screens
- Measured values from several measuring points
- Several menu languages

Information

- Status
- Diagnosis
- Logbooks

Maintenance functions

- Data backup
- I/O tests

Adjustment/validation

- Manual procedures
- Programmed automatic adjustments/validations

Configuration

- Measured values
- I/O connections
- Interface parameters

NOTE
Complete menu tree (see "Menu tree for "Authorized operator"", page 19)

4 Operation (general)

4.1 Switch-on procedure

Switching on

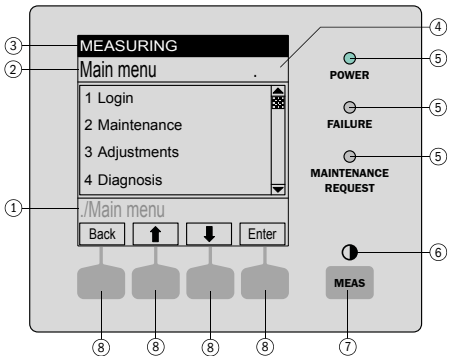
1. Switch the device on (start power supply)
   - The POWER LED goes on
   - Various information is displayed for a few seconds
   - It is possible that NO MEASURED VALUES is displayed for several seconds
2. Wait until the measuring screen appears (see "How to access the measuring screens", page 15)
3. Wait for the heating up phase to complete:
   - Power LED is on
   - Measured values blink
4. Check the operating state exists (see "Characteristics of the safe operating state", page 14)

Characteristics of the heating up phase

NOTICE
The display lighting can possibly switch off automatically after a certain time (see "Setting the automatic light off", page 84).

NOTE
The display SEE LOGBOOK appears during the heating up phase because the start process is recorded in the logbook. MEASURING should appear after a certain time (see "Characteristics of an uncertain operating state", page 14).

4.2 Operating and display elements



① Current menu branch
② Current menu
③ Status line
④ Menu number
⑤ LEDs
⑥ Contrast: Press the MEAS button for several seconds
⑦ MEAS button: Measuring Screen
⑧ Function button (function is displayed)

ENTER

MENU, etc.

NOTICE
The display lighting can possibly switch off automatically after a certain time

▶ To reactivate the display lighting: Press the left or right function button

4.2.1 LEDs

LED	Significance/ possible causes
POWER	The device is switched on, power voltage is available

LED	Significance/ possible causes
FAILURE	At least one status flag[1] F is activated
MAINTE-NANCE REQUEST	At least one status flag[1] M, C or U is activated for at least one measured value, analyzer module or sensor
	The MAINTENANCE MODE state is activated manually (see "Maintenance mode", page 21)

1 Explanation (see "Status message categories", page 49)

4.2.2 Function buttons

Button	Function
MEAS	Return to the measuring screen from any menu: see "Measuring screen", page 55 • Press <Save> to store any changes made. Otherwise the changes are lost
	◐ To adjust the contrast: Press the MEAS button for longer than 2 seconds

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

Display	Function
BACK	Return to the higher level menu. Press <Save> to store any changes made. Otherwise the changes are lost.
DIAG	DIAG is shown only when there is a message. To display the message: Press this button.
ENTER	Call up/start selected menu function
MENU	Call up the main menu. If the <MENU> button is not shown: Press MEAS first.
SAVE	Save input/exit
SET	Start setting
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

4.2.3 Possible messages in the status line

Message	Significance	Necessary measures
Measuring	The GMS800 is in the normal operating state and there are no current status or function messages.	-
Measuring: [Number] Measuring: [Name of measuring point]	As MEASURING + name of the measuring point from which the sample gas currently originates. [1]	

Message	Significance	Necessary measures
Flushing: [Number] Flushing: [Name of measuring point]	Flushing time in progress for specified measuring point (measuring is interrupted). [1]	
See logbook	There is at least one status or function message.	▶ If the cause is not known: Check the logbook (see "Displaying logbooks ", page 54)
Adj/Val: Flush test gas Adj/Val: Measure Adj/Val: Calculate Adj/Val: Flush sample gas	An adjustment procedure or validation measurement is running.	▶ When an adjustment procedure is being carried out: Continue the procedure according to the instructions (see "User-controlled adjustment", page 31) ▶ If a fully automatic adjustment is running (→ Technical Information "BCU Basic Control Unit – Operation with SOPAS ET"): Wait until the automatic procedure has ended

1 Only possible when there are several measuring points (see "Configuring measuring point switchover", page 81).

4.3 How to check the operating state (visual check)

4.3.1 Characteristics of the safe operating state

Characteristic	Safe state
LED POWER	On
LED FAILURE	Off
Display	When the measuring screen is active (see "How to access the measuring screens", page 15): The measured values are displayed constantly (without blinking).

NOTICE
The display lighting can possibly switch off automatically after a certain time (see "Setting the automatic light off", page 84).

- ▶ Reactivate the display lighting, see "Display lighting", page 9

4.3.2 Characteristics of an uncertain operating state

Display	Measures
POWER off	▶ Check power supply (external power switch, power fuses) ▶ In pressurized enclosures: Check status of pressurized enclosure: – Ignition protection gas shut off? – Enclosure open or leaky? – Further measures → Operating Instructions of the enclosure pressurization system
FAILURE on Measured values blink	▶ Check internal messages (see "Displaying logbooks ", page 54)
MAINTENANCE REQUEST on	▶ Measuring operation is possibly interrupted (see "LEDs", page 11)
Measured values implausible	▶ Check whether it is possible for the measured values to reach these values in the current situation ▶ Check sample gas supply (e.g. valves, filter) ▶ Carry out an adjustment

4.4 Shutdown

No measures are required on the BCU before shutting down. All the operating data are saved and are then valid again after the next start-up.

NOTE
Detailed information on shutting down → Operating Instructions “GMS800 Series”

4.5 Starting operation

4.5.1 How to access the measuring screens

▶ Touch MEAS once

– The last measuring screen selected is shown (see "Selecting the measuring screen", page 55)
  ○ If no measuring screen has been selected before, the LIST menu is shown (see "Displaying measured values as a list", page 55)

Options	Action
Select a different measuring screen:	▶ Touch MEAS until the desired measuring screen is displayed
View other measuring components[1]:	▶ Select ⬇/⬆
Switch to the Menu system:	▶ Select MENU[2]
When a measured value blinks:	▶ Select DIAG

1 If available. Hint: Check the function buttons display.
2 The last menu selected is displayed again when either the left or right function button was activated during the last 30 minutes. Otherwise the Main menu is displayed (see "How to access the Main menu", page 15).

NOTE
Measuring screen LIST is displayed automatically after start-up.

4.5.2 How to access the Main menu

▶ If the measuring screen is active (see "How to access the measuring screens", page 15): Select MENU
▶ If a menu function is active: Select BACK until the Main menu is displayed

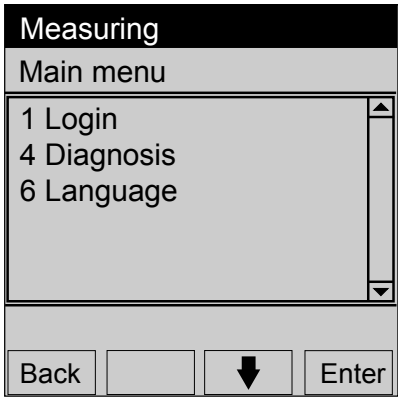


Figure 2: Main menu

NOTE
Calling up the measuring screen (see "How to access the measuring screens", page 15)

4.5.3 How to select a function

1. Move the highlighting to the desired function: Select ⬇/⬆
2. Select ENTER or SET (depending on the display)

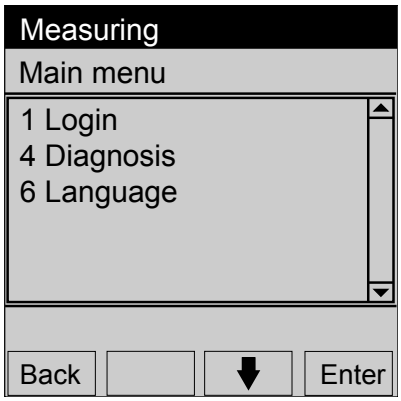


Figure 3: Main menu

4.5.4 How to return to the measuring screen

▶ Touch MEAS once

4.5.5 Language

Menu: LANGUAGE

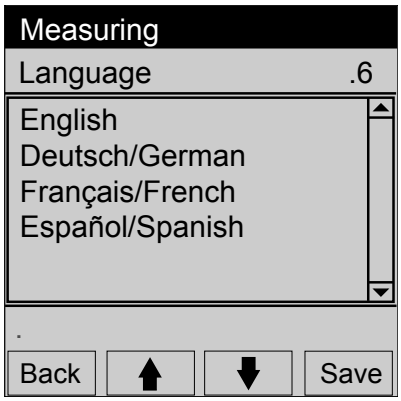


Figure 4: LANGUAGE menu (example)

▶ Select the desire language (⬇/⬆, SAVE)

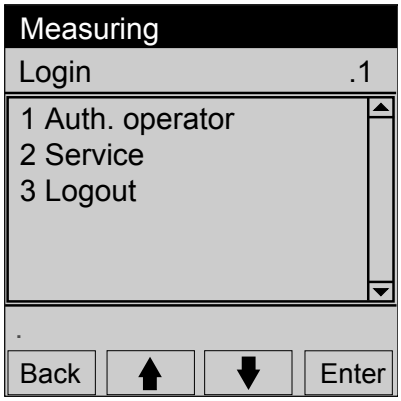
NOTE

- Languages available: German, English, French, Italian, Spanish, Portuguese, Russian
- In SOPAS ET, the language selection function is not in the menu tree but exists as a SOPAS ET program function
- Language selection in SOPAS ET and language selection for the menus on the BCU display are independent from each other. Language selection in SOPAS ET does not change the language on the display. Two different languages can be selected.

4.5.6 User level (Login)

Procedure

Menu: LOGIN



1 To user level AUTHORIZED OPERATOR
2 To user level SERVICE
3 To standard user level

1. Select AUTH. OPERATOR (↓/↑, ENTER)
2. Set HIDE as password (observe capital letters)
   - Set a letter with the EDIT button
   - Confirm letter with SELECT
   - Terminate with SAVE after entering the last letter

✓ AUTH. OPERATOR SUCCEEDED is displayed

NOTE

If, after the user level has been changed, no function button is activated before the automatic wait time (see "Setting the login timeout", page 84) elapses (e.g. ENTER, BACK), LOG-IN TIME-OUT is displayed in the status line when the next button is activated and the menu to enter the password appears automatically (RE-LOG-IN).

4.6 Menu tree for the basic functions

● = Setting up/starting
O = Viewing

	Menu level	O/●	Reference
.1	**Login**	●	chapter 4.5.6
.1.1	Auth. operator	●	
.1.2	Service	●	
.4	**Diagnosis**	O	chapter 7
.4.1	Status	O	chapter 7.3
.4.1.1	Measured values	O	
.4.1.2	Modules	O	
.4.1.3	Limit values	O	
.4.2	Logbooks	O	chapter 7.4
.4.2.1	Logbook compl.	O	
.4.2.2	Logbook category	O	
.4.3	Measured values	O	chapter 7.5
.4.3.1	List	O	
.4.3.2	Bar diagram	O	
.4.3.3	Y-T bar graph	O	
.4.3.5	Current outputs	O	
.4.3.6	Aux. values	O	
.4.4	Results	O	chapter 7.6
.4.4.1	Adjustment results	O	
.4.4.2	Validation results	O	
.4.5	IO	O	chapter 7.7
.4.5.1	Analog outs (AOi)	O	
.4.5.2	Digital outs (DOi)	O	
.4.5.3	Analog ins (AIi)	O	
.4.5.4	Digital ins (DIi)	O	
.4.6	System overview	O	chapter 7.8

.4.7	IO overview	0	chapter 7.9
.4.8	Product info	0	chapter 7.10
.4.8.1	System	0	
.4.8.2	BCU	0	
.4.8.3	Modules	0	
.4.9	Operating hours	0	chapter 7.11
.4.9.6	Module	0	
.6	**Language**	●	chapter 4.5.5

4.7 Menu tree for "Authorized operator"

● = Setting up/starting
O = Viewing

	Menu level	O/●	Reference
.1	**Login**	●	chapter 4.5.6
.1.1	Auth. operator	●	
.1.2	Service	●	
.1.3	Logout	●	
.2	**Maintenance**	●	chapter 5
.2.1	Maintenance mode	●	chapter 5.1
.2.2	Data backup	●	chapter 5.2
.2.2.1	System	●	
.2.2.2	Modules	●	
.2.3	IO test	●	chapter 5.3
.2.3.1	Analog outs (AOiO)	●	
.2.3.2	Digital outs (DOiO)	●	
.2.3.3	Analog ins (AIiI)	●	
.2.3.4	Digital ins (DIiI)	●	
.2.4	Reset BCU	●	chapter 5.4
.3	**Adjustments**	●	chapter 6
.3.1	Adjustment	●	chapter 6.1
.3.1.1	"Measuring component"	●	
.3.1.13	Aux. values	●	
.3.2	Validation	●	chapter 6.2
.3.2.1	"Measuring component"	●	
.3.3	Settings Adj.	●	chapter 6.4
.3.3.1	Meas. duration	●	
.3.3.2	Sample gas flush time	●	
.3.4	Group functions	●	chapter 6.3.1
.3.5	Settings	●	
.3.5.1	Test gases	●	chapter 6.5
.3.5.2	Automatic	●	chapter 6.3.2
.4	**Diagnosis**	O	chapter 7
.4.1	Status	O	chapter 7.3
.4.1.1	Meas. values	O	
.4.1.2	Modules	O	
.4.1.3	Limit values	O	
.4.2	Logbooks	O	chapter 7.4
.4.2.1	Logbook compl.	O	
.4.2.1	Logbook category	O	
.4.3	Measured values	O	chapter 7.5
.4.3.1	List	O	
.4.3.2	Bar diagram	O	
.4.3.3	Y-T bar graph	O	
.4.3.5	Current outputs	O	
.4.3.6	Aux. values	O	
.4.4	Results	O	chapter 7.6
.4.4.1	Adjustment results	O	
.4.4.2	Validation results	O	
.4.5	IO	O	chapter 7.7
.4.5.1	Analog outs (AOi)	O	
.4.5.2	Digital outs (DOi)	O	
.4.5.3	Analog ins (AIi)	O	
.4.5.4	Digital ins (DIi)	O	
.4.6	System overview	O	chapter 7.8
.4.7	IO overview	O	chapter 7.9
.4.8	Product info	O	chapter 7.10
.4.8.1.	System	O	
.4.8.2.	BCU	O	
.4.8.3	Modules	O	
4.9.	Operating hours	O	chapter 7.11

.4.9.6	Gas module	O	
.4.10	Service	O	chapter 7.12
.4.10.1	Gas module	O	
.5	**Parameter**	●	chapter 8
.5.1	Measured values	●	chapter 8.1
.5.1.x	"Measuring component"	●	
.5.1.13	Aux. values	●	
.5.2	Representation	●	chapter 8.2
.5.2.1	Measuring component	●	
.5.2.13	Aux. values	●	
.5.3	Output range	●	chapter 8.3
.5.3.x	"Measuring component"	●	
.5.4	Damping	●	chapter 8.4
.5.4.x	"Measuring component"	●	
.5.4.13	Aux. values		
.5.5	Limit values	●	chapter 8.5
.5.5.x	"Measuring component"	●	
.5.5.13	Aux. values	●	
.5.6	Pump	●	chapter 8.6
.5.6.1	Pump		
.5.6.2	"Pump off"	●	
.5.6.3	Power	●	
.5.7	IO	●	chapter 8.7
.5.7.1	Analog outs (AOi)	●	
.5.7.2	Digital outs (DOi)	●	
.5.7.3	Digital ins (DIi)	●	
.5.8	Communication	●	chapter 8.8
.5.8.1	LAN	●	
.5.8.2	Modbus	●	
.5.9	Date - Time	●	chapter 8.9
.5.9.1	Date	●	
.5.9.2	Time	●	
.5.10	Special	●	
.5.10.1	Meas. point autom.	●	chapter 8.10
.5.10.2	Customer functions	●	chapter 8.11
.5.10.3	Display settings	●	chapter 8.12
.5.10.4	Modules	●	chapter 8.13
.6	**Language**	●	chapter 4.5.5

5 Maintenance functions

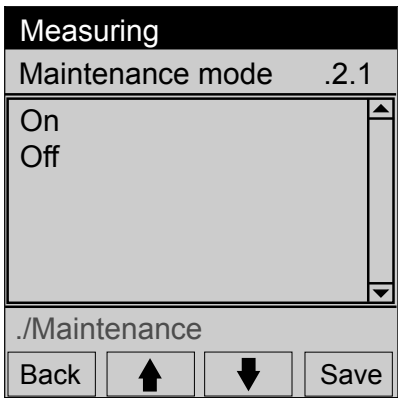
NOTE

- Menu representation is optimized for the description and does not always correspond exactly to the actual representation on the display
- All numeric values in the menus are examples without metrological significance The realistic values depend on the individual device in which the BCU is installed

These functions are only available for user level AUTHORIZED OPERATOR (see "Menu tree for "Authorized operator"", page 19).

5.1 Maintenance mode

Menu: MAINTENANCE/MAINTENANCE FLAG



On	Maintenance flag activated
Off	Maintenance flag deactivated

Purpose

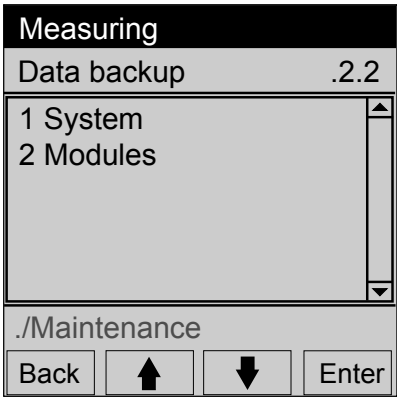
Menu function MAINTENANCE SIGNAL serves to set status C. If this status controls a digital output of the device, this can be used to signal to an external station that the device is no longer in measuring operation because, for example, maintenance is being carried out.

NOTE

Some maintenance functions activate status C automatically

5.2 Saving/restoring data

Menu: MAINTENANCE/BACKUP



1. Select desired scope (⬇/⬆, ENTER).

System	Complete GMS800 system (BCU + all connected modules)
Modules	A single module (→ Select in next menu)

2. When MODULES has been selected: Select the desired module (⬇/⬆, ENTER)
3. Select the desired function (⬇/⬆, ENTER)

Backup	Store a copy of the current settings (internal)
Restore	Replace current settings with a stored copy

When BACKUP has been selected:

✓ A message is displayed: ... SAVE?

4. To start the process: Select ENTER

When RESTORE has been selected:

5. Select the desired function (⬇/⬆, ENTER)

Last	Replace current settings with the last (youngest) copy
Next to last	Replace current settings with the next to last (older) copy
Production	Replace current settings with the manufacturer's settings (factory settings)[1]

[1] Recommendation: Save the current settings first.

✓ A message is displayed: ... RESTORE?

NOTICE

The GMS800 performs an automatic warm start after the settings have been restored. The measuring function is interrupted for a short time.

6. To start the process: Select ENTER .

✓ GMS800 restarts automatically (warm start).

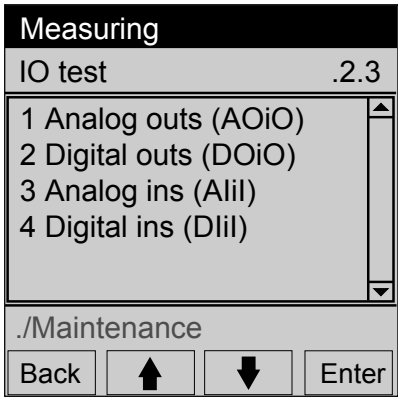
7. Wait until the GMS800 is ready for operation.

Purpose

The functions of DATA BACKUP serve to store a copy of the current settings internally (SAVE) or to replace the current settings with a stored copy (RESTORE). Two copies can be stored (LAST, NEXT TO LAST). Restoring the original factory settings is useful for carrying out tests for example.

5.3 I/O test

Menu: MAINTENANCE/IO TEST



1 Analog outputs
2 Digital outputs
3 Analog inputs
4 Digital inputs

5.3.1 Purpose of the I/O test functions

The functions of menu branch IO TEST serve to control signal ouputs manually or to display the current state of the signal inputs. This allows testing the function of the signal connections and the interaction with connected devices.

The test functions for outputs affect one single signal output; the remaining signal outputs remain in the normal operating state.

5.3.2 Safety information for the I/O test

CAUTION
Risk for connected systems

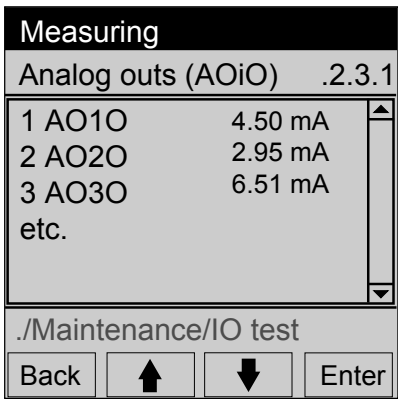
The normal operating function of the selected signal output is deactivated as soon as the test function is selected. The signal output switches to the electronic state selected in the test function.

▶ Ensure this situation cannot cause any problems for connected stations [1]

[1] The CHECK (see "Status message categories", page 49) status is automatically activated while the test function is active.

5.3.3 Testing the analog outputs

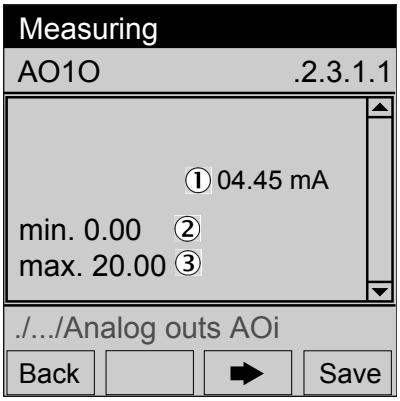
Menu: MAINTENANCE/IO TEST/ANALOG OUTS (AOIO)



1 Current electronic output signal

1. Select the desired analog output (🡻/🡹, ENTER)

▶ To terminate the test: Select BACK

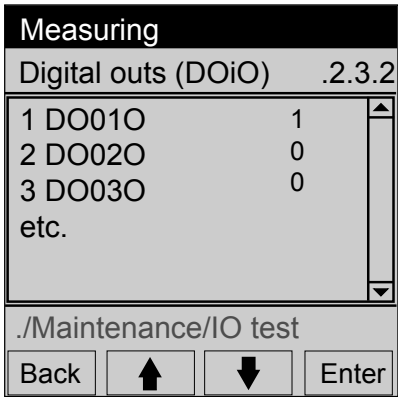


1 Input value
2 Minimum value
3 Maximum value

2. Set the value the analog output is to output

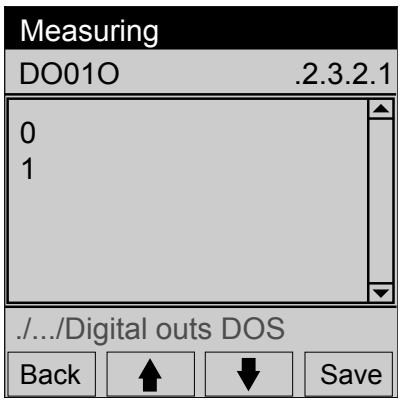
5.3.4 Testing the digital outputs

Menu: MAINTENANCE/IO TEST/DIGITAL OUTS (DOIO)



1. Select the desired digital output (🡻/🡹, ENTER)

▶ To terminate the test: Select BACK



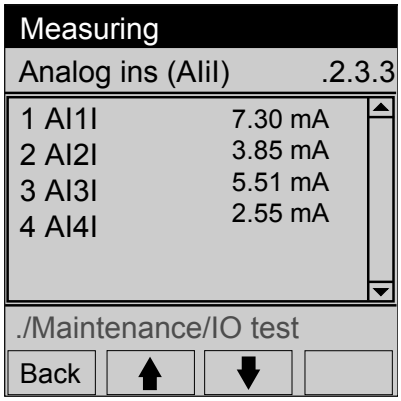
0 Electronic deactivated state
1 Electronic activated state

2. Set the state the digital output should have

✓ A message confirming the change made is displayed for a short while

5.3.5 Testing the analog inputs

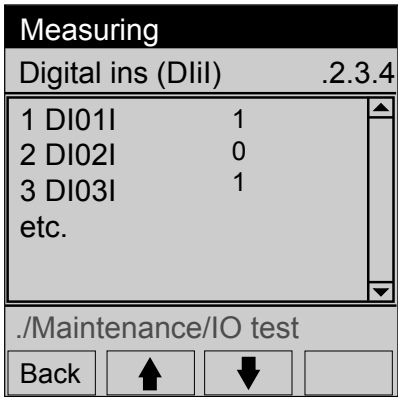
Menu: MAINTENANCE/IO TEST/ANALOG INS (AIII)



1, 2, ... Current electronic input signal

5.3.6 Testing the digital inputs

Menu: MAINTENANCE/IO TEST/DIGITAL INS (DIII)

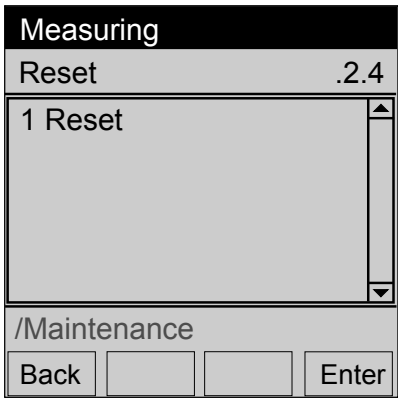


1 Current electronic state (1 = activated)

▶ To view all digital inputs: Select ⬇/⬆

5.4 Reset

Menu: MAIN MENU/MAINTENANCE/RESET



▶ To trigger the reset: Select ENTER

CAUTION
Risks for connected devices/systems

The measuring functions are interrupted for a short time during the reset and the maintenance flag is activated automatically

▶ Ensure this situation cannot cause any problems for connected stations

6 Adjustment functions

NOTE

- Menu representation is optimized for the description and does not always correspond exactly to the actual representation on the display
- All numeric values in the menus are examples without metrological significance
  The realistic values depend on the individual device in which the BCU is installed

NOTE

These functions are only available for user level AUTHORIZED OPERATOR (see "Menu tree for "Authorized operator"", page 19).

NOTE

Detailed information on adjustments → Operating Instructions "GMS800 Series“

Difference between adjustment / validation

For a **validation**, the measuring results are stored with the date and time.

For an **adjustment**, in addition to storing the measuring results, the deviations between the span gas value and the measured value are also calculated as a percentage deviation (drift) and included in the calculation for further measurements.

Sequence of an adjustment/validation

Validation and adjustment sequences are identical.

The following options exist for an adjustment/validation:

- Adjustment of a single component: see "Adjustment of single components ", page 27
- Validation of a single component: see "Validation of single components", page 34
- Adjustment/validation of several components (group function): see "Adjustment/ validation of several components (group function)", page 37

6.1 Adjustment of single components

NOTE

- Normally, certain settings that suit the individual GMS800 and the planned usage are already specified at the factory
- The test gas settings could possibly plan having the test gases fed automatically via solenoid valves controlled by the digital outputs of the GMS800
- Detailed information concerning adjustments → Operating Instructions “GMS800 Series”

"The "adjustment of single components" can be carried out in 2 ways:

- Adjustment with preset (see "General settings for adjustments", page 39) time sequences
  After the adjustment has been started, the individual adjustment steps run independently (see "Adjustment with preset time sequences", page 29)
- User-controlled adjustment: The user starts the individual adjustment steps (see "User-controlled adjustment", page 31)

6.1.1 Prerequisites for manual adjustments

- Only use adjustment functions when the required test gas settings have been programmed correctly (see "Configuring test gases", page 41)
- Observe the physical requirements for the test gases (→ Operating Instructions “GMS800 Series”)

NOTICE

- Always carry out the respective zero point adjustment before a reference point adjustment.

Otherwise the reference point adjustment will not be correct.

CAUTION

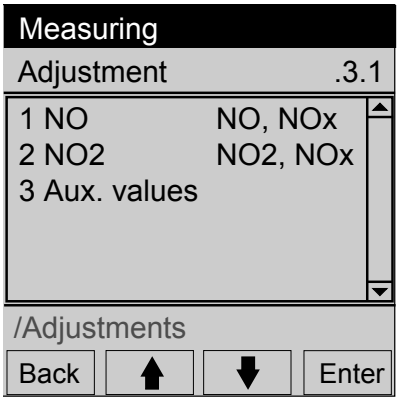
Possible interference when stations are connected

An adjustment procedure interrupts measuring operation

- Before an adjustment: Inform connected stations that measuring operation will soon be interrupted

6.1.2 Starting the adjustment procedure

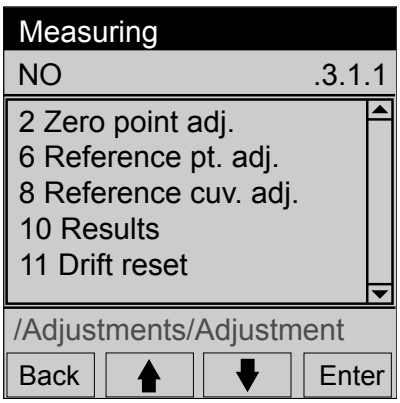
Menu: ADJUSTMENTS/ADJUSTMENT



1 Measuring component | Internal use[1]
2 Measuring component | Internal use
13 Branch to the auxiliary values[2]

1 List of measuring components where the measured value of the measuring component is used for calculation.
2 Explanation see "Damping", page 87.

1. Select a measuring component (↓/↑, ENTER)
   When an auxiliary value (see "Auxiliary values", page 87) is to be adjusted:
   Select AUX. VALUES and then select the desired auxiliary value



2. Select the desired adjustment function (↓/↑, ENTER).

Adj. zero p.[1]	Zero point adjustment
Reference pt. adj.[1]	Reference point adjustment
Reference pt. cuv. adj.[2]	Reference point adjustment with adjustment cuvette[3]
Results	View the results of the last adjustment
Drift reset	Delete stored drift values (reset to 0)[4]

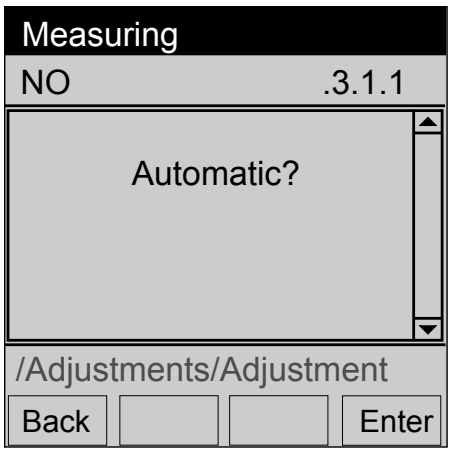
1 Only displayed when an appropriate test gas setting exists.
2 Only displayed when the measuring component is measured with an Analyzer module that has an adjustment cuvette (option) and an appropriate test gas setting exists.
3 Use a zero gas as test gas.
4 Detailed information see "Deleting drift values (drift reset)", page 90.

NOTE

Only adjustments that can be carried out in the current operating state are shown. The respective adjustment procedure is not available for selection when at least one status message exists where the cause could make an adjustment procedure unreliable or impossible (e.g. malfunction in module, test gas malfunction).

6.1.3 Carrying out the adjustment procedure

- A prompt appears for the desired adjustment procedure:
  - With preset time sequences ("automatic"): see "Adjustment with preset time sequences", page 29
  - User-controlled (step by step): see "User-controlled adjustment", page 31



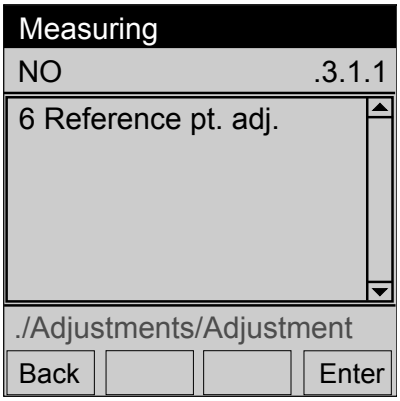
ENTER Starts the automatic adjustment
BACK Starts the user-controlled adjustment

6.1.3.1 Adjustment with preset time sequences

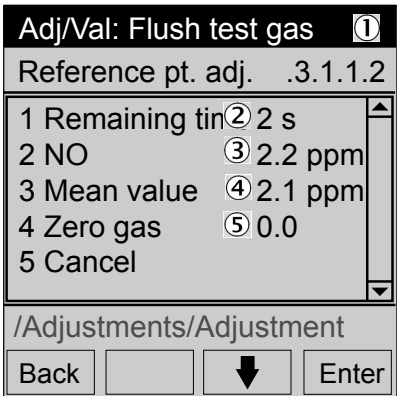
Adjustment with preset (see "General settings for adjustments", page 39) time sequences.

After the adjustment has been started, the individual adjustment steps run independently.

Menu: ADJUSTMENTS/ADJUSTMENT/MEAS. COMPONENT/ADJ. FUNCTION



1. When the test gas is to be fed manually: Feed the appropriate test gas into the sample gas inlet of the device
2. To start the adjustment: Select ENTER
✓ When test gas feed runs automatically (see "Configuring the digital outputs", page 77): The test gas flows into the device instead of the sampling gas
✓ The adjustment runs



1 Procedure phase (see "table 4: Procedure phases for adjustment procedures and validation measurements", page 31)

2 Remaining time of the procedure phase

3 Measuring component | Current measured value (actual value)

4 Mean value of measured values (during MEASURE)

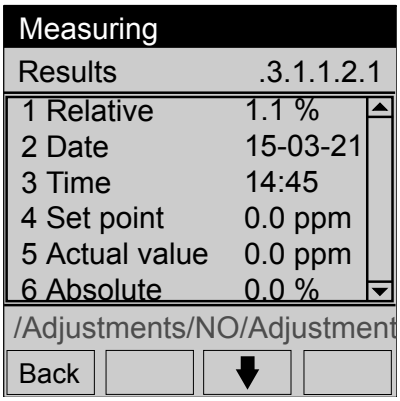
5 Name of the test gas setting | Set point

Procedure phase		Text in the status line
1	Test gas is fed.	Flush test gas
2	The measured value of the test gas is determined (actual value).	Measuring
3	The results are calculated and stored. – For adjustment: The adjustment is carried out.	Calculate
4	The sample gas is fed again.	Flush sample gas

Table 3: Procedure phases for adjustment and validation

▶ To abort the procedure: Select CANCEL (⬇/⬆, ENTER)

3. Wait until SHOW RESULTS? is displayed
4. To view the results (for information): Select ENTER . Otherwise: Select BACK



1 Drift between this adjustment and the previous one[1]
2 Date of adjustment (completion) [year–month–day]
3 Time of adjustment (completion) [00:00 ... 23::59]
4 Set point of test gas assigned
5 Mean value of measured actual values
6 Absolute drift[2]

1 Information on calculation method see "How drift values are calculated", page 88
2 Explanation see "Absolute drift", page 89

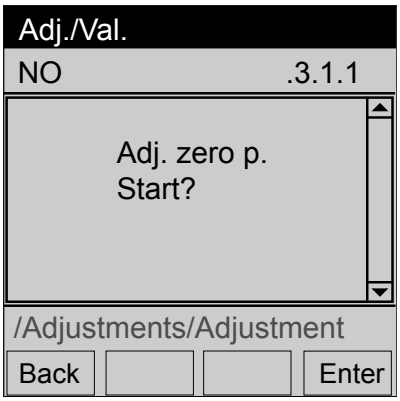
5. The adjustment is completed

6.1.3.2 User-controlled adjustment

User-controlled adjustment: The user starts the individual adjustment steps

This adjustment method requires starting the individual adjustment steps singly

Menu: ADJUSTMENTS/ADJUSTMENT/MEAS. COMPONENT/ADJ. FUNCTION



ENTER Start the adjustment

1. When the test gas is to be fed manually: Feed the appropriate test gas into the sample gas inlet of the device
2. To start the adjustment procedure: Select ENTER

✓ When test gas feed runs automatically (see "Configuring the digital outputs", page 77): The test gas flows into the device instead of the sampling gas

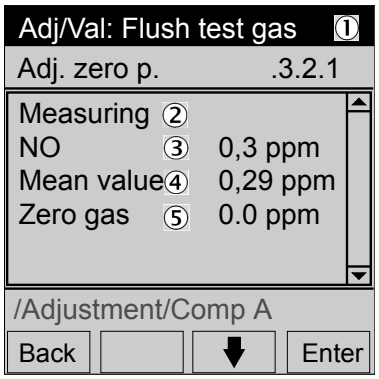
✓ The adjustment procedure is running

The adjustment is carried out in single steps (flush test gas - measurement - calculate - flush sample gas - measuring operation).

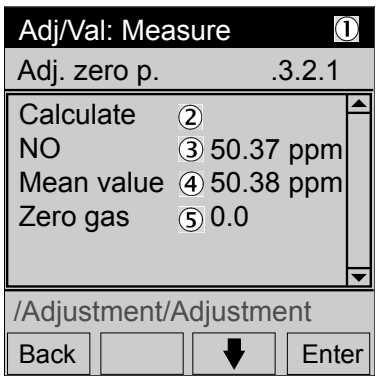
Procedure phase		Text in the status line
1	Test gas is fed.	Flush test gas
2	The measured value of the test gas is determined (actual value).	Measuring
3	The results are calculated and stored. For adjustment procedures: The adjustment is carried out.	Calculate
4	The sample gas is fed again.	Flush sample gas

Table 4: Procedure phases for adjustment procedures and validation measurements

Each step must be started with ENTER.



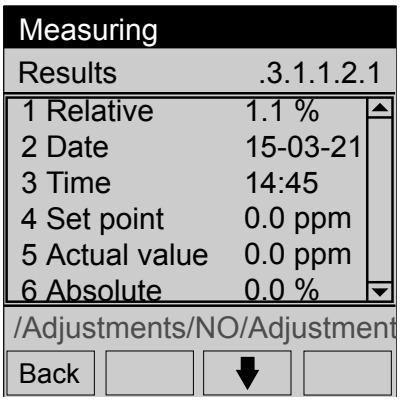
1 Procedure phase (see "table 4: Procedure phases for adjustment procedures and validation measurements", page 31)
2 Start the next phase "Measure" with "Enter"
3 Measuring component | Current measured value (actual value)
4 Mean value of measured values (during MEASURE)
5 Name of the test gas setting | Set point



1 Procedure phase (page 31)
2 Start the next phase "Calculate" with "Enter"
3 Measuring component | Current measured value (actual value)
4 The calculated mean value is saved (adjustment)
5 Name of the test gas setting | Set point

▶ To abort the procedure: Select CANCEL (⬇/⬆, ENTER)

3. Wait until SHOW RESULTS? is displayed
4. To view the results (for information): Select ENTER . Otherwise: Select BACK



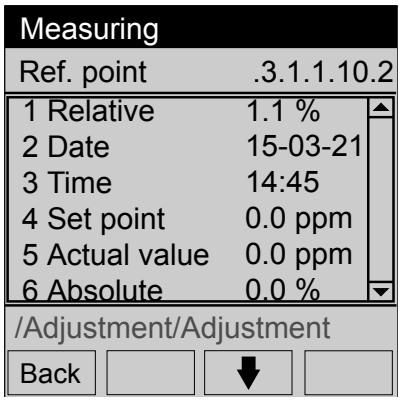
1 Drift between this adjustment measurement and the previous one[1]
2 Date of adjustment (completion) [year–month–day]
3 Time of adjustment (completion) [00:00 ... 23::59]
4 Set point of test gas assigned
5 Mean value of measured actual values
6 Absolute drift[2]

1 Information on calculation method see "How drift values are calculated", page 88
2 Explanation see "Absolute drift", page 89

5. The adjustment procedure has completed

6.1.4 Viewing adjustment results

Menu: ADJUSTMENTS/ADJUSTMENT/MEASURING COMPONENT/RESULTS/ZERO POINT or /REF. POINT



1 Drift between this adjustment measurement and the previous one
2 Date of adjustment (completion) [year–month–day]
3 Time of adjustment (completion) [00:00 ... 23::59]
4 Set point of test gas assigned
When using a calibration cuvette: Concentration of the calibration cuvette
5 Mean value of measured actual values
6 Absolute drift (explanation see "Absolute drift", page 89)

Purpose

This menu shows the respective result of the last adjustment for the selected measuring component.

NOTE

This information is also available in menu ADJUSTMENT RESULTS (see "Adjustment/validations results", page 58).

6.2 Validation of single components

Purpose

A validation is a measuring procedure with a test gas. A validation runs just like an adjustment procedure; the measuring results are stored as in an adjustment procedure. The device parameters are however not changed.

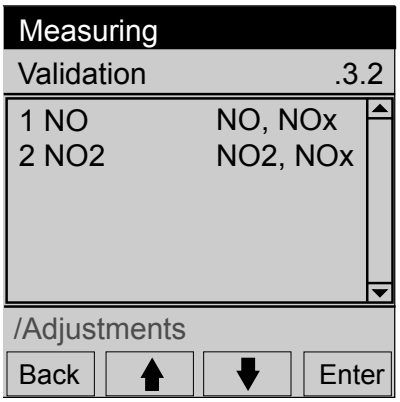
Corresponds to see "Adjustment of single components ", page 27 and see "Adjustment with preset time sequences", page 29.

NOTE

- Validations are only carried out for measuring components, not for auxiliary values or virtual measuring components
- The test gas settings could possibly plan having the test gases fed automatically via solenoid valves controlled by the digital outputs of the device
- Validations can be automated in the same manner as adjustments (see "Automatic adjustments/validations", page 91)

Procedure

Menu: ADJUSTMENTS/VALIDATION



1 Measuring component | Internal use[1]
2 Measuring component | Internal use

[1] List of measuring components where the measured value of the measuring component is used for calculation.

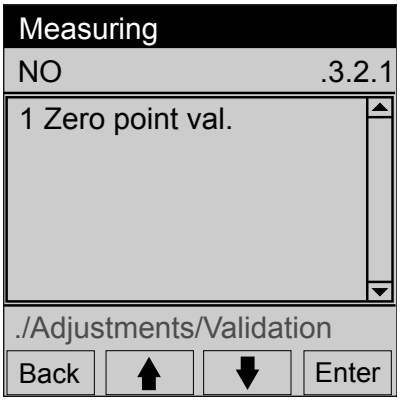
1. Select a measuring component (⬇/⬆, ENTER).
2. Select the desired validation function (⬇/⬆, ENTER).

Zero point val.[1]	Validation at zero point
Reference pt. val.[1]	Validation at reference point
Reference pt. cuv. val.[2]	Validation with the adjustment cuvette[3]
Results	View the results of the last validation

[1] Only displayed when an appropriate test gas setting exists.
[2] Only displayed when the measuring component is measured with an Analyzer module that has an adjustment cuvette (option) and an appropriate test gas setting exists.
[3] Use a zero gas as test gas.

NOTE

Only validations that can be carried out correctly in the current operating state are shown. The respective validation is not available for selection when at least one status message exists where the cause could make a validation unreliable or impossible (e.g. malfunction in Analyzer module, test gas malfunction).



3. When the test gas is to be fed manually: Feed the assigned test gas into the sample gas inlet of the device
4. To start a validation: Select ENTER

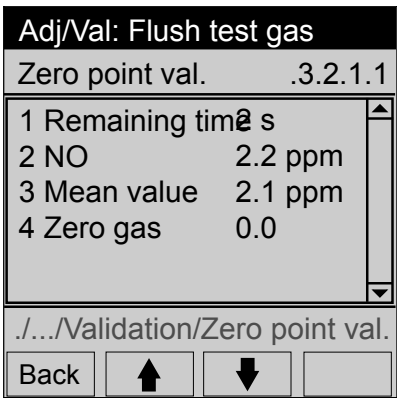
✓ When test gas feed runs automatically (see "Selecting the valve control ", page 44): The test gas flows into the device instead of the sampling gas

CAUTION

Possible interference when stations are connected

A validation interrupts measuring operation.

▶ Before a validation: Inform connected stations that measuring operation will soon be interrupted

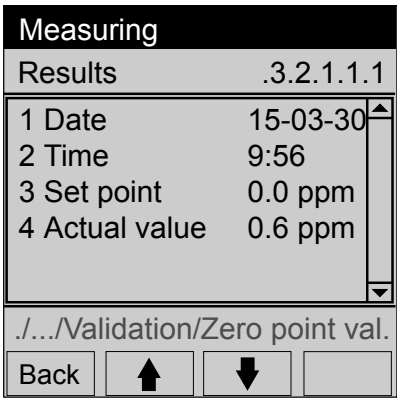


1 Remaining time of the procedure phase
2 Measuring component | Current measured value (actual value)
3 Mean value of measured values (during MEASURE)
4 Name of the test gas setting | Set point
1

1 Not shown: 5 CANCEL

▶ To abort the procedure: Select CANCEL (⬇/⬆, ENTER)

5. Wait until SHOW RESULTS? is displayed
6. To view the result (for information): Select ENTER . Otherwise: Select BACK

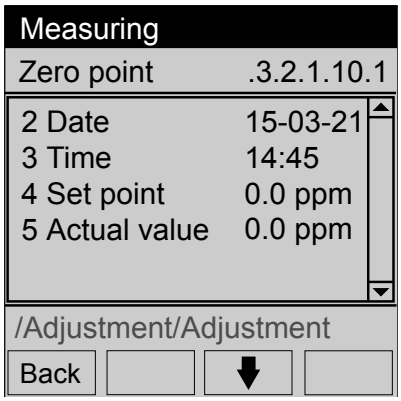


1 Date of validation (completion) [year–month–day]
2 Time of validation (completion) [00:00 ... 23::59]
3 Set point of test gas assigned
4 Mean value of measured actual values

7. The adjustment has completed

6.2.1 Viewing validation results

Menu: ADJUSTMENTS/VALIDATION/MEASURING COMPONENT/RESULTS/ZERO POINT or /REF. POINT



2 Date of validation (completion) [year–month–day]
3 Time of validation (completion) [00:00 ... 23::59]
4 Set point of test gas assigned
5 Mean value of measured actual values

NOTE
This information is also available in menu VALIDATION RESULTS (see "Viewing validation results ", page 59).

6.3 Adjustment/validation of several components (group function)

The following options can be started:

- Manual start: see "Starting adjustment manually (group function)", page 37
- Automatic time-controlled start: see "Setting an automatic adjustment start", page 37
- Triggered via:
  - Digital signals (see "Configuring the digital inputs", page 78)
  - Modbus (see "BCU Technical Information" chapter I/O Configuration)

6.3.1 Starting adjustment manually (group function)

Menu: ADJUSTMENTS/GROUP FUNCTIONS

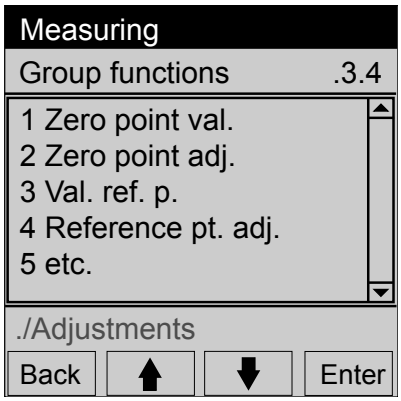


Figure 5: Menu GROUP FUNCTIONS (example)

1 Validation (check) of zero point
2 Adjustment (check and set) of zero point
3 Reference point validation
4 Reference point adjustment
5 Reference point validation with cuvette
6 Reference point adjustment with cuvette
9 Cancel

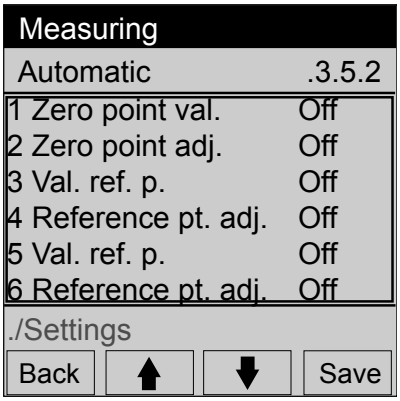
NOTE

- Normally, some adjustment procedures suitable for the individual device are already specified at the factory
- Adjustment procedures currently “active” cannot be started
- Only adjustments that can be carried out in the current operating state are shown for selection. The respective adjustment procedures are not available for selection when a status message exists where the cause could make an adjustment procedure unreliable or impossible.

1. Select the desired adjustment procedure (🡻/🡹, ENTER)
✓ START ADJUSTMENT PROCEDURE? is displayed
2. To start the automatic process: Select ENTER
   To stop the automatic process: Select CANCEL (🡻/🡹, SET)
✓ The **yellow** LED goes on and ACTIVE is shown
3. Wait until the adjustment procedure has completed: The **yellow** LED goes off again
   - When an error has occurred, the **yellow** LED remains on or the **red** LED comes on. The status bar displays SEE LOGBOOK

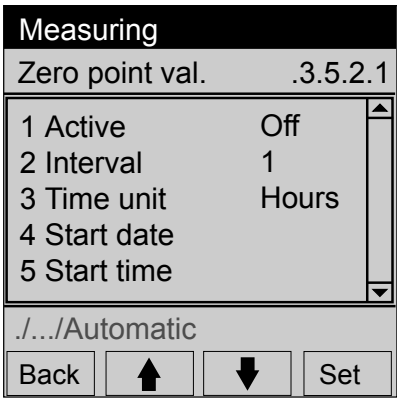
6.3.2 Setting an automatic adjustment start

Menu: ADJUSTMENTS/SETTINGS/AUTOMATIC



1, 2, ... Name of the automatic adjustment procedure | Activation status

Menu: ADJUSTMENTS/SETTINGS/AUTOMATIC/ADJUSTMENT PROCEDURE



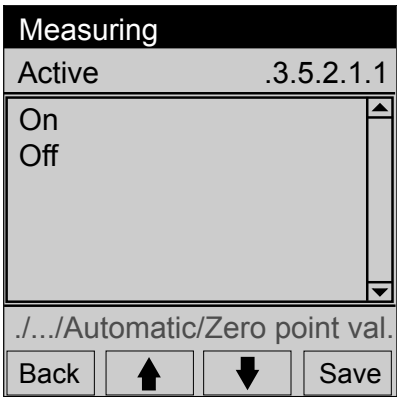
1 Function | Current setting

2, 3 Interval and time unit. Adjustment is carried out every hour in the example.

4, 5 Start time for the first adjustment

6.3.2.1 Activating/deactivating adjustment

Menu: ADJUSTMENTS/SETTINGS/AUTOMATIC/ADJUSTMENT PROCEDURE/ACTIVE



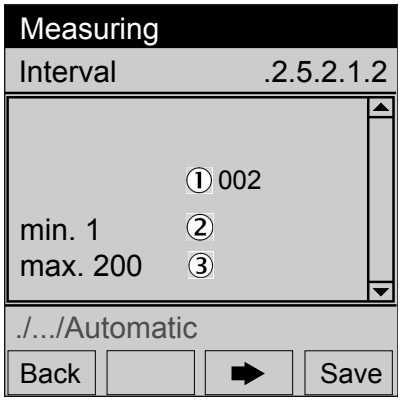
On Automatic procedure activated

Off Automatic procedure deactivated

▶ Select the desired state (⬇/⬆, SAVE)

6.3.2.2 Setting the interval for the automatic adjustment

Menü: ADJUSTMENTS/SETTINGS/AUTOMATIC/ADJUSTMENT PROCEDURE/INTERVAL

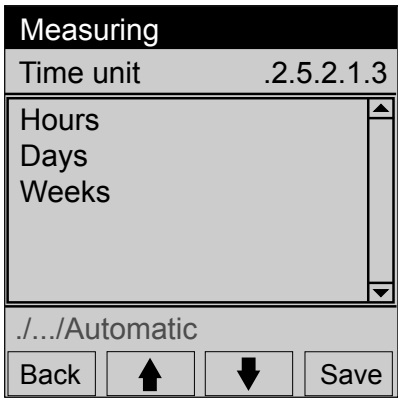


1 Numeric value for the interval
2 Smallest value allowed
3 Largest value allowed

▶ Set the desired value

Changing the time unit (when necessary):

Menu: ADJUSTMENTS/SETTINGS/AUTOMATIC/ADJUSTMENT PROCEDURE/TIME UNIT



▶ Set the appropriate time unit (⬇/⬆, SAVE)

6.3.2.3 Setting the start time for the next adjustment

Menu: ADJUSTMENTS/SETTINGS/AUTOMATIC/ADJUSTMENT PROCEDURE/START DATE

1. Set the desired date
2. BACK → Select start time

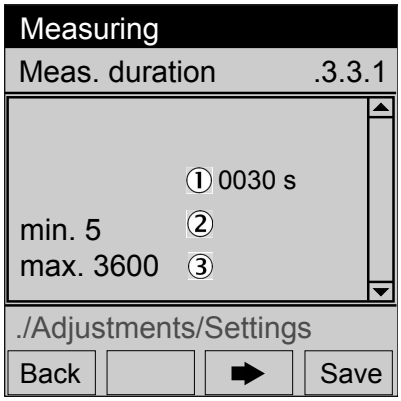
Menu: ADJUSTMENTS/SETTINGS/AUTOMATIC/ADJUSTMENT PROCEDURE/START TIME

3. Set the desired time

6.4 General settings for adjustments

6.4.1 Setting the measuring duration for adjustments

Menu: ADJUSTMENTS/SETTINGS ADJ./MEAS. DURATION



1 Measuring duration [seconds]
2 Minimum value
3 Maximum value

▶ Set the appropriate value.

Purpose

The measuring duration specifies how long the measured values of a fed test gas are determined. It starts each time after a test gas flush time (see "Setting the flush time for adjustments", page 47). The mean value of these measured values is:

– During adjustments: The actual value for the adjustment
– During validation measurements: The measured value for the validation measurement

Criteria for the setting

- Adapting to the damping: The measuring duration must be at least 150 ... 200% of the set damping time constant (see "Setting a constant damping", page 71 + see "Setting a dynamic damping", page 72)
- Adapting to measuring behavior: Select the measuring duration at least so long that averaging completely compensates any “noise” and measured value fluctuations within the measuring duration

CAUTION
Risk of incorrect adjustment

Adjustments will be inaccurate or incorrect when the measuring duration is set too short

▶ Preferably set the measuring duration too long rather than too short

CAUTION
Risk of incorrect adjustment

The measuring duration must be at least 150% of the set damping time constant

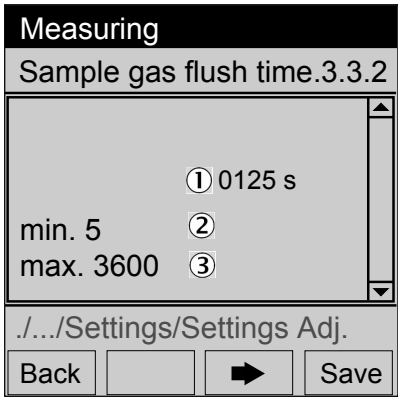
▶ Check the damping setting (see "Setting a constant damping", page 71)

NOTE

- The longer the measuring duration, the more exact the adjustment will be
- The measuring duration affects manual adjustments (see "Adjustment of single components ", page 27)

6.4.2 Setting the sample gas flush time for adjustments

Menu: ADJUSTMENTS/SETTINGS ADJ./SAMPLE GAS FLUSH TIME



1 Sample gas flush time [seconds]
2 Minimum value
3 Maximum value

▶ Set the appropriate value

Purpose

The sample gas flush time is a wait time that runs down after each adjustment or validation before the status ADJUSTMENT or VALIDATION is reset. The sample gas flush time belongs to the process flow of the adjustment/validation procedure. This considers the response time after switching from the last test gas to sample gas. The setting is valid for all adjustments and validations.

CAUTION
Possible interference when systems are connected

When the sample gas flush time is set too short, the GMS800 signals the normal operating state before the measured values correspond to the actual concentrations. This could cause control faults when the measured values control the connected system.

▶ Preferably set the sample gas flush time too long rather than too short

Criteria for the setting

When the flush time has elapsed, the Analyzer module should be completely filled with the new gas and the GMS800 should display the “final” measured values of this gas. An appropriate flush time more or less corresponds to the response time of the GMS800 (lag time + 100% time).

Measuring the response time:

▶ Check for each measuring component how long it takes for the displayed measured value to remain constant after switching to a different gas
▶ Use the longest response time as flush time

On the other hand, flush times should not be longer than necessary because the normal measuring function is interrupted during an adjustment or validation procedure.

6.5 Configuring test gases

6.5.1 Principle for test gas settings

The test gas settings serve as basis for adjustments. A test gas setting includes the set point (concentration) and process parameters for the adjustment procedure for a real test gas. With which adjustment procedures a test gas setting can be used is also specified.

A real test gas can be used in several test gas settings. This allows configuring one certain real test gas with different tests gas settings for different adjustments.

All test gas settings can also be used for validation measurements. 12 different test gas settings can be programmed.

NOTE

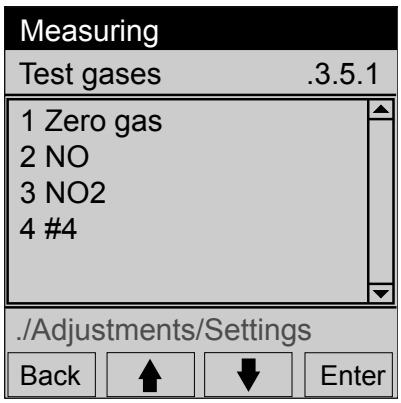
- Suitable test gas settings are normally programmed at the manufacturer's factory
- To program the new test gas settings yourself: Use the following overview and see "Programming a test gas setting – Part 1: Integration", page 44, see "Programming a test gas setting – Part 2: Usage", page 45
- Recommendation: Only use each test gas setting for one particular adjustment or validation

6.5.2 Overview of test gas settings

	Setting	Menu title	Instructions
1	Defining the name of the test gas setting	Name	see "Defining the name of the test gas setting", page 44
2	Setting the availability of the test gas setting	Active	see "Setting the availability of the test gas setting", page 44
3	Setting the pump mode	Pump off	see "Setting the pump mode", page 44
4	Selecting the valve control	Valve	see "Selecting the valve control ", page 44
5	Calling up the usage menu for a measuring component	Usage	see "Usage menu for a test gas", page 45
6	Assigning a measuring component	Measuring component	see "Assigning a measuring component", page 46
7	Setting the availability for the measuring components	Active	see "Setting the availability for the measuring components", page 46
8	Setting the set point for a measuring component	Concentration	see "Setting the set point for a measuring component", page 47
9	Setting the usability as zero gas	As zero gas	see "Setting the usability as zero gas", page 47
10	Setting the usability as span gas	As ref. gas	see "Setting the usability as span gas", page 48

6.5.3 Menu "Test gases"

Menu: ADJUSTMENTS/SETTINGS/TEST GASES

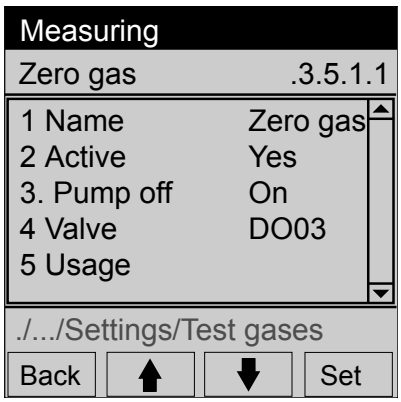


1 Name of the test gas setting
2 Name of the test gas setting
3 Name of the test gas setting
4 Unused[1]

[1] Or a test gas setting for which a name has not been programmed.

To change or check an existing test gas setting:

1. Select the desired test gas setting (⬇/⬆, ENTER)
   To program a new test gas setting: Select a free location



1 Name of this test gas setting[1]
2 YES = this test gas can be selected for adjustments/validations
3 State of the sample gas pump when using the test gas
4 Digital output to be activated when the test gas is used (to control a solenoid valve)
5 Metrological settings of the test gas

[1] If a name has not been programmed, the number of the measuring point is displayed as “#N” in other menus instead of the name (N = number of the measuring point).

2. Select the desired setting (⬇/⬆, ENTER/SET)
3. Create the desired state (see "Programming a test gas setting – Part 1: Integration", page 44 / see "Programming a test gas setting – Part 2: Usage", page 45)

6.5.4 Programming a test gas setting – Part 1: Integration

These settings define whether, and under which name, a test gas setting appears in other functions and which control functions it triggers.

6.5.4.1 Defining the name of the test gas setting

Menu: ADJUSTMENTS/SETTINGS/TEST GASES/TESTGAS SETTING/NAME

▶ Set the desired name

Purpose

The name of a test gas setting is freely selectable (maximum 16 characters). Examples: “Nitrogen”, “Zero gas”, “NO test gas”.

6.5.4.2 Setting the availability of the test gas setting

Menu: ADJUSTMENTS/SETTINGS/TEST GASES/TEST GAS SETTING/ACTIVE

Yes	This test gas setting can be used.
No	This test gas setting cannot be used.

▶ Select the desired state (🡻/🡹, SAVE)

Purpose

This setting serves to deactivate a test gas setting completely without deleting it.

6.5.4.3 Setting the pump mode

Menu: ADJUSTMENTS/SETTINGS/TEST GASES/TESTGAS SETTING/PUMP OFF

On	The sample gas pump is switched off automatically when the test gas is used.
Off	The sample gas pump remains on when the test gas is used.

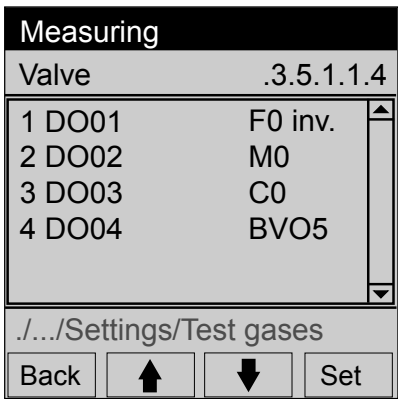
▶ Select the desired state (🡻/🡹, SAVE)

Purpose

The sample gas pump can be switched off automatically when this test gas setting is active – i.e. when the respective test gas flows into the device.

6.5.4.4 Selecting the valve control

Menu: ADJUSTMENTS/SETTINGS/TEST GASES/TEST GAS SETTING/VALVE



1 Digital output | Internal control signal | Switching logic

- ▶ Select the desired digital output (⬇/⬆, SET)
- ▶ Select the electronic switching logic in the next menu (⬇/⬆, SAVE)

NOTE

- These settings are also available elsewhere (see "Assigning a digital output to a status or control function (source)", page 77)
- Explanation of the electronic switching logic (see "Selecting the electronic switching logic", page 78)

Purpose

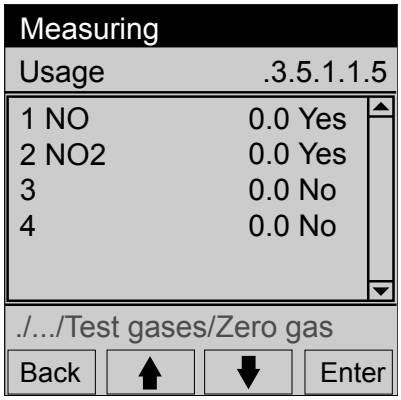
The setting defines which dialog output is activated when this test gas setting is active during an adjustment procedure or a validation measurement. This allows automatic control of test gas feed.

6.5.5 Programming a test gas setting – Part 2: Usage

These settings define:
- With which measuring components this test gas can be used
- For which adjustment procedures and validation measurements
- Which physical parameters are valid for the respective usage.

6.5.5.1 Usage menu for a test gas

Menu: ADJUSTMENTS/SETTINGS/TEST GASES/TEST GAS SETTING/USAGE

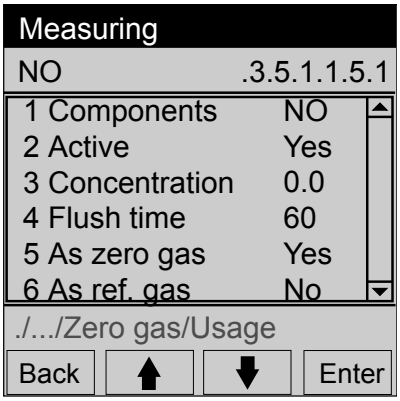


1 Selected measuring component | Set point (Concentration) | Usage
2 Selected measuring component | Set point (Concentration) | Usage
3 Unused
4 Unused

NOTE

- The list shows all measuring components already assigned (maximum 8)
- When the test gas is not to be used any more for one of these measuring components, this component does not have to be deleted from the list (see "Setting the availability for the measuring components", page 46)

- ▶ To change the settings for an existing measuring component: Select the desired measuring component (⬇/⬆, ENTER)
- ▶ To add a measuring component: Select an unused location

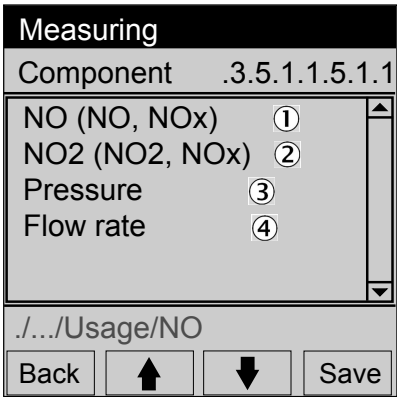


1 Selected measuring component
2 Yes = this test gas setting is available in other functions[1]
3 Set point (concentration) of test gas
4 Wait time between activating the test gas and start of the measurements
5 Yes/no: This test gas can/cannot be used for zero point adjustments[2]
6 Yes/no: This test gas can/cannot be used for reference point adjustments[2]

1 NO prevents use in adjustments and validations. This can be used, for example, when the real test gas is not available temporarily or should not be used.
2 Also applicable for validation measurements.

6.5.5.2 Assigning a measuring component

Menu: ADJUSTMENTS/SETTINGS/TEST GASES/TEST GAS SETTING/USAGE/MEASURING COMPONENT/COMPONENT



1, 2 Real measuring component | Real + virtual measuring components[1]
3, 4 Further variables

1 The right specifications to the information of the measuring components for which the real measuring component is used. Nothing is displayed there when this is identical with the real measuring component.
– Explanation on virtual measuring components see "Virtual measuring components", page 87.

▶ Select a measuring component (🡻/🡹, SAVE)

Purpose

This setting assigns a measuring component to the respective location in the USAGE list of the test gas setting.

6.5.5.3 Setting the availability for the measuring components

Menu: ADJUSMENTS/SETTINGS/TEST GASES/TEST GAS SETTING/USAGE/MEASURING COMPONENT/ACTIVE

Yes	The test gas is available for adjustment procedures for this measuring component[1]
No	The test gas cannot be selected for adjustment procedures for this measuring component[1]

1 Also applicable for validation measurements.

▶ Select the desired state (🡻/🡹, SAVE)

Purpose

This setting serves deactivating usage of the test gas for the respective measuring component without deleting the settings for this measuring component.

6.5.5.4 Setting the set point for a measuring component

Menu: ADJUSTMENTS/SETTINGS/TEST GASES/TEST GAS SETTING/USAGE/MEASURING COMPONENT/CONCENTRATION

▶ Desired set point (set in the physical unit of the respective measured value)

Purpose

This setting determines the set point of the test gas for the adjustments during which these test gas settings are used.

Criteria for the setting

- The set point is normally the actual concentration of the measuring component in the test gas used
- It is however possible to set a set point that deviates from the actual concentration – e.g. to compensate a cross-sensitivity effect

NOTE

It is possible to set different set point values for various measuring components in the same test gas setting. This can be useful, for example, when a test gas mixture containing several measuring components is used.

6.5.5.5 Setting the flush time for adjustments

Menu: ADJUSTMENTS/SETTINGS/TEST GASES/TEST GAS SETTING/USAGE/MEASURING COMPONENT/FLUSH TIME

▶ Set the desired value

Purpose

The flush time is the wait time between switching to the test gas and the start of the measuring duration (see "Setting the usability as zero gas", page 47). It can be set individually in each test gas setting for each measuring component.

Criteria for the setting

see "Setting the sample gas flush time for adjustments", page 40

CAUTION

Risk of incorrect adjustment

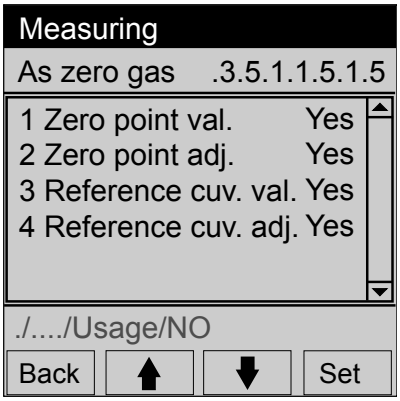
The adjustment will be incorrect when the flush time is set too short.

▶ Preferably set the flush time too long rather than too short

6.5.5.6 Setting the usability as zero gas

Menu: ADJUSTMENTS/SETTINGS/TEST GASES/TEST GAS SETTING/USAGE/MEASURING COMPONENT/AS ZERO GAS

These settings determine during which adjustments and validations the respective test gas is available as zero gas.



1 Zero point validation
2 Zero point adjustment
3 Reference point validation with adjustment cuvette[1]
4 Reference point adjustment with adjustment cuvette[1]

[1] Only available when the respective measuring component is measured with an Analyzer module that has an adjustment cuvette (option)

1. Select an adjustment or validation (⬇/⬆, SET)
2. Select the desired state (⬇/⬆, SAVE)

Yes	The test gas is available for the selected adjustment/validation procedure for the respective measuring component.
No	The test gas is not available for the selected adjustment/validation procedure for the respective measuring component.

NOTE
The test gas must be used as zero gas during a reference point adjustment with an adjustment cuvette (option on some Analyzer modules).

6.5.5.7 Setting the usability as span gas

Menu: ADJUSTMENTS/SETTINGS/TEST GASES/TEST GAS SETTING/USAGE/MEASURING COMPONENT/AS REF. GAS

These settings determine during which adjustments and validations the respective test gas is available as span gas.

▶ Set the desired states in the same manner as for AS ZERO GAS (see "Setting the usability as zero gas", page 47)

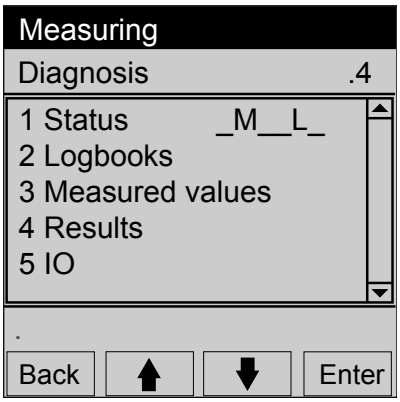
7 Diagnosis functions

NOTE

- Menu representation is optimized for the description and does not always correspond exactly to the actual representation on the display
- All numeric values in the menus are examples without metrological significance The realistic values depend on the individual device in which the BCU is installed

7.1 Diagnosis functions overview

Menu: DIAGNOSIS



1 Function selection | Group status[1]
2, 3 ... Select the desired overview

Figure 6: Menu DIAGNOSIS

1 BCU + all connected modules; key to symbols (see "Status message categories", page 49)

Status	see "Checking the status", page 51
Logbooks	see "Displaying logbooks ", page 54
Measured values	see "Measuring screen", page 55
Results	see "Adjustment/validations results", page 58
IO	see "Checking signal connections (I/O)", page 59
System overview	see "Displaying the system overview", page 64
IO overview	see "Displaying the I/O overview", page 64
Product info	see "Displaying the product information", page 65
Operating hours	see "Displaying the operating hours", page 65
Service	see "Displaying the service information", page 65

7.2 Status message categories

Flag	Significance	
F	Failure	Failure[1]
M	Maintenance request	Maintenance request[1]
C	Check	Function check[2] (measuring function is interrupted)/ “Maintenance” state[1]
U	Uncertain	Uncertain state or uncertain measured value[1]
L	Limit	Limit value overflown or underflown
T	Timeout	Internal measurement signal failure

Flag	Significance	
E	Extended	Extended information

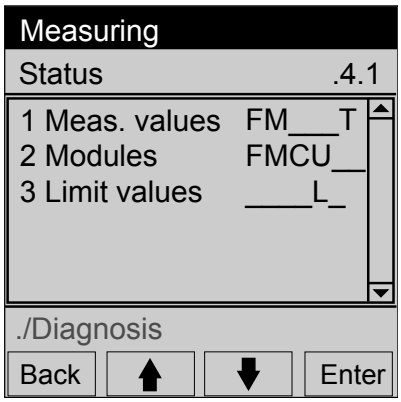
1 Corresponds to NAMUR specification.
2 Example: Adjustment.

7.3 Checking the status

7.3.1 Menu “Status”

Menu: DIAGNOSIS/STATUS

This menu shows the function groups with their group status.



1, 2 ... Function group | Function group status[1]

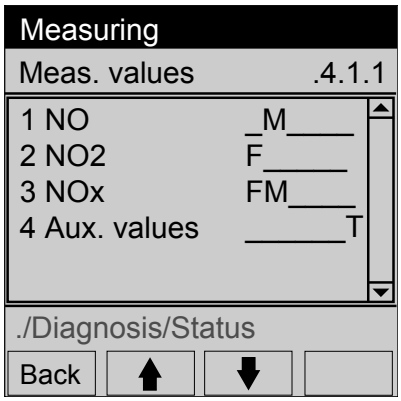
1 Key to symbols (see "Status message categories", page 49)

▶ To check a single status: Select a function group

7.3.2 Measured value status

Menu: DIAGNOSIS/STATUS/MEAS. VALUES

This menu shows the status for single measured values.



1 Measuring component | Status[1]
2 Measuring component | Status
3 Measuring component | Status
4 Branch to status of auxiliary values | Group status[2]

1 Key to symbols (see "Status message categories", page 49)
2 Group status of all auxiliary values

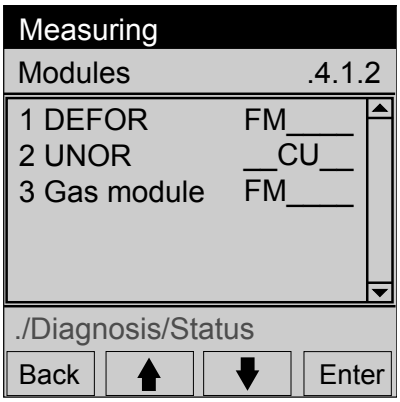
- For real measuring components (in the example: NO, NO2), the displayed status is the status, sent by the hardware, which delivers internally the measurement signal for the measuring components (e.g. an Analyzer module)
- For virtual measuring components (in the example: NOx), the status is a group status for all signal sources from which the virtual measuring component is calculated

NOTE
Explanation on virtual measuring components (see "Virtual measuring components", page 87)

7.3.3 Module status

Menu: DIAGNOSIS/STATUS/MODULES

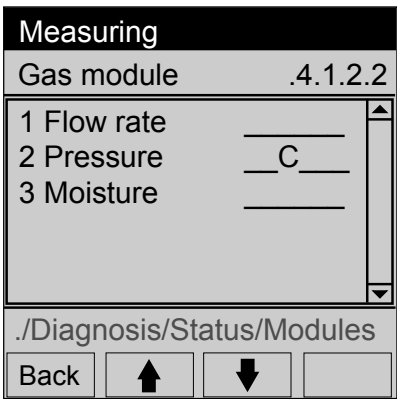
The menus under MODULES show the status of single device modules.



1, 2, ... Module | Module status[1]

1 Key to symbols (see "Status message categories", page 49)

▶ To view detailed information: Select a module (🡻/🡹, ENTER)



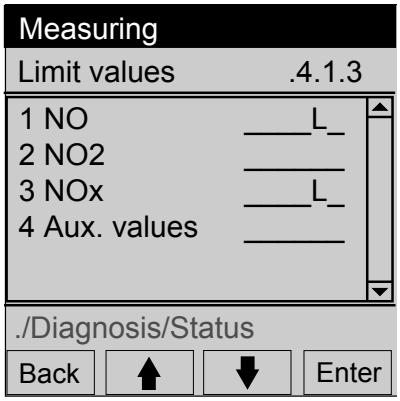
1, 2, ... Measuring component | Status of measurement[1]

1 Key to symbols (see "Status message categories", page 49)

7.3.4 Limit values status

Menu: DIAGNOSIS/STATUS/LIMIT VALUES

This menu shows which measured values are beyond a set limit value. The limit values are displayed when a measuring component is selected.

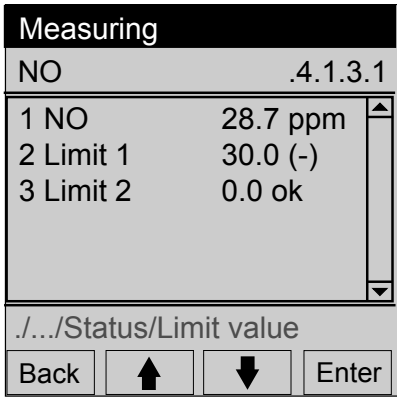


1 .. 3 Measuring component | Status[1]

4 Branch to the auxiliary values | Group status[2]

1 L = the current measured value is beyond a limit value.
2 Group status of all auxiliary values.

▶ To view the limit values: Select a measuring component (🡻/🡹, ENTER)



1 Measuring component | Current measured value

2 Limit value 1 | Limit value status

3 Limit value 2 | Limit value status

Limit value status	Significance
OK	The current measured value is within the programmed limit values.
(-)	The current value is lower than the limit value.[1]
(+)	The current value is higher than the limit value.[2]

1 Only displayed when the limit value is set to MESSAGE WHEN UNDERFLOWN (see "Configuring a limit value", page 72).
2 Only displayed when the limit value is set to MESSAGE WHEN OVERFLOWN.

NOTE

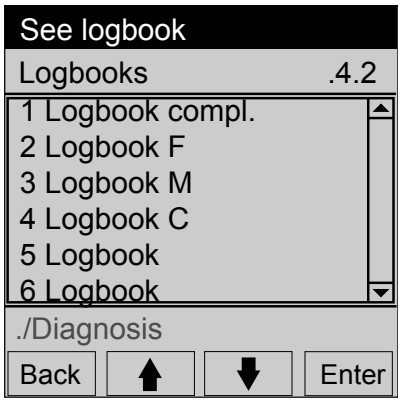
Setting limit values (see "Setting limit values", page 72)

7.4 Displaying logbooks

Menu: DIAGNOSIS/LOGBOOKS

One logbook contains the latest internal function and status messages.

- For the BCU: Maximum 50 messages
- For other modules: Maximum 30 messages

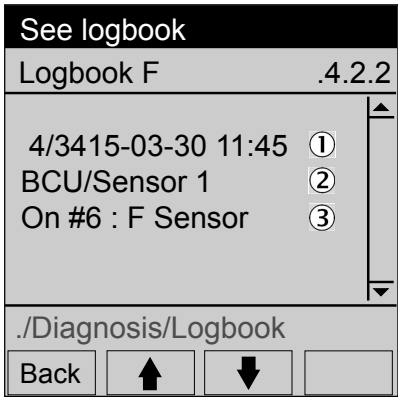


1 Logbook with all messages

2, 3, ... Logbook for a certain status category[1]

1 Explanation (see "Status message categories", page 49)

1. Select a logbook (⬇/⬆, ENTER)



1 Sequential No./Total number of messages | Date+time of last status change for this message (on/off)

2 Triggering module/detected cause[1]

3 "On": Status of this message (last status change)

"#x": Number of activations for this message[2]

"F": Status category of the status message[4]

"Sensor": Message/Cause[3]

1 When detected
2 Since last logbook deletion (Service function)
3 Explanation (see "Logbook messages", page 96)
4 Explanation: see "Status message categories", page 49

2. To view the other logbook entries: Select ⬇/⬆.

NOTE

Sequence of logbook entries

– First the messages currently existing (cause still present) in the activation sequence, youngest message first
– Then messages already deactivated (cause no longer present), youngest message again first

NOTE

Explanation on messages (see "Logbook messages", page 96)

7.5 Measuring screen

NOTE
Use the MEAS button to access the measuring screen (see "Operating and display elements", page 11).

7.5.1 Selecting the measuring screen

Menu: DIAGNOSIS/MEASURED VALUES

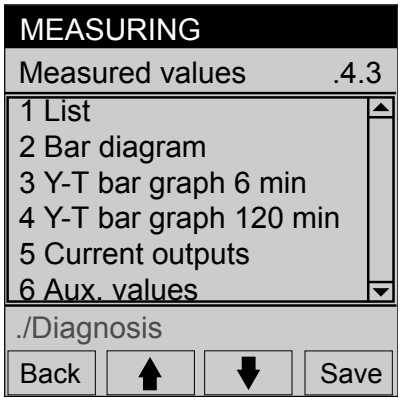


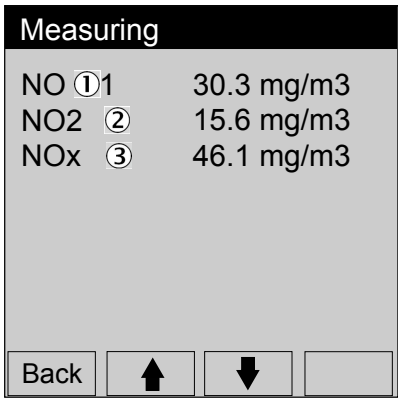
Figure 7: Menu MEASURED VALUES

List	All values as numerical value	see "Displaying measured values as a list", page 55
Bar diagram	Measured values as bar diagrams	see "Displaying measured values as a bar diagram", page 56
Y-T bar graph 6 min.	Measured value curve as line graph	see "Displaying measured values as Y-T bar graph", page 56
Y-T bar graph 120 min.		
Current outputs	Measured values as mA values	see "Displaying measured values as mA values", page 56
Auxiliary values	All auxiliary values as numerical values	see "Limit values status", page 53

▶ Select the desired function (⬇/⬆, ENTER)

7.5.2 Displaying measured values as a list

Menu: DIAGNOSIS/MEASURED VALUES/LIST



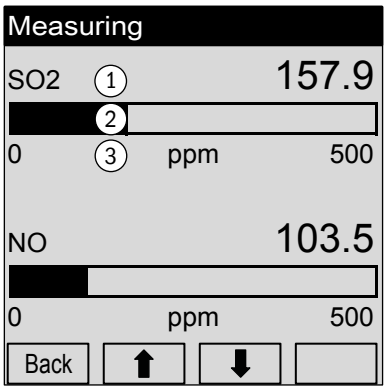
1, 2 ... Measuring component | Measuring point (with measuring point switchover) | Current measured value

NOTE

- The menu can also contain virtual measuring components (explanation see "Virtual measuring components", page 87). In the example: NOx
- The menu can also contain measured values from other measuring points (explanation see "Automatic measuring point switchover", page 92)
- The number of decimal places is adjustable: (see "Setting the number of decimal places", page 68)
- It could be that a constant measured value is displayed as long as the real concentration of the measuring component is in a certain range ("measured value mask" see "Setting measured value masks", page 68)

7.5.3 Displaying measured values as a bar diagram

Menu: DIAGNOSIS/MEASURED VALUES/BAR DIAGRAM



1 Measuring component | Current measured value
2 Current measured value in relation to the measuring range
3 Measuring range (Start value | Unit | End value)

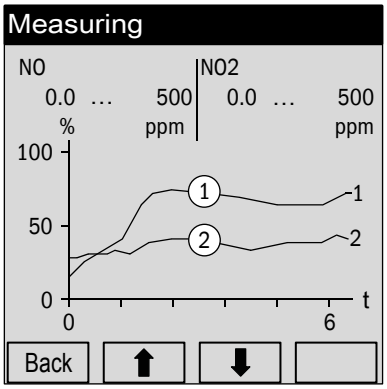
Figure 8: Menu BAR DIAGRAM (example)

▶ To view other measured values (as available): Select ⬇/⬆

7.5.4 Displaying measured values as Y-T bar graph

Menu: DIAGNOSIS/MEASURED VALUES/Y-T BAR GRAPH 6 MIN. OR /Y-T BAR GRAPH 120 MIN.

An Y-T bar graph shows the curve of the measured values during the last 6 or 120 minutes. A maximum of 8 Y-T bar graphs are displayed. Each Y-T bar graph shows two measured values when the device has more than 8 measuring components.



1 1 = left measuring component
2 2 = right measuring component

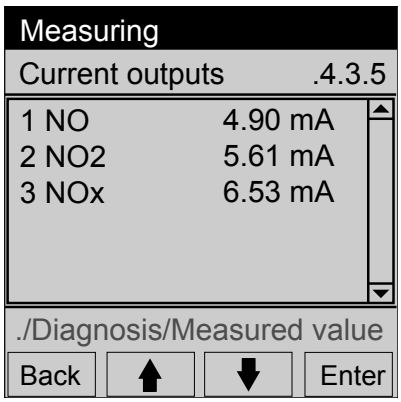
Figure 9: Menu Y-T BAR GRAPH with two measured values (example)

▶ To view other measured values (as available): Select ⬇/⬆

7.5.5 Displaying measured values as mA values

Menu: DIAGNOSIS/MEASURED VALUES/CURRENT OUTPUT

This menu shows the measured values output via an analog output as output signal of the analog output.

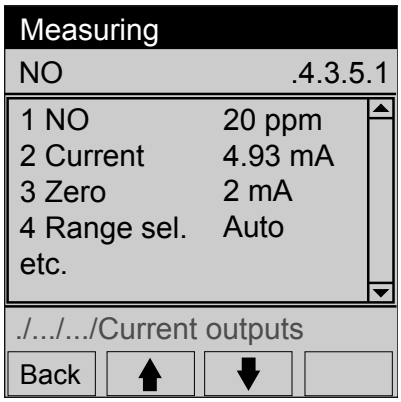


1, 2, ... Measuring component | Current output value

NOTE

- Measured values with measuring point information are only output when a measuring points switchover is programmed (see "Configuring measuring point switchover", page 81). One of the measured values corresponds to the current measured value and the remaining measuring point values are constant “held” measured values (sample hold).
- The menu can also contain virtual measuring components (explanation see "Virtual measuring components", page 87)

▶ To view detailed information: Select one of the lines (↓/↑, ENTER)

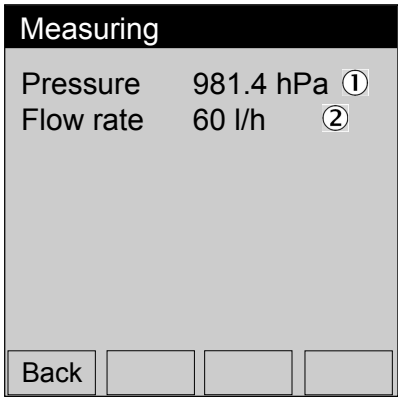


NO	Assigned measuring component
Current	Current output value
Zero	Live zero (zero point of the electronic signal range)
Range sel.	Mode of output range selection
State (AOiR)	Current output range (0/1) [AOi = assigned analog output]
Range 0	Activation status of output range 0 (on/off)
Range 0 S	Physical start value of output range 0
Range 0 E	Physical end value of output range 0
Range 1	Same as for output range 1
Range 1 S	
Range 1 E	

NOTE
This information is also available in menu branch I0 (see "Checking the analog outputs", page 59).

7.5.6 Displaying auxiliary values

Menu: DIAGNOSIS/MEASURED VALUES/AUX. VALUES



1, 2 ... Auxiliary value | Current measured value

NOTE
The menu contents depend on which internal auxiliary values are available (explanation see "Damping", page 87).

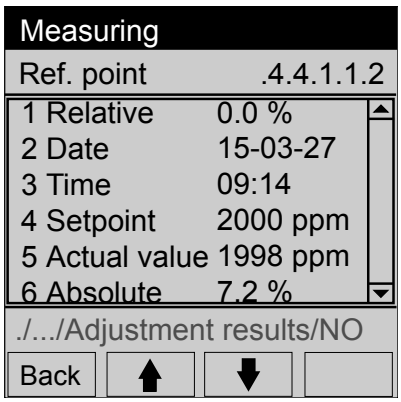
7.6 Adjustment/validations results

7.6.1 Viewing adjustment results

Menu: DIAGNOSIS/RESULTS/ADJUSTMENT RESULTS

These menus show the data from the respective last adjustment.

1. Select a measuring component (↓/↑, ENTER). To select an auxiliary value: Select AUX. VALUES and then select the desired auxiliary value
2. Select ZERO POINT or REF. POINT



1 Drift between this adjustment measurement and the previous one
2 Date of adjustment (completion) [year–month–day]
3 Time of adjustment (completion) [00:00 ... 23::59]
4 Set point of test gas assigned
5 Mean value of measured actual values
6 Absolute drift (explanation see "Absolute drift", page 89)

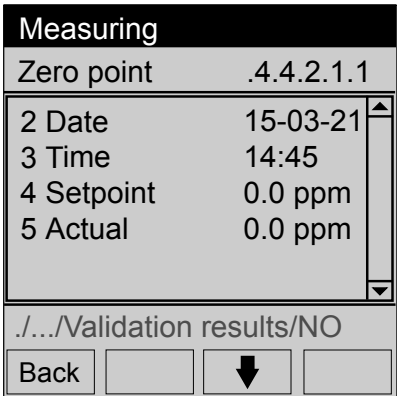
NOTE
- User level AUTHORIZED OPERATOR can also view this information in menu RESULTS (see "Viewing adjustment results", page 32)

7.6.2 Viewing validation results

Menu: DIAGNOSIS/RESULTS/VALIDATION RESULTS

These menus show the data from the respective last validation.

1. Select a measuring component (ENTER)
2. Select ZERO or REF. POINT
3. The following menu is displayed:



2 Date of validation (completion) [year–month–day]
3 Time of validation (completion) [00:00 ... 23::59]
4 Set point of test gas assigned
5 Mean value of measured actual values (validation result)

NOTE

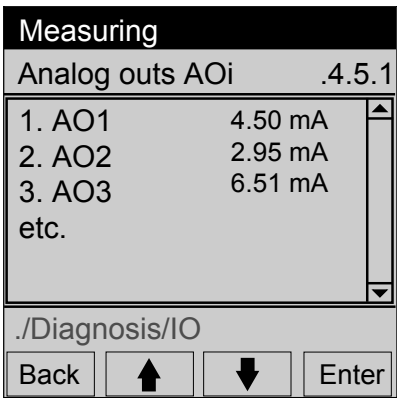
- User level AUTHORIZED OPERATOR can also view this information in menu RESULTS

7.7 Checking signal connections (I/O)

The status and settings for each signal connection can be viewed in menu branch IO .

7.7.1 Checking the analog outputs

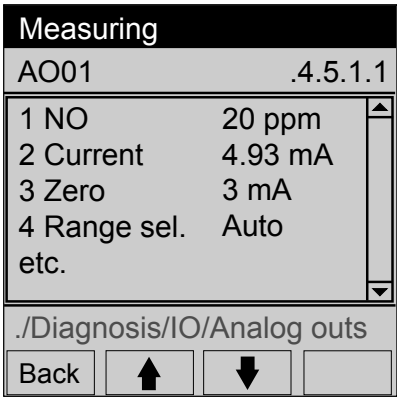
Menu: DIAGNOSIS/IO/ANALOG OUTS AOI



1 Analog output | Current output value

This menu only shows analog outputs having a signal source (see "Configuring the analog outputs", page 75).

▶ To view more information: Select an analog output (↓/↑, ENTER)

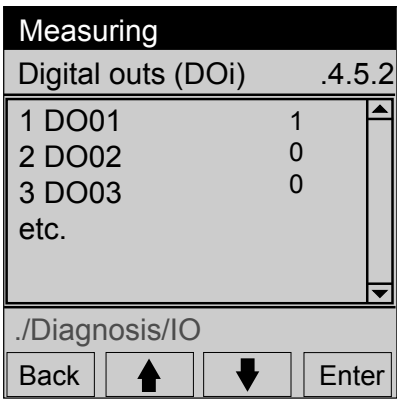


NO	Assigned measuring component (example)
Current	Current output value
Zero	Live zero (zero point of the electronic signal range)
Range sel.	Mode for measuring range selection
Status	Current output range (0/1) [AOi = assigned analog output]
Range 0	Activation status of output range 0 (on/off)
Range 0 S	Physical start value of output range 0
Range 0 E	Physical end value of output range 0
Range 1	Same as for output range 1
Range 1 S	
Range 1 E	

NOTE
This information is also available in menu branch MEASURED VALUES (see "Displaying measured values as mA values", page 56).

7.7.2 Checking the digital outputs

Menu: DIAGNOSIS/IO/DIGITAL OUTS (DOI)

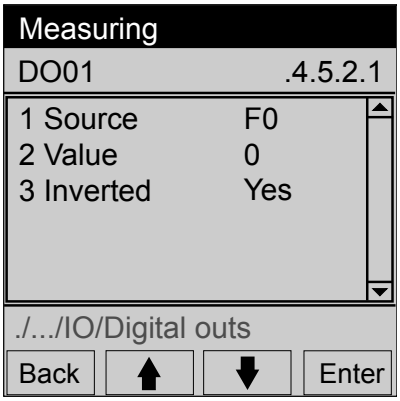


1, 2 ... Digital output | Current logical status []1

1 1 = activated, 0 = deactivated (electronic inversion possible see "Selecting the electronic switching logic", page 78)

This menu only shows digital outputs having a function (see "Assigning a digital output to a status or control function (source)", page 77).

▶ To view more information: Select a digital output (⬇/⬆, ENTER)

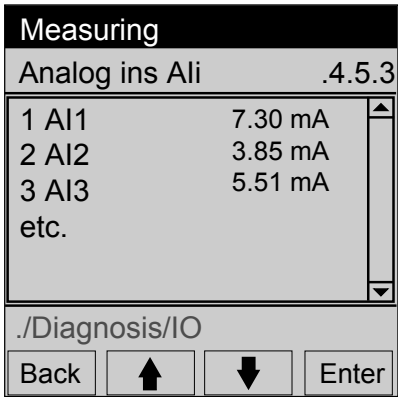


1 Assigned internal signal
2 Current logical status of the output[1]
3 Electronic switching logic[2]

1 1 = logically activated, 0 = logically deactivated.
2 YES = inverted (see "Selecting the electronic switching logic", page 78).

7.7.3 Checking the analog inputs

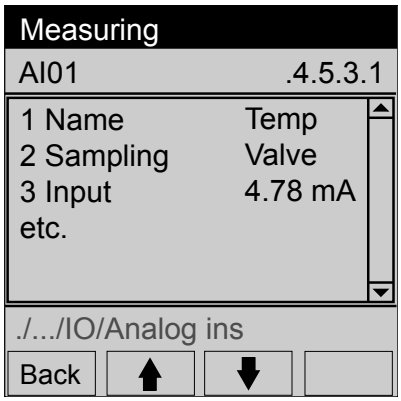
Menu: DIAGNOSIS/IO/ANALOG INS AII



1, 2 ... Analog input | Current input signal

This menu only shows analog inputs having a name (see "Configuring the analog inputs (information)", page 80).

▶ To view more information: Select an analog input (🡻/🡹, ENTER)



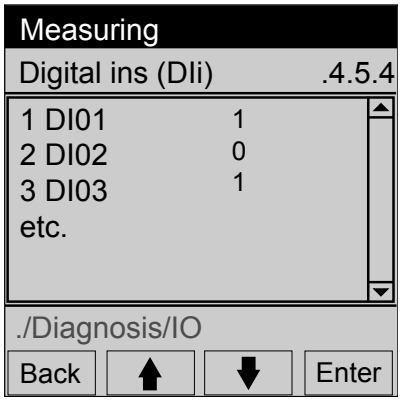
Name	Programmed name for the analog input
Sampling	Programmed sampling (information, remark)
Input	Current input signal
Zero	Zero point of the electronic signal range (live zero)
Max. current	End value of the electronic signal range
Measured value	Input signal as measured value
MR start	Start value of physical measuring range
MR end	End value of physical measuring range

NOTE

The analog inputs can be configured with SOPAS ET (→ Technical Information "BCU Basic Control Unit – Operation with SOPAS ET“).

7.7.4 Checking the digital inputs

Menu: DIAGNOSIS/IO/DIGITAL INS (DII)

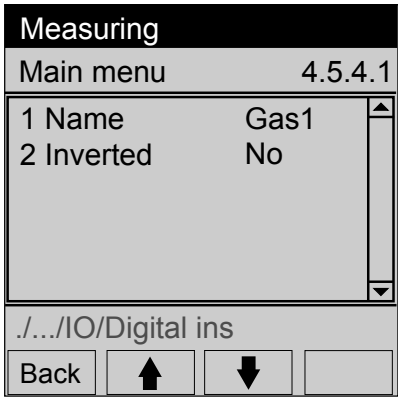


1, 2 ... Digital input | Current logical status[1]

1 1 = activated, 0 = deactivated (electronic inversion possible see "Selecting the electronic switching logic", page 80)

This menu only shows dialog inputs having a function (see "Assigning a digital input to an internal function (target)", page 79).

▶ To view more information: Select a digital input (🡻/🡹, ENTER)



1 Programmed designation[1]

2 Electronic switching logic[2]

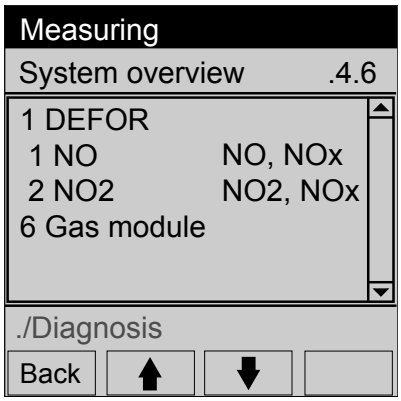
1 1 = logically activated, 0 = logically deactivated.

2 YES = inverted (see "Selecting the electronic switching logic", page 80).

7.8 Displaying the system overview

Menu: DIAGNOSIS/SYSTEM OVERVIEW

This menu shows which measured values are measured with which module (Analyzer module, Gas module).



1 Module

1-1 Measured value number in module, measuring component

1-2 Measured value number in module, measuring component

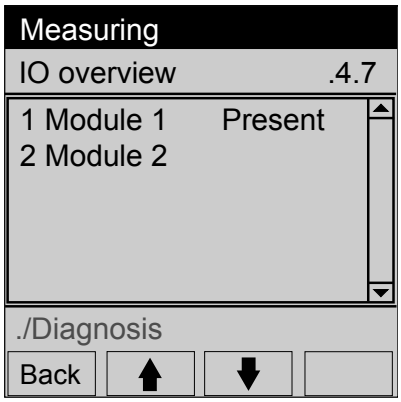
6 Module

etc.

7.9 Displaying the I/O overview

Menu: DIAGNOSIS/IO OVERVIEW

This menu shows whether the analyzer has one or two I/O modules.



1 I/O module 1 | Hardware status []1

2 I/O module 2 | Hardware status []1

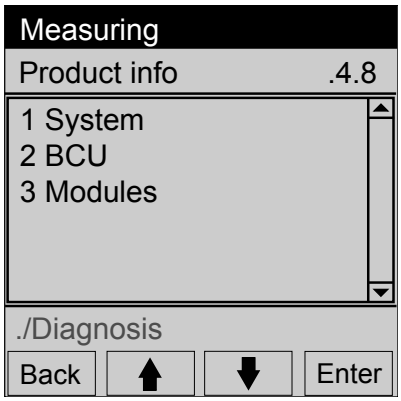
1 No data = module not present.

7.10 Displaying the product information

Menu: DIAGNOSIS/PRODUCT INFO

This menu leads to information on hardware and software of the device.

Select and display the desired system components.



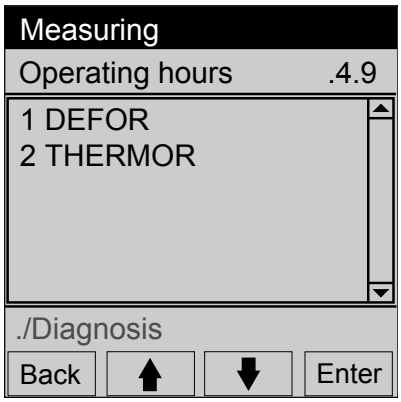
1, 2, ... System components

7.11 Displaying the operating hours

Menu: DIAGNOSIS/OPERATING HOURS

This menu shows the current number of operating hours (current usage duration) of certain device groups. For some device groups, the operating hours of components with a limited service life (e.g. lamp) are also counted.

Select the desired device group and display the operating hours.



1, 2 Device groups

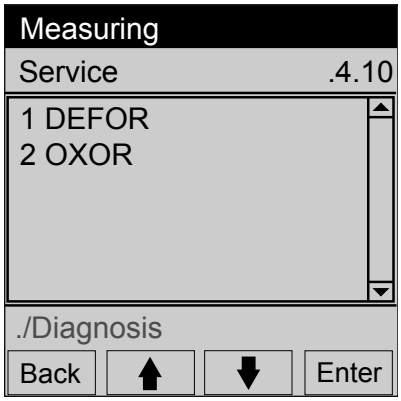
NOTE

User level SERVICE can reset the operating hours to 0.

7.12 Displaying the service information

Only available for user level AUTHORIZED OPERATOR (see "Menu tree for "Authorized operator"", page 19).

Menu: DIAGNOSIS/SERVICE



1. Select a module (↓/↑, ENTER).
2. Select the desired function (↓/↑, ENTER).

Temperature electronics[1]	Current temperature of the electronics in the module
Name/unit	Name of the measuring component/physical unit of measured values
Phys. meas.range	Physical measuring range of the measuring component
Adjustment cuvette[2]	Basic values of the adjustment cuvette
Drift limit value	Programmed drift limit values (see "Automatic drift value monitoring", page 89)
Raw values	Internal values from measurement signal processing
AD values	Internal values from measurement signal processing
Heaters[2]	Set point and actual values of an internal heater
Motors[2]	Operating state of an internal motor
Reset	Restart of module electronics[2] [3]
Maintenance flag	Activating message M (status flag) for the module[3]

Table 5: Functions

1 Only for a module with own electronics.
2 Only for a module with this property.
3 Only functions in user level SERVICE.

Purpose

The menus show internal measurement signals and control values. These displays can help, together with the manufacturer's Customer Service, to analyze malfunctions.

NOTE
Some of these parameters can be set in user level SERVICE.

8 Configuring

NOTE

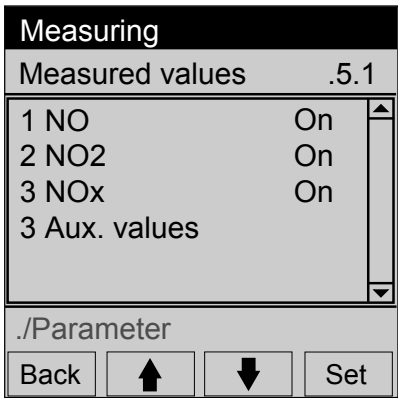
- Menu representation is optimized for the description and does not always correspond exactly to the actual representation on the display
- All numeric values in the menus are examples without metrological significance
  The realistic values depend on the individual device in which the BCU is installed

NOTE

These functions are only available for user level AUTHORIZED OPERATOR (see "Menu tree for "Authorized operator"", page 19).

8.1 Activating/deactivating measured values

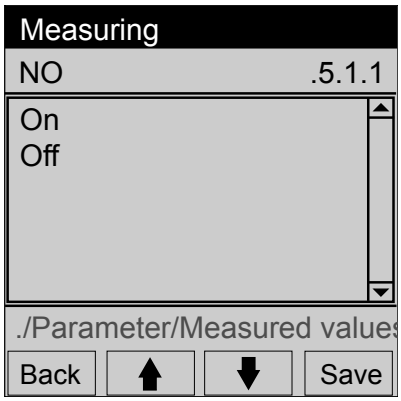
Menu: PARAMETER/MEASURED VALUES



1, 2 ... Measuring component | Activation status

To change an activation status:

1. Select a measuring component (🡻/🡹, SET)
   To select an auxiliary value: Select AUX. VALUES and then select the desired auxiliary value



On	The measured values of the measuring component are displayed.
Off	The measured values are hidden.

2. Select the desired state (🡻/🡹, SAVE)

Purpose

This function allows hiding the measured values of a measuring component in the complete GMS800 system. This can be useful when the current measured values are implausible (e.g. due to an external malfunction) or when the measured values are unavailable temporarily (e.g. because a module is defective)).

8.2 Configuring the measured value format

8.2.1 Setting the number of decimal places

Purpose

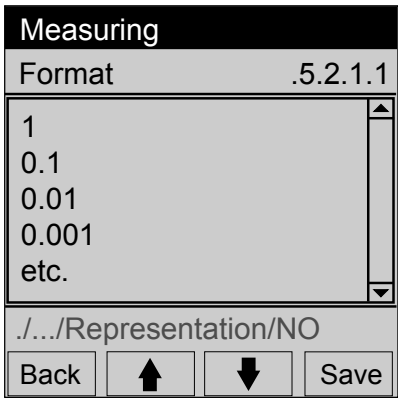
Maximum 6 digits are available on the display to show a measured value. The desired number of decimal places can be selected when a measured value also has decimal places – individually for each measuring component.

NOTE

When the measuring screen has more than 3 digits, the measured value is displayed more exactly than the defined measuring precision. Apart from that, the last digits of the measuring screen could possibly change frequently even though the measured value - under consideration of the measuring precision - is constant (measured value “noise”). This effect can be influenced by changing the damping (see "Setting damping", page 71).
Restricting the number of decimal places so that the measured value only has 2 or 3 digits can mean that changes in the measured value could possibly remain undetected.

Setting

Menu: PARAMETER/REPRESENTATION./MEASURING COMPONENT/FORMAT



1 No decimal places
0.1 1 decimal place
0.01 2 decimal places
etc.

▶ Select the desired state (🡻/🡹, SAVE)

8.2.2 Setting measured value masks

Purpose

The hold value can be displayed instead of the current measured value for measured values close to a “hold value”. This means the hold value is always displayed in a certain measured value range - this range is “hidden”. The size of the range in which this occurs (“span”) and the hold value can be set – individually for each measuring component.

NOTE

Application example: Measured value fluctuations at the zero point are hidden to suppress negative measured value displays or to set connected controllers “quiet” for small measured values.

Effect

Hidden ranges are effective for all measured value displays, i.e. for all measured value displays on the display, for analog outputs and for digital measured values outputs via interfaces.

CAUTION

Risk of undesired effects with connected stations

With measured value masks: The measured value displayed does not normally correspond to the current measured value when it is within the hidden range. The actual measured value then appears suddenly when it leaves the hidden area. This effect also occurs in the reverse direction. This behavior should be considered when external controllers are connected.

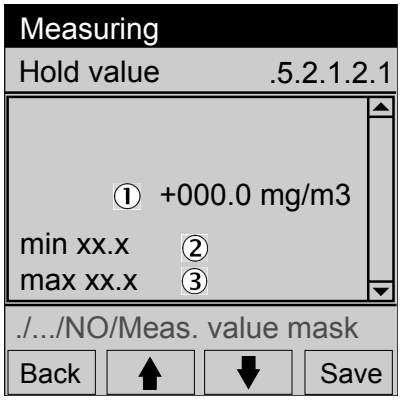
Without measured value masks: The measuring screen follows the measurement signals consequently, even at the start of the measuring range. This means negative measured values can also occur.

▶ Check which effect the measured value masks have with external stations connected

Setting

Menu: PARAMETER/REPRESENTATION./MEASURING COMPONENT/MEAS. VALUE MASK

1. To set the hold value:
   a) Select HOLD VALUE
   b) Set the desired hold value



1 Hold value
2 Minimum value (–10% of the measurement span)[1]
3 Maximum value (+110% of the measurement span)[1]

[1] The corresponding value is displayed.

2. To set the span:
   a) Select SPAN
   b) Set the desired span

8.3 Setting the output range

8.3.1 Options

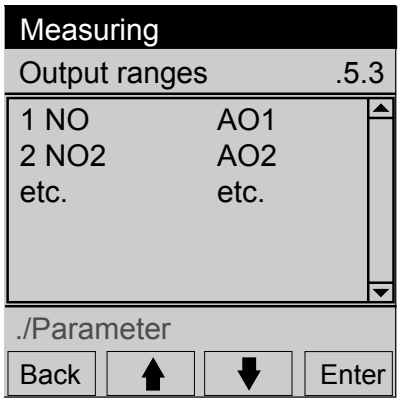
The menu function OUTPUT RANGES serves to select:

- Via which analog output a certain measured value is to be output
- Whether one certain output range or both output ranges are to be used
- Which digital output signals the current output range

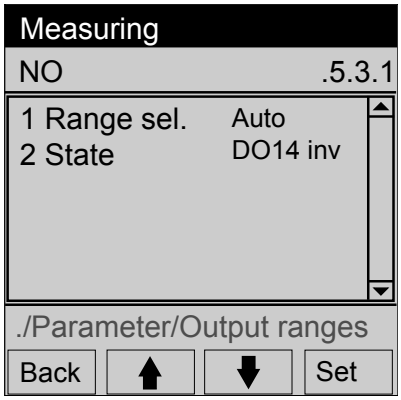
The settings are available for each single measuring component (for virtual measuring components as well see "Virtual measuring components", page 87). When a measuring point switchover is set up (see "Configuring a measuring point", page 81), the settings can be made for each single measuring point.

NOTE

- Configuring the output ranges see "Configuring an output range", page 76
- The output ranges are configured at the factory as specified in the order



1, 2 ... Measuring component | Analog output for output



1 Range selection mode

2 Digital output for range status | Function mode

8.3.2 How automatic range switchover functions

- The small output range is active automatically when the current measured value is within the small output range (in the output range with the smaller measuring span)
- The large output range is activated automatically (i.e. the electronic signal span of the analog output is adjusted) as soon as the measured value exceeds the end value of the small output range
- The small output range is activated again as soon as the current measured value drops below 90% of the end value of the small output range

8.3.3 Selecting output ranges

Menu: PARAMETER/OUTPUT RANGES/MEASURING COMPONENT/RANGE SEL.

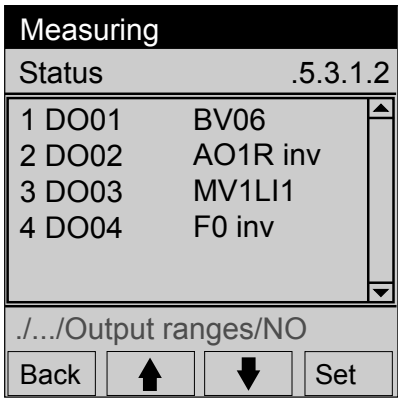
▶ Set the desired mode:

Auto	Automatic range switchover
0	Output range 0 permanently active

1	Output range 1 permanently active

8.3.4 Selecting the digital output for the output range status

Menu: PARAMETER/OUTPUT RANGES/MEASURING COMPONENT/STATE



1, 2, ... Digital output | Controlling tag | Electronic switching logic[1]

1 No entry means: Direct (not inverted).

1. Select the desired digital output (⬇/⬆, SET)
2. Select the electronic switching logic in the next menu (⬇/⬆, SAVE)

NOTE

- These settings are also available elsewhere (see "Assigning a digital output to a status or control function (source)", page 77)
- Explanation of the electronic switching logic (see "Selecting the electronic switching logic", page 78)

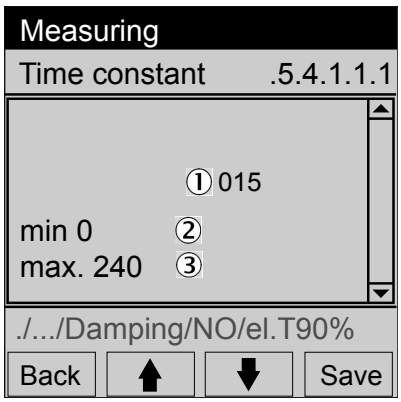
8.4 Setting damping

8.4.1 Setting a constant damping

NOTE

Purpose, function see "Automatic adjustments/validations", page 91

Menu: PARAMETER/DAMPING/MEASURING COMPONENT/EL. T90%



1 Time constant set
2 Smallest value allowed
3 Largest value allowed

To change the TIME CONSTANT:

1. Select SET
2. Set the desired time constant

NOTE

Risk of incorrect adjustments

When damping has been increased:

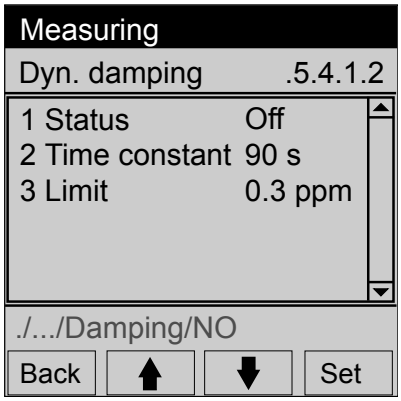
- Check whether the measuring duration for adjustments must be increased. (Explanation see "Constant damping", page 87, setting see "Setting the measuring duration for adjustments", page 39)

8.4.2 Setting a dynamic damping

NOTE

Purpose, function see "Automatic adjustments/validations", page 91

Menu: PARAMETER/DAMPING/MEASURING COMPONENT/DYN. DAMPING



1 Activation status
2 Time constant set
3 Limit set

Activating/deactivating dynamic damping

1. Select STATE (⬇/⬆, SET)
2. Select ON or OFF (⬇/⬆, SAVE)

Changing the time constant

1. Select TIME CONSTANT (⬇/⬆, SET)
2. Set the desired time constant

Changing the limit

1. Select LIMIT (⬇/⬆, SET)
2. Set the desired limit

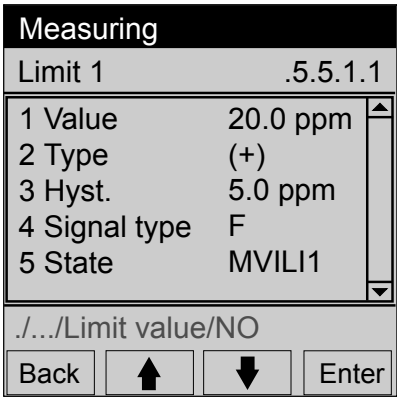
8.5 Setting limit values

8.5.1 Purpose of limit values

Two limit values can be set for each measuring component and auxiliary value to monitor the measured value. The limit value message can be triggered when the limit value is either underflown or overflown. Apart from that, the switching hysteresis and the category to which the message should belong can also be set (SIGNAL TYPE).

8.5.2 Configuring a limit value

Menu: PARAMETER/LIMIT VALUES/MEASURING COMPONENT/LV1 (or /LV2)



Setting the limit value

1. Select VALUE (⬇/⬆, SET)
2. Set the desired limit value

Selecting the message for underflow or overflow

1. Select TYPE (⬇/⬆, SET)
2. Set (–) UNDERFLOW or (+) OVERFLOW (⬇/⬆, SAVE)

Setting the switching hysteresis at the limit value

1. Select HYST. (⬇/⬆, SET)
2. Set the switching hysteresis

Selecting the signal type (category) of the limit value message

1. Select SIGNAL TYPE (⬇/⬆, SET)
2. Set the desired signal type (⬇/⬆, SAVE)
   Possible: F, M, C, U, E (significance see "Status message categories", page 49)

Selecting the digital output for the limit value message

1. Select STATUS (MVILIJ) (⬇/⬆, ENTER)
2. Select the desired digital output (⬇/⬆, SET)
3. Select the electronic switching logic in the next menu (⬇/⬆, SAVE)

NOTE

- These settings are also available elsewhere (see "Assigning a digital output to a status or control function (source)", page 77)
- Explanation of the electronic switching logic see "Selecting the electronic switching logic", page 78

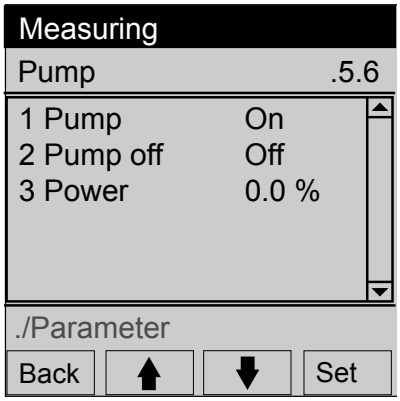
8.6 Setting the gas pump

NOTE

The gas pump is part of the Gas module (option on GMS800).

8.6.1 Switching the pump on/off

Menu: PARAMETER/PUMP/PUMP OFF



See next chapter for details

▶ Select the desired state (🡻/🡹, SET)

Purpose

This function serves to switch the gas pump on and off manually. This can be useful for tests and maintenance work. This function controls the fitted pump of the Gas module (when present) and the tag BVO1 (see "Tags of functions for analog and digital outputs", page 94).

Switching on does not work if the pump is switched off for other reasons (see "Other influences", page 74).

Other influences

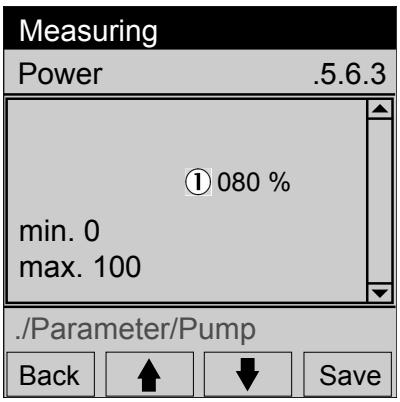
The pump remains off automatically:

- When the temperature of the measuring system is too low (after switching the device on)
- As long as the condensate sensor (option) of the Gas module triggers
- During feeding an adjustment gas when this is set (see "Setting the pump mode", page 44)
- When a digital input is set up and activated with the PUMP OFF function (see "Configuring the digital inputs", page 78)

8.6.2 Setting the pump power

Setting

Menu: PARAMETER/PUMP/POWER



1 Relative pump power (electronic value)

▶ Set the desired value

Purpose

Only applicable for the gas pump of the Gas module (option).

The setting determines the electrical power supply of the pump. This determines the pump flow rate.

NOTE

▶ Use this function to set the desired sample gas volume flow

This is better than using the pump at full power and regulating the volume flow with a control valve. This reduces the pump load and lengthens the service life.

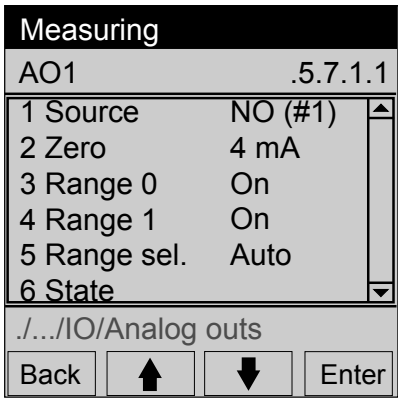
8.7 Configuring the I/O

NOTE

- Only applicable for GMS800 with at least one I/O module
- Each I/O module has 4 analog outputs

8.7.1 Configuring the analog outputs

Menu: PARAMETER/IO/ANALOG OUTS (AOI)/AOI

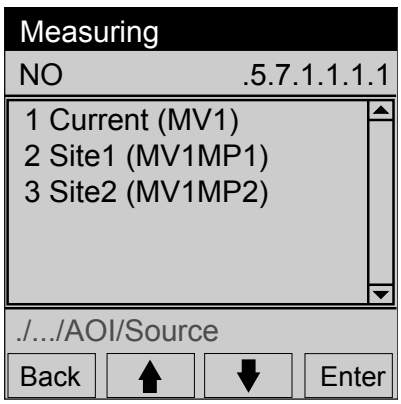


1 Assigned internal signal source
2 Zero point of the electronic signal span
3 Activation status of output range 0
4 Activation status of output range 1
5 Range selection mode
6 Digital output for output range status

8.7.1.1 Assigning an analog output to the internal signal source

Menu: PARAMETER/IO/ANALOG OUTS (AOI)/AOI/SOURCE

1. Select the measuring component for which the measured value is to be output by the analog output
   To select an auxiliary value: Select AUX. VALUES and then select the desired auxiliary value. – To shut the analog output off: Set NONE.
2. Set the desired source (⬇/⬆, SAVE)



1 Measuring point (example)[2]
2 Measuring point "Site1"
3 Measuring point "Site 2"

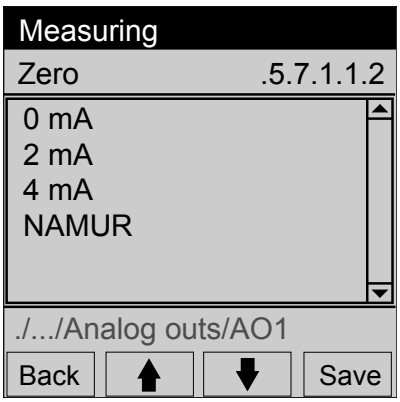
1 Data in brackets = source tag.
2 Explanations see "Configuring a measuring point", page 81.

Current	The analog output continuously outputs the current measured value of the measuring component.
[One measuring point]	• When this measuring point is active: The analog output outputs the current measured value of the measuring component • When other measuring points are active: The analog output constantly outputs the measured value last measured with this measuring point

8.7.1.2 Setting the electronic zero point (live zero)

Menu: PARAMETER/IO/ANALOG OUTS (AOI)/AOI/ZERO

▶ Select the desired setting (🡻/🡹, SAVE)



NAMUR Functions in accordance with the NAMUR standard:
Operating state → measured value 4 ... 20 mA
Category C or M message → constant 2 mA
Category F message → constant 0 mA

NOTE
When a live zero is set (2 mA or 4 mA), the electronic signal “0 mA” can be interpreted as a malfunction of the device or the electrical connection.

8.7.1.3 Configuring an output range

Menu: PARAMETER/IO/ANALOG OUTS (AOI)/AOI/RANGE 0 or /RANGE 1

Activating/deactivating the selected output range:

1. Select ON/OFF (🡻/🡹, SET)
2. Select the desired state (🡻/🡹, SAVE)

Setting the start value for the output range:

1. Select START (🡻/🡹, SET)
2. Set the physical value that should correspond to the electronic zero point (see "Setting the electronic zero point (live zero)", page 76)

Setting the end value for the output range:

1. Select END (🡻/🡹, SET)
2. Set the physical value that should correspond to the end value of the electronic signal span (20 mA)

Setting the range selection mode:

1. Select RANGE SEL. (🡻/🡹, SET)
2. Set the desired mode (🡻/🡹, SAVE)

Auto	Automatic range switchover[1]
0	Output range 0 permanently active
1	Output range 1 permanently active

[1] Functionality see "How automatic range switchover functions", page 70

Selecting the digital output for the output range status

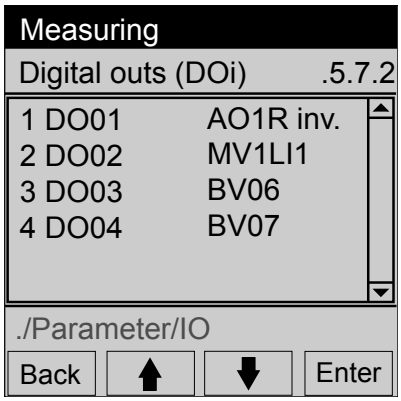
1. Select STATE
2. Select the desired digital output (⬇/⬆, SET)
3. Select the electronic switching logic in the next menu (⬇/⬆, SAVE)

NOTE

- These settings are also available elsewhere (see "Assigning a digital output to a status or control function (source)", page 77)
- Explanation of the electronic switching logic see "Selecting the electronic switching logic", page 78

8.7.2 Configuring the digital outputs

Menu: PARAMETER/IO/DIGITAL OUTS (DOI)



1, 2, ... Digital output | Source tag | Electronic switching logic[1]

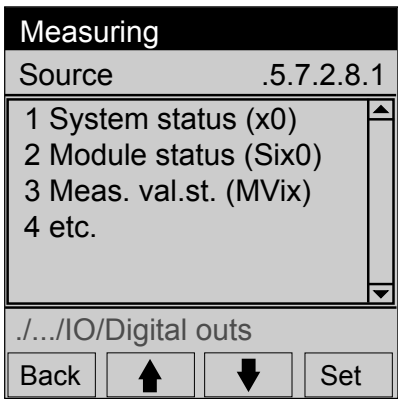
[1] No entry means: Direct (not inverted).

8.7.2.1 How the digital outputs function

Each digital output can be assigned an internal status or control function. This “Source” controls the state of the digital output. The source tag identifies the source. The electronic switching logic can be inverted.

8.7.2.2 Assigning a digital output to a status or control function (source)

Menu: PARAMETER/IO/DIGITAL OUTS (DOI)/DOI/SOURCE



System status (x0)	Group message category x
Module status (Six0)	Status message from module i, message category x
Meas.val.st. (MVix)	Message from module i relating to the measured value, message category x

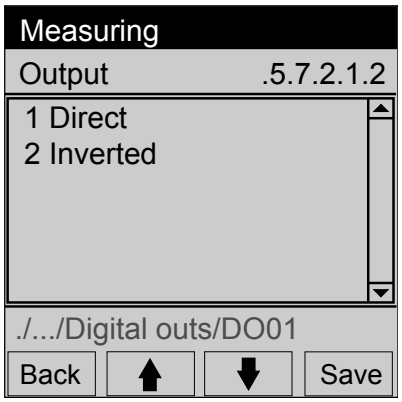
Limit status (MViLIj)	Limit value message for measured value i, limit value j
Current outp. (AOiR)	Output range status of analog output i
Meas.val.st. (MPS)	Measuring status for measuring point switchover[1]
Meas. p. (MPiS)	Activation status of measuring point i (control signal for external valve)
Pump off (BV01)	Control signal for gas pump (see "Switching the pump on/off", page 73)
Meas. gas (BV04)	Control signal for external sample gas valve
Test gases	Activation status of test gas i (control signal for external valve)
Meas.val.st.	Advance extraction/flush with several active measuring points Measuring point switchover must be active: see "Configuring measuring point switchover", page 81
None	Digital output is in logical state “0”

1 0 = flush time, 1 = measuring duration

1. Select a source group (🡻/🡹, ENTER)
2. Find and set the desired source in the following menus

8.7.2.3 Selecting the electronic switching logic

Menu: PARAMETER/IO/DIGITAL OUTS (DOI)/DOI/OUTPUT



1 The digital output is activated electronically (relay energized) when the source is also logically in the activated state (open-circuit principle).

2 The digital output is activated electronically when the source is logically inactive (closed-circuit principle). When the source is logically activated, the switching output is electronically in the inactive state (relay de-energized).

▶ Set the desired switching logic (🡻/🡹, SAVE)

CAUTION
Risks for connected devices/systems

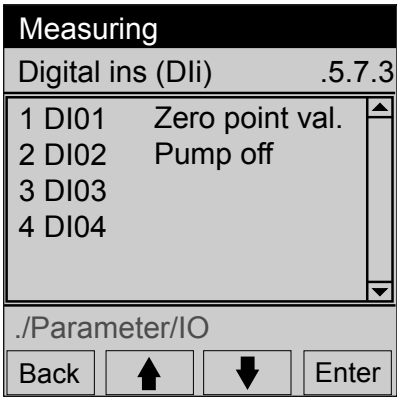
▶ Before using the digital outputs, clarify the safety-relevant consequences of the following operational malfunctions:
- Power failure (for example, local power failure or accidental switching-off or defective fuse)
- Electronic defect on digital output
- Interruption of the electrical connection

▶ Select the switching logic considering safety aspects:
- Digital outputs with direct switching logic signal that the respective function is not active when the power voltage fails
- Digital outputs with inverted switching logic signal that the respective function has been triggered when the power voltage fails

▶ Clarify the consequences thoroughly and make sure no dangerous situations can arise when a failure or defect occurs

8.7.3 Configuring the digital inputs

Menu: PARAMETER/IO/DIGITAL INS (DII)



1, 2 ... Digital input | Assigned function | Electronic switching logic[1]

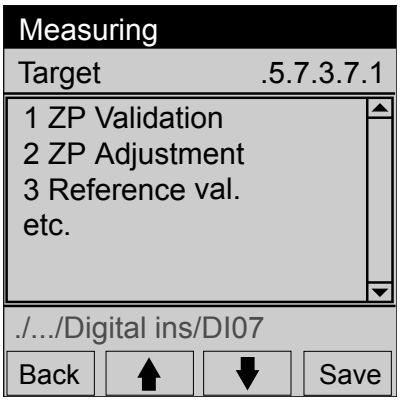
1 No entry means: Direct (not inverted).

8.7.3.1 How the digital inputs function

Each digital input can be assigned an internal status or control function. The electronic state of the digital input determines the logical state of the internal function. The electronic switching logic can be inverted.

8.7.3.2 Assigning a digital input to an internal function (target)

Menu: PARAMETER/IO/DIGITAL INS (DII)/DII/TARGETL



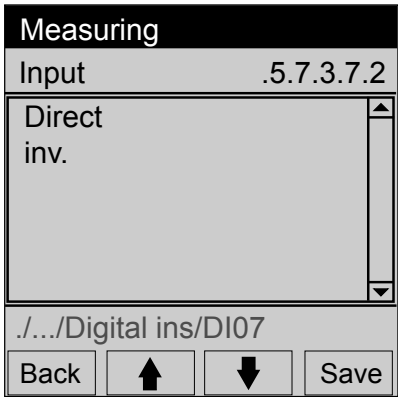
Name of the adjustment	Programmed automatic adjustment (see "Automatic adjustments/validations", page 91)
Name of the validation	Programmed automatic validation measurement (see "Automatic adjustments/validations", page 91)
Cancel adj./val.	Abort a running adjustment/validation
Failure	Activate status flag “F” (for complete system)
Maintenance	Activate status flag “M” (for complete system)
Pump off	External control signal to switch the gas pump off
Test gas fault	External malfunction message “Test gas not available”[1]
Lock adj./val.	External control signal to prevent adjustments/validations[1]
None	The electronic state of the digital input has no effect

1 Prevents adjustments and validations

1. Select a target group (⬇/⬆, SAVE)
2. Select the function to control the digital input in the following menus

8.7.3.3 Selecting the electronic switching logic

Menu: PARAMETER/IO/DIGITAL INS (DII)/DII/INPUT



Direct The target function is also activated when the digital input is electronically activated.

inv. The target function is not activated when the digital input is electronically activated. The target function is activated when the digital input is electronically deactivated.

▶ Set the appropriate switching logic (⬇/⬆, SAVE)

8.7.4 Configuring the analog inputs (information)

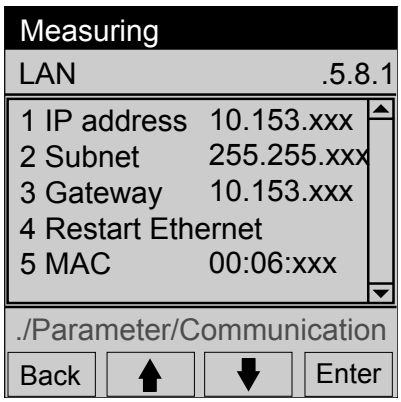
The function of the analog inputs can be configured with SOPAS ET (→ Technical Information “BCU Basic Control Unit – operation with SOPAS ET”).

The BCU has no menu functions here.

8.8 Configuring digital communication

8.8.1 Configuring a LAN connection

Menu: PARAMETER/COMMUNICATION/LAN



Setting an address

1. Select the respective address (⬇/⬆, SET)
2. Select the respective line (⬇/⬆, ENTER)

Restarting the internal LAN controller

▶ Select RESTART ETHERNET (⬇/⬆, ENTER)

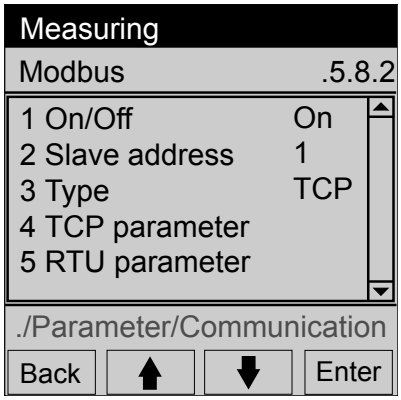
NOTE

▶ Use this function when the LAN connection is interrupted or cannot be established

8.8.2 Configuring a Modbus connection

NOTE
A detailed description of the Modbus can be found in "BCU Technical Information"

Menu: PARAMETER/COMMUNICATION/MODBUS



1 Switch the Modbus function on/off
2 Device address
See "BCU Technical Information" chapter "Introduction to the Modbus protocol"
3 Select type of interface (TCP or RTU)[1]
4 Set the TCP parameters[2]
5 Set the RTU parameters[3]

1 Create a hardware connection
See "BCU Technical Information" Section "Installing the Modbus connection"
2 TCP port
3 Baud rate, parity, data bits, stop bits

1. Select the function (🡻/🡹, ENTER/SET)
2. Set the desired settings in the following menus

8.9 Setting the internal clock

8.9.1 Setting the date

Menu: PARAMETER/DATE - TIME/DATE

▶ Setting the date

8.9.2 Setting the time

Menu: PARAMETER/DATE - TIME/TIME

▶ Setting the time

8.10 Configuring measuring point switchover

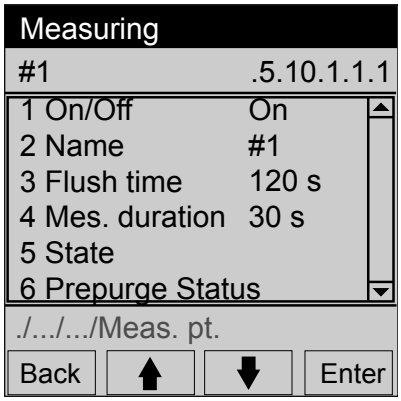
NOTE
Functional principle, prerequisites and consequences of measuring point switchover:
See “Operating Instructions BCU” Chapter “Automatic measuring point switchover”

A measuring point is shown as follows on the display:

- NO Mx = component NO on measuring point x
or for long texts
- #x = indicator for measuring point x

8.10.1 Configuring a measuring point

Menu: PARAMETER/SPECIAL FCT./MEAS.POINT AUTOM./MEAS. PT.(MPI)/MEASURING POINT



1 Activation status
2 Programmed name of the measuring point
3 Set flush time
4 Set measuring duration
5 Status
6 Prepurging status

Activating/deactivating the measuring point

1. Select ON/OFF (↓/↑, SET)
2. Select the desired state (↓/↑, SAVE)

On	This measuring point is used for measuring point switchover
Off	This measuring point is ignored for measuring point switchover

Setting the measuring point name

1. Select NAME (↓/↑, SET)
2. Set the desired name

Setting the flush time

1. Select FLUSH TIME (↓/↑, SET)
2. Set the desired flush time

NOTE
Information on correct setting: see “Operating Instructions BCU” Chapter “Setting the flush time for adjustments”

Setting the measuring duration

1. Select MEASURING DURATION (↓/↑, SET)
2. Set the desired measuring duration

NOTE
Current measured values are determined for this measuring point during the measuring duration.. The total time for the measuring point is flush time + measuring duration

Assigning a status output for the measuring point

The assigned digital output is used to control a solenoid valve that switches the sample gas path on this measuring point. The digital output is activated during the time the measuring point is activated. The electronic switching logic can be inverted.

1. Select STATE (↓/↑, ENTER)
2. Select the desired digital output (↓/↑, SET)
3. Select the electronic switching logic in the next menu (↓/↑, SAVE)

NOTE

- These settings are also available elsewhere: see “Operating Instructions BCU” Chapter “Assigning a digital output to a status or control function”
- Explanation of the electronic switching logic: see “Operating Instructions BCU” Chapter “Selecting the electronic switching logic”

8.10.2 Assigning a status output for the switchover phase

Menu: PARAMETER/SPECIAL FCT./MEAS.POINT AUTOM./STATUS (MPS)

1. Select the desired digital output (⬇/⬆, SET)
2. Select the electronic switching logic in the next menu (⬇/⬆, SAVE)

NOTE

- These settings are also available elsewhere (see "Assigning a digital output to a status or control function (source)", page 77)
- Explanation of the electronic switching logic see "Selecting the electronic switching logic", page 78

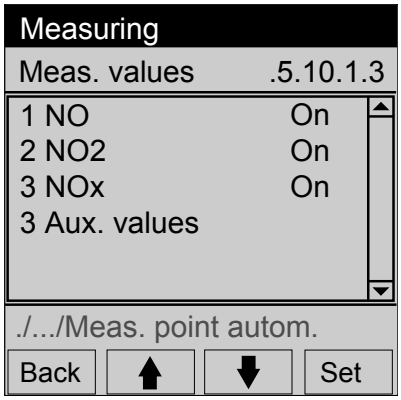
Purpose

The assigned digital output indicates whether the automatic measuring point switch-over is in the flush phase or the measuring phase:

Logical state of the digital output	Significance
0	Flush time
1	Meas. duration

8.10.3 Selecting the measuring point display

Menu: PARAMETER/SPECIAL FCT./MEAS.POINT AUTOM./MEAS.VALUES

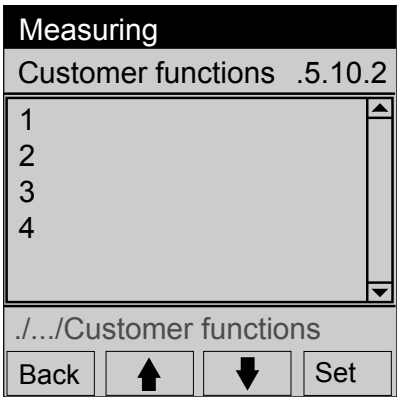


1. Select a measuring component (⬇/⬆, SET)
   To select an auxiliary value: Select AUX. VALUES and then select the desired auxiliary value
2. Select the desired state (⬇/⬆, SAVE)

On	The current measured value and the measured values for the measuring points are available in menus and measured value displays (example: See “Operating Instructions BCU” Chapter “Displaying measured values as mA values”)
Off	Only the current measured value is available for the measuring component in menus and measured value displays

8.11 Starting customer functions

Menu: PARAMETER/SPECIAL FCT./CUSTOMER FUNCTIONS



Customer functions are individual functions that have been programmed using SOPAS ET (→ Technical Information “BCU Basic Control Unit – operation with SOPAS ET”).

Menu CUSTOMER FUNCTIONS serves to start functions manually or to assign values to internal variables (for example, entering test gas concentrations).

The menu is empty when no customer functions have been programmed.

8.12 Display settings

8.12.1 Setting the login timeout

Menu: PARAMETER/SPECIAL FCT./DISPLAY SETTINGS/LOG-IN TIME-OUT

- ▶ Set the desired time (🡻/🡹, SAVE)
  Possible: 30 minutes, 1/2/4/8/16 hours, 1 day

Purpose

When user level AUTHORIZED OPERATOR is activated (see "Menu tree for "Authorized operator"", page 19), it is automatically deactivated again (logged out), when no text function button is used during the timeout time (e.g. ENTER, BACK).

8.12.2 Setting the automatic light off

Menu: PARAMETER/SPECIAL FCT./DISPLAY SETTINGS/AUTO LIGHT-OFF

- ▶ Select the desired state (🡻/🡹, SAVE)

On	The display lighting can go off automatically
Off	The display lighting remains on permanently

Purpose

The setting determines whether the display lighting switches off automatically when no text function button (e.g. ENTER, BACK) is activated within 30 minutes.

8.13 Modules

Menu: PARAMETER/SPECIAL FCT./MODULES

This menu is only relevant when a FIDOR module is integrated.

For further information, see "GMS810-/GMS811-FIDOR Operating Instructions".

9 Language

Menu: LANGUAGE

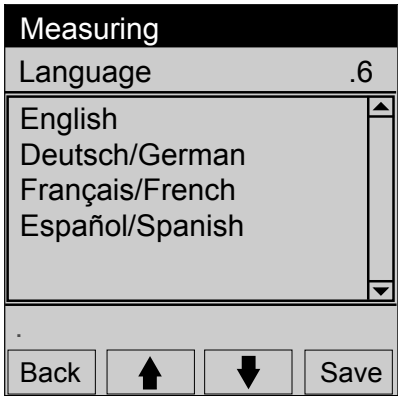


Figure 10: LANGUAGE menu (example)

▶ Select the desire language (↓/↑, SAVE)

NOTE

- Languages available: German, English, French, Italian, Spanish, Portuguese, Russian
- In SOPAS ET, the language selection function is not in the menu tree but exists as a SOPAS ET program function
- Language selection in SOPAS ET and language selection for the menus on the BCU display are independent from each other. Language selection in SOPAS ET does not change the language on the display. Two different languages can be selected.

10 Explanations

10.1 Auxiliary values

Auxiliary values are measured values that are not shown in the measured value displays on the display. Otherwise an auxiliary value can be used in the same manner as a measuring component. The main use of auxiliary values is in internal computations, e.g. for pressure correction or cross-sensitivity compensation of measured values.

Auxiliary values can be adjusted. Appropriate test gas settings are required here in the same manner as for measuring components. The set point values for adjustment are defined in the test gas settings even when the auxiliary value is not a gas concentration.

10.2 Virtual measuring components

Measured values are created by assigning a calculation algorithm to a measurement signal. The result of the calculation is the measured value.

It is possible to link several measuring signals mathematically. The result of such linking is a “virtual” measuring component that is displayed as a real physical measuring component. Example: The total is calculated from real measuring components NO und NO2 and displayed as measuring component NOX.

A virtual measuring component cannot be directly adjusted. Instead, all real measurements from which the virtual measured value is calculated must be adjusted. Only real measuring components are available for adjustments; virtual measuring components dependent on the adjustment of a real measuring component are displayed as a commentary (example see "Starting the adjustment procedure", page 28).

Mathematical links also function with internal auxiliary values and with signals from analog inputs. This means, for example, physical correction calculations and automatic compensations are possible.

10.3 Damping

10.3.1 Constant damping

- When a damping has been set, the mean value from the current measured value and the previous measured values (rolling averaging) is displayed instead of the current measured value
- A damping can be set individually for each measuring component
- The damping affects all measured value displays and outputs. It is also active during an adjustment procedure

Application options:

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

NOTE

Setting a constant damping see "Setting a constant damping", page 71

NOTE

- Increasing damping normally increases the response 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 duration must be at least 150% of the set damping time constant during adjustments.

- When a damping has been setup new or increased: Check whether the measuring duration for adjustments needs to be adapted (see "Setting the measuring duration for adjustments", page 39)

10.3.2 Dynamic damping

"Dynamic damping" serves to compensate measured value fluctuations without significantly increasing the response 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.

The settings are available for each single measuring component (for virtual measuring components as well see "Virtual measuring components", page 87). When a measuring point switchover is set up (see "Configuring a measuring point", page 81), the settings can be made for each single measuring point.

NOTE
Setting a dynamic damping see "Setting a dynamic damping", page 72

10.4 Drift values

10.4.1 How drift values are calculated

Zero point drift

Zero point drift = (actual value - set point)/[physical measurement span]

Example		
Physical measuring range	=	0 ... 500 ppm
Physical measurement span	=	500 ppm
Set point of the test gas	=	0.0 ppm
Actual value during the adjustment	=	2.5 ppm
Zero point drift	=	(2.5 – 0.0)/500 = 0.005 = +0.5 %

Reference point drift

Example: 1		
Set point of the test gas	=	100 ppm
Actual value during the adjustment	=	98 ppm

Example: 1		
Reference point drift	=	(98 – 100)/100 = –2.00 %

Example: 2		
Set point of the test gas	=	100 ppm
Actual value during the adjustment	=	102 ppm
Reference point drift	=	(102 – 100)/102 = +1.96 %

NOTE

When the set point is lower than the actual value, the actual value is divided by the set point. Otherwise, a drift that has been determined in one direction with the same absolute measured value does not return to drift value zero.

10.4.2 Absolute drift

An “absolute” drift represents the total change of a drift value across several adjustments – therefore it is not the difference between the last two adjustments.

Absolute drifts relate to the measured values displayed (including linearization, drift compensation etc.). The zero point drifts relate to the physical measurement span of the respective Analyzer module and the reference drifts relate to the set point of the test gas during the adjustment.

NOTE

- On brand new devices, absolute drifts only exist after an adjustment has been carried out
- A drift reset (see "Deleting drift values (drift reset)", page 90) can reset the absolute drifts to “0” again. Drift value addition then starts again; values for absolute drifts are then only available after an adjustment has been carried out.

10.4.3 Automatic drift value monitoring

How drift limit values function

After every adjustment, the BCU compares the calculated “absolute drifts" (see "Absolute drift", page 89) against the programmed drift limit values. Drift limit value violation is reported in two stages:

1 When an absolute drift is 100 ... 120% of the drift limit value, status flag “M” is set for the respective module (explanation see "Status message categories", page 49). “M zero drift” or “M span drift” is entered in the logbook

2 Status flag “F” is set as soon as the absolute drift is more than 120% of the drift limit value. “F zero drift” or “F span drift” is entered in the logbook

Purpose of monitoring

Drifts are caused, for example, by contamination, mechanical changes or aging effects. It is not useful to perform more and more mathematical compensation for permanently increasing “absolute drifts”. Inspect and reset the respective Analyzer module when an “absolute drift” has become very large. The “M” messages on drifts report this situation automatically in good time.

NOTE

- The drift limit values are set at the factory and can be changed in user level SERVICE
- Displaying the drift limit values see "Displaying the service information", page 65

10.4.4 Deleting drift values (drift reset)

To reset drifts, the BCU calculates the current absolute drifts (see "Absolute drift", page 89) and then starts totaling absolute drifts again from “0.0”. The drift reset serves starting recording absolute drifts again at any time – e.g. to determine drifts during a certain period.

CAUTION

Risk of incorrect adjustment

If very large drift values are displayed after a manual adjustment procedure, the test gases used probably did not match the set point values set or gas feed was interrupted – and the adjustment result was accepted by pressing a button despite the large deviations displayed.

- ▶ Never correct such an erroneous state with a drift reset but repeat the adjustment with more care

NOTICE

- A drift reset cannot be reset
- The previous chronicle of “absolute drifts” is lost after a drift reset

NOTICE

- ▶ Do not use the drift reset to compensate extensive physical changes of an Analyzer module but first carry out the necessary adjustment or cleaning work [1]
- ▶ Always carry out a drift reset after the Analyzer module has been cleaned or replaced

[1] Such work should only be carried out by the manufacturer's Customer Service or authorized skilled persons with appropriate training.

10.5 Automatic adjustments/validations

10.5.1 Prerequisites for automatic adjustments (overview)

1	External devices are installed to feed the test gases automatically (test gas containers, gas lines, solenoid valves).	
2	These devices are connected to the corresponding digital outputs of the GMS800.	
3	The required test gases are available (gas cylinders connected and filled sufficiently) and are fed correctly.[1]	
4	At least one automatic adjustment is programmed.[2]	
5	Suitable test gas settings exist.	see "Configuring test gases", page 41
6	The set point values of the adjustment gases are set correctly.	see "Setting the set point for a measuring component", page 47
7	Flush time and measuring duration are set appropriately.	see "Setting the flush time for adjustments", page 47
8	When automatic adjustments are to be started automatically: Timepoint and time interval are set appropriately.	see "Setting an automatic adjustment start", page 37
9	If a digital input is setup with the function SPERRE JUST./VAL.: This digital input is not activated.	see "Configuring the digital inputs", page 78

1 Physical conditions for the test gases → Operating Instructions "GMS800 Series".
2 see "Programming automatic adjustments", page 91

NOTICE

▶ Always carry out the respective zero point adjustment before a reference point adjustment

Otherwise the reference point adjustment will not be correct.

10.5.2 Programming automatic adjustments

Automatic adjustment procedures can be programmed with SOPAS ET (→ Technical Information “BCU Basic Control Unit – operation with SOPAS ET”).

The menu functions of the BCU serve to

- deactivate automatic adjustments
- set the time interval for automatic adjustment procedures
- define the next timepoint for an automatic adjustment procedure

NOTE

It is possible that automatic adjustment procedures have already been programmed at the factory (→ individual information in scope of delivery).

10.6 Automatic measuring point switchover

10.6.1 Functional principle of the automatic measuring point switchover

Measuring points are extraction points for sample gas. The measuring point automatic allows the GMS800 to control up to 8 measuring points (i.e. give control signals to switch the sample gas path).

Programmable for each measuring point:

- Name of the measuring point (freely selectable)
- Flush time (wait time after the switchover before the measured value is output)
- Measuring duration (duration of measurement on the measuring point)
- Digital output to control switchover

10.6.2 Prerequisites for the measuring point automatic

- Separate devices to switchover the gas feed between the measuring points (e.g., solenoid valves)
- Electrical connections with the controlling digital outputs (as required: Additional intermediate electrical devices, e.g. power relay)
- Programmed measuring points (see "Configuring measuring point switchover", page 81)

10.6.3 Consequences of measuring point switchover

Measured values of the measuring points

When measuring points are programmed and active, the measured values of a measuring component from the single measuring points are provided in addition to the current measured value of a measuring component. The measuring components, measuring point and the last measured value are displayed in the menus for measured value displays (example see "Displaying measured values as mA values", page 56). As a result, not only the current measured value of a measuring component can be selected but in addition the measured values from the single measuring points.

This effect can also be deactivated (see "Selecting the measuring point display", page 83).

Holding the measured value

- When a measuring point is activated, the measured values for this measuring point correspond to the current measured value of the device (after the flush time)
- During the time other measuring points are activated, the measured value last measured at the measuring point is displayed constantly as measured value for this measuring point (sample-and-hold amplifier function)

This also functions with analog outputs which output the measured value of a measuring point.

NOTE

Programming the measuring point switchover see "Configuring measuring point switchover", page 81

10.6.4 Advance extraction

With several measuring points, exhaust gas is continually extracted and discharged from the measuring points not routed via the device at that time. This ensures that the exhaust gas to be measured is quickly fed to the device (principle of advance extraction) when the measuring point is switched.

10.7 Tags

The tags can be used in SOPAS ET to configure or program functions. The tags are displayed at some locations as information within the menu system of the BCU.

NOTE
General explanation and usage of tags → Technical Information “BCU Basic Control Unit – operation with SOPAS ET.

10.7.1 Tags of functions for digital inputs

These functions can be assigned to a digital input. The respective internal function is triggered when the assigned digital input is logically activated.

Tag	Function	Type[1]	Indices
Control functions			
BVI1	Start “ZP validation”	B	–
BVI2	Start “ZP adjustment”	B	
BVI3	Start “Ref. Val.”	B	
BVI4	Start “Ref. Adj.”	B	
BVI5	Start “Ref. val. cuv.”	B	
BVI6	Start “Ref. adj. cuv.”	B	
BVI9	Abort adjustment/validation	B	
BVI10	Trigger failure message	B	
BVI11	Trigger maintenance message	B	
BVI12	Switch the pump off	B	
BVI13	Test gas fault[2]	B	
BVI14	Lock adjustment/validation[2]	B	
BVI15	None	B	
Programmable values			
BVi	Boolean variable	B	i = 01 ... 24

1 B = Boolean (digital) value
2 Prevents adjustments and validation measurements.

NOTE
Checking assigned functions / assigning a function see "Assigning a digital input to an internal function (target)", page 79.

10.7.2 Tags of functions for analog and digital outputs

- Type “R” (real) functions can be assigned to an analog output
- Type “B” (Boolean) functions can be assigned to a digital output. The assigned digital output is logically activated when the respective internal function is triggered

Tag	Function		Type [1]	Indices
Measured values				
MVi	Current measured value i		R	i = 1 … 12
MViMPj	Measured value i from measuring point j		R	i = 1 … 12 j = 1 … 8
MPS	Operating phase of the measuring point switchover[2]		B	–
MPjS	Operating status of the measuring point j[3]		B	j = 1 … 8
Limit values				
MViLIk	Limit value message (limit value k) for measured value i		B	i = 1 … 12 k = 1 … 2
I/O				
DIi	Logical state	of digital input DIi	B	i = 01 … 16
DIiI	Electronic state			
DOi	Logical state	of digital output DOi		
DOiO	Electronic state			
AIi	Current input value[4]	of analog input AIi	R	i = 01 … 4
AIiI	Current input signal (mA)[5]			
AOi	Current output value	of analog output AOi	R	i = 01 … 8
AOiO	Current output signal (mA)[5]			
AOiR	Current output range of analog output AOi[6]		B	i = 01 … 8
BVO1	Pump off		B	
BVO4	Sample gas			
BV0x	Test gas [x–4][7]		B	x = 05 … 16
Status				
F0	“F” group status[8]	of the GMS800 system	B	–
M0	“M” group status			
C0	“C” group status			
U0	“U” group status			
E0	“E” group status			
SiF0	“F” group status	of module Si	B	i = 1 … 6
SiM0	“M” group status			
SiC0	“C” group status			
SiU0	“U” group status			
SiE0	“E” group status			

Tag	Function		Type [1]	Indices
MViF0	“F” group status	of measured value MVi	B	i = 1 ... 12
MViM0	“M” group status			
MViC0	“C” group status			
MViU0	“U” group status			
MViE0	“E” group status			

1 R = floating point value (for analog output), B = Boolean (digital) value for digital output
2 0 = flush time, 1 = measuring duration
3 0 = not active, 1 = currently active
4 According to programmed conversion, e.g. in physical unit.
5 0.00 ... 20.00
6 0 = output range 0; 1 = output range 1
7 BV05 – Test gas 1, BV06 – Test gas 2 etc.
8 A group status is activated when at least one message of the respective category (F/M/C/U/E) exists. Explanation on categories see "Status message categories", page 49.

10.8 Logbook messages

Logbook messages	Source[1]						Cause → Effect	– Information ▸ Measures[2]
	BC	DE	OX	TH	UM	GM		
Sequence control program error	●						Unable to initialize Sequencer-Threads.	▸ Restart the BCU.[3] ▸ If this does not help: Inform Customer Service.
AO range | Line y	●						The output ranges of the analog outputs are not configured correctly.	▸ Check/correct the settings (see "Configuring an output range", page 76; Line number valid for SOPAS ET).
BVG1 Start Adj/Val x	●						Automatic adjustment/validation procedure x started manually (via BCU menu function) (x = 1 ... 8).	– Status message (not an error).
BVG12 Pump off	●						Gas pump switched off manually (via BCU menu function).	– Status message (not an error).
BVG9 Abort Adj/Val	●						Automatic adjustment/validation procedure aborted manually (via BCU menu function).	– Status message (not an error).
BVI12 Pump off	●						Stop command for gas pump activated.[4]	– Status message (not an error).
BVI14 Lock Adj/Val	●						Command to prevent adjustments/validation measurements activated.[4]	– Status message (not an error).
BVI9 Abort Adj./Val.	●						Abort command for automatic adjustment/validation (variable BV9).[4]	– Status message (not an error).
BVIx Start Adj./Val. x	●						Start command for automatic adjustment/validation procedure x.[4]	– Status message (not an error).
BVO1 Pump off	●						“Pump off” activated.	– Status message (not an error).
BVO4 Sample gas	●						“Sample gas” activated.	– Status message (not an error).
BVOx Test gas [x–4]	●						Test gas x activated (x = 5... 16).	– Status message (not an error).
C Bridge adjustment				●			Automatic bridge adjustment running.	– Duration: < 5 minutes
C Manual adjust	●						A manual adjustment procedure is running.	– Status message (not an error).
C Function check		●	●	●	●	●	An adjustment or validation is active, sensor or system being checked.	– Status message (not an error). ▸ If the message remains too long: Restart adjustment/validation.
C IO module test	●						An “I/O test” function is active.	– Status message (not an error). – I/O test see "I/O test", page 22.
C IO module x adjustment	●						Electronic adjustment of I/O module x running (x = 1/2).	– Status message (not an error).
C Adj./Val.	●						Automatic adjustment/validation procedure running.	– Status message (not an error).
C Adjustment cuvette active					●		Adjustment cuvette in beam path.	– Status message (not an error).
C Cuvette active		●					Adjustment cuvette in beam path	– Status message (not an error)
C Sensor | Sensor x	●						Category “C” message from sensor x.	▸ Evaluate logbook messages.
C Start check		●	●	●	●	●	Start check	– Check functions active after switching on.
C Start check	●						BCU starting.	– Status message (not an error).
C System check (formula res.)	●						Message “C0” activated by a programmed relation (formula res.).	– Status message (not an error).
C Seek amplification			●	●	●	●	Automatic amplification adjustment running.	– Duration: < 5 minutes
C Maintenance active		●	●	●	●	●	Maintenance flag active.	– Status message (not an error).
CAN initialization	●						CANOPEN initialization failed.	▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
CAN error	●						Invalid sensor number or queue overflow (SDO).	– Temporary status message. ▸ When an "F" message also exists: Restart BCU.[3]. ▸ If this does not help: Inform Customer Service.
E Gas pump off		●	●	●	●	●	Gas pump switched off.	– Status message (not an error).
E No A/D reference		●					Internal reference values for measurement missing.	▸ Inform Customer Service.
E Cuvette adjustment		●					Reference point adjustment with adjustment cuvette running.	– Status message (not an error).
E Motor 1 temperature		●			●		Temperature in motor control electronics too high (DE: Motor 1 / UM: Filter wheel drive).	▸ Check motor.

Logbook messages	Source[1]						Cause → Effect	– Information ▸ Measures[2]
	BC	DE	OX	TH	UM	GM		
E Motor 2 temperature		●			●		Temperature in motor control electronics too high (DE: Motor 2 / UM: Chopper disk drive).	▸ Check motor.
E Motor 3 temperature		●					Temperature in motor control electronics too high (motor 3).	▸ Check motor.
E Motor chopper motor V reduced					●		Motor speed reduced.	– Status message (not an error).
E Motor filter motor V reduced					●		Motor speed reduced.	– Status message (not an error).
E Motor X V reduced		●					Motor speed reduced.	– Status message (not an error).
F Failure		●	●	●	●	●	Malfunction in sensor system → measuring operation not possible.	▸ Evaluate logbook messages.
F BVI10 Failure	●						External failure message activated (variable BVI10).[4]	– Status message (not an error).
F Span drift		●	●	●	●	●	Reference point drift > 120% of drift limit value	▸ Check test gas and set point settings. ▸ Check measuring system.
F Filter wheel					●		Malfunction with the filter wheel	▸ Check internal electric connections. ▸ Check Hall sensor.
F Initialization	●						Error during start (checksum or RAM)	▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
F IR source x					●		Source x voltage incorrect.	▸ Check internal electric connections. ▸ Check source voltage. ▸ Check source.
F Measuring detector		●					Malfunction in light detector (measurement).	▸ Inform Customer Service.
F MV calculation		●	●	●	●	●	Error in measured value calculation; measured value > 150% of measurement span	▸ Check: Real gas concentration large? – Settings (component) changed? ▸ Otherwise: Check adjustment.
F Motor 1		●			●		Motor not functioning (DE: Motor 1 / UM: filter wheel drive).	▸ Check internal electric connections. ▸ Check motor.
F Motor 2		●			●		Motor not functioning (DE: Motor 2 / UM: chopper disk drive).	▸ Check internal electric connections. ▸ Check motor.
F Motor 3		●					Motor not functioning (motor 3).	▸ Check internal electric connections. ▸ Check motor.
F Position motor X		●					Motor zero position not recognized reliably.	▸ Check internal electric connections. ▸ Check light barrier. ▸ Check motor.
F Zero drift		●	●	●	●	●	Zero point drift > 120% of drift limit value	▸ Check test gas and set point settings. ▸ Check measuring system.
F Position filter wheel motor F Position chopper motor					●		Motor zero position not recognized.	▸ Check internal electric connections. ▸ Check zero point recognition. ▸ Check motor.
F Position filter wheel motor F Position chopper motor					●		Motor zero position not recognized → measured values unreliable.	▸ Check internal electric connections. ▸ Check zero point recognition. ▸ Check motor.
F Reference detector		●					Malfunction in light detector (reference measurement).	▸ Inform Customer Service.
F Sensor | Sensor x	●						Category “F” message from sensor x.	▸ Evaluate logbook messages.
F Memory error	●						Dynamic memory could not be assigned.	▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
F System failure (formula res.)	●						Message “F0” activated by a programmed relation (formula res.).	– Status message (not an error).
Error AutoIP	●						SOPAS ET could not find all sensors (connection not possible).	▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
Sequence control program error	●						Error in sequence of automatic adjustment or validation.	– Procedure aborted automatically.
Limit value x MVy	●						Measured value y beyond limit value x (x = 1/2).	– Status message (not an error).
I2C x	●						Internal malfunction (x = 1/2/3)	When an "F" message also exists: ▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.

Logbook messages	Source[1]						Cause → Effect	– Information ▸ Measures[2]
	BC	DE	OX	TH	UM	GM		
Internal	●						Error in Ethernet controller.	– Internal malfunction. ▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
Adj./Val. | Line x	●						Error in configuration of automatic adjustment/validation x.	▸ In SOPAS ET: Check/correct parameters of automatic adjustments/validation measurements.
Cyclic trigger | Line x	●						Cyclic trigger x not configured correctly.	▸ Check internal clock (see "Setting the internal clock", page 81). When OK: ▸ In SOPAS ET: Check/correct parameters of the long-term timer.
LM75	●						Internal malfunction.	When an "F" message also exists: ▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
M BVG11 Maintenance	●						Maintenance flag activated manually (via BCU menu function).	– Status message (not an error).
M BVI11 Maintenance	●						External maintenance message activated (variable BVI11).[4]	– Status message (not an error).
M BVI13 Test gas fault	●						Message for external test gas fault activated (variable BVI13).[4]	– Status message (not an error).
M CAN address assigned twice	●						Double sensor CAN-ID	▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
M CAN address too large	●						Sensor CAN-ID too large	▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
M Span drift		●	●	●	●	●	Reference point drift > drift limit value	▸ Check test gas and set point settings. ▸ Check measuring system.
M Error during sensor login | Sensor x	●						Connection between BCU and sensor x interrupted.	▸ Restart BCU.[3] ▸ Switch GMS800 off/on. ▸ Check internal electric connections. ▸ If this does not help: Inform Customer Service.
M Error during CFG restore	●						Stored configuration could not be restored.	▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
M Filter		●					Filter malfunction	▸ Check optical filter (on the filter wheels).
M Extraneous light		●					Light rays from outside into measuring optics.	▸ Check: Enclosure open?
M IO module x lost	●						Connection between BCU and I/O module x interrupted. (x = 1/2)	▸ Check electrical connection (plug connection, cable).
M Restart by user	●						Restart procedure running.	– Status message (not an error).
M Zero drift		●	●	●	●	●	Zero point drift > drift limit value	▸ Check test gas and set point settings. ▸ Check measuring system.
M Zero gas		●	●	●	●	●	Zero point drift > 150% of drift limit value → zero point not adjusted	▸ Check test gas and set point settings. ▸ Check measuring system.
M Ref. gas		●	●	●	●	●	Reference point drift > 150% of drift limit value → reference point not adjusted	▸ Check test gas and set point settings. ▸ Check measuring system.
M SD card defective	●						SD card probably defective.	▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
M Sensor | Sensor x	●						Category “M” message from sensor x.	▸ Evaluate logbook messages.
M Sensor lost | Sensor x	●						Internal malfunction on sensor x.	▸ Restart BCU.[3] ▸ Switch GMS800 off/on. ▸ Check internal electric connections. ▸ If this does not help: Inform Customer Service.
M Sensor error A/B | Sensor x	●						Connection between BCU and sensor x interrupted.	▸ Restart BCU.[3] ▸ Switch GMS800 off/on. ▸ Check internal electric connections. ▸ If this does not help: Inform Customer Service.
M Mirror		●					Malfunction with mirror	▸ Check mirror (contamination, defects, position).
M Beam splitter		●					Malfunction with beam splitter	▸ Check beam splitter (contamination, defects, position).
M System check (formula res.)	●						Message “M0” activated by a programmed relation (formula res.).	– Status message (not an error).
M UV source intensity		●					Lamp intensity < limit value	– UV lamp reached end of service life. ▸ Replace UV lamp as soon as possible.

Logbook messages	Source[1]						Cause → Effect	– Information ▸ Measures[2]
	BC	DE	OX	TH	UM	GM		
M Maintenance request		●	●	●	●	●	A module reported “Maintenance request”.	▸ Evaluate logbook messages.
Measuring screen | Line x	●						Measuring screen in line x configured incorrectly.	▸ In SOPAS ET: Check/correct configuration of measuring screen.
RTC x	●						Internal malfunction (x = A/B/C).	When an "F" message also exists: ▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
SD error	●						Internal malfunction with memory card.	When an "F" message also exists: ▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
Sensor logout error	●						A sensor could not be logged off.	– Internal malfunction. When an "F" message also exists: ▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
Sensor measured value error	●						The BCU does not receive correct number of measured values from a sensor.	– Internal malfunction. ▸ Restart GMS800. ▸ If this does not help: Inform Customer Service.
Sensor comp. failure | Sensor x	●						Message from sensor x: Measurement of a measuring component failed.	– Internal malfunction. ▸ Evaluate logbook messages.
User settings backup failed.	●						Error during backup: Data could not be stored.	– Internal malfunction. ▸ Repeat procedure.
Prod. settings backup failed.	●						Error during backup: Factory settings could not be stored.	– Internal malfunction. ▸ Repeat procedure.
SOPAS error x	●						Error in internal data communication (SOPAS hub function; x = A: Out path, x = B: Return path).	▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
SPI x	●						Internal malfunction (x = 1/2)	When an "F" message also exists: ▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
Stack overflow	●						Stack overflow	– Internal malfunction. ▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
Tag: Analog output | Line y	●						Analog outputs not configured correctly.	▸ Check/correct settings (see "Configuring the analog outputs", page 75; line number valid for SOPAS ET).
Tag: BVI Table x | Line y	●						Variable BVIx not configured correctly.	▸ In SOPAS ET: Check/correct respective configuration.
Tag: Digital output | Line y	●						Digital outputs not configured correctly.	▸ Check/correct settings (see "Assigning a digital output to a status or control function (source)", page 77; line number valid for SOPAS ET).
Tag: Formula | Line y	●						Incorrect tag in a formula.	▸ In SOPAS ET: Check/correct programmed formulas.
Tag: Measured value config. | Line y	●						Internal assignment error.	▸ Inform Customer Service.
Tag: Modbus output | Line y	●						Modbus outputs not configured correctly.	▸ In SOPAS ET: Check/correct Modbus configuration.
Tag: Test gas Table | Line y	●						Error in test gas settings.	▸ Check/correct tet gas settings (see "Configuring test gases", page 41; line number valid for SOPAS ET).
TCP error D	●						SOPAS TCP send threads could not be initialized.	– Internal malfunction. ▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
TCP error x	●						TCP sockets could not be initialized (x = A/B/C).	– Internal malfunction. ▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
TCP connection timeout	●						TCP connection interrupted after timeout.	– Temporary status message. ▸ When an “F” message also exists: Check Ethernet connections.
Timeout | MVy	●						The BCU did not receive measured value y.	– Internal malfunction. ▸ Evaluate logbook messages.
Timeout monitoring	●						Timing malfunction in software.	– Internal malfunction. When an "F" message also exists: ▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
Timer error	●						Counter threads could not be initalized.	▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.

Logbook messages	Source[1]						Cause → Effect	– Information ▸ Measures[2]
	BC	DE	OX	TH	UM	GM		
U ADC value		●	●	●	●	●	Measurement signal distorted → resolution no longer possible	▸ Check: Real gas concentration large? – Detector damaged – Optics or cuvette contaminated – Optics mechanical adjustment incorrect
U Filter		●					Malfunction with a filter → Measured values unreliable.	▸ Check optical filter (on the filter wheels).
U Extraneous light		●					Light rays from outside into the measuring optics → measured values unreliable.	▸ Check: Enclosure open?
U Device		●	●	●	●	●		– Device status uncertain. ▸ Evaluate logbook messages.
U Heating ...			●	●	●	●	Heater not in regulation range.	▸ Temperature set point not reached yet? ▸ Actual temperature in tolerance range? ▸ Overheat fuse triggered? ▸ Sensor defective? ▸ Operating voltage for heater available (24 V)?
U Adjustment cuvette		●			●		Malfunction in adjustment cuvette	▸ Check measuring system ▸ Check adjustment cuvette
U Cuvette adjustment		●					Adjustment cuvette active with a different component → measured value held	– Status message (not an error).
U MV overflow			●	●	●	●	Measured value > 120% of measurement span	▸ Check: Real gas concentration large? – Settings (component) changed? ▸ Otherwise: Check adjustment.
U Pos. motor ...		●					Motor zero position not recognized reliably → measured values unreliable.	▸ Check internal electric connections. ▸ Check light barrier. ▸ Check motor.
U Sensor | Sensor x	●						Category “U” message from sensor x.	▸ Evaluate logbook messages.
U Mirror		●					Malfunction with mirror → measured values unreliable.	▸ Check mirror (contamination, defects, position).
U Start test		●	●	●	●	●	Start check	– Check functions active after switching on.
U Beam splitter		●					Malfunction with optical beam splitter → measured values unreliable.	▸ Check beam splitter (contamination, defects, position).
U System check (formula res.)	●						Message “U0” activated by a programmed relation (formula res.).	– Status message (not an error).
U Temperatures		●	●	●	●	●	Mainboard temperature > 75 °C	▸ Check temperatures (heaters).
U UV source intensity		●					Lamp intensity < limit value → measured values unreliable.	– UV lamp reached end of service life. ▸ Replace UV lamp.
U Maintenance active		●	●	●	●	●	Maintenance active	– Maintenance active, measured values unreliable.
UDP error	●						UDP options could not be initalized.	– Internal malfunction. ▸ Restart BCU.[3] ▸ If this does not help: Inform Customer Service.
Too many TCP connections	●						More than 5 accesses (SOPAS ET sessions) on the BCU.	– Status message (not an error).

1 BC = BCU | DE = DEFOR | OX = OXOR-E, OXOR-P | TH = THERMOR |UM = UNOR-MULTOR |GM = Gas Module
2 Only necessary when logbook message is “On”.
3 see "Reset", page 26
4 Originates from a digital input when the variable is assigned to the digital input.

11 Index

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