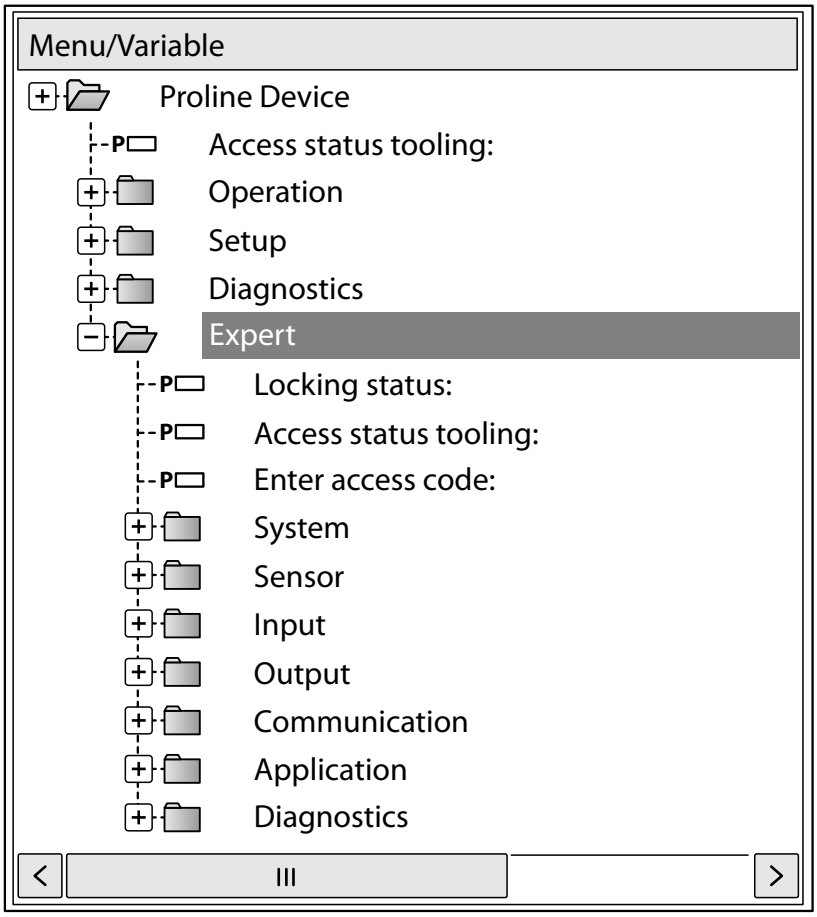
GP01065D/06/EN/01.15
71291587

Valid as of version
01.03.zz (Device firmware)

Description of Device Parameters
Proline Cubemass 100
Modbus RS485

Coriolis flowmeter



Endress+Hauser
People for Process Automation

Table of contents

1 Document information

1.1 Document function

The document is part of the Operating Instructions and serves as a reference for parameters, providing a detailed explanation of each individual parameter of the Expert operating menu.

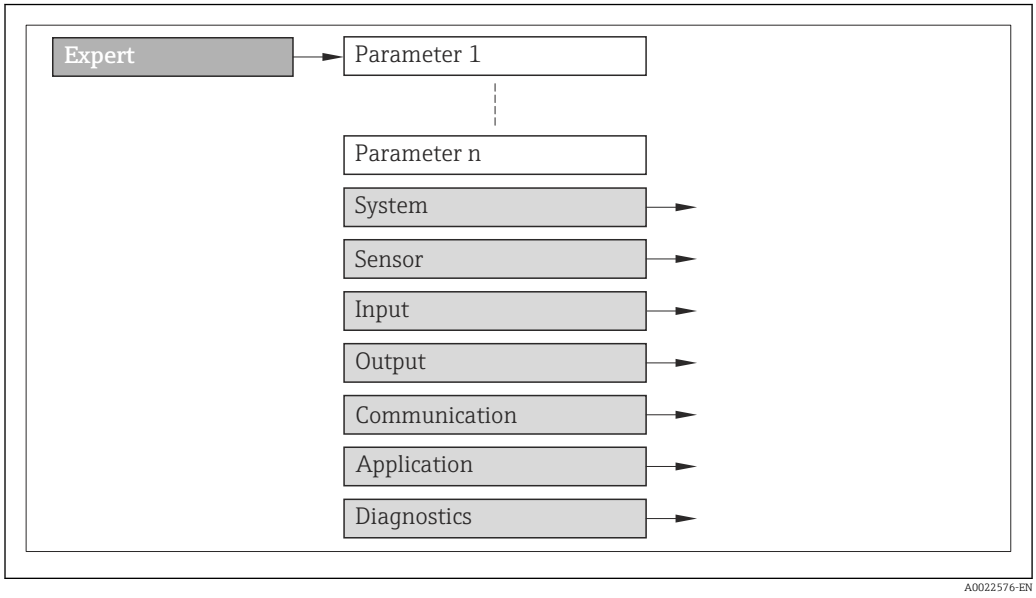
1.2 Target group

The document is aimed at specialists who work with the device over the entire life cycle and perform specific configurations.

1.3 Using this document

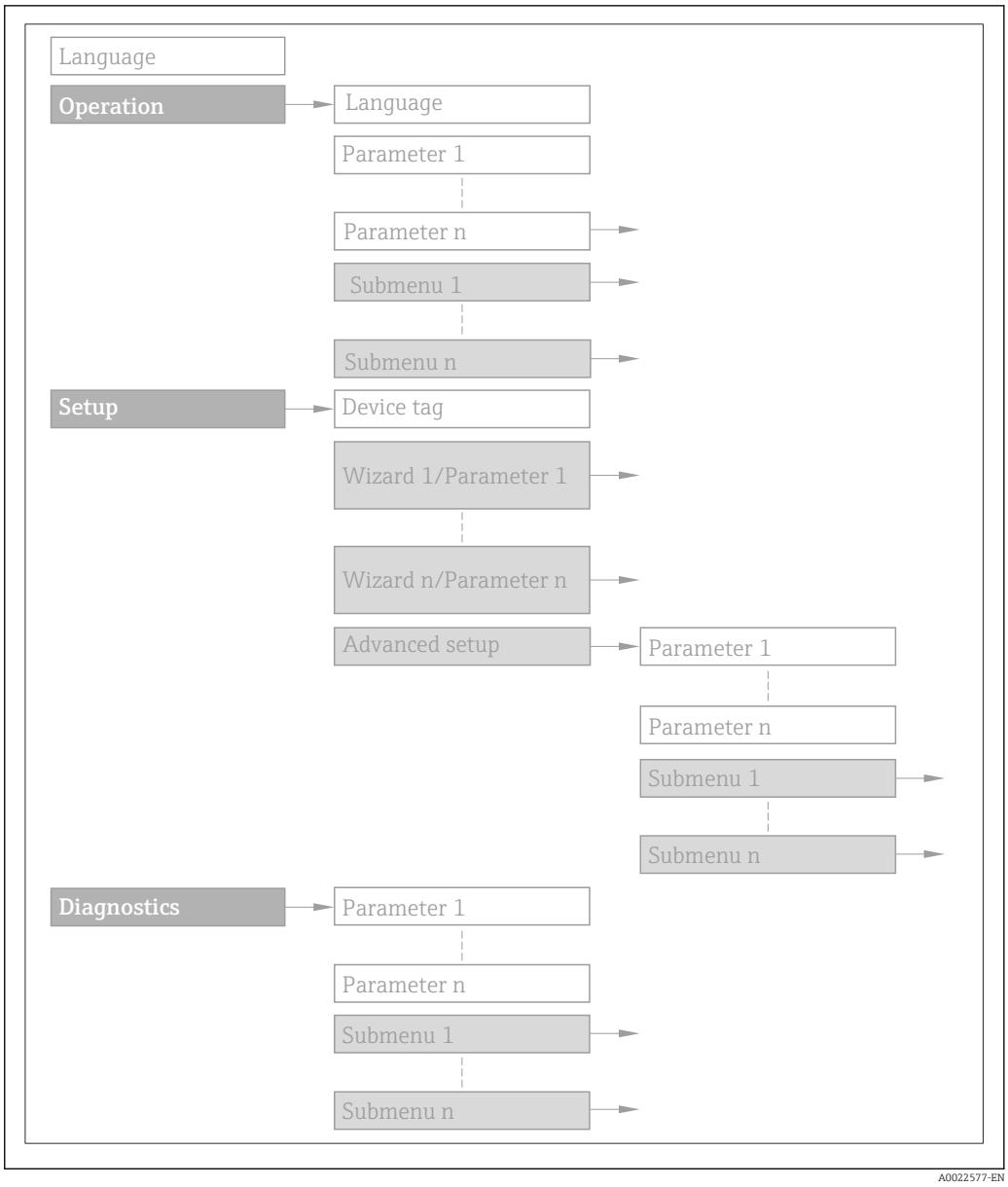
1.3.1 Information on the document structure

This document lists the submenus and their parameters according to the structure of the **Expert** menu (→ 🖹 7) menu that are available once the **"Operator" user role** or the **"Maintenance" user role** is enabled.



1 Sample graphic

For information on the arrangement of the parameters according to the structure of the **Operation** menu, **Setup** menu, **Diagnostics** menu (→ 🖹 81), along with a brief description, see the Operating Instructions for the device.



2 *Sample graphic*

For information about the operating philosophy, see the "Operating philosophy" chapter in the device's Operating Instructions

1.3.2 Structure of a parameter description

The individual parts of a parameter description are described in the following section:

Complete parameter name	Write-protected parameter =

Navigation — Navigation path to the parameter via the operating tool
The names of the menus, submenus and parameters are displayed in abbreviated format.

Prerequisite — The parameter is only available under these specific conditions

Description — Description of the parameter function

Selection — List of the individual options for the parameter
- Option 1
- Option 2

User entry — Input range for the parameter

User interface — Display value/data for the parameter

Factory setting — Default setting ex works

Additional information — Additional explanations (e.g. in examples):
- On individual options
- On display values/data
- On the input range
- On the factory setting
- On the parameter function

1.4 Symbols used

1.4.1 Symbols for certain types of information

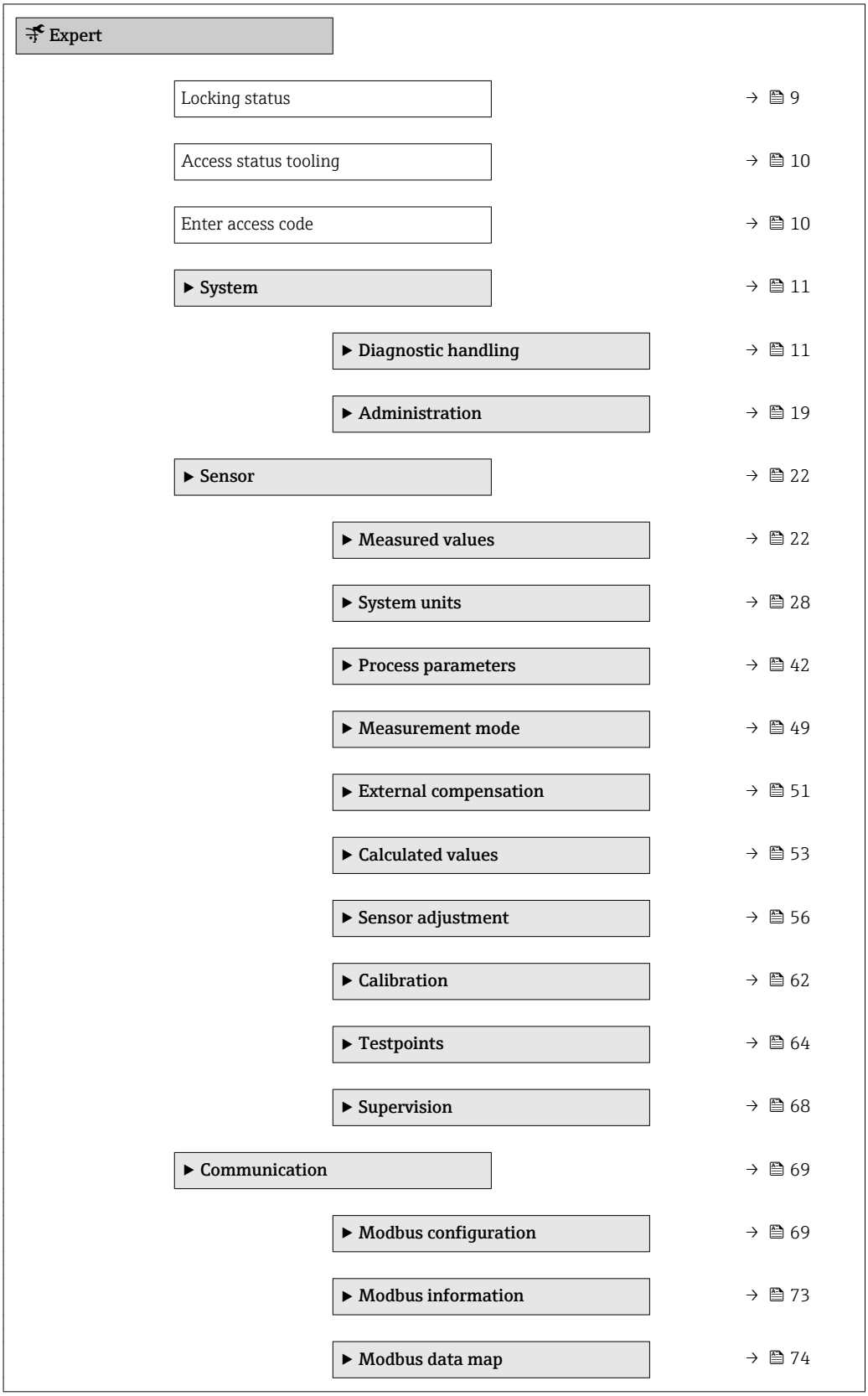
Symbol	Meaning
	Tip Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
	Operation via operating tool
	Write-protected parameter

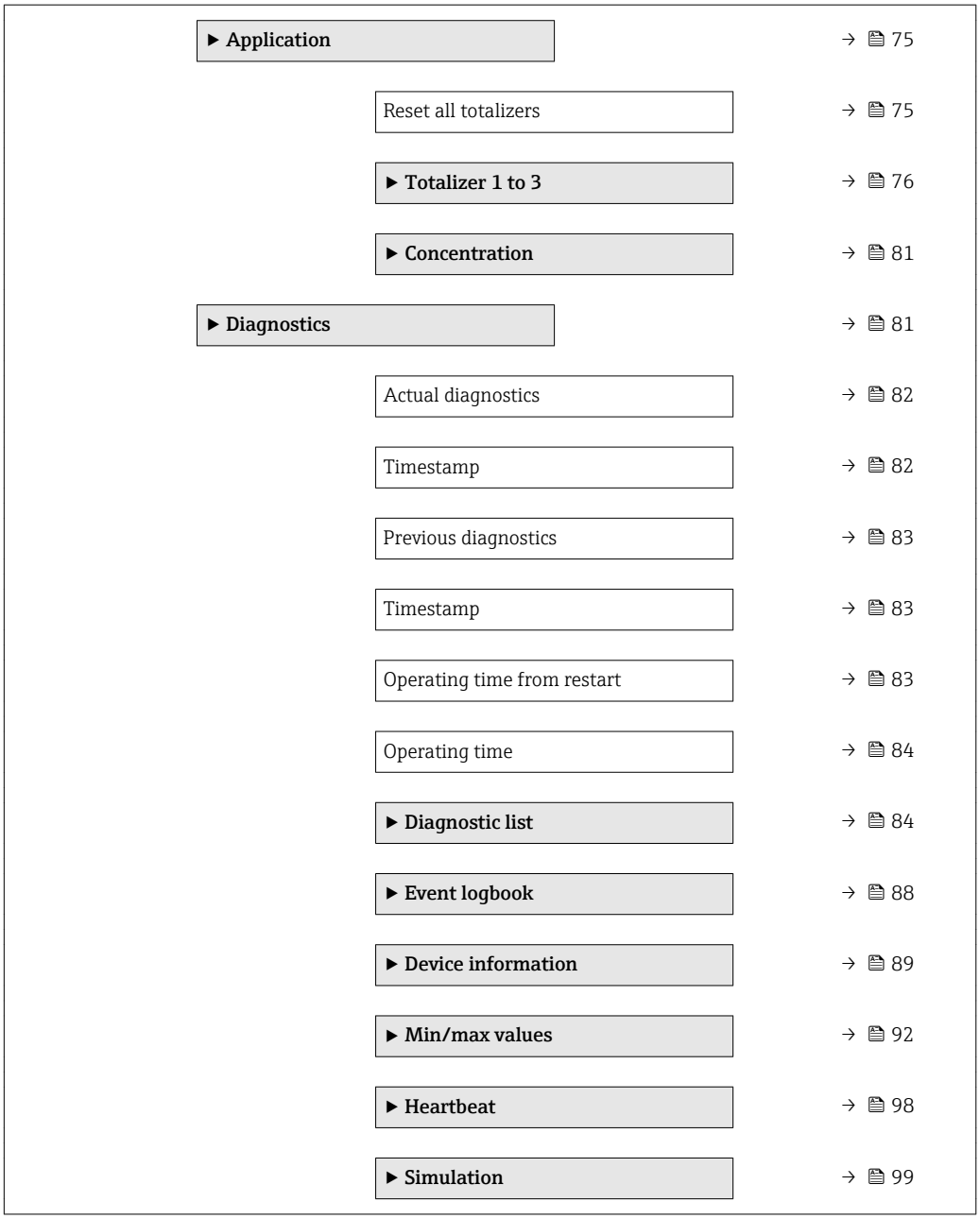
1.4.2 Symbols in graphics

Symbol	Meaning	Symbol	Meaning
1, 2, 3 ...	Item numbers	A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections		

2 Overview of the Expert operating menu

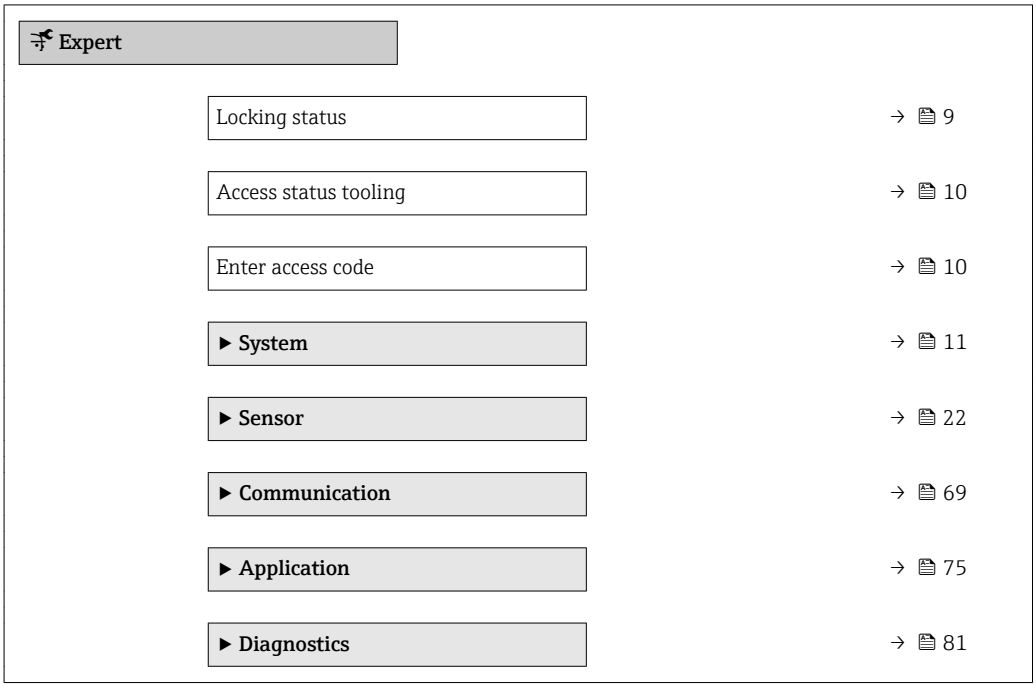
The following table provides an overview of the menu structure of the expert operating menu and its parameters. The page reference indicates where the associated description of the submenu or parameter can be found.




▶ Application → 75
Reset all totalizers → 75
▶ Totalizer 1 to 3 → 76
▶ Concentration → 81
▶ Diagnostics → 81
Actual diagnostics → 82
Timestamp → 82
Previous diagnostics → 83
Timestamp → 83
Operating time from restart → 83
Operating time → 84
▶ Diagnostic list → 84
▶ Event logbook → 88
▶ Device information → 89
▶ Min/max values → 92
▶ Heartbeat → 98
▶ Simulation → 99

3 Description of device parameters

In the following section, the parameters are listed according to the menu structure of the local display. Specific parameters for the operating tools are included at the appropriate points in the menu structure.



Locking status

Navigation Expert → Locking status

Description Use this function to view the active write protection.

User interface
- Hardware locked
- Temporarily locked

Additional information

User interface

In the operating tool all active types of write protection are selected.

If additional write protection is active, this restricts the current access authorization even further. The write protection status can be viewed via the **Locking status** parameter (→ 9).

"Hardware locked" option (priority 1)

The DIP switch for hardware locking is activated on the main electronics module. This locks write access to the parameters (e.g. via local display or operating tool).

Information on access authorization is provided in the "User roles and associated access authorization" and "Operating concept" sections of the Operations Instructions for the device.

"Temporarily locked" option (priority 2)

Write access to the parameters is temporarily locked on account of internal processes running in the device (e.g. data upload/download, reset etc.). Once the internal processing has been completed, the parameters can be changed once again.

Access status tooling

Navigation Expert → Access stat.tool

Description Use this function to view the access authorization to the parameters via the operating tool.

User interface

- Operator
- Maintenance

Factory setting Maintenance

Additional information

Description

The access authorization can be modified via the **Enter access code** parameter.

If additional write protection is active, this restricts the current access authorization even further. The write protection status can be viewed via the **Locking status** parameter (→ 9).

Display

Information on access authorization is provided in the "User roles and associated access authorization" and "Operating concept" sections of the Operations Instructions for the device.

Enter access code

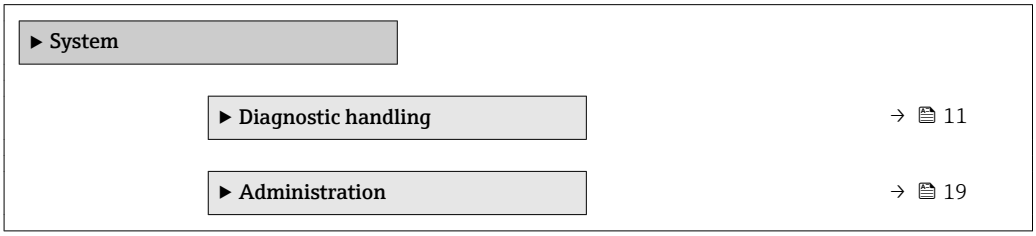
Navigation Expert → Ent. access code

Description Use this function to enter the user-specific release code to remove parameter write protection.

User entry 0 to 9 999

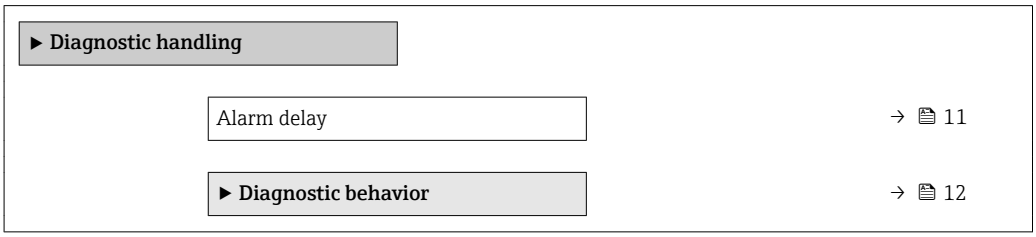
3.1 "System" submenu

Navigation Expert → System



3.1.1 "Diagnostic handling" submenu

Navigation Expert → System → Diagn. handling



Alarm delay

Navigation Expert → System → Diagn. handling → Alarm delay

Description Use this function to enter the time interval until the device generates a diagnostic message.

The diagnostic message is reset without a time delay.

User entry 0 to 60 s

Factory setting 0 s

Additional information *Effect*

This setting affects the following diagnostic messages:
- 046 Sensor limit exceeded
- 140 Sensor signal
- 144 Measuring error too high
- 190 Special event 1
- 191 Special event 5
- 192 Special event 9
- 830 Sensor temperature too high
- 831 Sensor temperature too low

- 832 Electronic temperature too high
- 833 Electronic temperature too low
- 834 Process temperature too high
- 835 Process temperature too low
- 843 Process limit
- 910 Tubes not oscillating
- 912 Medium inhomogeneous
- 913 Medium unsuitable
- 944 Monitoring failed
- 990 Special event 4
- 991 Special event 8
- 992 Special event 12

"Diagnostic behavior" submenu

Each item of diagnostic information is assigned a specific diagnostic behavior at the factory. The user can change this assignment for specific diagnostic information in the **Diagnostic behavior** submenu (→ 12).

The following options are available in the **Assign behavior of diagnostic no. xxx** parameters:

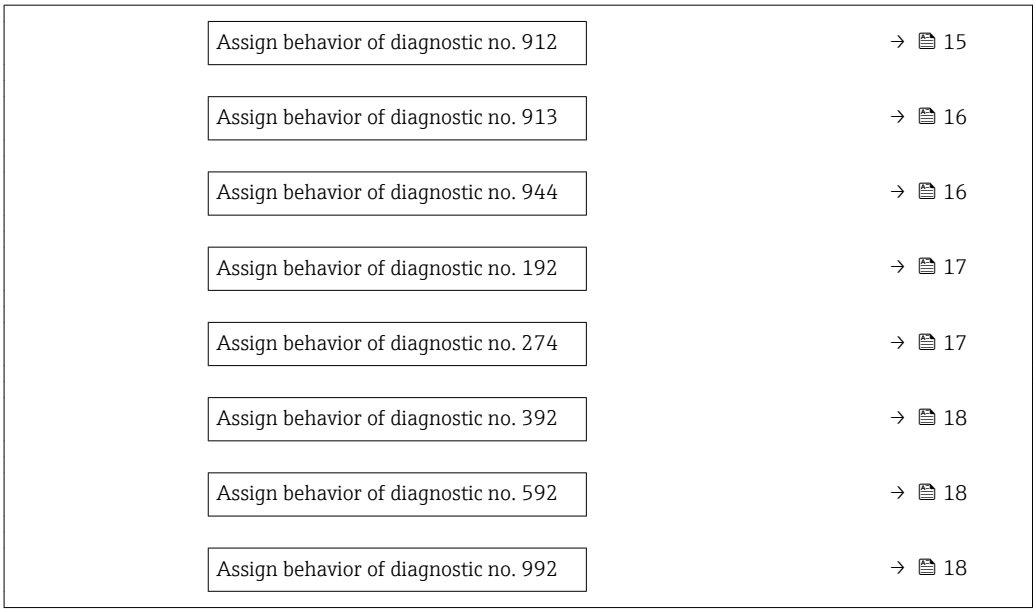
Options	Description
Alarm	The device stops measurement. The measured value output via Modbus RS485 and the totalizers assume the defined alarm condition. A diagnostic message is generated.
Warning	The device continues to measure. The measured value output via Modbus RS485 and the totalizers are not affected. A diagnostic message is generated.
Logbook entry only	The device continues to measure. The diagnostic message is entered only in the **Event logbook** submenu (→ 88).
Off	The diagnostic event is ignored, and no diagnostic message is generated or entered.

For a list of all the diagnostic events, see the Operating Instructions for the device.

Navigation Expert → System → Diagn. handling → Diagn. behavior

▶ **Diagnostic behavior**

Assign behavior of diagnostic no. 140	→ 13
Assign behavior of diagnostic no. 046	→ 13
Assign behavior of diagnostic no. 144	→ 14
Assign behavior of diagnostic no. 832	→ 14
Assign behavior of diagnostic no. 833	→ 14
Assign behavior of diagnostic no. 834	→ 15
Assign behavior of diagnostic no. 835	→ 15



Assign behavior of diagnostic no. 140 (Sensor signal)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 140

Description Use this function to change the diagnostic behavior of the diagnostic message **140 Sensor signal**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see

Assign behavior of diagnostic no. 046 (Sensor limit exceeded)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 046

Description Use this function to change the diagnostic behavior of the diagnostic message **046 Sensor limit exceeded**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see

Assign behavior of diagnostic no. 144 (Measuring error too high)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 144

Description Use this function to change the diagnostic behavior of the diagnostic message **144 Measuring error too high**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Alarm

Additional information For a detailed description of the options available, see

Assign behavior of diagnostic no. 832 (Electronic temperature too high)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 832

Description Use this function to change the diagnostic behavior of the diagnostic message **832 Electronic temperature too high**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see

Assign behavior of diagnostic no. 833 (Electronic temperature too low)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 833

Description Use this function to change the diagnostic behavior of the diagnostic message **833 Electronic temperature too low**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see

Assign behavior of diagnostic no. 834 (Process temperature too high)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 834

Description Use this function to change the diagnostic behavior of the diagnostic message **834 Process temperature too high**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see

Assign behavior of diagnostic no. 835 (Process temperature too low)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 835

Description Use this function to change the diagnostic behavior of the diagnostic message **835 Process temperature too low**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see

Assign behavior of diagnostic no. 912 (Medium inhomogeneous)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 912

Description Use this function to change the diagnostic behavior of the diagnostic message **912 Medium inhomogeneous**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see

Assign behavior of diagnostic no. 913 (Medium unsuitable)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 913

Description Use this function to change the diagnostic behavior of the diagnostic message **913 Medium unsuitable**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see

Assign behavior of diagnostic no. 944 (Monitoring failed)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 944

Description Use this function to change the diagnostic behavior of the diagnostic message **944 Monitoring failed**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see

Assign behavior of diagnostic no. 948 (Tube damping too high)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 948

Description Use this function to change the diagnostic behavior of the diagnostic message **948 Tube damping too high**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see

Assign behavior of diagnostic no. 192 (Special event 9)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 192

Description Use this function to change the diagnostic behavior of the diagnostic message **192 Special event 9**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see

Assign behavior of diagnostic no. 274 (Main electronic failure)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 274

Description Use this function to change the diagnostic behavior of the diagnostic message **274 Main electronic failure**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see

Assign behavior of diagnostic no. 392 (Special event 10)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 392

Description Use this function to change the diagnostic behavior of the diagnostic message **392 Special event 10**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see

Assign behavior of diagnostic no. 592 (Special event 11)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 592

Description Use this function to change the diagnostic behavior of the diagnostic message **592 Special event 11**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see

Assign behavior of diagnostic no. 992 (Special event 12)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 992

Description Use this function to change the diagnostic behavior of the diagnostic message **992 Special event 12**.

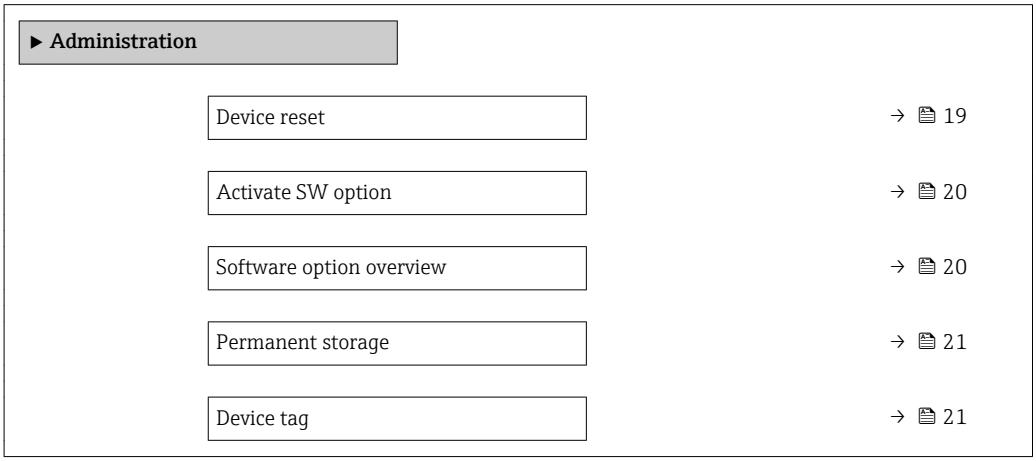
Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see

3.1.2 "Administration" submenu

Navigation Expert → System → Administration



Device reset

Navigation Expert → System → Administration → Device reset

Description Use this function to choose whether to reset the device configuration - either entirely or in part - to a defined state.

Selection
- Cancel
- To fieldbus defaults *
- To delivery settings
- Restart device

Factory setting Cancel

* Visibility depends on communication

Additional information

"Cancel" option

No action is executed and the user exits the parameter.

"To fieldbus defaults" option

Every parameter is reset to fieldbus default values.

"To delivery settings" option

Every parameter for which a customer-specific default setting was ordered is reset to this customer-specific value. All other parameters are reset to the factory setting.

This option is not visible if no customer-specific settings have been ordered.

"Restart device" option

The restart resets every parameter whose data are in the volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.

Activate SW option

Navigation Expert → System → Administration → Activate SW opt.

Description Use this function to enter an activation code to enable an additional, ordered software option.

User entry Max. 10-digit string consisting of numbers.

Factory setting 0

Additional information

User entry

Endress+Hauser provides the corresponding activation code for the software option with the order.

NOTICE! This activation code varies depending on the measuring device and the software option. If an incorrect or invalid code is entered, this can result in the loss of software options that are already been activated. After commissioning the measuring device: in this parameter only enter activation codes which Endress+Hauser has provided (e.g. when a new software option was ordered). If an incorrect or invalid activation code is entered, enter the activation code from the parameter protocol again and contact your Endress+Hauser sales organization, quoting the serial number of your device.

Example for a software option

Order code for "Application package", option EB "Heartbeat Verification + Monitoring"

Software option overview

Navigation Expert → System → Administration → SW option overv.

Description Displays all the software options that are enabled in the device.

User interface
- Heartbeat Verification
- Heartbeat Monitoring
- Concentration

Additional information

Description

Displays all the options that are available if ordered by the customer.

"Heartbeat Verification" option and "Heartbeat Monitoring" option

Order code for "Application package", option EB "Heartbeat Verification + Monitoring"

"Concentration" option

Order code for "Application package", option ED "Concentration" and option EF "Special density + concentration"

Permanent storage

Navigation Expert → System → Administration → Perm. storage

Description Use this function to switch permanent storage on and off.

Selection
- Off
- On

Factory setting On

Additional information

Description

NOTE!

If non-volatile device parameters are modified via the MODBUS RS485 function codes 06, 16 or 23, the change is saved in the EEPROM of the measuring device.

The number of writes to the EEPROM is technically restricted to a maximum of 1 million.

▸ Make sure to comply with this limit since, if it is exceeded, data loss and measuring device failure will result.

▸ Avoid constantly writing non-volatile device parameters via the MODBUS RS485.

Device tag

Navigation Expert → System → Administration → Device tag

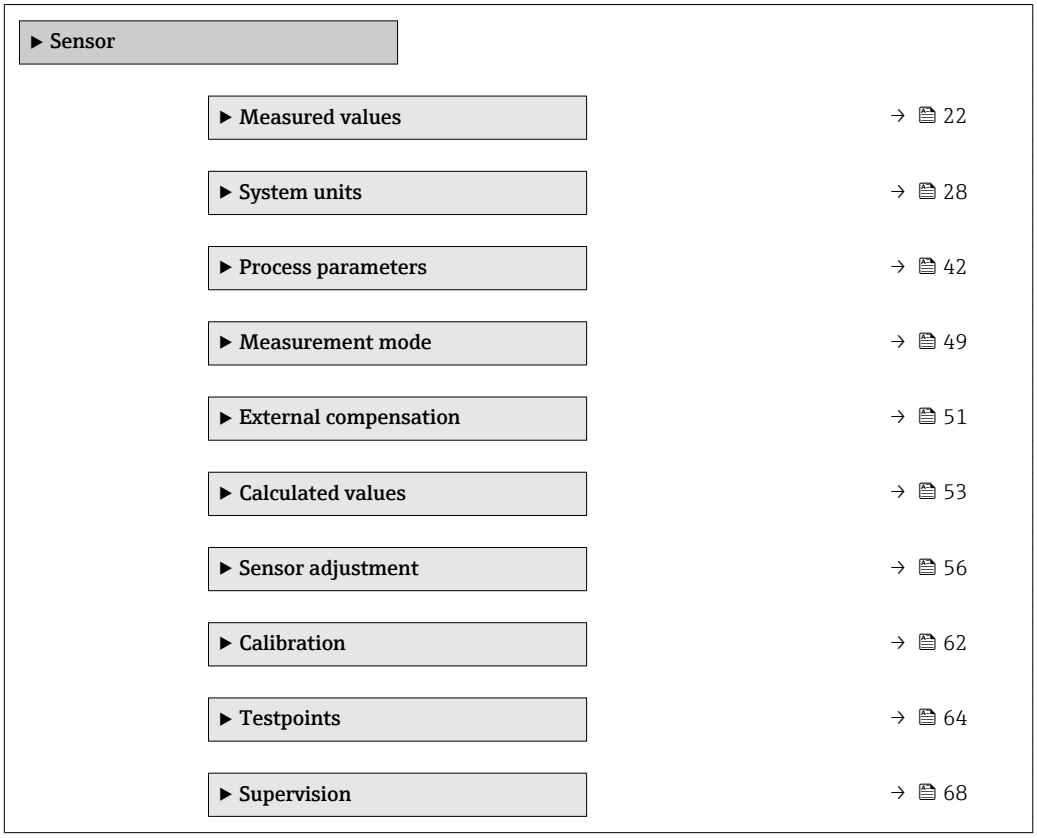
Description Use this function to enter the name for the measuring point.

User entry Max. 32 characters such as letters, numbers or special characters (e.g. @, %, /).

Factory setting Cubemass

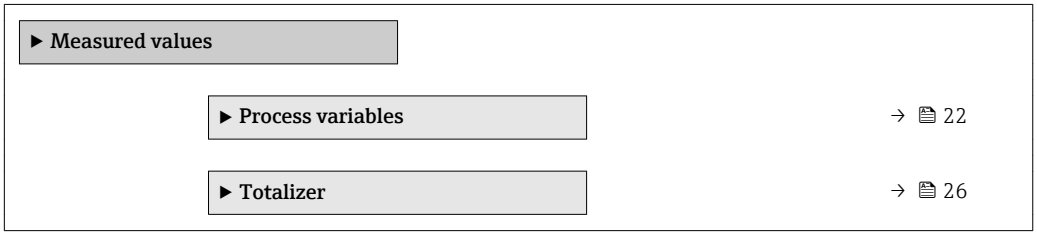
3.2 "Sensor" submenu

Navigation Expert → Sensor



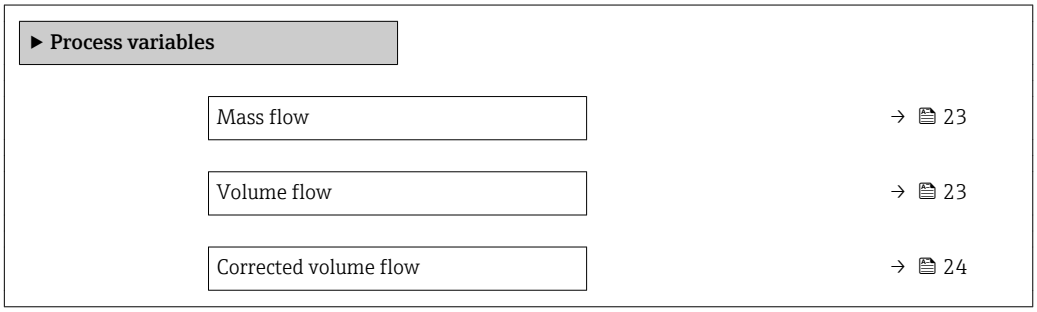
3.2.1 "Measured values" submenu

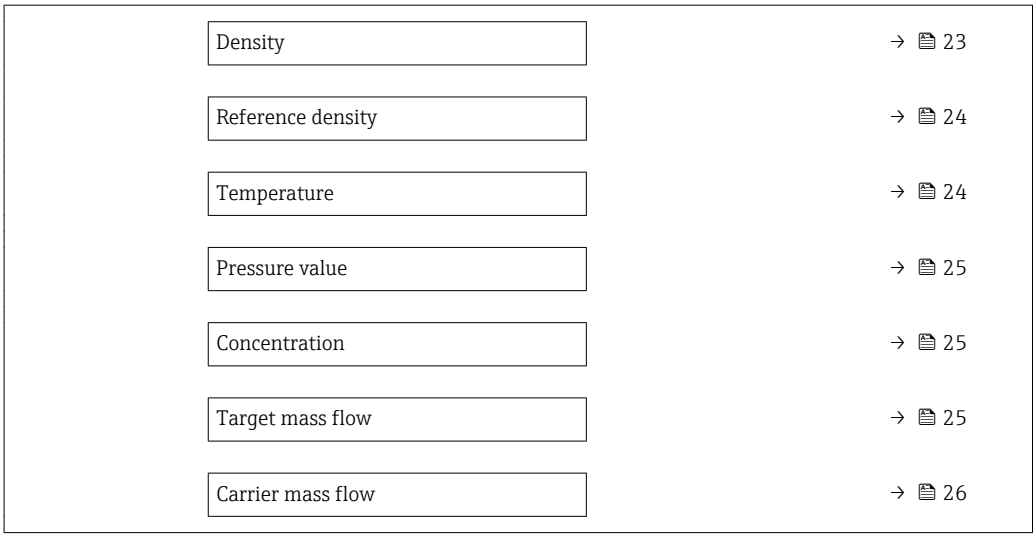
Navigation Expert → Sensor → Measured val.



"Process variables" submenu

Navigation Expert → Sensor → Measured val. → Process variab.





Mass flow

Navigation Expert → Sensor → Measured val. → Process variab. → Mass flow

Description Displays the mass flow that is currently measured.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Mass flow unit** parameter (→ 29)

Volume flow

Navigation Expert → Sensor → Measured val. → Process variab. → Volume flow

Description Displays the volume flow currently calculated.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Volume flow unit** parameter (→ 30)

Density

Navigation Expert → Sensor → Measured val. → Process variab. → Density

Description Displays the density currently measured.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Density unit** parameter (→ 34)

Corrected volume flow

Navigation Expert → Sensor → Measured val. → Process variab. → Correct.vol.flow

Description Displays the corrected volume flow currently measured.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Corrected volume flow unit** parameter (→ 32)

Reference density

Navigation Expert → Sensor → Measured val. → Process variab. → Ref.density

Description Displays the reference density currently calculated.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Reference density unit** parameter (→ 35)

Temperature

Navigation Expert → Sensor → Measured val. → Process variab. → Temperature

Description Displays the medium temperature currently measured.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 35)

Pressure value

Navigation Expert → Sensor → Measured val. → Process variab. → Pressure value

Description Displays the fixed or external pressure value.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Pressure unit** parameter (→ 36)

Concentration

Navigation Expert → Sensor → Measured val. → Process variab. → Concentration

Prerequisite For the following order code:
"Application package", option ED "Concentration"

The software options currently enabled are displayed in the **Software option overview** parameter (→ 20).

Description Displays the concentration currently calculated.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Concentration unit** parameter.

Target mass flow

Navigation Expert → Sensor → Measured val. → Process variab. → Target mass flow

Prerequisite With the following conditions:
- Order code for "Application package", option ED "Concentration"
- The **WT-%** option or the **User conc.** option is selected in the **Concentration unit** parameter.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 20).

Description Displays the mass flow currently measured for the target medium.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Mass flow unit** parameter (→ 29)

Carrier mass flow

Navigation Expert → Sensor → Measured val. → Process variab. → Carrier mass fl.

Prerequisite

With the following conditions:
- Order code for "Application package", option ED "Concentration"
- The **WT-%** option or the **User conc.** option is selected in the **Concentration unit** parameter.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 20).

Description

Displays the mass flow currently measured for the carrier medium.

User interface

Signed floating-point number

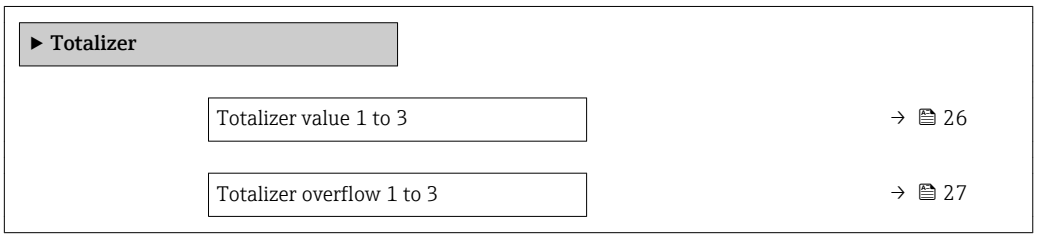
Additional information

Dependency

The unit is taken from the **Mass flow unit** parameter (→ 29)

"Totalizer" submenu

Navigation Expert → Sensor → Measured val. → Totalizer



Totalizer value 1 to 3

Navigation Expert → Sensor → Measured val. → Totalizer → Totalizer val. 1 to 3

Prerequisite

One of the following options is selected in the **Assign process variable** parameter (→ 76) of the **Totalizer 1 to 3** submenu:
- Volume flow
- Mass flow
- Corrected volume flow
- Target mass flow **
- Carrier mass flow **

Description

Displays the current totalizer reading.

User interface

Signed floating-point number

** Visibility depends on order options or device settings

Additional information

Description

As it is only possible to display a maximum of 7 digits, the current counter value is the sum of the totalizer value and the overflow value from the **Totalizer overflow 1 to 3** parameter if the display range is exceeded.

In the event of an error, the totalizer adopts the mode defined in the **Failure mode** parameter (→ 80).

User interface

The value of the process variable totalized since measuring began can be positive or negative. This depends on the settings in the **Totalizer operation mode** parameter (→ 78).

The unit of the selected process variable is specified for the totalizer depending on the selection made in the **Assign process variable** parameter (→ 76):
- **Volume flow** option: **Volume flow unit** parameter (→ 30)
- **Mass flow** option, **Target mass flow** option, **Carrier mass flow** option: **Mass flow unit** parameter (→ 29)
- **Corrected volume flow** option: **Corrected volume unit** parameter (→ 78)

Example

Calculation of the current totalizer reading when the value exceeds the 7-digit display range:
- Value in the **Totalizer value 1** parameter: 196 845.7 m^3
- Value in the **Totalizer overflow 1** parameter: $1 \cdot 10^7$ (1 overflow) = 10 000 000 [m^3]
- Current totalizer reading: 10 196 845.7 m^3

Totalizer overflow 1 to 3

Navigation Expert → Sensor → Measured val. → Totalizer → Tot. overflow 1 to 3

Prerequisite

One of the following options is selected in the **Assign process variable** parameter (→ 76) of the **Totalizer 1 to 3** submenu:
- Volume flow
- Mass flow
- Corrected volume flow
- Target mass flow **
- Carrier mass flow **

Description Displays the current totalizer overflow.

User interface Integer with sign

Additional information

Description

If the current totalizer reading has more than 7 digits, which is the maximum value range that can be displayed, the value above this range is output as an overflow. The current

** Visibility depends on order options or device settings

totalizer value is therefore the sum of the overflow value and the totalizer value from the **Totalizer value 1 to 3** parameter.

User interface

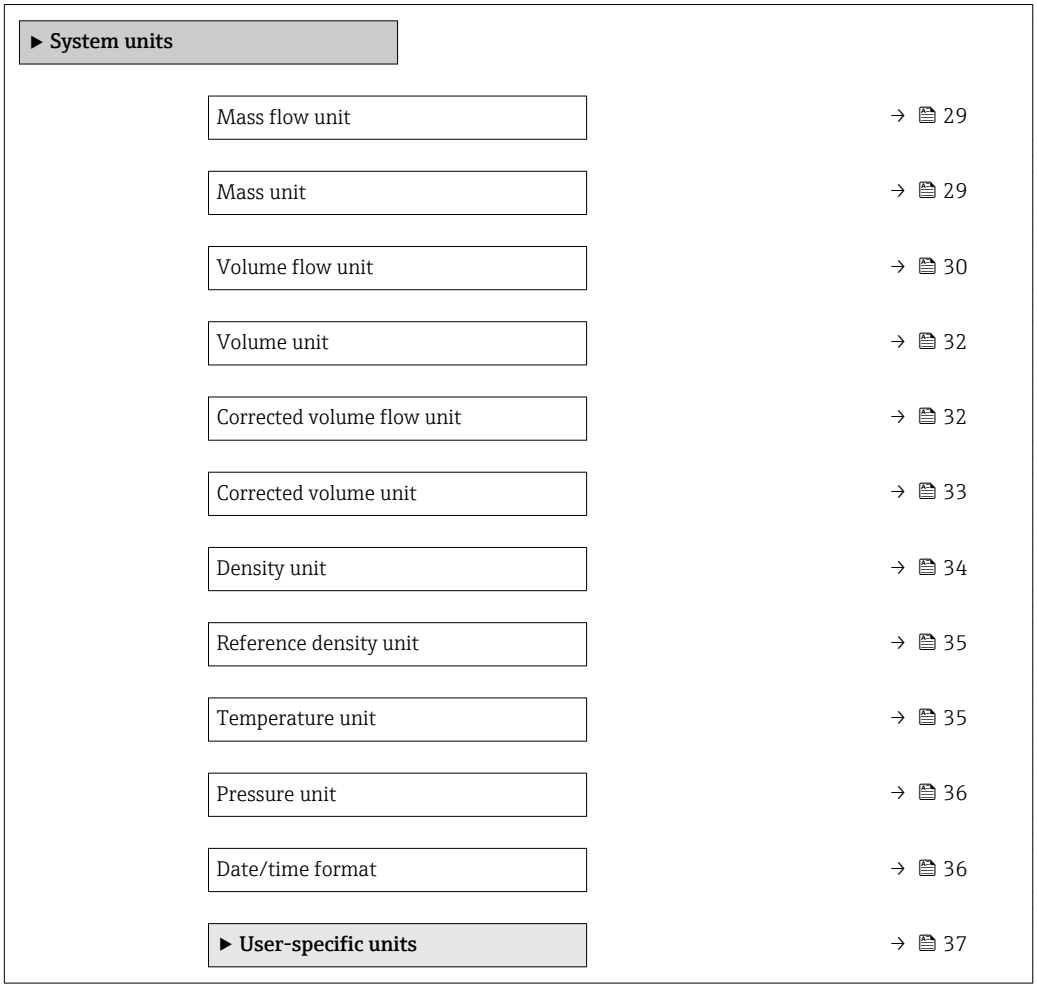
The unit of the selected process variable is specified for the totalizer depending on the selection made in the **Assign process variable** parameter (→ 76):
- **Volume flow** option: **Volume flow unit** parameter (→ 30)
- **Mass flow** option, **Target mass flow** option, **Carrier mass flow** option: **Mass flow unit** parameter (→ 29)
- **Corrected volume flow** option: **Corrected volume unit** parameter (→ 78)

Example

Calculation of the current totalizer reading when the value exceeds the 7-digit display range:
- Value in the **Totalizer value 1** parameter: 196 845.7 m^3
- Value in the **Totalizer overflow 1** parameter: $2 \cdot 10^7$ (2 overflows) = 20 000 000 [m^3]
- Current totalizer reading: 20 196 845.7 m^3

3.2.2 "System units" submenu

Navigation Expert → Sensor → System units



Mass flow unit

Navigation Expert → Sensor → System units → Mass flow unit

Description Use this function to select the unit for the mass flow.

Selection

SI units
- g/s
- g/min
- g/h
- g/d
- kg/s
- kg/min
- kg/h
- kg/d
- t/s
- t/min
- t/h
- t/d

US units
- oz/s
- oz/min
- oz/h
- oz/d
- lb/s
- lb/min
- lb/h
- lb/d
- STon/s
- STon/min
- STon/h
- STon/d

Custom-specific units
- User mass/s
- User mass/min
- User mass/h
- User mass/d

Factory setting Country-specific:
- kg/h
- lb/min

Additional information

Result

The selected unit applies for:
Mass flow parameter (→ 23)

Selection

For an explanation of the abbreviated units: → 104

Customer-specific units

The unit for the customer-specific mass is specified in the **User mass text** parameter (→ 37).

Mass unit

Navigation Expert → Sensor → System units → Mass unit

Description Use this function to select the unit for the mass.

Selection

SI units
- g
- kg
- t

US units
- oz
- lb
- STon

Custom-specific units
User mass

Factory setting

Country-specific:
- kg
- lb

Additional information

Selection

For an explanation of the abbreviated units: → 104

Customer-specific units

The unit for the customer-specific mass is specified in the **User mass text** parameter (→ 37).

Volume flow unit

Navigation

Expert → Sensor → System units → Volume flow unit

Description

Use this function to select the unit for the volume flow.

Selection

SI units
- cm^3/s
- cm^3/min
- cm^3/h
- cm^3/d
- dm^3/s
- dm^3/min
- dm^3/h
- dm^3/d
- m^3/s
- m^3/min
- m^3/h
- m^3/d
- ml/s
- ml/min
- ml/h
- ml/d
- l/s
- l/min
- l/h
- l/d
- hl/s
- hl/min
- hl/h
- hl/d
- Ml/s
- Ml/min
- Ml/h
- Ml/d

US units
- af/s
- af/min
- af/h
- af/d
- ft^3/s
- ft^3/min
- ft^3/h
- ft^3/d
- fl oz/s (us)
- fl oz/min (us)
- fl oz/h (us)
- fl oz/d (us)
- gal/s (us)
- gal/min (us)
- gal/h (us)
- gal/d (us)
- kgal/s (us)
- kgal/min (us)
- kgal/h (us)
- kgal/d (us)
- Mgal/s (us)
- Mgal/min (us)
- Mgal/h (us)
- Mgal/d (us)
- bbl/s (us;liq.)
- bbl/min (us;liq.)
- bbl/h (us;liq.)
- bbl/d (us;liq.)
- bbl/s (us;beer)
- bbl/min (us;beer)
- bbl/h (us;beer)
- bbl/d (us;beer)
- bbl/s (us;oil)
- bbl/min (us;oil)
- bbl/h (us;oil)
- bbl/d (us;oil)
- bbl/s (us;tank)
- bbl/min (us;tank)
- bbl/h (us;tank)
- bbl/d (us;tank)

Imperial units
- gal/s (imp)
- gal/min (imp)
- gal/h (imp)
- gal/d (imp)
- Mgal/s (imp)
- Mgal/min (imp)
- Mgal/h (imp)
- Mgal/d (imp)
- bbl/s (imp;beer)
- bbl/min (imp;beer)
- bbl/h (imp;beer)
- bbl/d (imp;beer)
- bbl/s (imp;oil)
- bbl/min (imp;oil)
- bbl/h (imp;oil)
- bbl/d (imp;oil)

Custom-specific units
- User vol./s
- User vol./min
- User vol./h
- User vol./d

Factory setting

Country-specific:
- l/h
- gal/min (us)

Additional information

Result

The selected unit applies for:
Volume flow parameter (→ 23)

Selection

For an explanation of the abbreviated units: → 104

Customer-specific units

The unit for the customer-specific volume is specified in the **User volume text** parameter (→ 38).

Volume unit

Navigation Expert → Sensor → System units → Volume unit

Description Use this function to select the unit for the volume.

Selection

SI units
- cm^3
- dm^3
- m^3
- ml
- l
- hl
- Ml Mega

US units
- af
- ft^3
- fl oz (us)
- gal (us)
- kgal (us)
- Mgal (us)
- bbl (us;oil)
- bbl (us;liq.)
- bbl (us;beer)
- bbl (us;tank)

Imperial units
- gal (imp)
- Mgal (imp)
- bbl (imp;beer)
- bbl (imp;oil)

Custom-specific units
User vol.

Factory setting

Country-specific:
- l
- gal (us)

Additional information

Selection

For an explanation of the abbreviated units: → 104

Customer-specific units

The unit for the customer-specific volume is specified in the **User volume text** parameter (→ 38).

Corrected volume flow unit

Navigation Expert → Sensor → System units → Cor.volflow unit

Description Use this function to select the unit for the corrected volume flow.

Selection

SI units
- Nl/s
- Nl/min
- Nl/h
- Nl/d
- Nm^3/s
- Nm^3/min
- Nm^3/h
- Nm^3/d
- Sm^3/s
- Sm^3/min
- Sm^3/h
- Sm^3/d

US units
- Sft^3/s
- Sft^3/min
- Sft^3/h
- Sft^3/d
- Sgal/s (us)
- Sgal/min (us)
- Sgal/h (us)
- Sgal/d (us)
- Sbbl/s (us;liq.)
- Sbbl/min (us;liq.)
- Sbbl/h (us;liq.)
- Sbbl/d (us;liq.)
- Sgal/s (imp)
- Sgal/min (imp)
- Sgal/h (imp)
- Sgal/d (imp)

Custom-specific units
- UserCrVol./s
- UserCrVol./min
- UserCrVol./h
- UserCrVol./d

Factory setting

Country-specific:
- Nl/h
- Sft^3/min

Additional information

Result

The selected unit applies for:
Corrected volume flow parameter (→ 24)

Selection

For an explanation of the abbreviated units: → 104

Corrected volume unit

Navigation

Expert → Sensor → System units → Corr. vol. unit

Description

Use this function to select the unit for the corrected volume.

Selection

SI units
- Nl
- Nm^3
- Sl
- Sm^3

US units
- Sft^3
- Sgal (us)
- Sbbl (us;liq.)

Imperial units
Sgal (imp)

Custom-specific units
UserCrVol.

Factory setting

Country-specific:
- Nl
- Sft^3

Additional information *Selection*

For an explanation of the abbreviated units: → 104

Density unit

Navigation Expert → Sensor → System units → Density unit

Description Use this function to select the unit for the density.

Selection

SI units
- g/cm³
- g/m³
- g/ml
- kg/dm³
- kg/l
- kg/m³
- SD4°C
- SD15°C
- SD20°C
- SG4°C
- SG15°C
- SG20°C

US units
- lb/ft³
- lb/gal (us)
- lb/bbl (us;liq.)
- lb/bbl (us;beer)
- lb/bbl (us;oil)
- lb/bbl (us;tank)

Imperial units
- lb/gal (imp)
- lb/bbl (imp;beer)
- lb/bbl (imp;oil)

Custom-specific units
User dens.

Factory setting Country-specific:
- kg/l
- lb/ft³

Additional information *Result*

The selected unit applies for:
Density parameter (→ 23)

Selection

- SD = specific density
  The specific density is the ratio of the fluid density to the water density at a water temperature of +4 °C (+39 °F), +15 °C (+59 °F), +20 °C (+68 °F).
- SG = specific gravity
  The specific gravity is the ratio of the fluid density to the water density at a water temperature of +4 °C (+39 °F), +15 °C (+59 °F), +20 °C (+68 °F).

For an explanation of the abbreviated units: → 104

Customer-specific units

The unit for the customer-specific density is specified in the **User density text** parameter (→ 40).

Reference density unit

Navigation Expert → Sensor → System units → Ref. dens. unit

Description Use this function to select the unit for the reference density.

Selection

SI units
- kg/Nm³
- kg/Nl
- g/Scm³
- kg/Sm³

US units
- lb/Sft³

Factory setting Country-dependent
- kg/Nl
- lb/Sft³

Additional information

Result

The selected unit applies for:
- **External reference density** parameter (→ 54)
- **Fixed reference density** parameter (→ 54)
- **Reference density** parameter (→ 24)

Selection

For an explanation of the abbreviated units: → 104

Temperature unit

Navigation Expert → Sensor → System units → Temperature unit

Description Use this function to select the unit for the temperature.

Selection

SI units
- °C
- K

US units
- °F
- °R

Factory setting Country-specific:
- °C
- °F

Additional information

Result

The selected unit applies for:
- **Maximum value** parameter (→ 94)
- **Minimum value** parameter (→ 93)
- **Maximum value** parameter (→ 94)
- **Minimum value** parameter (→ 94)
- **Maximum value** parameter (→ 95)
- **Minimum value** parameter (→ 95)

- **External temperature** parameter (→ 53)
- **Reference temperature** parameter (→ 55)
- **Temperature** parameter (→ 24)

Selection

For an explanation of the abbreviated units: → 104

Pressure unit

Navigation Expert → Sensor → System units → Pressure unit

Description Use this function to select the unit for the pipe pressure.

Selection

SI units
- Pa a
- kPa a
- MPa a
- bar
- Pa g
- kPa g
- MPa g
- bar g

US units
- psi a
- psi g

Custom-specific units
User pres.

Factory setting
Country-specific:
- bar a
- psi a

Additional information

Result

The unit is taken from:
- **Pressure value** parameter (→ 25)
- **External pressure** parameter (→ 52)
- **Pressure value** parameter (→ 52)

Selection

For an explanation of the abbreviated units: → 104

Date/time format

Navigation Expert → Sensor → System units → Date/time format

Description Use this function to select the desired time format for calibration history.

Selection
- dd.mm.yy hh:mm
- dd.mm.yy hh:mm am/pm
- mm/dd/yy hh:mm
- mm/dd/yy hh:mm am/pm

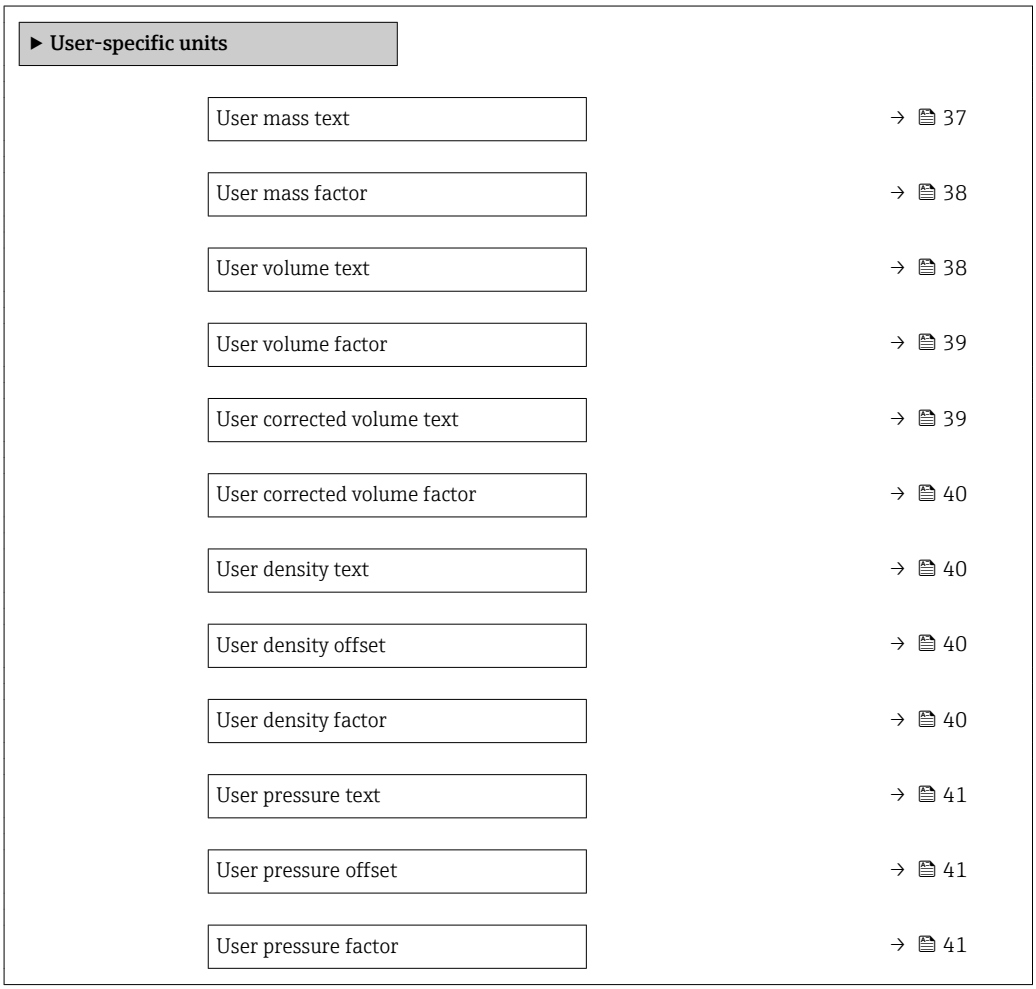
Factory setting dd.mm.yy hh:mm

Additional information *Selection*

For an explanation of the abbreviated units: → 104

"User-specific units" submenu

Navigation Expert → Sensor → System units → User-spec. units



User mass text

Navigation Expert → Sensor → System units → User-spec. units → Mass text

Description Use this function to enter a text for the user-specific unit of mass and mass flow. The corresponding time units (s, min, h, d) for mass flow are generated automatically.

User entry Max. 10 characters such as letters, numbers or special characters (@, %, /)

Factory setting User mass

Additional information *Result*

The defined unit is shown as an option in the choose list of the following parameters:
- **Mass flow unit** parameter (→ 29)
- **Mass unit** parameter (→ 29)

Example

If the text CENT for "centner" is entered, the following options are displayed in the picklist for the **Mass flow unit** parameter (→ 29):
- CENT/s
- CENT/min
- CENT/h
- CENT/d

User mass factor

Navigation Expert → Sensor → System units → User-spec. units → Mass factor

Description Use this function to enter a quantity factor (without time) for the user-specific mass and mass flow unit.

User entry Signed floating-point number

Factory setting 1.0

Additional information *Example*

Mass of 1 Zentner = 50 kg → 0.02 Zentner = 1 kg → entry: 0.02

User volume text

Navigation Expert → Sensor → System units → User-spec. units → Volume text

Description Use this function to enter a text for the user-specific unit of volume and volume flow. The corresponding time units (s, min, h, d) for volume flow are generated automatically.

User entry Max. 10 characters such as letters, numbers or special characters (@, %, /)

Factory setting User vol.

Additional information *Result*

The defined unit is shown as an option in the choose list of the following parameters:
- **Volume flow unit** parameter (→ 30)
- **Volume unit** parameter (→ 32)

Example

If the text GLAS is entered, the choose list of the **Volume flow unit** parameter (→ 30) shows the following options:
- GLAS/s
- GLAS/min
- GLAS/h
- GLAS/d

User volume factor

Navigation Expert → Sensor → System units → User-spec. units → Volume factor

Description Use this function to enter a quantity factor (without time) for the user-specific volume and volume flow unit.

User entry Signed floating-point number

Factory setting 1.0

User corrected volume text

Navigation Expert → Sensor → System units → User-spec. units → Corr. vol. text

Description Use this function to enter a text for the user-specific unit of the corrected volume and corrected volume flow. The corresponding time units (s, min, h, d) for mass flow are generated automatically.

User entry Max. 10 characters such as letters, numbers or special characters (@, %, /)

Factory setting UserCrVol.

Additional information *Result*

The defined unit is shown as an option in the choose list of the following parameters:
- **Corrected volume flow unit** parameter (→ 32)
- **Corrected volume unit** parameter (→ 33)

Example

If the text GLAS is entered, the choose list of the **Corrected volume flow unit** parameter (→ 32) shows the following options:
- GLAS/s
- GLAS/min
- GLAS/h
- GLAS/d

User corrected volume factor

Navigation Expert → Sensor → System units → User-spec. units → Cor.vol. factor

Description Use this function to enter a quantity factor (without time) for the user-specific corrected volume unit and corrected volume flow unit.

User entry Signed floating-point number

Factory setting 1.0

User density text

Navigation Expert → Sensor → System units → User-spec. units → Density text

Description Use this function to enter a text or the user-specific unit of density.

User entry Max. 10 characters such as letters, numbers or special characters (@, %, /)

Factory setting User dens.

Additional information *Result*

The defined unit is shown as an option in the choose list of the **Density unit** parameter (→ 34).

Example

Enter text “CE_L” for centners per liter

User density offset

Navigation Expert → Sensor → System units → User-spec. units → Density offset

Description Use this function to enter the zero point shift for the user-specific density unit.

Value in user-specific unit = (factor × value in base unit) + offset

User entry Signed floating-point number

Factory setting 0

User density factor

Navigation Expert → Sensor → System units → User-spec. units → Density factor

Description Use this function to enter a quantity factor for the user-specific density unit.

User entry Signed floating-point number

Factory setting 1.0

User pressure text

Navigation Expert → Sensor → System units → User-spec. units → Pressure text

Description Use this function to enter a text for the user-specific pressure unit.

User entry Max. 10 characters such as letters, numbers or special characters (@, %, /)

Factory setting User pres.

Additional information *Result*

The defined unit is shown as an option in the choose list of the **Pressure unit** parameter (→ 36).

User pressure offset

Navigation Expert → Sensor → System units → User-spec. units → Pressure offset

Description Use this function to enter the offset for adapting the user-specific pressure unit.

User entry Signed floating-point number

Factory setting 0

User pressure factor

Navigation Expert → Sensor → System units → User-spec. units → Pressure factor

Description Use this function to enter a quantity factor for the user-specific pressure unit.

User entry Signed floating-point number

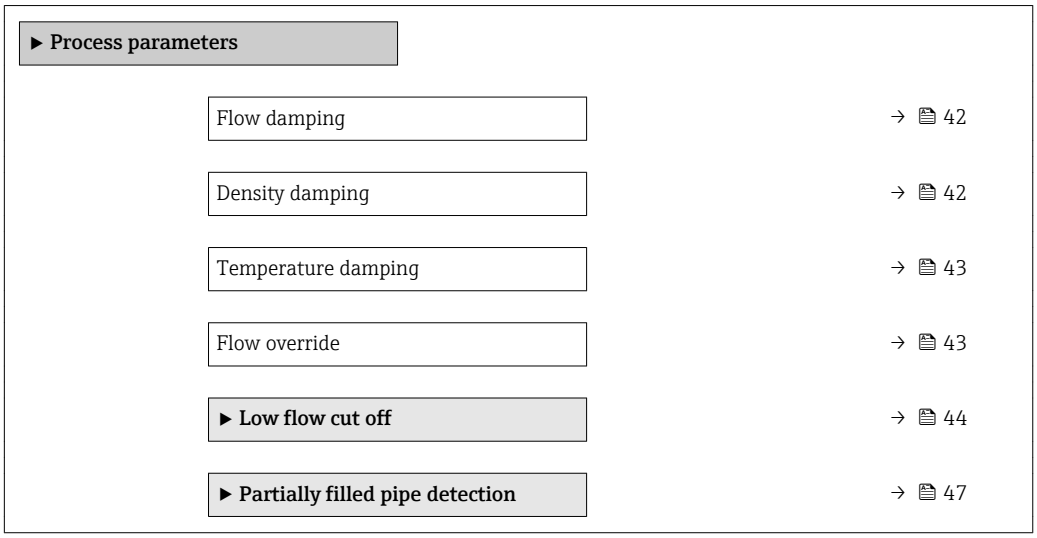
Factory setting 1.0

Additional information *Example*

1 Dyn/cm² = 0.1 Pa → 10 Dyn/cm² = 1 Pa → user entry: 10

3.2.3 "Process parameters" submenu

Navigation Expert → Sensor → Process param.



Flow damping

Navigation Expert → Sensor → Process param. → Flow damping

Description Use this function to enter a time constant for flow damping. Reduction of the variability of the flow measured value (in relation to interference). For this purpose, the depth of the flow filter is adjusted: when the filter setting increases, the reaction time of the device also increases.

User entry 0 to 100.0 s

Factory setting 0 s

Additional information *User entry*

- Value = 0: no damping
- Value > 0: damping is increased

Effect

The damping affects the following variables of the device:
- Outputs
- Low flow cut off → 44
- Totalizers

Density damping

Navigation Expert → Sensor → Process param. → Density damping

Description Use this function to enter the time constant for the damping of the density measured value.

User entry 0 to 999.9 s

Factory setting 0 s

Temperature damping

Navigation Expert → Sensor → Process param. → Temp. damping

Description Use this function to enter a time constant for the damping of the temperature measured value.

User entry 0 to 999.9 s

Factory setting 0 s

Flow override

Navigation Expert → Sensor → Process param. → Flow override

Description Use this function to select whether to interrupt the evaluation of measured values. This is useful for the cleaning processes of a pipeline, for example.

Selection
- Off
- On

Factory setting Off

Additional information

Result

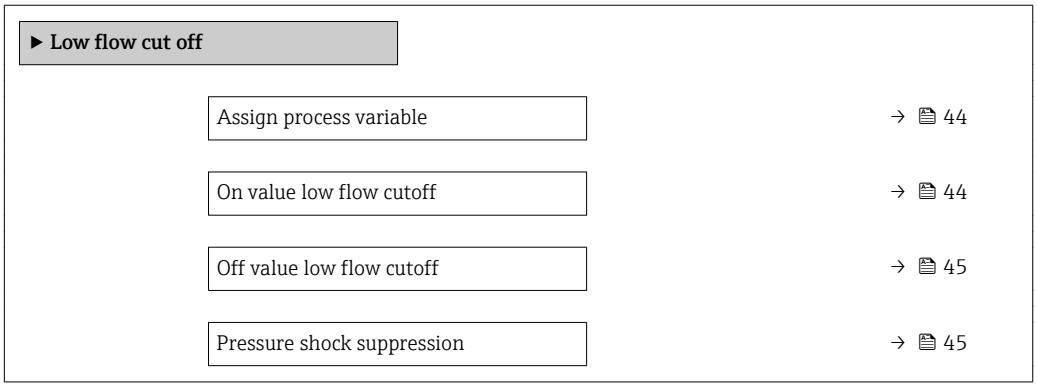
This setting affects all the functions and outputs of the measuring device.

Description

Flow override is active
- The diagnostic message diagnostic message ⚠**C453 Flow override** is displayed.
- Output values
  - Output: Value at zero flow
  - Temperature: proceeding output
  - Totalizers 1-3: Stop being totalized

"Low flow cut off" submenu

Navigation Expert → Sensor → Process param. → Low flow cut off



Assign process variable

Navigation Expert → Sensor → Process param. → Low flow cut off → Assign variable

Description Use this function to select the process variable for low flow cutoff detection.

Selection
- Off
- Mass flow
- Volume flow
- Corrected volume flow

Factory setting Mass flow

On value low flow cutoff

Navigation Expert → Sensor → Process param. → Low flow cut off → On value

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 44):
- Mass flow
- Volume flow
- Corrected volume flow

Description Use this function to enter a switch-on value for low flow cut off. Low flow cut off is activated if the value entered is not equal to 0 → 45.

User entry Positive floating-point number

Factory setting Depends on country and nominal diameter → 101

Additional information *Dependency*

The unit depends on the process variable selected in the **Assign process variable** parameter (→ 44).

Off value low flow cutoff

Navigation Expert → Sensor → Process param. → Low flow cut off → Off value

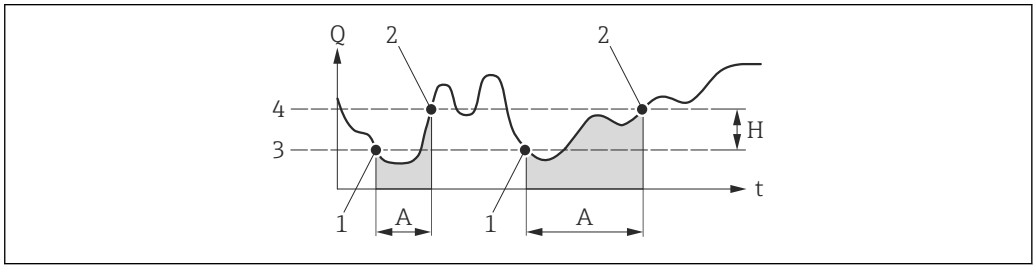
Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 44):
- Mass flow
- Volume flow
- Corrected volume flow

Description Use this function to enter a switch-off value for low flow cut off. The off value is entered as a positive hysteresis from the on value→ 44.

User entry 0 to 100.0 %

Factory setting 50 %

Additional information *Example*



A0012887

Q Flow
t Time
H Hysteresis
A Low flow cut off active
1 Low flow cut off is activated
2 Low flow cut off is deactivated
3 On value entered
4 Off value entered

Pressure shock suppression

Navigation Expert → Sensor → Process param. → Low flow cut off → Pres. shock sup.

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 44):
- Mass flow
- Volume flow
- Corrected volume flow

Description Use this function to enter the time interval for signal suppression (= active pressure shock suppression).

User entry 0 to 100 s

Factory setting 0 s

Additional information

Description

Pressure shock suppression is enabled

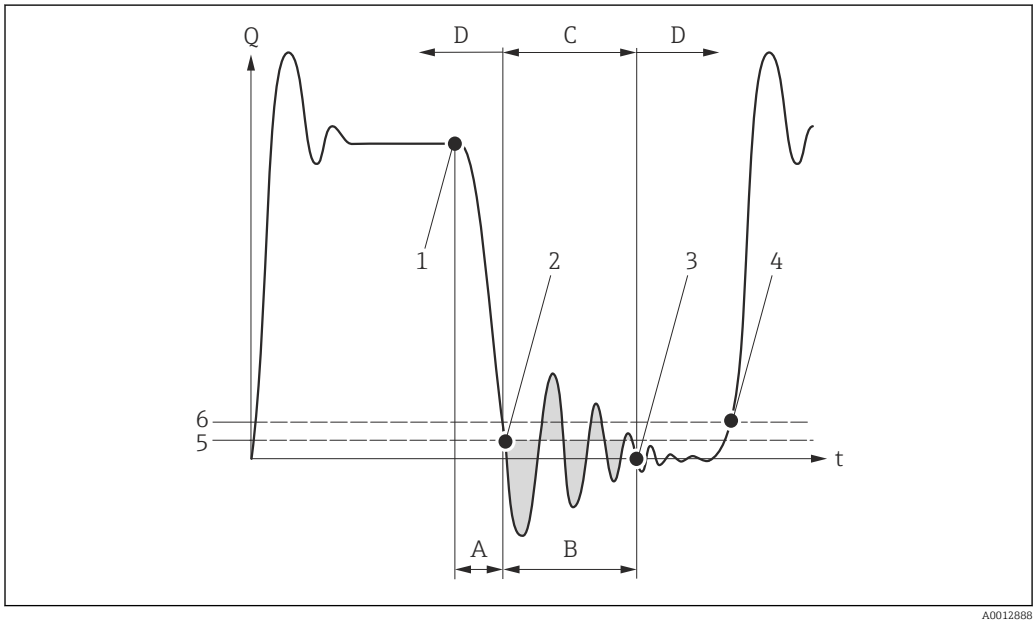
- Prerequisite:
  - Flow rate < on-value of low flow cut off
    or
  - Changing the flow direction
- Output values
  - Flow displayed: 0
  - Totalizer: the totalizers are pegged at the last correct value

Pressure shock suppression is disabled

- Prerequisite: the time interval set in this function has elapsed.
- If the flow also exceeds the switch-off value for low flow cut off, the device starts processing the current flow value again and displays it.

Example

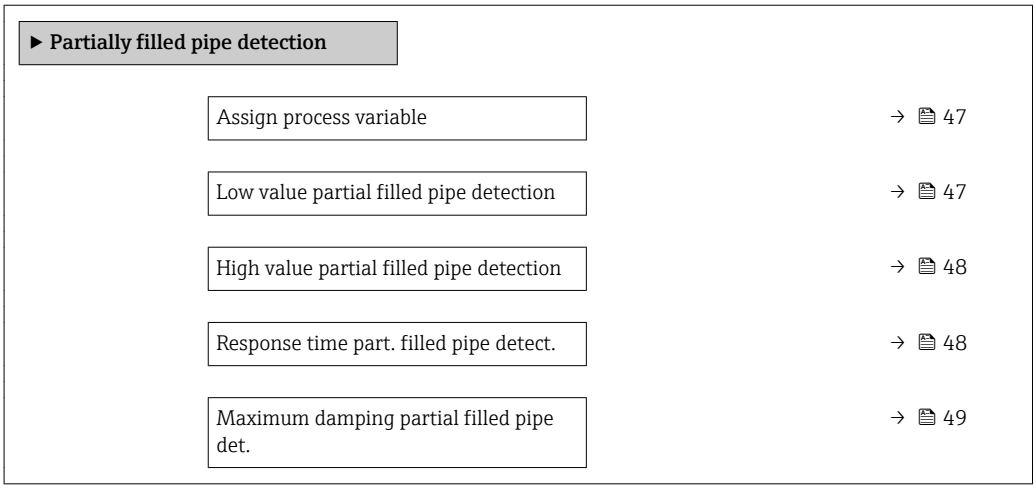
When closing a valve, momentarily strong fluid movements may occur in the pipeline, which are registered by the measuring system. These totalized flow values lead to a false totalizer status, particularly during batching processes.



Q Flow
t Time
A Drip
B Pressure shock
C Pressure shock suppression active as specified by the time entered
D Pressure shock suppression inactive
1 Valve closes
2 Flow falls below the on-value of the low flow cut off: pressure shock suppression is activated
3 The time entered has elapsed: pressure shock suppression is deactivated
4 The actual flow value is now displayed and output
5 On value for low flow cut off
6 Off value for low flow cut off

"Partially filled pipe detection" submenu

Navigation Expert → Sensor → Process param. → Partial pipe det



Assign process variable

Navigation Expert → Sensor → Process param. → Partial pipe det → Assign variable

Description Use this function to select a process variable to detect empty or partially filled measuring tubes.

For gas measurement: Deactivate monitoring due to low gas density.

Selection
- Off
- Density
- Reference density

Factory setting Off

Low value partial filled pipe detection

Navigation Expert → Sensor → Process param. → Partial pipe det → Low value

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 47):
- Density
- Reference density

Description Use this function to enter a lower limit value to enable detection of empty or partially filled measuring tubes. If the measured density falls below this value, monitoring is enabled.

User entry Signed floating-point number

Factory setting 200

Additional information

User entry

The lower limit value must be less than the upper limit value defined in the **High value partial filled pipe detection** parameter (→ 48).

The unit depends on the process variable selected in the **Assign process variable** parameter (→ 47).

Limit value

If the displayed value is outside the limit value, the measuring device displays the diagnostic message ⚠**S862 Partly filled pipe**.

High value partial filled pipe detection

Navigation Expert → Sensor → Process param. → Partial pipe det → High value

Prerequisite

One of the following options is selected in the **Assign process variable** parameter (→ 47):
- Density
- Reference density

Description

Use this function to enter an upper limit value to enable detection of empty or partially filled measuring tubes. If the measured density exceeds this value, detection is enabled.

User entry

Signed floating-point number

Factory setting

6 000

Additional information

User entry

The upper limit value must be greater than the lower limit value defined in the **Low value partial filled pipe detection** parameter (→ 47).

The unit depends on the process variable selected in the **Assign process variable** parameter (→ 47).

Limit value

If the displayed value is outside the limit value, the measuring device displays the diagnostic message ⚠**S862 Partly filled pipe**.

Response time part. filled pipe detect.

Navigation Expert → Sensor → Process param. → Partial pipe det → Response time

Prerequisite

One of the following options is selected in the **Assign process variable** parameter (→ 47):
- Density
- Reference density

Description

Enter the minimum length of time (debouncing time) the signal must be present for the diagnostic message ⚠**S862 Partly filled pipe** to be triggered if the measuring pipe is empty or partially full.

User entry 0 to 100 s

Factory setting 1 s

Maximum damping partial filled pipe det.

Navigation Expert → Sensor → Process param. → Partial pipe det → Max. damping

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 47):
- Density
- Reference density

Description Use this function to enter a damping value to enable detection of empty or partially filled measuring tubes.

User entry Positive floating-point number

Factory setting 0

Additional information *Description*

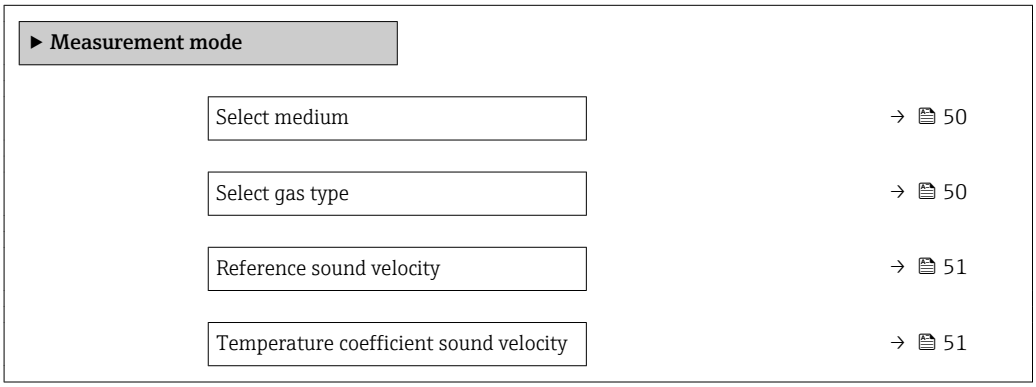
If pipe damping (**Testpoints** submenu (→ 64)) exceeds the specified value, the measuring device presumes that the pipe is partially filled and the flow signal is set to **0**. The measuring device displays the diagnostic message ⚠**S862 Partly filled pipe**. In the case of non-homogeneous media or air pockets, the damping of the measuring tubes increases.

User entry

The function is enabled only if the input value is greater than **0**.

3.2.4 "Measurement mode" submenu

Navigation Expert → Sensor → Measurement mode



Select medium

Navigation Expert → Sensor → Measurement mode → Select medium

Description Use this function to select the type of medium.

Selection
- Liquid
- Gas

Factory setting Liquid

Select gas type

Navigation Expert → Sensor → Measurement mode → Select gas type

Prerequisite The **Gas** option is selected in the **Select medium** parameter (→ 50).

Description Use this function to select the type of gas for the measuring application.

Selection
- Air
- Ammonia NH3
- Argon Ar
- Sulfur hexafluoride SF6
- Oxygen O2
- Ozone O3
- Nitrogen oxide NOx
- Nitrogen N2
- Nitrous oxide N2O
- Methane CH4
- Hydrogen H2
- Helium He
- Hydrogen chloride HCl
- Hydrogen sulfide H2S
- Ethylene C2H4
- Carbon dioxide CO2
- Carbon monoxide CO
- Chlorine Cl2
- Butane C4H10
- Propane C3H8
- Propylene C3H6
- Ethane C2H6
- Others

Factory setting Methane CH4

Reference sound velocity

Navigation Expert → Sensor → Measurement mode → Sound velocity

Prerequisite The **Others** option is selected in the **Select gas type** parameter (→ 50).

Description Use this function to enter the sound velocity of the gas at 0 °C (+32 °F).

User entry 1 to 99 999.9999 m/s

Factory setting 0 m/s

Temperature coefficient sound velocity

Navigation Expert → Sensor → Measurement mode → Temp. coeff. SV

Prerequisite The **Others** option is selected in the **Select gas type** parameter (→ 50).

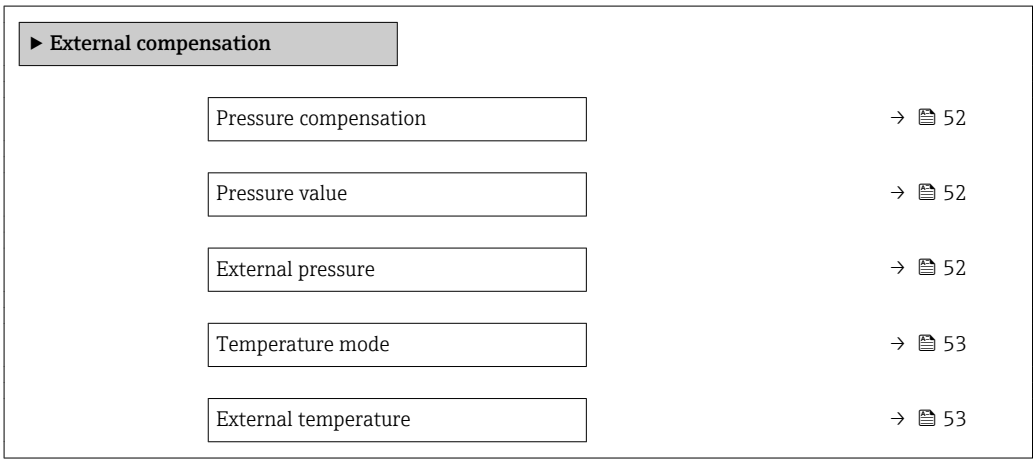
Description Use this function to enter a temperature coefficient for the sound velocity of the gas.

User entry Positive floating-point number

Factory setting 0 (m/s)/K

3.2.5 "External compensation" submenu

Navigation Expert → Sensor → External comp.



Pressure compensation

Navigation Expert → Sensor → External comp. → Pressure compen.

Prerequisite The **Gas** option is selected in the **Select medium** parameter (→ 50).

Description Use this function select the type of pressure compensation.

Selection
- Off
- Fixed value
- External value

Factory setting Off

Pressure value

Navigation Expert → Sensor → External comp. → Pressure value

Prerequisite The **Fixed value** option is selected in the **Pressure compensation** parameter (→ 52).

Description Use this function to enter a value for the process pressure that is used for pressure correction.

User entry Positive floating-point number

Factory setting 0 bar

Additional information *User entry*

The unit is taken from the **Pressure unit** parameter (→ 36)

External pressure

Navigation Expert → Sensor → External comp. → External press.

Prerequisite The **External value** option is selected in the **Pressure compensation** parameter (→ 52).

Description Use this function to enter an external pressure value.

User entry Positive floating-point number

Factory setting 0 bar

Additional information *User entry*

The unit is taken from the **Pressure unit** parameter (→ 36)

Temperature mode

Navigation Expert → Sensor → External comp. → Temperature mode

Description Use this function to select the temperature mode.

Selection
- Internal measured value
- External value

Factory setting Internal measured value

External temperature

Navigation Expert → Sensor → External comp. → External temp.

Prerequisite The **External value** option is selected in the **Temperature mode** parameter (→ 53) parameter.

Description Use this function to enter the external temperature.

User entry −273.15 to 99 999 °C

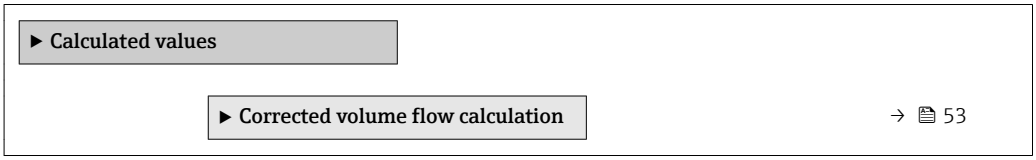
Factory setting
- 0 °C
- +32 °F

Additional information *Description*

The unit is taken from the **Temperature unit** parameter (→ 35)

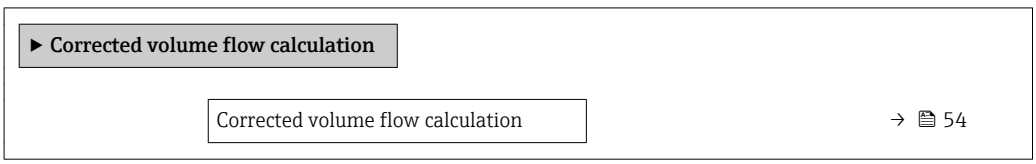
3.2.6 "Calculated values" submenu

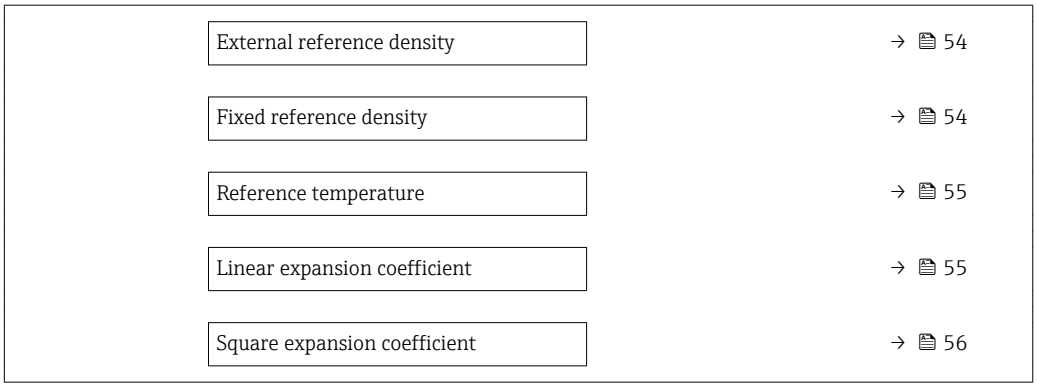
Navigation Expert → Sensor → Calculated value



"Corrected volume flow calculation" submenu

Navigation Expert → Sensor → Calculated value → Corr. vol.flow.





Corrected volume flow calculation

Navigation Expert → Sensor → Calculated value → Corr. vol.flow. → Corr. vol.flow.

Description Use this function to select the reference density for calculating the corrected volume flow.

Selection
- Fixed reference density
- Calculated reference density
- Reference density by API table 53
- External reference density

Factory setting Calculated reference density

External reference density

Navigation Expert → Sensor → Calculated value → Corr. vol.flow. → Ext. ref.density

Prerequisite The **External reference density** option is selected in the **Corrected volume flow calculation** parameter (→ 54).

Description Use this function to enter the external reference density.

User entry Floating point number with sign

Factory setting 0 kg/Nl

Fixed reference density

Navigation Expert → Sensor → Calculated value → Corr. vol.flow. → Fix ref.density

Prerequisite The **Fixed reference density** option is selected in the **Corrected volume flow calculation** parameter (→ 54) parameter.

Description Use this function to enter a fixed value for the reference density.

User entry Positive floating-point number

Factory setting 1 kg/Nl

Additional information *Dependency*

The unit is taken from the **Reference density unit** parameter (→ 35).

Reference temperature

Navigation Expert → Sensor → Calculated value → Corr. vol.flow. → Ref. temperature

Prerequisite In the **Corrected volume flow calculation** parameter (→ 54) the **Calculated reference density** option is selected.

Description Use this function to enter a reference temperature for calculating the reference density.

User entry −273.15 to 99 999 °C

Factory setting Country-specific:
- +20 °C
- +68 °F

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 35)

Reference density calculation

$$\rho_n = \rho \cdot (1 + \alpha \cdot \Delta t + \beta \cdot \Delta t^2)$$

A0023403

- ρ_N: reference density
- ρ: fluid density currently measured
- t: fluid temperature currently measured
- t_N: reference temperature at which the reference density is calculated (e.g. 20 °C)
- Δt: $t - t_N$
- α: linear expansion coefficient of the fluid, unit = [1/K]; K = Kelvin
- β: square expansion coefficient of the fluid, unit = [1/K²]

Linear expansion coefficient

Navigation Expert → Sensor → Calculated value → Corr. vol.flow. → Linear exp coeff

Prerequisite In the **Corrected volume flow calculation** parameter (→ 54) the **Calculated reference density** option is selected.

Description Use this function to enter a linear, fluid-specific expansion coefficient for calculating the reference density.

User entry Signed floating-point number

Factory setting 0.0

Square expansion coefficient

Navigation Expert → Sensor → Calculated value → Corr. vol.flow. → Square exp coeff

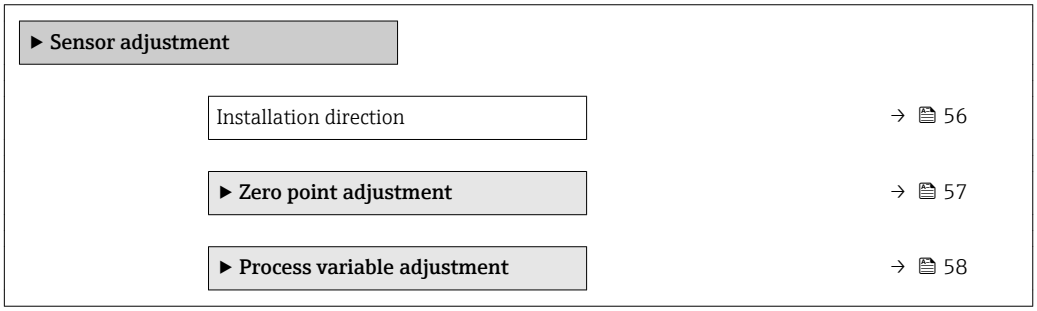
Description For fluid with a non-linear expansion pattern: use this function to enter a quadratic, fluid-specific expansion coefficient for calculating the reference density.

User entry Signed floating-point number

Factory setting 0.0

3.2.7 "Sensor adjustment" submenu

Navigation Expert → Sensor → Sensor adjustm.



Installation direction

Navigation Expert → Sensor → Sensor adjustm. → Install. direct.

Description Use this function to change the sign of the medium flow direction.

Selection
- Flow in arrow direction
- Flow against arrow direction

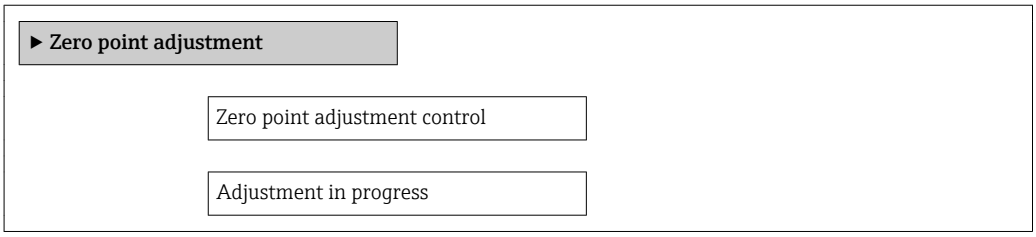
Factory setting Flow in arrow direction

Additional information *Description*

Before changing the sign: ascertain the actual direction of fluid flow with reference to the direction indicated by the arrow on the sensor nameplate.

"Zero point adjustment" submenu

Navigation Expert → Sensor → Sensor adjustm. → Zero point adj.



Zero point adjustment control

Navigation Expert → Sensor → Sensor adjustm. → Zero point adj. → Zero point adj.

Description Use this function to select the start of the zero point adjustment.

Note conditions .

Selection
- Cancel
- Busy
- Zero point adjust failure
- Start

Factory setting Cancel

Additional information *Description*
- Cancel
  If zero point adjustment has failed, select this option to cancel zero point adjustment.
- Busy
  Is displayed during zero point adjustment.
- Zero point adjust failure
  Is displayed if zero point adjustment has failed.
- Start
  Select this option to start zero point adjustment.

Progress

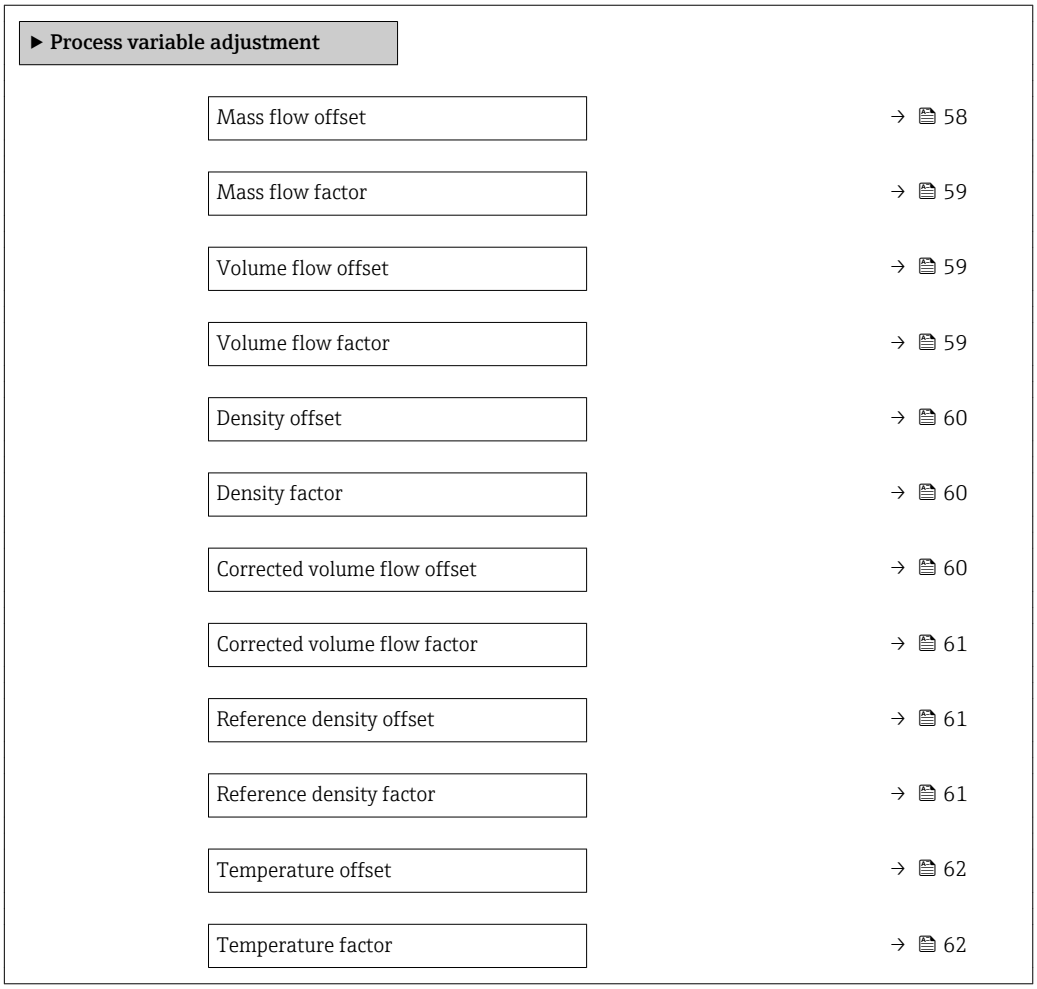
Navigation Expert → Sensor → Sensor adjustm. → Zero point adj. → Progress

Description The progress of the process is indicated.

User interface 0 to 100 %

"Process variable adjustment" submenu

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust



Mass flow offset

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Mass flow offset

Description Use this function to enter the zero point shift for the mass flow trim. The mass flow unit on which the shift is based is kg/s.

User entry Signed floating-point number

Factory setting 0 kg/s

Additional information *Description*

Corrected value = (factor × value) + offset

Mass flow factor

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Mass flow factor

Description Use this function to enter a quantity factor (without time) for the mass flow. This multiplication factor is applied over the mass flow range.

User entry Positive floating-point number

Factory setting 1

Additional information *Description*

Corrected value = (factor × value) + offset

Volume flow offset

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Vol. flow offset

Description Use this function to enter the zero point shift for the volume flow trim. The volume flow unit on which the shift is based is m^3/s.

User entry Signed floating-point number

Factory setting 0 m^3/s

Additional information *Description*

Corrected value = (factor × value) + offset

Volume flow factor

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Vol. flow factor

Description Use this function to enter a quantity factor (without time) for the volume flow. This multiplication factor is applied over the volume flow range.

User entry Positive floating-point number

Factory setting 1

Additional information *Description*

Corrected value = (factor × value) + offset

Density offset

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Density offset

Description Use this function to enter the zero point shift for the density trim. The density unit on which the shift is based is kg/m^3.

User entry Signed floating-point number

Factory setting 0 kg/m^3

Additional information *Description*

Corrected value = (factor × value) + offset

Density factor

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Density factor

Description Use this function to enter a quantity factor for the density. This multiplication factor is applied over the density range.

User entry Positive floating-point number

Factory setting 1

Additional information *Description*

Corrected value = (factor × value) + offset

Corrected volume flow offset

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Corr. vol offset

Description Use this function to enter the zero point shift for the corrected volume flow trim. The corrected volume flow unit on which the shift is based is 1 Nm^3/s.

User entry Signed floating-point number

Factory setting 0 Nm^3/s

Additional information *Description*

Corrected value = (factor × value) + offset

Corrected volume flow factor

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Corr. vol factor

Description Use this function to enter a quantity factor (without time) for the corrected volume flow. This multiplication factor is applied over the corrected volume flow range.

User entry Positive floating-point number

Factory setting 1

Additional information *Description*

Corrected value = (factor × value) + offset

Reference density offset

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Ref.dens. offset

Description Use this parameter to enter the zero point shift for the reference density trim. The reference density unit on which the shift is based is 1 kg/Nm³.

User entry Signed floating-point number

Factory setting 0 kg/Nm³

Additional information *Description*

Corrected value = (factor × value) + offset

Reference density factor

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Ref.dens. factor

Description Use this function to enter a quantity factor (without time) for the reference density. This multiplication factor is applied over the reference density range.

User entry Positive floating-point number

Factory setting 1

Additional information *Description*

Corrected value = (factor × value) + offset

Temperature offset

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Temp. offset

Description Use this function to enter the zero point shift for the temperature trim. The temperature unit on which the shift is based is K.

User entry Signed floating-point number

Factory setting 0 K

Additional information *Description*

Corrected value = (factor × value) + offset

Temperature factor

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Temp. factor

Description Use this function to enter a quantity factor for the temperature. In each case, this factor refers to the temperature in K.

User entry Positive floating-point number

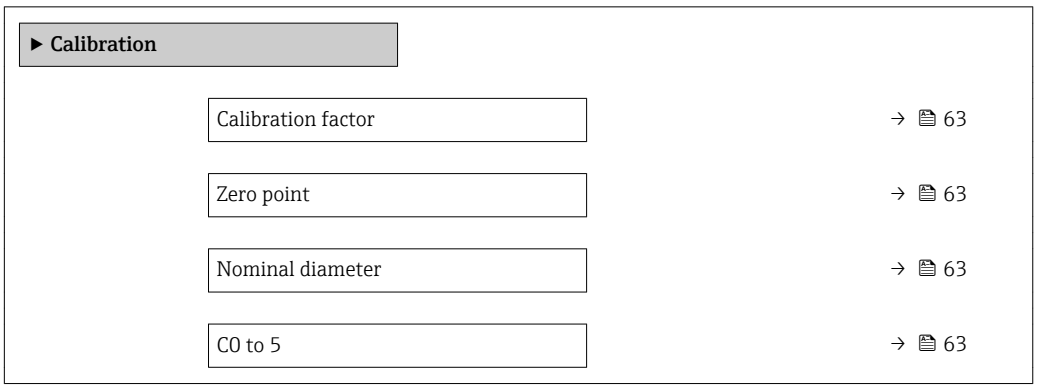
Factory setting 1

Additional information *Description*

Corrected value = (factor × value) + offset

3.2.8 "Calibration" submenu

Navigation Expert → Sensor → Calibration



Calibration factor

Navigation Expert → Sensor → Calibration → Cal. factor

Description Displays the current calibration factor for the sensor.

User interface Signed floating-point number

Factory setting Depends on nominal diameter and calibration.

Zero point

Navigation Expert → Sensor → Calibration → Zero point

Description Use this function to enter the zero point correction value for the sensor.

User entry Signed floating-point number

Factory setting Depends on nominal diameter and calibration.

Nominal diameter

Navigation Expert → Sensor → Calibration → Nominal diameter

Description Displays the nominal diameter of the sensor.

User interface DNxx / x"

Factory setting Depends on the size of the sensor

Additional information *Description*

The value is also specified on the sensor nameplate.

C0 to 5

Navigation Expert → Sensor → Calibration → C0 to 5

Description Displays the current density coefficients C0 to 5 of the sensor.

User interface Signed floating-point number

Factory setting 0

3.2.9 "Testpoints" submenu

- The **Testpoints** submenu (→ 64) is used to test the measuring device or the application.
- The parameters can only be accessed via CDI interface or Modbus.

Navigation Expert → Sensor → Testpoints

▶ **Testpoints**

Oscillation frequency 0	→ 64
Frequency fluctuation 0	→ 65
Oscillation amplitude 0	→ 65
Oscillation damping 0	→ 65
Tube damping fluctuation 0	→ 66
Signal asymmetry	→ 66
Electronic temperature	→ 67
Carrier pipe temperature	→ 67
Exciter current 0	→ 68
RawMassFlow	→ 68

Oscillation frequency 0

Navigation Expert → Sensor → Testpoints → Osc. freq. 0

Description Displays the current oscillation frequency.

User interface Positive floating point number

Additional information *Typical values*

Sensor	Material	DN		f_{Air}		f_{Water}	
		[mm]	[in]	Min. nom. [Hz]	max. nom. [Hz]	Min. nom. [Hz]	max. nom. [Hz]
Cubemass C	Stainless steel, 1.4539 (904L)	1	1/24	113	129	106	122
		2	1/12	227	261	199	229
		4	1/8	290	334	250	288
		6	1/4	430	494	360	414

Frequency fluctuation 0

Navigation Expert → Sensor → Testpoints → Freq. fluct. 0

Description Displays the current frequency fluctuation.

User interface Signed floating-point number

Oscillation amplitude 0

Navigation Expert → Sensor → Testpoints → Osc. ampl. 0

Description Displays the relative oscillation amplitude of the sensor in relation to the optimum value.

User interface Signed floating-point number

Additional information

Description

This value is 100 % under optimum conditions. The value can fall in the case of complex media (two-phase, high viscosity or high gas velocity).

Limit values

5 %

If the displayed value is outside the limit value, the measuring device displays the following diagnostic messages:
- Diagnostic message ⚠**S913 Medium unsuitable**, associated service ID **205 Osc Amp Limit**
  Explanation: The measured oscillation amplitude has dropped below the xMin limit value.
- Diagnostic message ⚠**S912 Medium inhomogeneous**, associated service ID **196 Fluid Inhomogeneous Amp**
  – Explanation: The fluctuation (standard deviation) of the amplitude is too high.
  – Possible cause: Air or suspended solids in the medium (multiphase)

For detailed information about troubleshooting, refer to the section entitled "Overview of the service-specific diagnostics information"

Oscillation damping 0

Navigation Expert → Sensor → Testpoints → Osc. damping 0

Description Displays the current oscillation damping.

User interface Positive floating-point number

Additional information

Description

Oscillation damping is an indicator of the sensor's current need for excitation power.

Typical values

Sensor	Material	DN		Nominal value, air	Nominal value, water
		[mm]	[in]	[A/m]	[A/m]
Cubemass C	Stainless steel, 1.4539 (904L)	1	1/24	90	130
		2	1/12	240	220
		4	1/8	790	1150
		6	1/4	310	340

Limit values

The damping depends on the transmitter type and model and changes with the type of medium (differences between models: approx. ±30 %). The minimum value is reached when the sensor is empty. The value can be several 1000 for viscous media and even several 10000 in the case of multiphase media. In such cases, the relative oscillation amplitude should also be used for diagnosis.

If the displayed value is outside the limit value, the measuring device displays the following diagnostic message:
Diagnostic message ⚠**S862 Partly filled pipe**, associated service ID **146 Density Monitoring**

For detailed information about troubleshooting, refer to the section entitled "Overview of the service-specific diagnostics information"

Tube damping fluctuation 0

Navigation Expert → Sensor → Testpoints → Damping fluct 0

Description Displays the current fluctuation of tube damping.

User interface Signed floating-point number

Signal asymmetry

Navigation Expert → Sensor → Testpoints → Signal asymmetry

Description Displays the relative difference between the oscillation amplitude measured at the inlet and outlet of the sensor.

User interface Signed floating-point number

Additional information

Description

The measured value is the result of production tolerances of the sensor coils and should remain constant over the life time of a sensor.

Limit values

If the value is > 10 %, this is an indicator of a damaged sensor or sensor cable.

If the displayed value is outside the limit value, the measuring device displays the following diagnostic message:
Diagnostic message ⚠**S140 Sensor signal**, associated service ID **204 El Dyn Sensor**
- Explanation: The amplitude asymmetry between the inlet and outlet sensor has exceeded the limit value.
- Possible cause: Virtually only occurs if one of the two signal sensors is defective.

For detailed information about troubleshooting, refer to the section entitled "Overview of the service-specific diagnostics information"

Electronic temperature

Navigation Expert → Sensor → Testpoints → Electronic temp.

Description Displays the current temperature inside the main electronics.

User interface Signed floating-point number

Additional information

Description

As there is minimum internal heating in the electronics, the electronics temperature corresponds to the housing or ambient temperature.

NOTE!

Stay within the specified ambient temperature range.

Dependency

The unit is taken from the **Temperature unit** parameter

Carrier pipe temperature

Navigation Expert → Sensor → Testpoints → Carr. pipe temp.

Prerequisite
- Order code for "Application package", option EB "Heartbeat Verification + Monitoring"
- If the carrier tube temperature is provided:
  Cubemass C

Description Use this function to display the current temperature of the measuring tube housing.
Displays the 2nd measured temperature for compensation.

User interface Signed floating-point number

Additional information *Limit values*

In thermally insulated sensors, the carrier tube temperature can reach the temperature of the medium.

Dependency

The unit is taken from the **Temperature unit** parameter

Exciter current 0

Navigation Expert → Sensor → Testpoints → Exc. current 0

Description Displays the current excitation current.

User interface Signed floating-point number

RawMassFlow

Navigation Expert → Sensor → Testpoints → RawMassFlow

Description Displays the unprocessed mass flow (contains all sensor corrections etc.).

User interface Signed floating-point number

Additional information *Description*

Displays the mass flow value before offset and factor correction, damping, low flow cut off and monitoring of a partially filled pipe. This value can be used to check the current zero point, similar to the zero point adjustment function.

Dependency

The unit is taken from the **Mass flow unit** parameter (→ 29)

3.2.10 "Supervision" submenu

Navigation Expert → Sensor → Supervision

Limit value measuring tube damping

Navigation Expert → Sensor → Supervision → Limit tube damp.

Description Use this function to enter a limit value for measuring tube damping.

User entry Positive floating-point number

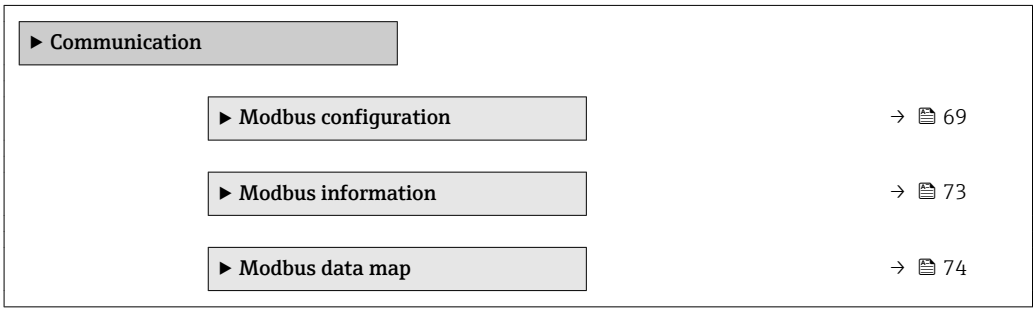
Factory setting Positive floating-point number

Additional information *Limit value*

- If the displayed value is outside the limit value, the measuring device displays the diagnostic message ⚠**S948 Tube damping too high**.
- For detecting inhomogeneous media, for example

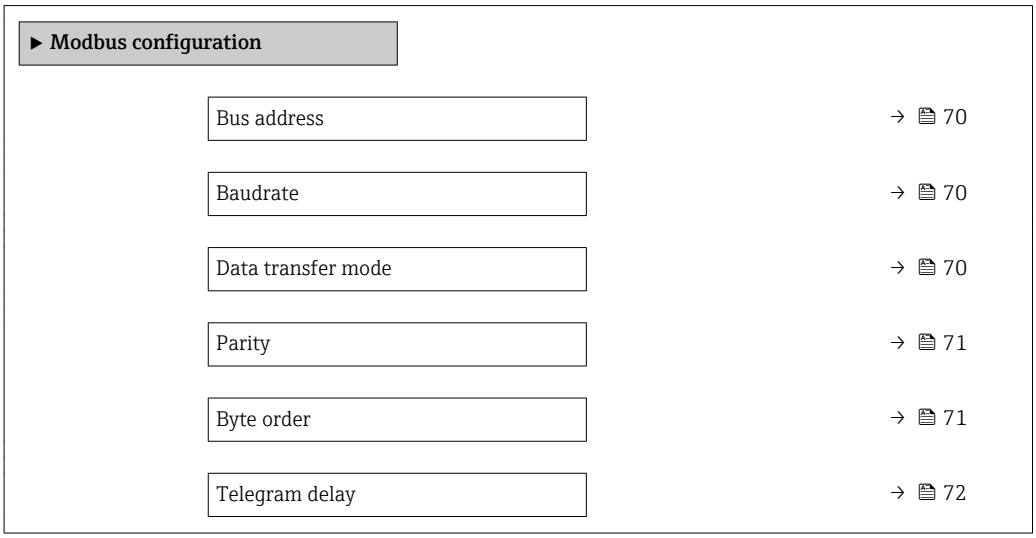
3.3 "Communication" submenu

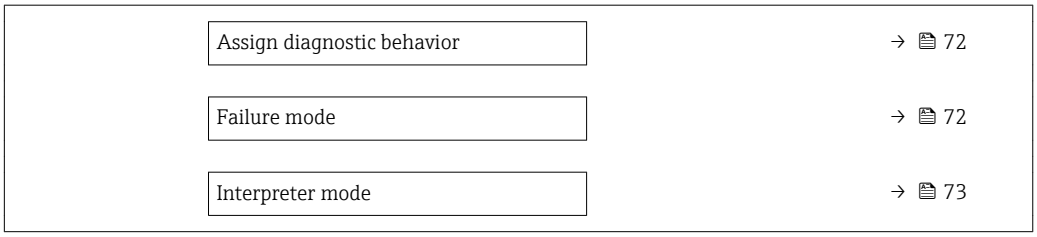
Navigation Expert → Communication



3.3.1 "Modbus configuration" submenu

Navigation Expert → Communication → Modbus config.





Bus address

Navigation Expert → Communication → Modbus config. → Bus address

Description For entering the device address.

User entry 1 to 247

Factory setting 247

Baudrate

Navigation Expert → Communication → Modbus config. → Baudrate

Description Use this function to select a transmission rate.

Selection
- 1200 BAUD
- 2400 BAUD
- 4800 BAUD
- 9600 BAUD
- 19200 BAUD
- 38400 BAUD
- 57600 BAUD
- 115200 BAUD

Factory setting 19200 BAUD

Data transfer mode

Navigation Expert → Communication → Modbus config. → Data trans. mode

Description Use this function to select the data transmission mode.

Selection
- ASCII
- RTU

Factory setting RTU

Additional information *Options*

- ASCII
  Transmission of data in the form of readable ASCII characters. Error protection via LRC.
- RTU
  Transmission of data in binary form. Error protection via CRC16.

Parity

Navigation Expert → Communication → Modbus config. → Parity

Description Use this function to select the parity bit.

Selection
- Odd
- Even
- None / 1 stop bit
- None / 2 stop bits

Factory setting Even

Additional information *Options*

Picklist **ASCII** option:
- 0 = **Even** option
- 1 = **Odd** option

Picklist **RTU** option:
- 0 = **Even** option
- 1 = **Odd** option
- 2 = **None / 1 stop bit** option
- 3 = **None / 2 stop bits** option

Byte order

Navigation Expert → Communication → Modbus config. → Byte order

Description Use this function to select the sequence in which the bytes are transmitted. The transmission sequence must be coordinated with the Modbus master.

Selection
- 0-1-2-3
- 3-2-1-0
- 1-0-3-2
- 2-3-0-1

Factory setting 1-0-3-2

Telegram delay

Navigation Expert → Communication → Modbus config. → Telegram delay

Description Use this function to enter a delay time after which the measuring device replies to the request telegram of the Modbus master. This allows communication to be adapted to slow Modbus RS485 masters.

User entry 0 to 100 ms

Factory setting 6 ms

Assign diagnostic behavior

Navigation Expert → Communication → Modbus config. → Assign diag. beh

Description Use this function to select the diagnostic behavior for Modbus communication.

Selection
- Off
- Alarm or warning
- Warning
- Alarm

Factory setting Alarm

Additional information *Description*

Defines the category of messages to which data transmission responds:
- Off
  The device continues to measure. The diagnostic event is ignored, and no diagnostic message is generated.
- Alarm or warning
  The device continues to measure. A diagnostic message is generated. In the event of an alarm, the signal outputs assume the specified alarm condition.
- Warning
  The device continues to measure. A diagnostic message is generated.
- Alarm
  The device continues to measure. The signal outputs assume the specified alarm condition. A diagnostic message is generated.

Failure mode

Navigation Expert → Communication → Modbus config. → Failure mode

Description Use this function to select the measured value output in the event of a diagnostic message via Modbus communication.

Selection
- NaN value
- Last valid value

Factory setting NaN value

Additional information *Options*

- NaN value
  The device outputs the NaN value [1].
- Last valid value
  The device outputs the last valid measured value before the fault occurred.

This effect of this parameter depends on the option selected in the **Assign diagnostic behavior** parameter (→ 72).

Interpreter mode

Navigation Expert → Communication → Modbus config. → Interpreter mode

Description Use this function to select the interpreter mode. This mode defines the behavior of the telegram reception interpreter.

Selection

- Standard
- Ignore surplus bytes

Factory setting Standard

Additional information *"Standard" option*

Behaves according to the Modbus standard, i.e. the last two bytes received are the checksum CRC16.

NOTE!

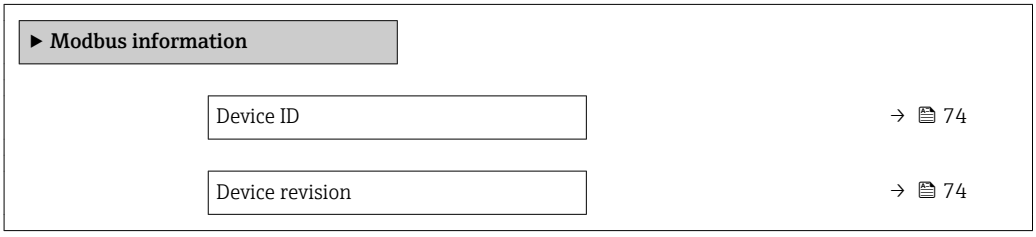
The selection is only relevant in the RTU mode. In the ASCII mode, the device always behaves according to the Modbus standard.

"Ignore surplus bytes" option

If supported by the function code, the two bytes for the checksum CRC16 are determined from the anticipated telegram length. Surplus bytes at the end of the actual telegram are ignored. This is not the standard Modbus behavior.

3.3.2 "Modbus information" submenu

Navigation Expert → Communication → Modbus info



1) Not a Number

Device ID

Navigation Expert → Communication → Modbus info → Device ID

Description Displays the device ID for identifying the measuring device.

User interface 4-digit hexadecimal number

Device revision

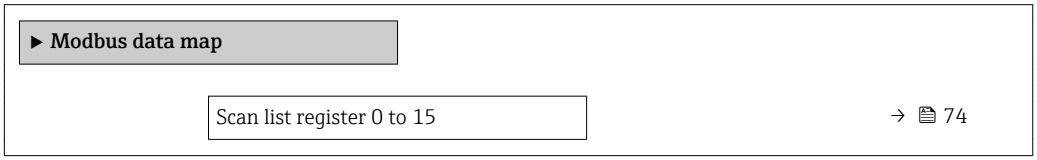
Navigation Expert → Communication → Modbus info → Device revision

Description Displays the device revision.

User interface 4-digit hexadecimal number

3.3.3 "Modbus data map" submenu

Navigation Expert → Communication → Modbus data map



Scan list register 0 to 15

Navigation Expert → Communication → Modbus data map → Scan list reg.0 to 15

Description Use this function to enter the scan list register. By entering the register address (1-based), up to 16 device parameters can be grouped in the auto-scan buffer by assigning them to the scan list registers 0 to 15. The data of the device parameters assigned here are read out via the register addresses 5051 to 5081.

User entry 1 to 65 535

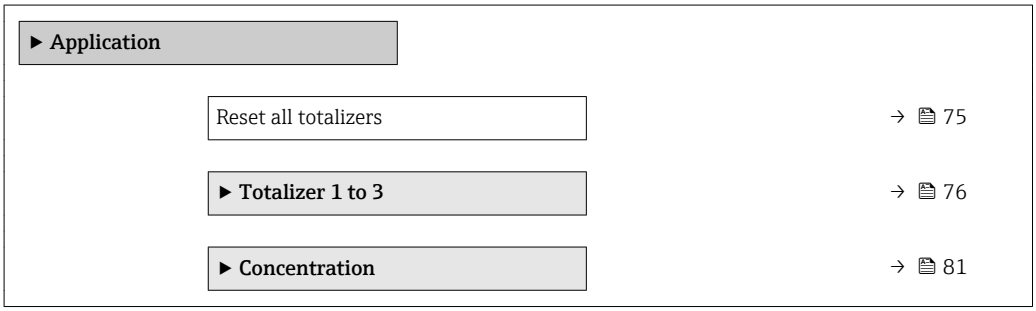
Factory setting 1

Additional information *Description*

- Scan list: Configuration area
  The device parameters to be grouped are defined in a list in that their Modbus RS485 register addresses are entered in the list.
- Data area
  The measuring device reads out the register addresses entered in the scan list cyclically and writes the associated device data (values) to the data area.

3.4 "Application" submenu

Navigation Expert → Application



Reset all totalizers

Navigation Expert → Application → Reset all tot.

Description Use this function to reset all totalizers to the value **0** and restart the totaling process. This deletes all the flow values previously totalized.

Selection
- Cancel
- Reset + totalize

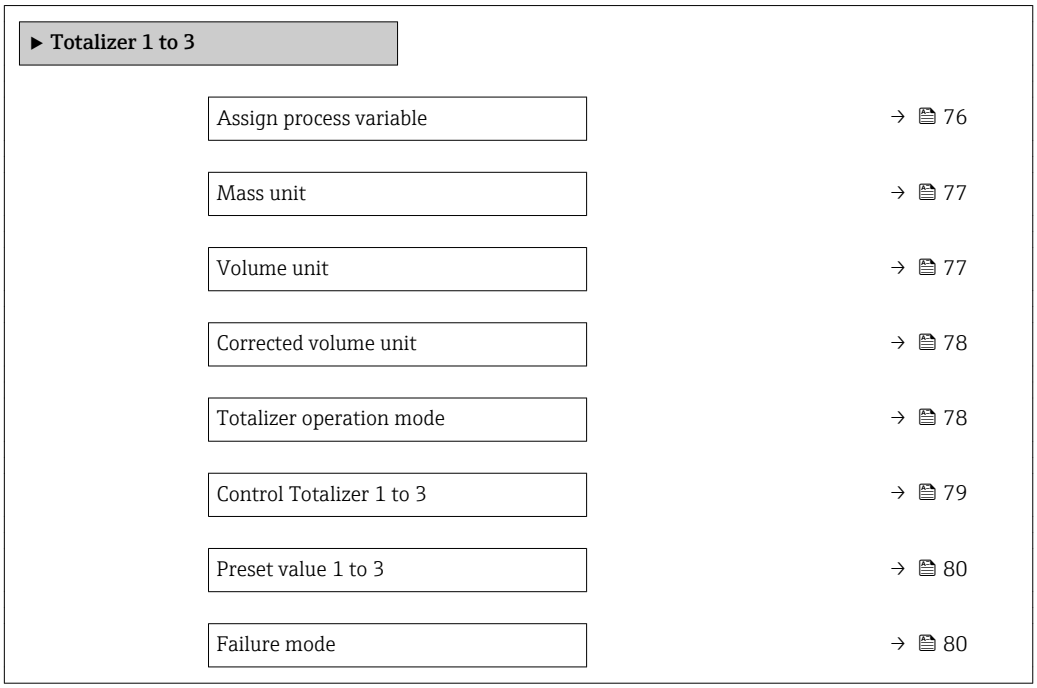
Factory setting Cancel

Additional information *Selection*

- Cancel
  No action is executed and the user exits the parameter.
- Reset + totalize
  All totalizers are reset to 0 and the totaling process is restarted.

3.4.1 "Totalizer 1 to 3" submenu

Navigation Expert → Application → Totalizer 1 to 3



Assign process variable

Navigation Expert → Application → Totalizer 1 to 3 → Assign variable

Description Use this function to select a process variable for the Totalizer 1 to 3.

Selection
- Off
- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow **
- Carrier mass flow **

Factory setting Mass flow

Additional information *Description*

If the option selected is changed, the device resets the totalizer to 0.

Selection

If the **Off** option is selected, only **Assign process variable** parameter (→ 76) is still displayed in the **Totalizer 1 to 3** submenu. All other parameters in the submenu are hidden.

** Visibility depends on order options or device settings

Mass unit

Navigation Expert → Application → Totalizer 1 to 3 → Mass unit

Prerequisite The **Mass flow** option is selected in the **Assign process variable** parameter (→ 76) of the **Totalizer 1 to 3** submenu.

Description Use this function to select the unit for the mass.

Selection

SI units
- g
- kg
- t

US units
- oz
- lb
- STon

Custom-specific units
User mass

Factory setting Country-specific:
- kg
- lb

Additional information *Selection*

For an explanation of the abbreviated units: → 104

Volume unit

Navigation Expert → Application → Totalizer 1 to 3 → Volume unit

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 76) of the **Totalizer 1 to 3** submenu:
- Volume flow
- Target mass flow **
- Carrier mass flow **

Description Use this function to select the unit for the volume.

Selection

SI units
- cm^3
- dm^3
- m^3
- ml
- l
- hl
- Ml Mega

US units
- af
- ft^3
- fl oz (us)
- gal (us)
- kgal (us)
- Mgal (us)
- bbl (us;oil)
- bbl (us;liq.)
- bbl (us;beer)
- bbl (us;tank)

Imperial units
- gal (imp)
- Mgal (imp)
- bbl (imp;beer)
- bbl (imp;oil)

Custom-specific units
User vol.

** Visibility depends on order options or device settings

Factory setting
Country-specific:
- l
- gal (us)

Additional information
Selection

For an explanation of the abbreviated units: → 104

Corrected volume unit

Navigation Expert → Application → Totalizer 1 to 3 → Corr. vol. unit

Prerequisite
The **Corrected volume flow** option is selected in the **Assign process variable** parameter (→ 76) of the **Totalizer 1 to 3** submenu.

Description
Use this function to select the unit for the corrected volume.

Selection

SI units
- Nl
- Nm^3
- Sl
- Sm^3

US units
- Sft^3
- Sgal (us)
- Sbbl (us;liq.)

Imperial units
Sgal (imp)

Custom-specific units
UserCrVol.

Factory setting
Country-specific:
- Nl
- Sft^3

Additional information
Selection

For an explanation of the abbreviated units: → 104

Totalizer operation mode

Navigation Expert → Application → Totalizer 1 to 3 → Operation mode

Prerequisite
One of the following options is selected in the **Assign process variable** parameter (→ 76)**Totalizer 1 to 3** submenu:
- Volume flow
- Mass flow
- Corrected volume flow
- Target mass flow **
- Carrier mass flow **

Description
Use this function to select how the totalizer summates the flow.

** Visibility depends on order options or device settings

Selection
- Net flow total
- Forward flow total
- Reverse flow total

Factory setting Net flow total

Additional information *Selection*
- Net flow total
  Positive and negative flow values are totalized and balanced against one another. Net flow is registered in the flow direction.
- Forward flow total
  Only the flow in the forward flow direction is totalized.
- Reverse flow total
  Only the flow against the forward flow direction is totalized (= reverse flow total).

Control Totalizer 1 to 3

Navigation Expert → Application → Totalizer 1 to 3 → Control Tot. 1 to 3

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 76) of the **Totalizer 1 to 3** submenu:
- Volume flow
- Mass flow
- Corrected volume flow
- Target mass flow **
- Carrier mass flow **

Description Use this function to select the control of totalizer value 1-3.

Selection
- Totalize
- Reset + hold
- Preset + hold
- Reset + totalize
- Preset + totalize

Factory setting Totalize

Additional information *Selection*
- Totalize
  The totalizer is started or continues totalizing with the current counter reading.
- Reset + hold
  The totaling process is stopped and the totalizer is reset to 0.
- Preset + hold
  The totaling process is stopped and the totalizer is set to its defined start value from the **Preset value** parameter (→ 80).
- Reset + totalize
  The totalizer is reset to 0 and the totaling process is restarted.
- Preset + totalize
  The totalizer is set to the defined start value from the **Preset value** parameter (→ 80) and the totaling process is restarted.

** Visibility depends on order options or device settings

Preset value 1 to 3

Navigation Expert → Application → Totalizer 1 to 3 → Preset value 1 to 3

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 76) of the **Totalizer 1 to 3** submenu:
- Volume flow
- Mass flow
- Corrected volume flow
- Target mass flow **
- Carrier mass flow **

Description Use this function to enter a start value for the Totalizer 1 to 3.

User entry Signed floating-point number

Factory setting Country-specific:
- 0 kg
- 0 lb

Additional information *User entry*

The unit of the selected process variable is specified for the totalizer depending on the selection made in the **Assign process variable** parameter (→ 76):
- **Volume flow** option: **Volume flow unit** parameter (→ 30)
- **Mass flow** option, **Target mass flow** option, **Carrier mass flow** option: **Mass flow unit** parameter (→ 29)
- **Corrected volume flow** option: **Corrected volume unit** parameter (→ 78)

Example

This configuration is suitable for applications such as iterative filling processes with a fixed batch quantity.

Failure mode

Navigation Expert → Application → Totalizer 1 to 3 → Failure mode

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 76) of the **Totalizer 1 to 3** submenu:
- Volume flow
- Mass flow
- Corrected volume flow
- Target mass flow **
- Carrier mass flow **

Description Use this function to select how a totalizer behaves in the event of a device alarm.

Selection
- Stop
- Actual value
- Last valid value

** Visibility depends on order options or device settings

Factory setting Stop

Additional information *Description*

This setting does not affect the failsafe mode of other totalizers and the outputs. This is specified in separate parameters.

Selection

- Stop
  Totalizing is stopped when a device alarm occurs.
- Actual value
  The totalizer continues to count based on the actual measured value; the device alarm is ignored.
- Last valid value
  The totalizer continues to count based on the last valid measured value before the device alarm occurred.

3.4.2 "Concentration" submenu

For detailed information on the parameter descriptions for the **Concentration** application package: Special Documentation for the device

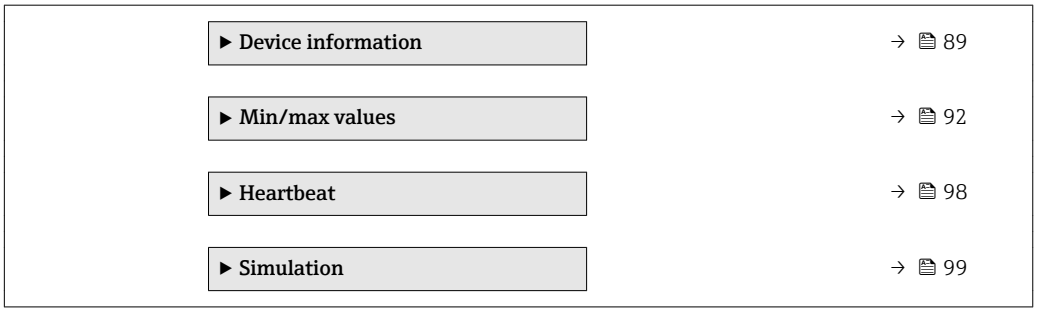
Navigation Expert → Application → Concentration

▶ **Concentration**

3.5 "Diagnostics" submenu

Navigation Expert → Diagnostics

▶ **Diagnostics**	
Actual diagnostics	→ 82
Timestamp	→ 82
Previous diagnostics	→ 83
Timestamp	→ 83
Operating time from restart	→ 83
Operating time	→ 84
▶ **Diagnostic list**	→ 84
▶ **Event logbook**	→ 88



Actual diagnostics

Navigation Expert → Diagnostics → Actual diagnos.

Prerequisite A diagnostic event has occurred.

Description Displays the current diagnostic message. If two or more messages occur simultaneously, the message with the highest priority is shown on the display.

User interface Symbol for diagnostic behavior, diagnostic code and short message.

Additional information *Display*

Additional pending diagnostic messages can be viewed in the **Diagnostic list** submenu (→ 84).

Example

For the display format:
⊗F271 Main electronic failure

Timestamp

Navigation Expert → Diagnostics → Timestamp

Description Displays the operating time when the current diagnostic message occurred.

User interface Days (d), hours (h), minutes (m) and seconds (s)

Additional information *Display*

The diagnostic message can be viewed via the **Actual diagnostics** parameter (→ 82).

Example

For the display format:
24d12h13m00s

Previous diagnostics

Navigation Expert → Diagnostics → Prev.diagnostics

Prerequisite Two diagnostic events have already occurred.

Description Displays the diagnostic message that occurred before the current message.

User interface Symbol for diagnostic behavior, diagnostic code and short message.

Additional information *Example*

For the display format:
⊗F271 Main electronic failure

Timestamp

Navigation Expert → Diagnostics → Timestamp

Description Displays the operating time when the last diagnostic message before the current message occurred.

User interface Days (d), hours (h), minutes (m) and seconds (s)

Additional information *Display*

The diagnostic message can be viewed via the **Previous diagnostics** parameter (→ 83).

Example

For the display format:
24d12h13m00s

Operating time from restart

Navigation Expert → Diagnostics → Time fr. restart

Description Use this function to display the time the device has been in operation since the last device restart.

User interface Days (d), hours (h), minutes (m) and seconds (s)

Operating time

Navigation Expert → Diagnostics → Operating time

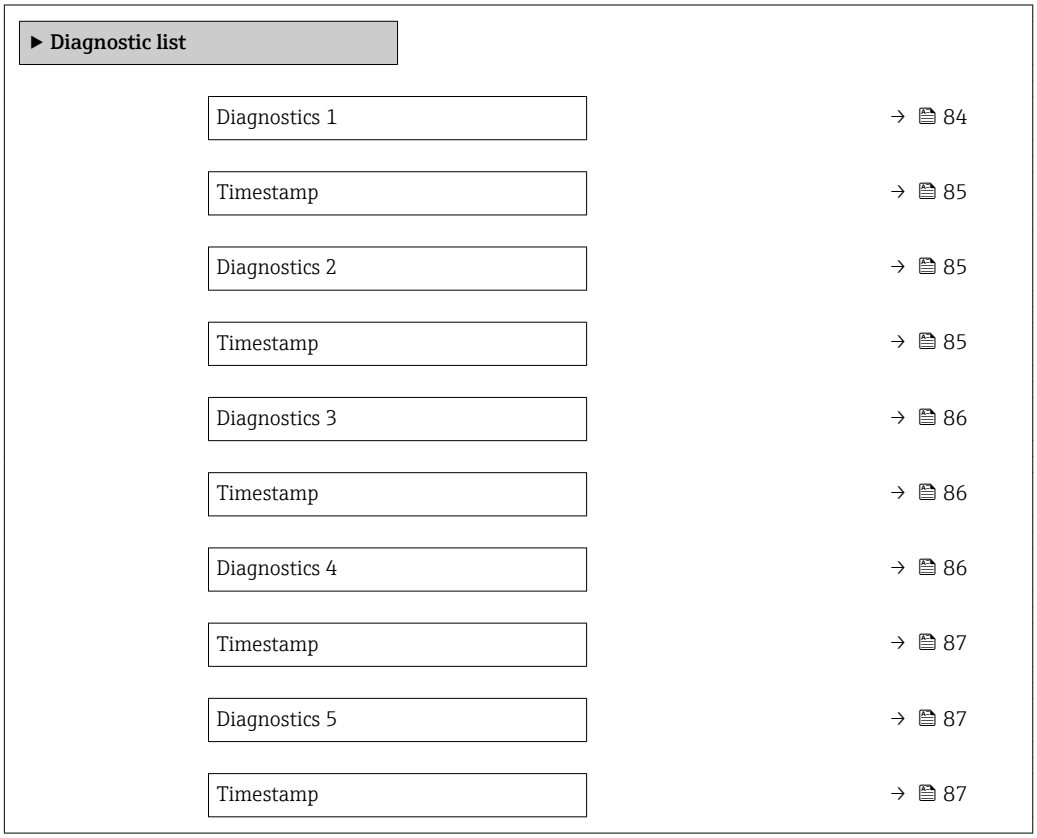
Description Use this function to display the length of time the device has been in operation.

User interface Days (d), hours (h), minutes (m) and seconds (s)

Additional information *User interface*
The maximum number of days is 9999, which is equivalent to 27 years.

3.5.1 "Diagnostic list" submenu

Navigation Expert → Diagnostics → Diagnostic list



Diagnostics 1

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 1

Description Displays the current diagnostics message with the highest priority.

User interface Symbol for diagnostic behavior, diagnostic code and short message.

Additional information *Examples*

For the display format:
- ⊗F271 Main electronic failure
- ⊗F276 I/O module failure

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

Description Displays the operating time when the diagnostic message with the highest priority occurred.

User interface Days (d), hours (h), minutes (m) and seconds (s)

Additional information *Display*

The diagnostic message can be viewed via the **Diagnostics 1** parameter (→ 84).

Example

For the display format:
24d12h13m00s

Diagnostics 2

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 2

Description Displays the current diagnostics message with the second-highest priority.

User interface Symbol for diagnostic behavior, diagnostic code and short message.

Additional information *Examples*

For the display format:
- ⊗F271 Main electronic failure
- ⊗F276 I/O module failure

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

Description Displays the operating time when the diagnostic message with the second-highest priority occurred.

User interface Days (d), hours (h), minutes (m) and seconds (s)

Additional information *Display*

The diagnostic message can be viewed via the **Diagnostics 2** parameter (→ 85).

Example

For the display format:
24d12h13m00s

Diagnostics 3

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 3

Description Displays the current diagnostics message with the third-highest priority.

User interface Symbol for diagnostic behavior, diagnostic code and short message.

Additional information *Examples*

For the display format:
- ⊗F271 Main electronic failure
- ⊗F276 I/O module failure

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

Description Displays the operating time when the diagnostic message with the third-highest priority occurred.

User interface Days (d), hours (h), minutes (m) and seconds (s)

Additional information *Display*

The diagnostic message can be viewed via the **Diagnostics 3** parameter (→ 86).

Example

For the display format:
24d12h13m00s

Diagnostics 4

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 4

Description Displays the current diagnostics message with the fourth-highest priority.

User interface Symbol for diagnostic behavior, diagnostic code and short message.

Additional information *Examples*

For the display format:
- ⊗F271 Main electronic failure
- ⊗F276 I/O module failure

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

Description Displays the operating time when the diagnostic message with the fourth-highest priority occurred.

User interface Days (d), hours (h), minutes (m) and seconds (s)

Additional information *Display*

The diagnostic message can be viewed via the **Diagnostics 4** parameter (→ 86).

Example

For the display format:
24d12h13m00s

Diagnostics 5

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 5

Description Displays the current diagnostics message with the fifth-highest priority.

User interface Symbol for diagnostic behavior, diagnostic code and short message.

Additional information *Examples*

For the display format:
- ⊗F271 Main electronic failure
- ⊗F276 I/O module failure

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

Description Displays the operating time when the diagnostic message with the fifth-highest priority occurred.

User interface Days (d), hours (h), minutes (m) and seconds (s)

Additional information *Display*

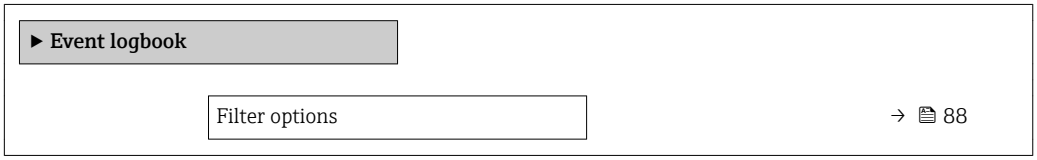
The diagnostic message can be viewed via the **Diagnostics 5** parameter (→ 87).

Example

For the display format:
24d12h13m00s

3.5.2 "Event logbook" submenu

Navigation Expert → Diagnostics → Event logbook



Filter options

Navigation Expert → Diagnostics → Event logbook → Filter options

Description Use this function to select the category whose event messages are displayed in the event list of the operating tool.

Selection
- All
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- Information (I)

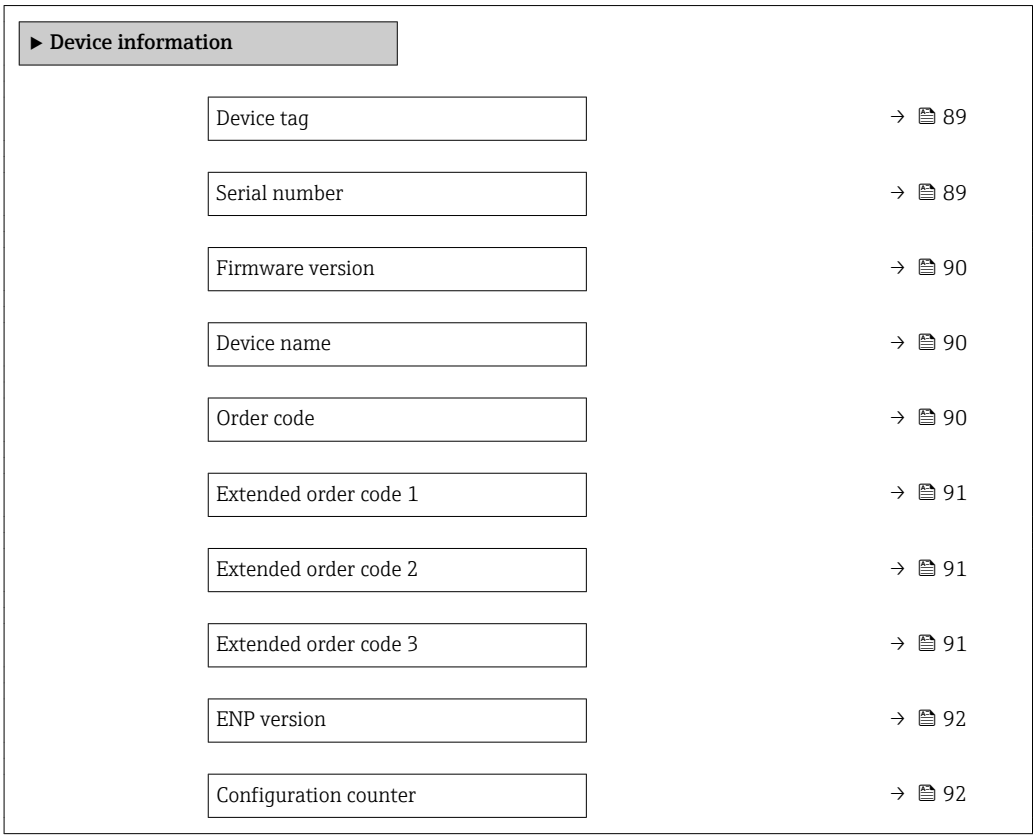
Factory setting All

Additional information *Description*

The status signals are categorized in accordance with VDI/VDE 2650 and NAMUR Recommendation NE 107:
- F = Failure
- C = Function Check
- S = Out of Specification
- M = Maintenance Required

3.5.3 "Device information" submenu

Navigation Expert → Diagnostics → Device info



Device tag

Navigation Expert → Diagnostics → Device info → Device tag

Description Displays a unique name for the measuring point so it can be identified quickly within the plant.

User interface Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /).

Factory setting Cubemass 100

Serial number

Navigation Expert → Diagnostics → Device info → Serial number

Description Displays the serial number of the measuring device.

The number can be found on the nameplate of the sensor and transmitter.

User interface A maximum of 11-digit character string comprising letters and numbers.

Additional information *Description*

Uses of the serial number
- To identify the measuring device quickly, e.g. when contacting Endress+Hauser.
- To obtain specific information on the measuring device using the Device Viewer: www.endress.com/deviceviewer

Firmware version

Navigation Expert → Diagnostics → Device info → Firmware version

Description Displays the device firmware version installed.

User interface Character string in the format xx.yy.zz

Additional information *Display*

The Firmware version is also located:
- On the title page of the Operating instructions
- On the transmitter nameplate

Device name

Navigation Expert → Diagnostics → Device info → Device name

Description Displays the name of the transmitter. It can also be found on the nameplate of the transmitter.

User interface Max. 32 characters such as letters or numbers.

Factory setting Cubemass 100

Order code

Navigation Expert → Diagnostics → Device info → Order code

Description Displays the device order code.

User interface Character string composed of letters, numbers and certain punctuation marks (e.g. /).

Additional information *Description*

The order code can be found on the nameplate of the sensor and transmitter in the "Order code" field.

The order code is generated from the extended order code through a process of reversible transformation. The extended order code indicates the attributes for all the device features in the product structure. The device features are not directly readable from the order code.

Uses of the order code
- To order an identical spare device.
- To identify the device quickly and easily, e.g. when contacting Endress+Hauser.

Extended order code 1

Navigation Expert → Diagnostics → Device info → Ext. order cd. 1

Description Displays the first part of the extended order code.

On account of length restrictions, the extended order code is split into a maximum of 3 parameters.

User interface Character string

Additional information *Description*

The extended order code indicates the version of all the features of the product structure for the measuring device and thus uniquely identifies the measuring device.

The extended order code can also be found on the nameplate of the sensor and transmitter in the "Ext. ord. cd." field.

Extended order code 2

Navigation Expert → Diagnostics → Device info → Ext. order cd. 2

Description Displays the second part of the extended order code.

User interface Character string

Additional information For additional information, see **Extended order code 1** parameter (→ 91)

Extended order code 3

Navigation Expert → Diagnostics → Device info → Ext. order cd. 3

Description Displays the third part of the extended order code.

User interface Character string

Additional information For additional information, see **Extended order code 1** parameter (→ 91)

ENP version

Navigation Expert → Diagnostics → Device info → ENP version

Description Displays the version of the electronic nameplate.

User interface Character string

Factory setting 2.02.00

Additional information *Description*

This electronic nameplate stores a data record for device identification that includes more data than the nameplates attached to the outside of the device.

Configuration counter

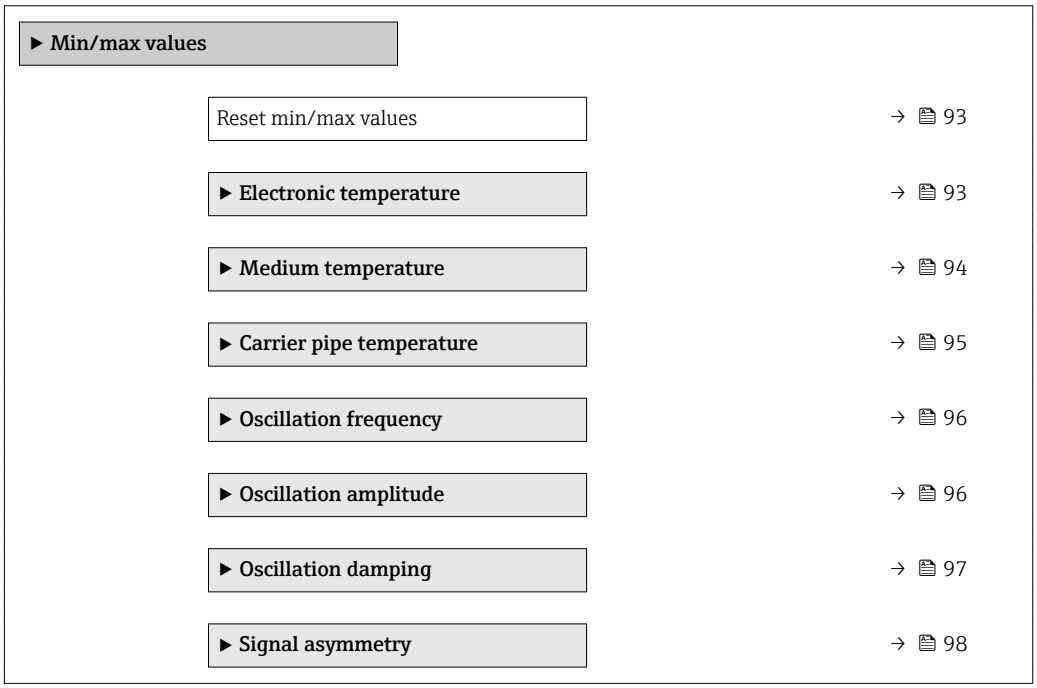
Navigation Expert → Diagnostics → Device info → Config. counter

Description Displays the number of parameter modifications for the device. When the user changes a parameter setting, this counter is incremented.

User interface 0 to 65 535

3.5.4 "Min/max values" submenu

Navigation Expert → Diagnostics → Min/max val.



Reset min/max values

Navigation Expert → Diagnostics → Min/max val. → Reset min/max

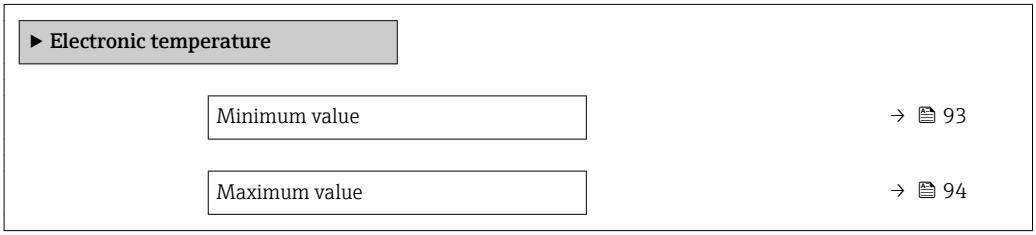
Description Use this function to select measured variables whose minimum, maximum and average measured values are to be reset.

Selection
- Cancel
- Oscillation amplitude
- Oscillation damping
- Oscillation frequency
- Signal asymmetry

Factory setting Cancel

"Electronic temperature" submenu

Navigation Expert → Diagnostics → Min/max val. → Electronic temp.



Minimum value

Navigation Expert → Diagnostics → Min/max val. → Electronic temp. → Minimum value

Description Displays the lowest previously measured temperature value of the main electronics module.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 35)

Maximum value

Navigation Expert → Diagnostics → Min/max val. → Electronic temp. → Maximum value

Description Displays the highest previously measured temperature value of the main electronics module.

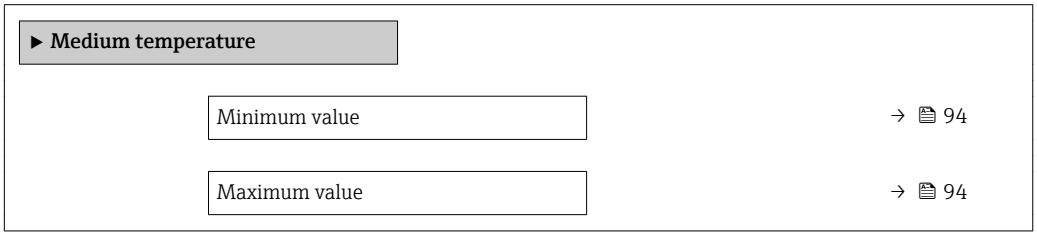
User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 35)

"Medium temperature" submenu

Navigation Expert → Diagnostics → Min/max val. → Medium temp.



Minimum value

Navigation Expert → Diagnostics → Min/max val. → Medium temp. → Minimum value

Description Displays the lowest previously measured medium temperature value.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 35)

Maximum value

Navigation Expert → Diagnostics → Min/max val. → Medium temp. → Maximum value

Description Displays the highest previously measured medium temperature value.

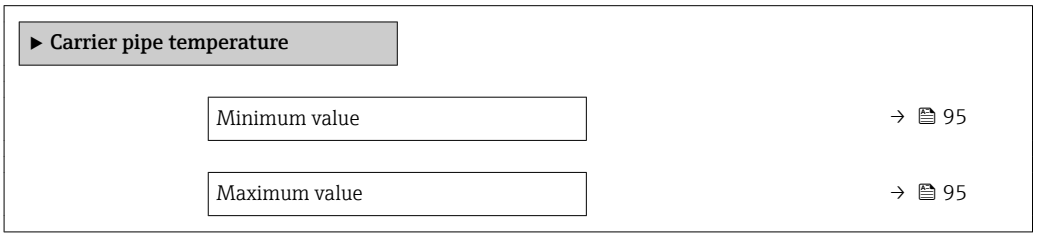
User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 35)

"Carrier pipe temperature" submenu

Navigation Expert → Diagnostics → Min/max val. → Carr. pipe temp.



Minimum value

Navigation Expert → Diagnostics → Min/max val. → Carr. pipe temp. → Minimum value

Prerequisite Order code for "Application package", option EB "Heartbeat Verification + Monitoring"

Description Displays the lowest previously measured temperature value of the carrier pipe.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 35)

Maximum value

Navigation Expert → Diagnostics → Min/max val. → Carr. pipe temp. → Maximum value

Prerequisite Order code for "Application package", option EB "Heartbeat Verification + Monitoring"

Description Displays the highest previously measured temperature value of the carrier pipe.

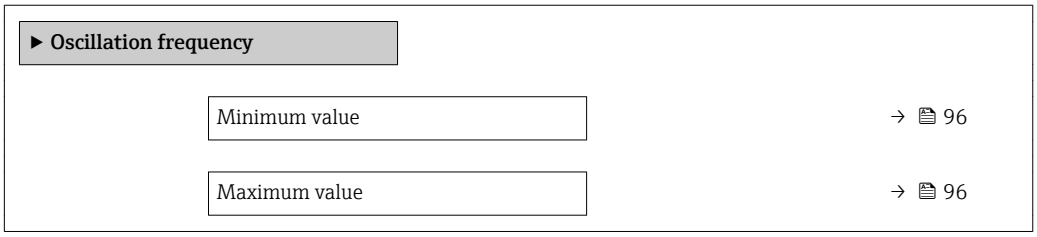
User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 35)

"Oscillation frequency" submenu

Navigation Expert → Diagnostics → Min/max val. → Oscil. frequency



Minimum value

Navigation Expert → Diagnostics → Min/max val. → Oscil. frequency → Minimum value

Description Displays the lowest previously measured oscillation frequency.

User interface Signed floating-point number

Maximum value

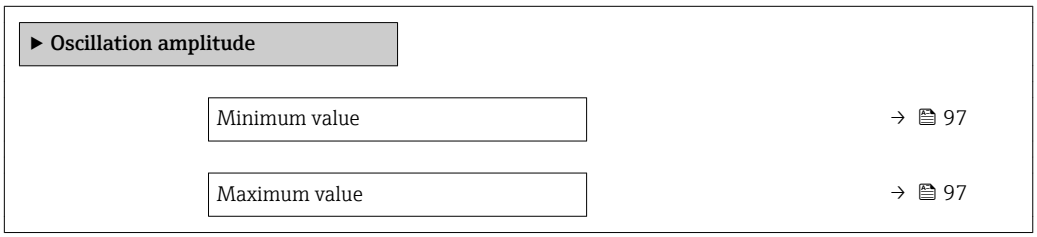
Navigation Expert → Diagnostics → Min/max val. → Oscil. frequency → Maximum value

Description Displays the highest previously measured oscillation frequency.

User interface Signed floating-point number

"Oscillation amplitude" submenu

Navigation Expert → Diagnostics → Min/max val. → Oscil. amplitude



Minimum value

Navigation Expert → Diagnostics → Min/max val. → Oscil. amplitude → Minimum value

Description Displays the lowest previously measured oscillation amplitude.

User interface Signed floating-point number

Maximum value

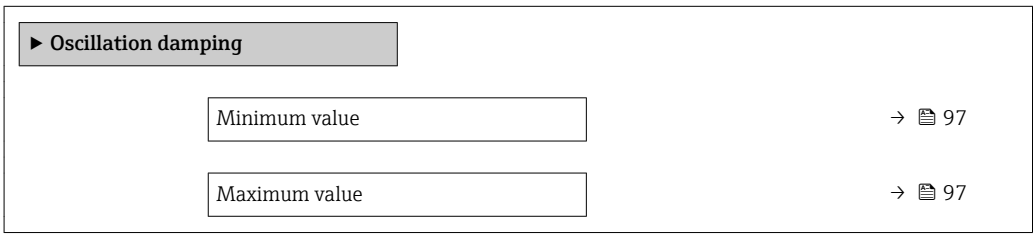
Navigation Expert → Diagnostics → Min/max val. → Oscil. amplitude → Maximum value

Description Displays the highest previously measured oscillation amplitude.

User interface Signed floating-point number

"Oscillation damping" submenu

Navigation Expert → Diagnostics → Min/max val. → Oscil. damping



Minimum value

Navigation Expert → Diagnostics → Min/max val. → Oscil. damping → Minimum value

Description Displays the lowest previously measured oscillation damping.

User interface Signed floating-point number

Maximum value

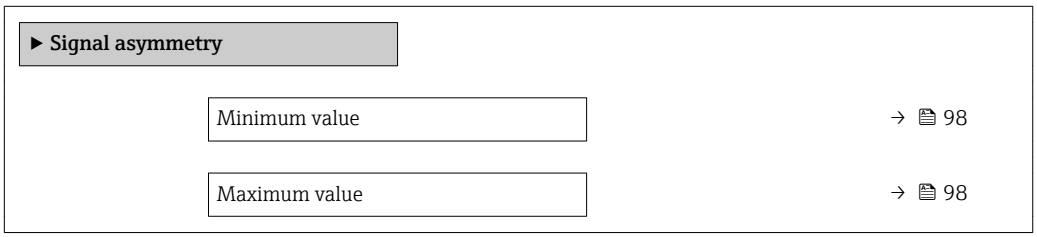
Navigation Expert → Diagnostics → Min/max val. → Oscil. damping → Maximum value

Description Displays the highest previously measured oscillation damping.

User interface Signed floating-point number

"Signal asymmetry" submenu

Navigation Expert → Diagnostics → Min/max val. → Signal asymmetry



Minimum value

Navigation Expert → Diagnostics → Min/max val. → Signal asymmetry → Minimum value

Description Displays the lowest previously measured signal asymmetry.

User interface Signed floating-point number

Maximum value

Navigation Expert → Diagnostics → Min/max val. → Signal asymmetry → Maximum value

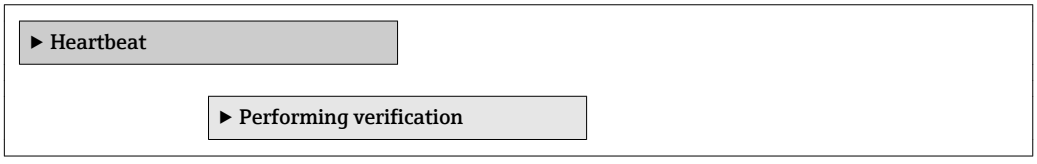
Description Displays the highest previously measured signal asymmetry.

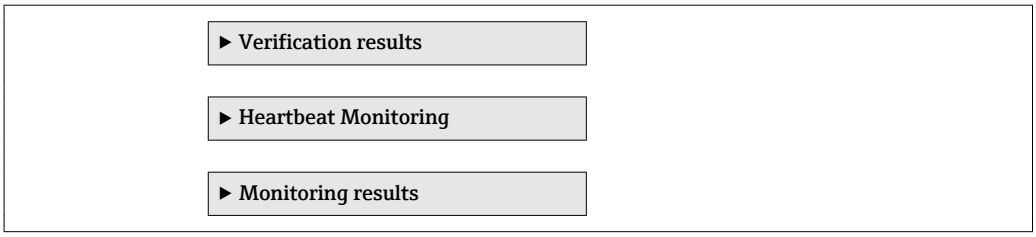
User interface Signed floating-point number

3.5.5 "Heartbeat" submenu

For detailed information on the parameter descriptions of the **Heartbeat Verification** application package, see the Special Documentation for the device

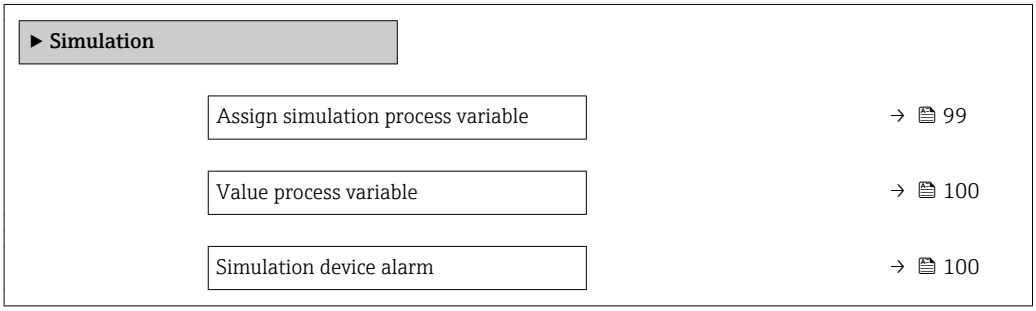
Navigation Expert → Diagnostics → Heartbeat





3.5.6 "Simulation" submenu

Navigation Expert → Diagnostics → Simulation



Assign simulation process variable

Navigation Expert → Diagnostics → Simulation → Assign proc.var.

Description Use this function to select a process variable for the simulation process that is activated.

Selection
- Off
- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature
- Concentration **
- Target mass flow **
- Carrier mass flow **

Factory setting Off

Additional information *Description*

The simulation value of the process variable selected is defined in the **Value process variable** parameter (→ 100).

** Visibility depends on order options or device settings

Value process variable

Navigation Expert → Diagnostics → Simulation → Value proc. var.

Prerequisite One of the following options is selected in the **Assign simulation process variable** parameter (→ 99):
- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature
- Concentration **
- Target mass flow **
- Carrier mass flow **

Description Use this function to enter a simulation value for the selected process variable. Subsequent measured value processing and the signal output use this simulation value. In this way, users can verify whether the measuring device has been configured correctly.

User entry Depends on the process variable selected

Factory setting 0

Additional information *User entry*

The unit of the displayed measured value is taken from the **System units** submenu (→ 28).

Simulation device alarm

Navigation Expert → Diagnostics → Simulation → Sim. alarm

Description Use this function to switch the device alarm on and off.

Selection
- Off
- On

Factory setting Off

** Visibility depends on order options or device settings

4 Country-specific factory settings

4.1 SI units

Not valid for USA and Canada.

4.1.1 System units

Mass	kg
Mass flow	kg/h
Volume	l
Volume flow	l/h
Corrected volume	Nl
Corrected volume flow	Nl/h
Density	kg/l
Reference density	kg/Nl
Temperature	°C
Pressure	bar a

4.1.2 Full scale values

The factory settings applie to the following parameters:
100% bar graph value 1

Nominal diameter [mm]	[kg/h]
1	4
2	20
4	90
6	200

4.1.3 On value low flow cut off

The switch-on point depends on the type of medium and the nominal diameter.

Nominal diameter [mm]	On-value for liquid [kg/h]
1	0.08
2	0.4
4	1.8
6	4

Nominal diameter [mm]	Switch-on value for gas [kg/h]
1	0.02
2	0.1

Nominal diameter [mm]	Switch-on value for gas [kg/h]
4	0.45
6	1

4.2 US units

Only valid for USA and Canada.

4.2.1 System units

Mass	lb
Mass flow	lb/min
Volume	gal (us)
Volume flow	gal/min (us)
Corrected volume	Sft^3
Corrected volume flow	Sft^3/min
Density	lb/ft^3
Reference density	lb/Sft^3
Temperature	lb/ft^3
Pressure	psi a

4.2.2 Full scale values

The factory settings applie to the following parameters:
100% bar graph value 1

Nominal diameter [in]	[lb/min]
$^1/_{24}$	0.15
$^1/_{12}$	0.75
$^1/_{8}$	3.3
$^1/_{4}$	7.4

4.2.3 On value low flow cut off

The switch-on point depends on the type of medium and the nominal diameter.

Nominal diameter [in]	On-value for liquid [lb/min]
$^1/_{24}$	0.003
$^1/_{12}$	0.015
$^1/_{8}$	0.066
$^1/_{4}$	0.15

Nominal diameter [in]	Switch-on value for gas [lb/min]
1/24	0.001
1/12	0.004
1/8	0.016
1/4	0.0375

5 Explanation of abbreviated units

5.1 SI units

Process variable	Units	Explanation
Density	g/cm³, g/m³	Gram/volume unit
	kg/dm³, kg/l, kg/m³	Kilogram/volume unit
	SD4°C, SD15°C, SD20°C	Specific density: The specific density is the ratio of the density of the fluid to the density of water at a water temperature of 4 °C (39 °F), 15 °C (59 °F), 20 °C (68 °F).
	SG4°C, SG15°C, SG20°C	Specific gravity: The specific gravity is the ratio of the density of the fluid to the density of water at a water temperature of 4 °C (39 °F), 15 °C (59 °F), 20 °C (68 °F).
Pressure	Pa a, kPa a, MPa a	Pascal, kilopascal, megapascal (absolute)
	bar	Bar
	Pa g, kPa g, MPa g	Pascal, kilopascal, megapascal (relative/gauge)
	bar g	Bar (relative/gauge)
Mass	g, kg, t	Gram, kilogram, metric ton
Mass flow	g/s, g/min, g/h, g/d	Gram/time unit
	kg/s, kg/min, kg/h, kg/d	Kilogram/time unit
	t/s, t/min, t/h, t/d	Metric ton/time unit
Reference density	kg/Nm³, kg/Nl, g/Scm³, kg/Sm³	Kilogram, gram/standard volume unit
Corrected volume	Nl, Nm³, Sm³	Normal liter, normal cubic meter, standard cubic meter
Corrected volume flow	Nl/s, Nl/min, Nl/h, Nl/d	Normal liter/time unit
	Nm³/s, Nm³/min, Nm³/h, Nm³/d	Normal cubic meter/time unit
	Sm³/s, Sm³/min, Sm³/h, Sm³/d	Standard cubic meter/time unit
Temperature	°C , K	Celsius, Kelvin
Volume	cm³, dm³, m³	Cubic centimeter, cubic decimeter, cubic meter
	ml, l, hl, Ml Mega	Milliliter, liter, hectoliter, megaliter
Volume flow	cm³/s, cm³/min, cm³/h, cm³/d	Cubic centimeter/time unit
	dm³/s, dm³/min, dm³/h, dm³/d	Cubic decimeter/time unit
	m³/s, m³/min, m³/h, m³/d	Cubic meter/time unit
	ml/s, ml/min, ml/h, ml/d	Milliliter/time unit
	l/s, l/min, l/h, l/d	Liter/time unit
	hl/s, hl/min, hl/h, hl/d	Hectoliter/time unit
	Ml/s, Ml/min, Ml/h, Ml/d	Megaliter/time unit
Time	s, m, h, d, y	Second, minute, hour, day, year

5.2 US units

Process variable	Units	Explanation
Density	lb/ft³, lb/gal (us)	Pound/cubic foot, pound/gallon
	lb/bbl (us;liq.), lb/bbl (us;beer), lb/bbl (us;oil), lb/bbl (us;tank)	Pound/volume unit

Process variable	Units	Explanation
Pressure	psi a	Pounds per square inch (absolute)
	psi g	Pounds per square inch (gauge)
Mass	oz, lb, STon	Ounce, pound, standard ton
Mass flow	oz/s, oz/min, oz/h, oz/d	Ounce/time unit
	lb/s, lb/min, lb/h, lb/d	Pound/time unit
	STon/s, STon/min, STon/h, STon/d	Standard ton/time unit
Reference density	lb/Sft³	Weight unit/standard volume unit
Corrected volume	Sft³, Sgal (us), Sbbl (us;liq.)	Standard cubic foot, standard gallon, standard barrel
Corrected volume flow	Sft³/s, Sft³/min, Sft³/h, Sft³/d	Standard cubic foot/time unit
	Sgal/s (us), Sgal/min (us), Sgal/h (us), Sgal/d (us)	Standard gallon/time unit
	Sbbl/s (us;liq.), Sbbl/min (us;liq.), Sbbl/h (us;liq.), Sbbl/d (us;liq.)	Barrel/time unit (normal liquids)
Temperature	°F, °R	Fahrenheit, Rankine
Volume	af	Acre foot
	ft³	Cubic foot
	fl oz (us), gal (us), kgal (us), Mgal (us)	Fluid ounce, gallon, kilogallon, million gallon
	bbl (us;liq.), bbl (us;beer), bbl (us;oil), bbl (us;tank)	Barrel (normal liquids), barrel (beer), barrel (petrochemicals), barrel (filling tanks)
Volume flow	af/s, af/min, af/h, af/d	Acre foot/time unit
	ft³/s, ft³/min, ft³/h, ft³/d	Cubic foot/time unit
	fl oz/s (us), fl oz/min (us), fl oz/h (us), fl oz/d (us)	Fluid ounce/time unit
	gal/s (us), gal/min (us), gal/h (us), gal/d (us)	Gallon/time unit
	kgal/s (us), kgal/min (us), kgal/h (us), kgal/d (us)	Kilogallon/time unit
	Mgal/s (us), Mgal/min (us), Mgal/h (us), Mgal/d (us)	Million gallon/time unit
	bbl/s (us;liq.), bbl/min (us;liq.), bbl/h (us;liq.), bbl/d (us;liq.)	Barrel/time unit (normal liquids) Normal liquids: 31.5 gal/bbl
	bbl/s (us;beer), bbl/min (us;beer), bbl/h (us;beer), bbl/d (us;beer)	Barrel /time unit (beer) Beer: 31.0 gal/bbl
	bbl/s (us;oil), bbl/min (us;oil), bbl/h (us;oil), bbl/d (us;oil)	Barrel/time unit (petrochemicals) Petrochemicals: 42.0 gal/bbl
	bbl/s (us;tank), bbl/min (us;tank), bbl/h (us;tank), bbl/d (us;tank)	Barrel/time unit (filling tank) Filling tanks: 55.0 gal/bbl
Time	s, m, h, d, y	Second, minute, hour, day, year
	am, pm	Ante meridiem (before midday), post meridiem (after midday)

5.3 Imperial units

Process variable	Units	Explanation
Density	lb/gal (imp), lb/bbl (imp;beer), lb/bbl (imp;oil)	Pound/volume unit
Corrected volume	Sgal (imp)	Standard gallon
Corrected volume flow	Sgal/s (imp), Sgal/min (imp), Sgal/h (imp), Sgal/d (imp)	Standard gallon/time unit
Volume	gal (imp), Mgal (imp)	Gallon, mega gallon
	bbl (imp;beer), bbl (imp;oil)	Barrel (beer), barrel (petrochemicals)
Volume flow	gal/s (imp), gal/min (imp), gal/h (imp), gal/d (imp)	Gallon/time unit
	Mgal/s (imp), Mgal/min (imp), Mgal/h (imp), Mgal/d (imp)	Mega gallon/time unit
	bbl/s (imp;beer), bbl/min (imp;beer), bbl/h (imp;beer), bbl/d (imp;beer)	Barrel /time unit (beer) Beer: 36.0 gal/bbl
	bbl/s (imp;oil), bbl/min (imp;oil), bbl/h (imp;oil), bbl/d (imp;oil)	Barrel/time unit (petrochemicals) Petrochemicals: 34.97 gal/bbl
Time	s, m, h, d, y	Second, minute, hour, day, year
	am, pm	Ante meridiem (before midday), post meridiem (after midday)

6 Modbus RS485 Register Information

6.1 Notes

6.1.1 Structure of the register information

The individual parts of a parameter description are described in the following section:

Navigation: navigation path to the parameter					
Parameter	**Register**	**Data type**	**Access type**	**Selection/input**	**→**
Name of parameter	Indicated in decimal numerical format	▪ Float length = 4 byte ▪ Integer length = 2 byte ▪ String length, depending on parameter	Possible type of access to parameter: ▪ Read access via function codes 03, 04 or 23 ▪ Write access via function codes 06, 16 or 23	**Selection** List of the individual options for the parameter ▪ Option 1 ▪ **Option 2** ▪ **Option 3** (+) ▪ Factory setting highlighted in bold ▪ (+) = Factory setting depends on country, order options or device settings **User entry** Input range for the parameter	Specified number of pages and cross-reference to standard parameter description

NOTICE

If non-volatile device parameters are modified via the MODBUS RS485 function codes 06, 16 or 23, the change is saved in the EEPROM of the measuring device.

The number of writes to the EEPROM is technically restricted to a maximum of 1 million.

- ▶ Make sure to comply with this limit since, if it is exceeded, data loss and measuring device failure will result.
- ▶ Avoid constantly writing non-volatile device parameters via the MODBUS RS485.

6.1.2 Address model

The Modbus RS485 register addresses of the measuring device are implemented in accordance with the "Modbus Applications Protocol Specification V1.1".

In addition, systems are used that work with the register address model "Modicon Modbus Protocol Reference Guide (PI-MBUS-300 Rev. J)".

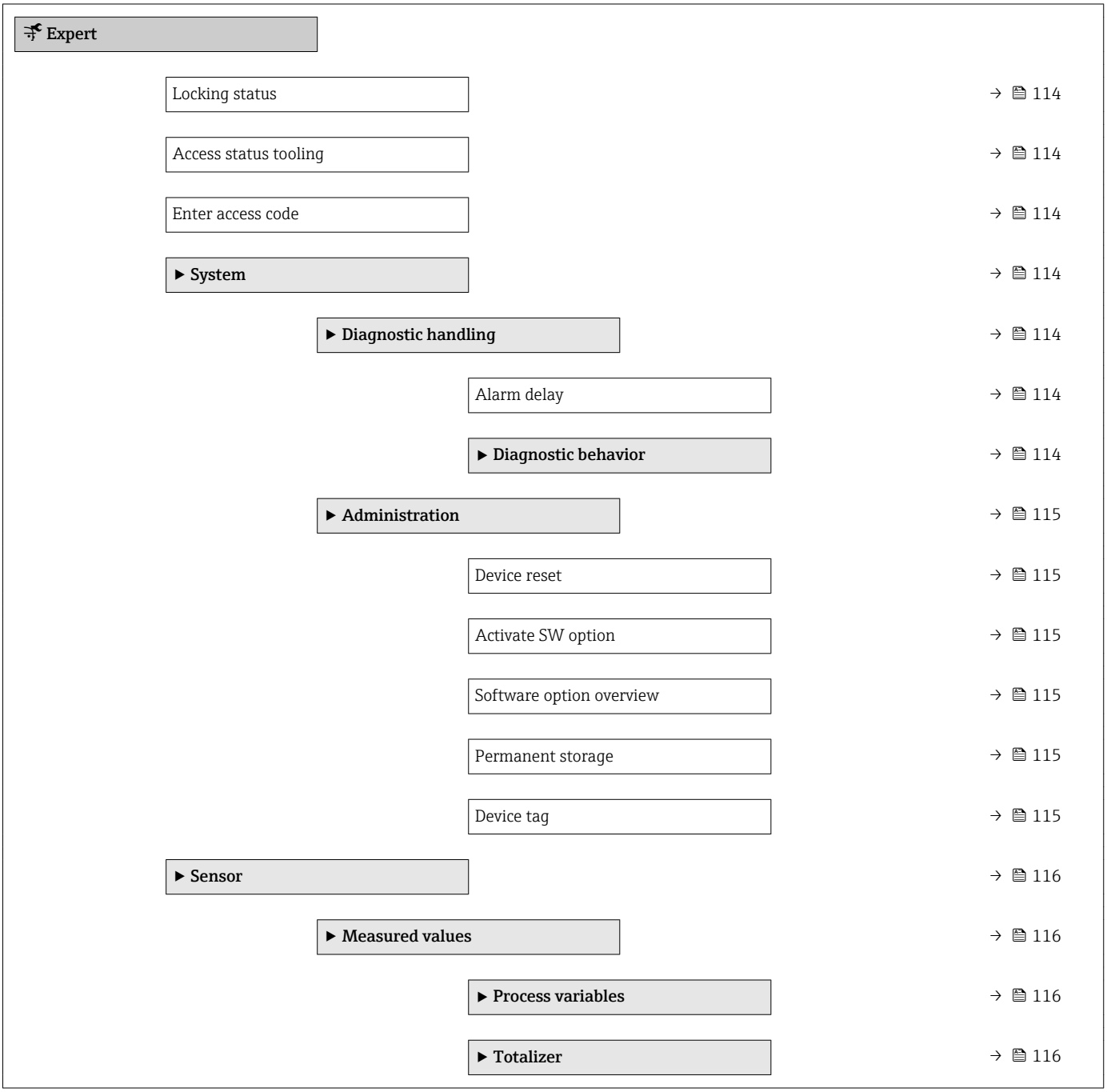
Depending on the function code used, a number is added at the start of the register address with this specification:

- "3" → "Read" access
- "4" → "Write" access

Function code	Access type	Register in accordance with "Modbus Applications Protocol Specification"	Register in accordance with "Modicon Modbus Protocol Reference Guide"
03 04 23	Read	XXXX Example: mass flow = 2007	3XXXX Example: mass flow = 32007
06 16 23	Write	XXXX Example: reset totalizer = 6401	4XXXX Example: reset totalizer = 46401

6.2 Overview of the Expert operating menu

The following table provides an overview of the menu structure of the expert operating menu and its parameters. The page reference indicates where the associated description of the submenu or parameter can be found.



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  - Mass unit → 117
  - Volume flow unit → 118
  - Volume unit → 119
  - Corrected volume flow unit → 120
  - Corrected volume unit → 120
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  - Reference density unit → 121
  - Temperature unit → 121
  - Pressure unit → 121
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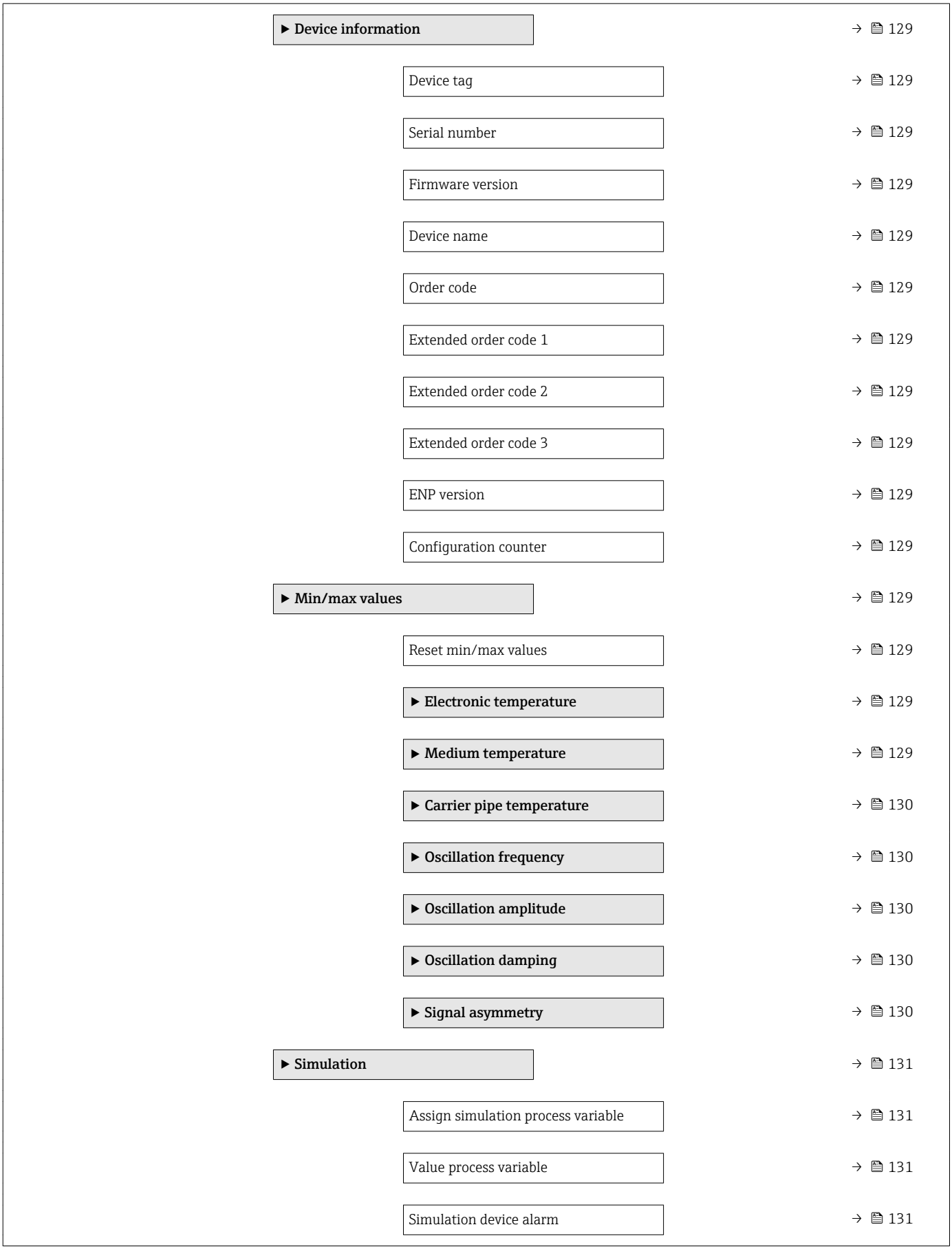
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6.3 Register information

Navigation: Expert					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Locking status	4918	Integer	Read	256 = Hardware locked 512 = Temporarily locked	9
Access status tooling	2178	Integer	Read	0 = Operator **1 = Maintenance**	10
Enter access code	2177	Integer	Read / Write	0 to 9999	10

6.3.1 "System" submenu

"Diagnostic handling" submenu

Navigation: Expert → System → Diagnostic handling					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Alarm delay	6808	Float	Read / Write	0 to 60 s	11

"Diagnostic behavior" submenu

Navigation: Expert → System → Diagnostic handling → Diagnostic behavior					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Assign behavior of diagnostic no. 140	2757	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	13
Assign behavior of diagnostic no. 046	2756	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	13
Assign behavior of diagnostic no. 144	2081	Integer	Read / Write	0 = Off 1 = Logbook entry only 2 = Warning **3 = Alarm**	14
Assign behavior of diagnostic no. 832	2759	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	14
Assign behavior of diagnostic no. 833	2762	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	14
Assign behavior of diagnostic no. 834	2761	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	15
Assign behavior of diagnostic no. 835	2760	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	15
Assign behavior of diagnostic no. 912	2758	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	15

Navigation: Expert → System → Diagnostic handling → Diagnostic behavior					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Assign behavior of diagnostic no. 913	2754	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	16
Assign behavior of diagnostic no. 944	2082	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	16
Assign behavior of diagnostic no. 192	2022	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	17
Assign behavior of diagnostic no. 274	2755	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	17
Assign behavior of diagnostic no. 392	2023	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	18
Assign behavior of diagnostic no. 592	2024	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	18
Assign behavior of diagnostic no. 992	2021	Integer	Read / Write	0 = Off 1 = Logbook entry only **2 = Warning** 3 = Alarm	18

"Administration" submenu

Navigation: Expert → System → Administration					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Device reset	6817	Integer	Read / Write	**0 = Cancel** 1 = Restart device 2 = To delivery settings 14 = To fieldbus defaults *	19
Activate SW option	2795	Integer	Read / Write	Max. 10-digit string consisting of numbers.	20
Software option overview	2902	Integer	Read	4 = Concentration 16384 = Heartbeat Monitoring 32768 = Heartbeat Verification	20
Permanent storage	6907	Integer	Read / Write	0 = Off **1 = On**	21
Device tag	4901	String	Read / Write	Max. 32 characters such as letters, numbers or special characters (e.g. @, %, /).	21

* Visibility depends on communication

6.3.2 "Sensor" submenu

"Measured values" submenu

"Process variables" submenu

Navigation: Expert → Sensor → Measured values → Process variables					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Mass flow	2007	Float	Read	Signed floating-point number	23
Volume flow	2009	Float	Read	Signed floating-point number	23
Corrected volume flow	2011	Float	Read	Signed floating-point number	24
Density	2013	Float	Read	Signed floating-point number	23
Reference density	2015	Float	Read	Signed floating-point number	24
Temperature	2017	Float	Read	Signed floating-point number	24
Pressure value	2089	Float	Read	Signed floating-point number	25
Concentration	2598	Float	Read	Signed floating-point number	25
Target mass flow	2797	Float	Read	Signed floating-point number	25
Carrier mass flow	2799	Float	Read	Signed floating-point number	26

"Totalizer" submenu

Navigation: Expert → Sensor → Measured values → Totalizer					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Totalizer value 1 to 3	1: 2610 2: 2810 3: 3010	Float	Read	Signed floating-point number	26
Totalizer overflow 1 to 3	1: 2612 2: 2812 3: 3012	Float	Read	Integer with sign	27

"System units" submenu

Navigation: Expert → Sensor → System units					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	→ 🖹
Mass flow unit	2101	Integer	Read / Write	0 = g/s 1 = g/min 2 = g/h 3 = g/d 4 = kg/s 5 = kg/min **6 = kg/h** (+) 7 = kg/d 8 = t/s 9 = t/min 10 = t/h 11 = t/d 12 = oz/s 13 = oz/min 14 = oz/h 15 = oz/d 16 = lb/s 17 = lb/min 18 = lb/h 19 = lb/d 20 = STon/s 21 = STon/min 22 = STon/h 23 = STon/d 24 = User mass/s 25 = User mass/min 26 = User mass/h 27 = User mass/d	29
Mass unit	2102	Integer	Read / Write	0 = g **1 = kg** (+) 2 = t 3 = oz 4 = lb 5 = STon 6 = User mass	29

Navigation: Expert → Sensor → System units					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Volume flow unit	2103	Integer	Read / Write	0 = cm^3/s 1 = cm^3/min 2 = cm^3/h 3 = cm^3/d 4 = dm^3/s 5 = dm^3/min 6 = dm^3/h 7 = dm^3/d 8 = m^3/s 9 = m^3/min 10 = m^3/h 11 = m^3/d 12 = ml/s 13 = ml/min 14 = ml/h 15 = ml/d 16 = l/s 17 = l/min **18 = l/h** (+) 19 = l/d 20 = hl/s 21 = hl/min 22 = hl/h 23 = hl/d 24 = Ml/s 25 = Ml/min 26 = Ml/h 27 = Ml/d 32 = af/s 33 = af/min 34 = af/h 35 = af/d 36 = ft^3/s 37 = ft^3/min 38 = ft^3/h 39 = ft^3/d 40 = fl oz/s (us) 41 = fl oz/min (us) 42 = fl oz/h (us) 43 = fl oz/d (us) 44 = gal/s (us) 45 = gal/min (us) 46 = gal/h (us) 47 = gal/d (us) 48 = Mgal/s (us) 49 = Mgal/min (us) 50 = Mgal/h (us) 51 = Mgal/d (us) 52 = bbl/s (us;liq.) 53 = bbl/min (us;liq.) 54 = bbl/h (us;liq.) 55 = bbl/d (us;liq.) 56 = bbl/s (us;beer) 57 = bbl/min (us;beer) 58 = bbl/h (us;beer) 59 = bbl/d (us;beer) 60 = bbl/s (us;oil) 61 = bbl/min (us;oil) 62 = bbl/h (us;oil) 63 = bbl/d (us;oil) 64 = bbl/s (us;tank) 65 = bbl/min (us;tank) 66 = bbl/h (us;tank) 67 = bbl/d (us;tank) 68 = gal/s (imp) 69 = gal/min (imp) 70 = gal/h (imp)	30

Navigation: Expert → Sensor → System units					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	→
				71 = gal/d (imp) 72 = Mgal/s (imp) 73 = Mgal/min (imp) 74 = Mgal/h (imp) 75 = Mgal/d (imp) 76 = bbl/s (imp;beer) 77 = bbl/min (imp;beer) 78 = bbl/h (imp;beer) 79 = bbl/d (imp;beer) 80 = bbl/s (imp;oil) 81 = bbl/min (imp;oil) 82 = bbl/h (imp;oil) 83 = bbl/d (imp;oil) 84 = User vol./s 85 = User vol./min 86 = User vol./h 87 = User vol./d 88 = kgal/s (us) 89 = kgal/min (us) 90 = kgal/h (us) 91 = kgal/d (us)	
Volume unit	2104	Integer	Read / Write	0 = cm^3 1 = dm^3 2 = m^3 3 = ml **4 = l** (+) 5 = hl 6 = Ml Mega 8 = af 9 = ft^3 10 = fl oz (us) 11 = gal (us) 12 = Mgal (us) 13 = bbl (us;liq.) 14 = bbl (us;beer) 15 = bbl (us;oil) 16 = bbl (us;tank) 17 = gal (imp) 18 = Mgal (imp) 19 = bbl (imp;beer) 20 = bbl (imp;oil) 21 = User vol. 22 = kgal (us)	32

Navigation: Expert → Sensor → System units					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Corrected volume flow unit	2105	Integer	Read / Write	0 = Nl/s 1 = Nl/min **2 = Nl/h** (+) 3 = Nl/d 4 = Nm^3/s 5 = Nm^3/min 6 = Nm^3/h 7 = Nm^3/d 8 = Sm^3/s 9 = Sm^3/min 10 = Sm^3/h 11 = Sm^3/d 12 = Sft^3/s 13 = Sft^3/min 14 = Sft^3/h 15 = Sft^3/d 16 = Sgal/s (us) 17 = Sgal/min (us) 18 = Sgal/h (us) 19 = Sgal/d (us) 20 = Sbbl/s (us;liq.) 21 = Sbbl/min (us;liq.) 22 = Sbbl/h (us;liq.) 23 = Sbbl/d (us;liq.) 24 = Sgal/s (imp) 25 = Sgal/min (imp) 26 = Sgal/h (imp) 27 = Sgal/d (imp) 28 = UserCrVol./s 29 = UserCrVol./min 30 = UserCrVol./h 31 = UserCrVol./d	32
Corrected volume unit	2106	Integer	Read / Write	**0 = Nl** (+) 1 = Nm^3 2 = Sm^3 3 = Sft^3 4 = Sl 5 = Sgal (us) 6 = Sbbl (us;liq.) 7 = Sgal (imp) 8 = UserCrVol.	33
Density unit	2107	Integer	Read / Write	0 = g/cm^3 2 = kg/dm^3 **3 = kg/l** (+) 4 = kg/m^3 5 = SD4°C 6 = SD15°C 7 = SD20°C 8 = SG4°C 9 = SG15°C 10 = SG20°C 11 = lb/ft^3 12 = lb/gal (us) 13 = lb/bbl (us;liq.) 14 = lb/bbl (us;beer) 15 = lb/bbl (us;oil) 16 = lb/bbl (us;tank) 17 = lb/gal (imp) 18 = lb/bbl (imp;beer) 19 = lb/bbl (imp;oil) 20 = User dens. 21 = g/m^3 22 = g/ml	34

Navigation: Expert → Sensor → System units					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	→
Reference density unit	2108	Integer	Read / Write	0 = g/Scm³ **1 = kg/Nl** (+) 2 = kg/Nm³ 3 = kg/Sm³ 4 = lb/Sft³	35
Temperature unit	2109	Integer	Read / Write	**0 = °C** (+) 1 = K 2 = °F 3 = °R	35
Pressure unit	2130	Integer	Read / Write	0 = bar 1 = psi a 2 = bar g 3 = psi g 4 = Pa a 5 = kPa a 6 = MPa a 7 = Pa g 8 = kPa g 9 = MPa g 10 = User pres.	36
Date/time format	2150	Integer	Read / Write	**0 = dd.mm.yy hh:mm** 1 = mm/dd/yy hh:mm am/pm 2 = dd.mm.yy hh:mm am/pm 3 = mm/dd/yy hh:mm	36

"User-specific units" submenu

Navigation: Expert → Sensor → System units → User-specific units					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	→
User mass text	2531	String	Read / Write	Max. 10 characters such as letters, numbers or special characters (@, %, /)	37
User mass factor	2115	Float	Read / Write	Signed floating-point number	38
User volume text	2542	String	Read / Write	Max. 10 characters such as letters, numbers or special characters (@, %, /)	38
User volume factor	2119	Float	Read / Write	Signed floating-point number	39
User corrected volume text	2568	String	Read / Write	Max. 10 characters such as letters, numbers or special characters (@, %, /)	39
User corrected volume factor	2573	Float	Read / Write	Signed floating-point number	40
User density text	2549	String	Read / Write	Max. 10 characters such as letters, numbers or special characters (@, %, /)	40
User density offset	2556	Float	Read / Write	Signed floating-point number	40
User density factor	2123	Float	Read / Write	Signed floating-point number	40
User pressure text	2559	String	Read / Write	Max. 10 characters such as letters, numbers or special characters (@, %, /)	41
User pressure offset	2566	Float	Read / Write	Signed floating-point number	41
User pressure factor	2564	Float	Read / Write	Signed floating-point number	41

"Process parameters" submenu

Navigation: Expert → Sensor → Process parameters					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Flow damping	5510	Float	Read / Write	0 to 100.0 s	42
Density damping	5508	Float	Read / Write	0 to 999.9 s	42
Temperature damping	5127	Float	Read / Write	0 to 999.9 s	43
Flow override	5503	Integer	Read / Write	**0 = Off** 1 = On	43

"Low flow cut off" submenu

Navigation: Expert → Sensor → Process parameters → Low flow cut off					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Assign process variable	5101	Integer	Read / Write	0 = Off **1 = Mass flow** 2 = Volume flow 3 = Corrected volume flow	44
On value low flow cutoff	5138	Float	Read / Write	Positive floating-point number	44
Off value low flow cutoff	5104	Float	Read / Write	0 to 100.0 %	45
Pressure shock suppression	5140	Float	Read / Write	0 to 100 s	45

"Partially filled pipe detection" submenu

Navigation: Expert → Sensor → Process parameters → Partially filled pipe detection					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Assign process variable	5106	Integer	Read / Write	**0 = Off** 4 = Density 5 = Reference density	47
Low value partial filled pipe detection	5110	Float	Read / Write	Signed floating-point number	47
High value partial filled pipe detection	5112	Float	Read / Write	Signed floating-point number	48
Response time part. filled pipe detect.	5108	Float	Read / Write	0 to 100 s	48
Maximum damping partial filled pipe det.	2414	Float	Read / Write	Positive floating-point number	49

"Measurement mode" submenu

Navigation: Expert → Sensor → Measurement mode					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Select medium	2442	Integer	Read / Write	**0 = Liquid** 1 = Gas	50
Select gas type	5229	Integer	Read / Write	0 = Air 1 = Nitrogen N2 2 = Argon Ar 3 = Helium He 4 = Carbon dioxide CO2 5 = Oxygen O2 **6 = Methane CH4** 7 = Ammonia NH3 9 = Hydrogen H2 10 = Ethane C2H6 11 = Propane C3H8 12 = Butane C4H10 13 = Chlorine Cl2 14 = Hydrogen chloride HCl 15 = Carbon monoxide CO 16 = Nitrous oxide N2O 17 = Nitrogen oxide NOx 18 = Hydrogen sulfide H2S 19 = Sulfur hexafluoride SF6 20 = Propylene C3H6 21 = Ozone O3 22 = Others 23 = Ethylene C2H4	50
Reference sound velocity	7413	Float	Read / Write	1 to 99 999.9999 m/s	51
Temperature coefficient sound velocity	7411	Float	Read / Write	Positive floating-point number	51

"External compensation" submenu

Navigation: Expert → Sensor → External compensation					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Pressure compensation	5184	Integer	Read / Write	**0 = Off** 1 = Fixed value 2 = External value	52
Pressure value	5185	Float	Read / Write	Positive floating-point number	52
External pressure	2440	Float	Read / Write	Positive floating-point number	52
Temperature mode	5515	Integer	Read / Write	**0 = Internal measured value** 1 = External value	53
External temperature	2507	Float	Read / Write	−273.15 to 99 999 °C	53

"Calculated values" submenu

"Corrected volume flow calculation" submenu

Navigation: Expert → Sensor → Calculated values → Corrected volume flow calculation					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Corrected volume flow calculation	5129	Integer	Read / Write	**0 = Calculated reference density** 1 = Fixed reference density 2 = External reference density 3 = Reference density by API table 53	54
External reference density	2509	Float	Read / Write	Floating point number with sign	54

Navigation: Expert → Sensor → Calculated values → Corrected volume flow calculation					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Fixed reference density	5130	Float	Read / Write	Positive floating-point number	54
Reference temperature	5136	Float	Read / Write	−273.15 to 99 999 °C	55
Linear expansion coefficient	5132	Float	Read / Write	Signed floating-point number	55
Square expansion coefficient	5134	Float	Read / Write	Signed floating-point number	56

"Sensor adjustment" submenu

Navigation: Expert → Sensor → Sensor adjustment					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Installation direction	5501	Integer	Read / Write	**0 = Flow in arrow direction** 1 = Flow against arrow direction	56

"Zero point adjustment" submenu

Navigation: Expert → Sensor → Sensor adjustment → Zero point adjustment					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Zero point adjustment control	5121	Integer	Read / Write	**0 = Cancel** 1 = Start 2 = Zero point adjust failure 8 = Busy	57
Progress	6797	Integer	Read	0 to 100 %	57

"Process variable adjustment" submenu

Navigation: Expert → Sensor → Sensor adjustment → Process variable adjustment					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Mass flow offset	5521	Float	Read / Write	Signed floating-point number	58
Mass flow factor	5519	Float	Read / Write	Positive floating-point number	59
Volume flow offset	5525	Float	Read / Write	Signed floating-point number	59
Volume flow factor	5523	Float	Read / Write	Positive floating-point number	59
Density offset	5529	Float	Read / Write	Signed floating-point number	60
Density factor	5527	Float	Read / Write	Positive floating-point number	60
Corrected volume flow offset	2044	Float	Read / Write	Signed floating-point number	60
Corrected volume flow factor	2076	Float	Read / Write	Positive floating-point number	61
Reference density offset	2046	Float	Read / Write	Signed floating-point number	61
Reference density factor	2042	Float	Read / Write	Positive floating-point number	61
Temperature offset	5533	Float	Read / Write	Signed floating-point number	62
Temperature factor	5531	Float	Read / Write	Positive floating-point number	62

"Calibration" submenu

Navigation: Expert → Sensor → Calibration					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Calibration factor	7513	Float	Read	Signed floating-point number	63
Zero point	7527	Float	Read / Write	Signed floating-point number	63

Navigation: Expert → Sensor → Calibration					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Nominal diameter	2048	String	Read	DNxx / x"	63
C0 to 5	0: 7501 1: 7503 2: 7505 3: 7507 4: 7509 5: 7511	Float	Read	Signed floating-point number	63

"Testpoints" submenu

Navigation: Expert → Sensor → Testpoints					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Oscillation frequency 0	0: 9501 1: 9503	Float	Read	Positive floating point number	64
Frequency fluctuation 0	0: 2498 1: 2500	Float	Read	Signed floating-point number	65
Oscillation amplitude 0	0: 2449 1: 2451	Float	Read	Signed floating-point number	65
Oscillation damping 0	0: 9505 1: 9507	Float	Read	Positive floating-point number	65
Tube damping fluctuation 0	0: 2502 1: 2504	Float	Read	Signed floating-point number	66
Signal asymmetry	2443	Float	Read	Signed floating-point number	66
Electronic temperature	2457	Float	Read	Signed floating-point number	67
Carrier pipe temperature	9513	Float	Read	Signed floating-point number	67
Exciter current 0	0: 9509 1: 9511	Float	Read	Signed floating-point number	68
RawMassFlow	10232	Float	Read	Signed floating-point number	68

6.3.3 "Communication" submenu

"Modbus configuration" submenu

Navigation: Expert → Communication → Modbus configuration					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Bus address	4910	Integer	Read / Write	1 to 247	70
Baudrate	4912	Integer	Read / Write	0 = 1200 BAUD 1 = 2400 BAUD 2 = 4800 BAUD 3 = 9600 BAUD **4 = 19200 BAUD** 5 = 38400 BAUD 6 = 57600 BAUD 7 = 115200 BAUD	70
Data transfer mode	4913	Integer	Read / Write	**0 = RTU** 1 = ASCII	70
Parity	4914	Integer	Read / Write	**0 = Even** 1 = Odd 2 = None / 2 stop bits 3 = None / 1 stop bit	71

Navigation: Expert → Communication → Modbus configuration					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Byte order	4915	Integer	Read / Write	0 = 0-1-2-3 1 = 3-2-1-0 2 = 2-3-0-1 **3 = 1-0-3-2**	71
Telegram delay	4916	Float	Read / Write	0 to 100 ms	72
Assign diagnostic behavior	4921	Integer	Read / Write	0 = Off 1 = Warning **2 = Alarm** 3 = Alarm or warning	72
Failure mode	4920	Integer	Read / Write	**0 = NaN value** 1 = Last valid value	72
Interpreter mode	4925	Integer	Read / Write	**0 = Standard** 1 = Ignore surplus bytes	73

"Modbus information" submenu

Navigation: Expert → Communication → Modbus information					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Device ID	2547	Integer	Read	4-digit hexadecimal number	74
Device revision	4481	Integer	Read	4-digit hexadecimal number	74

"Modbus data map" submenu

Navigation: Expert → Communication → Modbus data map					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Scan list register 0 to 15	0: 5001 1: 5002 2: 5003 3: 5004 4: 5005 5: 5006 6: 5007 7: 5008 8: 5009 9: 5010 10: 5011 11: 5012 12: 5013 13: 5014 14: 5015 15: 5016	Integer	Read / Write	1 to 65 535	74

6.3.4 "Application" submenu

Navigation: Expert → Application					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Reset all totalizers	2609	Integer	Read / Write	**0 = Cancel** 1 = Reset + totalize	75

"Totalizer 1 to 3" submenu

Navigation: Expert → Application → Totalizer 1 to 3					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Assign process variable	1: 2601 2: 2801 3: 3001	Integer	Read / Write	0 = Off **1 = Mass flow** 2 = Volume flow 3 = Corrected volume flow 13 = Target mass flow * 14 = Carrier mass flow *	76
Mass unit	1: 2602 2: 2802 3: 3002	Integer	Read / Write	0 = g **1 = kg** (+) 2 = t 3 = oz 4 = lb 5 = STon 6 = User mass	77
Volume unit	1: 2603 2: 2803 3: 3003	Integer	Read / Write	0 = cm^3 1 = dm^3 2 = m^3 3 = ml **4 = l** (+) 5 = hl 6 = Ml Mega 8 = af 9 = ft^3 10 = fl oz (us) 11 = gal (us) 12 = Mgal (us) 13 = bbl (us;liq.) 14 = bbl (us;beer) 15 = bbl (us;oil) 16 = bbl (us;tank) 17 = gal (imp) 18 = Mgal (imp) 19 = bbl (imp;beer) 20 = bbl (imp;oil) 21 = User vol. 22 = kgal (us)	77
Corrected volume unit	1: 2604 2: 2804 3: 3004	Integer	Read / Write	**0 = Nl** (+) 1 = Nm^3 2 = Sm^3 3 = Sft^3 4 = Sl 5 = Sgal (us) 6 = Sbbl (us;liq.) 7 = Sgal (imp) 8 = UserCrVol.	78
Totalizer operation mode	1: 2605 2: 2805 3: 3005	Integer	Read / Write	**0 = Net flow total** 1 = Forward flow total 2 = Reverse flow total	78
Control Totalizer 1 to 3	1: 2608 2: 2808 3: 3008	Integer	Read / Write	**0 = Totalize** 1 = Reset + totalize 2 = Preset + hold 3 = Reset + hold 4 = Preset + totalize	79
Preset value 1 to 3	1: 2590 2: 2592 3: 2594	Float	Read / Write	Signed floating-point number	80
Failure mode	1: 2606 2: 2806 3: 3006	Integer	Read / Write	**0 = Stop** 1 = Actual value 2 = Last valid value	80

* Visibility depends on order options or device settings

6.3.5 "Diagnostics" submenu

Navigation: Expert → Diagnostics					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Actual diagnostics	2732	Integer	Read	Symbol for diagnostic behavior, diagnostic code and short message.	82
Timestamp	2719	Integer	Read	Days (d), hours (h), minutes (m) and seconds (s)	82
Previous diagnostics	2734	Integer	Read	Symbol for diagnostic behavior, diagnostic code and short message.	83
Timestamp	2068	Integer	Read	Days (d), hours (h), minutes (m) and seconds (s)	83
Operating time from restart	2624	Integer	Read	Days (d), hours (h), minutes (m) and seconds (s)	83
Operating time	2631	Integer	Read	Days (d), hours (h), minutes (m) and seconds (s)	84

"Diagnostic list" submenu

Navigation: Expert → Diagnostics → Diagnostic list					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Diagnostics 1	2736	Integer	Read	Symbol for diagnostic behavior, diagnostic code and short message.	84
Timestamp	2710	Integer	Read	Days (d), hours (h), minutes (m) and seconds (s)	85
Diagnostics 2	2738	Integer	Read	Symbol for diagnostic behavior, diagnostic code and short message.	85
Timestamp	2701	Integer	Read	Days (d), hours (h), minutes (m) and seconds (s)	85
Diagnostics 3	2740	Integer	Read	Symbol for diagnostic behavior, diagnostic code and short message.	86
Timestamp	2692	Integer	Read	Days (d), hours (h), minutes (m) and seconds (s)	86
Diagnostics 4	2742	Integer	Read	Symbol for diagnostic behavior, diagnostic code and short message.	86
Timestamp	2683	Integer	Read	Days (d), hours (h), minutes (m) and seconds (s)	87
Diagnostics 5	2744	Integer	Read	Symbol for diagnostic behavior, diagnostic code and short message.	87
Timestamp	2675	Integer	Read	Days (d), hours (h), minutes (m) and seconds (s)	87

"Event logbook" submenu

Navigation: Expert → Diagnostics → Event logbook					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Filter options	2639	Integer	Read / Write	0 = Failure (F) 4 = Maintenance required (M) 8 = Function check (C) 12 = Out of specification (S) 16 = Information (I) **255 = All**	88

"Device information" submenu

Navigation: Expert → Diagnostics → Device information					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Device tag	2026	String	Read	Max. 32 characters, such as letters, numbers or special characters (e.g. @, %, /).	89
Serial number	7003	String	Read	A maximum of 11-digit character string comprising letters and numbers.	89
Firmware version	7277	String	Read	Character string in the format xx.yy.zz	90
Device name	7263	String	Read	Max. 32 characters such as letters or numbers.	90
Order code	2058	String	Read	Character string composed of letters, numbers and certain punctuation marks (e.g. /).	90
Extended order code 1	2212	String	Read	Character string	91
Extended order code 2	2222	String	Read	Character string	91
Extended order code 3	2232	String	Read	Character string	91
ENP version	4003	String	Read	Character string	92
Configuration counter	3100	Integer	Read	0 to 65 535	92

"Min/max values" submenu

Navigation: Expert → Diagnostics → Min/max values					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Reset min/max values	2525	Integer	Read / Write	**0 = Cancel** 8 = Oscillation amplitude 10 = Oscillation damping 12 = Oscillation frequency 13 = Signal asymmetry	93

"Electronic temperature" submenu

Navigation: Expert → Diagnostics → Min/max values → Electronic temperature					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Minimum value	2421	Float	Read	Signed floating-point number	93
Maximum value	2419	Float	Read	Signed floating-point number	94

"Medium temperature" submenu

Navigation: Expert → Diagnostics → Min/max values → Medium temperature					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Minimum value	7529	Float	Read	Signed floating-point number	94
Maximum value	7531	Float	Read	Signed floating-point number	94

"Carrier pipe temperature" submenu

Navigation: Expert → Diagnostics → Min/max values → Carrier pipe temperature					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Minimum value	7533	Float	Read	Signed floating-point number	95
Maximum value	7535	Float	Read	Signed floating-point number	95

"Oscillation frequency" submenu

Navigation: Expert → Diagnostics → Min/max values → Oscillation frequency					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Minimum value	2459	Float	Read	Signed floating-point number	96
Maximum value	2468	Float	Read	Signed floating-point number	96

"Oscillation amplitude" submenu

Navigation: Expert → Diagnostics → Min/max values → Oscillation amplitude					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Minimum value	2472	Float	Read	Signed floating-point number	97
Maximum value	2470	Float	Read	Signed floating-point number	97

"Oscillation damping" submenu

Navigation: Expert → Diagnostics → Min/max values → Oscillation damping					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Minimum value	2478	Float	Read	Signed floating-point number	97
Maximum value	2423	Float	Read	Signed floating-point number	97

"Signal asymmetry" submenu

Navigation: Expert → Diagnostics → Min/max values → Signal asymmetry					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	**→**
Minimum value	2474	Float	Read	Signed floating-point number	98
Maximum value	2476	Float	Read	Signed floating-point number	98

"Simulation" submenu

Navigation: Expert → Diagnostics → Simulation					
Parameter	**Register**	**Data type**	**Access**	**Selection / User entry / User interface**	→ 🖹
Assign simulation process variable	6813	Integer	Read / Write	**0 = Off** 1 = Mass flow 2 = Volume flow 3 = Corrected volume flow 4 = Density 5 = Reference density 7 = Temperature 13 = Target mass flow * 14 = Carrier mass flow * 15 = Concentration *	99
Value process variable	6814	Float	Read / Write	Depends on the process variable selected	100
Simulation device alarm	6812	Integer	Read / Write	**0 = Off** 1 = On	100

* Visibility depends on order options or device settings

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