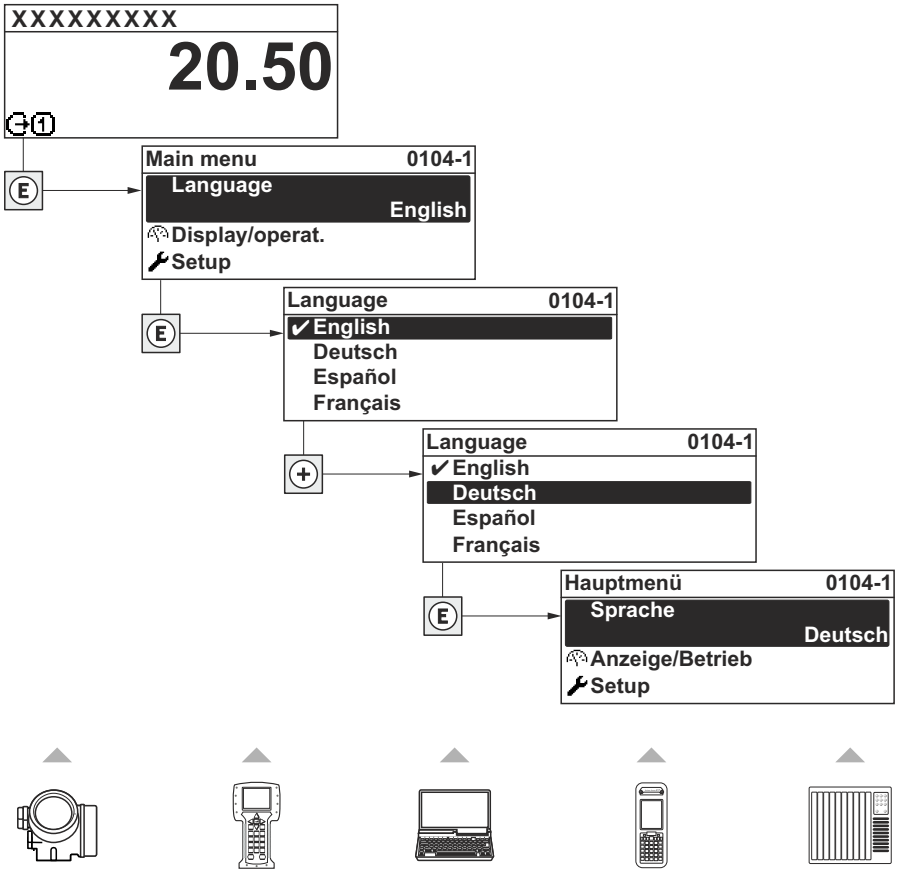
GP01019D/06/EN/02.15
71308256

Valid as of version
01.02.zz (Device firmware)

Description of Device Parameters
Proline Prowirl 200
HART

Vortex flowmeter

HART®
FIELD COMMUNICATION PROTOCOL



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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.

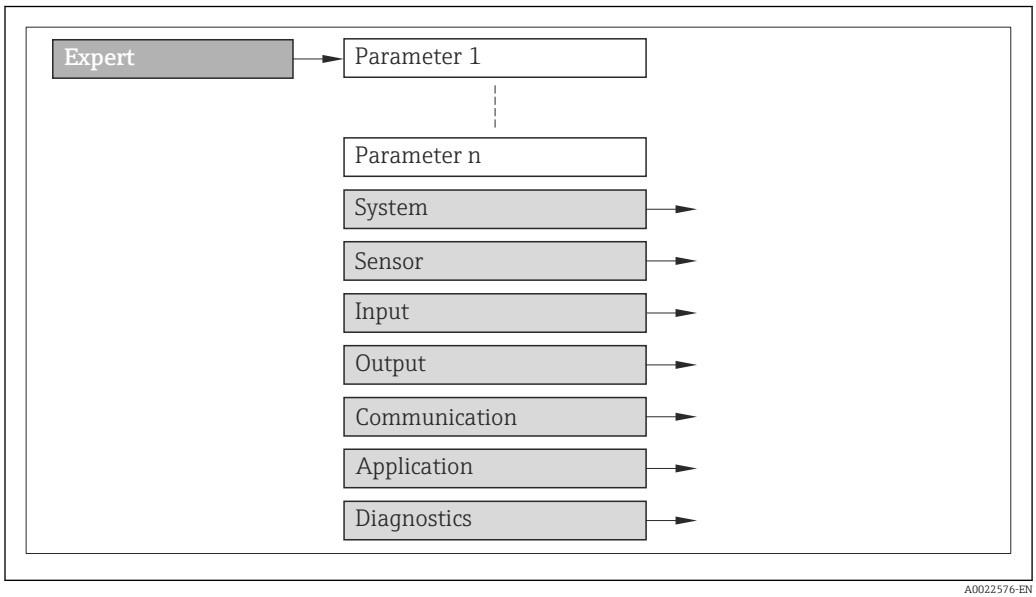
1.2 Target group

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

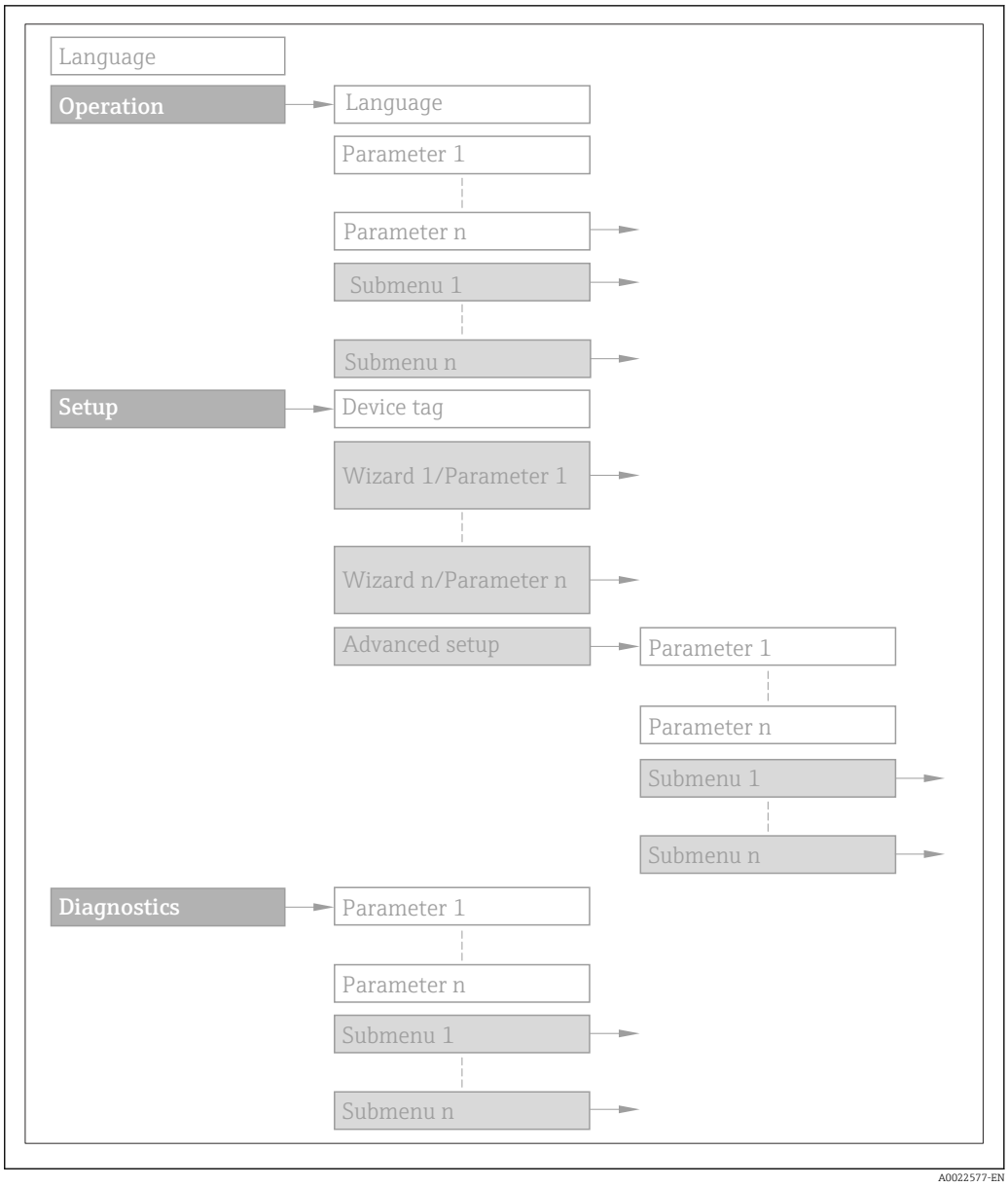
1.3.1 Information on the document structure

The document lists the submenus and their parameters according to the structure from the **Expert** menu (→ 8).



1 Sample graphic

For information on the arrangement of the parameters according to the structure of the **Operation** menu, **Setup** menu, **Diagnostics** menu (→ 189), 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 local display (direct access code)
Navigation path to the parameter via the operating tool
The names of the menus, submenus and parameters are abbreviated to the form in which they appear on the display and in the operating tool.

Prerequisite
The parameter is only available under these specific conditions

Description
Description of the parameter function

Options
List of the individual options for the parameter
- Option 1
- Option 2

User entry
Input range for the parameter

User interface
User interface value/data for 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

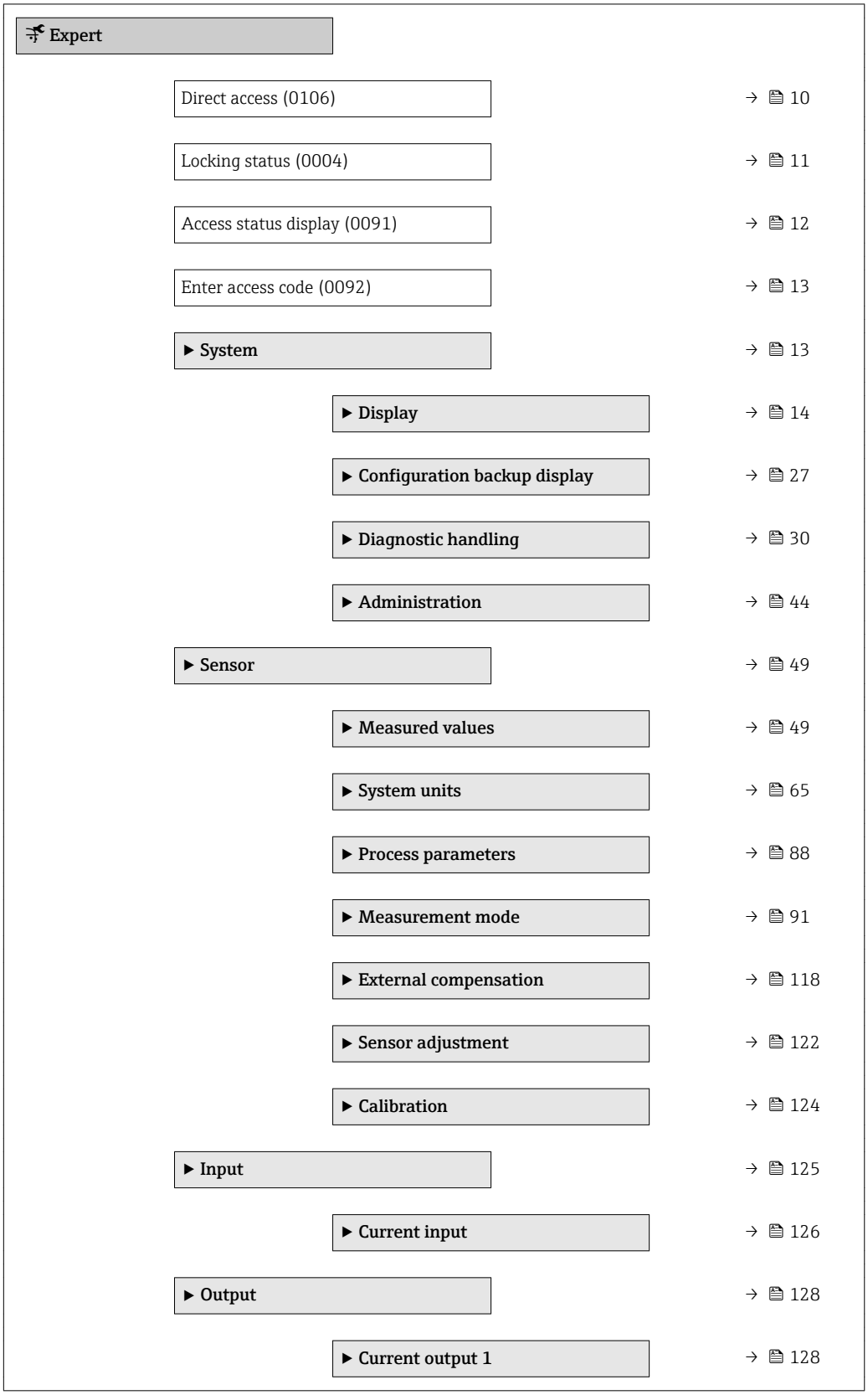
Symbol	Meaning
	Tip Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
	Operation via local display
	Operation via operating tool
	Write-protected parameter

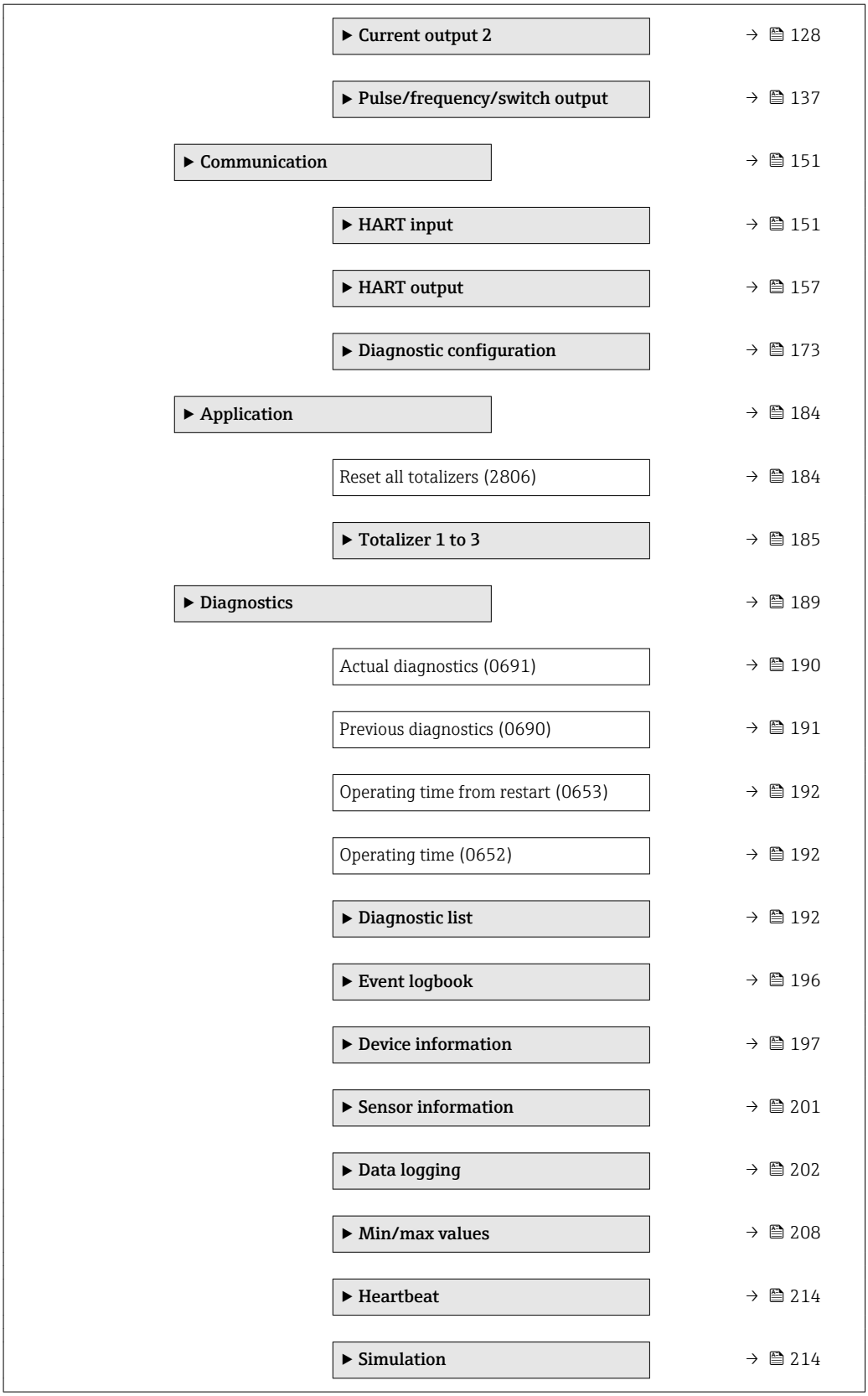
1.4.2 Symbols in graphics

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.




▶ Current output 2 → 128
▶ Pulse/frequency/switch output → 137
▶ Communication → 151
▶ HART input → 151
▶ HART output → 157
▶ Diagnostic configuration → 173
▶ Application → 184
Reset all totalizers (2806) → 184
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▶ Diagnostics → 189
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Operating time from restart (0653) → 192
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▶ Diagnostic list → 192
▶ Event logbook → 196
▶ Device information → 197
▶ Sensor information → 201
▶ Data logging → 202
▶ Min/max values → 208
▶ Heartbeat → 214
▶ Simulation → 214

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.

Direct access

Navigation Expert → Direct access (0106)

Description Input of the access code to enable direct access to the desired parameter via the local display. For this reason, each parameter is assigned a parameter number that appears on the right in the header of the selected parameter in the navigation view.

User entry 0 to 65 535

Additional information *User entry*

The direct access code consists of a 4-digit number and the channel number, which identifies the channel of a process variable: e.g. 0914-1

- The leading zeros in the direct access code do not have to be entered.
  Example: Input of **"914"** instead of **"0914"**
- If no channel number is entered, channel 1 is jumped to automatically.
  Example: Input of **0914** → **Assign process variable** parameter
- If a different channel is jumped to: Enter the direct access code with the corresponding channel number.
  Example: Input of **0914-3** → **Assign process variable** parameter

Locking status

Navigation Expert → Locking status (0004)

Description Use this function to view the active write protection.

User interface

- Hardware locked
- SIL locked
- Temporarily locked

Additional information *User interface*

If two or more types of write protection are active, the write protection with the highest priority is shown on the local display.

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 (→ 11).

"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.

"SIL locked" option (priority 2)

The SIL mode is enabled. This locks write access to the parameters (e.g. via local display or operating tool).

"Temporarily locked" option (priority 3)

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 display

Navigation Expert → Access stat.disp (0091)

Prerequisite A local display is provided.

Description Use this function to view the access authorization to the parameters via the local display.

User interface
- Operator
- Maintenance

Factory setting Operator

Additional information *Description*

If the -symbol appears in front of a parameter, it cannot be modified via the local display with the current access authorization.

The access authorization can be modified via the **Enter access code** parameter (→ 13).

For information on the **Enter access code** parameter (→ 13), see the "Disabling write protection via access code" section of the Operating Instructions for the device

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 (→ 11).

User interface

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.

Access status tooling

Navigation Expert → Access stat.tool (0005)

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 (→ 13).

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 (→ 11).

User interface

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 (0092)

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

User entry 0 to 9 999

Enter access code

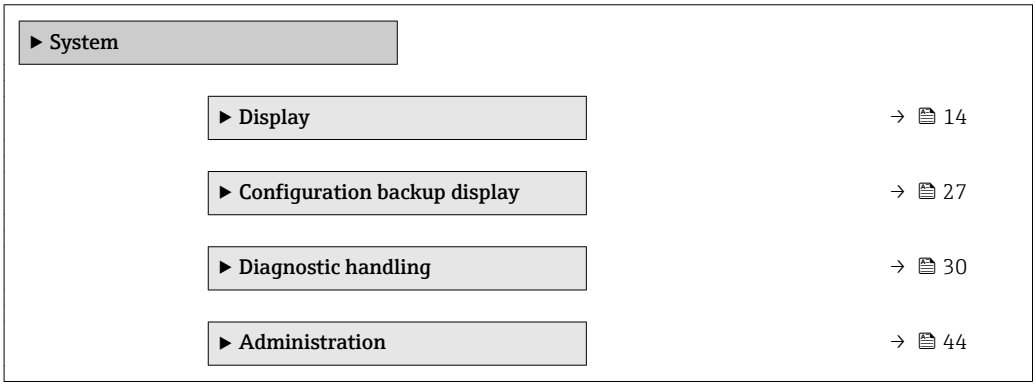
Navigation Expert → Ent. access code (0003)

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

User entry 0 to 9 999

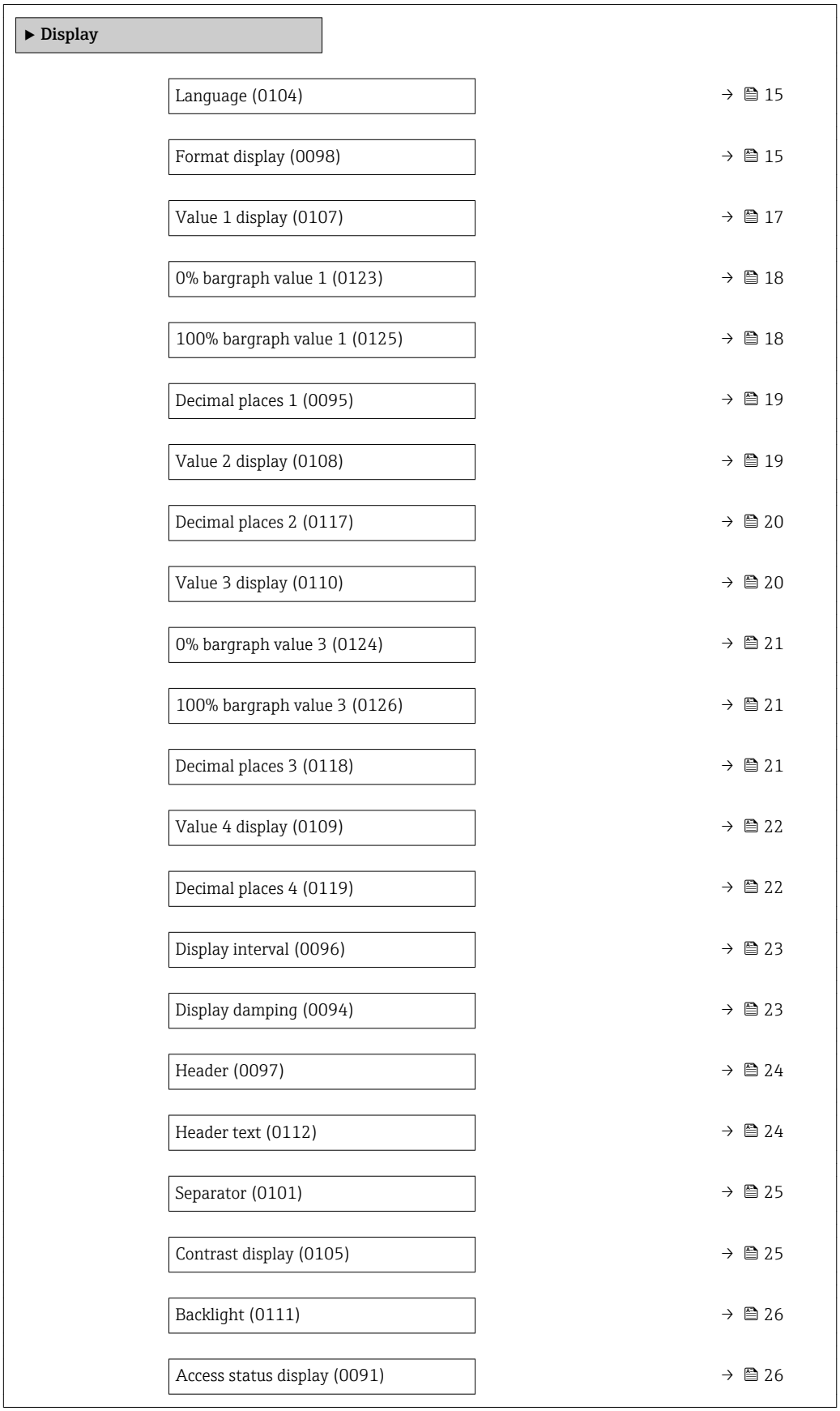
3.1 "System" submenu

Navigation Expert → System



3.1.1 "Display" submenu

Navigation Expert → System → Display



Language

Navigation Expert → System → Display → Language (0104)

Prerequisite A local display is provided.

Description Use this function to select the configured language on the local display.

Selection
- English
- Deutsch *
- Français *
- Español *
- Italiano *
- Nederlands *
- Portuguesa *
- Polski *
- русский язык (Russian) *
- Svenska *
- Türkçe *
- 中文 (Chinese) *
- 日本語 (Japanese) *
- 한국어 (Korean) *
- Bahasa Indonesia *
- tiếng Việt (Vietnamese) *
- čeština (Czech) *

Factory setting English (alternatively, the ordered language is preset in the device)

Format display

Navigation Expert → System → Display → Format display (0098)

Prerequisite A local display is provided.

Description Use this function to select how the measured value is shown on the local display.

Selection
- 1 value, max. size
- 1 bargraph + 1 value
- 2 values
- 1 value large + 2 values
- 4 values

Factory setting 1 value, max. size

* Visibility depends on order options or device settings

Additional information

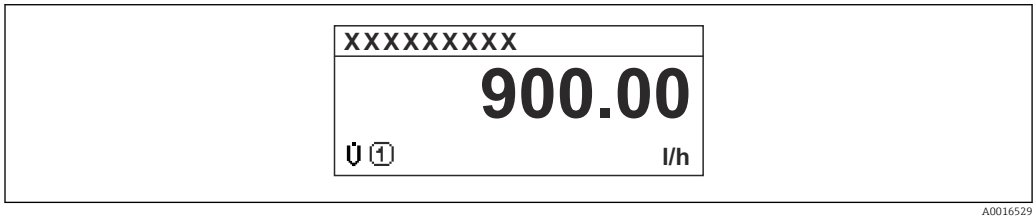
Description

The display format (size, bar graph etc.) and number of measured values displayed simultaneously (1 to 4) can be configured. This setting only applies to normal operation.

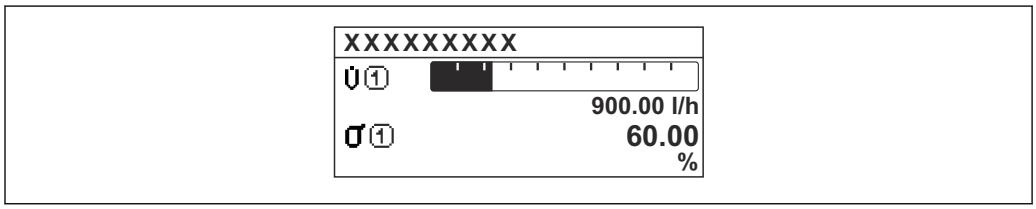
- The **Value 1 display** parameter (→ 17)...**Value 4 display** parameter (→ 22) parameters are used to specify which measured values are shown on the display and in which order.
- If more measured values are specified than the display mode selected permits, then the values alternate on the device display. The display time until the next change is configured using the **Display interval** parameter (→ 23) parameter.

Possible measured values shown on the local display:

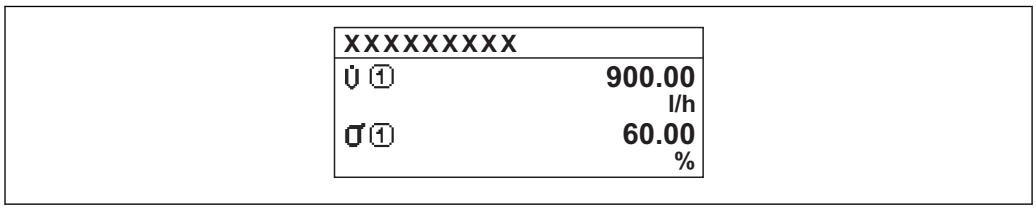
"1 value, max. size" option



"1 bargraph + 1 value" option

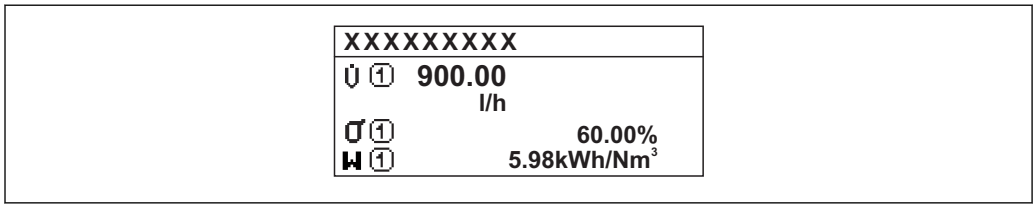


"2 values" option

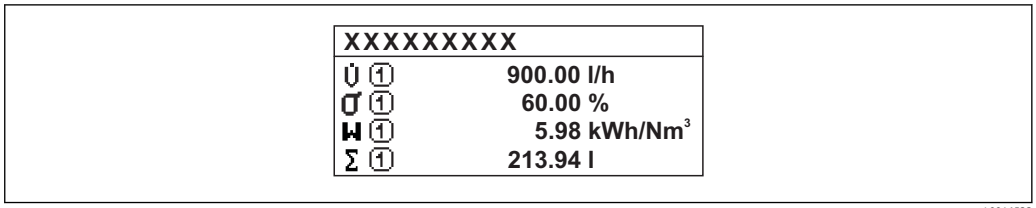


3

"1 value large + 2 values" option



"4 values" option



Value 1 display

Navigation Expert → System → Display → Value 1 display (0107)

Prerequisite A local display is provided.

Description Use this function to select one of the measured values to be shown on the local display.

Selection
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Condensate mass flow *
- Energy flow *
- Heat flow difference *
- Reynolds number *
- Density *
- Pressure *
- Specific volume *
- Degrees of superheat *
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Current output 1
- Current output 2 *

Factory setting Volume flow

Additional information *Description*

If several measured values are displayed at once, the measured value selected here will be the first value to be displayed. The value is only displayed during normal operation.

The **Format display** parameter (→ 15) is used to specify how many measured values are displayed simultaneously and how.

Options

The unit of the displayed measured value is taken from the **System units** submenu (→ 65).

* Visibility depends on order options or device settings

0% bargraph value 1

Navigation Expert → System → Display → 0% bargraph 1 (0123)

Prerequisite A local display is provided.

Description Use this function to enter the 0% bar graph value to be shown on the display for the measured value 1.

User entry Signed floating-point number

Factory setting Country-specific:
- 0 m^3/h
- 0 ft^3/h

Additional information

Description

The **Format display** parameter (→ 15) is used to specify that the measured value is to be displayed as a bar graph.

User entry

The unit of the displayed measured value is taken from the **System units** submenu (→ 65).

100% bargraph value 1

Navigation Expert → System → Display → 100% bargraph 1 (0125)

Prerequisite A local display is provided.

Description Use this function to enter the 100% bar graph value to be shown on the display for the measured value 1.

User entry Signed floating-point number

Factory setting Depends on country and nominal diameter → 222

Additional information

Description

The **Format display** parameter (→ 15) is used to specify that the measured value is to be displayed as a bar graph.

Options

The unit of the displayed measured value is taken from the **System units** submenu (→ 65).

Decimal places 1

Navigation Expert → System → Display → Decimal places 1 (0095)

Prerequisite A measured value is specified in the **Value 1 display** parameter (→ 17).

Description Use this function to select the number of decimal places for measured value 1.

Selection
- x
- x.x
- x.xx
- x.xxx
- x.xxxx

Factory setting x.xx

Additional information *Description*

This setting does not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display.

Value 2 display

Navigation Expert → System → Display → Value 2 display (0108)

Prerequisite A local display is provided.

Description Use this function to select one of the measured values to be shown on the local display.

Selection Picklist see **Value 1 display** parameter (→ 17)

Factory setting None

Additional information *Description*

If several measured values are displayed at once, the measured value selected here will be the second value to be displayed. The value is only displayed during normal operation.

The **Format display** parameter (→ 15) is used to specify how many measured values are displayed simultaneously and how.

Selection

The unit of the displayed measured value is taken from the **System units** submenu (→ 65).

Decimal places 2

Navigation Expert → System → Display → Decimal places 2 (0117)

Prerequisite A measured value is specified in the **Value 2 display** parameter (→ 19).

Description Use this function to select the number of decimal places for measured value 2.

Selection
- x
- x.x
- x.xx
- x.xxx
- x.xxxx

Factory setting x.xx

Additional information *Description*

This setting does not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display.

Value 3 display

Navigation Expert → System → Display → Value 3 display (0110)

Prerequisite A local display is provided.

Description Use this function to select one of the measured values to be shown on the local display.

Selection Picklist see **Value 1 display** parameter (→ 17)

Factory setting None

Additional information *Description*

If several measured values are displayed at once, the measured value selected here will be the third value to be displayed. The value is only displayed during normal operation.

The **Format display** parameter (→ 15) is used to specify how many measured values are displayed simultaneously and how.

Selection

The unit of the displayed measured value is taken from the **System units** submenu (→ 65).

0% bargraph value 3

Navigation Expert → System → Display → 0% bargraph 3 (0124)

Prerequisite An option was selected in the **Value 3 display** parameter (→ 20).

Description Use this function to enter the 0% bar graph value to be shown on the display for the measured value 3.

User entry Signed floating-point number

Factory setting 0

Additional information

Description

The **Format display** parameter (→ 15) is used to specify that the measured value is to be displayed as a bar graph.

User entry

The unit of the displayed measured value is taken from the **System units** submenu (→ 65).

100% bargraph value 3

Navigation Expert → System → Display → 100% bargraph 3 (0126)

Prerequisite An option was selected in the **Value 3 display** parameter (→ 20).

Description Use this function to enter the 100% bar graph value to be shown on the display for the measured value 3.

User entry Signed floating-point number

Factory setting Depends on country and nominal diameter → 222

Additional information

Description

The **Format display** parameter (→ 15) is used to specify that the measured value is to be displayed as a bar graph.

Options

The unit of the displayed measured value is taken from the **System units** submenu (→ 65).

Decimal places 3

Navigation Expert → System → Display → Decimal places 3 (0118)

Prerequisite A measured value is specified in the **Value 3 display** parameter (→ 20).

Description Use this function to select the number of decimal places for measured value 3.

Selection
- x
- x.x
- x.xx
- x.xxx
- x.xxxx

Factory setting x.xx

Additional information *Description*

This setting does not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display.

Value 4 display

Navigation Expert → System → Display → Value 4 display (0109)

Prerequisite A local display is provided.

Description Use this function to select one of the measured values to be shown on the local display.

Selection Picklist see **Value 1 display** parameter (→ 17)

Factory setting None

Additional information *Description*

If several measured values are displayed at once, the measured value selected here will be the fourth value to be displayed. The value is only displayed during normal operation.

The **Format display** parameter (→ 15) is used to specify how many measured values are displayed simultaneously and how.

Selection

The unit of the displayed measured value is taken from the **System units** submenu (→ 65).

Decimal places 4

Navigation Expert → System → Display → Decimal places 4 (0119)

Prerequisite A measured value is specified in the **Value 4 display** parameter (→ 22).

Description Use this function to select the number of decimal places for measured value 4.

Selection
- x
- x.x
- x.xx
- x.xxx
- x.xxxx

Factory setting x.xx

Additional information *Description*

This setting does not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display.

Display interval

Navigation Expert → System → Display → Display interval (0096)

Prerequisite A local display is provided.

Description Use this function to enter the length of time the measured values are displayed if the values alternate on the display.

User entry 1 to 10 s

Factory setting 5 s

Additional information *Description*

This type of alternating display only occurs automatically if the number of measured values defined exceeds the number of values the selected display format can display simultaneously.

- The **Value 1 display** parameter (→ 17)...**Value 4 display** parameter (→ 22) are used to specify which measured values are shown on the display.
- The display format of the displayed measured values is specified using the **Format display** parameter (→ 15).

Display damping

Navigation Expert → System → Display → Display damping (0094)

Prerequisite A local display is provided.

Description Use this function to enter the reaction time of the local display to fluctuations in the measured value caused by process conditions.

User entry 0.0 to 999.9 s

Factory setting 5.0 s

Additional information *User entry*

A time constant is entered:
- If a low time constant is entered, the display reacts particularly quickly to fluctuating measured variables.
- On the other hand, the display reacts more slowly if a high time constant is entered.

Header

Navigation Expert → System → Display → Header (0097)

Prerequisite A local display is provided.

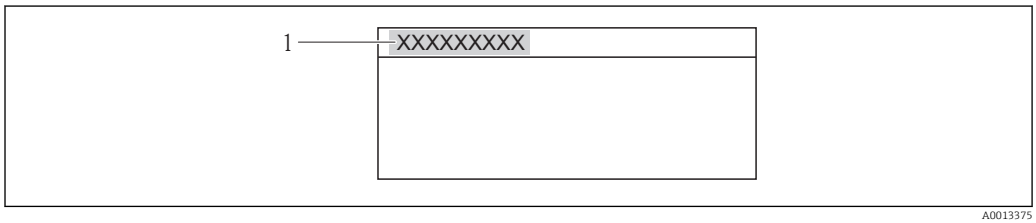
Description Use this function to select the contents of the header of the local display.

Selection
- Device tag
- Free text

Factory setting Device tag

Additional information *Description*

The header text only appears during normal operation.



1 Position of the header text on the display

Selection
- Device tag
  Is defined in the **Device tag** parameter (→ 198).
- Free text
  Is defined in the **Header text** parameter (→ 24).

Header text

Navigation Expert → System → Display → Header text (0112)

Prerequisite The **Free text** option is selected in the **Header** parameter (→ 24).

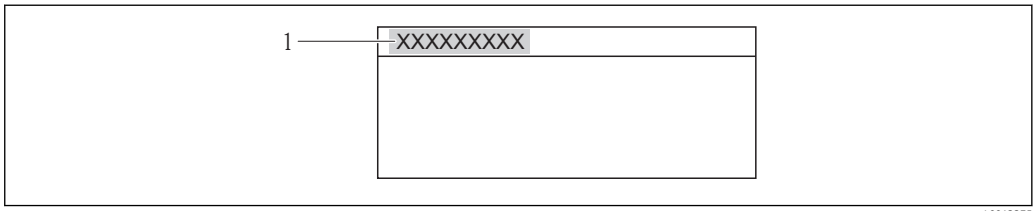
Description Use this function to enter a customer-specific text for the header of the local display.

User entry Max. 12 characters such as letters, numbers or special characters (e.g. @, %, /)

Factory setting ----------

Additional information *Description*

The header text only appears during normal operation.



1 Position of the header text on the display

User entry

The number of characters displayed depends on the characters used.

Separator

Navigation Expert → System → Display → Separator (0101)

Prerequisite A local display is provided.

Description Use this function to select the decimal separator.

Selection
- . (point)
- , (comma)

Factory setting . (point)

Contrast display

Navigation Expert → System → Display → Contrast display (0105)

Prerequisite A local display is provided.

Description Use this function to enter a value to adapt the display contrast to the ambient conditions (e.g. the lighting or viewing angle).

User entry 20 to 80 %

Factory setting Depends on the display

Additional information *Set the contrast via the push-buttons:*
- Brighter: Press and hold down the − E keys simultaneously.
- Darker: Press and hold down the + E keys simultaneously.

Backlight

Navigation Expert → System → Display → Backlight (0111)

Prerequisite Order code for "Display; operation", option E "SD03 4-line, illum.; touch control + data backup function"

Description Option for switching the backlight of the local display on and off.

Selection
- Disable
- Enable

Factory setting Disable

Access status display

Navigation Expert → System → Display → Access stat.disp (0091)

Prerequisite A local display is provided.

Description Use this function to view the access authorization to the parameters via the local display.

User interface
- Operator
- Maintenance

Factory setting Operator

Additional information

Description

If the -symbol appears in front of a parameter, it cannot be modified via the local display with the current access authorization.

The access authorization can be modified via the **Enter access code** parameter (→ 13).

For information on the **Enter access code** parameter (→ 13), see the "Disabling write protection via access code" section of the Operating Instructions for the device

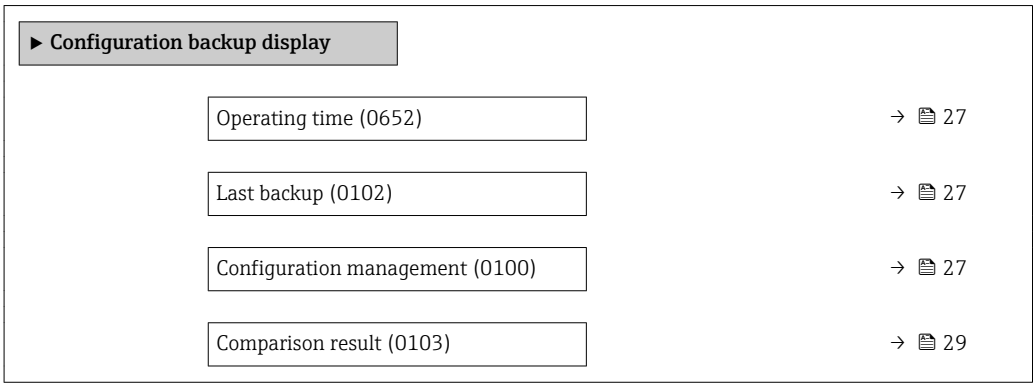
If additional write protection is active, this restricts the current access authorization even further. The write protection status can be viewed via the **Locking status** parameter (→ 11).

User interface

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.

3.1.2 "Configuration backup display" submenu

Navigation Expert → System → Conf.backup disp



Operating time

Navigation Expert → System → Conf.backup disp → Operating time (0652)

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.

Last backup

Navigation Expert → System → Conf.backup disp → Last backup (0102)

Prerequisite A local display is provided.

Description Use this function to display the time since a backup copy of the data was last saved to the display module.

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

Configuration management

Navigation Expert → System → Conf.backup disp → Config. managem. (0100)

Prerequisite A local display is provided.

Description Use this function to select an action to save the data to the display module.

Selection
- Cancel
- Execute backup
- Restore
- Duplicate
- Compare
- Clear backup data

Factory setting
Cancel

Additional information

Description

Configuration via the local display is disabled while the action is performed.

For information on the status message in the operating tool, see the **Backup state** parameter (→ 28)

Selection

- Cancel
  No action is executed and the user exits the parameter.
- Execute backup
  - A backup copy of the current device configuration in the HistoROM is saved to the display module of the device. The backup copy includes the transmitter data of the device.
  - The following message appears on local display: Backup active, please wait!
- Restore
  - The last backup copy of the device configuration is copied from the display module to the HistoROM of the device. The backup copy comprises the transmitter data of the device.
  - The following message appears on local display: Restore active! Do not interrupt power supply!
- Duplicate
  - The transmitter configuration from another device is duplicated to the device using the display module.
  - The following message appears on local display: Copy active! Do not interrupt power supply!
- Compare
  - The device configuration saved in the display module is compared to the current device configuration of the HistoROM.
  - The following message appears on local display: Comparing files
  - The result can be viewed in the **Comparison result** parameter (→ 29).
- Clear backup data
  - The backup copy of the device configuration is deleted from the display module of the device.
  - The following message appears on local display: Deleting file

HistoROM

A HistoROM is a "non-volatile" device memory in the form of an EEPROM.

Backup state

Navigation
Expert → System → Conf.backup disp → Backup state (0121)

Prerequisite
A local display is provided.

Description
Use this function to view the status of the data backup process.

User interface
- None
- Store in progress
- Restore in progress
- Import in progress
- Delete in progress
- Compare in progress

Factory setting None

Comparison result

Navigation Expert → System → Conf.backup disp → Compar. result (0103)

Prerequisite A local display is provided.

Description Use this function to view the last result of comparing the current device configuration to the backup copy in the display module.

User interface
- Settings identical
- Settings not identical
- No backup available
- Backup settings corrupt
- Check not done
- Dataset incompatible

Factory setting Check not done

Additional information

Description

The comparison is started via the **Compare** option in the **Configuration management** parameter (→ 27).

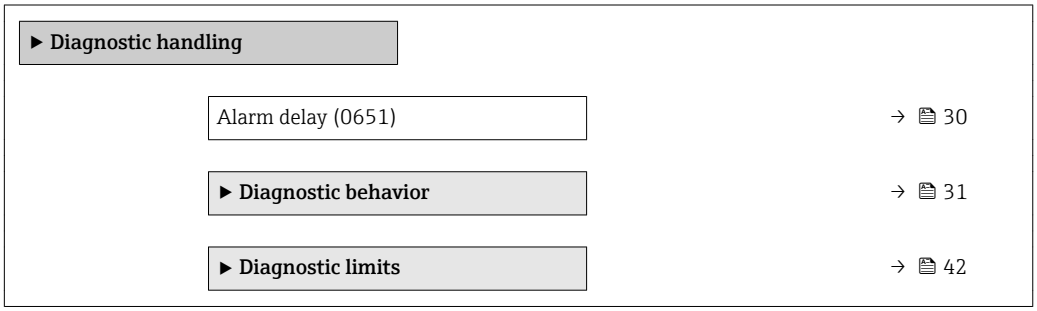
Selection
- Settings identical
  - The current device configuration of the HistoROM is identical to the backup copy in the display module.
  - If the transmitter configuration of another device has been copied to the device via the display module and the **Duplicate** option in the **Configuration management** parameter (→ 27), the current device configuration of the HistoROM only partly matches the backup copy in the display module: The settings for the transmitter are not identical.
- Settings not identical
  The current device configuration of the HistoROM is not identical to the backup copy in the display module.
- No backup available
  There is no backup copy of the device configuration of the HistoROM in the display module.
- Backup settings corrupt
  The current device configuration of the HistoROM is corrupt or not compatible with the backup copy in the display module.
- Check not done
  The device configuration of the HistoROM has not yet been compared to the backup copy in the display module.
- Dataset incompatible
  The backup copy in the display module is not compatible with the device.

HistoROM

A HistoROM is a "non-volatile" device memory in the form of an EEPROM.

3.1.3 "Diagnostic handling" submenu

Navigation Expert → System → Diagn. handling



Alarm delay

Navigation Expert → System → Diagn. handling → Alarm delay (0651)

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

User entry 0 to 60 s

Factory setting 0 s

Additional information *Description*

This setting affects the following diagnostic messages:
- 046 Sensor limit exceeded
- 828 Ambient temperature too low
- 829 Ambient temperature too high
- 832 Electronic temperature too high
- 833 Electronic temperature too low
- 834 Process temperature too high
- 835 Process temperature too low
- 841 Flow velocity too high
- 841 Sensor range
- 844 Sensor range exceeded
- 870 Measuring inaccuracy increased
- 871 Near steam saturation limit
- 872 Wet steam detected
- 873 Water detected
- 874 X% spec invalid
- 945 Sensor range exceeded

- 946 Vibration detected
- 947 Vibration exceeded
- 972 Degrees of superheat limit excceeded

"Diagnostic behavior" submenu

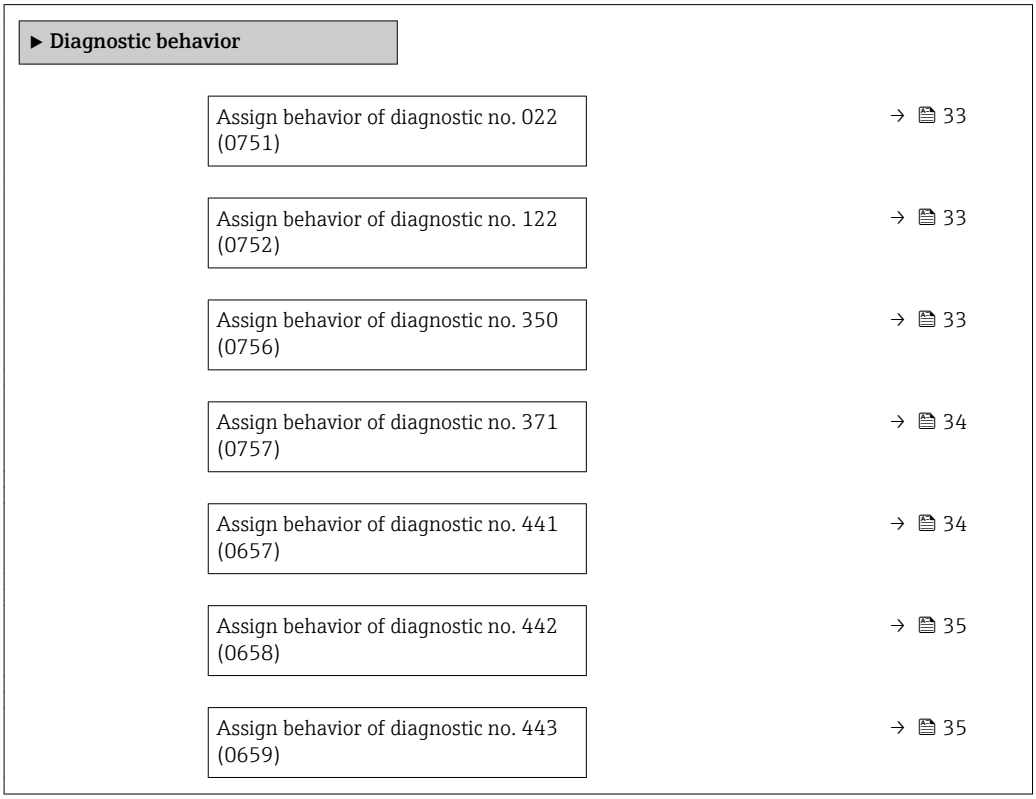
For a list of all the diagnostic events, see the Operating Instructions for the device.

Modifying the diagnostic behavior of a diagnostic event. Each diagnostic event is assigned a certain diagnostic behavior at the factory. The user can change this assignment for certain diagnostics events.

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

- **Off** option
  The diagnostic event is ignored; it is neither entered into the Event logbook, nor is a diagnostic message generated.
- **Alarm** option
  The device continues to measure. The signal outputs assume the defined alarm condition. A diagnostic message is generated.
- **Warning** option
  The device continues to measure. A diagnostic message is generated.
- **Logbook entry only** option
  The device continues to measure. The diagnostic message is entered in the **Event logbook** submenu (→ 196) (**Event list** submenu (→ 196)) only and is not displayed in alternation with the measured value display.

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



Assign behavior of diagnostic no. 444 (0740)	→ 35
Assign behavior of diagnostic no. 828 (0755)	→ 36
Assign behavior of diagnostic no. 829 (0754)	→ 36
Assign behavior of diagnostic no. 832 (0675)	→ 37
Assign behavior of diagnostic no. 833 (0676)	→ 37
Assign behavior of diagnostic no. 834 (0677)	→ 37
Assign behavior of diagnostic no. 835 (0678)	→ 38
Assign behavior of diagnostic no. 841 (0729)	→ 38
Assign behavior of diagnostic no. 844 (0747)	→ 38
Assign behavior of diagnostic no. 870 (0726)	→ 39
Assign behavior of diagnostic no. 871 (0748)	→ 39
Assign behavior of diagnostic no. 872 (0746)	→ 39
Assign behavior of diagnostic no. 873 (0749)	→ 40
Assign behavior of diagnostic no. 874 (0772)	→ 40
Assign behavior of diagnostic no. 945 (0750)	→ 41
Assign behavior of diagnostic no. 947 (0753)	→ 41
Assign behavior of diagnostic no. 972 (0758)	→ 41

Assign behavior of diagnostic no. 022 (Temperature sensor defective)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 022 (0751)

Prerequisite For the following order code:
"Sensor version", option "Mass flow"

Description Use this function to change the diagnostic behavior of the diagnostic message **022 Temperature sensor defective**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Alarm

Additional information For a detailed description of the options available for selection: → 31

Assign behavior of diagnostic no. 122 (Temperature sensor defective)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 122 (0752)

Prerequisite For the following order code:
"Sensor version", option "Mass flow"

Description Use this function to change the diagnostic behavior of the diagnostic message **122 Temperature sensor defective**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available for selection: → 31

Assign behavior of diagnostic no. 350 (Pre-amplifier defective)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 350 (0756)

Description Use this function to change the diagnostic behavior of the diagnostic message **350 Pre-amplifier defective**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Alarm

Additional information For a detailed description of the options available for selection: → 31

Assign behavior of diagnostic no. 371 (Temperature sensor defective)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 371 (0757)

Description Use this function to change the diagnostic behavior of the diagnostic message **371 Temperature sensor defective**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available for selection: → 31

Assign behavior of diagnostic no. 441 (Current output 1 to 2)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 441 (0657)

Description Use this function to change the diagnostic behavior of the diagnostic message **441 Current output 1 to 2**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available for selection: → 31

Assign behavior of diagnostic no. 442 (Frequency output)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 442 (0658)

Prerequisite The measuring device has a pulse/frequency/switch output.

Description Use this function to change the diagnostic behavior of the diagnostic message **442 Frequency output**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available for selection: → 31

Assign behavior of diagnostic no. 443 (Pulse output)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 443 (0659)

Prerequisite The measuring device has a pulse/frequency/switch output.

Description Use this function to change the diagnostic behavior of the diagnostic message **443 Pulse output**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available for selection: → 31

Assign behavior of diagnostic no. 444 (Current input 1)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 444 (0740)

Prerequisite The device has one current input (I/O module 218).

Description Use this function to change the diagnostic behavior of the diagnostic message **444 Current input 1**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available for selection: → 31

Assign behavior of diagnostic no. 828 (Ambient temperature too low)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 828 (0755)

Description Use this function to change the diagnostic behavior of the diagnostic message **828 Ambient temperature too low**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available for selection: → 31

Assign behavior of diagnostic no. 829 (Ambient temperature too high)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 829 (0754)

Description Use this function to change the diagnostic behavior of the diagnostic message **829 Ambient temperature too high**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available for selection: → 31

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

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 832 (0675)

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 for selection: → 31

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

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 833 (0676)

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 for selection: → 31

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

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 834 (0677)

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 for selection: → 31

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

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 835 (0678)

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 for selection: → 31

Assign behavior of diagnostic no. 841 (Flow velocity too high)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 841 (0729)

Description Use this function to change the diagnostic behavior of the diagnostic message **841 Flow velocity too high**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available for selection: → 31

Assign behavior of diagnostic no. 844 (Sensor range exceeded)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 844 (0747)

Description Use this function to change the diagnostic behavior of the diagnostic message **844 Sensor range exceeded**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available for selection: → 31

Assign behavior of diagnostic no. 870 (Measuring inaccuracy increased)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 870 (0726)

Description Use this function to change the diagnostic behavior of the diagnostic message **870 Measuring inaccuracy increased**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available for selection: → 31

Assign behavior of diagnostic no. 871 (Near steam saturation limit)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 871 (0748)

Prerequisite In the **Select medium** parameter (→ 92), the **Steam** option is selected.

Description Use this function to change the diagnostic behavior of the diagnostic message **871 Near steam saturation limit**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Off

Additional information For a detailed description of the options available for selection: → 31

Assign behavior of diagnostic no. 872 (Wet steam detected)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 872 (0746)

Prerequisite The **Wet steam detection** application package has been enabled.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 47).

Description Use this function to change the diagnostic behavior of the diagnostic message **872 Wet steam detected**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available for selection: → 31

Assign behavior of diagnostic no. 873 (Water detected)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 873 (0749)

Prerequisite In the **Select medium** parameter (→ 92), the **Steam** option is selected.

Description Use this function to change the diagnostic behavior of the diagnostic message **873 Water detected**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Off

Additional information For a detailed description of the options available for selection: → 31

Assign behavior of diagnostic no. 874 (X% spec invalid)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 874 (0772)

Prerequisite In the **Select medium** parameter (→ 92), the **Steam** option is selected.

Description Use this function to change the diagnostic behavior of the diagnostic message **874 X% spec invalid**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Off

Additional information For a detailed description of the options available for selection: → 31

Assign behavior of diagnostic no. 945 (Sensor range exceeded)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 945 (0750)

Prerequisite For the following order code:
"Sensor version", option "Mass flow"

Description Use this function to change the diagnostic behavior of the diagnostic message **945 Sensor range exceeded**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available for selection: → 31

Assign behavior of diagnostic no. 947 (Vibration exceeded)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 947 (0753)

Description Use this function to change the diagnostic behavior of the diagnostic message **947 Vibration exceeded**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Alarm

Additional information For a detailed description of the options available for selection: → 31

Assign behavior of diagnostic no. 972 (Degrees of superheat limit excceeded)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 972 (0758)

Prerequisite If the **Steam** option is selected in the **Select medium** parameter (→ 92).

Description Use this function to change the diagnostic behavior of the diagnostic message **972 Degrees of superheat limit excceeded**.

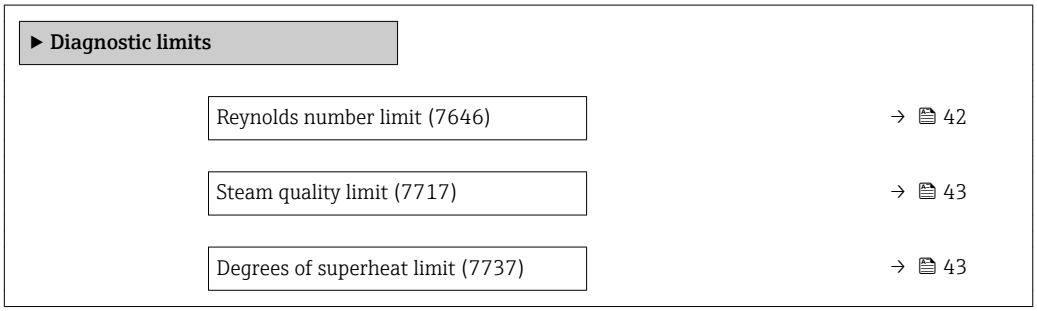
Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Off

Additional information For a detailed description of the options available for selection: → 31

"Diagnostic limits" submenu

Navigation Expert → System → Diagn. handling → Diagn. limits



Reynolds number limit

Navigation Expert → System → Diagn. handling → Diagn. limits → Re number limit (7646)

Prerequisite For the following order code:
"Sensor version", option "Mass flow (integrated temperature measurement)"

Description Use this function to enter the lower limit value for the Reynolds number which, if exceeded, triggers the diagnostic message **870 Measuring inaccuracy increased**.

User entry 4 000 to 100 000

Factory setting 5 000

Additional information *Limit value*

If the Reynolds number has exceeded the limit value configured here, the diagnostic behavior selected in the **Assign behavior of diagnostic no. 870** parameter (→ 39) is triggered.

Steam quality limit

Navigation Expert → System → Diagn. handling → Diagn. limits → SteamQualLimit (7717)

Prerequisite
The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Steam** option is selected.
- In the **Steam quality** parameter (→ 121), the **Calculated value** option is selected.

Description
Use this function to enter the threshold value for the steam quality which, if undershot, triggers the diagnostic message ⚠**S872 Wet steam detected**.

User entry
80 to 100 %

Factory setting
80 %

Additional information
Limit value

This limit value has a hysteresis of 5 %, i.e. the diagnostic message is reset at a threshold value of +5 % or if 100 % is reached (for factory setting of 80 % at 85 %).

If the steam quality has dropped below the limit value configured here, the diagnostic behavior selected in the **Assign behavior of diagnostic no. 872** parameter (0746) (→ 39) is triggered.

Degrees of superheat limit

Navigation Expert → System → Diagn. handling → Diagn. limits → Degr.superh.lim. (7737)

Prerequisite
In the **Select medium** parameter (→ 92), the **Steam** option is selected.

Description
Use this function to enter the threshold value for the degree of superheat which, if exceeded, triggers the diagnostic message **972 Degrees of superheat limit excceeded**.

User entry
0 to 500 K

Factory setting
5 K

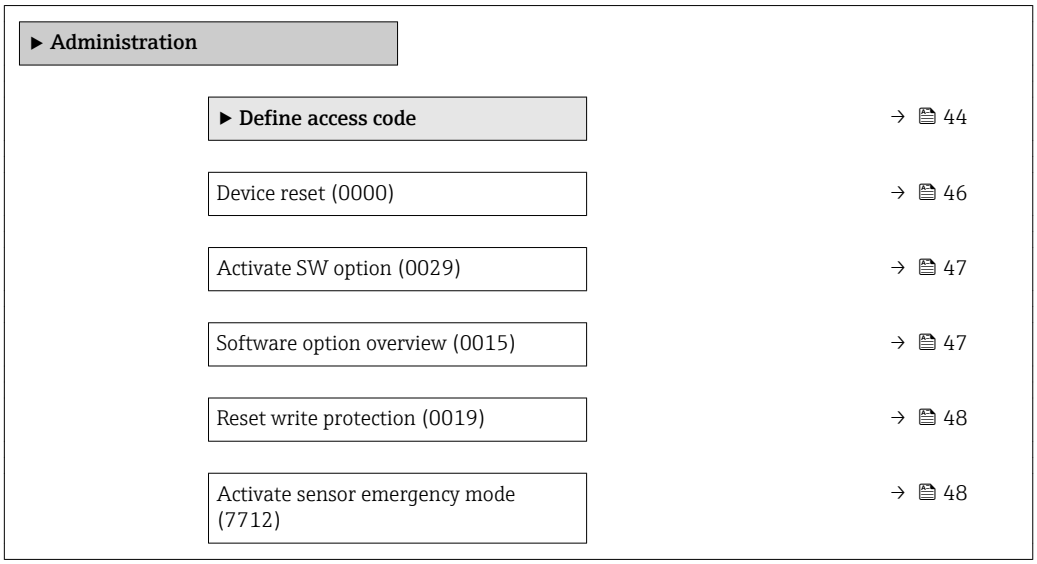
Additional information
Limit value

This limit value has a hysteresis of 1 K, i.e. the diagnostic message is triggered if the threshold value +1 K is reached and is reset again when the value drops below the threshold value.

If the degree of superheat has exceeded the limit value configured here, the diagnostic behavior selected in the **Assign behavior of diagnostic no. 972** parameter (→ 41) is triggered.

3.1.4 "Administration" submenu

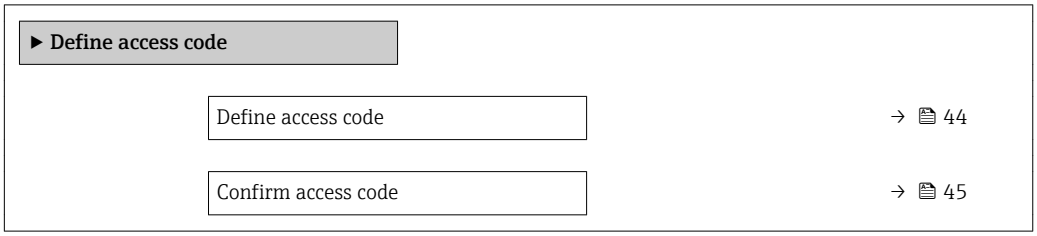
Navigation Expert → System → Administration



"Define access code" wizard

The **Define access code** wizard is only available if you are operating via the local display. If you are operating via the operating tool, the **Define access code** parameter (→ 45) is directly in the **Administration** submenu. The **Confirm access code** parameter is not available if you are operating via the operating tool.

Navigation Expert → System → Administration → Def. access code



Define access code

Navigation Expert → System → Administration → Def. access code → Def. access code

Description Use this function to enter a user-specific release code to restrict write-access to the parameters. This protects the configuration of the device against any inadvertent changes via the local display.

User entry 0 to 9 999

Factory setting 0

Additional information

Description

The write protection affects all parameters in the document marked with the symbol. On the local display, the symbol in front of a parameter indicates that the parameter is write-protected.

Once the access code has been defined, write-protected parameters can only be modified if the access code is entered in the **Enter access code** parameter (→ 13).

Please contact your Endress+Hauser Sales Center if you lose your access code.

User entry

A message is displayed if the access code is not in the input range.

Factory setting

If the factory setting is not changed or **0** is defined as the access code, the parameters are not write-protected and the device configuration data can be modified. The user is logged on in the **"Maintenance"** role.

Confirm access code

Navigation Expert → System → Administration → Def. access code → Confirm code

Description Enter the defined release code a second time to confirm the release code.

User entry 0 to 9 999

Factory setting 0

Additional parameters in the "Administration" submenu

Define access code

Navigation Expert → System → Administration → Def. access code (0093)

Description Use this function to enter a user-specific release code to restrict write-access to the parameters. This protects the configuration of the device against any inadvertent changes via the operating tool.

User entry 0 to 9 999

Factory setting 0

Additional information

Description

The write protection affects all parameters in the document marked with the 🔒 symbol.

Once the access code has been defined, write-protected parameters can only be modified if the access code is entered in the **Enter access code** parameter (→ 🖹 13).

Please contact your Endress+Hauser Sales Center if you lose your access code.

User entry

A message is displayed if the access code is not in the input range.

Factory setting

If the factory setting is not changed or **0** is defined as the access code, the parameters are not write-protected and the device configuration data can be modified. The user is logged on in the **"Maintenance"** role.

Device reset 🔒

Navigation Expert → System → Administration → Device reset (0000)

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

Selection

- Cancel
- To factory defaults
- To delivery settings
- Restart device

Factory setting Cancel

Additional information

"Cancel" option

No action is executed and the user exits the parameter.

"To factory defaults" option

Every parameter is reset to its factory setting.

"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. (0029)

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

User entry Positive integer

Factory setting 0

Additional information *User entry*

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

Example

Order code for "Application package", option EA "Extended HistoROM"

Software option overview

Navigation Expert → System → Administration → SW option overv. (0015)

Description Use this function to display all the software options that are enabled in the device.

User interface
- Extended HistoROM
- SIL
- Mass flow
- Natural gas
- Air + industrial gas
- Wet steam detection
- Wet steam measurement
- Heartbeat Verification

Additional information *Description*

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

"Extended HistoROM" option

Order code for "Application Package", option EA "Extended HistoROM"

"SIL" option

Order code for "Additional Approval", option LA "SIL"

"Mass flow" option

Order code for "Sensor Version"
- For Prowirl D, F, R 200: option 3 "Mass flow (integrated temperature measurement)"
- For Prowirl C, O: option 6 "Mass flow Alloy 718"

"Natural gas" option

Order code for "Application Package", option EN "Natural gas"

"Air + industrial gas" option

Order code for "Application Package", option ET "Air + Industrial Gas (spure+mixtures)"

"Wet steam detection" option

Order code for "Application Package", option ES "Wet steam detection"

"Wet steam measurement" option

Order code for "Application Package", option EU "Wet steam measurement"

"Heartbeat Verification" option

Order code for "Application Package", option EB "Heartbeat Verification"

Activate sensor emergency mode

Navigation Expert → System → Administration → Sens. emerg.mode (7712)

Prerequisite The device has identified an error during verification of the characteristics in the sensor data storage or electronics module. A diagnostic message of status type ⊗**F** is output.

Description Use this function to switch on the emergency mode of the sensor to use the backup of the sensor characteristics or main electronics characteristics stored in the HistoROM.

Selection
- Cancel
- Ok

Factory setting Cancel

Additional information *Description*

The status signal of the output diagnostic message changes from **F** (failure) to **M** (maintenance required), the diagnostic behavior changes from Alarm to Warning: ⚠**M**. The diagnostic message is output until the characteristics in the sensor data storage are again correct.

Information on what is causing the diagnostic message, and remedy measures, can be viewed by pressing the E-button.

Information on status signals and diagnostic behavior: Operating Instructions about the device, "Diagnostic message" chapter

Reset write protection

Navigation Expert → System → Administration → Res. write prot. (0019)

Prerequisite The SIL mode has been enabled.

Description Use this function to enter the SIL locking code to disable write protection in the SIL mode.

User entry 0 to 65 535

Factory setting 0

Additional information

Prerequisite

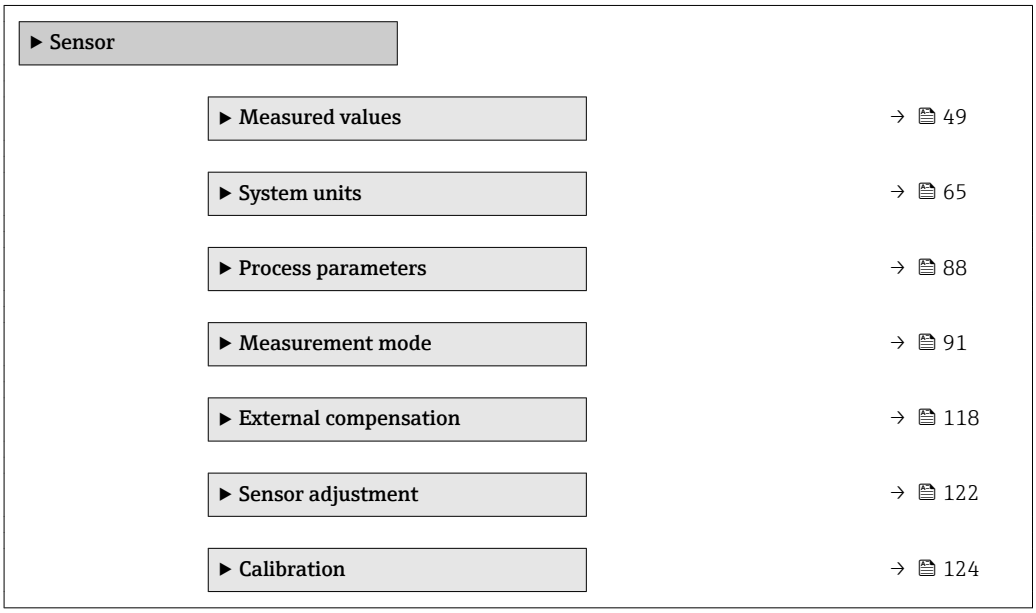
For detailed information about enabling and disabling the SIL mode, see the Special Documentation for the device

Description

Once the SIL mode has been activated, the process-related parameters are write protected, and thereby locked, for security reasons. It is still possible to read the parameters. When SIL locking is enabled, restrictions apply on all communication options, such as the service interface, the HART protocol and the onsite display.

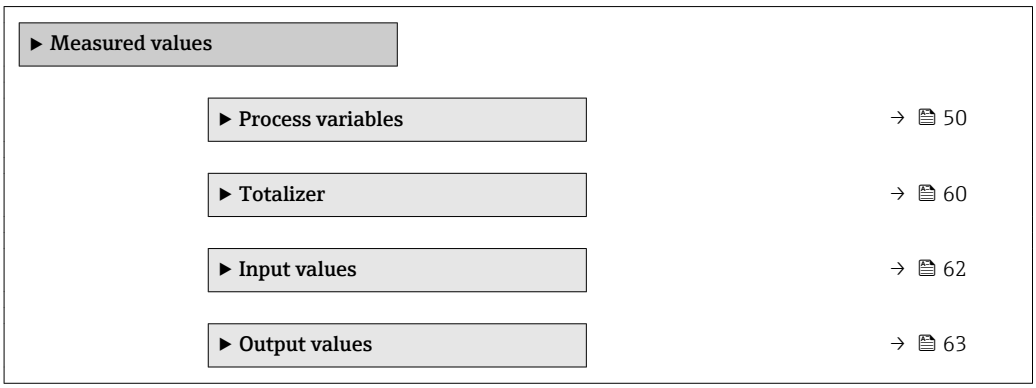
3.2 "Sensor" submenu

Navigation Expert → Sensor



3.2.1 "Measured values" submenu

Navigation Expert → Sensor → Measured val.



"Process variables" submenu

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

▶ Process variables	
Volume flow (1838)	→ 51
Corrected volume flow (1850)	→ 51
Mass flow (1847)	→ 52
Flow velocity (1865)	→ 52
Temperature (1851)	→ 53
Calculated saturated steam pressure (1852)	→ 53
Steam quality (1853)	→ 54
Total mass flow (1854)	→ 54
Condensate mass flow (1857)	→ 54
Energy flow (1872)	→ 55
Heat flow difference (1863)	→ 55
Reynolds number (1864)	→ 55
Density (7607)	→ 56
Specific volume (7739)	→ 56
Pressure (7696)	→ 57
Saturation temperature (7709)	→ 57
Degrees of superheat (7738)	→ 58
Compressibility factor (7729)	→ 58
Vortex frequency (7722)	→ 58

Volume flow

Navigation Expert → Sensor → Measured val. → Process variab. → Volume flow (1838)

Description Use this function to view the volume flow currently measured.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Volume flow unit** parameter (→ 66)

Corrected volume flow

Navigation Expert → Sensor → Measured val. → Process variab. → Correct.vol.flow (1850)

Description Displays the corrected volume flow currently calculated.

User interface Signed floating-point number

Additional information *Description*

To calculate the corrected volume flow, the measured volume flow is multiplied by the ratio of the density (**Density** parameter (→ 56)) to the reference density. The density and reference density here depend on the sensor version and the selected medium (see table). Outputting the corrected volume flow cannot be used for gases that condense (e.g. steam).

Sensor version	Medium	Medium type	Density	Reference density
Volume flow	All [1]	–	ρ	ρ_{Ref}
Mass flow	Steam	–	f(p, T)	–
	Gas	All except [2]	f(p, T)	f(p_{Ref}, T_{Ref})
	Liquid	All except [2]	f(T)	f(T_{Ref})
	Gas	[2]	f(p, T, z, p_{Ref}, T_{Ref}, z_{Ref}, ρ_{Ref})	ρ_{Ref}
	Liquid	[2]	f(T, a_{lin}, T_{Ref}, ρ_{Ref})	ρ_{Ref}

ρ	Fixed density (→ 119)
ρ_{Ref}	Reference density (→ 100)
p	Pressure (→ 57)
p_{Ref}	Reference pressure (→ 101)
T	Temperature (→ 53)
T_{Ref}	Reference temperature (→ 101)
z	Z-factor (→ 99)
z_{Ref}	Reference Z-factor (→ 101)
a_{lin}	Linear expansion coefficient (→ 96)
f(...)	Calculation method as function of ...

1) Outputting the corrected volume flow cannot be used for gases that condense.
2) User-specific gas or liquid

Dependency

The unit is taken from the **Corrected volume flow unit** parameter (→ 70)

Mass flow

Navigation Expert → Sensor → Measured val. → Process variab. → Mass flow (1847)

Description Displays the mass flow currently calculated.

User interface Signed floating-point number

Additional information *Description*

To calculate the mass flow, the measured volume flow is multiplied by the density (**Density** parameter (→ 56)). The density depends on the sensor version and the selected medium (see table).

Sensor version	Medium	Medium type	Density
Volume flow	All	–	ρ
Mass flow	Steam	–	f(p, T)
	Gas	All except [1]	f(p, T)
	Liquid	All except [1]	f(T)
	Gas	[1]	f(p, T, z, p_{Ref}, T_{Ref}, z_{Ref}, ρ_{Ref})
	Liquid	[1]	f(T, a_{lin}, T_{Ref}, ρ_{Ref})

ρ	Fixed density (→ 119)
ρ_{Ref}	Reference density (→ 100)
p	Pressure (→ 57)
p_{Ref}	Reference pressure (→ 101)
T	Temperature (→ 53)
T_{Ref}	Reference temperature (→ 101)
z	Z-factor (→ 99)
z_{Ref}	Reference Z-factor (→ 101)
a_{lin}	Linear expansion coefficient (→ 96)
f(...)	Calculation method as function of ...

1) User-specific gas or liquid

Dependency

The unit is taken from the **Mass flow unit** parameter (→ 68)

Flow velocity

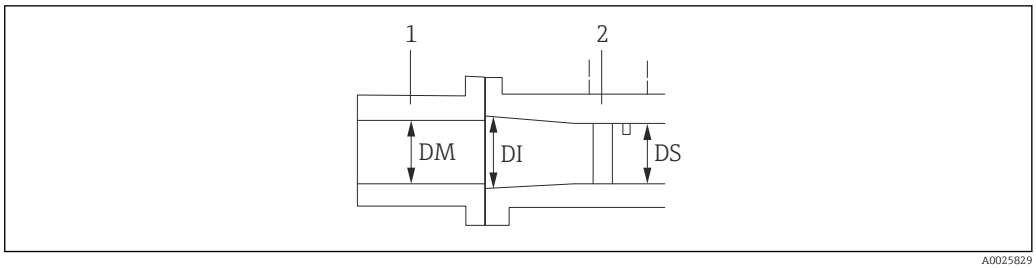
Navigation Expert → Sensor → Measured val. → Process variab. → Flow velocity (1865)

Description Displays the flow velocity currently calculated.

User interface Signed floating-point number

Additional information *Description*

The flow velocity is calculated based on the aspect ratio of the vortex measuring tube (DS) to the process connection of the sensor (DI), or to the **Mating pipe diameter** parameter (→ 123) (DM) if this has been entered by the customer; the DS and DI are production data that are defined by the shape and size of the meter body.



1 Process connection
2 Vortex measuring tube
DM Mating pipe diameter (→ 123)
DI Process connection of the sensor
DS Vortex measuring tube

Dependency

The unit is taken from the **Velocity unit** parameter (→ 76)

Temperature

Navigation Expert → Sensor → Measured val. → Process variab. → Temperature (1851)

Description Displays the temperature currently measured.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 72).

Calculated saturated steam pressure

Navigation Expert → Sensor → Measured val. → Process variab. → CalcSatSteamPres (1852)

Prerequisite The following conditions are met:
- Order code for "Sensor version", option "Mass flow"
- In the **Select medium** parameter (→ 92), the **Steam** option is selected.

Description Displays the saturated steam pressure currently calculated.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Pressure unit** parameter (→ 71)

Steam quality

Navigation Expert → Sensor → Measured val. → Process variab. → Steam quality (1853)

Prerequisite
The following conditions are met:
- Order code for "Sensor version", option "Mass flow"
- In the **Select medium** parameter (→ 92), the **Steam** option is selected.

Description
Displays the current steam quality. Depends on the compensation mode of the steam quality (**Steam quality** parameter (→ 121)).

User interface
Signed floating-point number

Total mass flow

Navigation Expert → Sensor → Measured val. → Process variab. → Total mass flow (1854)

Prerequisite
The following conditions are met:
- Order code for "Application package", option EU "Wet steam measurement"
- In the **Select medium** parameter (→ 92), the **Steam** option is selected.

Description
Displays the total mass flow (steam and condensate) currently calculated.

User interface
Signed floating-point number

Additional information
Dependency

The unit is taken from the **Mass flow unit** parameter (→ 68)

Condensate mass flow

Navigation Expert → Sensor → Measured val. → Process variab. → CondensMassFlow (1857)

Prerequisite
The following conditions are met:
- Order code for "Application package", option EU "Wet steam measurement"
- In the **Select medium** parameter (→ 92), the **Steam** option is selected.

Description
Displays the condensate mass flow currently calculated.

User interface
Signed floating-point number

Additional information
Dependency

The unit is taken from the **Mass flow unit** parameter (→ 68)

Energy flow

Navigation Expert → Sensor → Measured val. → Process variab. → Energy flow (1872)

Prerequisite For the following order code:
"Sensor version", option "Mass flow"

Description Displays the energy flow currently calculated.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Energy flow unit** parameter (→ 73)

Heat flow difference

Navigation Expert → Sensor → Measured val. → Process variab. → Heat flow diff. (1863)

Prerequisite The following conditions are met:
Order code for "Sensor version", option "Mass flow"

One of the following options is selected in the **Select gas type** parameter (→ 92):
- Single gas
- Gas mixture
- Natural gas
- User-specific gas

Description Displays the heat flow difference currently calculated.

User interface Signed floating-point number

Additional information *Description*

The measuring device requires the following to calculate the heat flow difference correctly:

1. Select the type of calculation in the **Delta heat calculation** parameter (→ 119).
2. Enter the value in the **2nd temperature delta heat** parameter (→ 120).

Dependency

The unit is taken from the **Energy flow unit** parameter (→ 73)

Reynolds number

Navigation Expert → Sensor → Measured val. → Process variab. → Reynolds number (1864)

Prerequisite For the following order code:
"Sensor version", option "Mass flow"

Description Displays the Reynolds number currently calculated.

User interface Signed floating-point number

Additional information *Description*

$$Re = \frac{\rho \cdot v \cdot d}{\eta}$$

Where:
- ρ is the density of the medium (**Density** parameter (→ 56))
- v is the flow velocity of the fluid in relation to the body (**Flow velocity** parameter (→ 52))
- d is the characteristic length of the body
- η is the viscosity of the medium
  - For gases: **Dynamic viscosity** parameter (→ 98)
  - For liquids: **Dynamic viscosity** parameter (→ 98)
- The mating pipe diameter is taken as the characteristic length (**Mating pipe diameter** parameter (→ 123))

Density

Navigation Expert → Sensor → Measured val. → Process variab. → Density (7607)

Prerequisite For the following order code:
"Sensor version", option "Mass flow"

Description Displays the density currently calculated.

User interface Positive floating-point number

Additional information *Description*

Depending on the selected medium the density is calculated with pressure and temperature and the corresponding method (e.g. IAPWS, NEL40...).

User interface

The unit is taken from the **Density unit** parameter (→ 76)

Specific volume

Navigation Expert → Sensor → Measured val. → Process variab. → Specific volume (7739)

Prerequisite For the following order code:
"Sensor version", option "Mass flow"

Description Displays the current value for the specific volume.

User interface Positive floating-point number

Additional information

Description

The specific volume is a process variable that is common in steam applications.

For the calculation: reciprocal value of the density (**Density** parameter (→ 56))

Dependency

The unit is taken from the **Specific volume unit** parameter (→ 77)

Pressure

Navigation Expert → Sensor → Measured val. → Process variab. → Pressure (7696)

Prerequisite

For the following order code:
- "Sensor version", option "Mass flow"
- In the **External value** parameter (→ 118), the **Pressure** option is selected.

Description

Displays the current process pressure.

User interface

0 to 250 bar

Additional information

Description

The value of the pressure which is read in (e.g. via the current input module) is displayed..

If the **Pressure** option is not selected as the external value in the **External value** parameter (→ 118), the input value for the fixed process pressure (**Fixed process pressure** parameter (→ 121)) is displayed.

Dependency

The unit is taken from the **Pressure unit** parameter (→ 71)

Saturation temperature

Navigation Expert → Sensor → Measured val. → Process variab. → Saturation temp. (7709)

Prerequisite

In the **Select medium** parameter (→ 92), the **Steam** option is selected.

Description

Displays the saturation temperature currently calculated.

User interface

Country-specific:
- °C
- °F

Additional information

The saturation temperature describes the temperature limit at which steam begins to condense. This value is calculated using the current process pressure (**Pressure** parameter (→ 57)) according to IAPWS-IF97.

Dependency

The unit is taken from the **Temperature unit** parameter (→ 72).

Degrees of superheat

Navigation Expert → Sensor → Measured val. → Process variab. → Degree superheat (7738)

Prerequisite In the **Select medium** parameter (→ 92), the **Steam** option is selected.

Description Displays the degree of superheating currently calculated.

User interface 0 to 500 K

Additional information *Description*

The degree of superheating describes the difference between the temperature (**Temperature** parameter (→ 53)) and the saturation temperature (**Saturation temperature** parameter (→ 57)). If the temperature is below the current saturation temperature, the degree of superheating has the value **0**.

Compressibility factor

Navigation Expert → Sensor → Measured val. → Process variab. → CompressFactor (7729)

Prerequisite The following conditions are met:
Order code for "Sensor version", option "Mass flow"

In the **Select medium** parameter (→ 92), the **Gas** option or **Steam** option is selected.

Description Displays the compressibility factor currently calculated.

User interface 0 to 2

Additional information *Description*

The compressibility factor describes the deviation of the medium from the ideal behavior under the current process conditions. If the medium is a user-specific gas/liquid, the compressibility factor is entered as the Z-factor (**Z-factor** parameter (→ 99)).

Vortex frequency

Navigation Expert → Sensor → Measured val. → Process variab. → Vortex frequency (7722)

Description Displays the measured variable for the flow in the measuring tube which is recorded directly with the DSC sensor.

User interface

Measuring range depending on the nominal diameter:
0.1 to 3 100 Hz

Additional information

Description

The filter settings specify the measuring range of the vortex frequency depending on the nominal diameter.

Filter settings for liquids

Nominal diameter	Minimum vortex frequency	Maximum vortex frequency
	f_{vmin} [Hz]	f_{vmax} [Hz]
DN 15 (½") DN 25 (1") > DN 15 (½") DN 40 (1½") >> DN 15 (½")	11.5	666.5
DN 25 (1") DN 40 (1½") > DN 25 (1") DN 50 (2") >> DN 25 (1")	6.7	388.8
DN 40 (1½") DN 50 (2") > DN 40 (1½") DN 80 (3") >> DN 40 (1½")	3.9	224.3
DN 50 (2") DN 80 (3") > DN 50 (2") DN 100 (4") >> DN 50 (2")	3.0	172.8
DN 80 (3") DN 100 (4") > DN 80 (3") DN150 (6") >> DN 80 (3")	2.1	122.8
DN 100 (4") DN150 (6") > DN 100 (4") DN 200 (8") >> DN 100 (4")	1.7	101.4
DN150 (6") DN 200 (8") > DN150 (6") DN 250 (10") >> DN150 (6")	1.1	66.6
DN 200 (8")	0.7	41.7
DN 250 (10")	0.6	34.3
DN 300 (12")	0.5	28.9

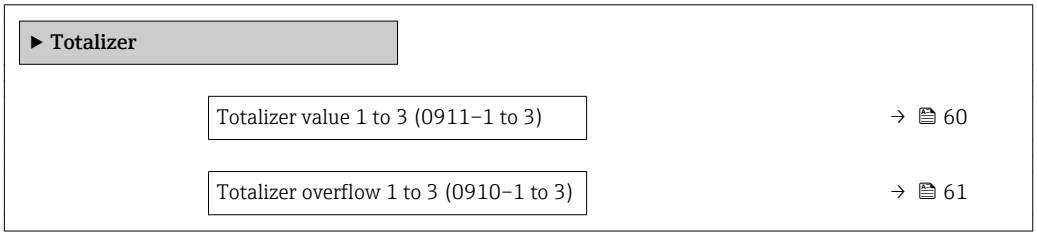
Filter settings for gases/steam

DN [mm (in)]	Minimum vortex frequency	Maximum vortex frequency
	f_{vmin} [Hz]	f_{vmax} [Hz]
DN 15 (½") DN 25 (1") > DN 15 (½") DN 40 (1½") >> DN 15 (½")	209.9	3 100
DN 25 (1") DN 40 (1½") > DN 25 (1") DN 50 (2") >> DN 25 (1")	67.1	3 100
DN 40 (1½") DN 50 (2") > DN 40 (1½") DN 80 (3") >> DN 40 (1½")	13.7	1 869.1
DN 50 (2") DN 80 (3") > DN 50 (2") DN 100 (4") >> DN 50 (2")	10.5	2 303.8

DN [mm (in)]	Minimum vortex frequency	Maximum vortex frequency
	f_{vmin} [Hz]	f_{vmax} [Hz]
DN 80 (3") DN 100 (4") > DN 80 (3") DN150 (6") >> DN 80 (3")	7.5	1 636.9
DN 100 (4") DN150 (6") > DN 100 (4") DN 200 (8") >> DN 100 (4")	6.2	1 352.3
DN150 (6") DN 200 (8") > DN150 (6") DN 250 (10") >> DN150 (6")	4.1	888.6
DN 200 (8")	2.5	555.4
DN 250 (10")	2.1	457.3
DN 300 (12")	1.8	385.3

Totalizer

Navigation Expert → Sensor → Measured val. → Totalizer → Totalizer val. 1 to 3 (0911–1 to 3)



Totalizer value 1 to 3

Navigation Expert → Sensor → Measured val. → Totalizer → Totalizer val. 1 to 3 (0911–1 to 3)

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 185) of the **Totalizer 1 to 3** submenu:
- Volume flow
- Corrected volume flow
- Mass flow
- Total mass flow *
- Condensate mass flow *
- Energy flow *
- Heat flow difference *

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** parameterif the display range is exceeded.

In the event of an error, the totalizer adopts the mode defined in the **Failure mode** parameter (→ 189).

User interface

The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→ 186).

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 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 (0910–1 to 3)

Prerequisite

One of the following options is selected in the **Assign process variable** parameter (→ 185) of the **Totalizer 1 to 3** submenu:
- Volume flow
- Corrected volume flow
- Mass flow
- Total mass flow *
- Condensate mass flow *
- Energy flow *
- Heat flow difference *

Description Displays the current totalizer overflow.

User interface Integer with sign

Additional information

Description

If the current reading has more than 7 digits, which is the maximum value range that can be displayed, the value above this range is given as an overflow. The current 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 in the **Unit totalizer** parameter (→ 186).

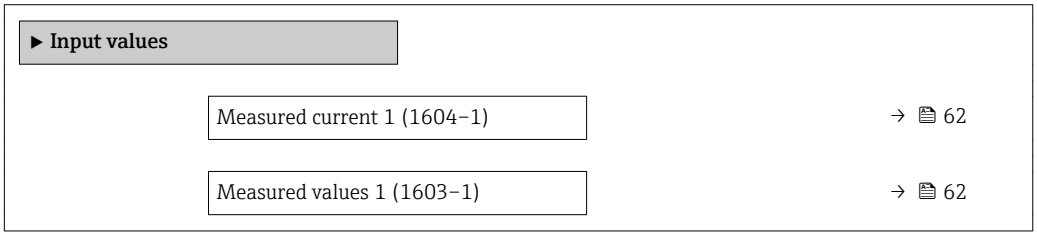
* Visibility depends on order options or device settings

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 10^7 (2 overflows) = 20 000 000 [m^3]
- Current totalizer reading: 20 196 845.7 m^3

"Input values" submenu

Navigation Expert → Sensor → Measured val. → Input values



Measured current 1

Navigation Expert → Sensor → Measured val. → Input values → Measur. curr. 1 (1604–1)

Description Displays the current value of the current input.

User interface 3.59 to 22.5 mA

Additional information *User interface*

Display depends on the process variable selected in the **External value** parameter (→ 118).

Measured values 1

Navigation Expert → Sensor → Measured val. → Input values → Measured val. 1 (1603–1)

Description Displays the current input value.

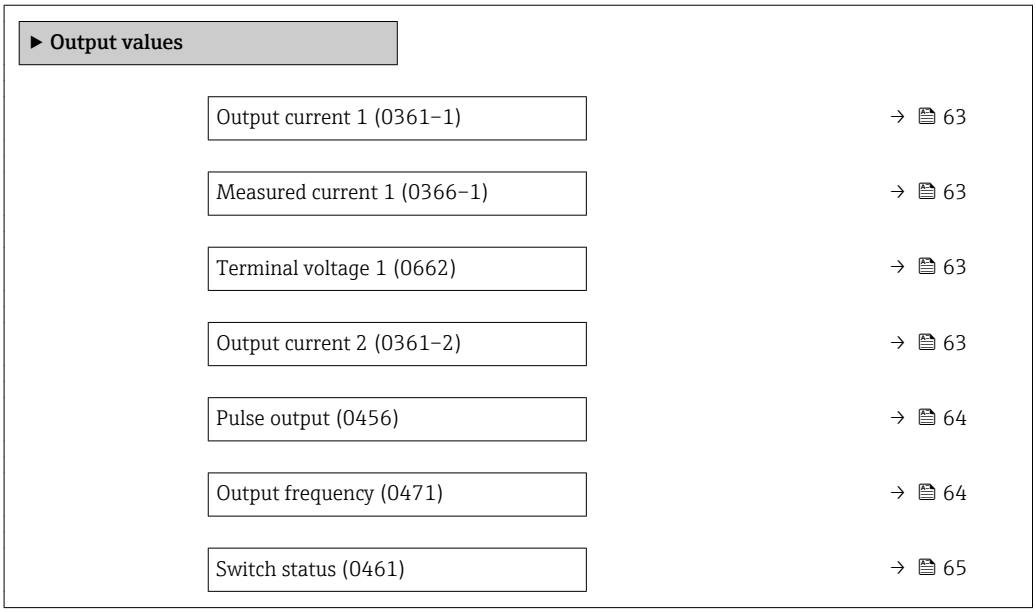
User interface Signed floating-point number

Additional information *Dependency*

The display depends on the option selected in the **External value** parameter (→ 118).

"Output values" submenu

Navigation Expert → Sensor → Measured val. → Output values



Output current 1 to 2

Navigation Expert → Sensor → Measured val. → Output values → Output curr. 1 to 2 (0361–1 to 2)

Description Displays the actual calculated value of the output current.

User interface 3.59 to 22.5 mA

Measured current 1

Navigation Expert → Sensor → Measured val. → Output values → Measur. curr. 1 (0366–1)

Description Use this function to display the actual measured value of the output current.

User interface 0 to 30 mA

Terminal voltage 1

Navigation Expert → Sensor → Measured val. → Output values → Terminal volt. 1 (0662)

Description Use this function to view the actual terminal voltage that is present at the current output.

User interface 0.0 to 50.0 V

Pulse output

Navigation Expert → Sensor → Measured val. → Output values → Pulse output (0456)

Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 139).

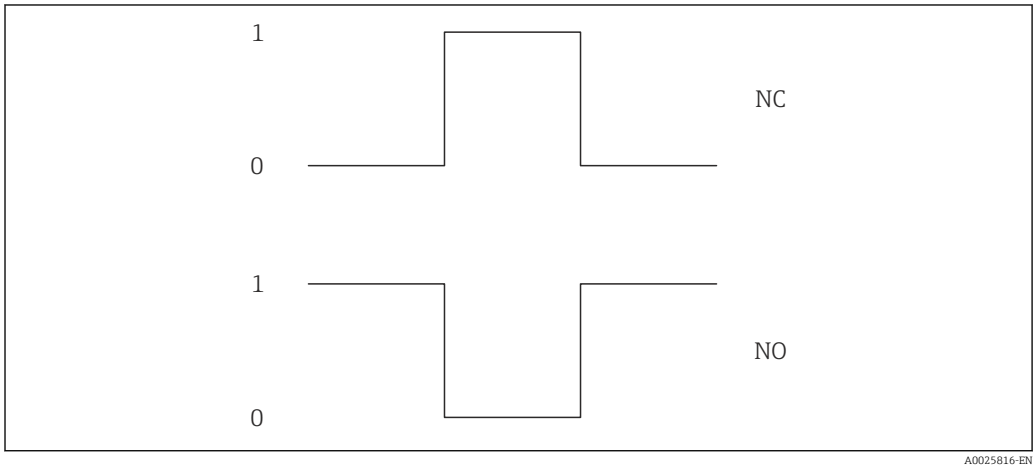
Description Use this function to display the pulse frequency currently output.

User interface Positive floating-point number

Additional information *Description*

The pulse output is an open collector output. This is configured at the factory so that the transistor is conductive for the duration of the pulse (NO contact).

With the **Value per pulse** parameter (→ 140) and **Pulse width** parameter (→ 140) it is possible to define the value - i.e. the measured value amount that is equivalent to a pulse, and the duration of the pulse.



0 Non-conductive
1 Conductive
NC Normally closed
NO Normally opened

The output behavior can be inverted via the **Invert output signal** parameter (→ 150), i.e. the transistor is not conductive for the duration of the pulse.

In addition, the behavior of the output in the event of an error (**Failure mode** parameter (→ 140)) can be configured.

Output frequency

Navigation Expert → Sensor → Measured val. → Output values → Output freq. (0471)

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 139).

Description Use this function to view the actual value of the output frequency which is currently measured.

User interface 0 to 1 250 Hz

Switch status

Navigation Expert → Sensor → Measured val. → Output values → Switch status (0461)

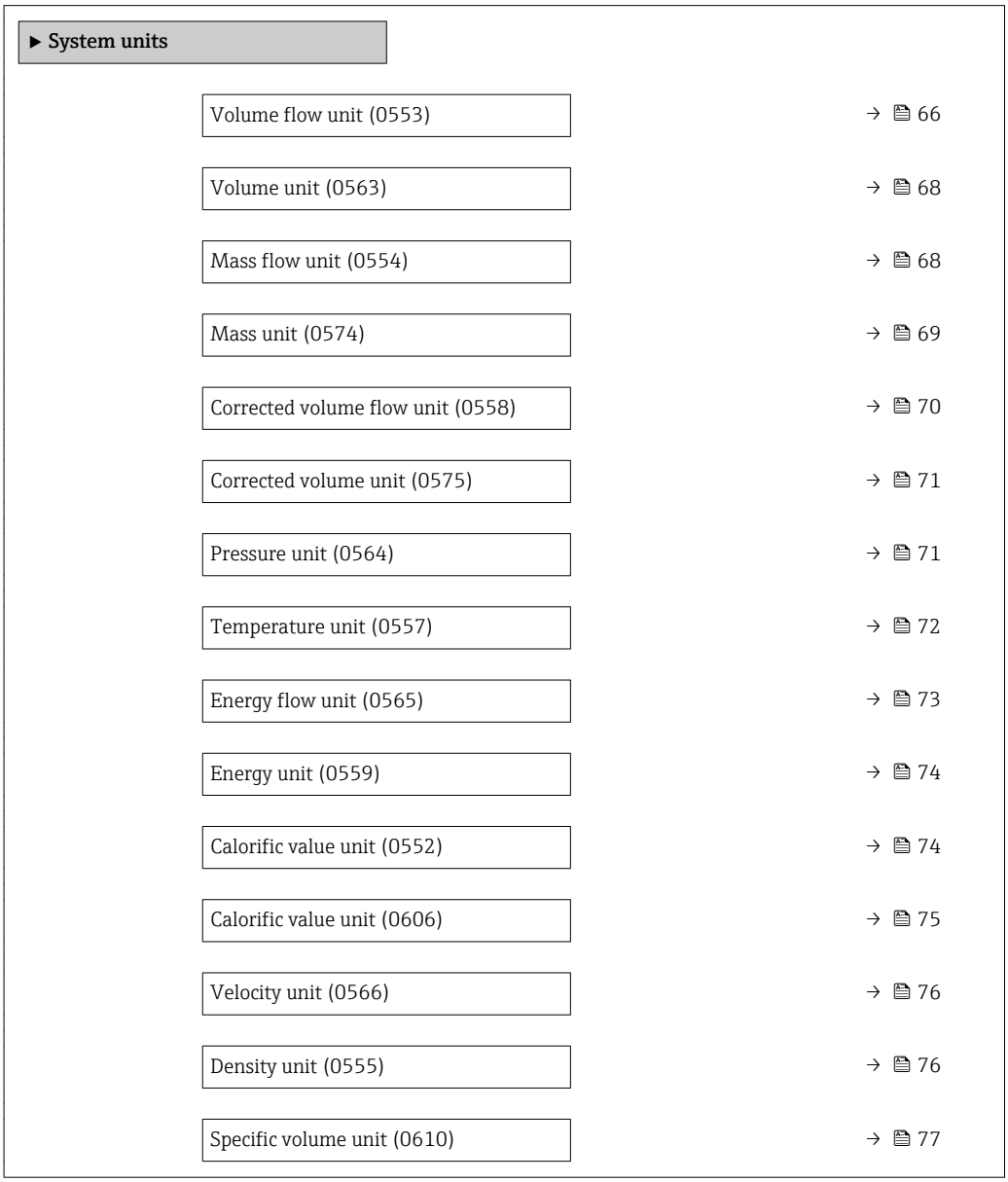
Prerequisite The **Switch** option is selected in the **Operating mode** parameter (→ 139).

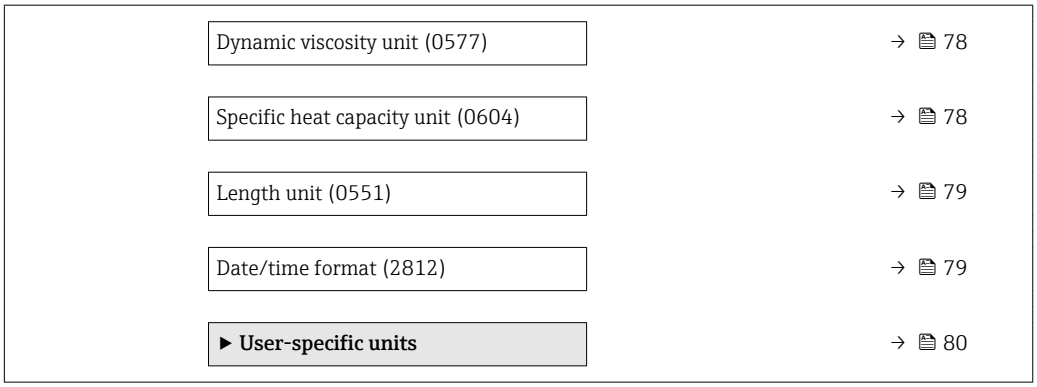
Description Use this function to view the current switch status of the status output.

User interface
- Open
- Closed

3.2.2 "System units" submenu

Navigation Expert → Sensor → System units





Volume flow unit

Navigation Expert → Sensor → System units → Volume flow unit (0553)

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:
- m^3/h
- ft^3/min

Additional information

Result

The selected unit applies for:
Volume flow parameter (→ 51)

Options

For an explanation of the abbreviated units: → 225

Customer-specific units

The unit for the customer-specific volume is specified in the **User volume text** parameter (→ 81).

Volume unit

Navigation Expert → Sensor → System units → Volume unit (0563)

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:
- m^3
- ft^3

Additional information

Selection

For an explanation of the abbreviated units: → 225

Customer-specific units

The unit for the customer-specific volume is specified in the **User volume text** parameter (→ 81).

Mass flow unit

Navigation Expert → Sensor → System units → Mass flow unit (0554)

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 (→ 52)
- **Total mass flow** parameter (→ 54)
- **Condensate mass flow** parameter (→ 54)

Options

For an explanation of the abbreviated units: → 225

Customer-specific units

The unit for the customer-specific mass is specified in the **User mass text** parameter (→ 82).

Mass unit

Navigation

Expert → Sensor → System units → Mass unit (0574)

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: → 225

Customer-specific units

The unit for the customer-specific mass is specified in the **User mass text** parameter (→ 82).

Corrected volume flow unit

Navigation

Expert → Sensor → System units → Cor.volflow unit (0558)

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

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

Factory setting

Country-specific:
- Nm^3/h
- Sft^3/h

Additional information

Result

The selected unit applies for:
Corrected volume flow parameter (→ 51)

Options

For an explanation of the abbreviated units: → 225

Customer-specific units

The unit for the customer-specific corrected volume is defined in the **User corrected volume text** parameter (→ 83).

Corrected volume unit

Navigation Expert → Sensor → System units → Corr. vol. unit (0575)

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

Selection

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

US units
Sft^3

Custom-specific units
UserCrVol.

Factory setting

Country-specific:
- Nm^3
- Sft^3

Additional information

Options

For an explanation of the abbreviated units: → 225

Customer-specific units

The unit for the customer-specific corrected volume is defined in the **User corrected volume text** parameter (→ 83).

Pressure unit

Navigation Expert → Sensor → System units → Pressure unit (0564)

Prerequisite

For the following order code:
"Sensor version", option "Mass flow"

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

Selection

SI units
- Pa
- kPa
- MPa
- mbar a
- bar
- torr
- atm
- gf/cm^2
- kgf/cm^2

US units
psi

Other units
- mmH2O (4°C)
- mmH2O (68°F)
- mmHg (0°C)
- inH2O (4°C)
- inH2O (68°F)
- ftH2O (68°F)
- inHg (0°C)

Custom-specific units
User pres.

Factory setting

Country-specific:
- bar
- psi

Additional information

Result

The unit is taken from:
- **Calculated saturated steam pressure** parameter (→ 53)
- **Atmospheric pressure** parameter (→ 119)
- **Maximum value** parameter (→ 213)
- **Fixed process pressure** parameter (→ 121)
- **Pressure** parameter (→ 57)
- **Reference pressure** parameter (→ 101)

Options

For an explanation of the abbreviated units: → 225

Customer-specific units

The unit is taken from the **Pressure unit** parameter (→ 71)

Temperature unit

Navigation Expert → Sensor → System units → Temperature unit (0557)

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

Selection

SI units	*US units*
▪ °C	▪ °F
▪ K	▪ °R

Factory setting

Country-specific:
- °C
- °F

Additional information

Result

The selected unit applies for:
- **Temperature** parameter (→ 53)
- **Maximum value** parameter (→ 210)
- **Minimum value** parameter (→ 210)
- **Average value** parameter (→ 211)
- **Maximum value** parameter (→ 212)
- **Minimum value** parameter (→ 211)
- **Maximum value** parameter (→ 212)
- **Minimum value** parameter (→ 212)
- **2nd temperature delta heat** parameter (→ 120)
- **Fixed temperature** parameter (→ 120)
- **Reference combustion temperature** parameter (→ 99)
- **Reference temperature** parameter (→ 101)
- **Saturation temperature** parameter (→ 57)

Options

For an explanation of the abbreviated units: → 225

Energy flow unit

Navigation Expert → Sensor → System units → Energy flow unit (0565)

Prerequisite For the following order code:
"Sensor version", option "Mass flow"

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

Selection

SI units
- kW
- MW
- GW
- kJ/s
- kJ/min
- kJ/h
- kJ/d
- MJ/s
- MJ/h
- MJ/min
- MJ/d
- GJ/s
- GJ/min
- GJ/h
- GJ/d
- kcal/s
- kcal/min
- kcal/h
- kcal/d
- Mcal/s
- Mcal/min
- Mcal/h
- Mcal/d
- Gcal/s
- Gcal/min
- Gcal/h
- Gcal/d

Imperial units
- Btu/s
- Btu/min
- Btu/h
- Btu/day
- MBtu/s
- MBtu/min
- MBtu/h
- MBtu/d
- MMBtu/s
- MMBtu/min
- MMBtu/h
- MMBtu/d

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

Factory setting Country-specific:
- kW
- Btu/h

Additional information

Result

The selected unit applies for:
- **Heat flow difference** parameter (→ 55)
- **Energy flow** parameter (→ 55)

Options

For an explanation of the abbreviated units: → 225

Customer-specific units

The unit for the customer-specific energy is specified in the **User energy text** parameter (→ 86).

Energy unit

Navigation Expert → Sensor → System units → Energy unit (0559)

Prerequisite For the following order code:
"Sensor version", option "Mass flow"

Description Use this function to select the unit for energy.

Selection

SI units
- kWh
- MWh
- GWh
- kJ
- MJ
- GJ
- kcal
- Mcal
- Gcal

Imperial units
- Btu
- MBtu
- MMBtu

Custom-specific units
User en.

Factory setting Country-specific:
- kWh
- Btu

Additional information

Options

For an explanation of the abbreviated units: → 225

Customer-specific units

The unit for the customer-specific energy is specified in the **User energy text** parameter (→ 86).

Calorific value unit

Navigation Expert → Sensor → System units → Cal. value unit (0552)

Prerequisite The following conditions are met:
- Order code for "Sensor version", option "Mass flow"
- In the **Calorific value type** parameter (→ 95), the **Gross calorific value volume** option or **Net calorific value volume** option is selected.

Description Use this function to select the unit for the calorific value.

Selection

SI units
- kJ/Nm³
- MJ/Nm³
- kWh/Nm³
- MWh/Sm³
- kJ/Sm³
- MJ/Sm³
- kWh/Sm³
- MWh/Nm³

Imperial units
- Btu/Sm³
- MBtu/Sm³
- Btu/Sft³
- MBtu/Sft³

Custom-specific units
User cval.

Factory setting

Country-specific:
- kJ/Nm³
- Btu/Sft³

Additional information

Result

The selected unit applies for:
Reference gross calorific value parameter (→ 100)

Options

For an explanation of the abbreviated units: → 225

Customer-specific units

The unit for the customer-specific calorific value is specified in the **User specific-enthalpy text** parameter (→ 85).

Calorific value unit (Mass)

Navigation

Expert → Sensor → System units → Cal. value unit (0606)

Prerequisite

The following conditions are met:
- Order code for "Sensor version", option "Mass flow"
- In the **Calorific value type** parameter (→ 95), the **Gross calorific value mass** option or **Net calorific value mass** option is selected.

Description

Use this function to select the unit for the calorific value (mass).

Selection

SI units
- kJ/kg
- MJ/kg
- kWh/kg
- MWh/kg

US units
- kJ/lb
- MJ/lb
- kWh/lb
- MWh/lb

Imperial units
- Btu/lb
- MBtu/lb

Custom-specific units
User cval.

Factory setting

Country-specific:
- kJ/kg
- Btu/lb

Additional information

Options

For an explanation of the abbreviated units: → 225

Customer-specific units

The unit for the customer-specific calorific value is specified in the **User specific-enthalpy text** parameter (→ 85).

Velocity unit

Navigation Expert → Sensor → System units → Velocity unit (0566)

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

Selection

SI units	*US units*
m/s	ft/s

Factory setting

Country-specific:
- m/s
- ft/s

Additional information

Result

The selected unit applies for:
- **Flow velocity** parameter (→ 52)
- **Maximum value** parameter (→ 213)

Options

For an explanation of the abbreviated units: → 225

Density unit

Navigation Expert → Sensor → System units → Density unit (0555)

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

Selection

SI units
- g/cm³
- 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/m³
- lb/ft³

Additional information

Result

The selected unit applies for:
- **Density** parameter (→ 56)
- **Fixed density** parameter (→ 119)
- **Reference density** parameter (→ 100)

Options

- SD = 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).
- SG = 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).

For an explanation of the abbreviated units: → 225

Customer-specific units

The unit for the customer-specific density is specified in the **User density text** parameter (→ 84).

Specific volume unit

Navigation

Expert → Sensor → System units → Spec. vol. unit (0610)

Prerequisite

For the following order code:
"Sensor version", option "Mass flow"

Description

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

Selection

Other units
- m³/kg
- ft3/lb

Factory setting

Country-specific:
- m³/kg
- ft³/lb

Additional information

Result

The selected unit applies for:
Specific volume parameter (→ 56)

Additional information

Options

For an explanation of the abbreviated units: → 225

Dynamic viscosity unit

Navigation Expert → Sensor → System units → Dyn. visc. unit (0577)

Description Use this function to select the unit for dynamic viscosity.

Selection
SI units
- Pa s
- cP
- P

Factory setting Pa s

Additional information *Result*

The selected unit applies for:
- **Dynamic viscosity** parameter (→ 98) (gases)
- **Dynamic viscosity** parameter (→ 98) (liquids)

Additional information *Options*

For an explanation of the abbreviated units: → 225

Specific heat capacity unit

Navigation Expert → Sensor → System units → SpecHeatCapaUnit (0604)

Prerequisite The following conditions are met:
- Selected medium:
  - In the **Select gas type** parameter (→ 92), the **User-specific gas** option is selected.
    Or
  - In the **Select liquid type** parameter (→ 93), the **User-specific liquid** option is selected.
- In the **Enthalpy type** parameter (→ 96), the **Heat** option is selected.

Description Use this function to select the unit for the specific heat capacity.

Selection

SI units
- kJ/(kgK)
- MJ/(kgK)
- kWh/(kgK)
- kcal/(kgK)

Imperial units
Btu/(lb˚R)

Factory setting kJ/(kgK)

Additional information *Result*

The selected unit applies for:
Specific heat capacity parameter (→ 102)

Additional information *Options*

For an explanation of the abbreviated units: → 225

Length unit

Navigation Expert → Sensor → System units → Length unit (0551)

Description Use this function to select the unit of length for the nominal diameter.

Selection

SI units
- mm
- m

US units
- in
- ft

Factory setting Country-specific:
- mm
- in

Additional information *Result*

The selected unit applies for:
- **Inlet run** parameter (→ 123)
- **Mating pipe diameter** parameter (→ 123)

Date/time format

Navigation Expert → Sensor → System units → Date/time format (2812)

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

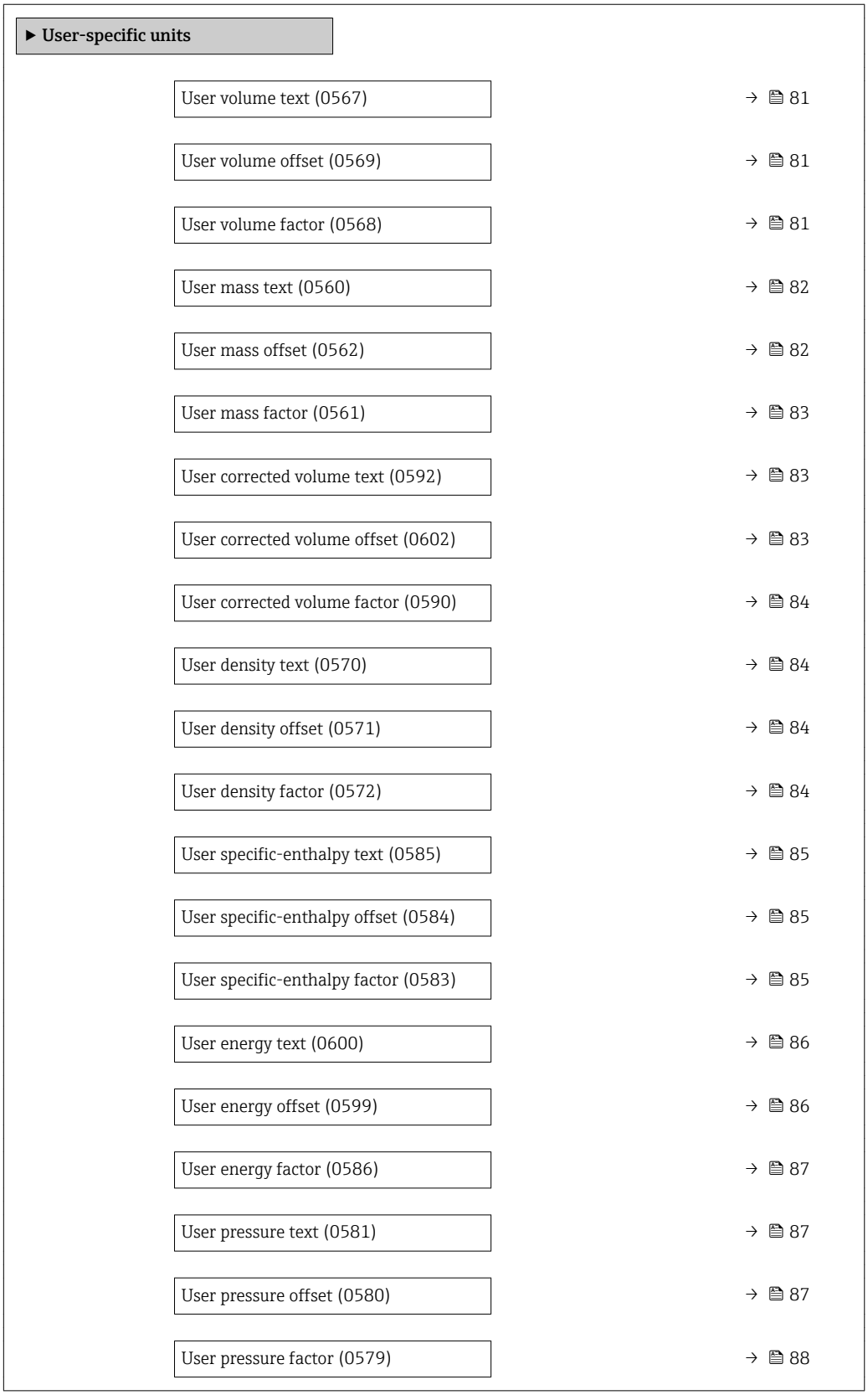
Factory setting dd.mm.yy hh:mm

Additional information *Selection*

For an explanation of the abbreviated units: → 225

"User-specific units" submenu

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



User volume text

Navigation Expert → Sensor → System units → User-spec. units → Volume text (0567)

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 (→ 66)
- **Volume unit** parameter (→ 68)

Example

If the text GLAS is entered, the choose list of the **Volume flow unit** parameter (→ 66) shows the following options:
- GLAS/s
- GLAS/min
- GLAS/h
- GLAS/d

User volume offset

Navigation Expert → Sensor → System units → User-spec. units → Volume offset (0569)

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

User entry Signed floating-point number

Factory setting 0

Additional information *Description*

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

User volume factor

Navigation Expert → Sensor → System units → User-spec. units → Volume factor (0568)

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 mass text

Navigation Expert → Sensor → System units → User-spec. units → Mass text (0560)

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 *Description*

The defined unit is shown as an option in the choose list of the following parameters:
- **Mass flow unit** parameter (→ 68)
- **Mass unit** parameter (→ 69)

Example

If the text GLAS is entered, the choose list of the **Mass flow unit** parameter (→ 68) shows the following options:
- GLAS/s
- GLAS/min
- GLAS/h
- GLAS/d

User mass offset

Navigation Expert → Sensor → System units → User-spec. units → Mass offset (0562)

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

User entry Signed floating-point number

Factory setting 0

Additional information *Description*

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

User mass factor

Navigation Expert → Sensor → System units → User-spec. units → Mass factor (0561)

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

User corrected volume text

Navigation Expert → Sensor → System units → User-spec. units → Corr. vol. text (0592)

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 (→ 70)
- **Corrected volume unit** parameter (→ 71)

Example

If the text GLAS is entered, the choose list of the **Corrected volume flow unit** parameter (→ 70) shows the following options:
- GLAS/s
- GLAS/min
- GLAS/h
- GLAS/d

User corrected volume offset

Navigation Expert → Sensor → System units → User-spec. units → Corr vol. offset (0602)

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

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

User entry Signed floating-point number

Factory setting 0

User corrected volume factor

Navigation Expert → Sensor → System units → User-spec. units → Cor.vol. factor (0590)

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 (0570)

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 (→ 76).

Example

Enter text “CE_L” for centners per liter

User density offset

Navigation Expert → Sensor → System units → User-spec. units → Density offset (0571)

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 (0572)

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 specific-enthalpy text

Navigation Expert → Sensor → System units → User-spec. units → Spec. enth. text (0585)

Description Use this function to enter a text for the user-specific calorific value unit. The corresponding volume units (cm^3, dm^3, m^3, ml, l, hl, Ml Mega, af, ft^3, fl oz, gal, kgal, Mgal, bbl) or mass units (g, kg, t, oz, lb, STon) for the calorific value are generated automatically.

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

Factory setting User enth.

Additional information *Result*

The defined unit is shown as an option in the choose list of the following parameters:
- **Calorific value unit** parameter (→ 74) (volume)
- **Calorific value unit** parameter (→ 74) (mass)

Example

If the text CAL is entered, the choose list of the **Calorific value unit** parameter (→ 74) shows the following options:
- CAL/Nm3
- CAL/m3
- CAL/ft3
- CAL/Sft3

User specific-enthalpy offset

Navigation Expert → Sensor → System units → User-spec. units → Spec. enth. off. (0584)

Description Use this function to enter the offset for adapting the user-specific calorific value unit (without volume).

User entry Signed floating-point number

Factory setting 0

User specific-enthalpy factor

Navigation Expert → Sensor → System units → User-spec. units → Spec. enth. fac. (0583)

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

User entry Signed floating-point number

Factory setting 1.0

Additional information *Example*

1 W × min = 60 J → 0.166 W × min = 1 J → user entry: 0.0166

User energy text

Navigation Expert → Sensor → System units → User-spec. units → Energy text (0600)

Prerequisite For the following order code:
"Sensor version", option "Mass flow"

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

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

Factory setting User en.

Additional information *Result*

The defined unit is shown as an option in the choose list of the following parameters:
- **Energy unit** parameter (→ 74)
- **Energy flow unit** parameter (→ 73)

Example

If the text W is entered, the choose list of the **Energy flow unit** parameter (→ 73) shows the following options:
- W/s
- W/min
- W/h
- W/d

User energy offset

Navigation Expert → Sensor → System units → User-spec. units → Energy offset (0599)

Prerequisite For the following order code:
"Sensor version", option "Mass flow"

Description Use this function to enter the offset for adapting the user-specific energy unit (without time).

User entry Signed floating-point number

Factory setting 0

User energy factor

Navigation Expert → Sensor → System units → User-spec. units → Energy factor (0586)

Prerequisite For the following order code:
"Sensor version", option "Mass flow"

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

User entry Signed floating-point number

Factory setting 1.0

User pressure text

Navigation Expert → Sensor → System units → User-spec. units → Pressure text (0581)

Prerequisite For the following order code:
"Sensor version", option "Mass flow"

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 (→ 71).

User pressure offset

Navigation Expert → Sensor → System units → User-spec. units → Pressure offset (0580)

Prerequisite For the following order code:
"Sensor version", option "Mass flow"

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 (0579)

Prerequisite For the following order code:
"Sensor version", option "Mass flow"

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

User entry Signed floating-point number

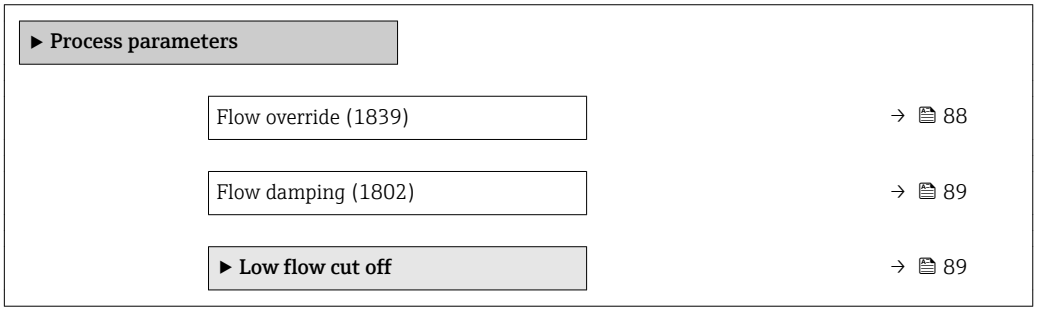
Factory setting 1.0

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 override

Navigation Expert → Sensor → Process param. → Flow override (1839)

Description Use this function to select whether to interrupt the evaluation of measured values. This is useful for the cleaning process 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

Flow damping

Navigation Expert → Sensor → Process param. → Flow damping (1802)

Description Use this function to enter 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 999.9 s

Factory setting 5 s

Additional information *Result*

The damping has an effect on the following variables of the device:
- Outputs → 128
- Low flow cut off → 89
- Totalizer → 184

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

"Low flow cut off" submenu

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

▶ Low flow cut off	
Assign process variable (1837)	→ 90
On value low flow cutoff (1805)	→ 90
Off value low flow cutoff (1804)	→ 90

Assign process variable

Navigation Expert → Sensor → Process param. → Low flow cut off → Assign variable (1837)

Description Use this function to select a process variable for low flow cut off.

Selection
- Off
- Volume flow
- Corrected volume flow
- Mass flow
- Reynolds number *

Factory setting Off

On value low flow cutoff

Navigation Expert → Sensor → Process param. → Low flow cut off → On value (1805)

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 90):
- Volume flow
- Corrected volume flow
- Mass flow
- Reynolds number *

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 → 90.

User entry Positive floating-point number

Factory setting 0

Additional information *Dependency*

The unit depends on the process variable selected in the **Assign process variable** parameter (→ 90).

Off value low flow cutoff

Navigation Expert → Sensor → Process param. → Low flow cut off → Off value (1804)

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 90):
- Volume flow
- Corrected volume flow
- Mass flow
- Reynolds number *

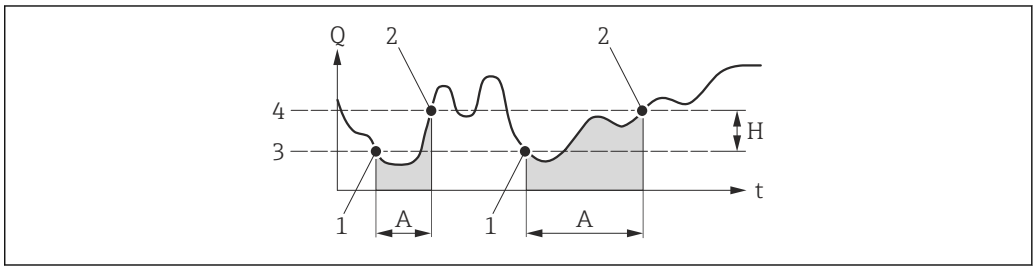
* Visibility depends on order options or device settings

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 → 90.

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

3.2.4 "Measurement mode" submenu

Navigation Expert → Sensor → Measurement mode

► **Measurement mode**	
Select medium (7653)	→ 92
Select gas type (7635)	→ 92
Select liquid type (7636)	→ 93
Density calculation (7608)	→ 94
Enthalpy calculation (7619)	→ 94
► **Medium properties**	→ 94

Select medium

Navigation Expert → Sensor → Measurement mode → Select medium (7653)

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

Selection
- Gas
- Liquid
- Steam

Factory setting Steam

Select gas type

Navigation Expert → Sensor → Measurement mode → Select gas type (7635)

Prerequisite The following conditions are met:
- Order code
  - "Sensor version", option "Mass flow"
  - "Application package", option "Air + Industrial gases" or option "Natural gas"
- The **Gas** option is selected in the **Select medium** parameter (→ 92).

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

Selection
- Single gas
- Gas mixture
- Air
- Natural gas
- User-specific gas

Factory setting User-specific gas

Additional information *"User-specific gas" option*

Applications: calculation of the mass flow of a user-specific gas

Calculated variables: the mass flow, the density, the corrected volume flow and the heat quantity are calculated from the measured volume flow and the measured temperature. Either the specific thermal capacity or the calorific value must be entered for calculating the heat quantity.

Formulae for calculation:
- Mass flow: $m = q \cdot \rho\ (T)$
- Density: $\rho = \rho_1\ (T_1) / (1 + \beta_p \cdot [T - T_1])$
- Corrected volume flow: $v_n = q \cdot (\rho\ (T) / \rho_{ref})$
- Heat quantity in the case of delta heat: $E = q \cdot \rho\ (T) \cdot c_p \cdot \Delta T$
- Heat quantity in the case of combustion: $E = q \cdot \rho\ (T) \cdot h$

m = Mass flow

q = Volume flow (measured)

v_n = Corrected volume flow

T = Process temperature (measured)

T_1 = Temperature (→ 53) at which the value for ρ_1 applies.

ρ = Density

ρ_{ref} = Reference density

= Density (→ 56) at which the value for T_1 applies.

β_p = Linear expansion coefficient (→ 96) of the liquid at T_1

Possible combinations of these values: **Linear expansion coefficient** parameter (→ 96)

Select liquid type

Navigation Expert → Sensor → Measurement mode → Sel. liquid type (7636)

Prerequisite

The following conditions are met:
- Order code for "Sensor version", option "Mass flow"
- The **Liquid** option is selected in the **Select medium** parameter (→ 92) parameter.

Description

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

Selection

- Water
- LPG (Liquefied Petroleum Gas)
- User-specific liquid

Factory setting

Water

Additional information

"User-specific liquid" option

Applications: calculation of the mass flow of a user-specific liquid, such as thermal oil.

Calculated variables: the mass flow, the density, the corrected volume flow and the heat quantity are calculated from the measured volume flow and the measured temperature. Either the specific thermal capacity or the calorific value must be entered for calculating the heat quantity.

Formulae for calculation:
- Mass flow: $m = q \cdot \rho\ (T)$
- Density: $\rho = \rho_1\ (T_1) / (1 + \beta_p \cdot [T - T_1])$
- Corrected volume flow: $v_n = q \cdot (\rho\ (T) / \rho_{ref})$
- Heat quantity in the case of delta heat: $E = q \cdot \rho\ (T) \cdot c_p \cdot \Delta T$
- Heat quantity in the case of combustion: $E = q \cdot \rho\ (T) \cdot h$

m = Mass flow

q = Volume flow (measured)

v_n = Corrected volume flow

T = Process temperature (measured)

T_1 = Temperature (→ 53) at which the value for ρ_1 applies.

ρ = Density

ρ_{ref} = Reference density

= Density (→ 56) at which the value for T_1 applies.

β_p = Linear expansion coefficient (→ 96) of the liquid at T_1

Possible combinations of these values: **Linear expansion coefficient** parameter (→ 96)

Density calculation

Navigation Expert → Sensor → Measurement mode → Density calc. (7608)

Prerequisite The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected.

Description Use this function to select the standard on the basis of which the density is calculated.

Selection
- AGA Nx19
- ISO 12213- 2
- ISO 12213- 3

Factory setting AGA Nx19

Enthalpy calculation

Navigation Expert → Sensor → Measurement mode → Enthalpy calc. (7619)

Prerequisite The following conditions are met:
- Order code
  - "Sensor version", option "Mass flow (integrated temperature measurement)"
  - "Application package", option "Natural gas"
- In the **Select medium** parameter (→ 92), the **Gas** option is selected and in the **Select gas type** parameter (→ 92), the **Natural gas** option is selected.

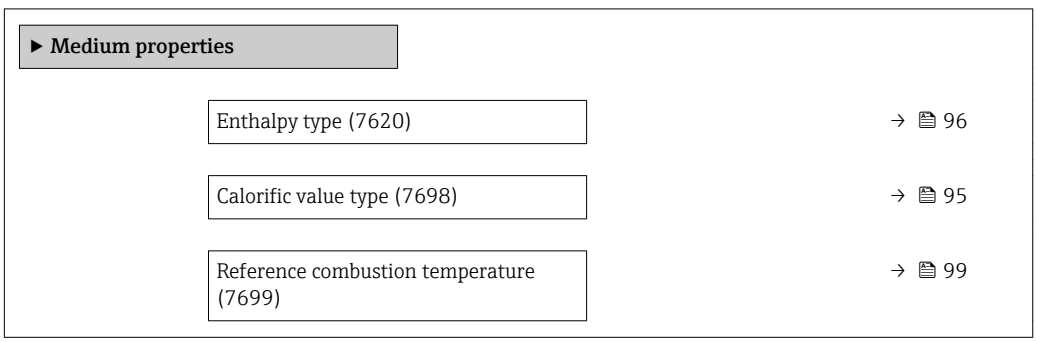
Description Use this function to select the standard on the basis of which the enthalpy is calculated.

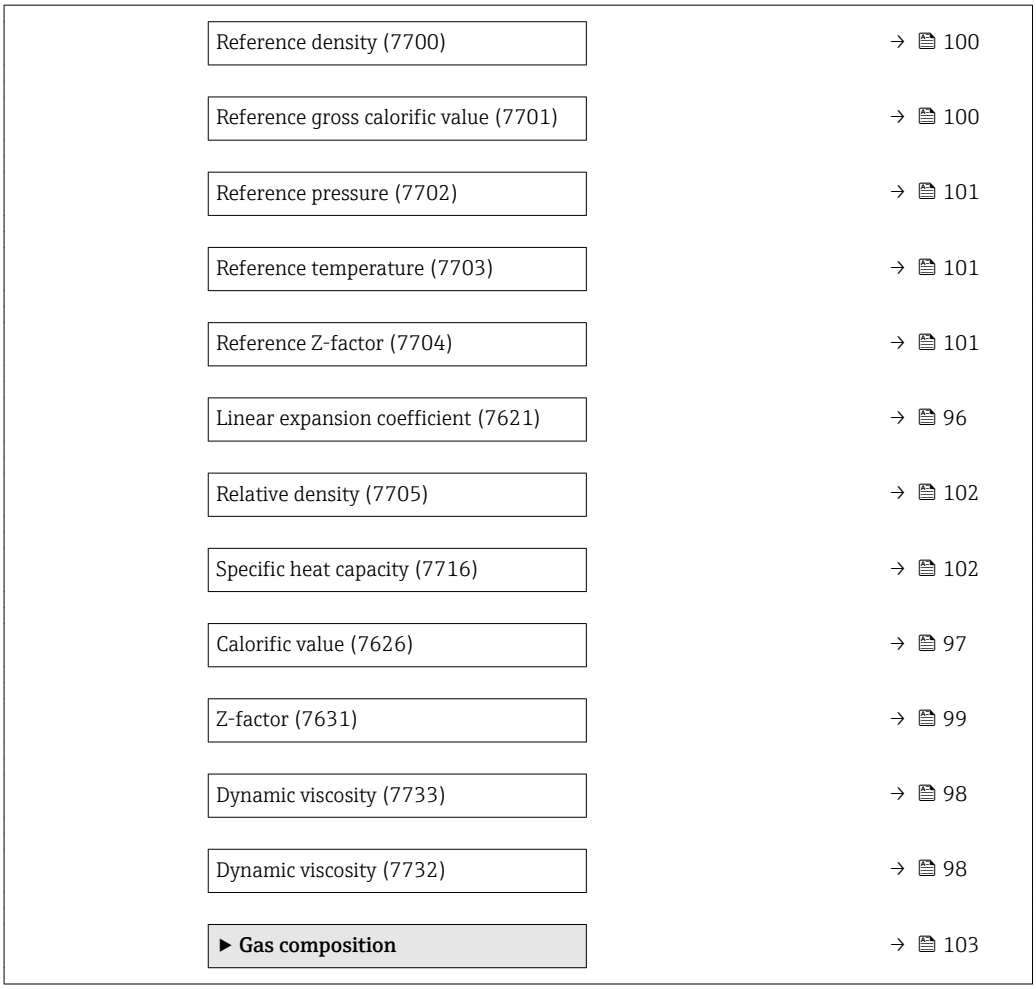
Selection
- AGA5
- ISO 6976

Factory setting AGA5

"Medium properties" submenu

Navigation Expert → Sensor → Measurement mode → Medium property





Calorific value type

Navigation Expert → Sensor → Measurement mode → Medium property → Cal. value type (7698)

Prerequisite The **Calorific value type** parameter (→ 95) is visible.

Description Use this function to select whether the net calorific value or the gross calorific value is used as the basis for calculation.

Selection
- Gross calorific value volume
- Net calorific value volume
- Gross calorific value mass
- Net calorific value mass

Factory setting Gross calorific value mass

Enthalpy type

Navigation Expert → Sensor → Measurement mode → Medium property → Enthalpy type (7620)

Prerequisite The following conditions are met:
- In the **Select gas type** parameter (→ 92), the **User-specific gas** option is selected.
  Or
- In the **Select liquid type** parameter (→ 93), the **User-specific liquid** option is selected.

Description Use this function to select the type of enthalpy.

Selection
- Heat
- Calorific value

Factory setting Heat

Linear expansion coefficient

Navigation Expert → Sensor → Measurement mode → Medium property → Linear exp coeff (7621)

Prerequisite The following conditions are met:
- The **Liquid** option is selected in the **Select medium** parameter (→ 92).
- The **User-specific liquid** option is selected in the **Select liquid type** parameter (→ 93).

Description Use this function to enter the linear, medium-specific expansion coefficient for calculating the reference density for user-specific liquids.

User entry 1.0^{-6} to 2.0^{-3}

Factory setting 2.06^{-4}

Additional information *User entry*

- If the value in this parameter is changed, it is advisable to reset the totalizer.
- The expansion coefficient can be determined using the Applicator.
- If two density and temperature value pairs are known (density ρ_1 at temperature T_1 and density ρ_2 at temperature T_2), the expansion coefficient can be calculated according to the following formula:
  $\beta_p = ((\rho_1/\rho_2) - 1)/(T_1 - +T_2)$

Sample values

The closer the process temperature is to the specific temperature value, the better the calculation of the density for application-specific liquids. If the process temperature deviates greatly from the value indicated, the expansion coefficient should be calculated according to the formula (see above).

Medium (liquid)	Temperature value [K]	Density value [kg/m³]	Expansion coefficient [10⁻⁴ 1/K]
Air	123.15	594	18.76
Ammonia	298.15	602	25
Argon	133.15	1028	111.3
n-butane	298.15	573	20.7
Carbon dioxide	298.15	713	106.6
Chlorine	298.15	1398	21.9
Cyclohexane	298.15	773	11.6
n-decane	298.15	728	10.2
Ethane	298.15	315	175.3
Ethylene	298.15	386	87.7
n-heptane	298.15	351	12.4
n-hexane	298.15	656	13.8
Hydrogen chloride	298.15	796	70.9
i-butane	298.15	552	22.5
Methane	163.15	331	73.5
Nitrogen	93.15	729	75.3
n-octane	298.15	699	11.1
Oxygen	133.15	876	95.4
n-pentane	298.15	621	16.2
Propane	298.15	493	32.1
Vinyl chloride	298.15	903	19.3
Table values according to Carl L. Yaws (2001): Matheson Gas Data Book, 7th edition			

Calorific value

Navigation Expert → Sensor → Measurement mode → Medium property → Calorific value (7626)

Prerequisite

The following conditions are met:
- Selected medium:
  - In the **Select gas type** parameter (→ 92), the **User-specific gas** option is selected. Or
  - In the **Select liquid type** parameter (→ 93), the **User-specific liquid** option is selected.
- In the **Enthalpy type** parameter (→ 96), the **Calorific value** option is selected.
- In the **Calorific value type** parameter (→ 95), the **Gross calorific value volume** option or **Gross calorific value mass** option is selected.

Description Use this function to enter the calorific value for calculating the energy flow.

User entry Positive floating-point number

Factory setting 50 000 kJ/kg

Dynamic viscosity (Liquids)

Navigation Expert → Sensor → Measurement mode → Medium property → Dynam. viscosity (7733)

Prerequisite
The following conditions are met:
- Order code for "Sensor version", option "Volume flow"
- The **Liquid** option is selected in the **Select medium** parameter (→ 92) parameter.
  Or
- The **User-specific liquid** option is selected in the **Select liquid type** parameter (→ 93).

Description Use this function to enter a fixed value for the dynamic viscosity for a liquid.

User entry Positive floating-point number

Factory setting 1 cP

Additional information

Description

The viscosity entered is used to linearize the measured error in the lower Reynolds number range if the calculated viscosity is not available e.g. "Volume flow" sensor version or the fluid is a user-specific liquid (see table).

Dependencies

Sensor version	Medium	Dyn. viscosity
Volume flow	All	x
Mass flow	All except [1]	–
	[1]	x
x	Dynamic viscosity as the input value	

1) User-specific liquid

Dependency

The unit is taken from the **Dynamic viscosity unit** parameter (→ 78)

Dynamic viscosity (Gases)

Navigation Expert → Sensor → Measurement mode → Medium property → Dynam. viscosity (7732)

Prerequisite
The following conditions are met:
- Order code for "Sensor version", option "Volume flow"
- The **Gas** option or the **Steam** option is selected in the **Select medium** parameter (→ 92).
  Or
- The **User-specific gas** option is selected in the **Select gas type** parameter (→ 92).

Description Use this function to enter a fixed value for the dynamic viscosity for a gas or steam.

User entry Positive floating-point number

Factory setting 0.015 cP

Additional information *Description*

The viscosity entered is used to linearize the measured error in the lower Reynolds number range if the calculated viscosity is not available e.g. "Volume flow" sensor version or the fluid is a user-specific gas (see table).

Dependencies

Sensor version	Medium	Dyn. viscosity
Volume flow	All	x
Mass flow	All except [1]	–
	[1]	x
x	Dynamic viscosity as the input value	

1) User-specific gas

Dependency

The unit is taken from the **Dynamic viscosity unit** parameter (→ 78)

Z-factor

Navigation Expert → Sensor → Measurement mode → Medium property → Z-factor (7631)

Prerequisite In the **Select gas type** parameter (→ 92), the **User-specific gas** option is selected.

Description Use this function to enter the real gas constant Z for gas under operating conditions.

User entry 0.1 to 2.0

Factory setting 1

Reference combustion temperature

Navigation Expert → Sensor → Measurement mode → Medium property → Ref. comb. temp. (7699)

Prerequisite The **Reference combustion temperature** parameter (→ 99) is visible.

Description Use this function to enter the reference combustion temperature for calculating the natural gas energy value.

User entry −200 to 450 °C

Factory setting 20 °C

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 72)

Reference density

Navigation Expert → Sensor → Measurement mode → Medium property → Ref.density (7700)

Prerequisite The following conditions are met:
- In the **Select gas type** parameter (→ 92), the **User-specific gas** option is selected.
  Or
- In the **Select liquid type** parameter (→ 93), the **Water** option or **User-specific liquid** option is selected.

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

User entry 0.01 to 15 000 kg/m³

Factory setting 1 000 kg/m³

Additional information *Dependency*

The unit is taken from the **Density unit** parameter (→ 76)

Reference gross calorific value

Navigation Expert → Sensor → Measurement mode → Medium property → Ref. GrossCalVal (7701)

Prerequisite The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected.
- In the **Density calculation** parameter (→ 94), the **ISO 12213- 3** option is selected.

Description Use this function to enter the reference gross calorific value of the natural gas.

User entry Positive floating-point number

Factory setting 50 000 kJ/Nm³

Additional information *Dependency*

The unit is taken from the **Calorific value unit** parameter (→ 74)

Reference pressure

Navigation Expert → Sensor → Measurement mode → Medium property → Ref. pressure (7702)

Prerequisite The following conditions are met:
- Order code for "Sensor version", option "Mass flow (integrated temperature measurement)"
- The **Gas** option is selected in the **Select medium** parameter (→ 92).

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

User entry 0 to 250 bar

Factory setting 1.01325 bar

Additional information *Dependency*

The unit is taken from the **Pressure unit** parameter (→ 71)

Reference temperature

Navigation Expert → Sensor → Measurement mode → Medium property → Ref. temperature (7703)

Prerequisite The following conditions are met:
- The **Gas** option is selected in the **Select medium** parameter (→ 92).
  Or
- The **Liquid** option is selected in the **Select medium** parameter (→ 92).

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

User entry −200 to 450 °C

Factory setting 20 °C

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 72)

Reference Z-factor

Navigation Expert → Sensor → Measurement mode → Medium property → Ref. Z-factor (7704)

Prerequisite In the **Select gas type** parameter (→ 92), the **User-specific gas** option is selected.

Description Use this function to enter the real gas constant Z for gas under reference conditions.

User entry 0.1 to 2

Factory setting 1

Relative density

Navigation Expert → Sensor → Measurement mode → Medium property → Relative density (7705)

Prerequisite The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected.
- In the **Density calculation** parameter (→ 94), the **ISO 12213- 3** option is selected.

Description Use this function to enter the relative density of the natural gas.

User entry 0.55 to 0.9

Factory setting 0.664

Specific heat capacity

Navigation Expert → Sensor → Measurement mode → Medium property → Spec. heat cap. (7716)

Prerequisite The following conditions are met:
- Selected medium:
  - In the **Select gas type** parameter (→ 92), the **User-specific gas** option is selected.
    Or
  - In the **Select liquid type** parameter (→ 93), the **User-specific liquid** option is selected.
- In the **Enthalpy type** parameter (→ 96), the **Heat** option is selected.

Description Use this function to enter the specific heat capacity of the medium.

User entry 0 to 50 kJ/(kgK)

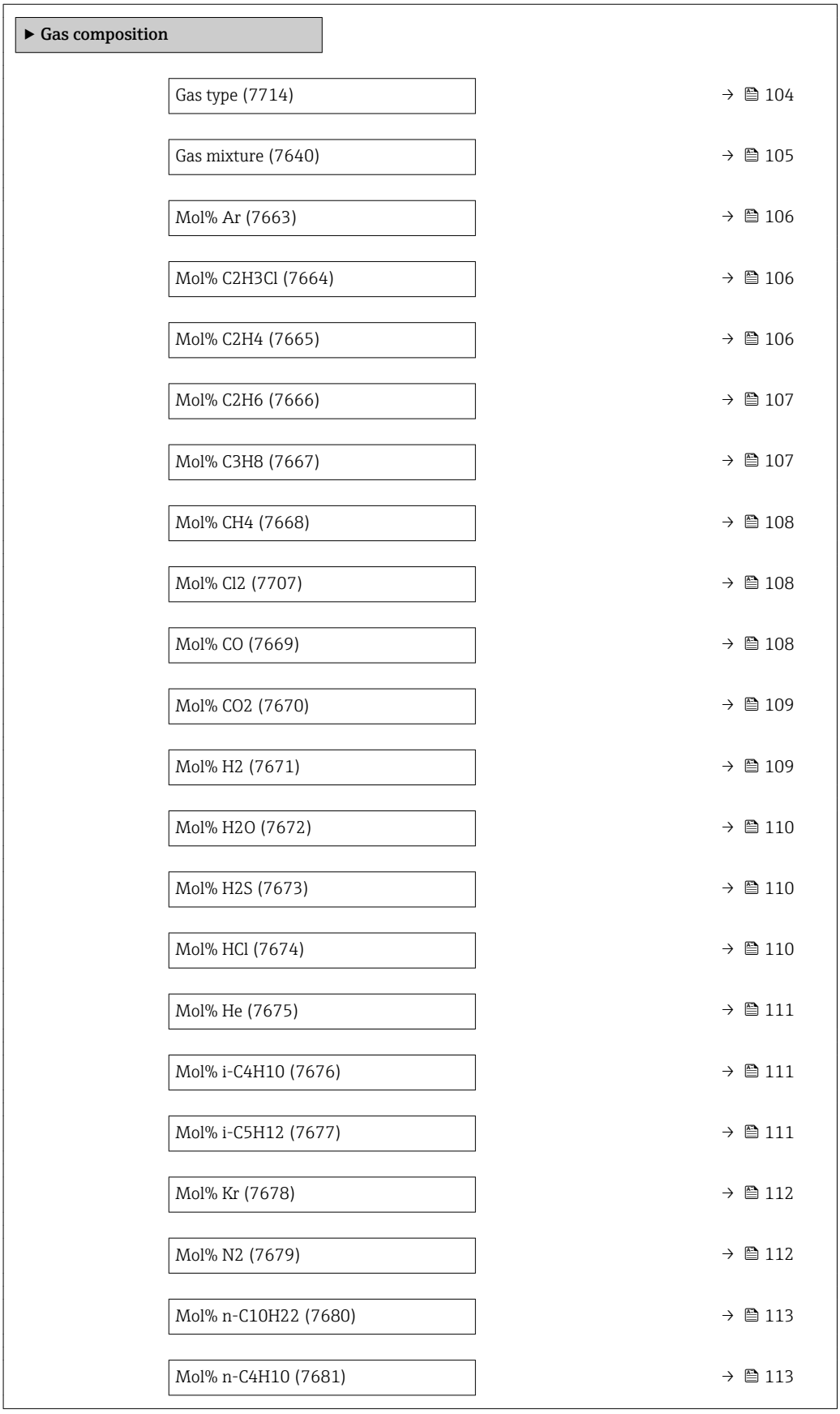
Factory setting 4.187 kJ/(kgK)

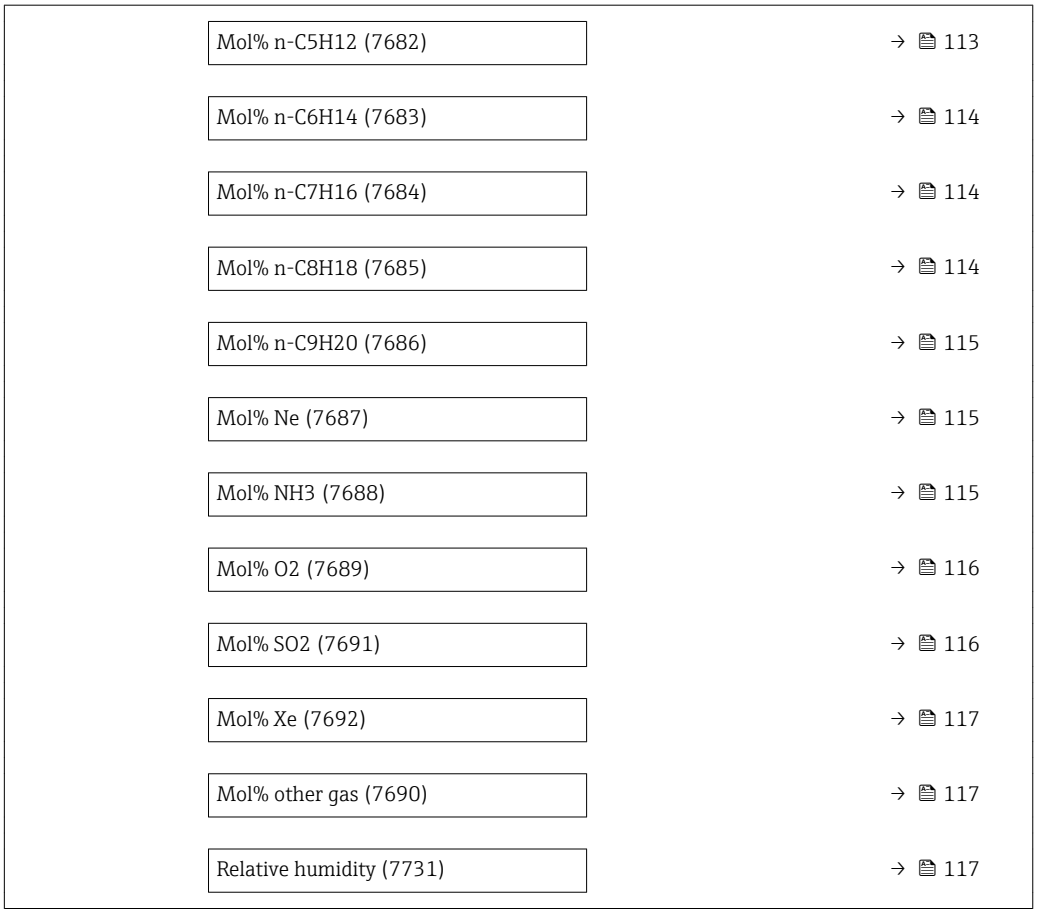
Additional information *Dependency*

The unit is taken from the **Specific heat capacity unit** parameter (→ 78)

"Gas composition" submenu

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition





Gas type

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Gas type (7714)

Prerequisite
The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Single gas** option is selected.

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

Selection
- Hydrogen H2
- Helium He
- Neon Ne
- Argon Ar
- Krypton Kr
- Xenon Xe
- Nitrogen N2
- Oxygen O2
- Chlorine Cl2
- Ammonia NH3
- Carbon monoxide CO
- Carbon dioxide CO2
- Sulfur dioxide SO2
- Hydrogen sulfide H2S
- Hydrogen chloride HCl

- Methane CH4
- Ethane C2H6
- Propane C3H8
- Butane C4H10
- Ethylene C2H4
- Vinyl Chloride C2H3Cl

Factory setting Methane CH4

Gas mixture

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Gas mixture (7640)

Prerequisite The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected.

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

Selection
- Hydrogen H2
- Helium He
- Neon Ne
- Argon Ar
- Krypton Kr
- Xenon Xe
- Nitrogen N2
- Oxygen O2
- Chlorine Cl2
- Ammonia NH3
- Carbon monoxide CO
- Carbon dioxide CO2
- Sulfur dioxide SO2
- Hydrogen sulfide H2S
- Hydrogen chloride HCl
- Methane CH4
- Ethane C2H6
- Propane C3H8
- Butane C4H10
- Ethylene C2H4
- Vinyl Chloride C2H3Cl
- Others

Factory setting Methane CH4

Mol% Ar

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% Ar (7663)

Prerequisite The following conditions are met:
In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected and in the **Gas mixture** parameter (→ 105), the **Argon Ar** option is selected.
  Or
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected and in the **Density calculation** parameter (→ 94), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% C2H3Cl

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% C2H3Cl (7664)

Prerequisite The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected.
- In the **Gas mixture** parameter (→ 105), the **Vinyl Chloride C2H3Cl** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% C2H4

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% C2H4 (7665)

Prerequisite The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected.
- In the **Gas mixture** parameter (→ 105), the **Ethylene C2H4** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% C2H6

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% C2H6 (7666)

Prerequisite The following conditions are met:
In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected and in the **Gas mixture** parameter (→ 105), the **Ethane C2H6** option is selected.
  Or
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected and in the **Density calculation** parameter (→ 94), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% C3H8

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% C3H8 (7667)

Prerequisite The following conditions are met:
In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected and in the **Gas mixture** parameter (→ 105), the **Propane C3H8** option is selected.
  Or
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected and in the **Density calculation** parameter (→ 94), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% CH4

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% CH4 (7668)

Prerequisite
The following conditions are met:
In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected and in the **Gas mixture** parameter (→ 105), the **Methane CH4** option is selected.
  Or
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 100 %

Mol% Cl2

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% Cl2 (7707)

Prerequisite
The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected.
- In the **Gas mixture** parameter (→ 105), the **Chlorine Cl2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% CO

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% CO (7669)

Prerequisite
The following conditions are met:
In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected and in the **Gas mixture** parameter (→ 105), the **Carbon monoxide CO** option is selected.
  Or
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected and in the **Density calculation** parameter (→ 94), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% CO2

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% CO2 (7670)

Prerequisite The following conditions are met:
In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected and in the **Gas mixture** parameter (→ 105), the **Carbon dioxide CO2** option is selected.
  Or
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% H2

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% H2 (7671)

Prerequisite The following conditions are met:
In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected and in the **Gas mixture** parameter (→ 105), the **Hydrogen H2** option is selected.
  Or
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected and in the **Density calculation** parameter (→ 94), the **AGA Nx19** option is **not** selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% H2O

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% H2O (7672)

Prerequisite
The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected.
- In the **Density calculation** parameter (→ 94), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% H2S

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% H2S (7673)

Prerequisite
The following conditions are met:
In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected and in the **Gas mixture** parameter (→ 105), the **Hydrogen sulfide H2S** option is selected.
  Or
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected and in the **Density calculation** parameter (→ 94), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% HCl

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% HCl (7674)

Prerequisite
The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected.
- In the **Gas mixture** parameter (→ 105), the **Hydrogen chloride HCl** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% He

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% He (7675)

Prerequisite The following conditions are met:
In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected and in the **Gas mixture** parameter (→ 105), the **Helium He** option is selected.
  Or
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected and in the **Density calculation** parameter (→ 94), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% i-C4H10

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% i-C4H10 (7676)

Prerequisite The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected.
- In the **Density calculation** parameter (→ 94), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% i-C5H12

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% i-C5H12 (7677)

Prerequisite The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected.
- In the **Density calculation** parameter (→ 94), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% Kr

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% Kr (7678)

Prerequisite The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected.
- In the **Gas mixture** parameter (→ 105), the **Krypton Kr** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% N2

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% N2 (7679)

Prerequisite The following conditions are met:
In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected and in the **Gas mixture** parameter (→ 105), the **Nitrogen N2** option is selected.
  Or
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected and in the **Density calculation** parameter (→ 94), the **AGA Nx19** option or the **ISO 12213-2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% n-C10H22

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% n-C10H22 (7680)

Prerequisite
The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected.
- In the **Density calculation** parameter (→ 94), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% n-C4H10

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% n-C4H10 (7681)

Prerequisite
The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
  - In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected and in the **Gas mixture** parameter (→ 105), the **Butane C4H10** option is selected.
    Or
  - In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected and in the **Density calculation** parameter (→ 94), the **ISO 12213- 2** option is selected.
- Or
  In the **Select medium** parameter (→ 92), the **Liquid** option is selected and in the **Select liquid type** parameter (→ 93), the **LPG** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% n-C5H12

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% n-C5H12 (7682)

Prerequisite
The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected.
- In the **Density calculation** parameter (→ 94), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% n-C6H14

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% n-C6H14 (7683)

Prerequisite The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected.
- In the **Density calculation** parameter (→ 94), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% n-C7H16

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% n-C7H16 (7684)

Prerequisite The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected.
- In the **Density calculation** parameter (→ 94), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% n-C8H18

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% n-C8H18 (7685)

Prerequisite The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected.
- In the **Density calculation** parameter (→ 94), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% n-C9H20

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% n-C9H20 (7686)

Prerequisite The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected.
- In the **Density calculation** parameter (→ 94), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% Ne

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% Ne (7687)

Prerequisite The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected.
- In the **Gas mixture** parameter (→ 105), the **Neon Ne** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% NH3

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% NH3 (7688)

Prerequisite The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected.
- In the **Gas mixture** parameter (→ 105), the **Ammonia NH3** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% O2

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% O2 (7689)

Prerequisite The following conditions are met:
In the **Select medium** parameter (→ 92), the **Gas** option is selected.
– In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected and in the **Gas mixture** parameter (→ 105), the **Oxygen O2** option is selected.
Or
– In the **Select gas type** parameter (→ 92), the **Natural gas** option is selected and in the **Density calculation** parameter (→ 94), the **ISO 12213- 2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% SO2

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% SO2 (7691)

Prerequisite The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected.
- In the **Gas mixture** parameter (→ 105), the **Sulfur dioxide SO2** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% Xe

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% Xe (7692)

Prerequisite
The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected.
- In the **Gas mixture** parameter (→ 105), the **Xenon Xe** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Mol% other gas

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Mol% other gas (7690)

Prerequisite
The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Gas mixture** option is selected.
- In the **Gas mixture** parameter (→ 105), the **Others** option is selected.

Description Use this function to enter the amount of the gas constituent in the gas mixture.

User entry 0 to 100 %

Factory setting 0 %

Relative humidity

Navigation Expert → Sensor → Measurement mode → Medium property → Gas composition → Rel. humidity (7731)

Prerequisite
The following conditions are met:
- In the **Select medium** parameter (→ 92), the **Gas** option is selected.
- In the **Select gas type** parameter (→ 92), the **Air** option is selected.

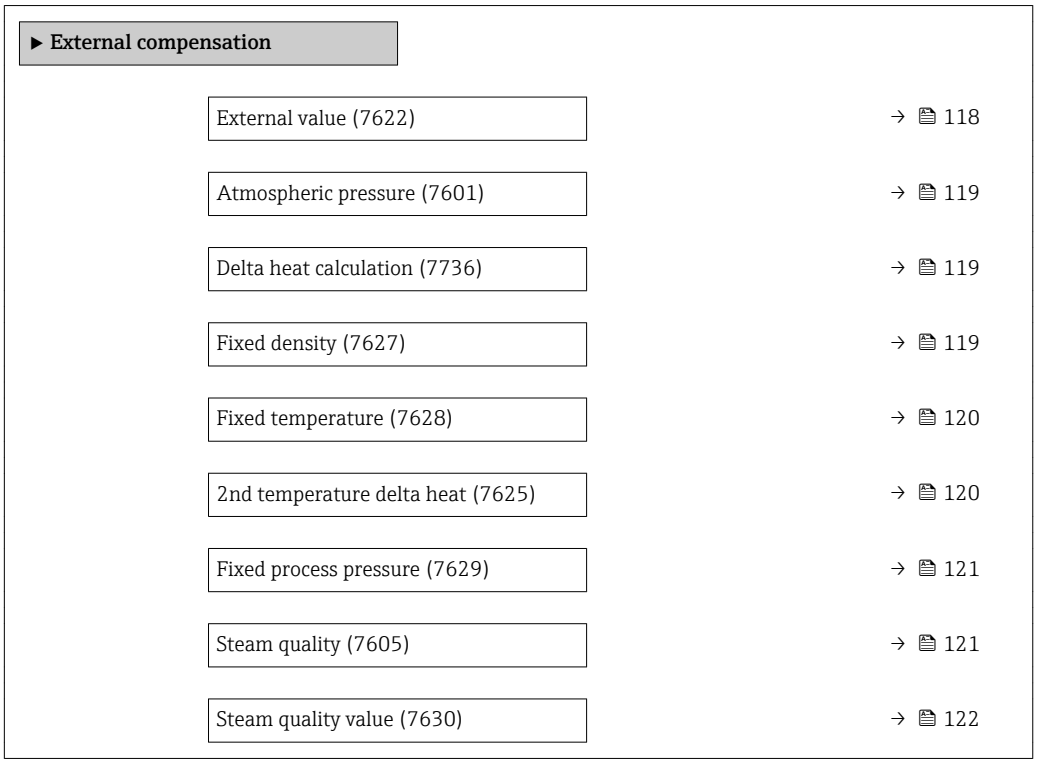
Description Use this function to enter the humidity content of the air in %.

User entry 0 to 100 %

Factory setting 0 %

3.2.5 "External compensation" submenu

Navigation Expert → Sensor → External comp.



External value

Navigation Expert → Sensor → External comp. → External value (7622)

Prerequisite For the following order code:
"Sensor version", option "Mass flow"

Description Use this function to select the process variable which is taken from an external device.

For detailed information on setting the parameter in steam applications, see the Special Documentation for the **Wet Steam Detection** and **Wet Steam Measurement** application package.

Selection
- Off
- Pressure
- Relative pressure
- Density
- Temperature
- 2nd temperature delta heat

Factory setting Off

Additional information *Selection*

The **Fixed process pressure** parameter (→ 121) is set to the value **0 bar abs.** (ex works). In this case, the measuring device ignores the pressure read in via the current input. For the measuring device to use the external (read-in) pressure, a value > 0 bar abs. must be entered in the **Fixed process pressure** parameter (→ 121).

Atmospheric pressure

Navigation Expert → Sensor → External comp. → Atmosph. press. (7601)

Prerequisite In the **External value** parameter (→ 118), the **Relative pressure** option is selected.

Description Use this function to enter the value for the ambient pressure to be used for pressure correction.

User entry 0 to 250 bar

Factory setting 1.01325 bar

Additional information *Dependency*

The unit is taken from the **Pressure unit** parameter (→ 71)

Delta heat calculation

Navigation Expert → Sensor → External comp. → Delta heat calc. (7736)

Prerequisite The **Delta heat calculation** parameter (→ 119) is visible.

Description Use this function to select the option for calculating the heat transferred via a heat exchanger (=delta heat).

Selection
- Off
- Device on cold side
- Device on warm side

Factory setting Device on warm side

Fixed density

Navigation Expert → Sensor → External comp. → Fixed density (7627)

Prerequisite For the following order code:
"Sensor version", option "Volume flow"

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

User entry 0.01 to 15 000 kg/m³

Factory setting 1 000 kg/m³

Additional information *Description*

The density entered is used to linearize the measured error in the lower Reynolds number range if the calculated density is not available e.g. "Volume flow" sensor version or the fluid is a user-specific gas (see table).

Dependency

The unit is taken from the **Density unit** parameter (→ 76)

Fixed temperature

Navigation Expert → Sensor → External comp. → Fixed temp. (7628)

Description Use this function to enter a fixed value for the process temperature.

User entry −200 to 450 °C

Factory setting 20 °C

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 72)

2nd temperature delta heat

Navigation Expert → Sensor → External comp. → 2ndTempDeltaHeat (7625)

Prerequisite The **2nd temperature delta heat** parameter (→ 120) is visible.

Description Use this function to enter the second temperature value for calculating the delta heat.

User entry −200 to 450 °C

Factory setting 20 °C

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 72)

Fixed process pressure

Navigation Expert → Sensor → External comp. → Fix. proc.press. (7629)

Prerequisite
The following conditions are met:
- Order code for "Sensor version", option "Mass flow (integrated temperature measurement)"
- In the **External value** parameter (→ 118) the **Pressure** option is not selected.

Description Use this function to enter a fixed value for the process pressure.

User entry 0 to 250 bar abs.

Factory setting 0 bar abs.

Additional information

User entry

For detailed information on setting the parameter in steam applications, see the Special Documentation for the **Wet Steam Detection** and **Wet Steam Measurement** application package.

Dependency

The unit is taken from the **Pressure unit** parameter (→ 71)

Steam quality

Navigation Expert → Sensor → External comp. → Steam quality (7605)

Prerequisite
The following conditions are met:
- Order code for "Application package":
  - Option ES "Wet steam detection"
  - Option EU "Wet steam measurement"
- In the **Select medium** parameter (→ 92) the **Steam** option is selected.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 47).

Description Use this function to select the compensation mode for the steam quality.

Selection
- Fixed value
- Calculated value

Factory setting Fixed value

Additional information

Selection

For detailed information on setting the parameter in steam applications, see the Special Documentation for the **Wet Steam Detection** and **Wet Steam Measurement** application package.

Steam quality value

Navigation Expert → Sensor → External comp. → Steam qual. val. (7630)

Prerequisite
The following conditions are met:
- In the **Select medium** parameter (→ 92) the **Steam** option is selected.
- In the **Steam quality** parameter (→ 121) the **Fixed value** option is selected.

Description Use this function to enter a fixed value for the steam quality.

User entry 0 to 100 %

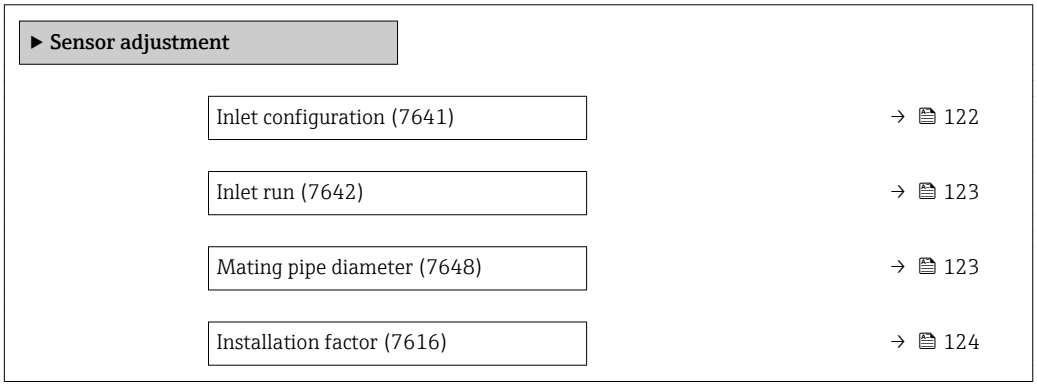
Factory setting 100 %

Additional information *User entry*

For detailed information on setting the parameter in steam applications, see the Special Documentation for the **Wet Steam Detection** and **Wet Steam Measurement** application package.

3.2.6 "Sensor adjustment" submenu

Navigation Expert → Sensor → Sensor adjustm.



Inlet configuration

Navigation Expert → Sensor → Sensor adjustm. → Inlet config. (7641)

Prerequisite
The **inlet run correction** feature:
- Is a standard feature and can only be used in Prowirl F 200.
- Can be used for the following pressure ratings and nominal diameters:
  DN 15 to 150 (1 to 6")
  – EN (DIN)
  – ASME B16.5, Sch. 40/80

Description Use this function to select the inlet configuration.

Selection
- Off
- Single elbow
- Double elbow
- Double elbow 3D
- Reduction

Factory setting Off

Inlet run

Navigation Expert → Sensor → Sensor adjustm. → Inlet run (7642)

Prerequisite The **inlet run correction** feature:
- Is a standard feature and can only be used in Prowirl F 200.
- Can be used for the following pressure ratings and nominal diameters:
  DN 15 to 150 (1 to 6")
  – EN (DIN)
  – ASME B16.5, Sch. 40/80

Description Use this function to enter the length of the straight inlet run.

User entry 0 to 20 m

Factory setting 0 m

Additional information *Dependency*

The unit is taken from the **Length unit** parameter (→ 79)

Mating pipe diameter

Navigation Expert → Sensor → Sensor adjustm. → D mating pipe (7648)

Description Use this function to enter the diameter of the mating pipe to enable diameter mismatch correction.

User entry 0 to 1 m (0 to 3 ft)

Factory setting Country-specific:
- 0 m
- 0 ft

Additional information *Description*

The device has diameter mismatch correction. This can be enabled by entering the actual internal diameter of the mating pipe in the **Mating pipe diameter** parameter.

User entry

If the value entered is **0**, diameter mismatch correction is disabled. If the standard internal diameter of the ordered process connection differs from the internal diameter of the

mating pipe, an additional measuring uncertainty of up to 2 % must be expected if diameter mismatch correction is disabled.

Limit values

Diameter mismatch correction should be enabled only within the following limit values:

Flange connection:
- DN 15 (½"): ±20 % of the internal diameter
- DN 25 (1"): ±15 % of the internal diameter
- DN 40 (1½"): ±12 % of the internal diameter
- DN ≥ 50 (2"): ±10 % of the internal diameter

Disc (wafer version):
- DN 15 (½"): ±15 % of the internal diameter
- DN 25 (1"): ±12 % of the internal diameter
- DN 40 (1½"): ±9 % of the internal diameter
- DN ≥ 50 (2"): ±8 % of the internal diameter

Dependency

The unit is taken from the **Length unit** parameter (→ 79)

Installation factor

Navigation Expert → Sensor → Sensor adjustm. → Install. factor (7616)

Description Use this function to enter the factor to adjust installation conditions.

User entry Positive floating-point number

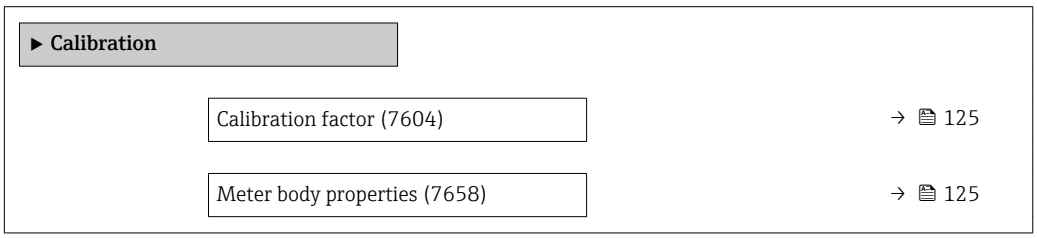
Factory setting 1.0

Additional information *Description*

The calculated volume flow and all measured variables derived from this are multiplied by the installation factor.

3.2.7 "Calibration" submenu

Navigation Expert → Sensor → Calibration



Calibration factor

Navigation Expert → Sensor → Calibration → Cal. factor (7604)

Description Displays the calibration factor. The calibration factor is determined during device calibration.

User interface Positive floating-point number

Factory setting This value is always > **0** when the device is delivered from the factory.

Additional information *Description*

Factor by which the measured vortex frequency must be divided in order to calculate the volume flow.

Unit

In $1/m^3$, or vortex pulses per cubic meter

Meter body properties

Navigation Expert → Sensor → Calibration → Meter body prop. (7658)

Description Displays informative text about the measuring tube.

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

Factory setting ----------

Additional information *Description*

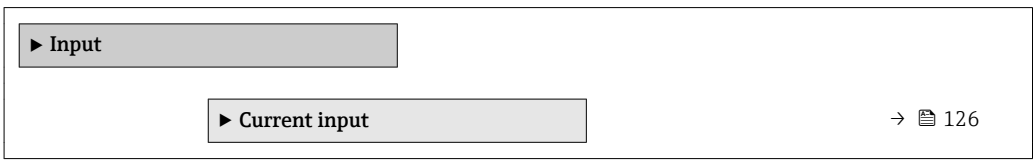
Summarized information about the meter body.

Example

DN25F-PN40: nominal diameter DN25, flange type, pressure rating 40 bar

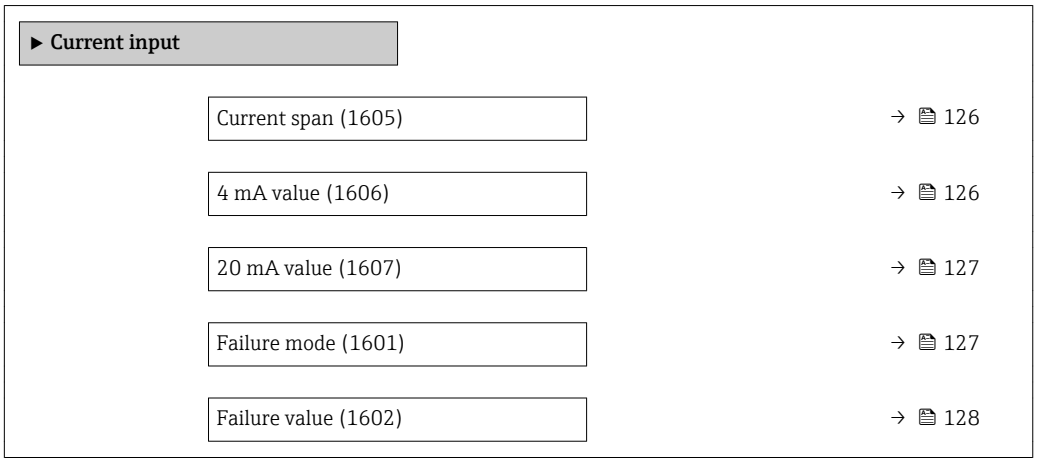
3.3 "Input" submenu

Navigation Expert → Input



3.3.1 "Current input" submenu

Navigation Expert → Input → Current input



Current span

Navigation Expert → Input → Current input → Current span (1605)

Description Use this function to select the current range for the process value to be read in.

Selection
- 4...20 mA
- 4...20 mA NAMUR
- 4...20 mA US

Factory setting Country-specific:
- 4...20 mA NAMUR
- 4...20 mA US

Additional information *Examples*

Sample values for the current range: **Current span** parameter (→ 129)

4 mA value

Navigation Expert → Input → Current input → 4 mA value (1606)

Description Use this function to enter a value for the 4 mA current.

User entry Signed floating-point number

Factory setting 0

Additional information *Dependency*

The entry depends on the process variable selected in the **External value** parameter (→ 118).

Current input behavior

The current input behaves differently depending on the settings configured in the following parameters:
- Current span (→ 126)
- Failure mode (→ 127)

Configuration examples

Pay attention to the configuration examples for **4 mA value** parameter (→ 131).

20 mA value

Navigation Expert → Input → Current input → 20 mA value (1607)

Description Use this function to enter a value for the 20 mA current.

User entry Signed floating-point number

Factory setting Depends on country and nominal diameter

Additional information

Dependency

The entry depends on the process variable selected in the **External value** parameter (→ 118).

Configuration examples

Pay attention to the configuration examples for **4 mA value** parameter (→ 131).

Failure mode

Navigation Expert → Input → Current input → Failure mode (1601)

Description Use this function to select the input behavior when measuring a current outside the configured **Current span** parameter (→ 126).

Selection
- Alarm
- Last valid value
- Defined value

Factory setting Alarm

Additional information

Options

- Alarm
  An error message is set.
- Last valid value
  The last valid measured value is used.
- Defined value
  A user-defined measured value is used (**Failure value** parameter (→ 128)).

Failure value

Navigation Expert → Input → Current input → Failure value (1602)

Prerequisite In the **Failure mode** parameter (→ 127), the **Defined value** option is selected.

Description Use this function to enter the value that the device uses if it does not receive an input signal from the external device, or if the input signal is invalid.

User entry Signed floating-point number

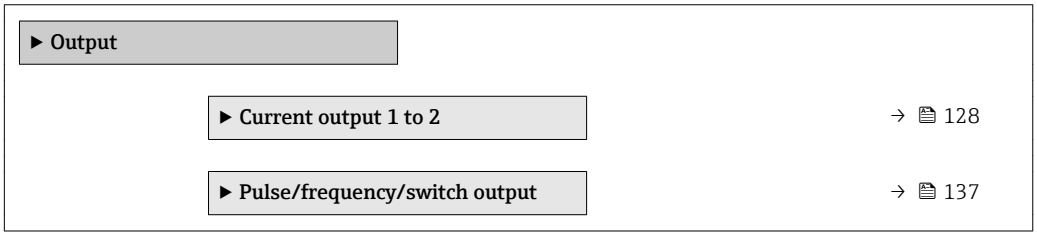
Factory setting 0

Additional information *Dependency*

The entry depends on the process variable selected in the **External value** parameter (→ 118).

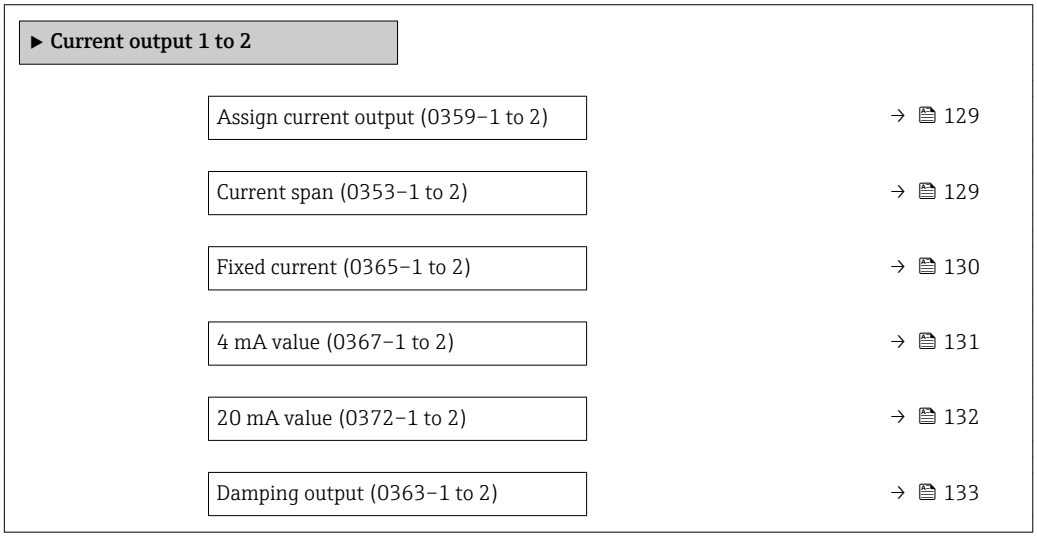
3.4 "Output" submenu

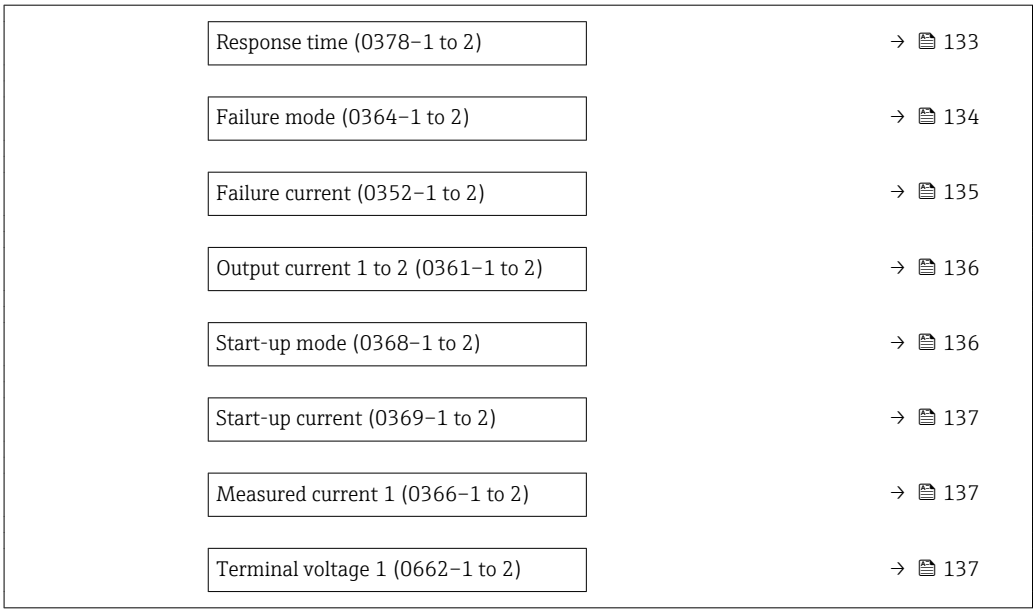
Navigation Expert → Output



3.4.1 "Current output 1 to 2" submenu

Navigation Expert → Output → Curr.output 1 to 2





Assign current output

Navigation
Expert → Output → Curr.output 1 → Assign curr. (0359–1)
Expert → Output → Curr.output 2 → Assign curr. (0359–2)

Description
Options for the assignment of a process variable to the current output.

Selection
- Off
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Energy flow *
- Heat flow difference *

Factory setting
Volume flow

Current span

Navigation
Expert → Output → Curr.output 1 → Current span (0353–1)
Expert → Output → Curr.output 2 → Current span (0353–2)

Description
The selection specifies the operational range for the process value and the upper and lower level for signal on alarm.

* Visibility depends on order options or device settings

Selection

- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA
- Fixed current

Factory setting

Country-specific:
- 4...20 mA NAMUR
- 4...20 mA US

Additional information

Description

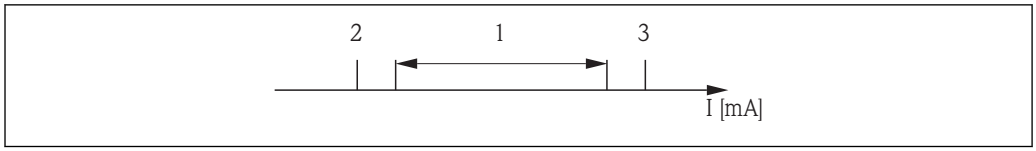
- If an error occurs, the current output adopts the value defined in the **Failure mode** parameter (→ 134).
- If the measured value is outside the measuring range, the diagnostic message ⚠**S441 Current output 1 to 2** is displayed.
- The measuring range is specified by the **4 mA value** parameter (→ 131) and **20 mA value** parameter (→ 132).

"Fixed current" option

The current value is set via the **Fixed current** parameter (→ 130).

Example

Shows the relationship between the current span for the output of the process variable and the lower and upper alarm levels:



I Current
1 Current span for process value
2 Lower level for signal on alarm
3 Upper level for signal on alarm

Options	1	2	3
4 to 20 mA NAMUR	3.8 to 20.5 mA	< 3.6 mA	> 21.95 mA
4 to 20 mA US	3.9 to 20.8 mA US	< 3.6 mA	> 21.95 mA
4 to 20 mA	4 to 20.5 mA	< 3.6 mA	> 21.95 mA

If the flow hits the upper or lower Signal on Alarm Level, the diagnostic message ⚠**S441 Current output 1 to 2** is displayed.

Fixed current

Navigation

Expert → Output → Curr.output 1 → Fixed current (0365–1)

Expert → Output → Curr.output 2 → Fixed current (0365–2)

Prerequisite

The **Fixed current** option is selected in the **Current span** parameter (→ 129).

Description

Use this function to enter a constant current value for the current output.

User entry 3.59 to 22.5 mA

Factory setting 4 mA

Additional information *Example*

This setting can be used for HART multidrop, for example.

4 mA value

Navigation
Expert → Output → Curr.output 1 → 4 mA value (0367–1)
Expert → Output → Curr.output 2 → 4 mA value (0367–2)

Prerequisite
One of the following options is selected in the **Current span** parameter (→ 129):
- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

Description
Use this function to enter a value for the 4 mA current.

User entry
Signed floating-point number

Factory setting
Country-specific:
- 0 m^3/h
- 0 ft^3/min

Additional information

Description

Positive and negative values are permitted depending on the process variable assigned in the **Assign current output** parameter (→ 129). In addition, the value can be greater or smaller than the value assigned for the 20 mA current in the **20 mA value** parameter (→ 132).

Dependency

The unit depends on the process variable selected in the **Assign current output** parameter (→ 129).

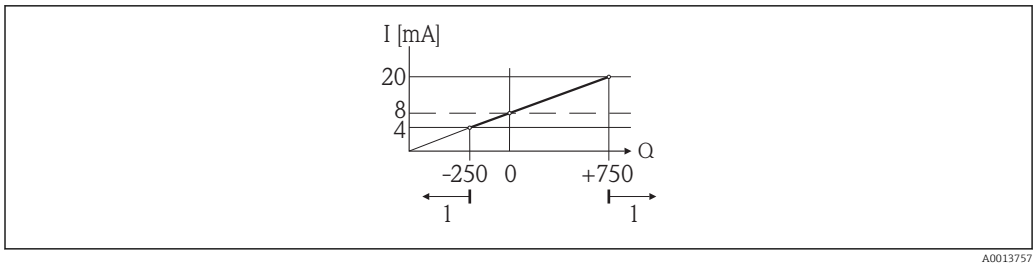
Current output behavior

The current output behaves differently depending on the settings configured in the following parameters:
- Current span (→ 129)
- Failure mode (→ 134)

Configuration examples

A configuration example and its effect on the current output is explained in the following section.

Configuration example
In Forward flow
- **4 mA value** parameter (→ 131) = not equal to zero flow (e.g. −250 m^3/h)
- **20 mA value** parameter (→ 132) = not equal to zero flow (e.g. +750 m^3/h)
- Calculated current value = 8 mA at zero flow



Q Flow
I Current
1 Measuring range is exceeded or undershot

The operational range of the measuring device is defined with the values entered for the **4 mA value** parameter (→ 131) and **20 mA value** parameter (→ 132). If the effective flow exceeds or falls below this operational range, the diagnostic message ⚠**S441 Current output 1 to 2** is output.

20 mA value

Navigation
Expert → Output → Curr.output 1 → 20 mA value (0372–1)
Expert → Output → Curr.output 2 → 20 mA value (0372–2)

Prerequisite
One of the following options is selected in the **Current span** parameter (→ 129):
- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

Description
Enter a value for the 20 mA current.

User entry
Signed floating-point number

Factory setting
Depends on country and nominal diameter → 222

Additional information

Description

Positive and negative values are permitted depending on the process variable assigned in the **Assign current output** parameter (→ 129). In addition, the value can be greater or smaller than the value assigned for the 4 mA current in the **4 mA value** parameter (→ 131).

Dependency

The unit depends on the process variable selected in the **Assign current output** parameter (→ 129).

Example

- Value assigned to 4 mA = −250 m^3/h
- Value assigned to 20 mA = +750 m^3/h
- Calculated current value = 8 mA (at zero flow)

Configuration examples

Pay attention to the configuration examples for **4 mA value** parameter (→ 131).

Damping output

Navigation

Expert → Output → Curr.output 1 → Damping out. (0363–1)

Expert → Output → Curr.output 2 → Damping out. (0363–2)

Prerequisite

One of the following options is selected in the **Assign current output** parameter (→ 129):
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Energy flow *
- Heat flow difference *

One of the following options is selected in the **Current span** parameter (→ 129):
- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

Description

Use this function to enter the reaction time of the current output signal to fluctuations in the measured value caused by process conditions.

User entry

0.0 to 999.9 s

Factory setting

1.0 s

Additional information

User entry

Use this function to enter a time constant:
- If a low time constant is entered, the current output reacts particularly quickly to fluctuating measured variables.
- On the other hand, the current output reacts more slowly if a high time constant is entered.

Response time

Navigation

Expert → Output → Curr.output 1 → Response time (0378–1)

Expert → Output → Curr.output 2 → Response time (0378–2)

Prerequisite

One of the following options is selected in the **Assign current output** parameter (→ 129):
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *

* Visibility depends on order options or device settings

- Steam quality *
- Total mass flow *
- Energy flow *
- Heat flow difference *

One of the following options is selected in the **Current span** parameter (→ 129):
- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

Prerequisite

Description

Displays the response time. This specifies how quickly the current output reaches the measured value change of 63 % of 100 % of the measured value change.

User interface

Positive floating-point number

Additional information

Description

The response time is made up of the time specified for the following dampings:
- Current output damping → 133
  and
- Depending on the measured variable assigned to the output.
  Flow damping

Failure mode

Navigation

Expert → Output → Curr.output 1 → Failure mode (0364–1)

Expert → Output → Curr.output 2 → Failure mode (0364–2)

Prerequisite

One of the following options is selected in the **Assign current output** parameter (→ 129):
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Energy flow *
- Heat flow difference *

One of the following options is selected in the **Current span** parameter (→ 129):
- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

Description

Use this function to select the value of the current output in the event of an alarm condition.

* Visibility depends on order options or device settings

Selection

- Min.
- Max.
- Last valid value
- Actual value
- Defined value

Factory setting

Max.

Additional information

Description

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

"Min." option

The current output adopts the value of the lower level for signal on alarm.

The signal on alarm level is defined via the **Current span** parameter (→ 129).

"Max." option

The current output adopts the value of the upper level for signal on alarm.

The signal on alarm level is defined via the **Current span** parameter (→ 129).

"Last valid value" option

The current output is based on the last measured value that was valid before the error occurred.

"Actual value" option

The current output is based on the actual measured value on the basis of the current flow measurement; the error is ignored.

"Defined value" option

The current output adopts a defined measured value.

The measured value is specified via the **Failure current** parameter (→ 135).

Failure current

Navigation

Expert → Output → Curr.output 1 → Failure current (0352–1)

Expert → Output → Curr.output 2 → Failure current (0352–2)

Prerequisite

The **Defined value** option is selected in the **Failure mode** parameter (→ 134).

Description

Use this function to enter a fixed value that the current output adopts in an alarm condition.

User entry

3.59 to 22.5 mA

Factory setting

22.5 mA

Output current 1 to 2

Navigation Expert → Output → Curr.output 1 to 2 → Output curr. 1 to 2 (0361–1 to 2)

Description Displays the actual calculated value of the output current.

User interface 3.59 to 22.5 mA

Factory setting 3.59 mA

Start-up mode

Navigation Expert → Output → Curr.output 1 → Start-up mode (0368–1)

Expert → Output → Curr.output 2 → Start-up mode (0368–2)

Prerequisite In the **Current span** parameter (→ 129), one of the following options is selected:
- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

Description Use this function to select the current value that the current output adopts during the device start-up phase as long as no measured value is present.

Selection
- Min.
- Max.
- Defined value

Factory setting Min.

Additional information

"Min." option

The current output adopts the value of the lower level for signal on alarm.

The signal on alarm level is defined via the **Current span** parameter (→ 129).

"Max." option

The current output adopts the value of the upper level for signal on alarm.

The signal on alarm level is defined via the **Current span** parameter (→ 129).

"Defined value" option

The current output outputs a defined current value.

The current value is defined via the **Start-up current** parameter (→ 137).

Start-up current

Navigation Expert → Output → Curr.output 1 → Start-up current (0369–1)
Expert → Output → Curr.output 2 → Start-up current (0369–2)

Prerequisite The **Defined value** option is selected in the **Start-up mode** parameter (→ 136).

Description Use this function to enter a fixed current value that the current output adopts during the device start-up phase as long as no measured value is present.

User entry 3.59 to 22.5 mA

Factory setting 3.6 mA

Measured current 1

Navigation Expert → Output → Curr.output 1 → Measur. curr. 1 (0366–1)

Description Use this function to display the actual measured value of the output current.

User interface 0 to 30 mA

Terminal voltage 1

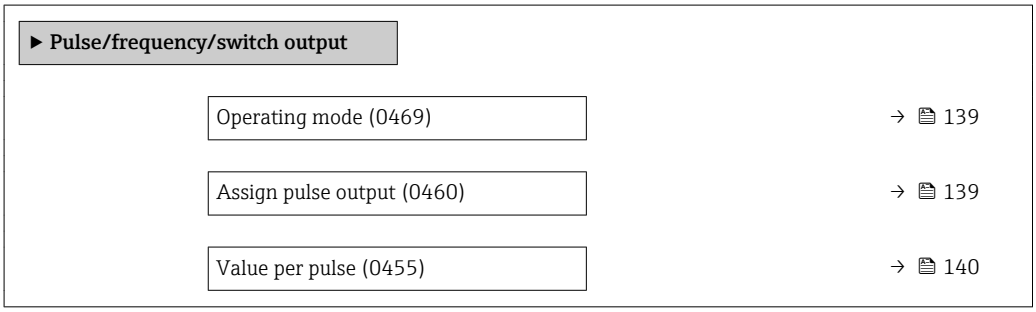
Navigation Expert → Output → Curr.output 1 → Terminal volt. 1 (0662–1)

Description Use this function to view the actual terminal voltage that is present at the current output.

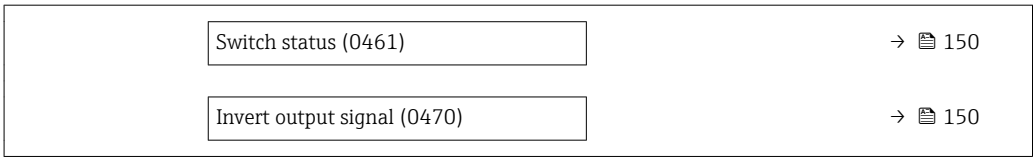
User interface 0.0 to 50.0 V

3.4.2 "Pulse/frequency/switch output" submenu

Navigation Expert → Output → PFS output



Pulse width (0452)	→ 140
Failure mode (0480)	→ 140
Pulse output (0456)	→ 141
Assign frequency output (0478)	→ 142
Minimum frequency value (0453)	→ 142
Maximum frequency value (0454)	→ 143
Measuring value at minimum frequency (0476)	→ 143
Measuring value at maximum frequency (0475)	→ 144
Damping output (0477)	→ 144
Response time (0491)	→ 145
Failure mode (0451)	→ 145
Failure frequency (0474)	→ 146
Output frequency (0471)	→ 146
Switch output function (0481)	→ 147
Assign diagnostic behavior (0482)	→ 147
Assign limit (0483)	→ 147
Switch-on value (0466)	→ 148
Switch-off value (0464)	→ 148
Assign flow direction check (0484)	→ 149
Assign status (0485)	→ 149
Switch-on delay (0467)	→ 149
Switch-off delay (0465)	→ 149
Failure mode (0486)	→ 150



Operating mode

Navigation Expert → Output → PFS output → Operating mode (0469)

Description Use this function to select the operating mode of the output as a pulse, frequency or switch output.

Selection
- Pulse
- Frequency
- Switch

Factory setting Pulse

Assign pulse output

Navigation Expert → Output → PFS output → Assign pulse (0460)

Prerequisite In the **Operating mode** parameter (→ 139) the **Pulse** option is selected.

Description Use this function to select the process variable for the pulse output.

Selection
- Off
- Volume flow
- Corrected volume flow
- Mass flow
- Total mass flow *
- Energy flow *
- Heat flow difference *

Factory setting Volume flow

* Visibility depends on order options or device settings

Value per pulse

Navigation Expert → Output → PFS output → Value per pulse (0455)

Prerequisite One of the following options is selected in the **Assign pulse output** parameter (→ 139):
- Volume flow
- Corrected volume flow
- Mass flow
- Total mass flow *
- Energy flow *
- Heat flow difference *

Description Use this function to enter the value for the measured value that a pulse is equivalent to.

User entry Positive floating-point number

Factory setting 1 m^3

Pulse width

Navigation Expert → Output → PFS output → Pulse width (0452)

Prerequisite One of the following options is selected in the **Assign pulse output** parameter (→ 139):
- Volume flow
- Corrected volume flow
- Mass flow
- Total mass flow *
- Energy flow *
- Heat flow difference *

Description Use this function to enter the duration of the output pulse.

User entry 5 to 2 000 ms

Factory setting 100 ms

Failure mode

Navigation Expert → Output → PFS output → Failure mode (0480)

Prerequisite One of the following options is selected in the **Assign pulse output** parameter (→ 139):
- Volume flow
- Corrected volume flow
- Mass flow

* Visibility depends on order options or device settings

- Total mass flow *
- Energy flow *
- Heat flow difference *

Description Use this function to select an output behavior in the event of a device alarm.

Selection
- Actual value
- No pulses

Factory setting No pulses

Pulse output

Navigation Expert → Output → PFS output → Pulse output (0456)

Prerequisite In the **Operating mode** parameter (→ 139) the **Pulse** option is selected.

Description Use this function to display the pulse frequency currently output.

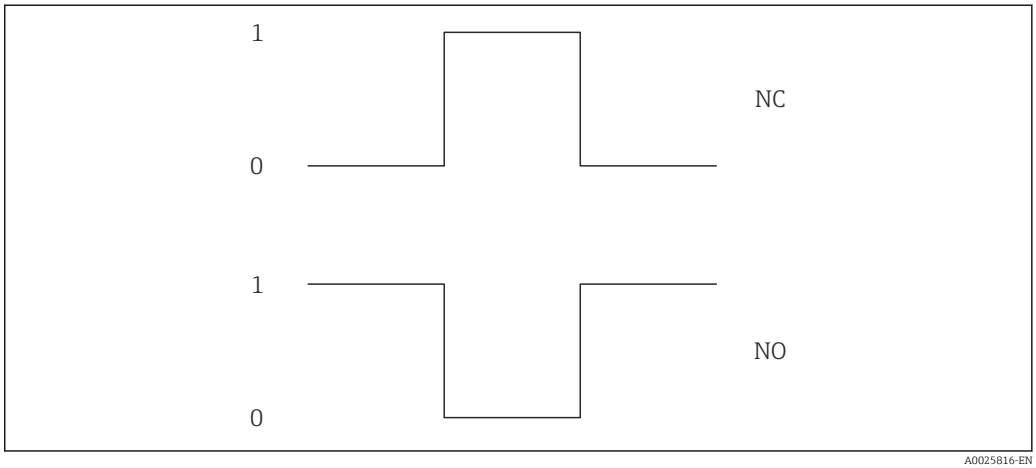
User interface Positive floating-point number

Factory setting 0 Hz

Additional information *Description*

The pulse output is an open collector output. This is configured at the factory so that the transistor is safety-oriented and conductive for the duration of the pulse (NO contact).

The value - i.e. the value of the measured value which is a pulse is equivalent to - and the duration of the pulse can be defined using the **Value per pulse** parameter (→ 140) and **Pulse width** parameter (→ 140).



0 Non-conductive
1 Conductive
NC Normally closed
NO Normally opened

* Visibility depends on order options or device settings

The output behavior can be inverted via the **Invert output signal** parameter (→ 150), i.e, the transistor is not conductive for the duration of the pulse.

In addition, the behavior of the output in the event of an error (**Failure mode** parameter (→ 140)) can also be configured.

Assign frequency output

Navigation Expert → Output → PFS output → Assign freq. (0478)

Prerequisite In the **Operating mode** parameter (→ 139) the **Frequency** option is selected.

Description Use this function to select the process variable for the frequency output.

Selection
- Off
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Energy flow *
- Heat flow difference *

Factory setting Off

Minimum frequency value

Navigation Expert → Output → PFS output → Min. freq. value (0453)

Prerequisite One of the following options is selected in the **Assign frequency output** parameter (→ 142):
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Energy flow *
- Heat flow difference *

Description Use this function to enter the start value frequency.

User entry 0 to 1 000 Hz

* Visibility depends on order options or device settings

Factory setting 0 Hz

Maximum frequency value

Navigation Expert → Output → PFS output → Max. freq. value (0454)

Prerequisite One of the following options is selected in the **Assign frequency output** parameter (→ 142):
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Energy flow *
- Heat flow difference *

Description Use this function to enter the end value frequency.

User entry 0 to 1 000 Hz

Factory setting 1 000 Hz

Measuring value at minimum frequency

Navigation Expert → Output → PFS output → Val. at min.freq (0476)

Prerequisite One of the following options is selected in the **Assign frequency output** parameter (→ 142):
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Energy flow *
- Heat flow difference *

Description Use this function to enter the measured value for the start value frequency.

User entry Signed floating-point number

Factory setting Depends on country and nominal diameter

* Visibility depends on order options or device settings

Additional information *Dependency*

The entry depends on the process variable selected in the **Assign frequency output** parameter (→ 142).

Measuring value at maximum frequency

Navigation Expert → Output → PFS output → Val. at max.freq (0475)

Prerequisite One of the following options is selected in the **Assign frequency output** parameter (→ 142):
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Energy flow *
- Heat flow difference *

Description Use this function to enter the measured value for the end value frequency.

User entry Signed floating-point number

Factory setting Depends on country and nominal diameter

Additional information *Dependency*

The entry depends on the process variable selected in the **Assign frequency output** parameter (→ 142).

Damping output

Navigation Expert → Output → PFS output → Damping out. (0477)

Prerequisite One of the following options is selected in the **Assign frequency output** parameter (→ 142):
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Energy flow *
- Heat flow difference *

* Visibility depends on order options or device settings

Description Use this function to enter the reaction time of the output signal to fluctuations in the measured value.

User entry 0 to 999.9 s

Factory setting 5.0 s

Response time

Navigation Expert → Output → PFS output → Response time (0491)

Prerequisite One of the following options is selected in the **Assign frequency output** parameter (→ 142):
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Energy flow *
- Heat flow difference *

Description Displays the response time. This specifies how quickly the pulse/frequency/switch output reaches the measured value change of 63 % of 100 % of the measured value change.

User interface Positive floating-point number

Additional information *Description*

The response time is made up of the time specified for the following dampings:
- Pulse/frequency/switch output damping → 133
  and
- Depending on the measured variable assigned to the output.
  Flow damping

Failure mode

Navigation Expert → Output → PFS output → Failure mode (0451)

Prerequisite One of the following options is selected in the **Assign frequency output** parameter (→ 142):
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *

* Visibility depends on order options or device settings

- Steam quality *
- Total mass flow *
- Energy flow *
- Heat flow difference *

Description Use this function to select an output behavior in the event of a device alarm.

Selection
- Actual value
- Defined value
- 0 Hz

Factory setting 0 Hz

Failure frequency

Navigation Expert → Output → PFS output → Failure freq. (0474)

Prerequisite One of the following options is selected in the **Assign frequency output** parameter (→ 142):
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Energy flow *
- Heat flow difference *

Description Use this function to enter the value for the frequency output in the event of a device alarm.

User entry 0.0 to 1250.0 Hz

Factory setting 0.0 Hz

Output frequency

Navigation Expert → Output → PFS output → Output freq. (0471)

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 139).

Description Use this function to view the actual value of the output frequency which is currently measured.

User interface 0 to 1250 Hz

* Visibility depends on order options or device settings

Switch output function

Navigation Expert → Output → PFS output → Switch out funct (0481)

Prerequisite The **Switch** option is selected in the **Operating mode** parameter (→ 139).

Description Use this function to select a function for the switch output.

Selection
- Off
- On
- Diagnostic behavior
- Limit
- Status

Factory setting Off

Assign diagnostic behavior

Navigation Expert → Output → PFS output → Assign diag. beh (0482)

Prerequisite The **Diagnostic behavior** option is selected in the **Switch output function** parameter (→ 147).

Description Use this function to select a diagnostic behavior for the switch output.

Selection
- Alarm
- Alarm or warning
- Warning

Factory setting Alarm

Assign limit

Navigation Expert → Output → PFS output → Assign limit (0483)

Prerequisite In the **Switch output function** parameter (→ 147) the **Limit** option is selected.

Description Use this function to select a process variable for the limit function.

Selection
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *

* Visibility depends on order options or device settings

- Total mass flow *
- Energy flow *
- Heat flow difference *
- Reynolds number *
- Totalizer 1
- Totalizer 2
- Totalizer 3

Factory setting Volume flow

Switch-on value

Navigation Expert → Output → PFS output → Switch-on value (0466)

Prerequisite In the **Switch output function** parameter (→ 147) the **Limit** option is selected.

Description Use this function to enter the measured value for the switch-on point.

User entry Signed floating-point number

Factory setting Country-specific:
- 0 m^3/h
- 0 ft^3/h

Additional information *Dependency*

The unit depends on the process variable selected in the **Assign limit** parameter (→ 147).

Switch-off value

Navigation Expert → Output → PFS output → Switch-off value (0464)

Prerequisite In the **Switch output function** parameter (→ 147) the **Limit** option is selected.

Description Use this function to enter the measured value for the switch-off point.

User entry Signed floating-point number

Factory setting Country-specific:
- 0 m^3/h
- 0 ft^3/h

Additional information *Dependency*

The unit depends on the process variable selected in the **Assign limit** parameter (→ 147).

* Visibility depends on order options or device settings

Assign flow direction check

Navigation Expert → Output → PFS output → Assign dir.check (0484)

Prerequisite The **Flow direction check** option is selected in the **Switch output function** parameter (→ 147).

Description Use this function to select a process variable for monitoring the flow direction.

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

Factory setting Volume flow

Assign status

Navigation Expert → Output → PFS output → Assign status (0485)

Prerequisite The **Status** option is selected in the **Switch output function** parameter (→ 147).

Description Use this function to select a device status for the switch output.

Selection Low flow cut off

Factory setting Low flow cut off

Switch-on delay

Navigation Expert → Output → PFS output → Switch-on delay (0467)

Prerequisite The **Limit** option is selected in the **Switch output function** parameter (→ 147).

Description Use this function to enter a delay time for switching on the switch output.

User entry 0.0 to 100.0 s

Factory setting 0.0 s

Switch-off delay

Navigation Expert → Output → PFS output → Switch-off delay (0465)

Prerequisite The **Limit** option is selected in the **Switch output function** parameter (→ 147).

Description Use this function to enter a delay time for switching off the switch output.

User entry 0.0 to 100.0 s

Factory setting 0.0 s

Failure mode

Navigation Expert → Output → PFS output → Failure mode (0486)

Description Use this function to select an output behavior in the event of a device alarm.

Selection
- Actual status
- Open
- Closed

Factory setting Open

Switch status

Navigation Expert → Output → PFS output → Switch status (0461)

Prerequisite The **Switch** option is selected in the **Operating mode** parameter (→ 139).

Description Use this function to view the current switch status of the status output.

User interface
- Open
- Closed

Invert output signal

Navigation Expert → Output → PFS output → Invert outp.sig. (0470)

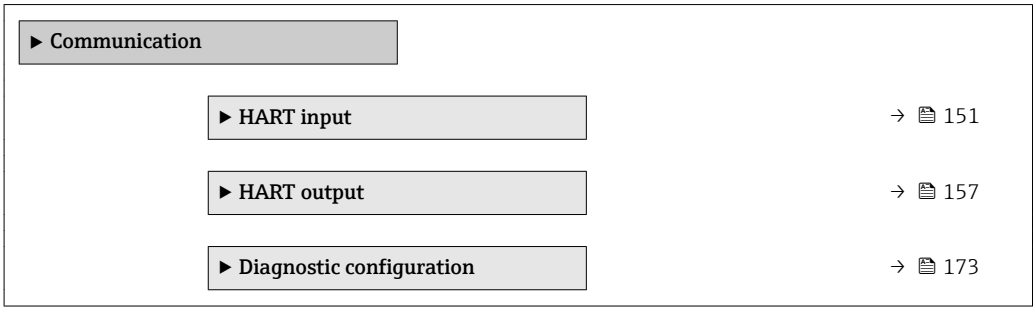
Description Use this function to select whether to invert the output signal.

Selection
- No
- Yes

Factory setting No

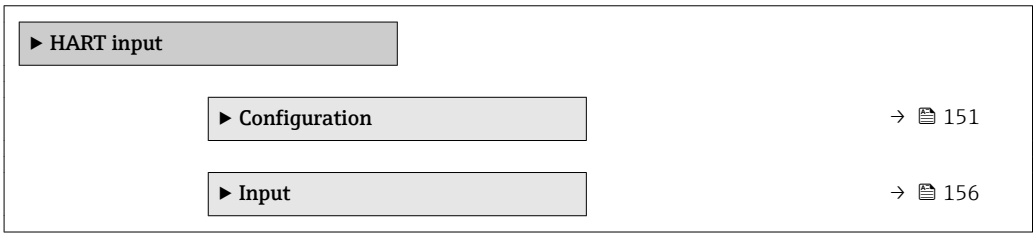
3.5 "Communication" submenu

Navigation Expert → Communication



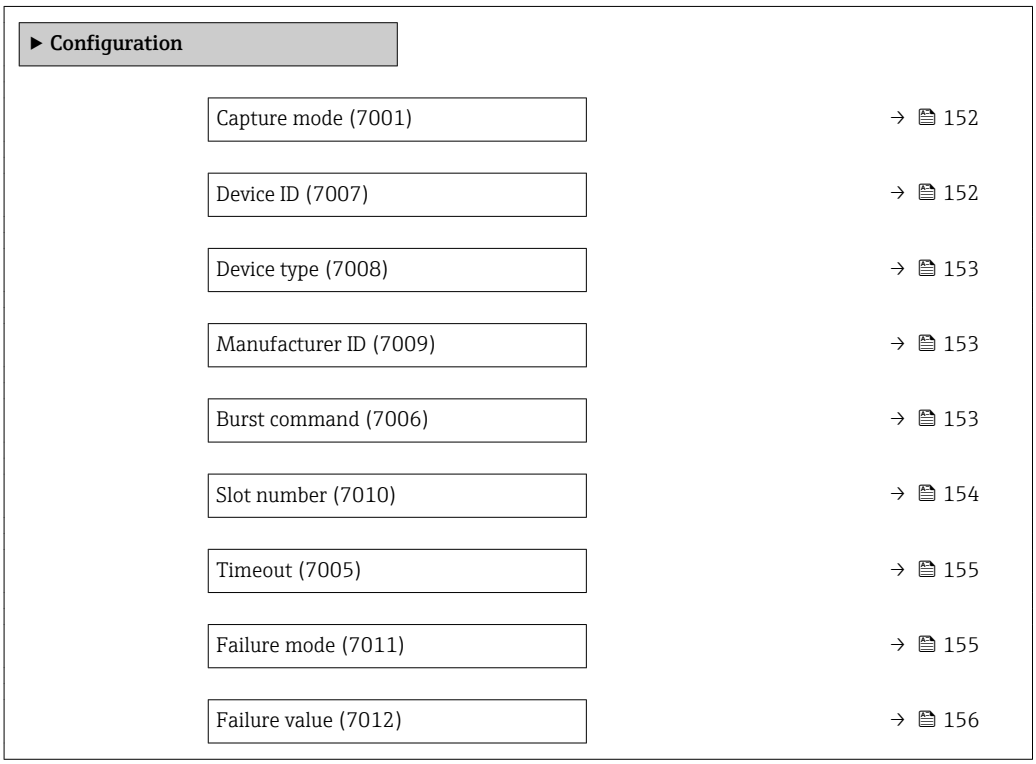
3.5.1 "HART input" submenu

Navigation Expert → Communication → HART input



"Configuration" submenu

Navigation Expert → Communication → HART input → Configuration



Capture mode

Navigation Expert → Communication → HART input → Configuration → Capture mode (7001)

Description Use this function to select the capture mode via burst or master communication.

Selection
- Off
- Burst network
- Master network

Factory setting Off

Additional information

"Burst network" option

The device records data sent via the burst mode in the network.

An external pressure, density or temperature sensor must also be in the burst mode.

"Master network" option

The device records all the responses that are sent by the configured HART slave device, which is located in the network, when requested by a master.

For details, see the section on "Burst mode functionality according to HART 7 specification" in the Operating Instructions

Device ID

Navigation Expert → Communication → HART input → Configuration → Device ID (7007)

Prerequisite In the **Capture mode** parameter (→ 152), the **Master network** option is selected.

Description Use this function to enter the device ID of the HART slave device whose data are to be recorded.

User entry 6-digit value:
- Via local operation: enter as hexadecimal or decimal number
- Via operating tool: enter as decimal number

Factory setting 0

Additional information

In addition to the device ID and manufacturer ID, the device type is part of the unique ID. Each HART device is uniquely identified by the unique device ID.

For details, see the section on "Burst mode functionality according to HART 7 specification" in the Operating Instructions

Device type

Navigation Expert → Communication → HART input → Configuration → Device type (7008)

Prerequisite In the **Capture mode** parameter (→ 152), the **Master network** option is selected.

Description Use this function to enter the device type of the HART slave device whose data are to be recorded.

User entry 4-digit hexadecimal number

Factory setting 0x1138

Additional information

In addition to the device ID and manufacturer ID, the device type is part of the unique ID. Each HART device is uniquely identified by the unique device ID.

For details, see the section on "Burst mode functionality according to HART 7 specification" in the Operating Instructions

Manufacturer ID

Navigation Expert → Communication → HART input → Configuration → Manufacturer ID (7009)

Prerequisite In the **Capture mode** parameter (→ 152), the **Master network** option is selected.

Description Use this function to enter the manufacturer ID of the HART slave device whose data are to be recorded.

User entry 2-digit value:
- Via local operation: enter as hexadecimal or decimal number
- Via operating tool: enter as decimal number

Factory setting 0

Additional information

In addition to the device ID and manufacturer ID, the device type is part of the unique ID. Each HART device is uniquely identified by the unique device ID.

For details, see the section on "Burst mode functionality according to HART 7 specification" in the Operating Instructions

Burst command

Navigation Expert → Communication → HART input → Configuration → Burst command (7006)

Prerequisite In the **Capture mode** parameter (→ 152), the **Burst network** option or **Master network** option is selected.

Description Use this function to select the burst command to be recorded.

Selection
- Command 1
- Command 3
- Command 9
- Command 33

Factory setting
Command 1

Additional information
Options
- Command 1
  Read in the primary variable.
- Command 3
  Read in the dynamic HART variables and the current.
- Command 9
  Read in the dynamic HART variables including the related status.
- Command 33
  Read in the dynamic HART variables including the related unit.

For details, see the section on "Burst mode functionality according to HART 7 specification" in the Operating Instructions

Slot number

Navigation
Expert → Communication → HART input → Configuration → Slot number (7010)

Prerequisite
In **Capture mode** parameter (→ 152), **Burst network** option or **Master network** option is selected.

Description
Use this function to enter the position of the process variable to be determined in burst command.

User entry
1 to 4

Factory setting
1

Additional information
User entry

Slot	Command			
	1	3	9	33
1	PV	PV	HART variable (slot 1)	HART variable (slot 1)
2	–	SV	HART variable (slot 2)	HART variable (slot 2)
3	–	TV	HART variable (slot 3)	HART variable (slot 3)
4	–	QV	HART variable (slot 4)	HART variable (slot 4)

Timeout

Navigation Expert → Communication → HART input → Configuration → Timeout (7005)

Prerequisite In the **Capture mode** parameter (→ 152), the **Burst network** option or **Master network** option is selected.

Description Use this function to enter the maximum permitted interval between two HART frames.

User entry 1 to 120 s

Factory setting 5 s

Additional information *Description*

If the interval is exceeded, the measuring device displays the diagnostic message **F410 Data transfer**.

Failure mode

Navigation Expert → Communication → HART input → Configuration → Failure mode (7011)

Prerequisite In the **Capture mode** parameter (→ 152), the **Burst network** option or **Master network** option is selected.

Description Use this function to select the device behavior if no data are recorded within the maximum permitted interval.

Selection
- Alarm
- Last valid value
- Defined value

Factory setting Alarm

Additional information *Options*
- Alarm
  An error message is set.
- Last valid value
  The last valid measured value is used.
- Defined value
  A user-defined measured value is used: (**Failure value** parameter (→ 156)).

Failure value

Navigation Expert → Communication → HART input → Configuration → Failure value (7012)

Prerequisite The following conditions are met:
- In the **Capture mode** parameter (→ 152), the **Burst network** option or **Master network** option is selected.
- In the **Failure mode** parameter (→ 155), the **Defined value** option is selected.

Description Use this function to enter the measured value to be used if no data are recorded within the maximum permitted interval.

User entry Signed floating-point number

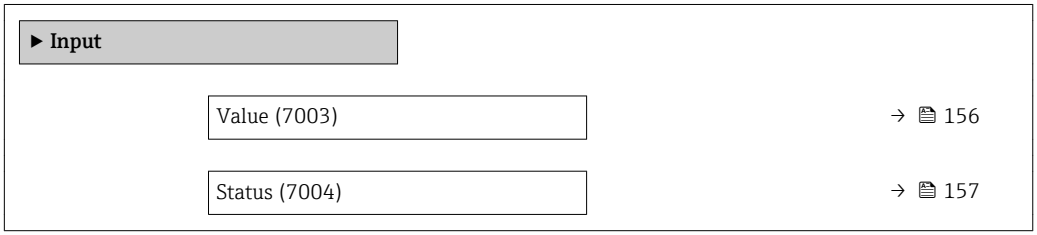
Factory setting 0

Additional information *Dependency*

The entry depends on the process variable selected in the **External value** parameter (→ 118).

"Input" submenu

Navigation Expert → Communication → HART input → Input



Value

Navigation Expert → Communication → HART input → Input → Value (7003)

Description Displays the value of the device variable recorded by the HART input.

User interface Signed floating-point number

Additional information *Dependency*

The unit depends on the process variable selected in the **External value** parameter (→ 118).

Status

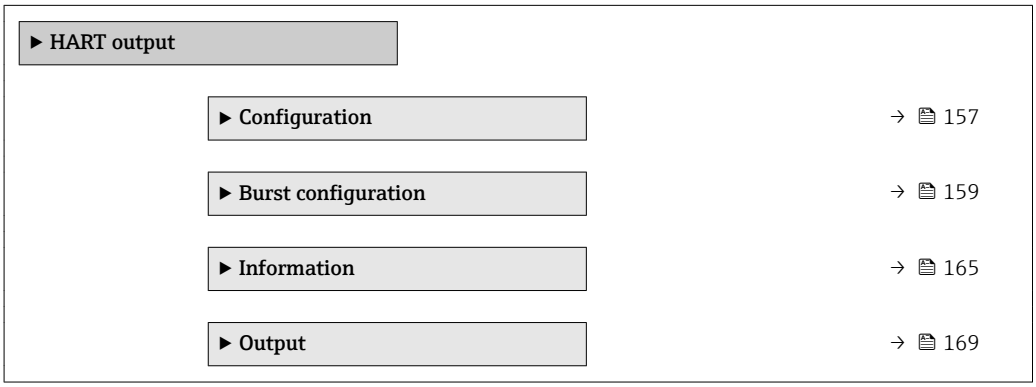
Navigation Expert → Communication → HART input → Input → Status (7004)

Description Displays the value of the device variable recorded by the HART input in accordance with the HART specification.

User interface
- Manual/Fixed
- Good
- Poor accuracy
- Bad

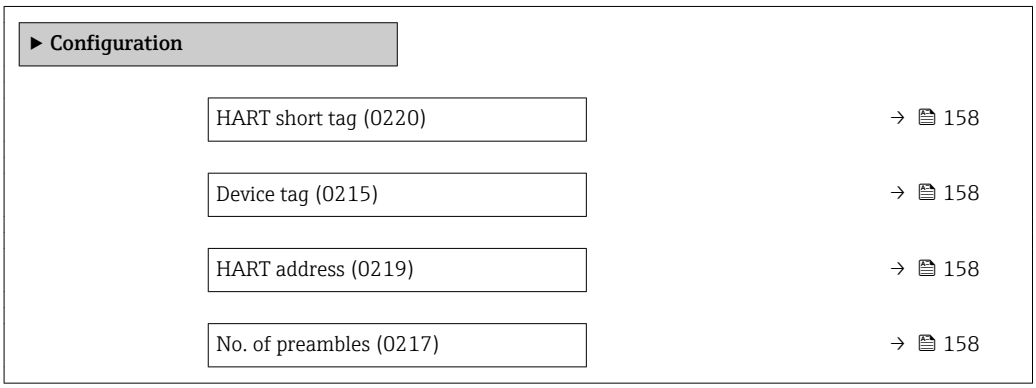
3.5.2 "HART output" submenu

Navigation Expert → Communication → HART output



"Configuration" submenu

Navigation Expert → Communication → HART output → Configuration



HART short tag

Navigation Expert → Communication → HART output → Configuration → HART short tag (0220)

Description Use this function to enter a brief description for the measuring point. This can be edited and displayed via HART protocol or using the local display.

User entry Max. 8 characters: A-Z, 0-9 and certain special characters (e.g. punctuation marks, @, %).

Factory setting PROWIRL

Device tag

Navigation Expert → Communication → HART output → Configuration → Device tag (0215)

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 Prowirl

HART address

Navigation Expert → Communication → HART output → Configuration → HART address (0219)

Description Use this function to enter the address via which the data exchange takes place via HART protocol.

User entry 0 to 63

Factory setting 0

No. of preambles

Navigation Expert → Communication → HART output → Configuration → No. of preambles (0217)

Description Use this function to enter the number of preambles in the HART protocol.

User entry 2 to 20

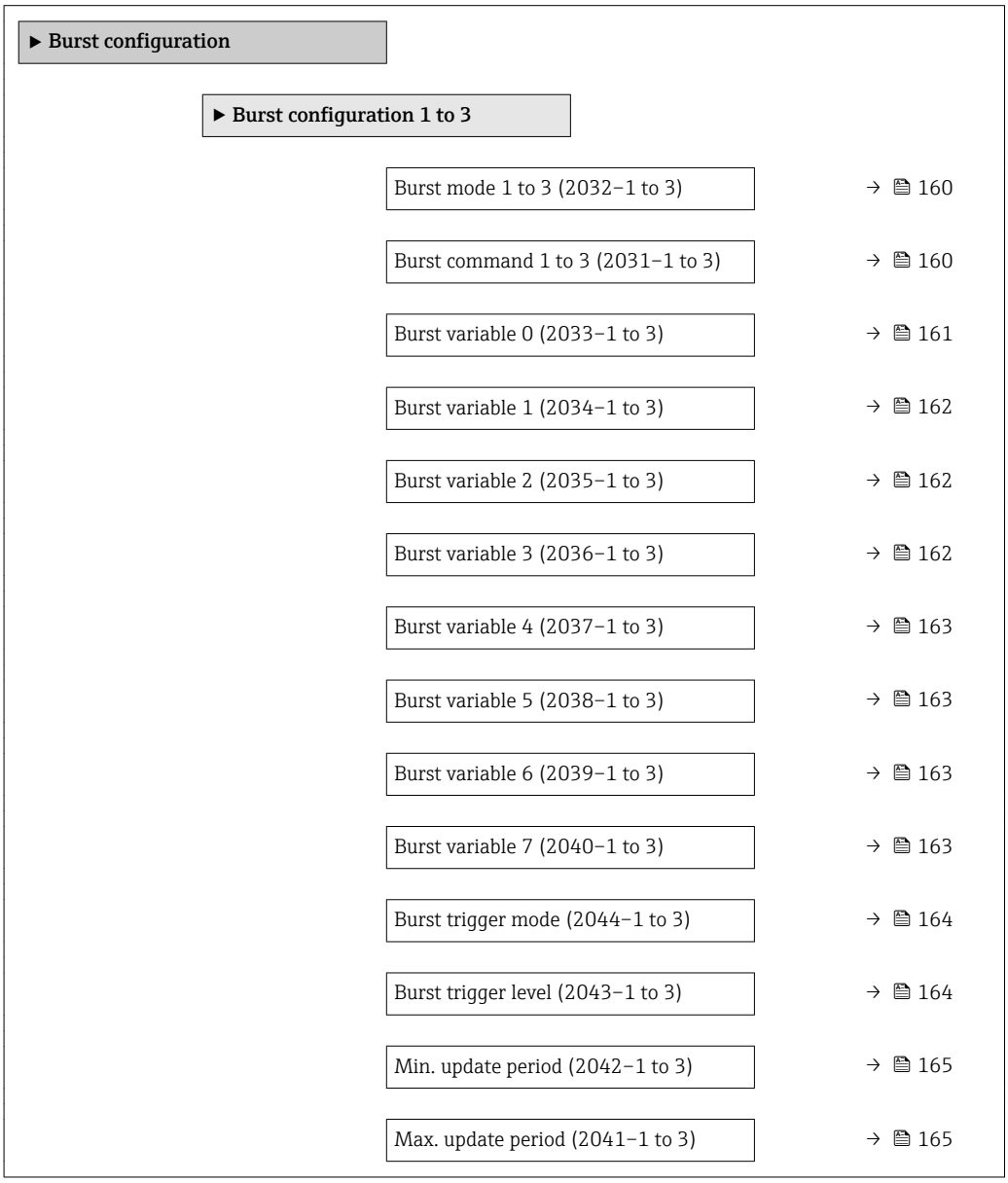
Factory setting 5

Additional information *User entry*

As every modem component can "swallow" a byte, 2-byte preambles at least must be defined.

"Burst configuration" submenu

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to 3



Burst mode 1 to 3

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Burst mode 1 to 3 (2032–1 to 3)

Description Use this function to select whether to activate the HART burst mode for burst message X.

Selection
- Off
- On

Factory setting Off

Additional information *Options*
- Off
  The measuring device transmits data only when requested by the HART master.
- On
  The measuring device transmits data regularly without being requested.

Burst command 1 to 3

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Burst command 1 to 3 (2031–1 to 3)

Description Use this function to select the HART command that is sent to the HART master.

Selection
- Command 1
- Command 2
- Command 3
- Command 9
- Command 33
- Command 48

Factory setting Command 2

Additional information *Options*
- Command 1
  Read out the primary variable.
- Command 2
  Read out the current and the main measured value as a percentage.
- Command 3
  Read out the dynamic HART variables and the current.
- Command 9
  Read out the dynamic HART variables including the related status.
- Command 33
  Read out the dynamic HART variables including the related unit.
- Command 48
  Read out the complete device diagnostics.

"Command 33" option

The HART device variables are defined via Command 107.

The following measured variables (HART device variables) can be read out:
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality
- Total mass flow *
- Energy flow *
- Heat flow difference *
- Condensate mass flow *
- Reynolds number *
- Totalizer 1…3
- HART input
- Density *
- Pressure *
- Specific volume *
- Degrees of superheat *
- Percent Of Range
- Measured current
- Primary variable (PV)
- Secondary variable (SV)
- Tertiary variable (TV)
- Quaternary variable (QV)

Commands

Information about the defined details of the command: HART specifications

The measured variables (HART device variables) are assigned to the dynamic variables in the **Output** submenu (→ 128).

Burst variable 0

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Burst variable 0 (2033–1 to 3)

Description For HART command 9 and 33: select the HART device variable or the process variable.

Selection
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Energy flow *
- Heat flow difference *
- Condensate mass flow *
- Reynolds number *
- Totalizer 1

* Visibility depends on order options or device settings

- Totalizer 2
- Totalizer 3
- HART input
- Density *
- Pressure *
- Specific volume *
- Degrees of superheat *
- Percent Of Range
- Measured current
- Primary variable (PV)
- Secondary variable (SV)
- Tertiary variable (TV)
- Quaternary variable (QV)
- Not used

Factory setting Volume flow

Burst variable 1

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Burst variable 1 (2034–1 to 3)

Description For HART command 9 and 33: select the HART device variable or the process variable.

Selection See **Burst variable 0** parameter (→ 161).

Factory setting Not used

Burst variable 2

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Burst variable 2 (2035–1 to 3)

Description For HART command 9 and 33: select the HART device variable or the process variable.

Selection See **Burst variable 0** parameter (→ 161).

Factory setting Not used

Burst variable 3

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Burst variable 3 (2036–1 to 3)

Description For HART command 9 and 33: select the HART device variable or the process variable.

* Visibility depends on order options or device settings

Selection See **Burst variable 0** parameter (→ 161).

Factory setting Not used

Burst variable 4

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Burst variable 4 (2037–1 to 3)

Description For HART command 33: select the HART device variable or the process variable.

Selection See **Burst variable 0** parameter (→ 161).

Factory setting Not used

Burst variable 5

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Burst variable 5 (2038–1 to 3)

Description For HART command 33: select the HART device variable or the process variable.

Selection See **Burst variable 0** parameter (→ 161).

Factory setting Not used

Burst variable 6

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Burst variable 6 (2039–1 to 3)

Description For HART command 33: select the HART device variable or the process variable.

Selection See **Burst variable 0** parameter (→ 161).

Factory setting Not used

Burst variable 7

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Burst variable 7 (2040–1 to 3)

Description For HART command 33: select the HART device variable or the process variable.

Selection See **Burst variable 0** parameter (→ 161).

Factory setting Not used

Burst trigger mode

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Trigger mode (2044–1 to 3)

Description Use this function to select the event that triggers burst message X.

Selection
- Continuous
- Window
- Rising
- Falling
- On change

Factory setting Continuous

Additional information *Options*
- Continuous
  The message is sent continuously, at least at intervals corresponding to the time frame specified in the **Burst min period** parameter (→ 165).
- Window
  The message is sent if the specified measured value has changed by the value in the **Burst trigger level** parameter (→ 164).
- Rising
  The message is sent if the specified measured value exceeds the value in the **Burst trigger level** parameter (→ 164).
- Falling
  The message is sent if the specified measured value drops below the value in the **Burst trigger level** parameter (→ 164).
- On change
  The message is sent if a measured value changes in the burst message.

Burst trigger level

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Trigger level (2043–1 to 3)

Description For entering the burst trigger value.

User entry Positive floating-point number

Additional information *Description*

Together with the option selected in the **Burst trigger mode** parameter (→ 164) the burst trigger value determines the time of burst message X.

Min. update period

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Min. upd. per. (2042–1 to 3)

Description Use this function to enter the minimum time span between two burst commands of burst message X.

User entry Positive integer

Factory setting 1 000 ms

Max. update period

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Max. upd. per. (2041–1 to 3)

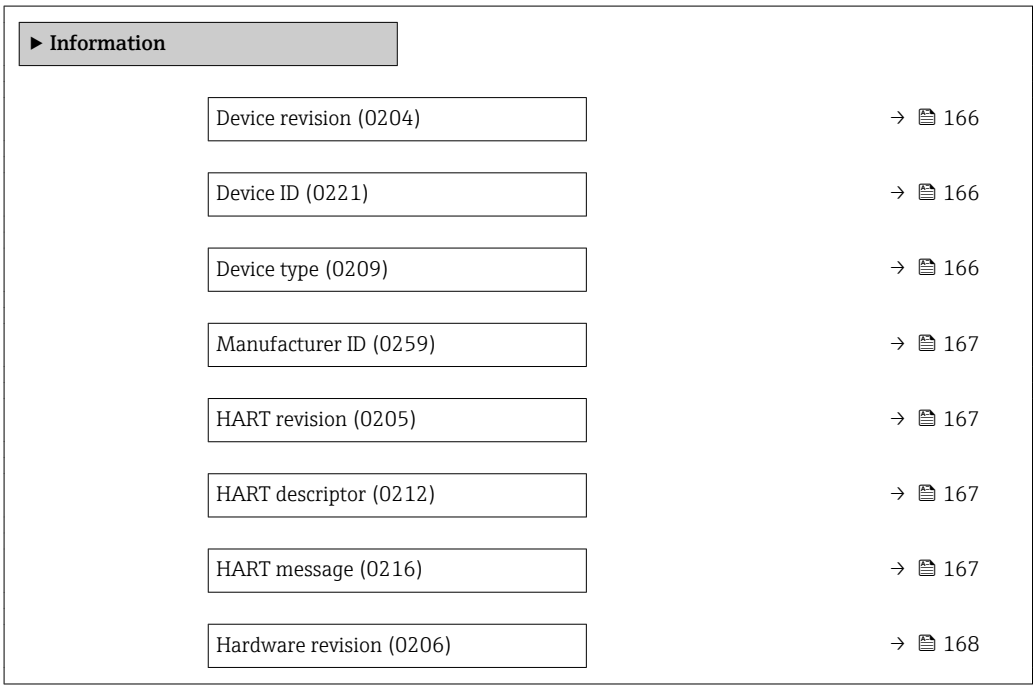
Description Use this function to enter the maximum time span between two burst commands of burst message X.

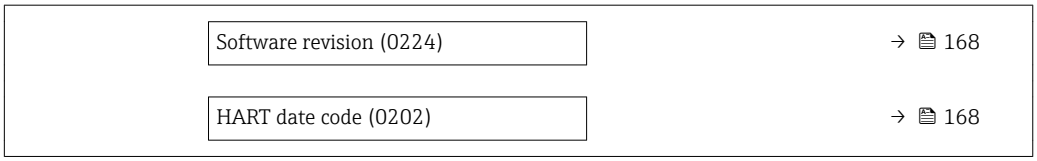
User entry Positive integer

Factory setting 2 000 ms

"Information" submenu

Navigation Expert → Communication → HART output → Information





Device revision

Navigation Expert → Communication → HART output → Information → Device revision (0204)

Description Use this function to view the device revision with which the device is registered with the HART Communication Foundation.

User interface 2-digit hexadecimal number

Factory setting 0x03

Additional information *Description*

The device revision is needed to assign the appropriate device description file (DD) to the device.

Device ID

Navigation Expert → Communication → HART output → Information → Device ID (0221)

Description Use this function to view the device ID for identifying the measuring device in a HART network.

User interface 6-digit hexadecimal number

Additional information *Description*

In addition to the device type and manufacturer ID, the device ID is part of the unique ID. Each HART device is uniquely identified by the unique device ID.

Device type

Navigation Expert → Communication → HART output → Information → Device type (0209)

Description Displays the device type with which the measuring device is registered with the HART Communication Foundation.

User interface 2-digit hexadecimal number

Factory setting 0x38 (for Prowirl 200)

Additional information *Description*

The device type is specified by the manufacturer. It is needed to assign the appropriate device description file (DD) to the device.

Manufacturer ID

Navigation Expert → Communication → HART output → Information → Manufacturer ID (0259)

Description Use this function to view the manufacturer ID with which the measuring device is registered with the HART Communication Foundation.

User interface 2-digit hexadecimal number

Factory setting 0x11 (for Endress+Hauser)

HART revision

Navigation Expert → Communication → HART output → Information → HART revision (0205)

Description Use this function to display the HART protocol revision of the measuring device.

User interface 5 to 7

Factory setting 7

HART descriptor

Navigation Expert → Communication → HART output → Information → HART descriptor (0212)

Description Use this function to enter a description for the measuring point. This can be edited and displayed via HART protocol or using the local display.

User entry Max. 16 characters such as letters, numbers or special characters (e.g. @, %, /)

Factory setting Prowirl

HART message

Navigation Expert → Communication → HART output → Information → HART message (0216)

Description Use this function to enter a HART message which is sent via the HART protocol when requested by the master.

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

Factory setting Prowirl

Hardware revision

Navigation Expert → Communication → HART output → Information → Hardware rev. (0206)

Description Displays the hardware revision of the measuring device.

User interface 0 to 255

Factory setting 1

Software revision

Navigation Expert → Communication → HART output → Information → Software rev. (0224)

Description Displays the software revision of the measuring device.

User interface 0 to 255

Factory setting 3

HART date code

Navigation Expert → Communication → HART output → Information → HART date code (0202)

Description Use this function to enter the date information for individual use.

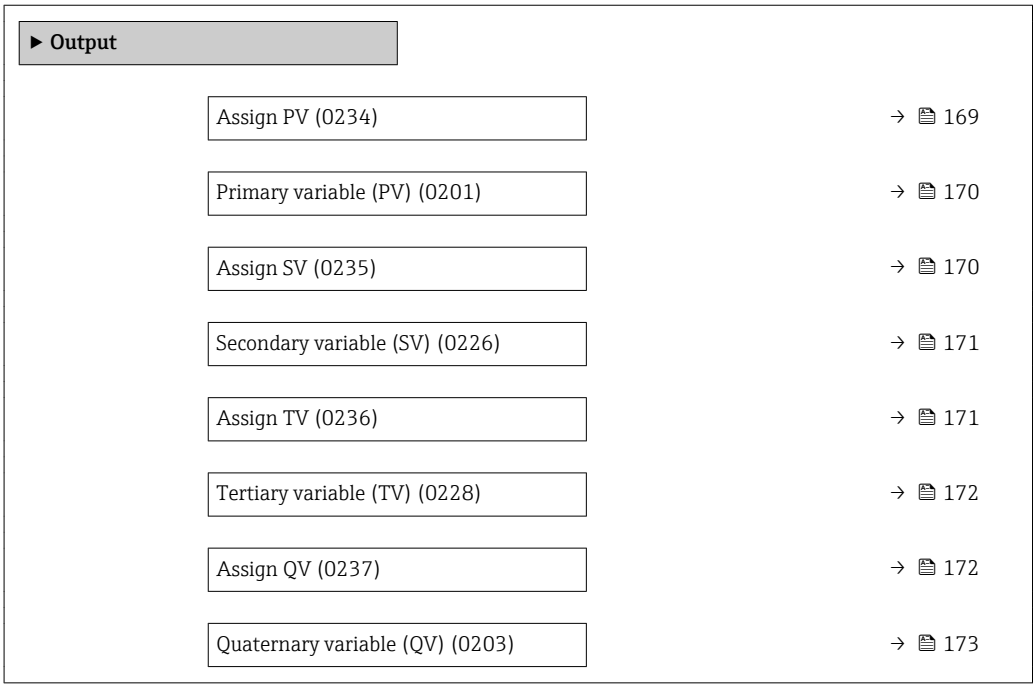
User entry Date entry format: yyyy-mm-dd

Factory setting 2009-07-20

Additional information *Example*
Device installation date

"Output" submenu

Navigation Expert → Communication → HART output → Output



Assign PV

Navigation Expert → Communication → HART output → Output → Assign PV (0234)

Description Use this function to select a measured variable (HART device variable) for the primary dynamic variable (PV).

Selection
- Off
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Energy flow *
- Heat flow difference *

* Visibility depends on order options or device settings

Primary variable (PV)

Navigation Expert → Communication → HART output → Output → Primary var (PV) (0201)

Description Displays the current measured value of the primary dynamic variable (PV).

User interface Signed floating-point number

Additional information

User interface

The measured value displayed depends on the process variable selected in the **Assign PV** parameter (→ 169).

Dependency

The unit of the displayed measured value is taken from the **System units** submenu (→ 65).

Assign SV

Navigation Expert → Communication → HART output → Output → Assign SV (0235)

Description Use this function to select a measured variable (HART device variable) for the secondary dynamic variable (SV).

Selection

- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Energy flow *
- Heat flow difference *
- Condensate mass flow *
- Reynolds number *
- Totalizer 1
- Totalizer 2
- Totalizer 3
- HART input
- Density *
- Pressure *
- Specific volume *
- Degrees of superheat *

* Visibility depends on order options or device settings

Secondary variable (SV)

Navigation Expert → Communication → HART output → Output → Second.var(SV) (0226)

Description Displays the current measured value of the secondary dynamic variable (SV).

User interface Positive floating point number

Additional information

User interface

The measured value displayed depends on the process variable selected in the **Assign SV** parameter (→ 170).

Dependency

The unit of the displayed measured value is taken from the **System units** submenu (→ 65).

Assign TV

Navigation Expert → Communication → HART output → Output → Assign TV (0236)

Description Use this function to select a measured variable (HART device variable) for the tertiary (third) dynamic variable (TV).

Selection

- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Energy flow *
- Heat flow difference *
- Condensate mass flow *
- Reynolds number *
- Totalizer 1
- Totalizer 2
- Totalizer 3
- HART input
- Density *
- Pressure *
- Specific volume *
- Degrees of superheat *

* Visibility depends on order options or device settings

Tertiary variable (TV)

Navigation Expert → Communication → HART output → Output → Tertiary var(TV) (0228)

Description Displays the current measured value of the tertiary dynamic variable (TV).

User interface Signed floating-point number

Additional information

User interface

The measured value displayed depends on the process variable selected in the **Assign TV** parameter (→ 171).

Dependency

The unit of the displayed measured value is taken from the **System units** submenu (→ 65).

Assign QV

Navigation Expert → Communication → HART output → Output → Assign QV (0237)

Description Use this function to select a measured variable (HART device variable) for the quaternary (fourth) dynamic variable (QV).

Selection

- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Energy flow *
- Heat flow difference *
- Condensate mass flow *
- Reynolds number *
- Totalizer 1
- Totalizer 2
- Totalizer 3
- HART input
- Density *
- Pressure *
- Specific volume *
- Degrees of superheat *

* Visibility depends on order options or device settings

Quaternary variable (QV)

Navigation Expert → Communication → HART output → Output → Quaterna.var(QV) (0203)

Description Displays the current measured value of the quaternary dynamic variable (QV).

User interface Signed floating-point number

Additional information *User interface*

The measured value displayed depends on the process variable selected in the **Assign QV** parameter (→ 172).

Dependency

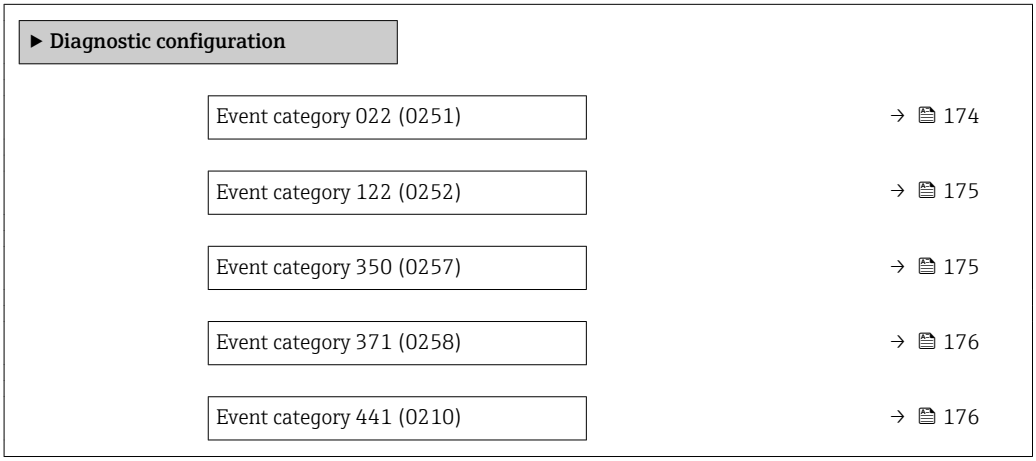
The unit of the displayed measured value is taken from the **System units** submenu (→ 65).

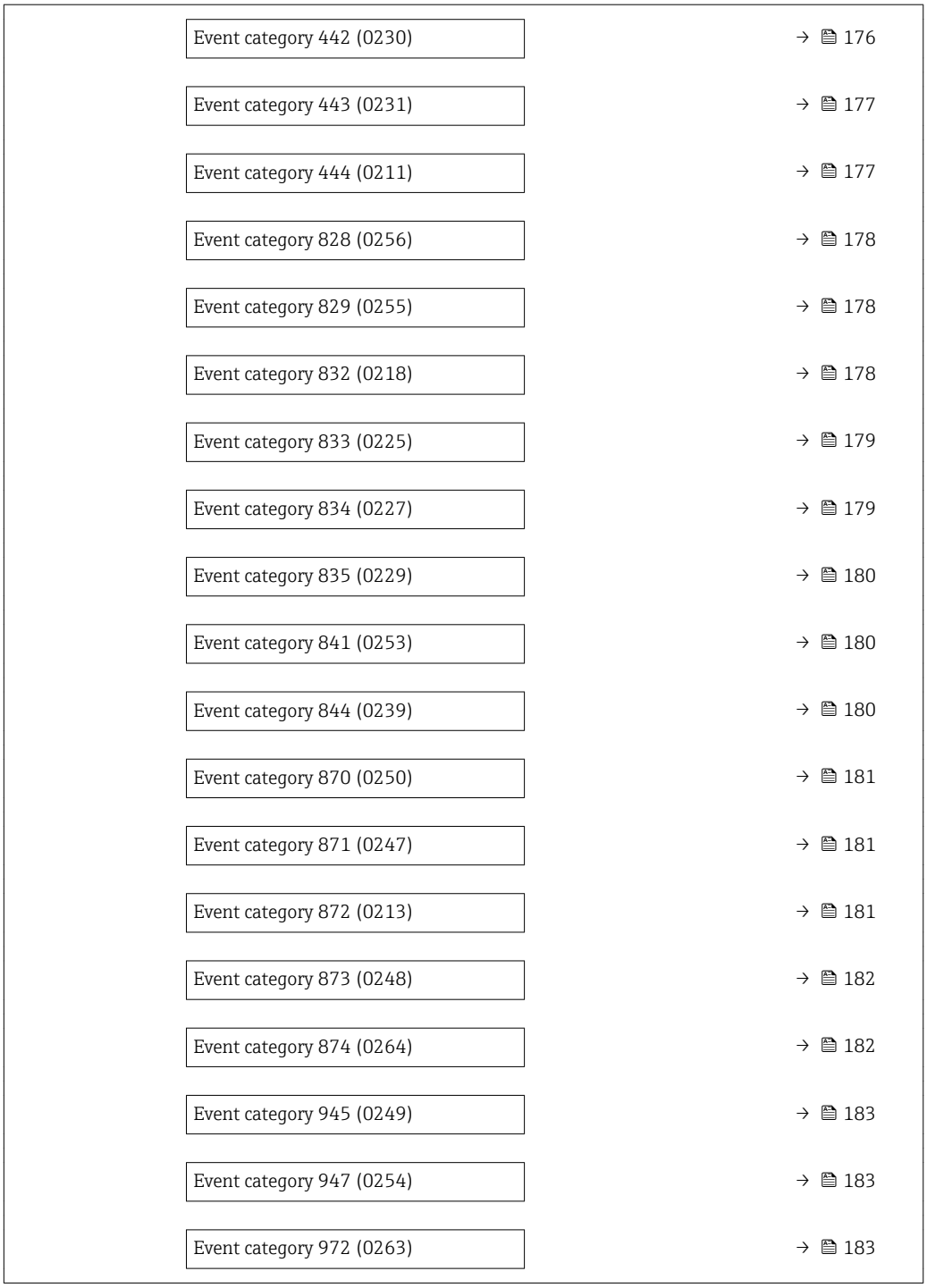
3.5.3 "Diagnostic configuration" submenu

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

Assign a category to the particular diagnostic event:
- **Failure (F)** option
  A device error has occurred. The measured value is no longer valid.
- **Function check (C)** option
  The device is in service mode (e.g. during a simulation).
- **Out of specification (S)** option
  The device is being operated:
  – Outside its technical specification limits (e.g. outside the process temperature range)
  – Outside of the configuration carried out by the user (e.g. maximum flow in parameter 20 mA value)
- **Maintenance required (M)** option
  Maintenance is required. The measured value is still valid.
- **No effect (N)** option
  Has no effect on the condensed status.

Navigation Expert → Communication → Diag. config.





Event category 022 (Temperature sensor defective)

Navigation Expert → Communication → Diag. config. → Event category 022 (0251)

Prerequisite For the following order code
"Sensor version", option "Mass flow"

Description Use this function to select a category for the diagnostic message **022 Temperature sensor defective**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Failure (F)

Additional information For a detailed description of the options available for selection: → 173

Event category 122 (Temperature sensor defective)

Navigation Expert → Communication → Diag. config. → Event category 122 (0252)

Prerequisite For the following order code
"Sensor version", option "Mass flow"

Description Use this function to select a category for the diagnostic message **122 Temperature sensor defective**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Maintenance required (M)

Additional information For a detailed description of the options available for selection: → 173

Event category 350 (Pre-amplifier defective)

Navigation Expert → Communication → Diag. config. → Event category 350 (0257)

Prerequisite For the following order code
"Sensor version", option "Mass flow"

Description Use this function to select a category for the diagnostic message **350 Pre-amplifier defective**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information For a detailed description of the options available for selection: → 173

Event category 371 (Temperature sensor defective)

Navigation Expert → Communication → Diag. config. → Event category 371 (0258)

Prerequisite For the following order code
"Sensor version", option "Mass flow"

Description Use this function to select a category for the diagnostic message **371 Temperature sensor defective**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Maintenance required (M)

Additional information For a detailed description of the options available for selection: → 173

Event category 441 (Current output 1 to 2)

Navigation Expert → Communication → Diag. config. → Event category 441 (0210)

Description Use this function to select a category for the diagnostic message **441 Current output 1 to 2**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information For a detailed description of the options available for selection: → 173

Event category 442 (Frequency output)

Navigation Expert → Communication → Diag. config. → Event category 442 (0230)

Prerequisite The pulse/frequency/switch output is available.

Description Use this function to select the category assigned to diagnostic message **442 Frequency output**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information For a detailed description of the options available for selection: → 173

Event category 443 (Pulse output)

Navigation Expert → Communication → Diag. config. → Event category 443 (0231)

Prerequisite The pulse/frequency/switch output is available.

Description Use this function to select the category assigned to diagnostic message **443 Pulse output**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information For a detailed description of the options available for selection: → 173

Event category 444 (Current input 1)

Navigation Expert → Communication → Diag. config. → Event category 444 (0211)

Prerequisite The current input is available.

Description Use this function to select a category for the diagnostic message **444 Current input 1**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information *Options*

For a detailed description of the options available for selection: → 173

Event category 828 (Ambient temperature too low)

Navigation Expert → Communication → Diag. config. → Event category 828 (0256)

Description Use this function to select a category for the diagnostic message **828 Ambient temperature too low**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information For a detailed description of the options available for selection: → 173

Event category 829 (Ambient temperature too high)

Navigation Expert → Communication → Diag. config. → Event category 829 (0255)

Description Use this function to select a category for the diagnostic message **829 Ambient temperature too high**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information For a detailed description of the options available for selection: → 173

Event category 832 (Electronic temperature too high)

Navigation Expert → Communication → Diag. config. → Event category 832 (0218)

Description Use this function to select the category assigned to diagnostic message **832 Electronic temperature too high**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information For a detailed description of the options available for selection: → 173

Event category 833 (Electronic temperature too low)

Navigation Expert → Communication → Diag. config. → Event category 833 (0225)

Description Use this function to select the category assigned to diagnostic message **833 Electronic temperature too low**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information For a detailed description of the options available for selection: → 173

Event category 834 (Process temperature too high)

Navigation Expert → Communication → Diag. config. → Event category 834 (0227)

Description Use this function to select a category for the diagnostic message **834 Process temperature too high**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information For a detailed description of the options available for selection: → 173

Event category 835 (Process temperature too low)

Navigation Expert → Communication → Diag. config. → Event category 835 (0229)

Description Use this function to select a category for the diagnostic message **835 Process temperature too low**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information For a detailed description of the options available for selection: → 173

Event category 841 (Flow velocity too high)

Navigation Expert → Communication → Diag. config. → Event category 841 (0253)

Description Use this function to select a category for the diagnostic message **841 Flow velocity too high**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information For a detailed description of the options available for selection: → 173

Event category 844 (Sensor range exceeded)

Navigation Expert → Communication → Diag. config. → Event category 844 (0239)

Description Use this function to select a category for the diagnostic message **844 Sensor range exceeded**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information For a detailed description of the options available for selection: → 173

Event category 870 (Measuring inaccuracy increased)

Navigation Expert → Communication → Diag. config. → Event category 870 (0250)

Description Use this function to select a category for the diagnostic message **870 Measuring inaccuracy increased**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information For a detailed description of the options available for selection: → 173

Event category 871 (Near steam saturation limit)

Navigation Expert → Communication → Diag. config. → Event category 871 (0247)

Prerequisite In the **Select medium** parameter (→ 92), the **Steam** option is selected.

Description Use this function to select a category for the diagnostic message **871 Near steam saturation limit**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information For a detailed description of the options available for selection: → 173

Event category 872 (Wet steam detected)

Navigation Expert → Communication → Diag. config. → Event category 872 (0213)

Prerequisite The **Wet steam detection** application package is enabled.

Description Use this function to select a category for the diagnostic message **872 Wet steam detected**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information *Prerequisite*

The software options currently enabled are displayed in the **Software option overview** parameter (→ 47).

For a detailed description of the options available for selection: → 173

Event category 873 (Water detected)

Navigation Expert → Communication → Diag. config. → Event category 873 (0248)

Prerequisite In the **Select medium** parameter (→ 92), the **Steam** option is selected.

Description Use this function to select a category for the diagnostic message **873 Water detected**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information For a detailed description of the options available for selection: → 173

Event category 874 (X% spec invalid)

Navigation Expert → Communication → Diag. config. → Event category 874 (0264)

Prerequisite In the **Select medium** parameter (→ 92), the **Steam** option is selected.

Description Use this function to select a category for the diagnostic message **874 X% spec invalid**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information For a detailed description of the options available for selection: → 173

Event category 945 (Sensor range exceeded)

Navigation Expert → Communication → Diag. config. → Event category 945 (0249)

Prerequisite For the following order code
"Sensor version", option "Mass flow"

Description Use this function to select a category for the diagnostic message **945 Sensor range exceeded**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information For a detailed description of the options available for selection: → 173

Event category 947 (Vibration exceeded)

Navigation Expert → Communication → Diag. config. → Event category 947 (0254)

Description Use this function to select a category for the diagnostic message **947 Vibration exceeded**.

Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information For a detailed description of the options available for selection: → 173

Event category 972 (Degrees of superheat limit excceeded)

Navigation Expert → Communication → Diag. config. → Event category 972 (0263)

Prerequisite In the **Select medium** parameter (→ 92), the **Steam** option is selected.

Description Use this function to select a category for the diagnostic message **972 Degrees of superheat limit excceeded**.

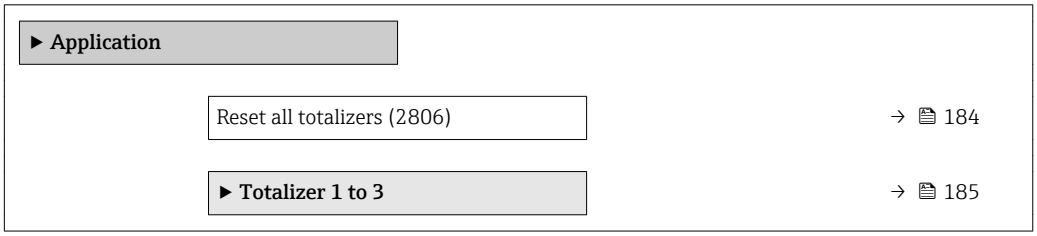
Selection
- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

Factory setting Out of specification (S)

Additional information For a detailed description of the options available for selection: → 173

3.6 "Application" submenu

Navigation Expert → Application



Reset all totalizers

Navigation Expert → Application → Reset all tot. (2806)

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.

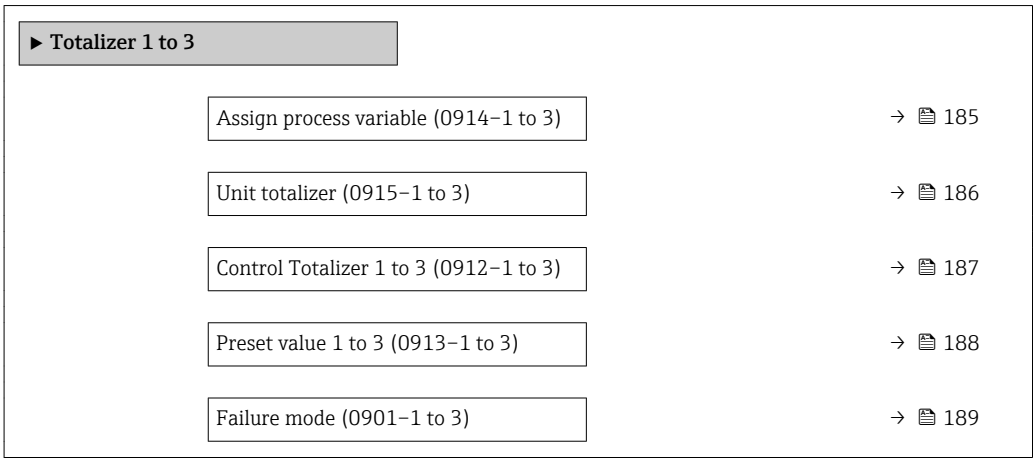
Selection
- Cancel
- Reset + totalize

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.

3.6.1 "Totalizer 1 to 3" submenu

Navigation Expert → Application → Totalizer 1 to 3



Assign process variable

Navigation Expert → Application → Totalizer 1 to 3 → Assign variable (0914–1 to 3)

Description Use this function to select a process variable for totalizer 1-3.

Selection
- Off
- Volume flow
- Corrected volume flow
- Mass flow
- Total mass flow *
- Condensate mass flow *
- Energy flow *
- Heat flow difference *

Factory setting Volume flow

Additional information

Description

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

Options

If the **Off** option is selected, only **Assign process variable** parameter (→ 185) is displayed in the **Totalizer 1 to 3** submenu. All other parameters in the submenu are hidden.

* Visibility depends on order options or device settings

Unit totalizer

Navigation Expert → Application → Totalizer 1 to 3 → Unit totalizer (0915–1 to 3)

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 185) of the **Totalizer 1 to 3** submenu:
- Volume flow
- Corrected volume flow
- Mass flow
- Total mass flow *
- Condensate mass flow *
- Energy flow *
- Heat flow difference *

Description Use this function to select the unit for the process variable of totalizer 1-3.

Selection

SI units
- g
- kg
- t

US units
- oz
- lb
- STon

Custom-specific units
User mass

or

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;liq.)
- bbl (us;beer)
- bbl (us;oil)
- bbl (us;tank)

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

Custom-specific units
User vol.

or

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.

or

* Visibility depends on order options or device settings

SI units
- kWh
- MWh
- GWh
- kJ
- MJ
- GJ
- kcal
- Mcal
- Gcal

Imperial units
- Btu
- MBtu
- MMBtu

Custom-specific units
User en.

Factory setting

Country-specific:
- m^3
- ft^3

Additional information

Description

The unit is selected separately for each totalizer. It is independent of the option selected in the **System units** submenu (→ 65).

Options

The selection depends on the process variable selected in the **Assign process variable** parameter (→ 185).

Control Totalizer 1 to 3

Navigation

Expert → Application → Totalizer 1 to 3 → Control Tot. 1 to 3 (0912–1 to 3)

Prerequisite

One of the following options is selected in the **Assign process variable** parameter (→ 185) of the **Totalizer 1 to 3** submenu:
- Volume flow
- Corrected volume flow
- Mass flow
- Total mass flow *
- Condensate mass flow *
- Energy flow *
- Heat flow difference *

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

* Visibility depends on order options or device settings

Additional information *Options*

- 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 (→ 188).
- 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 in the **Preset value** parameter (→ 188)and the totaling process is restarted.

Preset value 1 to 3

Navigation Expert → Application → Totalizer 1 to 3 → Preset value 1 to 3 (0913–1 to 3)

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 185) of the **Totalizer 1 to 3** submenu:
- Volume flow
- Corrected volume flow
- Mass flow
- Total mass flow *
- Condensate mass flow *
- Energy flow *
- Heat flow difference *

Description Use this function to enter a start value for totalizer 1-3.

User entry Signed floating-point number

Factory setting Country-specific:
- 0 m^3
- 0 ft^3

Additional information *User entry*

The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→ 186).

Example

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

* Visibility depends on order options or device settings

Failure mode

Navigation Expert → Application → Totalizer 1 to 3 → Failure mode (0901–1 to 3)

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 185) of the **Totalizer 1 to 3** submenu:
- Volume flow
- Corrected volume flow
- Mass flow
- Total mass flow *
- Condensate mass flow *
- Energy flow *
- Heat flow difference *

Description Use this function to select how a totalizer behaves in an alarm condition.

Selection
- Stop
- Actual value
- Last valid value

Factory setting Stop

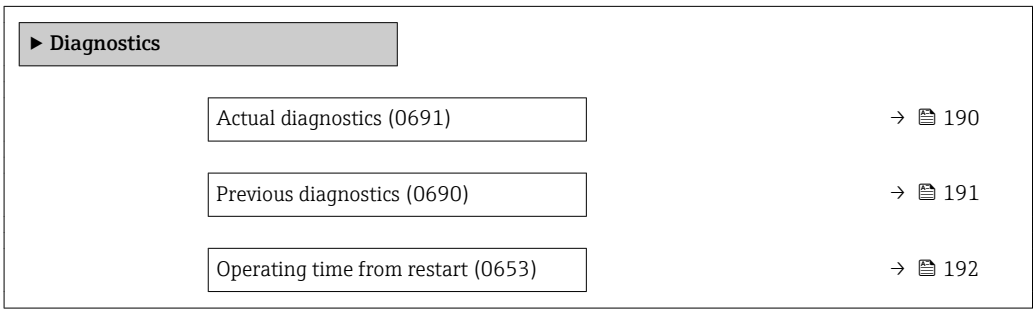
Additional information *Description*

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

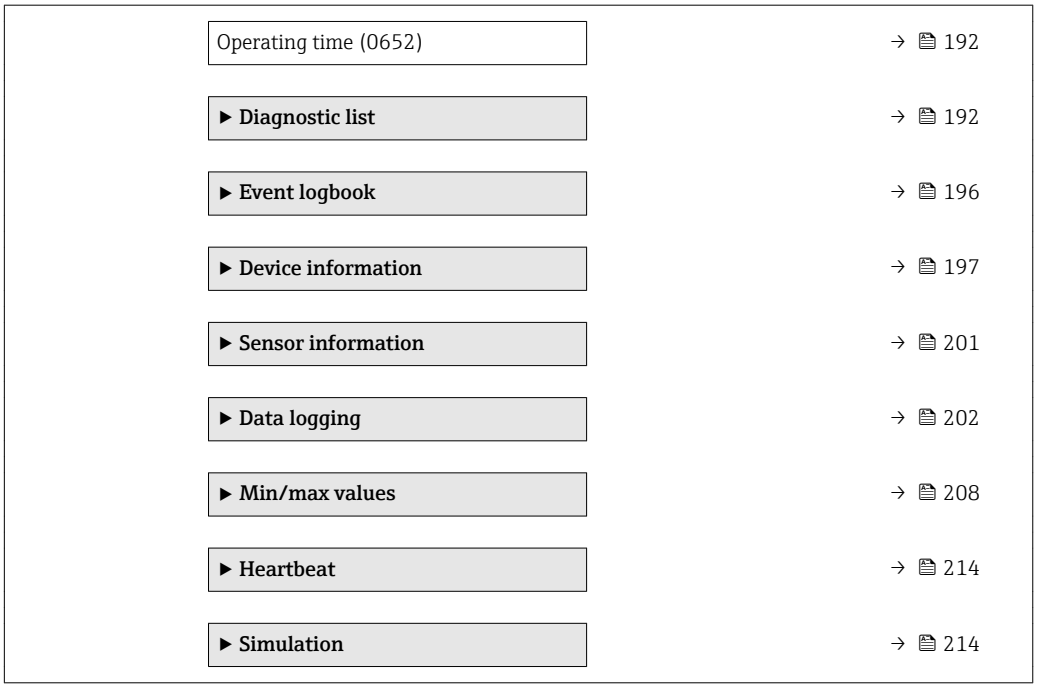
Options
- Stop
  Totalizing is stopped in an alarm condition.
- Actual value
  The totalizer continues to count based on the actual measured value; the error is ignored.
- Last valid value
  The totalizer continues to count based on the last valid measured value before the error occurred.

3.7 "Diagnostics" submenu

Navigation Expert → Diagnostics



* Visibility depends on order options or device settings



Actual diagnostics

Navigation Expert → Diagnostics → Actual diagnos. (0691)

Prerequisite A diagnostic event has occurred.

Description Use this function to display the current diagnostics 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 *User interface*

Additional pending diagnostic messages can be viewed in the **Diagnostic list** submenu (→ 192).

Information on what is causing the diagnostic message, and remedy measures, can be viewed by pressing the E-button.

Example

For the display format:
⚠S442 Frequency output

Timestamp

Navigation Expert → Diagnostics → Timestamp (0667)

Description Displays the operating time at which the current diagnostic message occurred.

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

Additional information *User interface*

The diagnostic message can be viewed via the **Actual diagnostics** parameter (→ 190).

Example

For the display format:
24d12h13m00s

Previous diagnostics

Navigation Expert → Diagnostics → Prev.diagnostics (0690)

Prerequisite Two diagnostic events have already occurred.

Description Use this function to display the diagnostic message last displayed before the current message.

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

Additional information *User interface*

Information on what is causing the diagnostic message, and remedy measures, can be viewed by pressing the E-button.

Example

For the display format:
⚠S442 Frequency output

Timestamp

Navigation Expert → Diagnostics → Timestamp (0672)

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

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

Additional information *User interface*

The diagnostic message can be viewed via the **Previous diagnostics** parameter (→ 191).

Example

For the display format:
24d12h13m00s

Operating time from restart

Navigation Expert → Diagnostics → Time fr. restart (0653)

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 (0652)

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

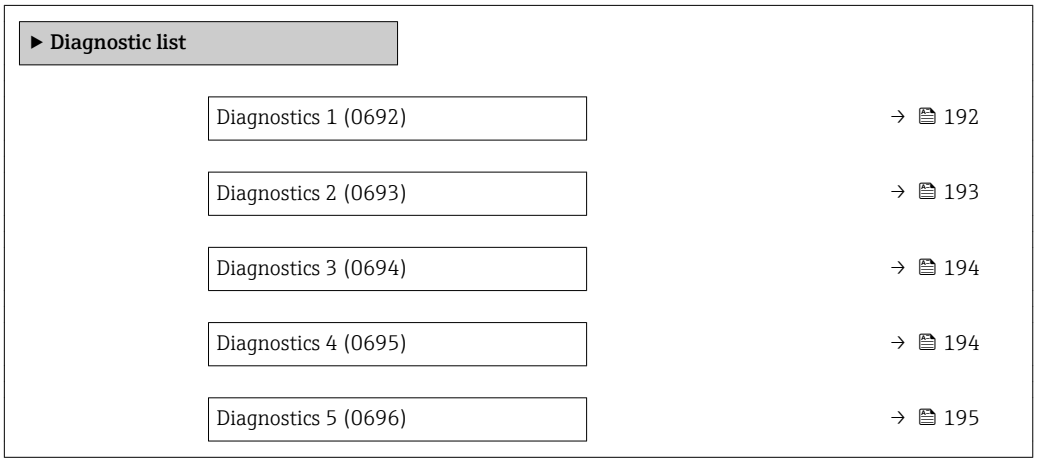
User interface Days (d), hours (h), minutes (m) and seconds (s)

Additional information *User interface*

The maximum number of days is 9999, which is equivalent to 27 years.

3.7.1 "Diagnostic list" submenu

Navigation Expert → Diagnostics → Diagnostic list



Diagnostics 1

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 1 (0692)

Description Use this function to display 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:
- ⚠S442 Frequency output
- ⊗F276 I/O module failure

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp (0683)

Description Displays the operating time at which the diagnostic message occurred.

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

Additional information *User interface*

The diagnostic message can be viewed via the **Diagnostics 1** parameter (→ 192).

Example

For the display format:
24d12h13m00s

Diagnostics 2

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 2 (0693)

Description Use this function to display 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:
- ⚠S442 Frequency output
- ⊗F276 I/O module failure

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp (0684)

Description Displays the operating time at which the diagnostic message occurred.

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

Additional information *User interface*

The diagnostic message can be viewed via the **Diagnostics 2** parameter (→ 193).

Example

For the display format:
24d12h13m00s

Diagnostics 3

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 3 (0694)

Description Use this function to display 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:
- ⚠S442 Frequency output
- ⊗F276 I/O module failure

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp (0685)

Description Displays the operating time at which the diagnostic message occurred.

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

Additional information *User interface*

The diagnostic message can be viewed via the **Diagnostics 3** parameter (→ 194).

Example

For the display format:
24d12h13m00s

Diagnostics 4

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 4 (0695)

Description Use this function to display 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:
- ⚠S442 Frequency output
- ⊗F276 I/O module failure

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp (0686)

Description Displays the operating time at which the diagnostic message occurred.

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

Additional information *User interface*

The diagnostic message can be viewed via the **Diagnostics 4** parameter (→ 194).

Example

For the display format:
24d12h13m00s

Diagnostics 5

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 5 (0696)

Description Use this function to display 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:
- ⚠S442 Frequency output
- ⊗F276 I/O module failure

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp (0687)

Description Displays the operating time at which the diagnostic message occurred.

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

Additional information *User interface*

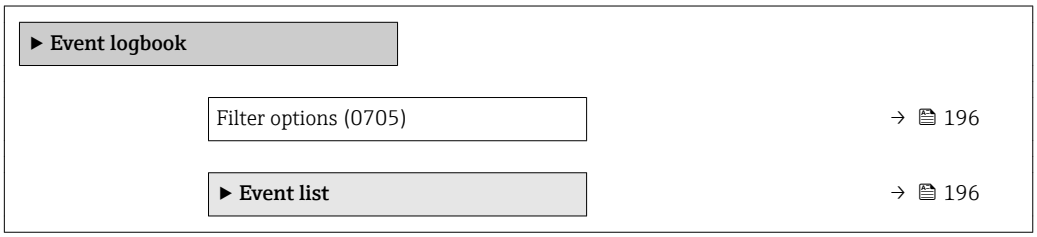
The diagnostic message can be viewed via the **Diagnostics 5** parameter (→ 195).

Example

For the display format:
24d12h13m00s

3.7.2 "Event logbook" submenu

Navigation Expert → Diagnostics → Event logbook



Filter options

Navigation Expert → Diagnostics → Event logbook → Filter options (0705)

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

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

"Event list" submenu

Navigation Expert → Diagnostics → Event logbook → Event list

	Event list	→ 197

Event list

Navigation Expert → Diagnostics → Event logbook → Event list

Description Use this function to display the history of event messages that have occurred in the category selected in the **Filter options** parameter (→ 196).

User interface
- For a "Category I" event message
  Information event, short message, symbol for event recording and operating time when error occurred
- For a "Category F, C, S, M" event message (status signal)
  Diagnostics code, short message, symbol for event recording and operating time when error occurred

Additional information

Description

A maximum of 20 event messages are displayed in chronological order. If the advanced HistoROM function is enabled in the device, the event list can contain up to 100 entries.

The following symbols indicate whether an event has occurred or has ended:
- ⊕: Occurrence of the event
- ⊖: End of the event

Examples

For the display format:
- I1091 Configuration modified
  ⊕ 24d12h13m00s
- ⚠S442 Frequency output
  ⊕ 01d04h12min30s

Additional information, such as remedial measures, can be called up via the E key.

HistoROM

A HistoROM is a "non-volatile" device memory in the form of an EEPROM.

To order the **HistoROM advanced capabilities** application package, see the "Accessories" section of the "Technical Information" document.

3.7.3 "Device information" submenu

Navigation Expert → Diagnostics → Device info

▶ **Device information**		
	Device tag (0011)	→ 198

Serial number (0009)	→ 199
Firmware version (0010)	→ 199
Device name (0013)	→ 199
Order code (0008)	→ 199
Extended order code 1 (0023)	→ 200
Extended order code 2 (0021)	→ 200
Extended order code 3 (0022)	→ 200
Configuration counter (0233)	→ 201
ENP version (0012)	→ 201

Device tag

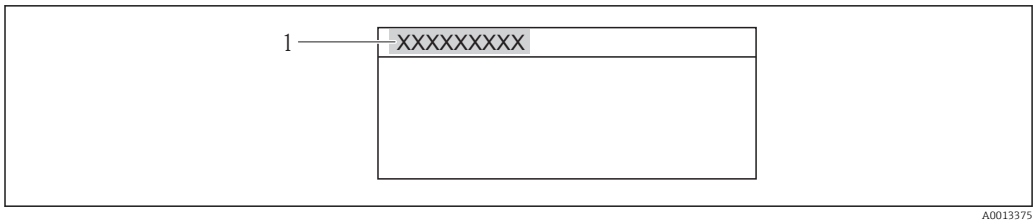
Navigation Expert → Diagnostics → Device info → Device tag (0011)

Description Use this function to display a unique name for the measuring point so it can be identified quickly within the plant. The name is displayed in the header.

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

Factory setting Prowirl

Additional information *User interface*



4 *Header text*

The number of characters displayed depends on the characters used.

Serial number

Navigation Expert → Diagnostics → Device info → Serial number (0009)

Description Use this function to view the serial number of the measuring device. It can also be found on the nameplate of the sensor and transmitter.

User interface Max. 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 (0010)

Description Use this function to view the device firmware version installed.

User interface Character string with the following format:
xx.yy.zz

Factory setting 01.02

Device name

Navigation Expert → Diagnostics → Device info → Device name (0013)

Description Use this function to view the name of the transmitter. It can also be found on the nameplate of the transmitter.

User interface Prowirl

Factory setting –

Order code

Navigation Expert → Diagnostics → Device info → Order code (0008)

Description Use this function to display 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 intelligible 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 (0023)

Description For displaying 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 (0021)

Description For displaying the second part of the extended order code.

User interface Character string

Additional information For additional information, see **Extended order code 1** parameter (→ 200)

Extended order code 3

Navigation Expert → Diagnostics → Device info → Ext. order cd. 3 (0022)

Description For displaying the third part of the extended order code.

User interface Character string

Additional information For additional information, see **Extended order code 1** parameter (→ 200)

Configuration counter

Navigation Expert → Diagnostics → Device info → Config. counter (0233)

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

Factory setting 0

ENP version

Navigation Expert → Diagnostics → Device info → ENP version (0012)

Description Displays the version of the electronic nameplate.

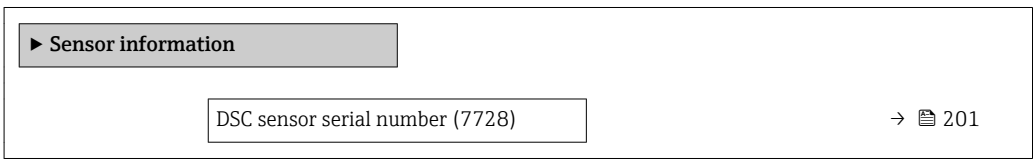
Factory setting 2.02.00

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.

3.7.4 "Sensor information" submenu

Navigation Expert → Diagnostics → Sensor info



DSC sensor serial number

Navigation Expert → Diagnostics → Sensor info → DSC serial no. (7728)

Description Displays the serial number of the DSC sensor that is used in the measuring tube.

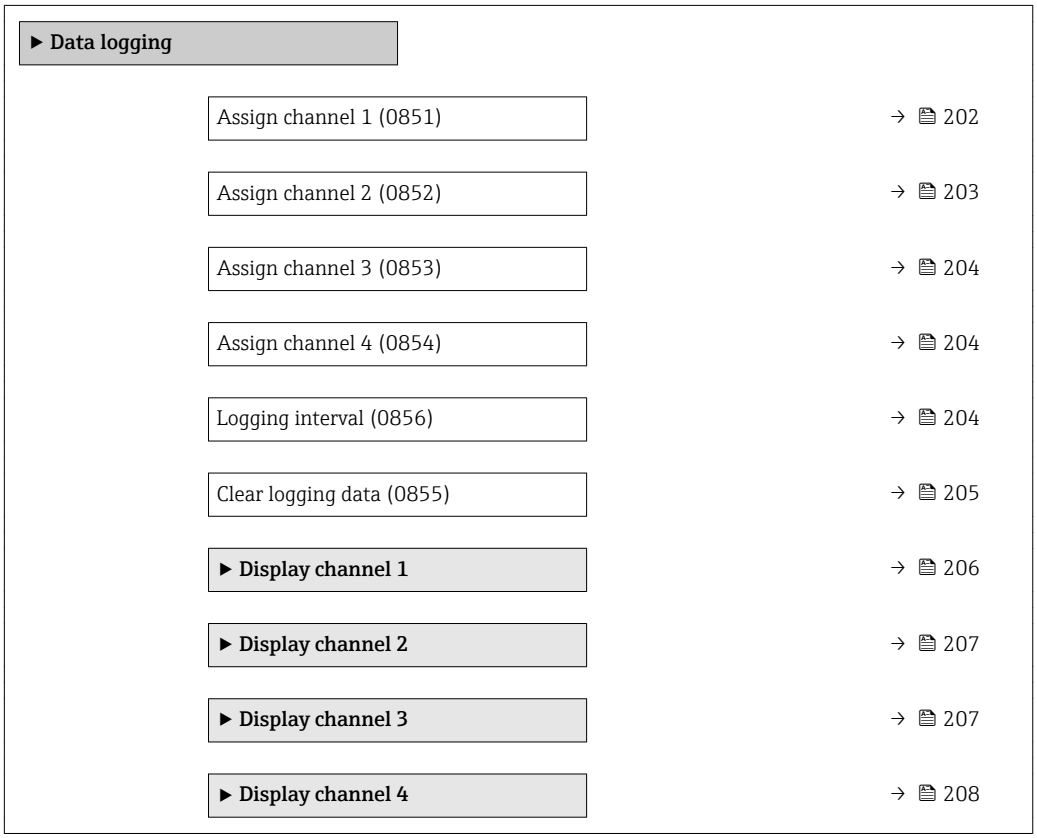
Additional information *Description*

The serial number and other individual values of the DSC sensor, such as the temperature range and reference values, for example, are saved to the S-DAT.

If the DSC sensor is replaced, the S-DAT must also always be replaced.

3.7.5 "Data logging" submenu

Navigation Expert → Diagnostics → Data logging



Assign channel 1

Navigation

Expert → Diagnostics → Data logging → Assign chan. 1 (0851)

Expert → Diagnostics → Data logging → Assign chan. 1 (0851)

Prerequisite

The **Extended HistoROM** application package is available.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 47).

Description

Use this function to select a process variable for the data logging channel.

Selection

- Off
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Condensate mass flow *
- Energy flow *
- Heat flow difference *
- Reynolds number *
- Current output 1
- Current output 2 *
- Density *
- Pressure *
- Specific volume *
- Degrees of superheat *
- Vortex frequency
- Electronic temperature

Factory setting

Off

Additional information

Description

A total of 1000 measured values can be logged. This means:
- 1000 data points if 1 logging channel is used
- 500 data points if 2 logging channels are used
- 333 data points if 3 logging channels are used
- 250 data points if 4 logging channels are used

Once the maximum number of data points is reached, the oldest data points in the data log are cyclically overwritten in such a way that the last 1000, 500, 333 or 250 measured values are always in the log (ring memory principle).

The log contents are cleared if the option selected is changed.

Assign channel 2

Navigation

Expert → Diagnostics → Data logging → Assign chan. 2 (0852)

Prerequisite

The **Extended HistoROM** application package is available.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 47).

Description

Options for the assignment of a process variable to the data logging channel.

Selection

Picklist, see **Assign channel 1** parameter (→ 202)

Factory setting

Off

* Visibility depends on order options or device settings

Assign channel 3

Navigation Expert → Diagnostics → Data logging → Assign chan. 3 (0853)

Prerequisite The **Extended HistoROM** application package is available.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 47).

Description Options for the assignment of a process variable to the data logging channel.

Selection Picklist, see **Assign channel 1** parameter (→ 202)

Factory setting Off

Assign channel 4

Navigation Expert → Diagnostics → Data logging → Assign chan. 4 (0854)

Prerequisite The **Extended HistoROM** application package is available.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 47).

Description Options for the assignment of a process variable to the data logging channel.

Selection Picklist, see **Assign channel 1** parameter (→ 202)

Factory setting Off

Logging interval

Navigation Expert → Diagnostics → Data logging → Logging interval (0856)

Expert → Diagnostics → Data logging → Logging interval (0856)

Prerequisite The **Extended HistoROM** application package is available.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 47).

Description Use this function to enter the logging interval t_{log} for data logging.

User entry 1.0 to 3 600.0 s

Factory setting 10.0 s

Additional information

Description

This defines the interval between the individual data points in the data log, and thus the maximum loggable process time T_{log}:
- If 1 logging channel is used: $T_{log} = 1000 \times t_{log}$
- If 2 logging channels are used: $T_{log} = 500 \times t_{log}$
- If 3 logging channels are used: $T_{log} = 333 \times t_{log}$
- If 4 logging channels are used: $T_{log} = 250 \times t_{log}$

Once this time elapses, the oldest data points in the data log are cyclically overwritten such that a time of Tlog always remains in the memory (ring memory principle).

The log contents are cleared if the length of the logging interval is changed.

Example

If 1 logging channel is used:
- $T_{log} = 1000 \times 1$ s = 1 000 s ≈15 min
- $T_{log} = 1000 \times 10$ s = 10 000 s ≈ 3 h
- $T_{log} = 1000 \times 80$ s = 80 000 s ≈ 1 d
- $T_{log} = 1000 \times 3\,600$ s = 3 600 000 s ≈ 41 d

Clear logging data

Navigation

Expert → Diagnostics → Data logging → Clear logging (0855)

Expert → Diagnostics → Data logging → Clear logging (0855)

Prerequisite

The **Extended HistoROM** application package is available.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 47).

Description

Option to clear the entire logging data.

Selection

- Cancel
- Clear data

Factory setting

Cancel

Additional information

Selection

- Cancel
  The data is not cleared. All the data is retained.
- Clear data
  The logging data is cleared. The logging process starts from the beginning.

"Display channel 1" submenu

Navigation Expert → Diagnostics → Data logging → Displ.channel 1

▸ Display channel 1		
	Display channel 1	→ 206

Display channel 1

Navigation Expert → Diagnostics → Data logging → Displ.channel 1

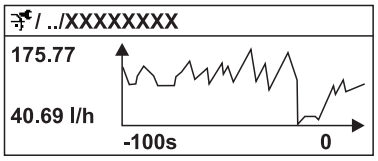
Prerequisite The **Extended HistoROM** application package is available.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 47).

One of the following options is selected in the **Assign channel 1** parameter (→ 202):
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Condensate mass flow *
- Energy flow *
- Heat flow difference *
- Reynolds number *
- Current output 1
- Current output 2 *
- Density *
- Pressure *
- Specific volume *
- Degrees of superheat *
- Vortex frequency
- Electronic temperature

Description Displays the measured value trend for the logging channel in the form of a chart.

Additional information *Description*



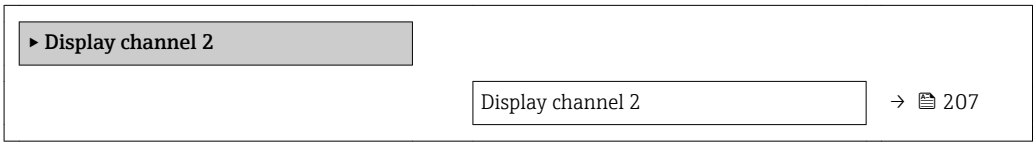
A0016222

* Visibility depends on order options or device settings

- x-axis: depending on the number of channels selected displays 250 to 1000 measured values of a process variable.
- y-axis: displays the approximate measured value span and constantly adapts this to the ongoing measurement.

"Display channel 2" submenu

Navigation Expert → Diagnostics → Data logging → Displ.channel 2



Display channel 2

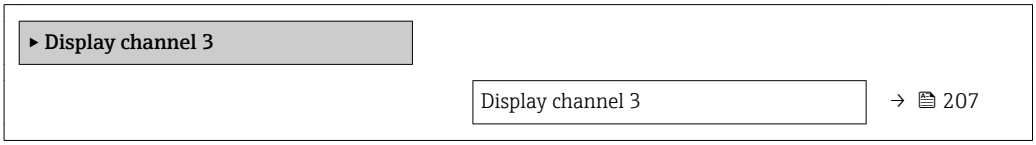
Navigation Expert → Diagnostics → Data logging → Displ.channel 2

Prerequisite A process variable is defined in the **Assign channel 2** parameter.

Description See the **Display channel 1** parameter → 206

"Display channel 3" submenu

Navigation Expert → Diagnostics → Data logging → Displ.channel 3



Display channel 3

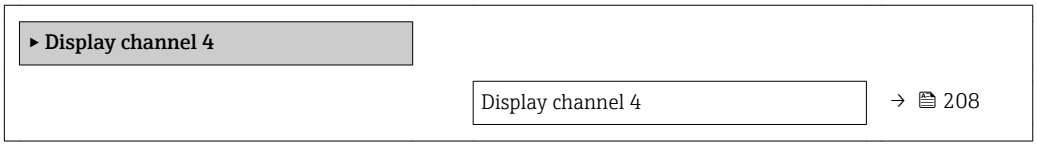
Navigation Expert → Diagnostics → Data logging → Displ.channel 3

Prerequisite A process variable is defined in the **Assign channel 3** parameter.

Description See the **Display channel 1** parameter → 206

"Display channel 4" submenu

Navigation Expert → Diagnostics → Data logging → Displ.channel 4



Display channel 4

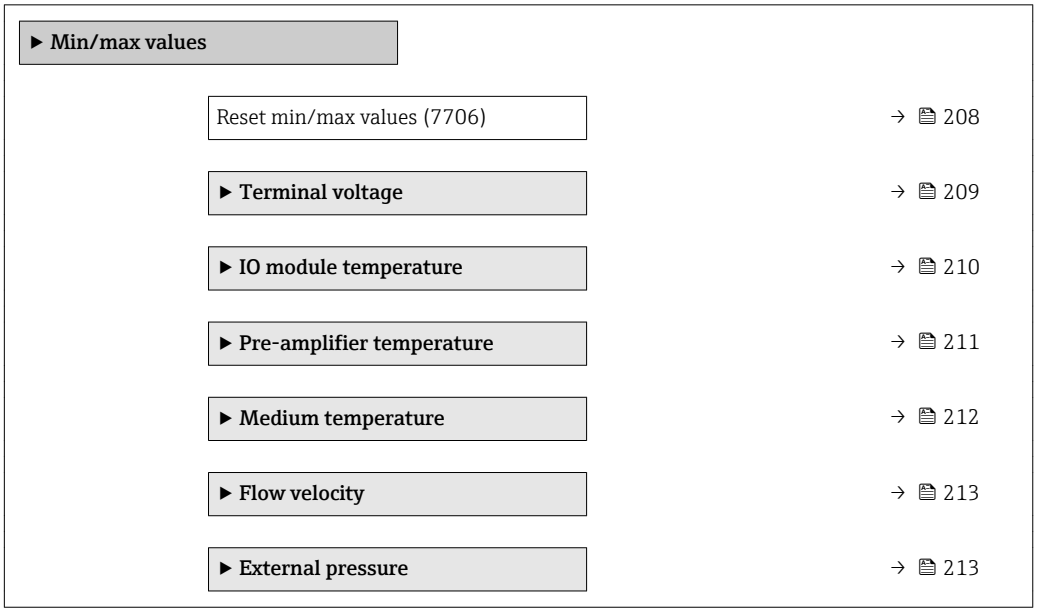
Navigation Expert → Diagnostics → Data logging → Displ.channel 4

Prerequisite A process variable is defined in the **Assign channel 4** parameter.

Description See the **Display channel 1** parameter → 206

3.7.6 "Min/max values" submenu

Navigation Expert → Diagnostics → Min/max val.



Reset min/max values

Navigation Expert → Diagnostics → Min/max val. → Reset min/max (7706)

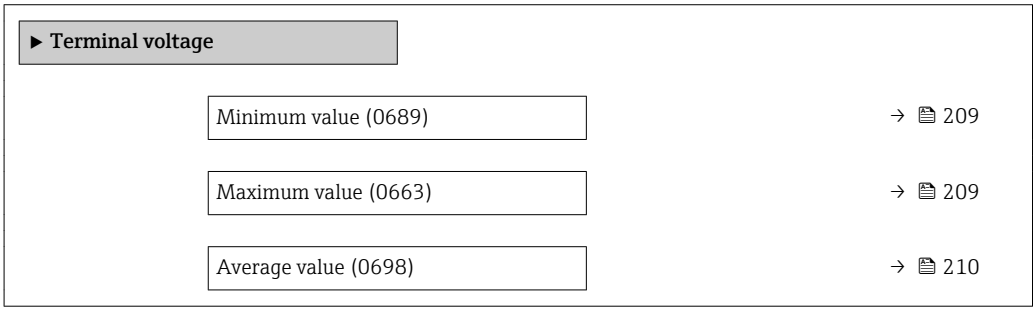
Description Use this function to select measured variables whose minimum, maximum and average measured values are to be reset.

Selection
- Cancel
- Terminal voltage 1
- Temperature
- Flow velocity
- Pressure

Factory setting Cancel

"Terminal voltage" submenu

Navigation Expert → Diagnostics → Min/max val. → Terminal volt.



Minimum value

Navigation Expert → Diagnostics → Min/max val. → Terminal volt. → Minimum value (0689)

Description Use this function to display the smallest previously measured terminal voltage value in Volts.

User interface 0.0 to 50.0 V

Maximum value

Navigation Expert → Diagnostics → Min/max val. → Terminal volt. → Maximum value (0663)

Description Use this function to view the largest previously measured terminal voltage value in Volts.

User interface 0.0 to 50.0 V

Average value

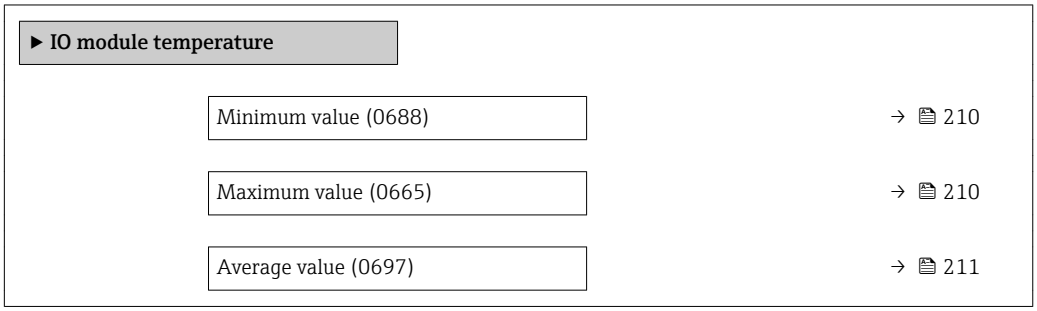
Navigation Expert → Diagnostics → Min/max val. → Terminal volt. → Average value (0698)

Description Use this function to view the average of all previously measured terminal voltage values in Volts.

User interface Signed floating-point number

"IO module temperature" submenu

Navigation Expert → Diagnostics → Min/max val. → IO module temp.



Minimum value

Navigation Expert → Diagnostics → Min/max val. → IO module temp. → Minimum value (0688)

Description Use this function to view the lowest previously measured temperature value of the I/O electronics module.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 72).

Maximum value

Navigation Expert → Diagnostics → Min/max val. → IO module temp. → Maximum value (0665)

Description Use this function to view the highest previously measured temperature value of the I/O electronics module.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 72).

Average value

Navigation Expert → Diagnostics → Min/max val. → IO module temp. → Average value (0697)

Description Use this function to view the average value of all previously measured temperature values of the I/O electronics module.

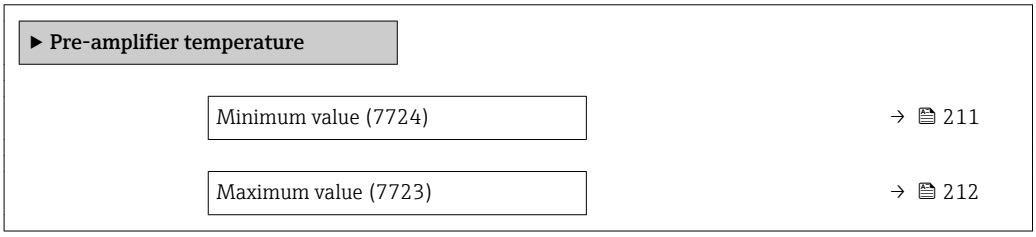
User interface −1 273.15 to 726.85 °C

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 72).

"Pre-amplifier temperature" submenu

Navigation Expert → Diagnostics → Min/max val. → Pre-amplif. temp



Minimum value

Navigation Expert → Diagnostics → Min/max val. → Pre-amplif. temp → Minimum value (7724)

Description Displays the lowest previously measured temperature value of the pre-amplifier module.

User interface 0 to 1 000 °C

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 72).

Maximum value

Navigation Expert → Diagnostics → Min/max val. → Pre-amplif. temp → Maximum value (7723)

Description Displays the highest previously measured temperature value of the pre-amplifier module.

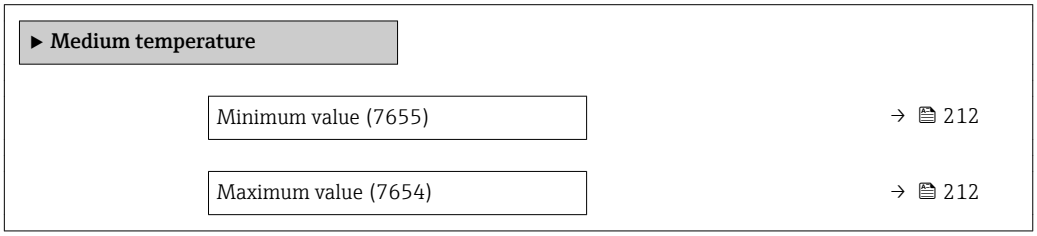
User interface 0 to 1 000 °C

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 72).

"Medium temperature" submenu

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



Minimum value

Navigation Expert → Diagnostics → Min/max val. → Medium temp. → Minimum value (7655)

Description Displays the lowest previously medium temperature.

User interface 0 to 1 000 °C

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 72).

Maximum value

Navigation Expert → Diagnostics → Min/max val. → Medium temp. → Maximum value (7654)

Description Displays the highest previously medium temperature.

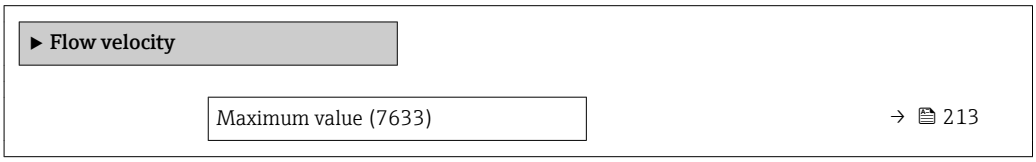
User interface 0 to 1 000 °C

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 72).

"Flow velocity" submenu

Navigation Expert → Diagnostics → Min/max val. → Flow velocity



Maximum value

Navigation Expert → Diagnostics → Min/max val. → Flow velocity → Maximum value (7633)

Description Displays the highest previously measured flow velocity.

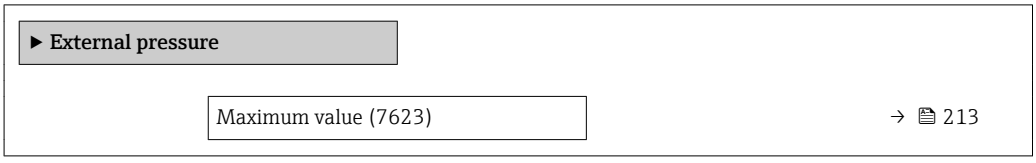
User interface Positive floating-point number

Additional information *Dependency*

The unit is taken from the **Velocity unit** parameter (→ 76)

"External pressure" submenu

Navigation Expert → Diagnostics → Min/max val. → External press.



Maximum value

Navigation Expert → Diagnostics → Min/max val. → External press. → Maximum value (7623)

Description Displays the highest previously measured external pressure.

User interface Positive floating-point number

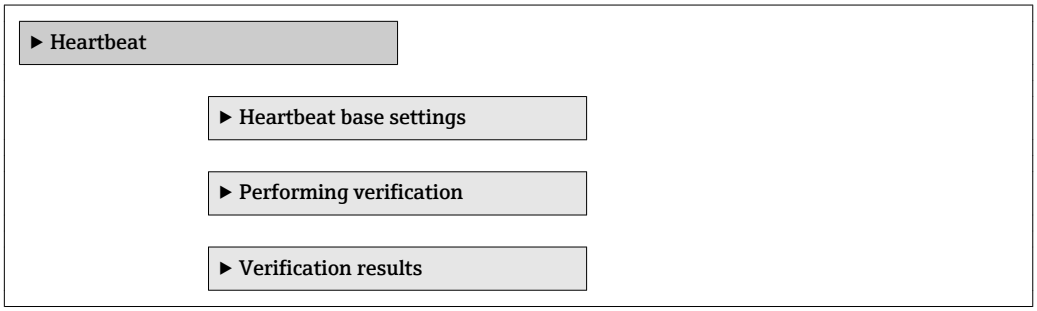
Additional information *Dependency*

The unit is taken from the **Pressure unit** parameter (→ 71)

3.7.7 "Heartbeat" submenu

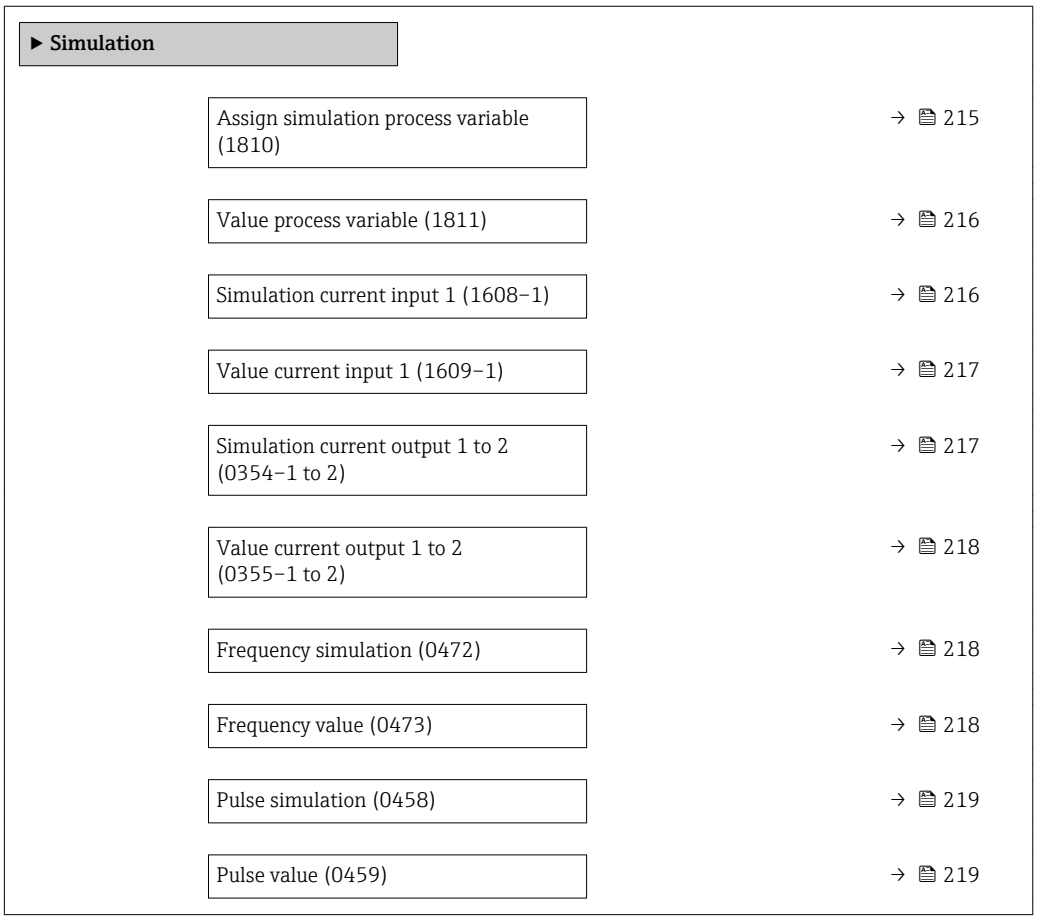
For detailed information on the parameter descriptions of the **Heartbeat Verification** application package, see the Special Documentation for the device

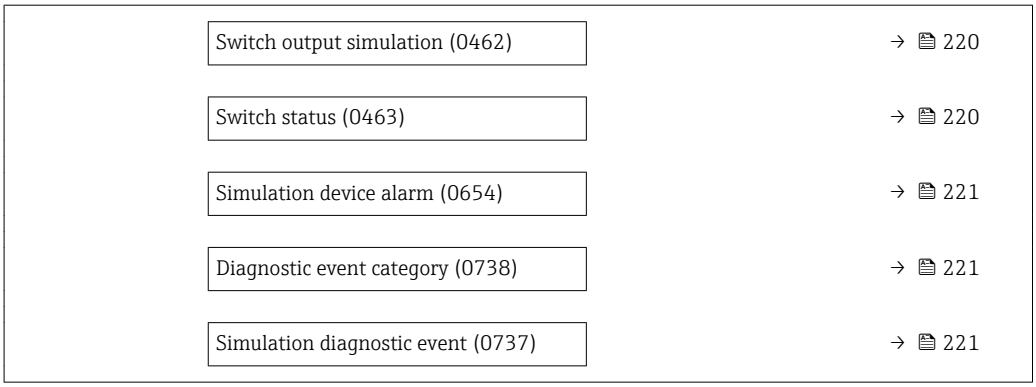
Navigation Expert → Diagnostics → Heartbeat



3.7.8 "Simulation" submenu

Navigation Expert → Diagnostics → Simulation





Assign simulation process variable

Navigation Expert → Diagnostics → Simulation → Assign proc.var. (1810)

Description Use this function to select a process variable for the simulation process that is activated. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.

Selection
- Off
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Condensate mass flow *
- Energy flow
- Heat flow difference *
- Reynolds number

Factory setting Off

Additional information *Description*

The simulation value of the selected process variable is specified in the **Value process variable** parameter (→ 216).

* Visibility depends on order options or device settings

Value process variable

Navigation Expert → Diagnostics → Simulation → Value proc. var. (1811)

Prerequisite One of the following options is selected in the **Assign simulation process variable** parameter (→ 215):
- Volume flow
- Corrected volume flow
- Mass flow
- Flow velocity
- Temperature
- Calculated saturated steam pressure *
- Steam quality *
- Total mass flow *
- Condensate mass flow *
- Energy flow *
- Heat flow difference *
- Reynolds number *

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 (→ 65).

Simulation current input 1

Navigation Expert → Diagnostics → Simulation → Sim.curr.inp 1 (1608–1)

Description Option for switching simulation of the current input on and off. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.

The desired simulation value is specified in the **Value current input** parameter (→ 217).

Selection
- Off
- On

Factory setting Off

* Visibility depends on order options or device settings

Additional information *Options*

- Off
  Current simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.
- On
  Current simulation is active.

Value current input 1

Navigation Expert → Diagnostics → Simulation → Value curr.inp 1 (1609–1)

Prerequisite In the **Simulation current input** parameter (→ 216) the **On** option is selected.

Description Use this function to enter the current value for the simulation. In this way, users can verify the correct configuration of the current input and the correct function of upstream feed-in units.

User entry 3.59 to 22.5 mA

Simulation current output 1 to 2

Navigation Expert → Diagnostics → Simulation → Sim.curr.out. 1 to 2 (0354–1 to 2)

Description Use this function to switch simulation of the current output on and off. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.

Selection

- Off
- On

Factory setting Off

Additional information *Description*

The desired simulation value is specified in the **Value current output 1 to 2** parameter.

Options

- Off
  Current simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.
- On
  Current simulation is active.

Value current output 1 to 2

Navigation Expert → Diagnostics → Simulation → Value curr.out 1 to 2 (0355–1 to 2)

Prerequisite In the **Simulation current output 1 to 2** parameter the **On** option is selected.

Description Use this function to enter a current value for the simulation. In this way, users can verify the correct adjustment of the current output and the correct function of downstream switching units.

User entry 3.59 to 22.5 mA

Factory setting 3.59 mA

Frequency simulation

Navigation Expert → Diagnostics → Simulation → Frequency sim. (0472)

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 139).

Description Use this function to switch simulation of the frequency output on and off. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.

Selection
- Off
- On

Factory setting Off

Additional information

Description

The desired simulation value is defined in the **Frequency value** parameter (→ 218).

Selection
- Off
  Current simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.
- On
  Current simulation is active.

Frequency value

Navigation Expert → Diagnostics → Simulation → Freq. value (0473)

Prerequisite The **On** option is selected in the **Frequency simulation** parameter (→ 218).

Description Use this function to enter a frequency value for the simulation. In this way, users can verify the correct adjustment of the frequency output and the correct function of downstream switching units.

User entry 0.0 to 1 250.0 Hz

Factory setting 0.0 Hz

Pulse simulation

Navigation Expert → Diagnostics → Simulation → Pulse sim. (0458)

Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 139).

Description Use this function to switch simulation of the pulse output on and off. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.

Selection
- Off
- Fixed value
- Down-counting value

Factory setting Off

Additional information

Description

The desired simulation value is defined in the **Pulse value** parameter (→ 219).

Selection
- Off
  Pulse simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.
- Fixed value
  Pulses are continuously output with the pulse width specified in the **Pulse width** parameter (→ 140).
- Down-counting value
  The pulses specified in the **Pulse value** parameter (→ 219) are output.

Pulse value

Navigation Expert → Diagnostics → Simulation → Pulse value (0459)

Prerequisite The **Down-counting value** option is selected in the **Pulse simulation** parameter (→ 219).

Description Use this function to enter a pulse value for the simulation. In this way, users can verify the correct adjustment of the pulse output and the correct function of downstream switching units.

User entry 0 to 65 535

Factory setting 0

Switch output simulation

Navigation Expert → Diagnostics → Simulation → Switch sim. (0462)

Prerequisite The **Switch** option is selected in the **Operating mode** parameter (→ 139).

Description Use this function to switch simulation of the switch output on and off. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.

Selection
- Off
- On

Factory setting Off

Additional information

Description

The desired simulation value is defined in the **Switch status** parameter (→ 220).

Selection

- Off
  Switch simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.
- On
  Switch simulation is active.

Switch status

Navigation Expert → Diagnostics → Simulation → Switch status (0463)

Prerequisite The **On** option is selected in the **Switch output simulation** parameter (→ 220).

Description Use this function to select a switch value for the simulation. In this way, users can verify the correct adjustment of the switch output and the correct function of downstream switching units.

Selection
- Open
- Closed

Factory setting Open

Additional information

Options

- Open
  Switch simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.
- Closed
  Switch simulation is active.

Simulation device alarm

Navigation Expert → Diagnostics → Simulation → Sim. alarm (0654)

Description Use this function to switch the device alarm on and off. In this way, users can verify the correct adjustment of the current output and the correct function of downstream switching units. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.

Selection
- Off
- On

Factory setting Off

Diagnostic event category

Navigation Expert → Diagnostics → Simulation → Event category (0738)

Description Use this function to select the category of the diagnostic events that are displayed for the simulation in the **Simulation diagnostic event** parameter (→ 221).

Selection
- Sensor
- Electronics
- Configuration
- Process

Factory setting Process

Simulation diagnostic event

Navigation Expert → Diagnostics → Simulation → Sim. diag. event (0737)

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

Selection
- Off
- Diagnostic event picklist (depends on the category selected)

Factory setting Off

Additional information *Description*

For the simulation, you can choose from the diagnostic events of the category selected in the **Diagnostic event category** parameter (→ 221).

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	m^3
Volume flow	m^3/h
Corrected volume	Nm^3
Corrected volume flow	Nm^3/h
Energy	kWh
Energy flow	kW
Calorific value (volume)	kJ/Nm^3
Calorific value (mass)	kJ/kg
Velocity	m/s
Density	kg/m^3
Specific volume	m^3/kg
Dynamic viscosity	Pa s
Specific heat capacity	kJ/(kgK)
Temperature	°C
Length	mm
Pressure	bar

4.1.2 Full scale values

The factory settings applie to the following parameters:
- 20 mA value (full scale value of the current output)
- 100% bar graph value 1
- 100% bar graph value 3

Nominal diameter [mm]	Full scale value [m^3/h]
15 25 > 15 40 >> 15	25
25 40 > 25 50 >> 25	125
40 50 > 40 80 >> 40	308
50 80 > 50 100 >> 50	513

Nominal diameter [mm]	Full scale value [m³/h]
80 100 > 80 150 >> 80	1152
100 150 > 100 200 >> 100	1995
150 200 > 150 250 >> 150	4539
200 250 > 200 300 >> 200	8713
250 300 > 250 350 >> 250	13735
300 350 > 300 400 >> 300	19701

4.1.3 Output current span

Current output 1	4 to 20 mA NAMUR
Current output 2	4 to 20 mA NAMUR

4.2 US units

Only valid for USA and Canada.

4.2.1 System units

Mass	lb
Mass flow	lb/min
Volume	ft³
Volume flow	ft³/min
Corrected volume	Sft³
Corrected volume flow	Sft³/min
Density	lb/ft³
Energy	Btu
Energy flow	Btu/h
Calorific value (volume)	Btu/Sft³
Calorific value (mass)	Btu/lb
Velocity	ft/s
Specific volume	ft³/lb
Temperature	°F
Length	in
Pressure	psi

4.2.2 Full scale values

The factory settings applie to the following parameters:
- 20 mA value (full scale value of the current output)
- 100% bar graph value 1
- 100% bar graph value 3

Nominal diameter [in]	Full scale value [ft³/h]
½ 1 > ½ 1½ >> ½	882
1 1½ > 1 2 >> 1	4 414
1½ 2 > 1½ 3 >> 1½	10 876
2 3 > 2 4 >> 2	18 116
3 4 > 3 6 >> 3	40 682
4 6 > 4 8 >> 4	70 452
6 8 > 6 10 >> 6	160 293
8 10 > 8 12 >> 8	307 696
10 12 > 10 14 >> 10	485 046
12 14 > 12 16 >> 12	695 734

4.2.3 Output current span

Current output 1	4 to 20 mA US
Current output 2	4 to 20 mA US

5 Explanation of abbreviated units

5.1 SI units

Process variable	Units	Explanation
Calorific value (volume)	kWh/Nm³, MWh/Nm³, kJ/Nm³, MJ/Nm³	Kilowatt hour, megawatt hour, kilojoule, megajoule/ standard cubic meter
	kWh/Sm³, MWh/Sm³, kJ/Sm³, MJ/Sm³	Kilowatt hour, megawatt hour, kilojoule, megajoule/ standard cubic meter
Calorific value (mass)	kWh/kg, MWh/kg, kJ/kg, MJ/kg	Kilowatt hour, megawatt hour, kilojoule, megajoule/ kilogram
Density	g/cm³	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, kPa, MPa	Pascal, kilopascal, megapascal
	mbar a	Millibar (absolute)
	bar, torr, atm	Bar, torr, physical atmosphere
	gf/cm², kgf/cm²	Gram force, kilogram force/square centimeter
Dynamic viscosity	Pa s	Pascal second
	cP, P	Centipoise, poise
Energy	kWh, MWh, GWh	Kilowatt hour, megawatt hour, gigawatt hour
	kJ, MJ, GJ	Kilojoule, megajoule, gigajoule
	kcal, Mcal, Gcal	Kilocalories, megacalories, gigacalories
Energy flow	kW, MW, GW	Kilowatt, megawatt
	kJ/s, kJ/min, kJ/h, kJ/d	Kilojoule/time unit
	MJ/s, MJ/min, MJ/h, MJ/d	Megajoule/time unit
	GJ/s, GJ/min, GJ/h, GJ/d	Gigajoule/time unit
	kcal/s, kcal/min, kcal/h, kcal/d	Kilocalories/time unit
	Mcal/s, Mcal/min, Mcal/h, Mcal/d	Megacalories/time unit
	Gcal/s, Gcal/min, Gcal/h, Gcal/d	Gigacalories/time unit
Velocity	m/s	Meter/time unit
Length	mm, m	Millimeter, meter
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
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

Process variable	Units	Explanation
Specific heat capacity	kJ/(kgK), MJ/(kgK)	Kilojoule, megajoule/kilogram Kelvin
	kWh/(kgK)	Kilowatt hour/kilogram Kelvin
	kcal/(kgK)	Kilocalories/kilogram Kelvin
Temperature	°C , °F, K, °R	Celsius, Fahrenheit, Kelvin, Rankine
Volume	cm^3, dm^3, m^3	Cubic centimeter, cubic decimeter, cubic meter
	ml, l	Milliliter, liter
Volume flow	cm^3/s , cm^3/min, cm^3/h, cm^3/d	Cubic centimeter/time unit
	dm^3/s, dm^3/min, dm^3/h, dm^3/d	Cubic decimeter/time unit
	m^3/s, m^3/min, m^3/h, m^3/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
Time	s, min, h, d	Second, minute, hour, day

5.2 US units

Process variable	Units	Explanation
Calorific value (mass)	kWh/lb, MWh/lb, kJ/lb, MJ/lb	Kilowatt hour, kilojoule, British thermal unit, thousand British thermal units/pound
Density	lb/ft^3, 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
Pressure	psi a	Psi absolute
Velocity	ft/s	Foot/time unit
Length	in, ft	Inch, foot
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
Corrected volume	Sft^3	Standard cubic foot
Corrected volume flow	Sft^3/s, Sft^3/min, Sft^3/h, Sft^3/d	Standard cubic foot/time unit
Temperature	°C , °F, K, °R	Celsius, Fahrenheit, Kelvin, Rankine
Volume	af	Acre foot
	ft^3	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
	ft^3/s, ft^3/min, ft^3/h, ft^3/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

Process variable	Units	Explanation
	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, min, h, d	Second, minute, hour, day

5.3 Imperial units

Process variable	Units	Explanation
Calorific value (volume)	Btu/Sm^3, MBtu/Sm^3	British thermal unit, thousand British thermal units/ standard cubic meter
	Btu/Sft^3, MBtu/Sft^3	British thermal unit, thousand British thermal units/ standard cubic foot
Calorific value (mass)	Btu/lb, MBtu/lb	British thermal unit, thousand British thermal units/ pound
Density	lb/gal (imp), lb/bbl (imp;beer), lb/bbl (imp;oil)	Pound/volume unit
Energy	Btu, MBtu, MMBtu	British thermal unit, thousand British thermal units, million British thermal units
Energy flow	Btu/s, Btu/min, Btu/h, Btu/day	British thermal unit/time unit
	MBtu/s, MBtu/min, MBtu/h, MBtu/d	Thousand British thermal units/time unit
	MMBtu/s, MMBtu/min, MMBtu/h, MMBtu/d	Million British thermal units/time unit
Specific heat capacity	Btu/(lb °R)	British thermal unit/pound degree Rankine
Temperature	°C , °F, K, °R	Celsius, Fahrenheit, Kelvin, Rankine
Volume	gal (imp), Mgal (imp), bbl (imp;beer), bbl (imp;oil)	Gallon, mega gallon, 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, min, h, d	Second, minute, hour, day

5.4 Other units

Process variable	Units	Explanation
Pressure	mmH2O (4°C)	Millimeter of water column (4 °C)
	mmH2O (68°F)	Millimeter of water column (68 °F)
	mmHg (0°C)	Millimeter of mercury column (0 °C)
	inH2O (4°C)	Inch of water column (4 °C)
	inH2O (68°F)	Inch of water column (68 °F)
	ftH2O (68°F)	Foot of water column (68 °F)
	inHg (0°C)	Inch of mercury (0 °C)
Specific volume	m^3/kg	Cubic meter/kilogram
	ft^3/lb	Cubic foot/pound

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