GP01010D/06/EN/04.18
71399887
2018-08-01

Valid as of version
01.04.zz (Device firmware)

Description of Device Parameters
Proline Promass 200
HART

Coriolis flowmeter

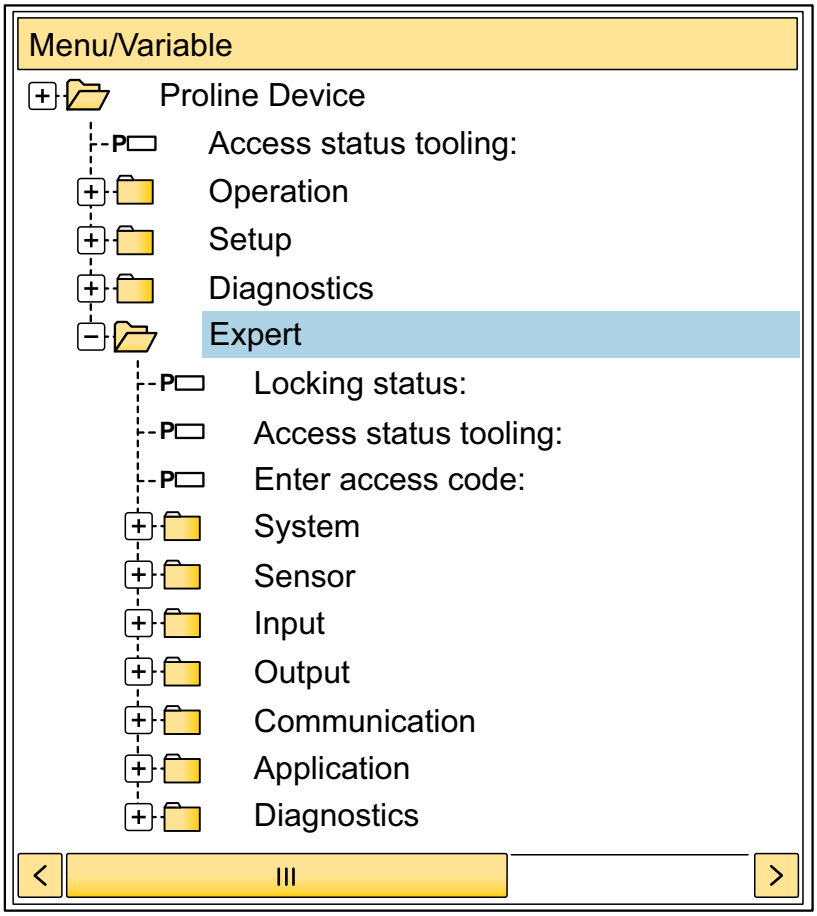

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Table of contents

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.

It is used to perform tasks that require detailed knowledge of the function of the device:
- Commissioning measurements under difficult conditions
- Optimal adaptation of the measurement to difficult conditions
- Detailed configuration of the communication interface
- Error diagnostics in difficult cases

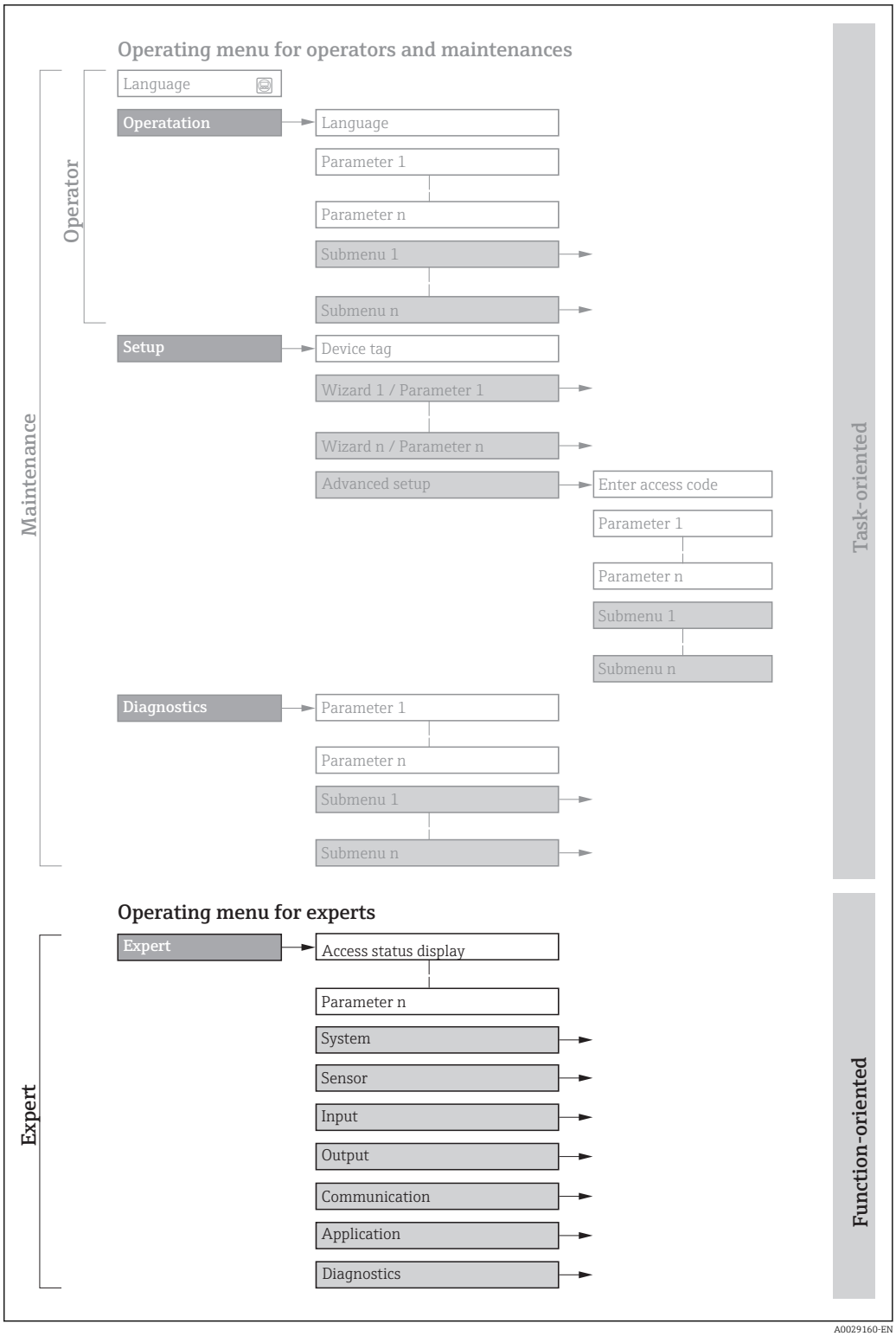
1.2 Target group

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), which is displayed when the **"Maintenance" user role** is enabled.



1 *Sample graphic for the schematic layout of the operating menu*

Additional information regarding:
- The arrangement of the parameters according to the menu structure of the **Operation** menu, **Setup** menu, **Diagnostics** menu with a brief description: Operating Instructions → 7
- Operating concept of the operating menus: Operating Instructions → 7

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

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

User entry
Input range for the parameter

User interface
Display value/data for the parameter

Factory setting
Default setting ex works

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

1.4 Symbols used

1.4.1 Symbols for certain types of information

Symbol	Meaning
	Tip Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
	Operation via 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		

1.5 Documentation

1.5.1 Standard documentation

Operating Instructions

Measuring device	Documentation code
Promass 8A2B**-...	BA01821D
Promass 8E2B**–...	BA01027D
Promass 8E2C**–...	BA01638D
Promass 8F2B**–...	BA01112D

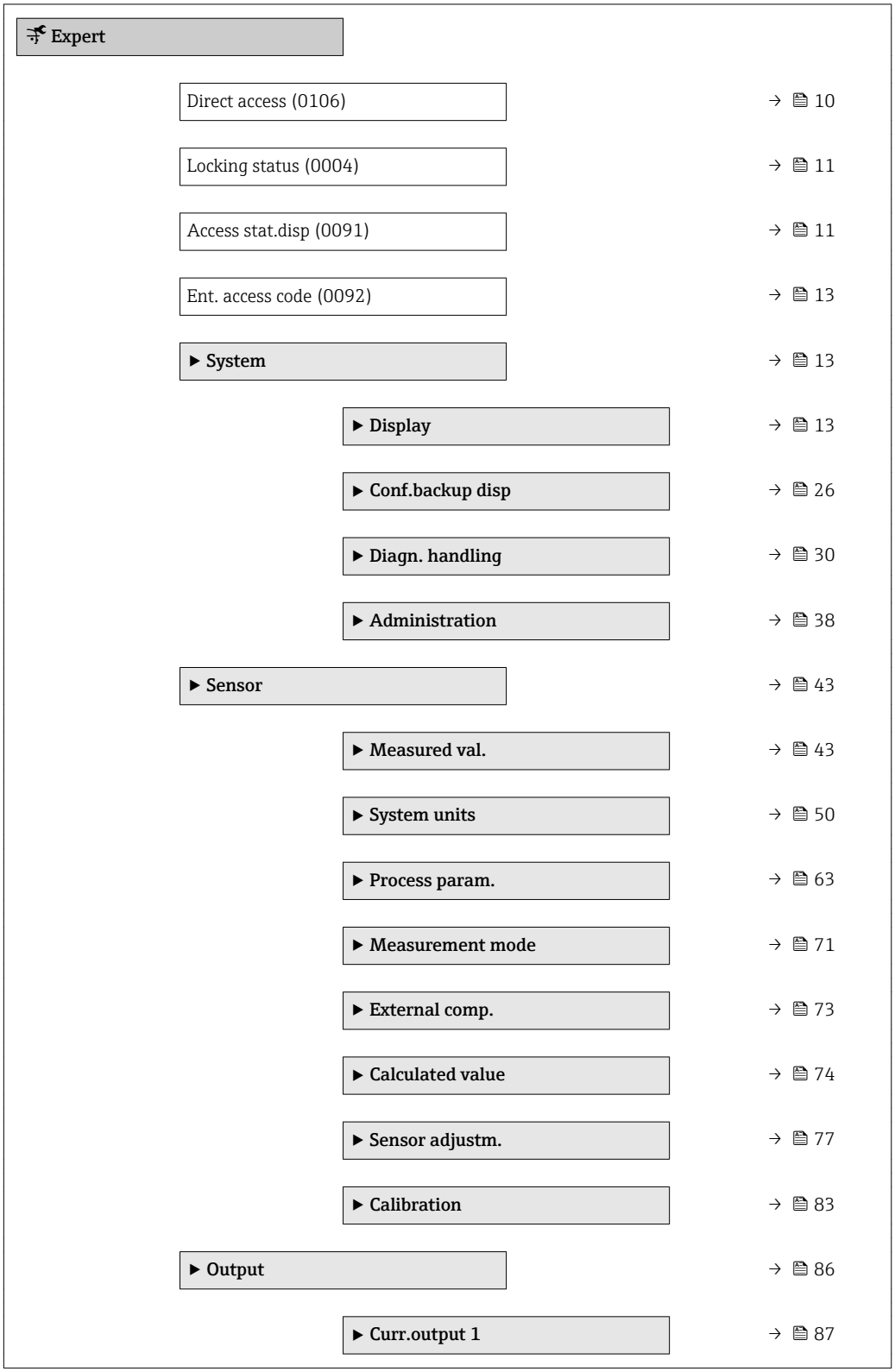
1.5.2 Supplementary device-dependent documentation

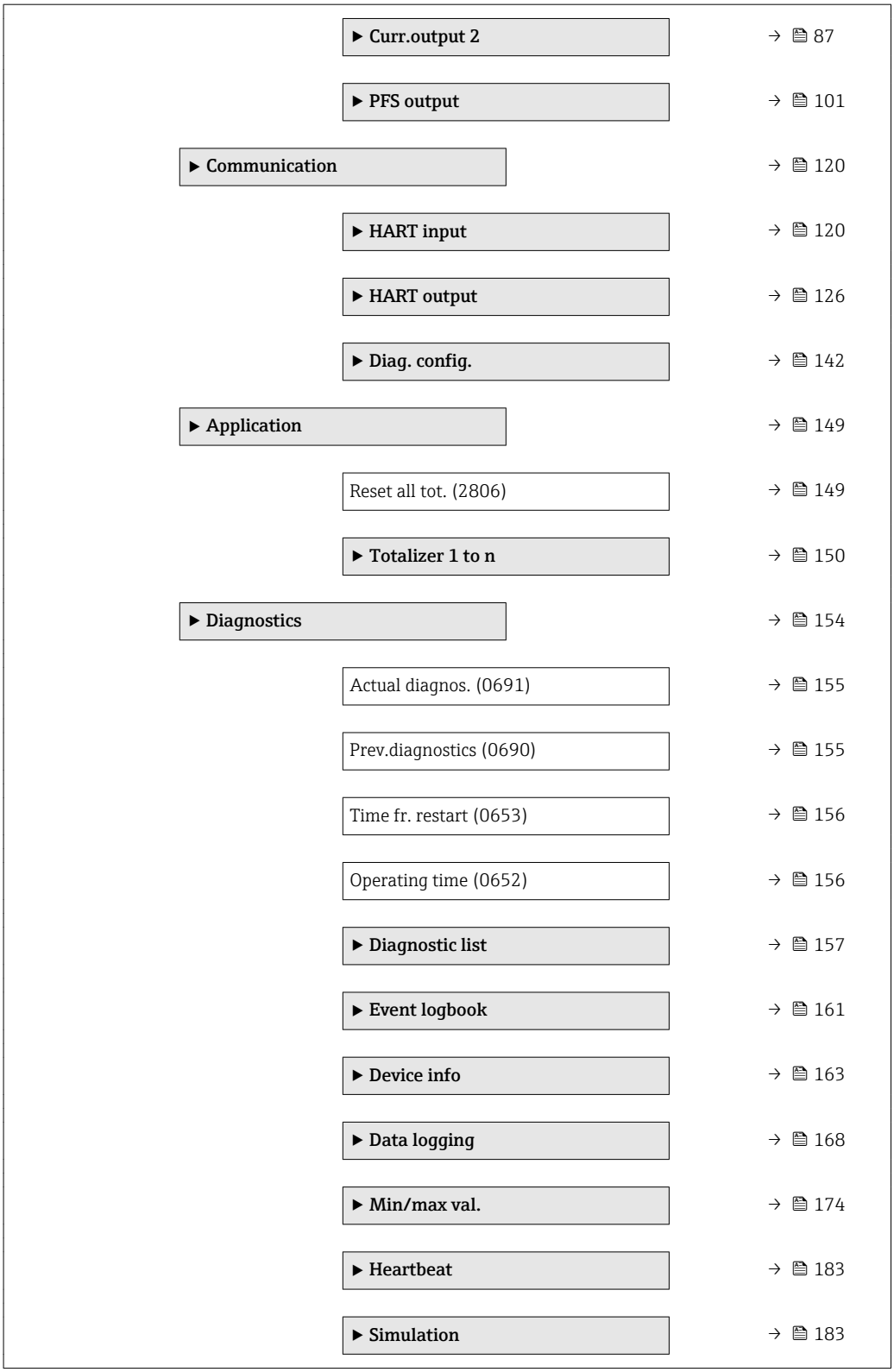
Special Documentation

Content	Documentation code
Information on the Pressure Equipment Directive	SD01614D
Functional Safety Manual	SD00147D
Display and operating module FHX50	SD01007F
Heartbeat Technology	SD01849D

2 Overview of the Expert operating menu

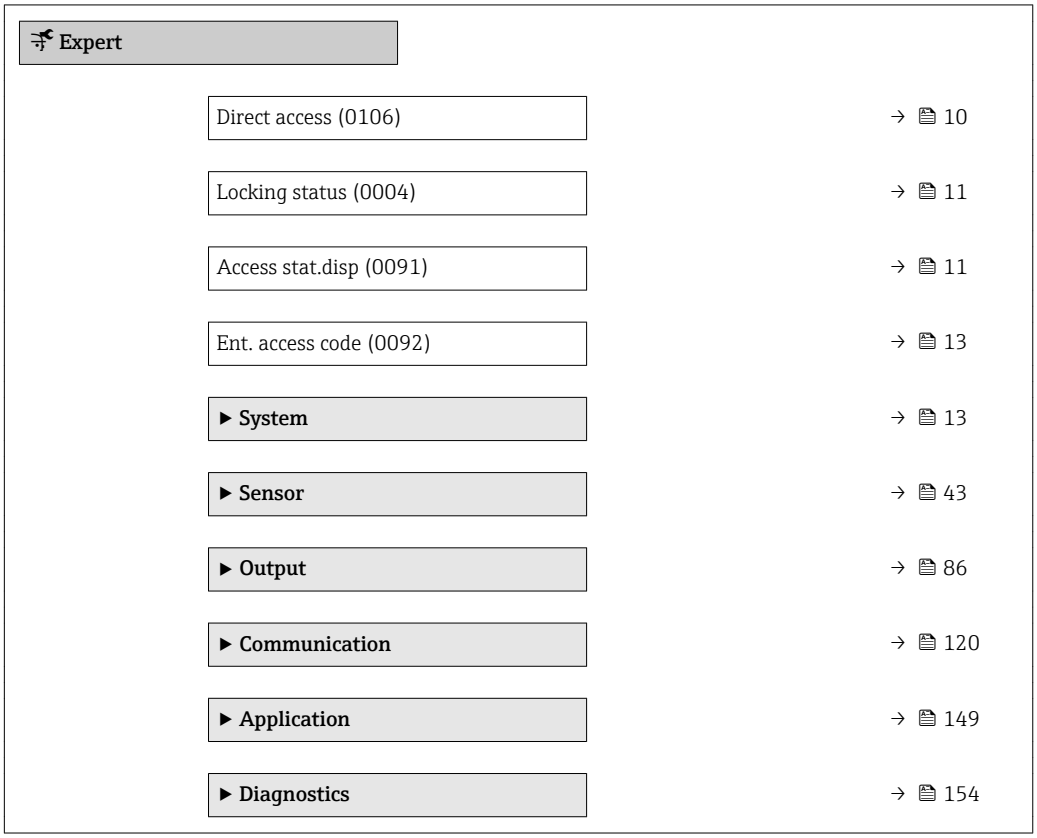
The following table provides an overview of the menu structure of the expert operating menu and its parameters. The page reference indicates where the associated description of the submenu or parameter can be found.




▶ Curr.output 2 → 87
▶ PFS output → 101
▶ Communication → 120
▶ HART input → 120
▶ HART output → 126
▶ Diag. config. → 142
▶ Application → 149
Reset all tot. (2806) → 149
▶ Totalizer 1 to n → 150
▶ Diagnostics → 154
Actual diagnos. (0691) → 155
Prev.diagnostics (0690) → 155
Time fr. restart (0653) → 156
Operating time (0652) → 156
▶ Diagnostic list → 157
▶ Event logbook → 161
▶ Device info → 163
▶ Data logging → 168
▶ Min/max val. → 174
▶ Heartbeat → 183
▶ Simulation → 183

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

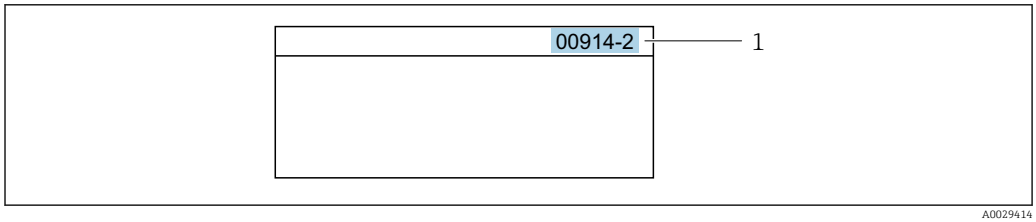
Navigation Expert → Direct access (0106)

Description Use this function to enter the access code to enable direct access to the desired parameter via the local display. A parameter number is assigned to each parameter for this purpose.

User entry 0 to 65 535

Additional information *User entry*

The direct access code consists of a 5-digit number (at maximum) and the channel number, which identifies the channel of a process variable: e.g. 00914-2. In the navigation view, this appears on the right-hand side in the header of the selected parameter.



1 Direct access code

Note the following when entering the direct access code:
- The leading zeros in the direct access code do not have to be entered.
  Example: Enter **"914"** instead of **"00914"**
- If no channel number is entered, channel 1 is accessed automatically.
  Example: Enter **00914** → **Assign variable** parameter
- If a different channel is accessed: Enter the direct access code with the corresponding channel number.
  Example: Enter **00914-2** → **Assign variable** parameter

Locking status

Navigation Expert → Locking status (0004)

Description Displays the active write protection.

User interface
- Hardware locked
- SIL locked
- Temp. locked

Additional information *Display*

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 displayed.

Detailed 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 → 7

Selection

Options	Description
None	The access status displayed in the **Access stat.disp** parameter (→ 11) applies . Only appears on local display.
Hardware locked (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) .
SIL locked (priority 2)	The SIL mode is enabled. This locks write access to the parameters (e.g. via local display or operating tool).
Temp. locked (priority 3) (priority 2)	Write access to the parameters is temporarily locked on account of internal processes running in the device (e.g. data upload/download, reset etc.). Once the internal processing has been completed, the parameters can be changed once again.

Access stat.disp

Navigation Expert → Access stat.disp (0091)

Prerequisite A local display is provided.

Description Displays 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 **Ent. access code** parameter (→ 13).

For information about the **Ent. access code** parameter (→ 13): see the "Disabling write protection via the access code" section of the Operating Instructions for the device → 7

If additional write protection is active, this restricts the current access authorization even further.

Display

Detailed 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 → 7

Access stat.tool

Navigation
Expert → Access stat.tool (0005)

Description
Displays 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 **Ent. access code** parameter (→ 13).

If additional write protection is active, this restricts the current access authorization even further.

Display

Detailed 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 → 7

Ent. 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

Ent. access code

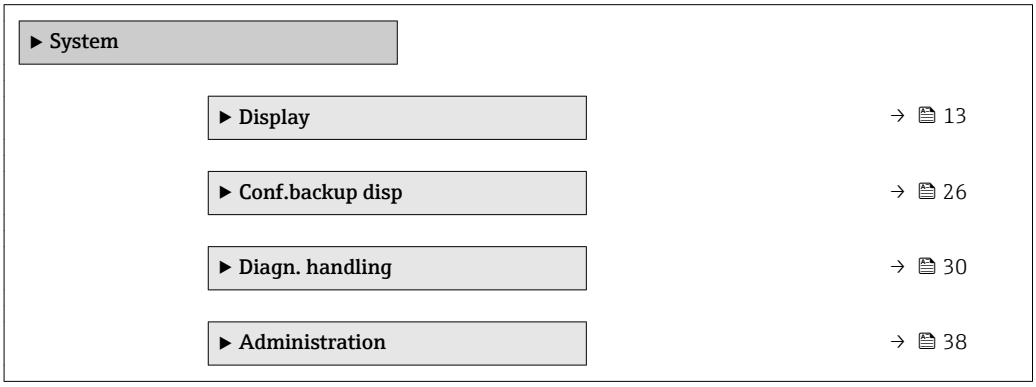
Navigation Expert → Ent. access code (0003)

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

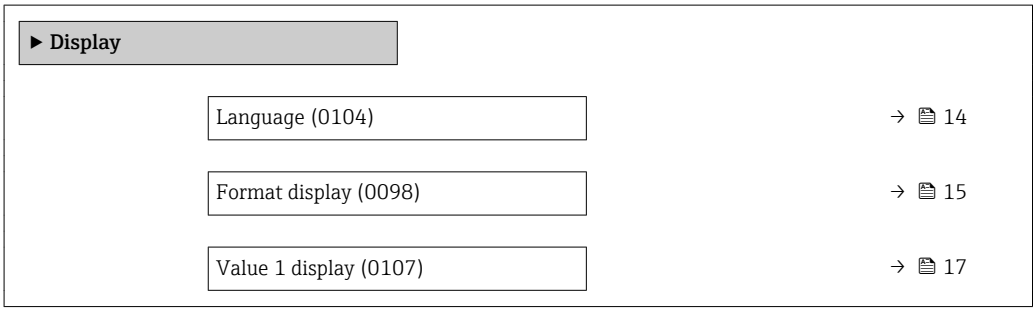
3.1 "System" submenu

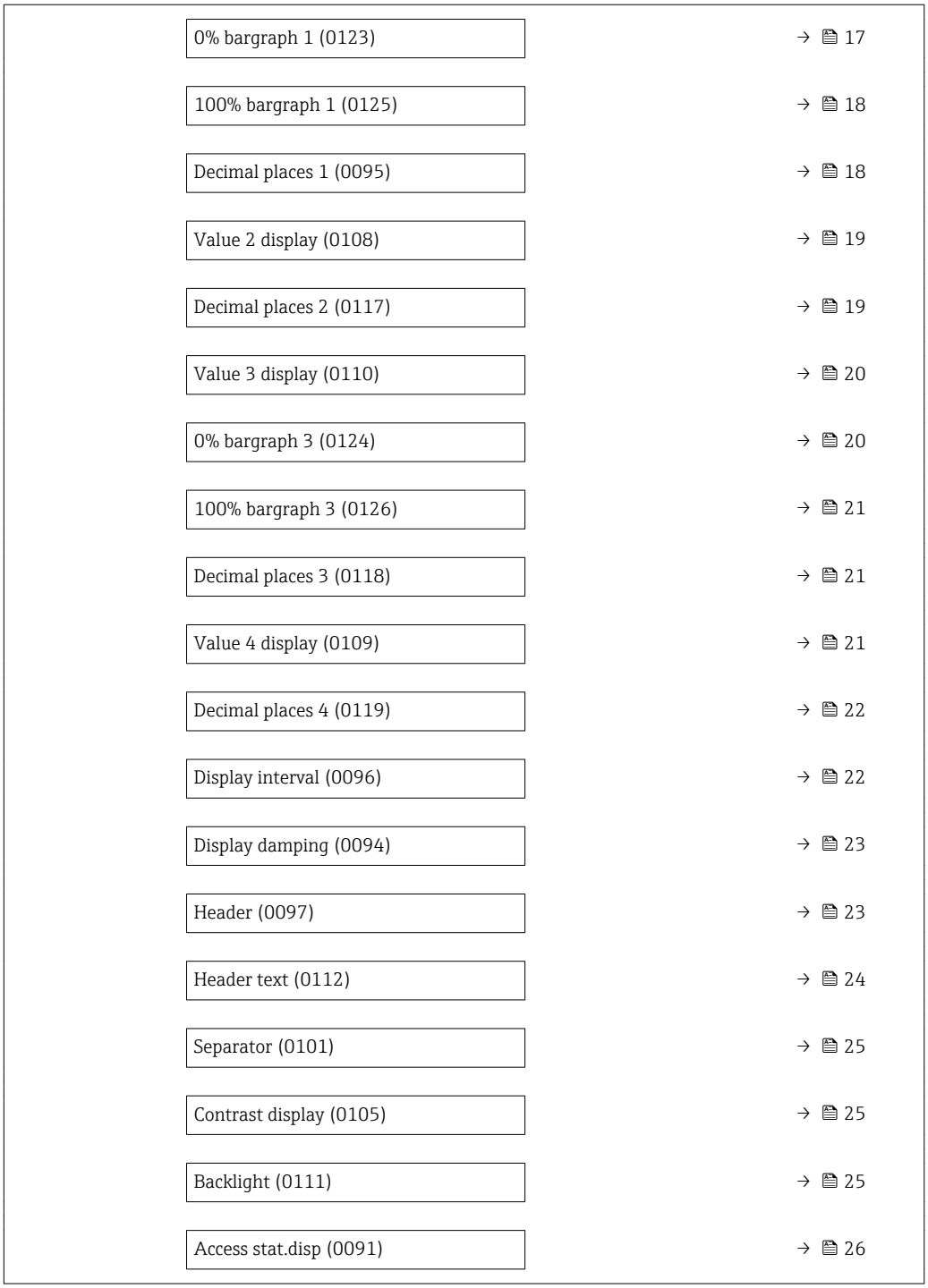
Navigation Expert → System



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(Ru) *
- Svenska *
- Türkçe *
- 中文 (Chinese) *
- 日本語 (Japanese) *
- 한국어 (Korean) *
- Bahasa Indonesia *
- tiếng Việt (Vit) *
- 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.
- Bargr. + 1 value
- 2 values
- Val. large+2val.
- 4 values

Factory setting 1 value, max.

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) to **Value 4 display** parameter (→ 21) are used to specify which measured values are shown on the local display and in what 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 via the **Display interval** parameter (→ 22).

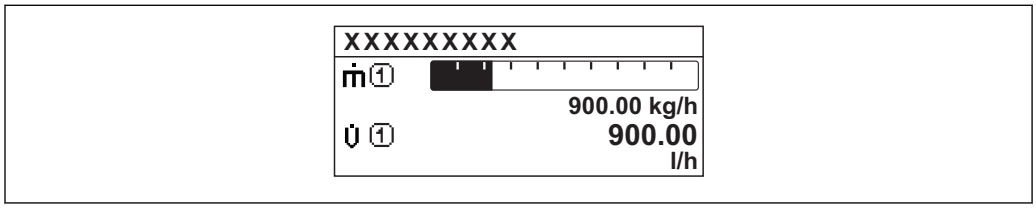
* Visibility depends on order options or device settings

Possible measured values shown on the local display:

"1 value, max." option

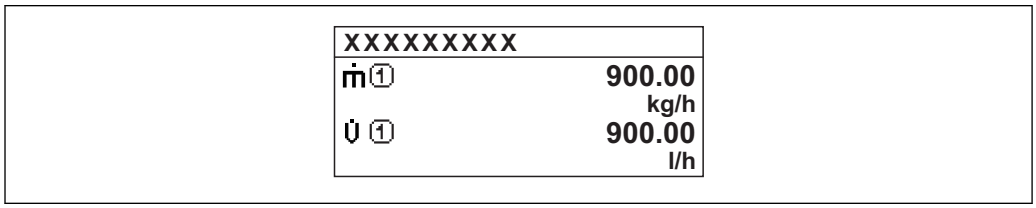
A0013099

"Bargr. + 1 value" option



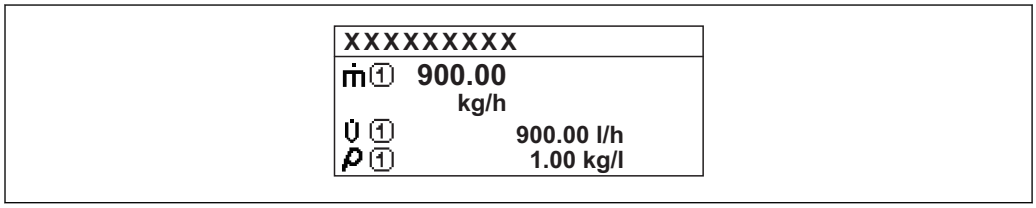
A0013098

"2 values" option



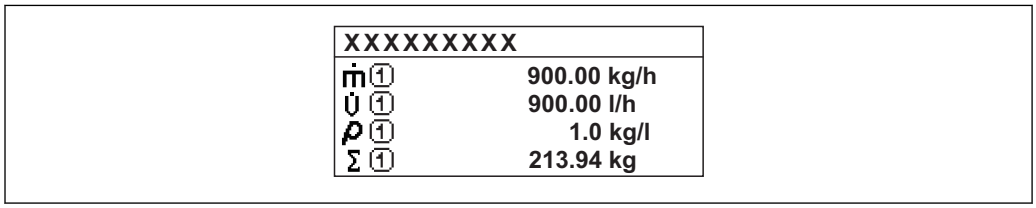
A0013100

"Val. large+2val." option



A0013102

"4 values" option



A0013103

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
- None
- Mass flow
- Volume flow
- Correct.vol.flow
- Density
- Ref.density
- Temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Curr.output 1
- Curr.output 2 *

Factory setting Mass 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.

Dependency

The unit of the displayed measured value is taken from the **System units** submenu (→ 50).

0% bargraph 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 kg/h
- 0 lb/min

* Visibility depends on order options or device settings

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 (→ 50).

100% bargraph 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 → 190

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 (→ 50).

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 For the picklist, see the **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.

Dependency

The unit of the displayed measured value is taken from the **System units** submenu (→ 50).

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 For the picklist, see the **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 (→ 50).

0% bargraph 3

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

Prerequisite A selection was made 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 Country-specific:
- 0 kg/h
- 0 lb/min

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 (→ 50).

100% bargraph 3

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

Prerequisite A selection was made 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 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 (→ 50).

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 For the picklist, see the **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 (→ 50).

Decimal places 4

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

Prerequisite A measured value is specified in the **Value 4 display** parameter (→ 21).

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) to **Value 4 display** parameter (→ 21) are used to specify which measured values are shown on the local 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 a time constant for 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 0.0 s

Additional information *User entry*

Use this function to enter a time constant (PT1 element [1]) for display damping:
- 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.

Damping is switched off if **0** is entered (factory setting).

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

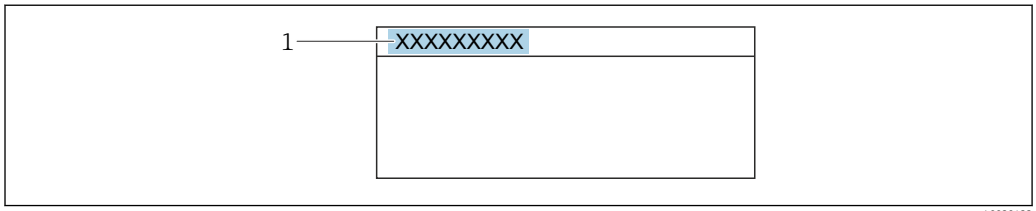
Factory setting Device tag

1) proportional transmission behavior with first order delay

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 (→ 164).
- Free text
  Is defined in the **Header text** parameter (→ 24).

Header text

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

Prerequisite In the **Header** parameter (→ 23), the **Free text** option is selected.

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

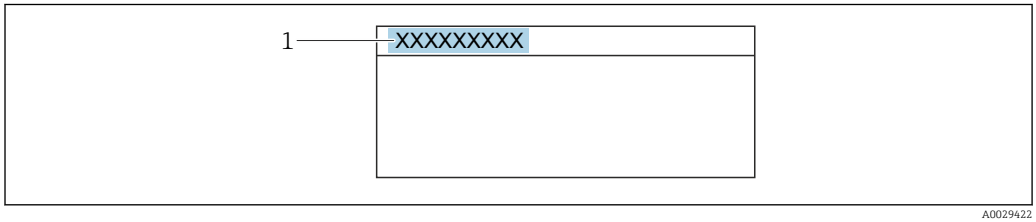
User entry Max. 12 characters such as letters, numbers or special characters (e.g. @, %, /)

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 Use this function to switch the backlight of the local display on and off.

Selection
- Disable
- Enable

Factory setting Disable

Access stat.disp

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

Prerequisite A local display is provided.

Description Displays 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 **Ent. access code** parameter (→ 13).

For information about the **Ent. access code** parameter (→ 13): see the "Disabling write protection via the access code" section of the Operating Instructions for the device → 7

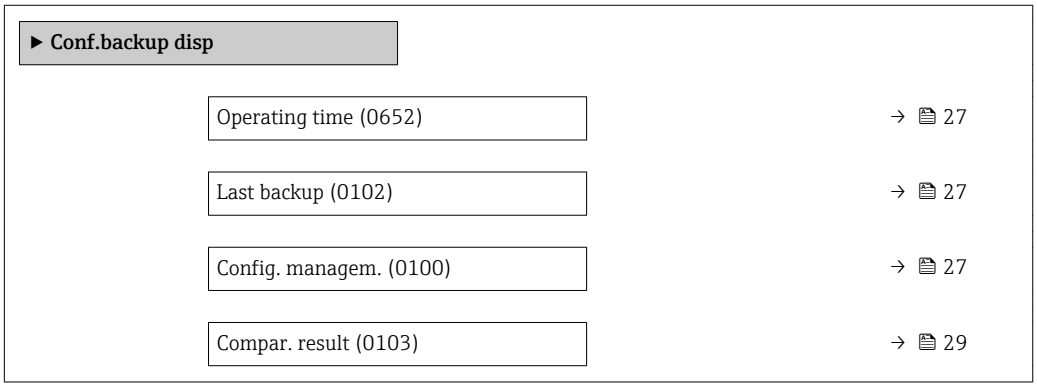
If additional write protection is active, this restricts the current access authorization even further.

Display

Detailed 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 → 7

3.1.2 "Conf.backup disp" 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)

Config. managem.

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

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: **Backup state** parameter (→ 28)

Selection

Options	Description
Cancel	No action is executed and the user exits the parameter.
Execute backup	A backup copy of the current device configuration is saved from the HistoROM backup 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 restored from the display module to the device's HistoROM backup. The backup copy includes the transmitter data of the device. The following message appears on local display: Restore active! Do not interrupt power supply!
Compare	The device configuration saved in the display module is compared with the current device configuration of the HistoROM backup. The following message appears on local display: Comparing files The result can be viewed in **Compar. result** parameter (→ 29).
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!
Clear backup	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 progr.
- Restore in progr
- Import in progr.
- Delete in progr.
- Comp. in progr.

Factory setting None

Compar. 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
- Set. identical
- Set. not ident.
- No backup
- Backup corrupt
- Check not done
- Dataset incomp.

Factory setting Check not done

Additional information

Description

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

Selection

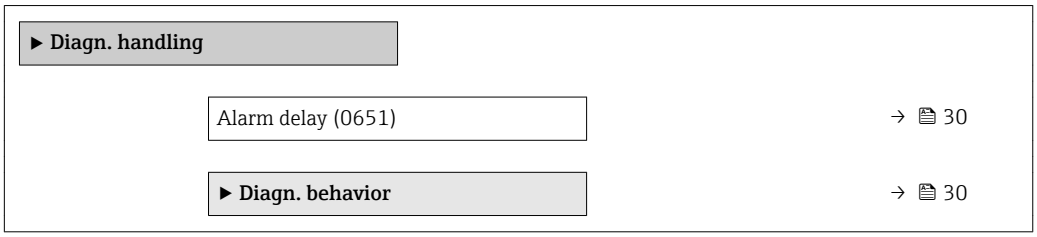
- Set. identical
  - The current device configuration of the HistoROM is identical to the backup copy in the display module.
  - If the transmitter configuration of another device has been copied to the device via the display module and the **Duplicate** option in the **Config. managem.** parameter (→ 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.
- Set. not ident.
  The current device configuration of the HistoROM is not identical to the backup copy in the display module.
- No backup
  There is no backup copy of the device configuration of the HistoROM in the display module.
- Backup 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 incomp.
  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 "Diagn. 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.

The diagnostic message is reset without a time delay.

User entry 0 to 60 s

Factory setting 0 s

Additional information *Description*

This setting affects the following diagnostic messages:
- 046 Sensor limit
- 140 Sensor signal
- 830 Sensor temp.
- 831 Sensor temp.
- 832 Electronic temp.
- 833 Electronic temp.
- 834 Process temp.
- 835 Process temp.
- 910 Tube not oscill.
- 912 Medium inhomog.
- 913 Medium unsuitab.

"Diagn. behavior" submenu

Each item of diagnostic information is assigned a specific diagnostic behavior at the factory. The user can change this assignment for specific diagnostic information in the **Diagn. behavior** submenu (→ 30).

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

Options	Description
Alarm	The device stops measurement. The signal outputs and totalizers assume the defined alarm condition. A diagnostic message is generated. For local display with touch control: the background lighting changes to red.
Warning	The device continues to measure. The signal outputs and totalizers are not affected. A diagnostic message is generated.
Logbook only	The device continues to measure. The diagnostic message is displayed only in the **Event logbook** submenu (→ 161) (**Event list** submenu (→ 162)) and is not displayed in alternation with the operational display.
Off	The diagnostic event is ignored, and no diagnostic message is generated or entered.

For a list of all the diagnostic events, see the Operating Instructions for the device → 7

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

► **Diagn. behavior**

Diagnostic no. 046 (0655)	→ 32
Diagnostic no. 140 (0723)	→ 32
Diagnostic no. 274 (0725)	→ 32
Diagnostic no. 441 (0657)	→ 33
Diagnostic no. 442 (0658)	→ 33
Diagnostic no. 443 (0659)	→ 34
Diagnostic no. 801 (0660)	→ 34
Diagnostic no. 830 (0715)	→ 34
Diagnostic no. 831 (0716)	→ 35
Diagnostic no. 832 (0675)	→ 35
Diagnostic no. 833 (0676)	→ 35
Diagnostic no. 834 (0677)	→ 36
Diagnostic no. 835 (0678)	→ 36
Diagnostic no. 862 (0679)	→ 37

Diagnostic no. 912 (0720)	→ 37
Diagnostic no. 913 (0717)	→ 37

Diagnostic no. 046 (Sensor limit)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 046 (0655)

Description Option for changing the diagnostic behavior of the diagnostic message ⚠**046 Sensor limit**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 30→ 31

Diagnostic no. 140 (Sensor signal)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 140 (0723)

Description Option for changing the diagnostic behavior of the diagnostic message **140 Sensor signal**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 30→ 31

Diagnostic no. 274 (Main electronic)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 274 (0725)

Description Option for changing the diagnostic behavior of the diagnostic message **274 Main electronic**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 30→ 31

Diagnostic no. 441 (Curr.output 1 to n)

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

Description Option for changing the diagnostic behavior of the diagnostic message **441 Curr.output 1 to n**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information *Selection*

Detailed description of the options available for selection: → 30→ 31

Diagnostic no. 442 (Freq. output)

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

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

Description Option for changing the diagnostic behavior of the diagnostic message **442 Freq. output**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information *Selection*

Detailed description of the options available for selection: → 30→ 31

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 Option for changing the diagnostic behavior of the diagnostic message **443 Pulse output**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information *Selection*

Detailed description of the options available for selection: → 30→ 31

Diagnostic no. 801 (Supply voltage)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 801 (0660)

Description Option for changing the diagnostic behavior of the diagnostic message **801 Supply voltage**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information *Selection*

Detailed description of the options available for selection: → 30→ 31

Diagnostic no. 830 (Sensor temp.)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 830 (0715)

Prerequisite If the carrier tube temperature is available (applies only to Promass F).

Description Option for changing the diagnostic behavior of the diagnostic message **830 Sensor temp.**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 30→ 31

Diagnostic no. 831 (Sensor temp.)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 831 (0716)

Prerequisite If the carrier tube temperature is available (applies only to Promass F).

Description Option for changing the diagnostic behavior of the diagnostic message **831 Sensor temp.**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 30→ 31

Diagnostic no. 832 (Electronic temp.)

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

Description Option for changing the diagnostic behavior of the diagnostic message **832 Electronic temp.**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information *Selection*

Detailed description of the options available for selection: → 30→ 31

Diagnostic no. 833 (Electronic temp.)

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

Description Option for changing the diagnostic behavior of the diagnostic message **833 Electronic temp.**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information *Selection*

Detailed description of the options available for selection: → 30→ 31

Diagnostic no. 834 (Process temp.)

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

Description Option for changing the diagnostic behavior of the diagnostic message **834 Process temp.**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information *Selection*

Detailed description of the options available for selection: → 30→ 31

Diagnostic no. 835 (Process temp.)

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

Description Option for changing the diagnostic behavior of the diagnostic message **835 Process temp.**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information *Selection*

Detailed description of the options available for selection: → 30→ 31

Diagnostic no. 862 (Empty pipe)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 862 (0679)

Description Option for changing the diagnostic behavior of the diagnostic message **862 Empty pipe**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 30→ 31

Diagnostic no. 912 (Medium inhomog.)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 912 (0720)

Description Option for changing the diagnostic behavior of the diagnostic message **912 Medium inhomog.**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 30→ 31

Diagnostic no. 913 (Medium unsuitab.)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 913 (0717)

Description Option for changing the diagnostic behavior of the diagnostic message **913 Medium unsuitab.**.

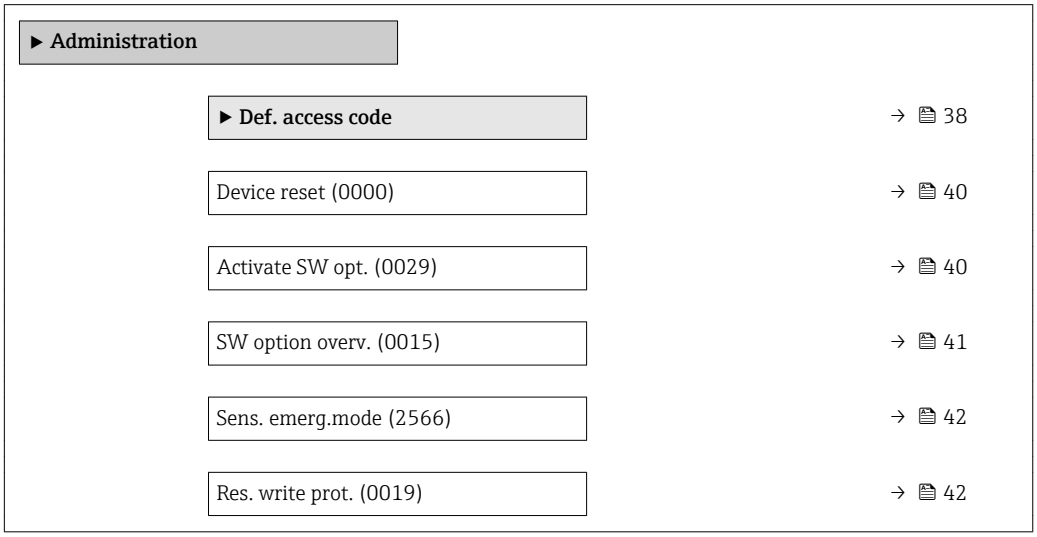
Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 30→ 31

3.1.4 "Administration" submenu

Navigation Expert → System → Administration

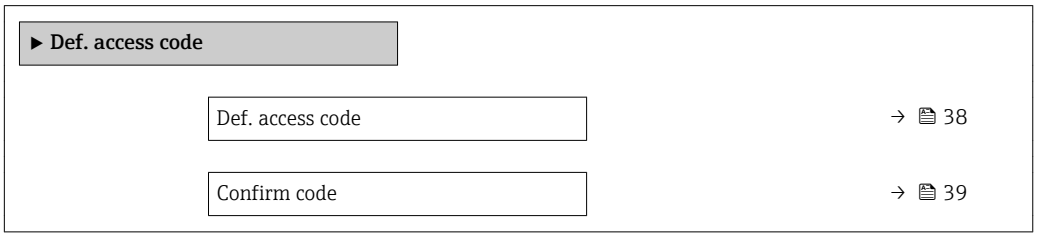


"Def. access code" wizard

The **Def. access code** wizard (→ 38) is only available when operating via the local display.

If operating via the operating tool, the **Def. access code** parameter (→ 39) can be found directly in the **Administration** submenu. There is no **Confirm code** parameter if the device is operated via the operating tool.

Navigation Expert → System → Administration → Def. access code



Def. 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 **Ent. access code** parameter (→ 13).

If you lose the access code, please contact your Endress+Hauser sales organization.

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 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

Def. access code 🔒

Navigation Expert → System → Administration → 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 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 **Ent. access code** parameter (→ 13).

If you lose the access code, please contact your Endress+Hauser sales organization.

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 fact.defaults
- To delivery set.
- Restart device

Factory setting Cancel

Additional information

Selection

Options	Description
Cancel	No action is executed and the user exits the parameter.
To fact.defaults	Every parameter is reset to its factory setting.
To delivery set.	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	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 opt.

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 Max. 10-digit string consisting of numbers.

Factory setting Depends on the software option ordered

Additional information

Description

If a measuring device was ordered with an additional software option, the activation code is programmed in the device at the factory.

User entry

To activate a software option subsequently, please contact your Endress+Hauser sales organization.

NOTE!

The activation code is linked to the serial number of the measuring device and varies according to the device and software option.

If an incorrect or invalid code is entered, this results in the loss of software options that have already been activated.

▸ Before you enter a new activation code, make a note of the current activation code .

▸ Enter the new activation code provided by Endress+Hauser when the new software option was ordered.

▸ Once the activation code has been entered, check if the new software option is displayed in the **SW option overv.** parameter (→ 41).

↳ The new software option is active if it is displayed.

↳ If the new software option is not displayed or all software options have been deleted, the code entered was either incorrect or invalid.

▸ If the code entered is incorrect or invalid, enter the old activation code .

▸ Have your Endress+Hauser sales organization check the new activation code remembering to specify the serial number or ask for the code again.

Example for a software option

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

The software options currently enabled are displayed in the **SW option overv.** parameter (→ 41).

SW option overv.

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

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

User interface

- Extend. HistoROM
- SIL
- HBT Monitoring
- HBT Verification

Additional information

Description

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

"Extend. HistoROM" option

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

"SIL" option

Order code for "Additional approval", option **LA** "SIL"

"HBT Verification" option and "HBT Monitoring" option

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

Sens. emerg.mode

Navigation Expert → System → Administration → Sens. emerg.mode (2566)

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

This parameter becomes visible if the data in the S-DAT or on-board memory cannot be read on account of a defect or error. There is a copy of the data on the HistoROM (FT10). If the emergency mode is activated, this copy is used and the device measure correctly again at least up until the next device switch-off/switch-on. After switch-on/switch-off, the emergency mode would have to be reactivated again. This ensures that the client can operate the device until a new spare part arrives.

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

Res. write prot.

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 reset write protection and disable the SIL mode.

User entry 0 to 65 535

Factory setting 0

Additional information *Prerequisite*

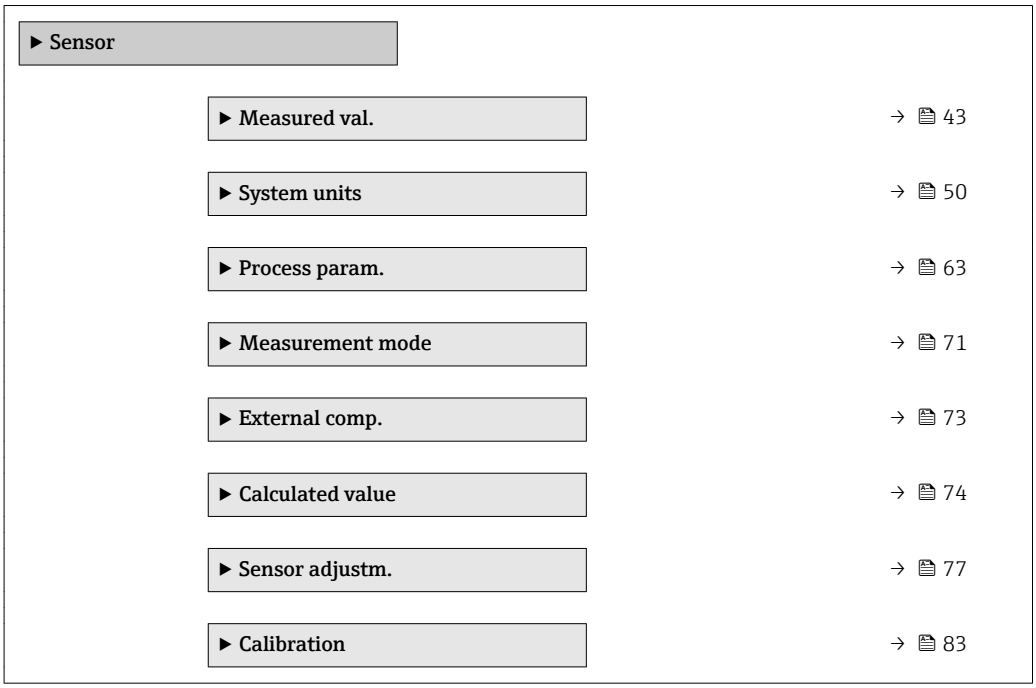
For detailed information about enabling and disabling the SIL mode, see the Special Documentation for the device

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 local display.

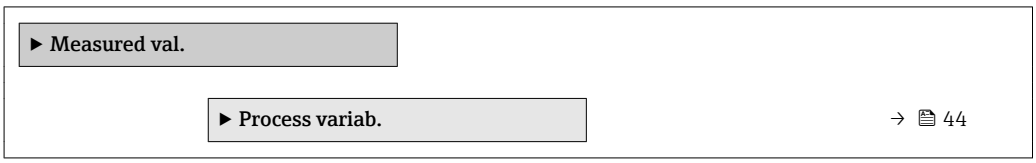
3.2 "Sensor" submenu

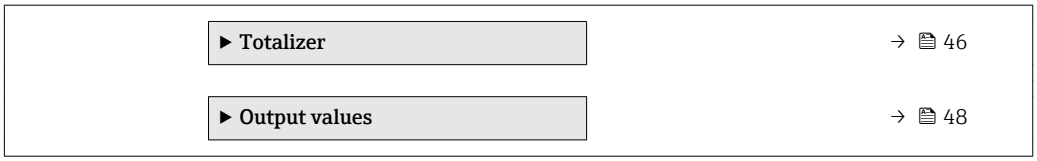
Navigation Expert → Sensor



3.2.1 "Measured val." submenu

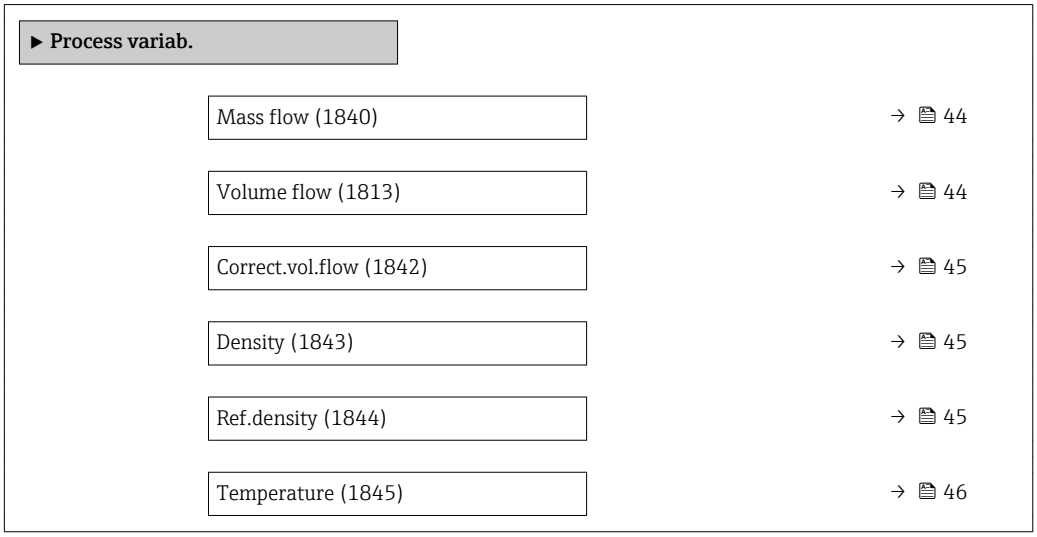
Navigation Expert → Sensor → Measured val.





"Process variab." submenu

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



Mass flow

Navigation Expert → Sensor → Measured val. → Process variab. → Mass flow (1840)

Description Use this function to view the mass flow currently calculated.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Mass flow unit** parameter (→ 51)

Volume flow

Navigation Expert → Sensor → Measured val. → Process variab. → Volume flow (1813)

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

User interface Signed floating-point number

Additional information *Description*

The volume flow is calculated from the measured mass flow and the measured density.

Dependency

The unit is taken from the **Volume flow unit** parameter (→ 52)

Correct.vol.flow

Navigation Expert → Sensor → Measured val. → Process variab. → Correct.vol.flow (1842)

Description Use this function to view the corrected volume flow currently calculated.

User interface Signed floating-point number

Additional information *Description*

The corrected volume flow is derived from the measured mass flow and the reference density of the fluid (density at reference temperature, measured or fixed entry).

Dependency

The unit is taken from the **Cor.volflow unit** parameter (→ 54)

Density

Navigation Expert → Sensor → Measured val. → Process variab. → Density (1843)

Description Use this function to view the currently measured density or its specific gravity.

User interface Positive floating-point number

Additional information *Dependency*

The unit is taken from the **Density unit** parameter (→ 56)

Ref.density

Navigation Expert → Sensor → Measured val. → Process variab. → Ref.density (1844)

Description Displays the density at the reference temperature.

User interface Positive floating-point number

Additional information *Description*

The reference density displayed is calculated using the measured density.

Dependency

The unit is taken from the **Ref. dens. unit** parameter (→ 56)

Temperature

Navigation Expert → Sensor → Measured val. → Process variab. → Temperature (1845)

Description Use this function to view the temperature currently measured.

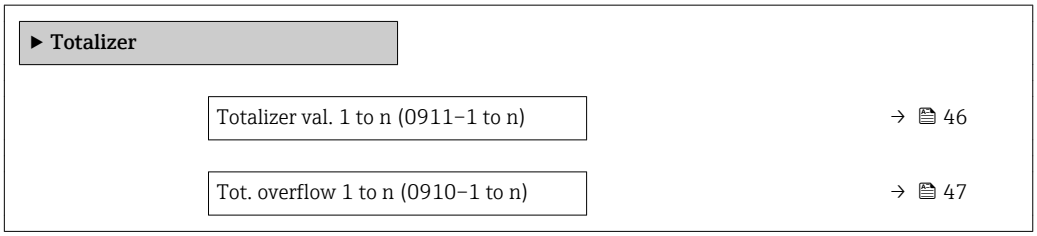
User interface Positive floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 57)

"Totalizer" submenu

Navigation Expert → Sensor → Measured val. → Totalizer



Totalizer val. 1 to n

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

Prerequisite One of the following options is selected in the **Assign variable** parameter (→ 150) of the **Totalizer 1 to n** submenu:
- Volume flow
- Mass flow
- Correct.vol.flow

Description Displays the current totalizer reading.

User interface Signed floating-point number

Additional information

Description

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

In the event of an error, the totalizer adopts the mode defined in the **Failure mode** parameter (→ 153).

User interface

The value of the process variable totalized since measuring began can be positive or negative. This depends on the settings in the **Operation mode** parameter (→ 152).

The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→ 151).

Example

Calculation of the current totalizer reading when the value exceeds the 7-digit display range of the operating tool:
- Value in the **Totalizer val. 1** parameter: 1 968 457 m^3
- Value in the **Tot. overflow 1** parameter: $1 \cdot 10^7$ (1 overflow) = 10 000 000 [m^3]
- Current totalizer reading: 11 968 457 m^3

Tot. overflow 1 to n

Navigation Expert → Sensor → Measured val. → Totalizer → Tot. overflow 1 to n (0910–1 to n)

Prerequisite One of the following options is selected in the **Assign variable** parameter (→ 150) of the **Totalizer 1 to n** submenu:
- Volume flow
- Mass flow
- Correct.vol.flow

Description Displays the current totalizer overflow.

User interface Integer with sign

Additional information

Description

If the current totalizer reading exceeds 7 digits, which is the maximum value range that can be displayed by the operating tool, the value above this range is output as an overflow. The current totalizer value is therefore the sum of the overflow value and the totalizer value from the **Totalizer val. 1 to n** parameter.

User interface

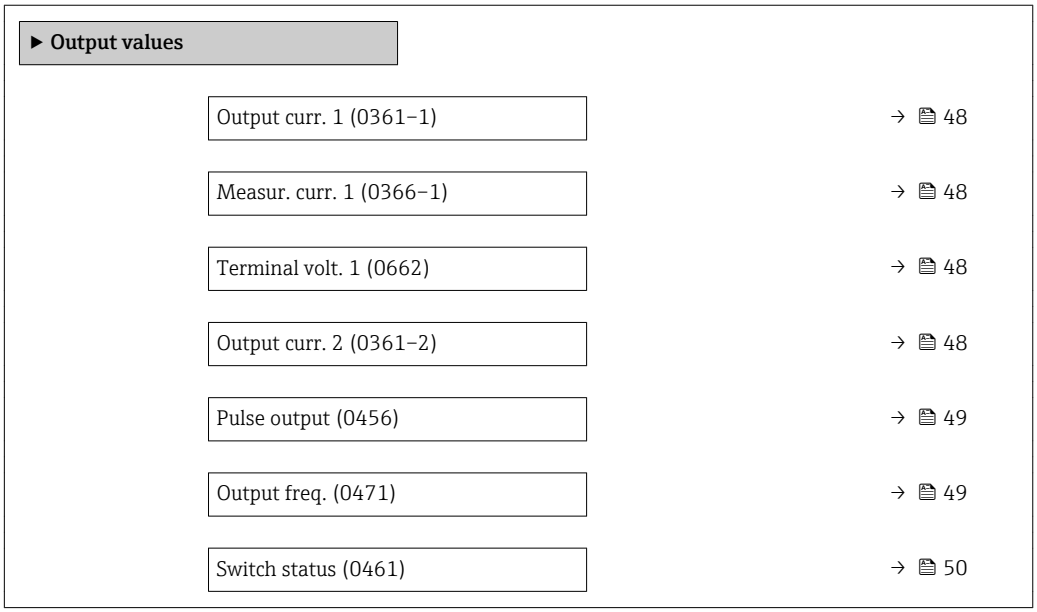
The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→ 151).

Example

Calculation of the current totalizer reading when the value exceeds the 7-digit display range of the operating tool:
- Value in the **Totalizer val. 1** parameter: 1 968 457 m^3
- Value in the **Tot. overflow 1** parameter: $2 \cdot 10^7$ (2 overflows) = 20 000 000 [m^3]
- Current totalizer reading: 21 968 457 m^3

"Output values" submenu

Navigation Expert → Sensor → Measured val. → Output values



Output curr. 1 to n

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

Description Displays the current value currently calculated for the current output.

User interface 3.59 to 22.5 mA

Measur. curr. 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 volt. 1

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

Description Displays the current terminal voltage that is applied at the output.

User interface 0.0 to 50.0 V

Pulse output

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

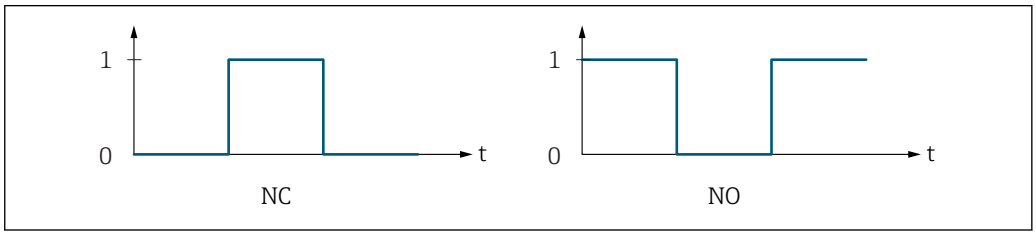
Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 102) parameter.

Description Displays 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 in such a way that the transistor is conductive for the duration of the pulse (NO contact) and is safety-oriented.
- The **Value per pulse** parameter (→ 104) and **Pulse width** parameter (→ 105) can be used to define the value (i.e. the measured value amount that corresponds to a pulse) and the duration of the pulse.



0 Non-conductive
1 Conductive
NC NC contact (normally closed)
NO NO contact (normally open)

The output behavior can be reversed via the **Invert outp.sig.** parameter (→ 119) i.e. the transistor does not conduct for the duration of the pulse.

In addition, the behavior of the output in the event of a device alarm (**Failure mode** parameter (→ 106)) can be configured.

Output freq.

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

Prerequisite In the **Operating mode** parameter (→ 102), the **Frequency** option is selected.

Description Displays 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 (→ 102).

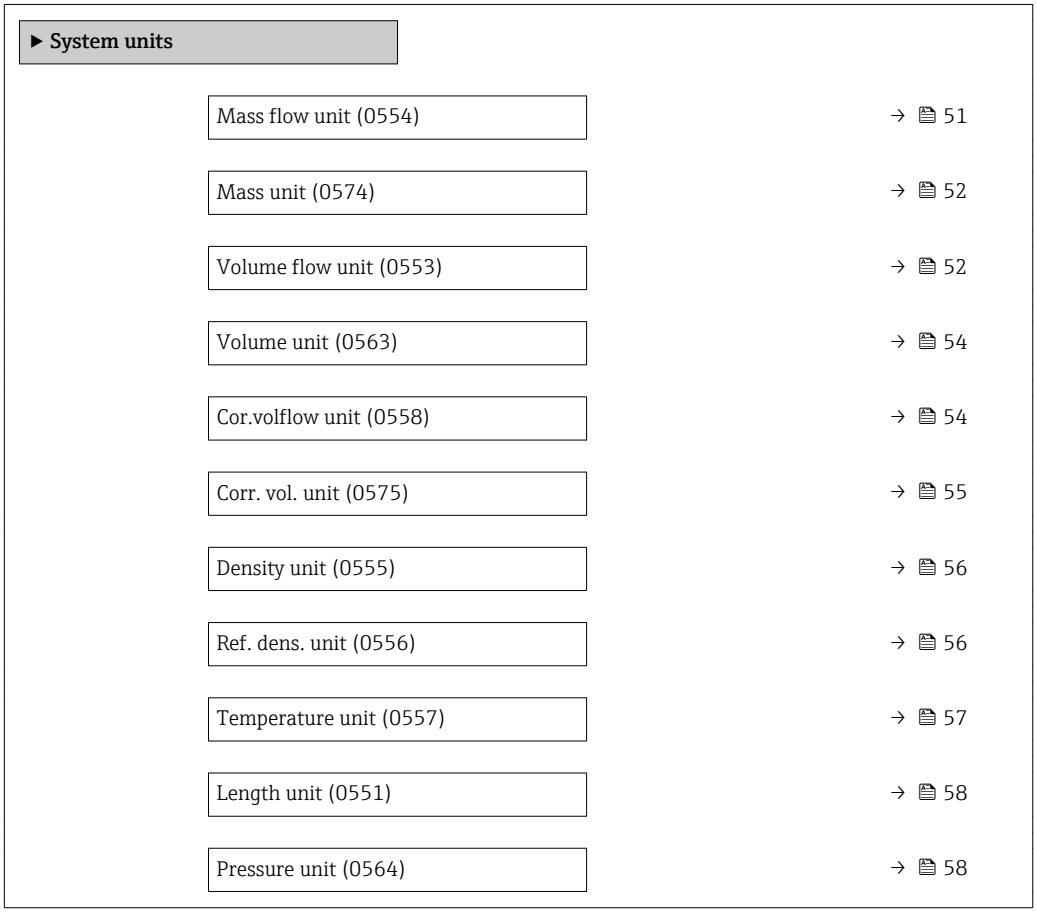
Description Displays the current switch status of the status output.

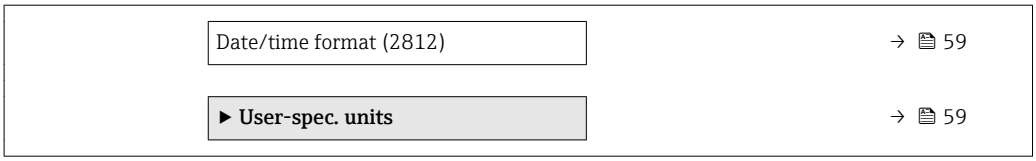
User interface
- Open
- Closed

Additional information *User interface*
- Open
  The switch output is not conductive.
- Closed
  The switch output is conductive.

3.2.2 "System units" submenu

Navigation Expert → Sensor → System units





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 (→ 44)

Selection

For an explanation of the abbreviated units: → 194

Customer-specific units

The unit for the customer-specific mass is specified in the **Mass text** parameter (→ 60).

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: → 194

Customer-specific units

The unit for the customer-specific mass is specified in the **Mass text** parameter (→ 60).

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

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

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

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

Factory setting

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

Additional information

Result

The selected unit applies for:
Volume flow parameter (→ 🖹 44)

Selection

For an explanation of the abbreviated units: → 🖹 194

Customer-specific units

The unit for the customer-specific volume is specified in the **Volume text** parameter (→ 🖹 61).

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

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

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

Custom-specific units
User vol.

Factory setting

Country-specific:
- l (DN > 150 (6"): m^3)
- gal (us)

Additional information

Selection

For an explanation of the abbreviated units: → 🖹 194

Customer-specific units

The unit for the customer-specific volume is specified in the **Volume text** parameter (→ 🖹 61).

Cor.volflow 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
- Sgal/s (us)
- Sgal/min (us)
- Sgal/h (us)
- Sgal/d (us)
- Sbbl/s (us;liq.)
- Sbbl/min (us;liq.)
- Sbbl/h (us;liq.)
- Sbbl/d (us;liq.)

Imperial units
- Sgal/s (imp)
- Sgal/min (imp)
- Sgal/h (imp)
- Sgal/d (imp)

Factory setting

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

Additional information

Result

The selected unit applies for:
Correct.vol.flow parameter (→ 45)

Selection

For an explanation of the abbreviated units: → 194

Corr. vol. 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
- Sgal (us)
- Sbbl (us;liq.)

Imperial units
Sgal (imp)

Factory setting

Country-specific:
- Nl
- Sft^3

Additional information

Selection

For an explanation of the abbreviated units: → 194

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
- g/m³
- kg/dm³
- kg/l
- kg/m³
- SD4°C
- SD15°C
- SD20°C
- SG4°C
- SG15°C
- SG20°C

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

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

Custom-specific units
User dens.

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

Additional information

Result

The selected unit applies for:
Density parameter (→ 45)

Selection

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

For an explanation of the abbreviated units: → 194

Customer-specific units

The unit for the customer-specific density is specified in the **Density text** parameter (→ 62).

Ref. dens. unit

Navigation Expert → Sensor → System units → Ref. dens. unit (0556)

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

Selection

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

US units
lb/Sft³

Factory setting

Country-dependent
- kg/Nl
- lb/Sft³

Additional information

Result

The selected unit applies for:
- **Fix ref.density** parameter (→ 75)
- **Ref.density** parameter (→ 45)

Selection

For an explanation of the abbreviated units: → 194

Temperature unit

Navigation

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

Description

Use this function to select the unit for the temperature.

Selection

SI units
- °C
- K

US units
- °F
- °R

Factory setting

Country-specific:
- °C
- °F

Additional information

Result

The selected unit applies for:
- **Minimum value** parameter (→ 177)
- **Maximum value** parameter (→ 177)
- **Maximum value** parameter (→ 178)
- **Minimum value** parameter (→ 178)
- **Average value** parameter (→ 178)
- **Minimum value** parameter (→ 179)
- **Maximum value** parameter (→ 179)
- **Minimum value** parameter (→ 180)
- **Maximum value** parameter (→ 180)
- **Ref. temperature** parameter (→ 76)

Selection

For an explanation of the abbreviated units: → 194

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
- m
- mm
- µm

US units
- ft
- in

Factory setting

Country-specific:
- mm
- in

Additional information

Selection

For an explanation of the abbreviated units: → 194

Pressure unit

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

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

Selection

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

US units
- psi a
- psi g

Factory setting

Country-specific:
- bar a
- psi a

Additional information

Result

The unit is taken from:
- **Pressure value** parameter (→ 73)
- **External press.** parameter (→ 74)

Selection

For an explanation of the abbreviated units: → 194

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

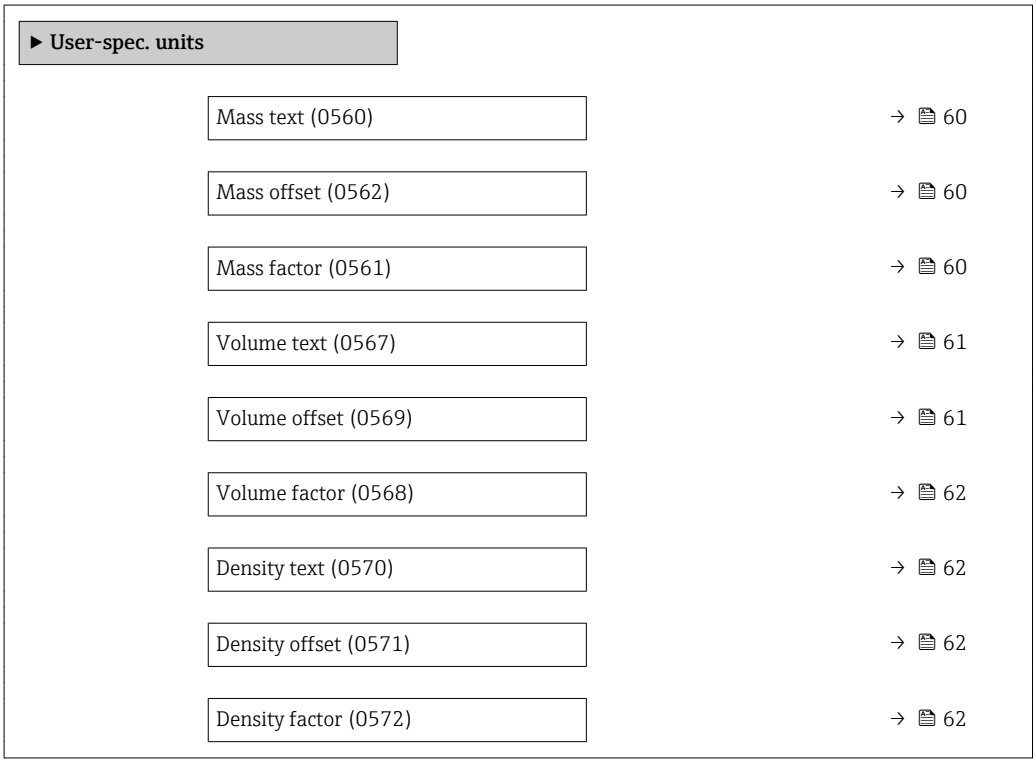
Factory setting dd.mm.yy hh:mm

Additional information *Selection*

For an explanation of the abbreviated units: → 194

"User-spec. units" submenu

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



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 *Result*

The defined unit is shown as an option in the choose list of the following parameters:
- **Mass flow unit** parameter (→ 51)
- **Mass unit** parameter (→ 52)

Example

If the text CENT for "centner" is entered, the following options are displayed in the picklist for the **Mass flow unit** parameter (→ 51):
- CENT/s
- CENT/min
- CENT/h
- CENT/d

Mass offset

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

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

User entry Signed floating-point number

Factory setting 0

Additional information *Description*

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

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

Additional information *Example*

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

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 (→ 52)
- **Volume unit** parameter (→ 54)

Example

If the text GLAS is entered, the choose list of the **Volume flow unit** parameter (→ 52) shows the following options:
- GLAS/s
- GLAS/min
- GLAS/h
- GLAS/d

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

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

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 (→ 56).

Example

Enter text “CE_L” for centners per liter

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

Density factor

Navigation Expert → Sensor → System units → User-spec. units → Density factor (0572)

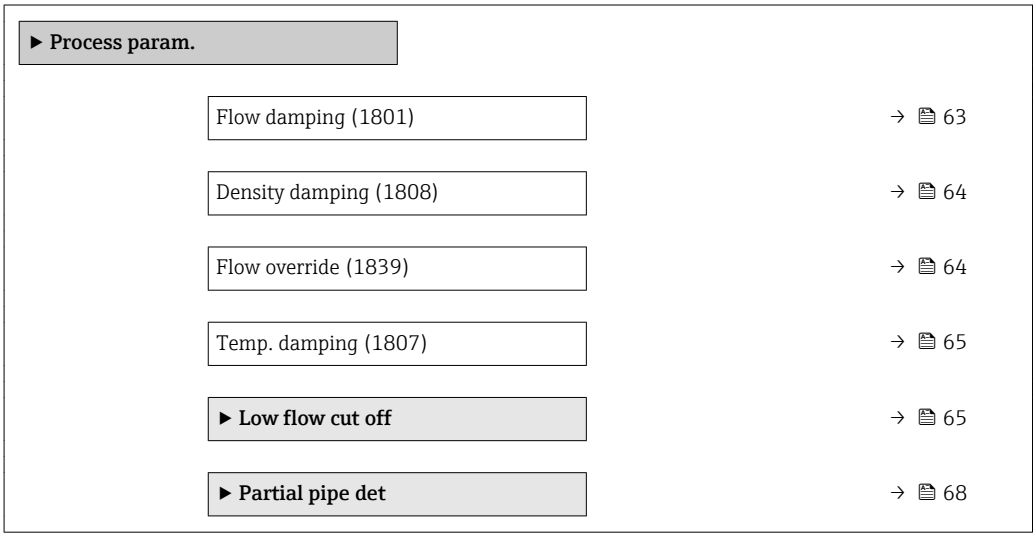
Description Use this function to enter a quantity factor for the user-specific density unit.

User entry Signed floating-point number

Factory setting 1.0

3.2.3 "Process param." submenu

Navigation Expert → Sensor → Process param.



Flow damping

Navigation Expert → Sensor → Process param. → Flow damping (1801)

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

User entry 0 to 999.9 s

Factory setting 0 s

Additional information *User entry*

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

Result

The damping affects the following variables of the device:
- Outputs → 86
- Low flow cut off → 65
- Totalizers → 150

Density damping

Navigation Expert → Sensor → Process param. → Density damping (1808)

Description Use this function to enter a value for density damping. Use this parameter to reduce the sensitivity of the measuring signal to fluctuations in the density of the medium. For this purpose, the depth of the density filter is adjusted. The damping is suitable for non-homogeneous liquids, for example.

User entry 0 to 999.9 s

Factory setting 0 s

Additional information *Result*

The damping has an effect on the following process variables:
- Density (→ 45)
- Ref.density (→ 45)
- Volume flow (→ 44)
- Correct.vol.flow (→ 45)

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 processes of a pipeline, for example.

Selection
- Off
- On

Factory setting Off

Additional information *Result*

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

Description

Flow override is active
- The diagnostic message diagnostic message ⚠**C453 Flow override** is displayed.
- Output values
  - Output: value at zero flow
  - Temperature: continues to be output
  - Totalizers 1-3: stop being totalized

The **Flow override** option can also be activated in the **Status input** submenu: **Assign stat.inp.** parameter.

Temp. damping

Navigation Expert → Sensor → Process param. → Temp. damping (1807)

Description Use this function to enter a value for temperature damping. Use this parameter to reduce the sensitivity of the temperature measuring signal to interference peaks. For this purpose, the temperature filter is adjusted.

User entry 0 to 999.9 s

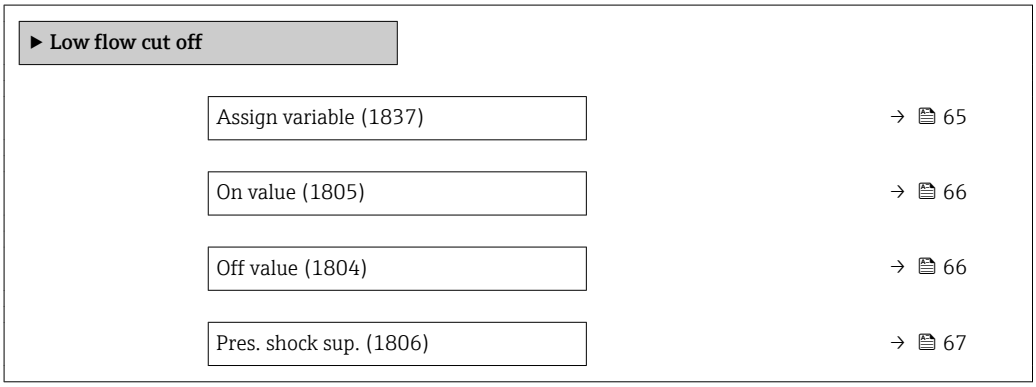
Factory setting 0 s

Additional information *Result*

In addition to the temperature, the damping has an effect on the following temperature-dependent process variables:
- Ref.density (→ 45)
- Correct.vol.flow (→ 45)

"Low flow cut off" submenu

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



Assign variable

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

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

Selection
- Off
- Mass flow
- Volume flow
- Correct.vol.flow

Factory setting Mass flow

On value

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

Prerequisite A process variable is selected in the **Assign variable** parameter (→ 65).

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 → 66.

User entry Positive floating-point number

Factory setting Depends on country and nominal diameter→ 191

Additional information *Dependency*

The unit depends on the process variable selected in the **Assign variable** parameter (→ 65).

Off value

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

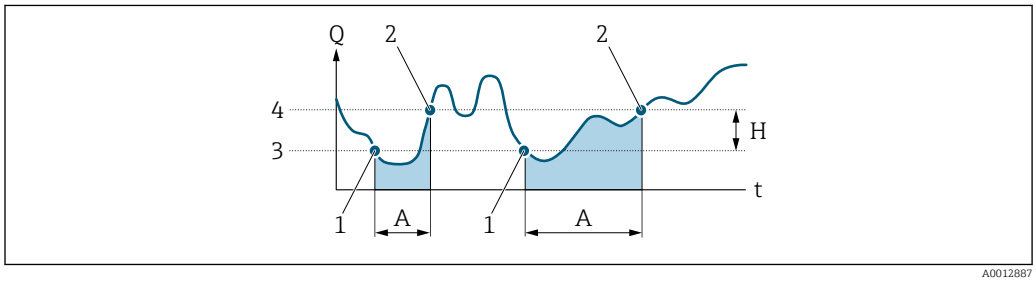
Prerequisite A process variable is selected in the **Assign variable** parameter (→ 65).

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→ 66.

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

Pres. shock sup.

Navigation Expert → Sensor → Process param. → Low flow cut off → Pres. shock sup. (1806)

Prerequisite A process variable is selected in the **Assign variable** parameter (→ 65).

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

User entry 0 to 100 s

Factory setting 0 s

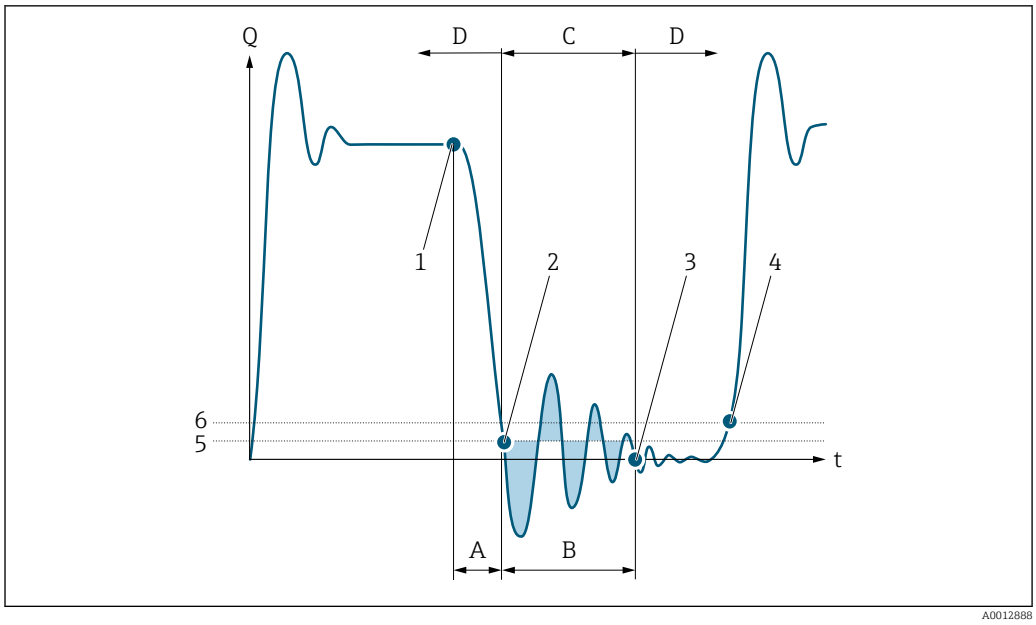
Additional information *Description*

Pressure shock suppression is enabled
- Prerequisite:
  - Flow rate < on-value of low flow cut off
    or
  - Changing the flow direction
- Output values
  - Current output: outputs the current corresponding to zero flow
  - Flow displayed: 0
  - Totalizer: the totalizers are pegged at the last correct value

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

Example

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



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

"Partial pipe det" submenu

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

▶ Partial pipe det		
	Assign variable (1833)	→ 69
	Low value (1834)	→ 69
	High value (1835)	→ 69
	Response time (1836)	→ 70
	Max. damping (2492)	→ 70

Assign variable

Navigation Expert → Sensor → Process param. → Partial pipe det → Assign variable (1833)

Description Use this function to select a process variable to detect empty or partially filled measuring tubes. For gas measurement: Deactivate monitoring due to low gas density.

Selection
- Off
- Density
- Ref.density

Factory setting Off

Low value

Navigation Expert → Sensor → Process param. → Partial pipe det → Low value (1834)

Prerequisite One of the following options is selected in the **Assign variable** parameter (→ 69):
- Density
- Ref.density

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

User entry Positive floating-point number

Factory setting 200

Additional information *User entry*

The lower limit value must be less than the upper limit value that is specified in the **High value** parameter (→ 69).

The unit depends on the process variable selected in the **Assign variable** parameter (→ 69).

High value

Navigation Expert → Sensor → Process param. → Partial pipe det → High value (1835)

Prerequisite One of the following options is selected in the **Assign variable** parameter (→ 69):
- Density
- Ref.density

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

User entry Signed floating-point number

Factory setting 6 000

Additional information *User entry*

The upper limit value must be greater than the lower limit value, that is specified in the **Low value** parameter (→ 69).

The unit depends on the process variable selected in the **Assign variable** parameter (→ 69).

Response time

Navigation Expert → Sensor → Process param. → Partial pipe det → Response time (1836)

Prerequisite One of the following options is selected in the **Assign variable** parameter (→ 69):
- Density
- Ref.density

Description Use this parameter to enter the time period until the diagnostic message ⚠**S862 Partly filled** appears in the case of a partially filled or empty measuring tube.

User entry 0 to 100 s

Factory setting 1 s

Max. damping

Navigation Expert → Sensor → Process param. → Partial pipe det → Max. damping (2492)

Prerequisite One of the following options is selected in the **Assign variable** parameter (→ 69):
- Density
- Ref.density

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

User entry Positive floating-point number

Factory setting 0

Additional information *Description*

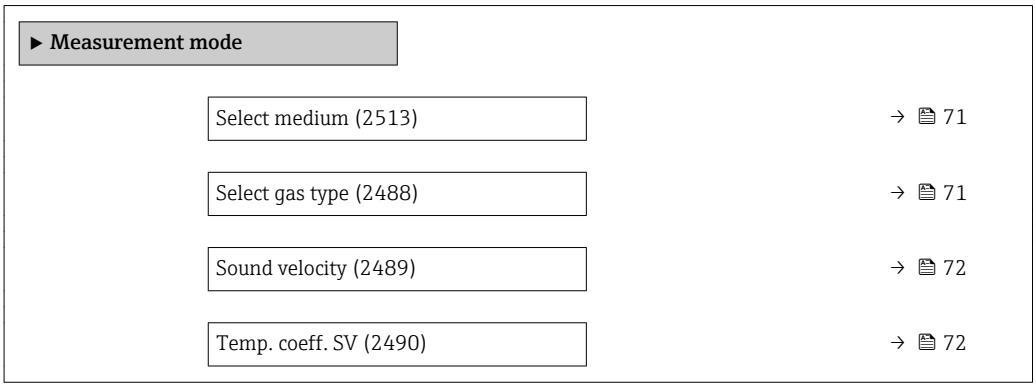
In the case of non-homogeneous media or air pockets, the damping of the measuring tubes increases. If the set value is exceeded, the diagnostic message ⚠**S862 Partly filled** is displayed.

User entry

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

3.2.4 "Measurement mode" submenu

Navigation Expert → Sensor → Measurement mode



Select medium

Navigation Expert → Sensor → Measurement mode → Select medium (2513)

Description Use this function to select the type of medium.

Selection
- Liquid
- Gas

Factory setting Liquid

Select gas type

Navigation Expert → Sensor → Measurement mode → Select gas type (2488)

Prerequisite In the **Select medium** parameter (→ 71) the **Gas** option is selected.

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

Selection
- Air
- Ammonia NH3
- Neon Ne
- Argon Ar
- Sulf. hex.fl.SF6
- Oxygen O2
- Ozone O3
- Nitrog. ox. NOx
- Nitrogen N2
- Nitrous ox. N2O
- Methane CH4
- Hydrogen H2
- Helium He
- Hydrog.chlor.HCl
- Hydrog.sulf. H2S

- Ethylene C2H4
- Carbon diox. CO2
- Carbon monox. CO
- Chlorine Cl2
- Butane C4H10
- Propane C3H8
- Propylene C3H6
- Ethane C2H6
- Others
- Krypton Kr
- Xenon Xe
- Vinyl Chloride
- Sulfur diox. SO2

Factory setting Air

Sound velocity

Navigation Expert → Sensor → Measurement mode → Sound velocity (2489)

Prerequisite In the **Select gas type** parameter (→ 71) the **Others** option is selected.

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

User entry 1 to 99 999.9999 m/s

Factory setting 331.5 m/s

Additional information *User entry*

For conversion: 1 m/s= 3.281 ft/s

Temp. coeff. SV

Navigation Expert → Sensor → Measurement mode → Temp. coeff. SV (2490)

Prerequisite In the **Select gas type** parameter (→ 71) the **Others** option is selected.

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

User entry Positive floating-point number

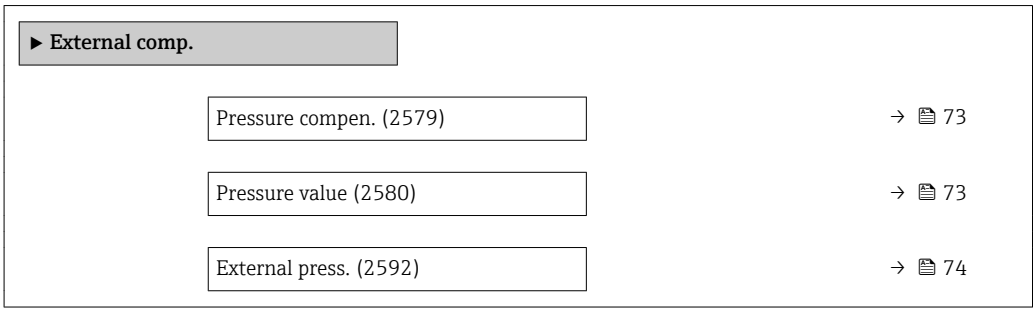
Factory setting 0.61 (m/s)/K

Additional information *User entry*

For conversion: T [K] = 0.555 × T [°F]

3.2.5 "External comp." submenu

Navigation Expert → Sensor → External comp.



Pressure compen.

Navigation Expert → Sensor → External comp. → Pressure compen. (2579)

Description Use this function to switch on automatic pressure correction.

Selection
- Off
- Fixed value
- External value

Factory setting Off

Additional information

Description

With the automatic pressure correction it is possible to compensate the differential pressure effect between the calibration pressure and process pressure, which affects the measured error of the mass flow or density.

"Off" option

Pressure correction is switched off.

"Fixed value" option

The process pressure for pressure correction is fixed.

The unit is taken from the **Pressure unit** parameter (→ 58)

"External value" option

The process pressure for pressure correction is read in.

Pressure value

Navigation Expert → Sensor → External comp. → Pressure value (2580)

Prerequisite In the **Pressure compen.** parameter (→ 73) the **Fixed value** option is selected.

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

User entry Positive floating-point number

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

Additional information *Dependency*

The unit is taken from the **Pressure unit** parameter (→ 58)

External press.

Navigation Expert → Sensor → External comp. → External press. (2592)

Prerequisite The following conditions are met:
- The **Gas** option is selected in the **Select medium** parameter (→ 71).
- The **External value** option is selected in the **Pressure compen.** parameter (→ 73).

Description Displays the fixed value for the process pressure.

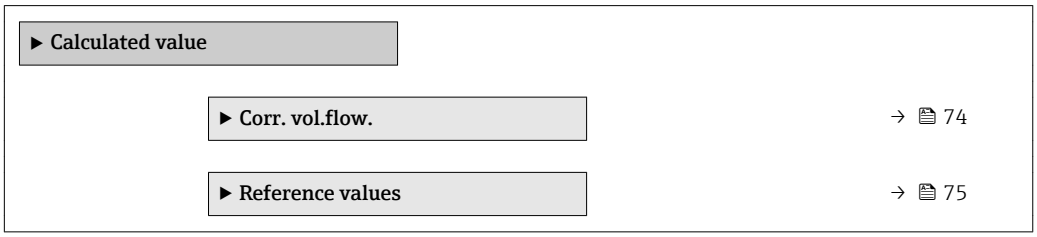
User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Pressure unit** parameter (→ 58)

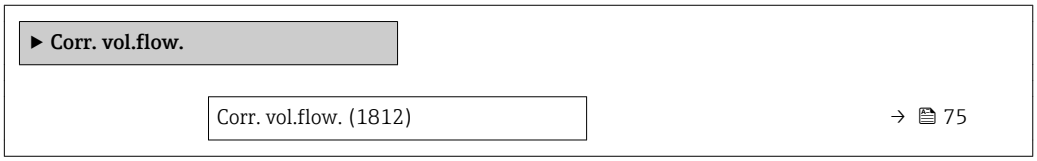
3.2.6 "Calculated value" submenu

Navigation Expert → Sensor → Calculated value



"Corr. vol.flow." submenu

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



Corr. vol.flow.

Navigation Expert → Sensor → Calculated value → Corr. vol.flow. → Corr. vol.flow. (1812)

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

Selection
- Fix ref.density
- Calc ref density

Factory setting Calc ref density

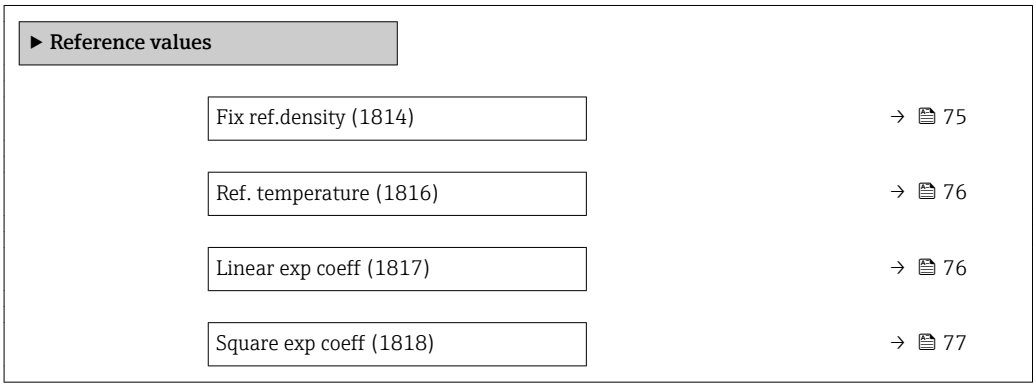
Additional information *Selection*

The **Ref. dens API 53** option is suitable only for applications involving LPG [2], where the flow rate is measured on the basis of the corrected volume flow.

Selecting this option means that the reference density is used, taking into account the values in table 53 E of API MPMS section 11.2. Temperature measurement (measured internally or read into the device from an external source) and density measurement take place during operation while the medium is flowing. The mass flow is divided by the reference density to give the corrected volume flow and is issued as an output signal.

"Reference values" submenu

Navigation Expert → Sensor → Calculated value → Reference values



Fix ref.density

Navigation Expert → Sensor → Calculated value → Reference values → Fix ref.density (1814)

Prerequisite The **Fix ref.density** option is selected in the **Corr. vol.flow.** parameter (→ 75) parameter.

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

2) liquefied petroleum gas

User entry Positive floating-point number

Factory setting 1 kg/Nl

Additional information *Dependency*

The unit is taken from the **Ref. dens. unit** parameter (→ 56)

Ref. temperature

Navigation Expert → Sensor → Calculated value → Reference values → Ref. temperature (1816)

Prerequisite The **Calc ref density** option is selected in the **Corr. vol.flow.** parameter (→ 75) parameter.

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

User entry −273.15 to 99 999 °C

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

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 57)

Reference density calculation

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

A0023403

- ρ_N: reference density
- ρ: fluid density currently measured
- t: fluid temperature currently measured
- t_N: reference temperature at which the reference density is calculated (e.g. 20 °C)
- Δt: t - t_N
- α: linear expansion coefficient of the fluid, unit = [1/K]; K = Kelvin
- β: square expansion coefficient of the fluid, unit = [1/K^2]

Linear exp coeff

Navigation Expert → Sensor → Calculated value → Reference values → Linear exp coeff (1817)

Prerequisite The **Calc ref density** option is selected in the **Corr. vol.flow.** parameter (→ 75) parameter.

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

User entry Signed floating-point number

Factory setting 0.0

Square exp coeff

Navigation Expert → Sensor → Calculated value → Reference values → Square exp coeff (1818)

Prerequisite The **Calc ref density** option is selected in the **Corr. vol.flow.** parameter (→ 75) parameter.

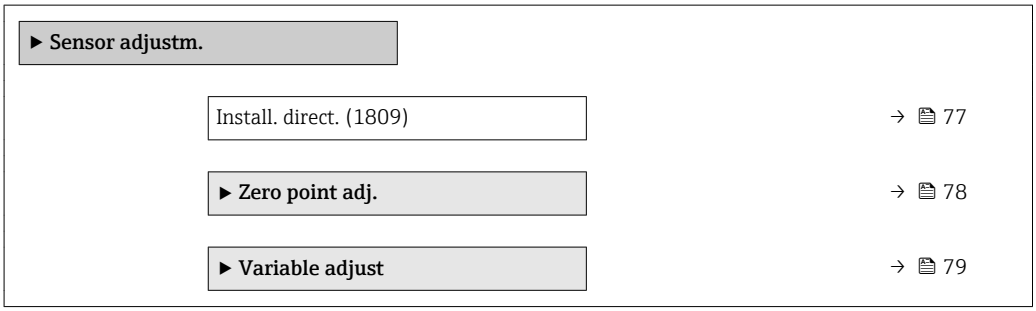
Description For fluid with a non-linear expansion pattern: use this function to enter a quadratic, fluid-specific expansion coefficient for calculating the reference density.

User entry Signed floating-point number

Factory setting 0.0

3.2.7 "Sensor adjustm." submenu

Navigation Expert → Sensor → Sensor adjustm.



Install. direct.

Navigation Expert → Sensor → Sensor adjustm. → Install. direct. (1809)

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

Selection
- In arrow direct.
- Against arrow

Factory setting In arrow direct.

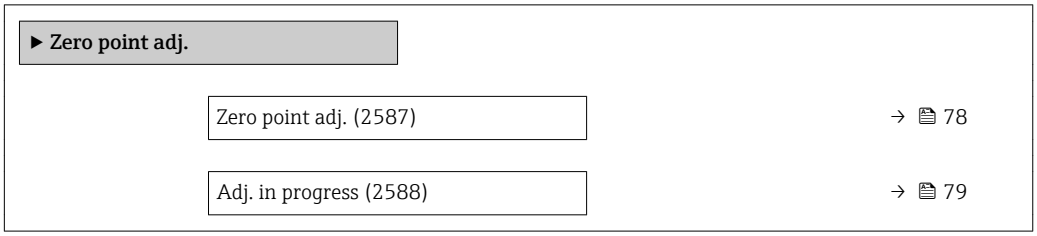
Additional information *Description*

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

"Zero point adj." submenu

- It is generally not necessary to perform zero point adjustment.
- However, this function may be needed in some applications with low flow and strict accuracy requirements.
- A zero point adjustment cannot increase repeatability.
- The following conditions should be met to perform a zero point adjustment successfully without the adjustment finishing in an error:
  – The real flow must be **0**.
  – The pressure must be at least 15 psi g.
- The adjustment takes a maximum of 60 s. The more stable the conditions, the faster the adjustment is completed.
- This function can also be used to check the health of the measuring device. A healthy measuring device has a maximum zero point deviation of ±100 compared to the factory setting of the measuring device (calibration report).

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



Zero point adj.

Navigation Expert → Sensor → Sensor adjustm. → Zero point adj. → Zero point adj. (2587)

Description Use this parameter to start automatic zero point adjustment.

Selection
- Cancel
- Busy
- Zero adjust fail
- Start

Factory setting Cancel

Additional information *Description*

During calibration, the **Busy** option and the **Adj. in progress** parameter (→ 79) appear beneath the parameter. If the sensor is defective or flow is present, the **Zero adjust**

fail option appears on the display. At the same time, this event is entered in the event logbook (event list) → 163.

The new zero point value determined by the measuring device is displayed in the **Zero point** parameter (→ 84).

Information on the procedure for performing zero point adjustment is provided in the Operating Instructions for the device.

Description

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

Adj. in progress

Navigation Expert → Sensor → Sensor adjustm. → Zero point adj. → Adj. in progress (2588)

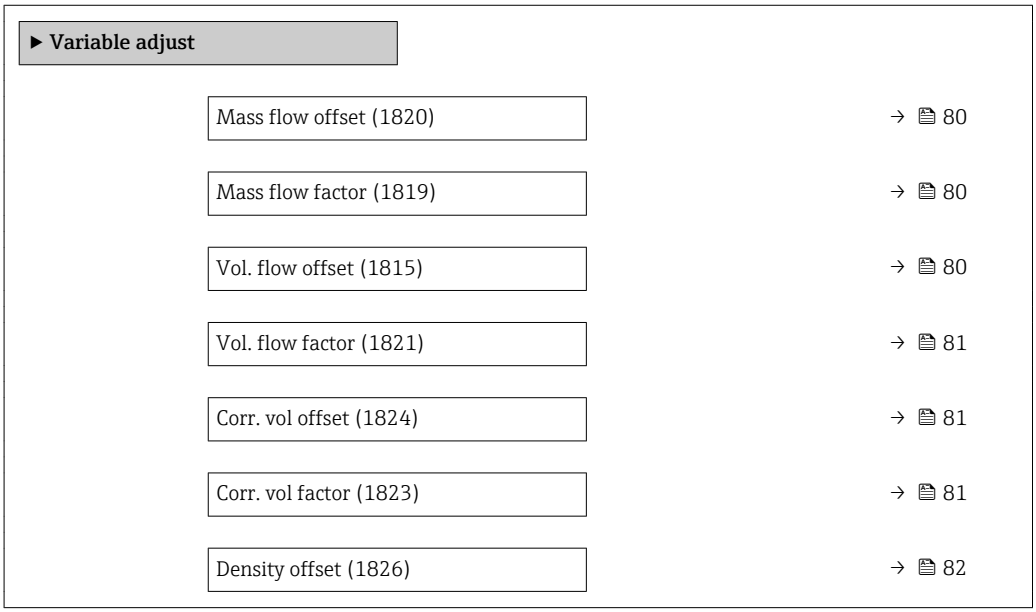
Prerequisite The **Start** option is selected in the **Zero point adj.** parameter (→ 78).

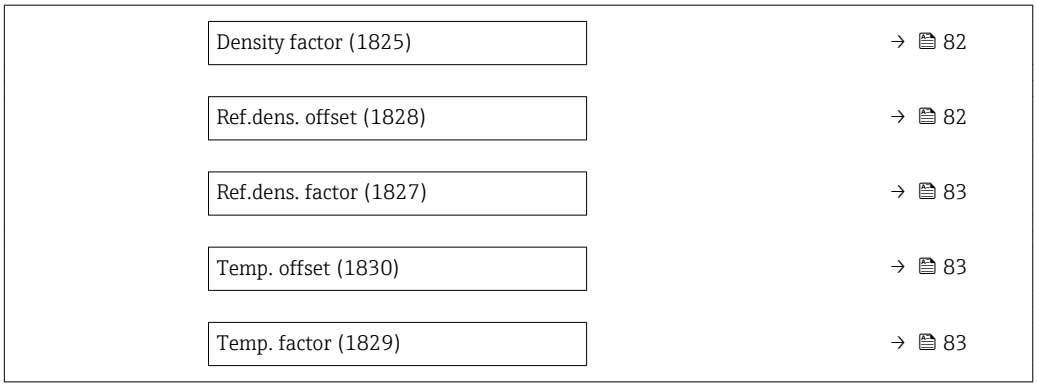
Description Displays the current status of the zero point adjustment via a progress bar.

User interface 0 to 100 %

"Variable adjust" submenu

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust





Mass flow offset

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Mass flow offset (1820)

Description Use this function to enter the zero point shift for the mass flow trim. The mass flow unit on which the shift is based is 1 kg/s.

User entry Signed floating-point number

Factory setting 0 kg/s

Additional information *Description*

Corrected value = (factor × value) + offset

Mass flow factor

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Mass flow factor (1819)

Description Use this function to enter a quantity factor (without time) for the mass flow. This factor refers in each case to the mass flow of 1 kg/s.

User entry Positive floating-point number

Factory setting 1

Vol. flow offset

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Vol. flow offset (1815)

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

User entry Signed floating-point number

Factory setting 0 m^3/s

Additional information *Description*

Corrected value = (factor × value) + offset

Vol. flow factor

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Vol. flow factor (1821)

Description Use this function to enter a quantity factor (without time) for the volume flow. This factor refers in each case to the volume of 1 m^3/s.

User entry Positive floating-point number

Factory setting 1

Corr. vol offset

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Corr. vol offset (1824)

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

User entry Signed floating-point number

Factory setting 0 Nm^3/s

Additional information *Description*

Corrected value = (factor × value) + offset

Corr. vol factor

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Corr. vol factor (1823)

Description Use this function to enter a quantity factor (without time) for the corrected volume flow. This factor refers in each case to the standard volume of 1 Nm^3/s.

User entry Positive floating-point number

Factory setting 1

Density offset

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Density offset (1826)

Description Use this parameter to enter the zero point shift for the density trim. The density unit on which the shift is based is 1 kg/m³.

User entry Signed floating-point number

Factory setting 0 kg/m³

Additional information *Description*

Corrected value = (factor × value) + offset

Density factor

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Density factor (1825)

Description Use this function to enter a quantity factor for the density. This factor refers in each case to the density of 1 kg/m³.

User entry Positive floating-point number

Factory setting 1

Ref.dens. offset

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Ref.dens. offset (1828)

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

User entry Signed floating-point number

Factory setting 0 kg/Nm³

Additional information *Description*

Corrected value = (factor × value) + offset

Ref.dens. factor

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Ref.dens. factor (1827)

Description Use this function to enter a quantity factor for the reference density. This factor refers in each case to the reference density of 1 kg/Nm³.

User entry Positive floating-point number

Factory setting 1

Temp. offset

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Temp. offset (1830)

Description Use this function to enter the zero point shift for the temperature trim. The temperature on which the shift is based is entered in Kelvin.

User entry Signed floating-point number

Factory setting 0 K

Additional information *Description*

Corrected value = (factor × value) + offset

Temp. factor

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Temp. factor (1829)

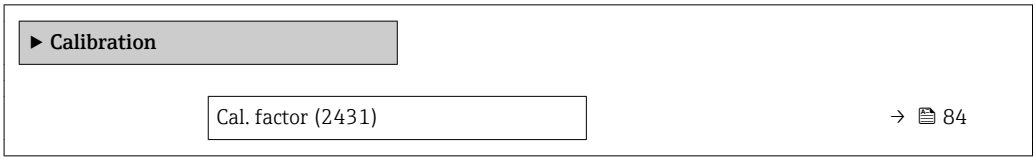
Description Use this parameter to enter a factor by which the temperature in Kelvin is multiplied.

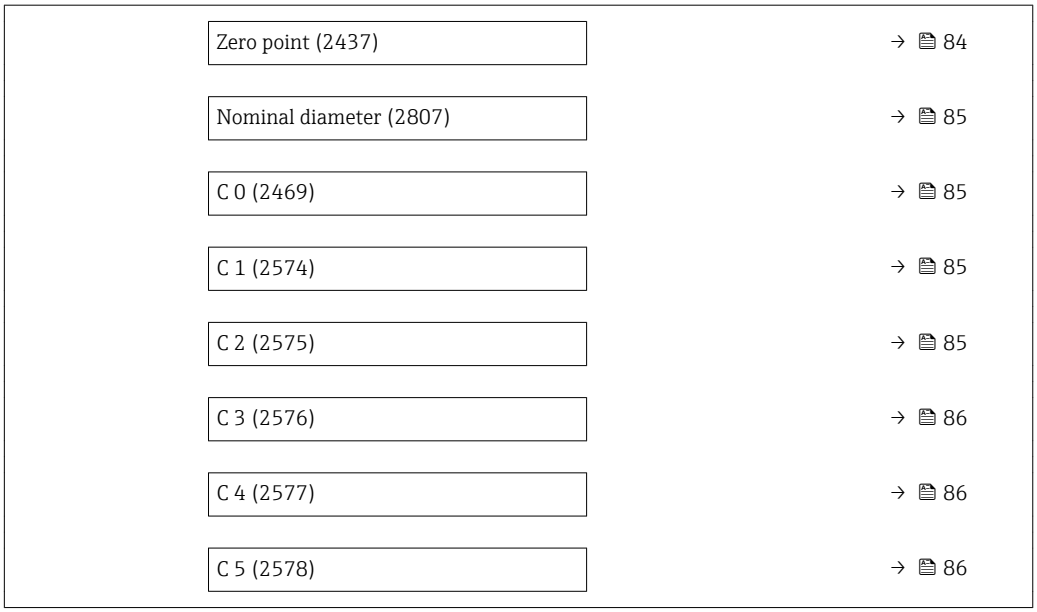
User entry Positive floating-point number

Factory setting 1

3.2.8 "Calibration" submenu

Navigation Expert → Sensor → Calibration





Cal. factor

Navigation Expert → Sensor → Calibration → Cal. factor (2431)

Description Displays the current calibration factor for the sensor.

User interface Signed floating-point number

Factory setting Depends on nominal diameter and calibration

Additional information *Description*

The value is also specified on the sensor nameplate.

Zero point

Navigation Expert → Sensor → Calibration → Zero point (2437)

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

User entry Signed floating-point number

Factory setting 0

Additional information *Description*

The value is also specified on the sensor nameplate.

Nominal diameter

Navigation Expert → Sensor → Calibration → Nominal diameter (2807)

Description Displays the nominal diameter of the sensor.

User interface DNxx / x"

Factory setting Depends on the size of the sensor

Additional information *Description*

The value is also specified on the sensor nameplate.

C 0

Navigation Expert → Sensor → Calibration → C 0 (2469)

Description Displays the current density coefficient C0 of the sensor.

Additional information *Description*

A density trim can alter the calibration value of the density coefficient.

C 1

Navigation Expert → Sensor → Calibration → C 1 (2574)

Description Displays the current density coefficient C1 of the sensor.

Additional information *Description*

A density trim can alter the calibration value of the density coefficient.

C 2

Navigation Expert → Sensor → Calibration → C 2 (2575)

Description Displays the current density coefficient C2 of the sensor.

Additional information *Description*

A density trim can alter the calibration value of the density coefficient.

C 3

Navigation Expert → Sensor → Calibration → C 3 (2576)

Description Displays the current density coefficient C3 of the sensor.

Additional information *Description*

A density trim can alter the calibration value of the density coefficient.

C 4

Navigation Expert → Sensor → Calibration → C 4 (2577)

Description Displays the current density coefficient C4 of the sensor.

Additional information *Description*

A density trim can alter the calibration value of the density coefficient.

C 5

Navigation Expert → Sensor → Calibration → C 5 (2578)

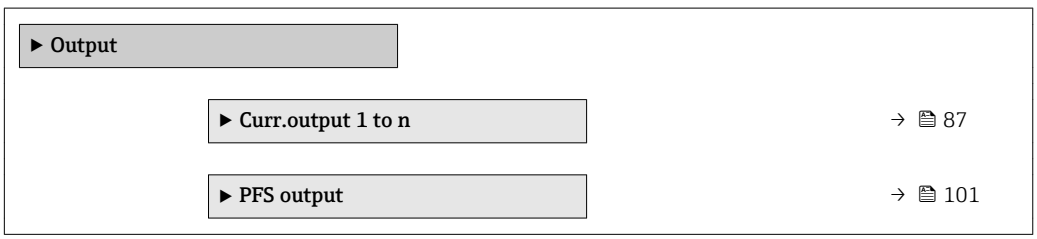
Description Displays the current density coefficient C5 of the sensor.

Additional information *Description*

A density trim can alter the calibration value of the density coefficient.

3.3 "Output" submenu

Navigation Expert → Output



3.3.1 "Current output 1 to n" submenu

Navigation Expert → Output → Curr.output 1 to n

Assign curr.

Navigation
Expert → Output → Curr.output 1 → Assign curr. (0359–1)
Expert → Output → Curr.output 2 → Assign curr. (0359)

Description
Use this function to select a process variable for the current output.

Selection
- Off
- Mass flow
- Volume flow
- Correct.vol.flow
- Density

- Ref.density
- Temperature
- Carr. pipe temp. *
- Electronic temp.
- Oscil. frequency
- Oscil. amplitude
- Oscil. damping
- Signal asymmetry

Factory setting Mass flow

Additional information *Selection*

- Oscil. frequency
  Displays the current oscillation frequency of the measuring tubes. This frequency depends on the density of the medium.
- Oscil. amplitude
  Displays the relative oscillation amplitude of the measuring tubes in relation to the preset value. This value is 100 % under optimum conditions. The value can decrease in the event of low 4 to 20 mA loop currents and/or difficult media (two-phase, high viscosity or high gas velocity).
- Oscil. damping
  Displays the current oscillation damping. Oscillation damping is an indicator of the sensor's current need for excitation power.
- Signal asymmetry
  Displays the relative difference between the oscillation amplitude at the inlet and outlet of the sensor. The measured value is the result of production tolerances of the sensor coils and should remain constant over the life time of a sensor.

Current span

Navigation Expert → Output → Curr.output 1 → Current span (0353–1)
Expert → Output → Curr.output 2 → Current span (0353)

Description Use this function to select the current range for the process value output and the upper and lower level for signal on alarm.

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

* Visibility depends on order options or device settings

Additional information

Description

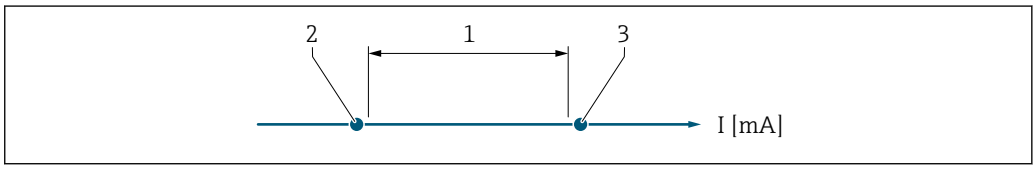
- In the event of a device alarm, the current output adopts the value specified in the **Failure mode** parameter (→ 98).
- If the measured value is outside the measuring range, the diagnostic message ⚠**S441 Curr.output 1 to n** is displayed.
- The measuring range is specified via the **4 mA value** parameter (→ 90) and **20 mA value** parameter (→ 92).

"Fixed current" option

- This option is used for a HART Multidrop network.
- It can only be used for the 4...20 mA HART current output (current output 1).
- The current value is set via the **Fixed current** parameter (→ 89).

Example

Shows the relationship between the current span for the output of the process variable and the lower and upper alarm levels:



1 *Current span for process value*
2 *Lower level for signal on alarm*
3 *Upper level for signal on alarm*

Selection

Options	1	2	3
4...20 mA NAMUR	3.8 to 20.5 mA	< 3.6 mA	> 21.95 mA
4...20 mA US	3.9 to 20.8 mA US	< 3.6 mA	> 21.95 mA
4...20 mA	4 to 20.5 mA	< 3.6 mA	> 21.95 mA

If the flow exceeds or falls below the upper or lower signal on alarm level, the diagnostic message ⚠**S441 Curr.output 1 to n** is displayed.

Fixed current

Navigation

Expert → Output → Curr.output 1 → Fixed current (0365–1)

Expert → Output → Curr.output 2 → Fixed current (0365)

Prerequisite

The **Fixed current** option is selected in the **Current span** parameter (→ 88).

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

4 mA value

Navigation

Expert → Output → Curr.output 1 → 4 mA value (0367–1)

Expert → Output → Curr.output 2 → 4 mA value (0367)

Prerequisite

One of the following options is selected in the **Current span** parameter (→ 88):
- 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 kg/h
- 0 lb/min

Additional information

Description

Positive and negative values are permitted depending on the process variable assigned in the **Assign curr.** parameter (→ 87). In addition, the value can be greater than or smaller than the value assigned for the 20 mA current in the **20 mA value** parameter (→ 92).

Dependency

The unit depends on the process variable selected in the **Assign curr.** parameter (→ 87).

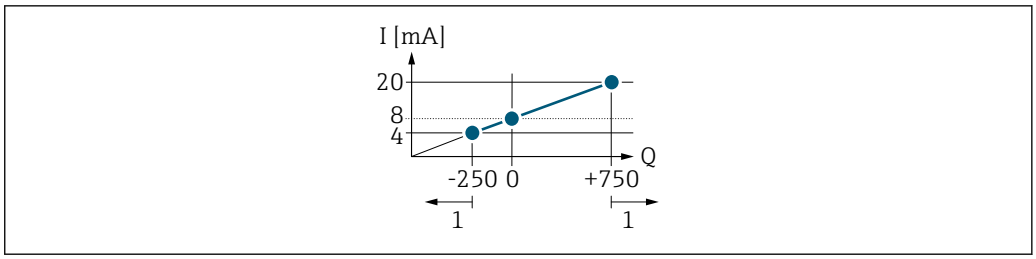
Current output behavior

The current output behaves differently depending on the settings configured in the following parameters:
- Current span (→ 88)
- Measuring mode (→ 92)
- Failure mode (→ 98)

Configuration examples

Some examples of parameter settings and their effect on the current output are given in the following section.

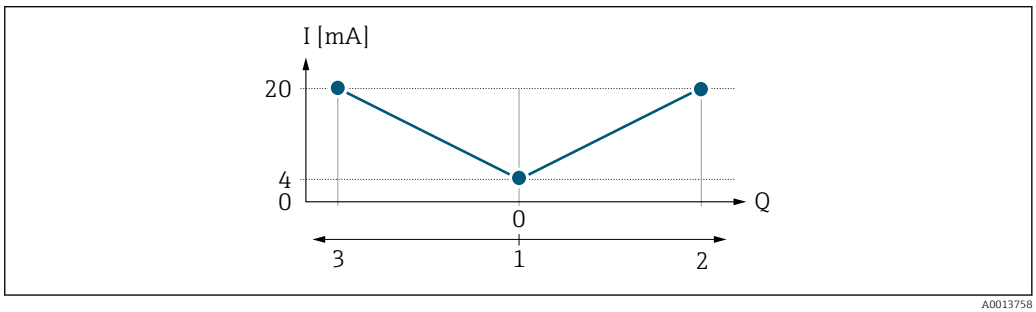
Configuration example A
Measuring mode with **Forward flow** option
- **4 mA value** parameter (→ 90) = not equal to zero flow (e.g. −250 m^3/h)
- **20 mA value** parameter (→ 92) = not equal to zero flow (e.g. +750 m^3/h)
- Calculated current value = 8 mA at zero flow



Q Flow
I Current
1 Measuring range is exceeded or undershot

The operational range of the measuring device is defined by the values entered for the **4 mA value** parameter (→ 🖹 90) and **20 mA value** parameter (→ 🖹 92). If the effective flow exceeds or falls below this operational range, the diagnostic message ⚠**S441 Curr.output 1 to n** is displayed.

Configuration example B
Measuring mode with **Forward/Reverse** option



I Current
Q Flow
1 Value assigned to the 4 mA current
2 Forward flow
3 Reverse flow

The current output signal is independent of the direction of flow (absolute amount of the measured variable). The values for the **4 mA value** parameter (→ 🖹 90) and **20 mA value** parameter (→ 🖹 92) must have the same sign. The value for the **20 mA value** parameter (→ 🖹 92) (e.g. reverse flow) corresponds to the mirrored value for the **20 mA value** parameter (→ 🖹 92) (e.g. forward flow).

Configuration example C
Measuring mode with **Rev. flow comp.** option
If flow is characterized by severe fluctuations (e.g. when using reciprocating pumps), flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 s → 🖹 92.

20 mA value

Navigation
Expert → Output → Curr.output 1 → 20 mA value (0372–1)
Expert → Output → Curr.output 2 → 20 mA value (0372)

Prerequisite
One of the following options is selected in the **Current span** parameter (→ 88):
- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

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→ 190

Additional information

Description

Positive and negative values are permitted depending on the process variable assigned in the **Assign curr.** parameter (→ 87). In addition, the value can be greater than or smaller than the value assigned for the 4 mA current in the **4 mA value** parameter (→ 90).

Dependency

The unit depends on the process variable selected in the **Assign curr.** parameter (→ 87).

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)

If the **Forward/Reverse** option is selected in the **Measuring mode** parameter (→ 92), different signs cannot be entered for the values of the **4 mA value** parameter (→ 90) and **20 mA value** parameter (→ 92). The diagnostic message ⚠**S441 Curr.output 1 to n** is displayed.

Configuration examples

Pay attention to the configuration examples for **4 mA value** parameter (→ 90).

Measuring mode

Navigation
Expert → Output → Curr.output 1 → Measuring mode (0351–1)
Expert → Output → Curr.output 2 → Measuring mode (0351)

Prerequisite
In the **Assign curr.** parameter (→ 87), one of the following options is selected:
- Mass flow
- Volume flow
- Correct.vol.flow
- Density
- Ref.density
- Temperature

- Carr. pipe temp. *
- Electronic temp.
- Oscil. frequency
- Oscil. amplitude
- Oscil. damping
- Signal asymmetry

Detailed description of the options **Oscil. frequency, Oscil. amplitude, Oscil. damping** and **Signal asymmetry**: **Assign curr.** parameter (→ 87)

In the **Current span** parameter (→ 88), 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 measuring mode for the current output.

Selection

- Forward flow
- Forward/Reverse
- Rev. flow comp.

Factory setting

Forward flow

Additional information

Description

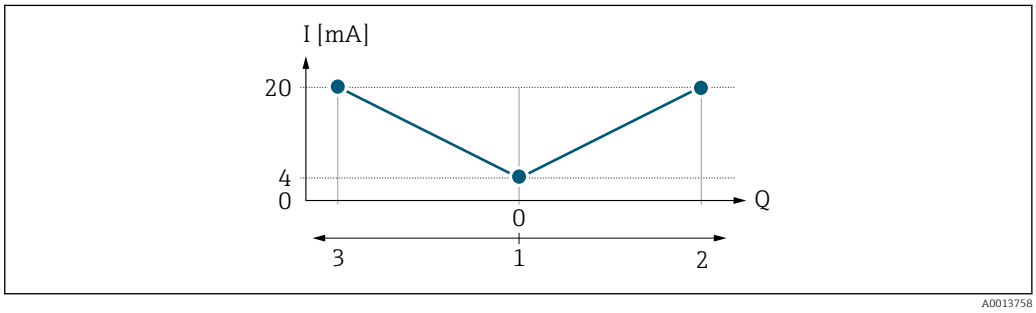
The process variable that is assigned to the current output via the **Assign curr.** parameter (→ 87) is displayed below the parameter.

"Forward flow" option

The current output signal is proportional to the process variable assigned. The measuring range is defined by the values that are assigned to the 4 mA and 20 mA current value.

The flow components outside the scaled measuring range are taken into account for signal output as follows:
- Both values are defined such that they are not equal to zero flow e.g.:
  - 4 mA current value = −5 m^3/h
  - 20 mA current value = 10 m^3/h
- If the effective flow exceeds or falls below this measuring range, the diagnostic message ⚠**S441 Curr.output 1 to n** is displayed.

"Forward/Reverse" option



I *Current*
Q *Flow*
1 *Value assigned to the 4 mA current*
2 *Forward flow*
3 *Reverse flow*

* Visibility depends on order options or device settings

- The current output signal is independent of the direction of flow (absolute amount of the measured variable). The values for the **4 mA value** parameter (→ 🖹 90) and **20 mA value** parameter (→ 🖹 92) must have the same sign.
- The value for the **20 mA value** parameter (→ 🖹 92) (e.g. reverse flow) corresponds to the mirrored value for the **20 mA value** parameter (→ 🖹 92) (e.g. forward flow).

"Rev. flow comp." option

The **Rev. flow comp.** option is primarily used to compensate for abrupt reverse flow which can occur in connection with positive displacement pumps as a result of wear or high viscosity. The reverse flows are recorded in a buffer and balanced against forward flow the next time flow is in the forward direction.

If buffering cannot be processed within approx. 60 s, the diagnostic message ⚠**S441 Curr.output 1 to n** is displayed.

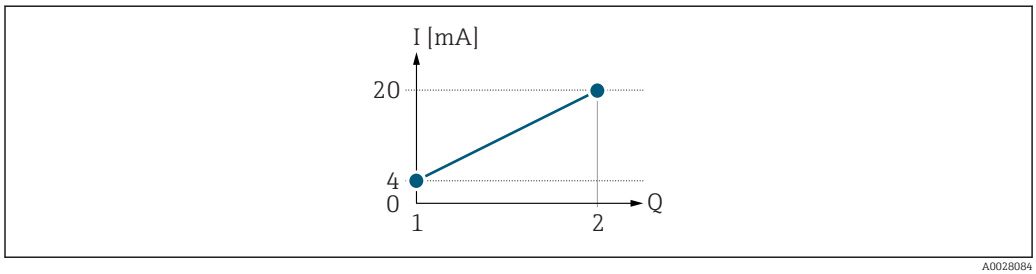
Flow values can aggregate in the buffer in the event of prolonged and unwanted fluid reverse flow. However, these flows are not taken into consideration by the current output configuration, i.e. the reverse flow is not compensated.

If this option is set, the measuring device does not attenuate the flow signal. The flow signal is not attenuated.

Examples of how the current output behaves

Example 1

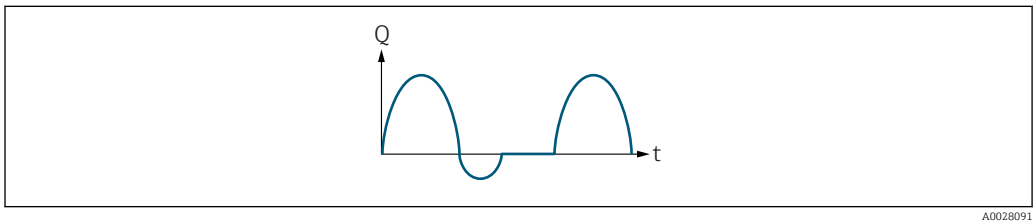
Defined measuring range: lower range value and upper range value with the **same** sign



🖼 2 *Measuring range*

I Current
Q Flow
1 Lower range value (value assigned to 4 mA current)
2 Upper range value (value assigned to 20 mA current)

With the following flow response:

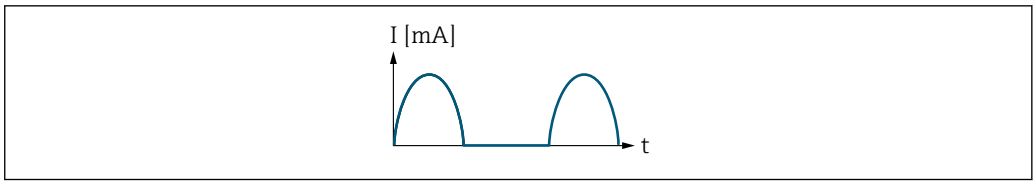


🖼 3 *Flow response*

Q Flow
t Time

With **Forward flow** option

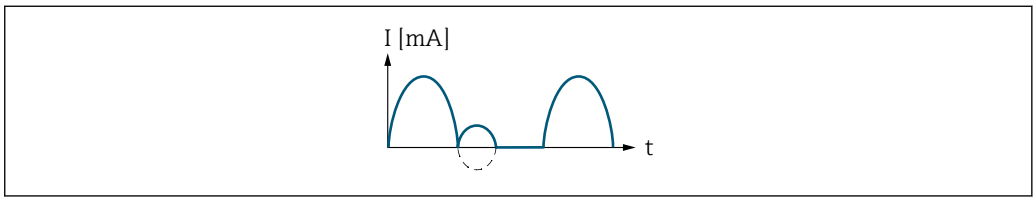
The current output signal is proportional to the process variable assigned. The flow components outside the scaled measuring range are not taken into account for signal output:.



I *Current*
t *Time*

With **Forward/Reverse** option

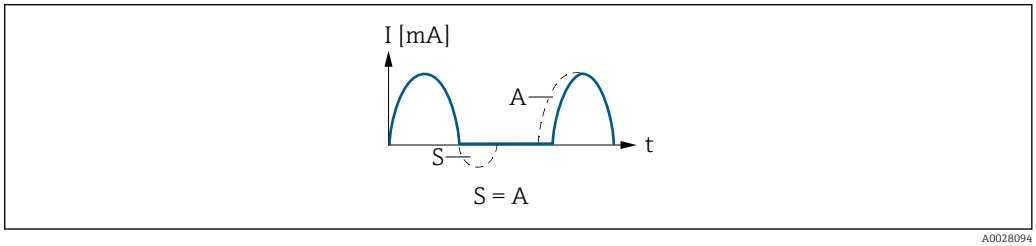
The current output signal is independent of the direction of flow.



I *Current*
t *Time*

With **Rev. flow comp.** option

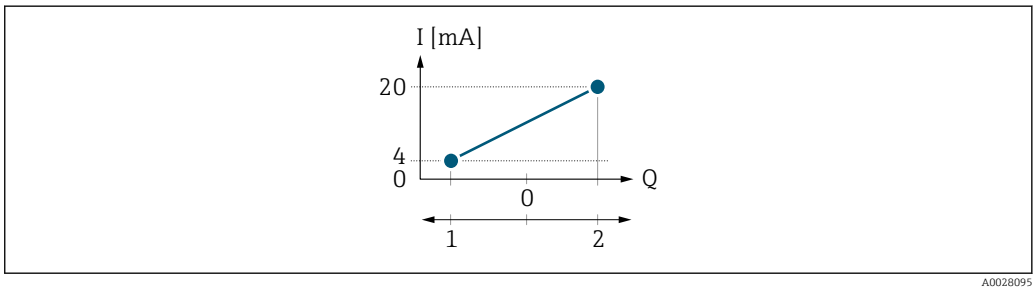
Flow components outside the span are buffered, balanced and output after a maximum delay of 60 s.



I *Current*
t *Time*
S *Flow components saved*
A *Balancing of saved flow components*

Example 2

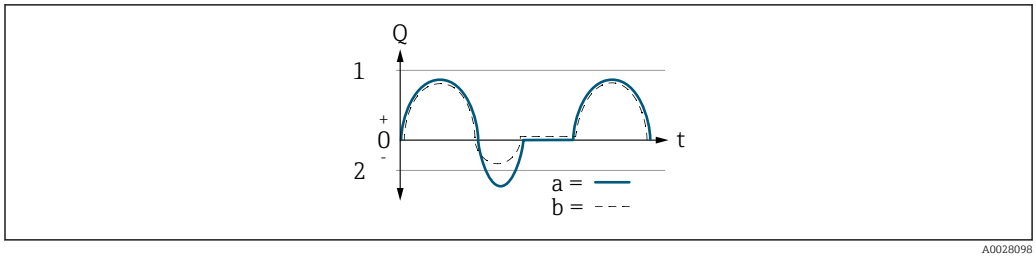
Defined measuring range: lower range value and upper range value with **different** signs



4 *Measuring range*

I *Current*
Q *Flow*
1 *Lower range value (value assigned to 4 mA current)*
2 *Upper range value (value assigned to 20 mA current)*

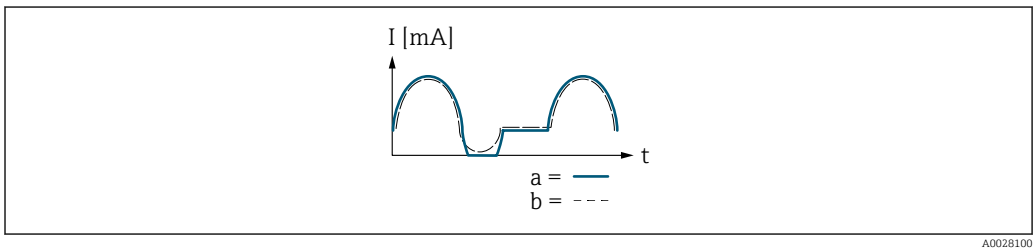
With flow a (—) outside, b (- -) inside the measuring range



Q Flow
t Time
1 Lower range value (value assigned to 4 mA current)
2 Upper range value (value assigned to 20 mA current)

With **Forward flow** option

- a (—): The flow components outside the scaled measuring range cannot be taken into account for signal output.
  The diagnostic message ⚠**S441 Curr.output 1 to n** is displayed.
- b (- -): The current output signal is proportional to the process variable assigned.



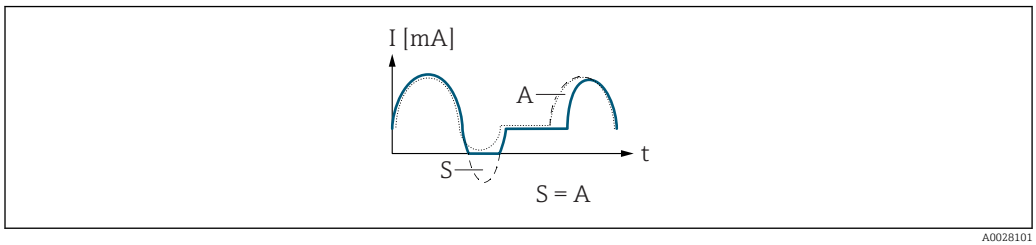
I Current
t Time

With **Forward/Reverse** option

This option is not possible in this case as the values for the **4 mA value** parameter (→ 📖 90) and **20 mA value** parameter (→ 📖 92) have different signs.

With **Rev. flow comp.** option

Flow components outside the span are buffered, balanced and output after a maximum delay of 60 s.



I Current
t Time
S Flow components saved
A Balancing of saved flow components

Damping out.

Navigation

Expert → Output → Curr.output 1 → Damping out. (0363–1)

Expert → Output → Curr.output 2 → Damping out. (0363)

Prerequisite

A process variable is selected in the **Assign curr.** parameter (→ 87) and one of the following options is selected in the **Current span** parameter (→ 88):
- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

Description

Use this function to enter a time constant for 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 (PT1 element [3]) for current output damping:
- 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.

Damping is switched off if **0** is entered (factory setting).

Response time

Navigation

Expert → Output → Curr.output 1 → Response time (0378–1)

Expert → Output → Curr.output 2 → Response time (0378)

Prerequisite

One of the following options is selected in the **Assign curr.** parameter (→ 87):
- Mass flow
- Volume flow
- Correct.vol.flow
- Density
- Ref.density
- Temperature
- Carr. pipe temp. *
- Electronic temp.
- Oscil. frequency
- Oscil. amplitude
- Oscil. damping
- Signal asymmetry

Detailed description of the options **Oscil. frequency, Oscil. amplitude, Oscil. damping** and **Signal asymmetry**: **Assign curr.** parameter (→ 87)

3) proportional transmission behavior with first order delay
* Visibility depends on order options or device settings

One of the following options is selected in the **Current span** parameter (→ 88):
- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

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 → 97
  and
- Depending on the measured variable assigned to the output.
  - Flow damping
    or
  - Density damping
    or
  - Temperature damping

Failure mode

Navigation

Expert → Output → Curr.output 1 → Failure mode (0364–1)

Expert → Output → Curr.output 2 → Failure mode (0364)

Prerequisite

A process variable is selected in the **Assign curr.** parameter (→ 87) and one of the following options is selected in the **Current span** parameter (→ 88):
- 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 a device alarm.

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 (→ 88).

"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 (→ 88).

"Last valid value" option

The current output adopts the last measured value that was valid before the device alarm occurred.

"Actual value" option

The current output adopts the measured value on the basis of the current flow measurement; the device alarm is ignored.

"Defined value" option

The current output adopts a defined measured value.

The measured value is defined via the **Failure current** parameter (→ 99).

Failure current

Navigation

Expert → Output → Curr.output 1 → Failure current (0352–1)

Expert → Output → Curr.output 2 → Failure current (0352)

Prerequisite

The **Defined value** option is selected in the **Failure mode** parameter (→ 98).

Description

Use this function to enter a fixed value that the current output adopts in the event of a device alarm.

User entry

3.59 to 22.5 mA

Factory setting

22.5 mA

Output curr. 1 to n

Navigation

Expert → Output → Curr.output 1 to n → Output curr. 1 to n (0361–1 to n)

Description

Displays the current value currently calculated for the current output.

User interface

3.59 to 22.5 mA

Start-up mode

Navigation
Expert → Output → Curr.output 1 → Start-up mode (0368–1)
Expert → Output → Curr.output 2 → Start-up mode (0368)

Prerequisite
One of the following options is selected in the **Current span** parameter (→ 88):
- 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 (→ 88).

"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 (→ 88).

"Defined value" option
The current output outputs a defined current value.
The current value is defined via the **Start-up current** parameter (→ 100).

Start-up current

Navigation
Expert → Output → Curr.output 1 → Start-up current (0369–1)
Expert → Output → Curr.output 2 → Start-up current (0369)

Prerequisite
The **Defined value** option is selected in the **Start-up mode** parameter (→ 100) parameter.

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

Measur. curr. 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 volt. 1

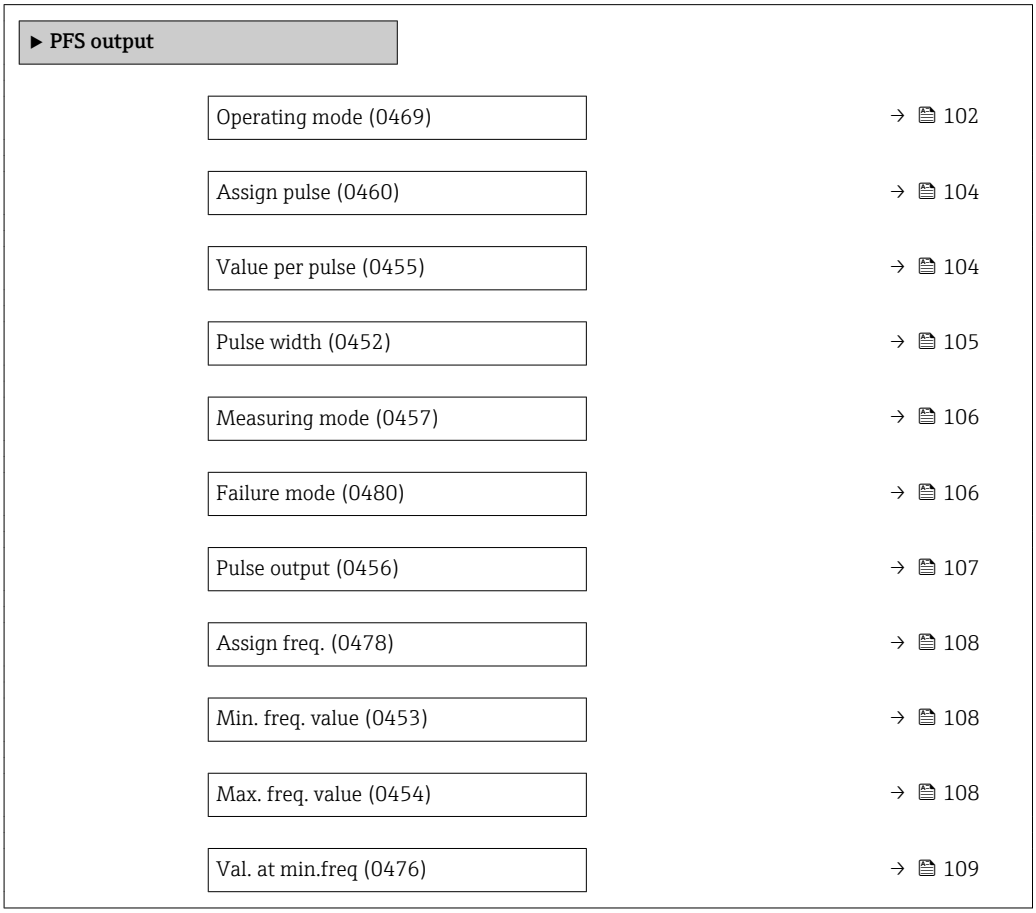
Navigation Expert → Output → Curr.output 1 → Terminal volt. 1 (0662)

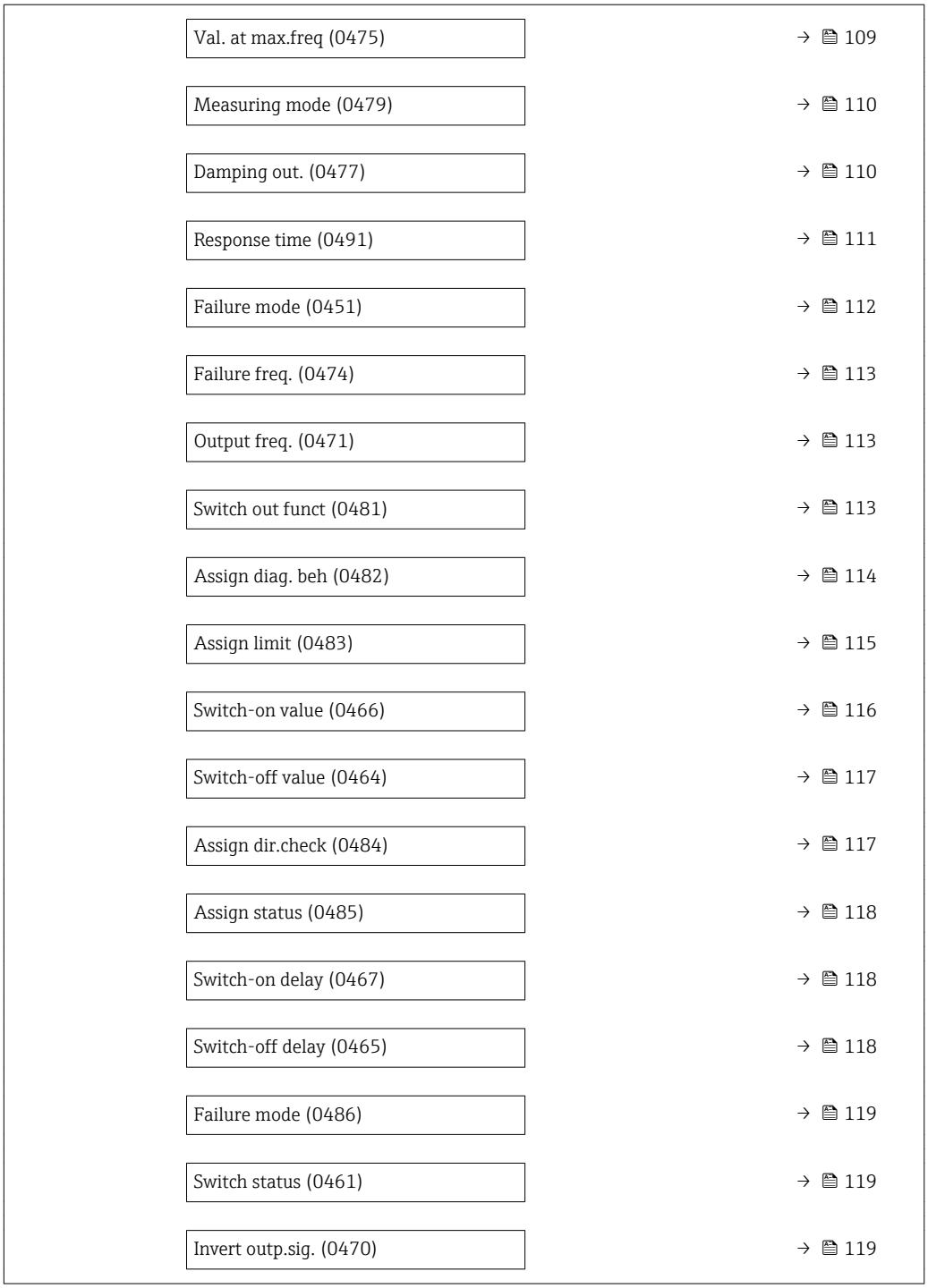
Description Displays the current terminal voltage that is applied at the output.

User interface 0.0 to 50.0 V

3.3.2 "Pulse/frequency/switch output" submenu

Navigation Expert → Output → PFS output





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

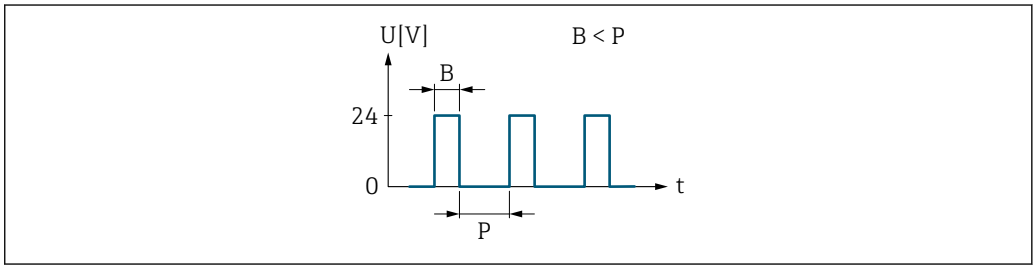
Factory setting Pulse

Additional information

"Pulse" option

Quantity-dependent pulse with configurable pulse width
- Whenever a specific mass, volume or corrected volume is reached (pulse value), a pulse is output, the duration of which was set previously (pulse width).
- The pulses are never shorter than the set duration.

Example
- Flow rate approx. 100 g/s
- Pulse value 0.1 g
- Pulse width 0.05 ms
- Pulse rate 1 000 Impuls/s



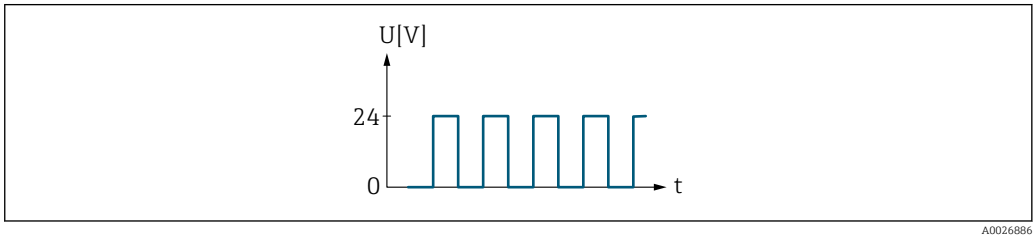
5 *Quantity-proportional pulse (pulse value) with pulse width to be configured*

B Pulse width entered
P Pauses between the individual pulses

"Frequency" option

Flow-proportional frequency output with 1:1 on/off ratio
An output frequency is output that is proportional to the value of a process variable, such as mass flow, volume flow, corrected volume flow, density, reference density, temperature, carrier tube temperature, electronic temperature, vibration frequency, oscillation amplitude, oscillation damping or signal asymmetry.

Example
- Flow rate approx. 100 g/s
- Max. frequency 10 kHz
- Flow rate at max. frequency 1 000 g/s
- Output frequency approx. 1 000 Hz

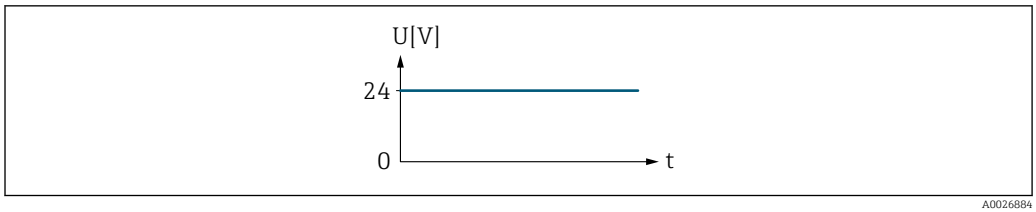


6 *Flow-proportional frequency output*

"Switch" option

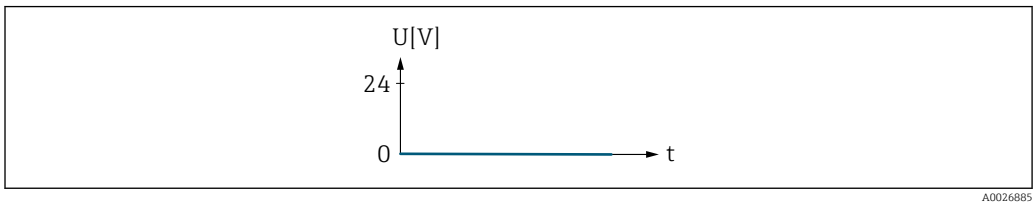
Contact for displaying a condition (e.g. alarm or warning if a limit value is reached)

Example
Alarm response without alarm



7 *No alarm, high level*

Example
Alarm response in case of alarm



8 *Alarm, low level*

Assign pulse

Navigation Expert → Output → PFS output → Assign pulse (0460)

Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 102) parameter.

Description Use this function to select the process variable for the pulse output.

Selection
- Off
- Mass flow
- Volume flow
- Correct.vol.flow

Factory setting Off

Value per pulse

Navigation Expert → Output → PFS output → Value per pulse (0455)

Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 102) and a process variable is selected in the **Assign pulse** parameter (→ 104).

Description Use this function to enter the value for the measured value that a pulse is equivalent to.

User entry Signed floating-point number

Factory setting Depends on country and nominal diameter→ 191

Additional information *User entry*

Weighting of the pulse output with a quantity.

The lower the pulse value, the
- better the resolution.
- the higher the frequency of the pulse response.

Pulse width

Navigation Expert → Output → PFS output → Pulse width (0452)

Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 102) and a process variable is selected in the **Assign pulse** parameter (→ 104).

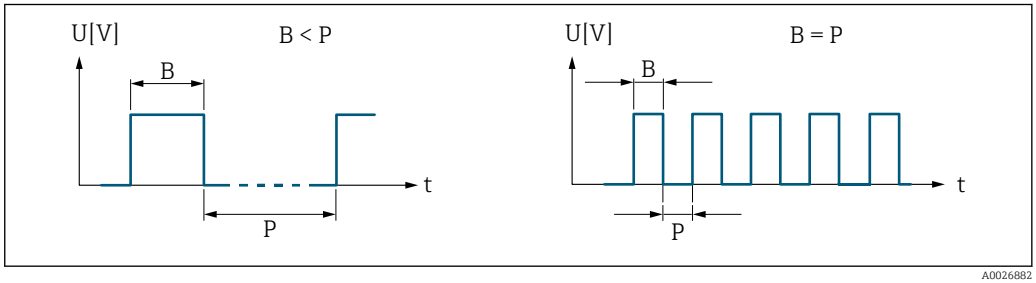
Description Use this function to enter the duration of the output pulse.

User entry 5 to 2 000 ms

Factory setting 100 ms

Additional information *Description*

- Define how long a pulse is (duration).
- The maximum pulse rate is defined by f_{max} = 1 / (2 × pulse width).
- The interval between two pulses lasts at least as long as the set pulse width.
- The maximum flow is defined by Q_{max} = f_{max} × pulse value.
- If the flow exceeds these limit values, the measuring device displays the diagnostic message ⚠**S443 Pulse output 1**.



B *Pulse width entered*
P *Pauses between the individual pulses*

Example

- Pulse value: 0.1 g
- Pulse width: 0.1 ms
- f_{max}: 1 / (2 × 0.1 ms) = 5 kHz
- Q_{max}: 5 kHz × 0.1 g = 0.5 kg/s

Measuring mode

Navigation Expert → Output → PFS output → Measuring mode (0457)

Prerequisite In the **Operating mode** parameter (→ 102), the **Pulse** option is selected, and one of the following options is selected in the **Assign pulse** parameter (→ 104):
- Mass flow
- Volume flow
- Correct.vol.flow

Description Use this function to select the measuring mode for the pulse output.

Selection
- Forward flow
- Forward/Reverse
- Reverse flow
- Rev. flow comp.

Factory setting Forward flow

Additional information *Selection*
- Forward flow
  Positive flow is output, negative flow is not output.
- Forward/Reverse
  Positive and negative flow are output (absolute value), but a distinction is not made between positive and negative flow.
- Reverse flow
  Negative flow is output, positive flow is not output.
- Rev. flow comp.
  The flow components outside the span are buffered, balanced and output after a maximum delay of 60 s.

For a detailed description of the options available, see the **Measuring mode** parameter (→ 92)

Examples

For a detailed description of the configuration examples, see the **Measuring mode** parameter (→ 92)

Failure mode

Navigation Expert → Output → PFS output → Failure mode (0480)

Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 102) and a process variable is selected in the **Assign pulse** parameter (→ 104).

Description Use this function to select the failure mode of the pulse output in the event of a device alarm.

Selection
- Actual value
- No pulses

Factory setting No pulses

Additional information

Description

The dictates of safety render it advisable to ensure that the pulse output shows a predefined behavior in the event of a device alarm.

Selection

- Actual value
  In the event of a device alarm, the pulse output continues on the basis of the current flow measurement. The fault is ignored.
- No pulses
  In the event of a device alarm, the pulse output is "switched off".

NOTICE! A device alarm is a measuring device error that must be taken seriously. It can affect the measurement quality such that the quality can no longer be guaranteed. The **Actual value** option is only recommended if it can be guaranteed that all possible alarm conditions will not affect the measurement quality.

Pulse output

Navigation Expert → Output → PFS output → Pulse output (0456)

Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 102) parameter.

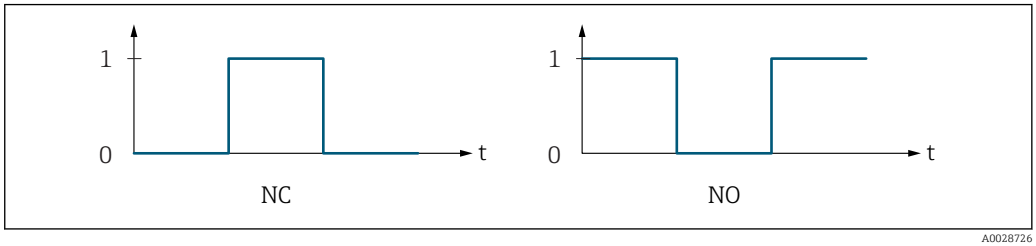
Description Displays the pulse frequency currently output.

User interface Positive floating-point number

Additional information

Description

- The pulse output is an open collector output.
- This is configured at the factory in such a way that the transistor is conductive for the duration of the pulse (NO contact) and is safety-oriented.
- The **Value per pulse** parameter (→ 104) and **Pulse width** parameter (→ 105) can be used to define the value (i.e. the measured value amount that corresponds to a pulse) and the duration of the pulse.



0 Non-conductive
1 Conductive
NC NC contact (normally closed)
NO NO contact (normally open)

The output behavior can be reversed via the **Invert outp.sig.** parameter (→ 119) i.e. the transistor does not conduct for the duration of the pulse.

In addition, the behavior of the output in the event of a device alarm (**Failure mode** parameter (→ 106)) can be configured.

Assign freq.

Navigation Expert → Output → PFS output → Assign freq. (0478)

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 102) parameter.

Description Use this function to select the process variable for the frequency output.

Detailed description of the options **Oscil. frequency, Oscil. amplitude, Oscil. damping** and **Signal asymmetry**: **Assign curr.** parameter (→ 87)

Selection
- Off
- Mass flow
- Volume flow
- Correct.vol.flow
- Density
- Ref.density
- Temperature
- Carr. pipe temp. *
- Electronic temp.
- Oscil. frequency
- Oscil. amplitude
- Oscil. damping
- Signal asymmetry

Factory setting Off

Min. freq. value

Navigation Expert → Output → PFS output → Min. freq. value (0453)

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 102) and a process variable is selected in the **Assign freq.** parameter (→ 108).

Description Use this function to enter the start value frequency.

User entry 0 to 1 000 Hz

Factory setting 0 Hz

Max. freq. value

Navigation Expert → Output → PFS output → Max. freq. value (0454)

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 102) and a process variable is selected in the **Assign freq.** parameter (→ 108).

* Visibility depends on order options or device settings

Description Use this function to enter the end value frequency.

User entry 0 to 1 000 Hz

Factory setting 1 000 Hz

Val. at min.freq

Navigation Expert → Output → PFS output → Val. at min.freq (0476)

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 102) and a process variable is selected in the **Assign freq.** parameter (→ 108).

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

Additional information *Dependency*

The entry depends on the process variable selected in the **Assign freq.** parameter (→ 108).

Val. at max.freq

Navigation Expert → Output → PFS output → Val. at max.freq (0475)

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 102) and a process variable is selected in the **Assign freq.** parameter (→ 108).

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 *Description*

Use this function to enter the maximum measured value at the maximum frequency. The selected process variable is output as a proportional frequency.

Dependency

The entry depends on the process variable selected in the **Assign freq.** parameter (→ 108).

Measuring mode

Navigation Expert → Output → PFS output → Measuring mode (0479)

Prerequisite In the **Operating mode** parameter (→ 102), the **Frequency** option is selected, and one of the following options is selected in the **Assign freq.** parameter (→ 108):
- Mass flow
- Volume flow
- Correct.vol.flow
- Density
- Ref.density
- Temperature
- Carr. pipe temp. *
- Electronic temp.
- Oscil. frequency
- Oscil. amplitude
- Oscil. damping
- Signal asymmetry

Detailed description of the options **Oscil. frequency, Oscil. amplitude, Oscil. damping** and **Signal asymmetry**: **Assign curr.** parameter (→ 87)

Description Use this function to select the measuring mode for the frequency output.

Selection
- Forward flow
- Forward/Reverse
- Rev. flow comp.

Factory setting Forward flow

Additional information *Selection*

For a detailed description of the options available, see the **Measuring mode** parameter (→ 92)

Examples

For a detailed description of the configuration examples, see the **Measuring mode** parameter (→ 92)

Damping out.

Navigation Expert → Output → PFS output → Damping out. (0477)

Prerequisite In the **Operating mode** parameter (→ 102), the **Frequency** option is selected, and one of the following options is selected in the **Assign freq.** parameter (→ 108):
- Mass flow
- Volume flow
- Correct.vol.flow
- Density
- Ref.density
- Temperature
- Carr. pipe temp. *

* Visibility depends on order options or device settings

- Electronic temp.
- Oscil. frequency
- Oscil. amplitude
- Oscil. damping
- Signal asymmetry

Detailed description of the options **Oscil. frequency, Oscil. amplitude, Oscil. damping** and **Signal asymmetry**: **Assign curr.** parameter (→ 87)

Description

Use this function to enter a time constant for the reaction time of the output signal to fluctuations in the measured value.

User entry

0 to 999.9 s

Factory setting

0.0 s

Additional information

User entry

Use this function to enter a time constant (PT1 element [4]) for frequency output damping:
- 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.

Damping is switched off if **0** is entered (factory setting).

The frequency output is subject to separate damping that is independent of all preceding time constants.

Response time

Navigation

Expert → Output → PFS output → Response time (0491)

Prerequisite

In the **Operating mode** parameter (→ 102), the **Frequency** option is selected, and one of the following options is selected in the **Assign freq.** parameter (→ 108):
- Mass flow
- Volume flow
- Correct.vol.flow
- Density
- Ref.density
- Temperature
- Carr. pipe temp. *
- Electronic temp.
- Oscil. frequency
- Oscil. amplitude
- Oscil. damping
- Signal asymmetry

Detailed description of the options **Oscil. frequency, Oscil. amplitude, Oscil. damping** and **Signal asymmetry**: **Assign curr.** parameter (→ 87)

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.

4) proportional transmission behavior with first order delay
* Visibility depends on order options or device settings

User interface Positive floating-point number

Additional information *Description*

The response time is made up of the time specified for the following dampings:
- Damping of pulse/frequency/switch output → 97
  and
- Depending on the measured variable assigned to the output.
  - Flow damping
    or
  - Density damping
    or
  - Temperature damping

Failure mode

Navigation Expert → Output → PFS output → Failure mode (0451)

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 102) and a process variable is selected in the **Assign freq.** parameter (→ 108).

Description Use this function to select the failure mode of the frequency output in the event of a device alarm.

Selection
- Actual value
- Defined value
- 0 Hz

Factory setting 0 Hz

Additional information *Selection*

- Actual value
  In the event of a device alarm, the frequency output continues on the basis of the current flow measurement. The device alarm is ignored.
- Defined value
  In the event of a device alarm, the frequency output continues on the basis of a predefined value. The Failure freq. (→ 113) replaces the current measured value, making it possible to bypass the device alarm. The actual measurement is switched off for the duration of the device alarm.
- 0 Hz
  In the event of a device alarm, the frequency output is "switched off".

NOTICE! A device alarm is a measuring device error that must be taken seriously. It can affect the measurement quality such that the quality can no longer be guaranteed. The **Actual value** option is only recommended if it can be guaranteed that all possible alarm conditions will not affect the measurement quality.

Failure freq.

Navigation Expert → Output → PFS output → Failure freq. (0474)

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 102) and a process variable is selected in the **Assign freq.** parameter (→ 108).

Description Use this function to enter the value for the frequency output in the event of a device alarm in order to bypass the alarm.

User entry 0.0 to 1 250.0 Hz

Factory setting 0.0 Hz

Output freq.

Navigation Expert → Output → PFS output → Output freq. (0471)

Prerequisite In the **Operating mode** parameter (→ 102), the **Frequency** option is selected.

Description Displays the actual value of the output frequency which is currently measured.

User interface 0 to 1 250 Hz

Switch out funct

Navigation Expert → Output → PFS output → Switch out funct (0481)

Prerequisite The **Switch** option is selected in the **Operating mode** parameter (→ 102).

Description Use this function to select a function for the switch output.

Selection
- Off
- On
- Diag. behavior
- Limit
- Fl. direct.check
- Status

Factory setting Off

Additional information *Selection*

- Off
  The switch output is permanently switched off (open, non-conductive).
- On
  The switch output is permanently switched on (closed, conductive).
- Diag. behavior
  Indicates if the diagnostic event is present or not. Is used to output diagnostic information and to react to it appropriately at the system level.
- Limit
  Indicates if a specified limit value has been reached for the process variable. Is used to output diagnostic information relating to the process and to react to it appropriately at the system level.
- Fl. direct.check
  Indicates the flow direction (forward or reverse flow).
- Status
  Indicates the device status depending on whether empty pipe detection or low flow cut off is selected.

Assign diag. beh

Navigation Expert → Output → PFS output → Assign diag. beh (0482)

Prerequisite
- In the **Operating mode** parameter (→ 102), the **Switch** option is selected.
- In the **Switch out funct** parameter (→ 113), the **Diag. behavior** option is selected.

Description Use this function to select the diagnostic event category that is displayed for the switch output.

Selection
- Alarm
- Alarm or warning
- Warning

Factory setting Alarm

Additional information *Description*

If no diagnostic event is pending, the switch output is closed and conductive.

Selection

- Alarm
  The switch output signals only diagnostic events in the alarm category.
- Alarm or warning
  The switch output signals diagnostic events in the alarm and warning category.
- Warning
  The switch output signals only diagnostic events in the warning category.

Assign limit

Navigation Expert → Output → PFS output → Assign limit (0483)

Prerequisite
- The **Switch** option is selected in the **Operating mode** parameter (→ 102) parameter.
- The **Limit** option is selected in the **Switch out funct** parameter (→ 113) parameter.

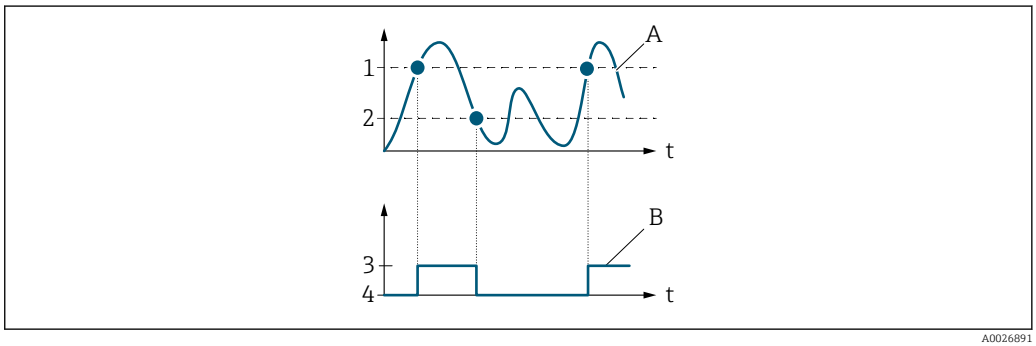
Description Use this function to select a process variable for the limit function.

Selection
- Mass flow
- Volume flow
- Correct.vol.flow
- Density
- Ref.density
- Temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3

Factory setting Mass flow

Additional information *Description*

Behavior of status output when Switch-on value > Switch-off value:
- Process variable > Switch-on value: transistor is conductive
- Process variable < Switch-off value: transistor is non-conductive



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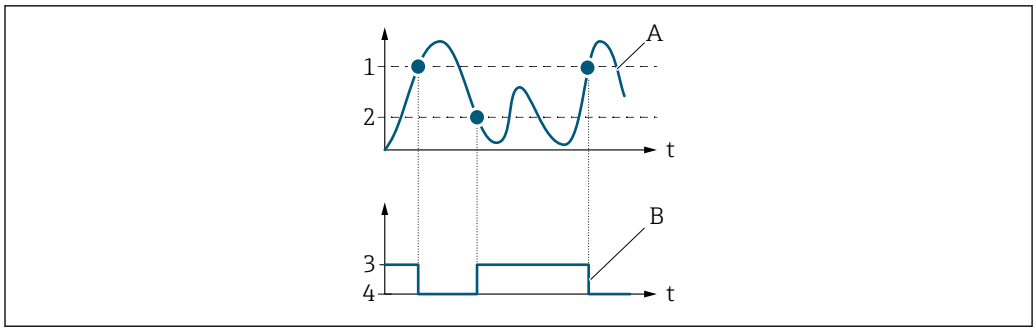
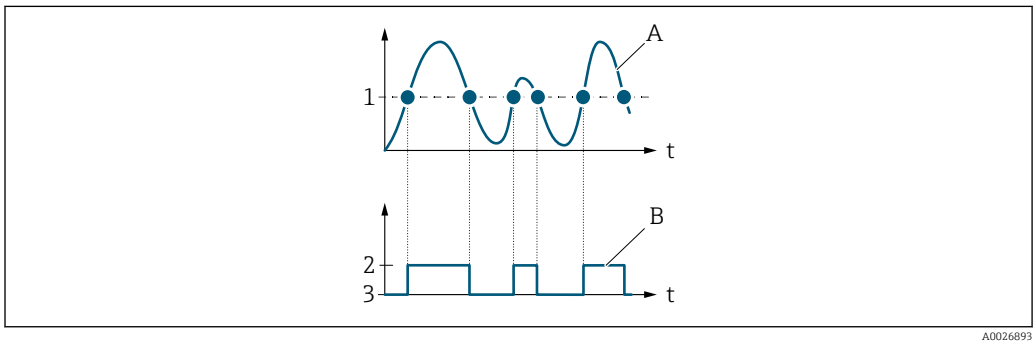
1 Switch-on value
2 Switch-off value
3 Conductive
4 Non-conductive
A Process variable
B Status output

Behavior of status output when Switch-on value < Switch-off value:
- Process variable < Switch-on value: transistor is conductive
- Process variable > Switch-off value: transistor is non-conductive



1 Switch-off value
2 Switch-on value
3 Conductive
4 Non-conductive
A Process variable
B Status output

Behavior of status output when Switch-on value = Switch-off value:
- Process variable > Switch-on value: transistor is conductive
- Process variable < Switch-off value: transistor is non-conductive



1 Switch-on value = Switch-off value
2 Conductive
3 Non-conductive
A Process variable
B Status output

Switch-on value

Navigation Expert → Output → PFS output → Switch-on value (0466)

Prerequisite
- In the **Operating mode** parameter (→ 102), the **Switch** option is selected.
- In the **Switch out funct** parameter (→ 113), 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 kg/h
- 0 lb/min

Additional information

Description

Use this function to enter the limit value for the switch-on value (process variable > switch-on value = closed, conductive).

When using a hysteresis: Switch-on value > Switch-off value.

Dependency

The unit depends on the process variable selected in the **Assign limit** parameter (→ 115).

Switch-off value

Navigation Expert → Output → PFS output → Switch-off value (0464)

Prerequisite
- In the **Operating mode** parameter (→ 102), the **Switch** option is selected.
- In the **Switch out funct** parameter (→ 113), 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 kg/h
- 0 lb/min

Additional information

Description

Use this function to enter the limit value for the switch-off value (process variable < switch-off value = open, non-conductive).

When using a hysteresis: Switch-on value > Switch-off value.

Dependency

The unit depends on the process variable selected in the **Assign limit** parameter (→ 115).

Assign dir.check

Navigation Expert → Output → PFS output → Assign dir.check (0484)

Prerequisite
- The **Switch** option is selected in the **Operating mode** parameter (→ 102).
- The **Fl. direct.check** option is selected in the **Switch out funct** parameter (→ 113).

Description Use this function to select a process variable for monitoring the flow direction.

Selection
- Mass flow
- Volume flow
- Correct.vol.flow

Factory setting Mass flow

Assign status

Navigation Expert → Output → PFS output → Assign status (0485)

Prerequisite
- The **Switch** option is selected in the **Operating mode** parameter (→ 102).
- The **Status** option is selected in the **Switch out funct** parameter (→ 113).

Description Use this function to select a device status for the switch output.

Selection
- Partial pipe det
- Low flow cut off

Factory setting Partial pipe det

Additional information *Options*

If empty pipe detection or low flow cut off are enabled, the output is conductive. Otherwise, the switch output is non-conductive.

Switch-on delay

Navigation Expert → Output → PFS output → Switch-on delay (0467)

Prerequisite
- The **Switch** option is selected in the **Operating mode** parameter (→ 102).
- The **Limit** option is selected in the **Switch out funct** parameter (→ 113).

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 **Switch** option is selected in the **Operating mode** parameter (→ 102).
- The **Limit** option is selected in the **Switch out funct** parameter (→ 113).

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 a failsafe mode for the switch output in the event of a device alarm.

Selection
- Actual status
- Open
- Closed

Factory setting Open

Additional information *Options*
- Actual status
  In the event of a device alarm, faults are ignored and the current behavior of the input value is output by the switch output. The **Actual status** option behaves in the same way as the current input value.
- Open
  In the event of a device alarm, the switch output's transistor is set to **non-conductive**.
- Closed
  In the event of a device alarm, the switch output's transistor is set to **conductive**.

Switch status

Navigation Expert → Output → PFS output → Switch status (0461)

Prerequisite The **Switch** option is selected in the **Operating mode** parameter (→ 102).

Description Displays the current switch status of the status output.

User interface
- Open
- Closed

Additional information *User interface*
- Open
  The switch output is not conductive.
- Closed
  The switch output is conductive.

Invert outp.sig.

Navigation Expert → Output → PFS output → Invert outp.sig. (0470)

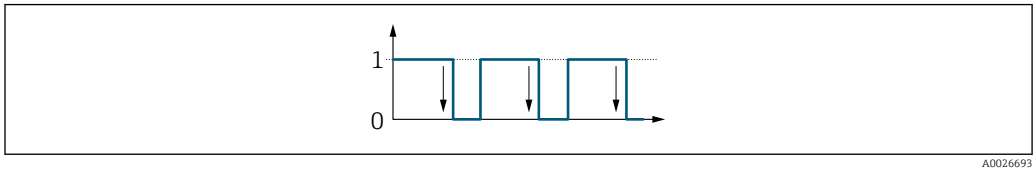
Description Use this function to select whether to invert the output signal.

Selection
- No
- Yes

Factory setting No

Additional information *Selection*

No option (passive - negative)



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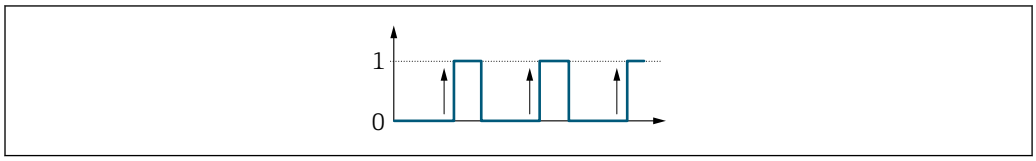
Yes option (passive - positive)



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3.4 "Communication" submenu

Navigation Expert → Communication

▶ **Communication**	
▶ **HART input**	→ 120
▶ **HART output**	→ 126
▶ **Diag. config.**	→ 142

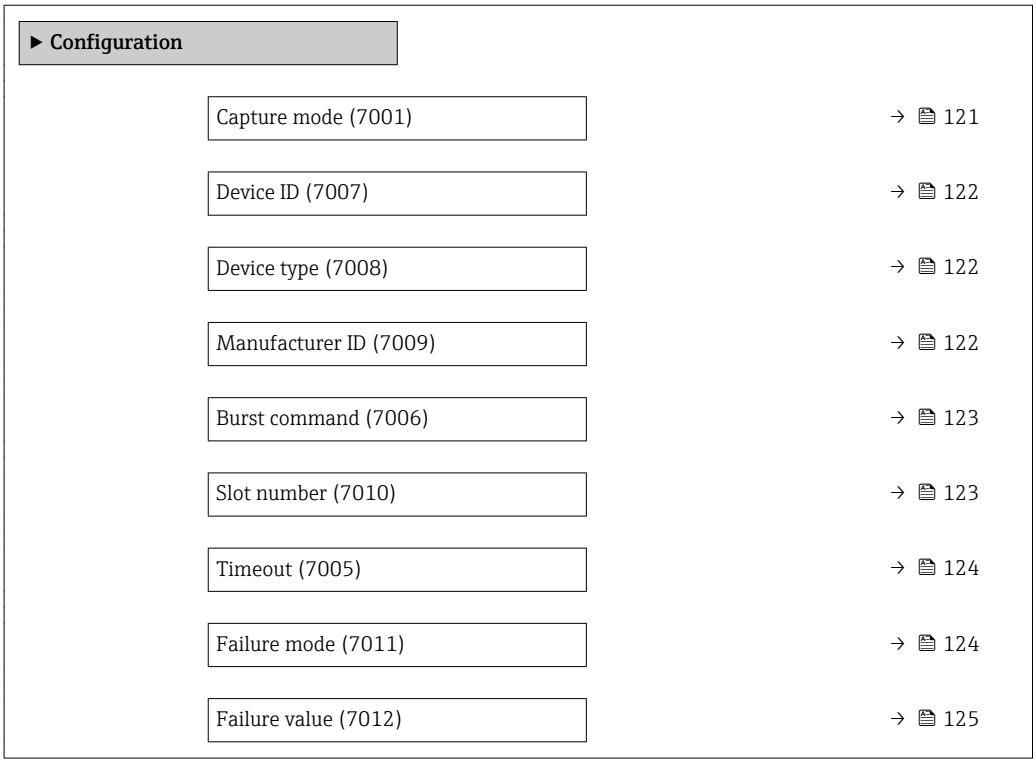
3.4.1 "HART input" submenu

Navigation Expert → Communication → HART input

▶ **HART input**	
▶ **Configuration**	→ 121
▶ **Input**	→ 125

"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 transmitted via burst in the network.

An external pressure sensor must be in the burst mode.

"Master network" option

In this case, the device must be located in a HART network in which a HART master (control) queries the measured values of the up to 64 network participants. The device reacts only to the responses of a specific device in the network. Device ID,device type, manufacturer ID and the HART commands used by the master must be defined.

Device ID

Navigation Expert → Communication → HART input → Configuration → Device ID (7007)

Prerequisite The **Master network** option is selected in the **Capture mode** parameter (→ 121).

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.

Device type

Navigation Expert → Communication → HART input → Configuration → Device type (7008)

Prerequisite In the **Capture mode** parameter (→ 121), 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 2-digit hexadecimal number

Factory setting 0x00

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.

Manufacturer ID

Navigation Expert → Communication → HART input → Configuration → Manufacturer ID (7009)

Prerequisite The **Master network** option is selected in the **Capture mode** parameter (→ 121).

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.

Burst command

Navigation Expert → Communication → HART input → Configuration → Burst command (7006)

Prerequisite The **Burst network** option or the **Master network** option are selected in the **Capture mode** parameter (→ 121).

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 *Selection*
- Command 1
  Use this function to capture the primary variable.
- Command 3
  Use this function to capture the dynamic HART variables and the current.
- Command 9
  Use this function to capture the dynamic HART variables including the associated status.
- Command 33
  Use this function to capture the dynamic HART variables including the associated unit.

Slot number

Navigation Expert → Communication → HART input → Configuration → Slot number (7010)

Prerequisite The **Burst network** option or the **Master network** option is selected in the **Capture mode** parameter (→ 121).

Description Use this function to enter the position of the process variable to be recorded in the burst command.

User entry 1 to 8

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)
5	–	–	HART variable (slot 5)	–
6	–	–	HART variable (slot 6)	–
7	–	–	HART variable (slot 7)	–
8	–	–	HART variable (slot 8)	–

Timeout

Navigation Expert → Communication → HART input → Configuration → Timeout (7005)

Prerequisite The **Burst network** option or the **Master network** option is selected in the **Capture mode** parameter (→ 121).

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 **F882 Input signal**.

Failure mode

Navigation Expert → Communication → HART input → Configuration → Failure mode (7011)

Prerequisite In the **Capture mode** parameter (→ 121), 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 (→ 125)).

Failure value

Navigation Expert → Communication → HART input → Configuration → Failure value (7012)

Prerequisite The following conditions are met:
- In the **Capture mode** parameter (→ 121), the **Burst network** option or **Master network** option is selected.
- In the **Failure mode** parameter (→ 124), the **Defined value** option is selected.

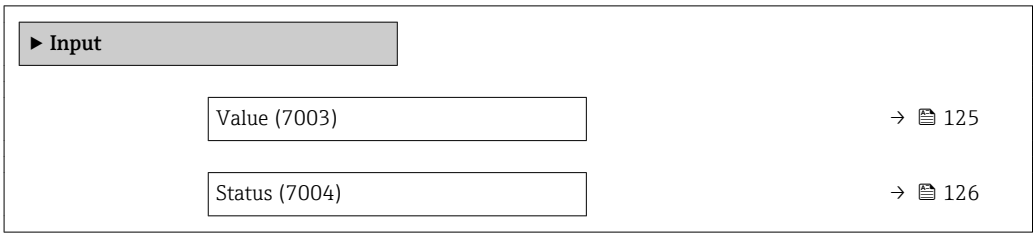
Description Use this function to enter the measured value to be used if no data are recorded within the maximum permitted interval.

User entry Signed floating-point number

Factory setting 0

"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 Positive floating-point number

Additional information *Dependency*

The unit is taken from the **Pressure unit** parameter (→ 58)

Status

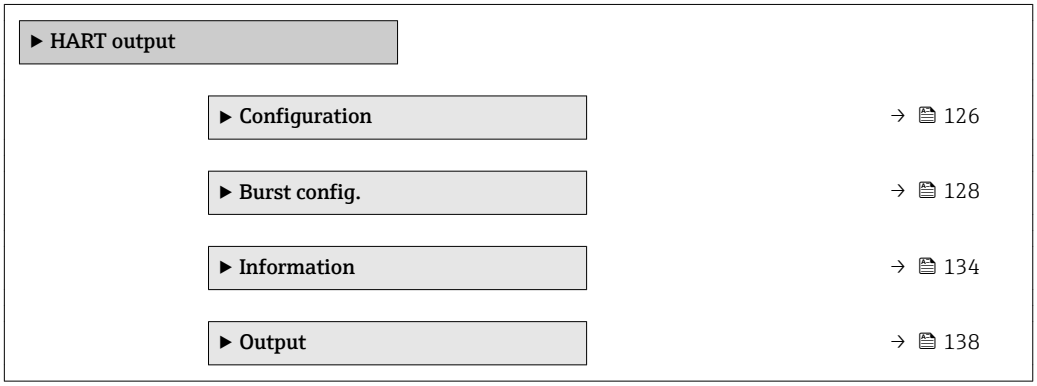
Navigation Expert → Communication → HART input → Input → Status (7004)

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

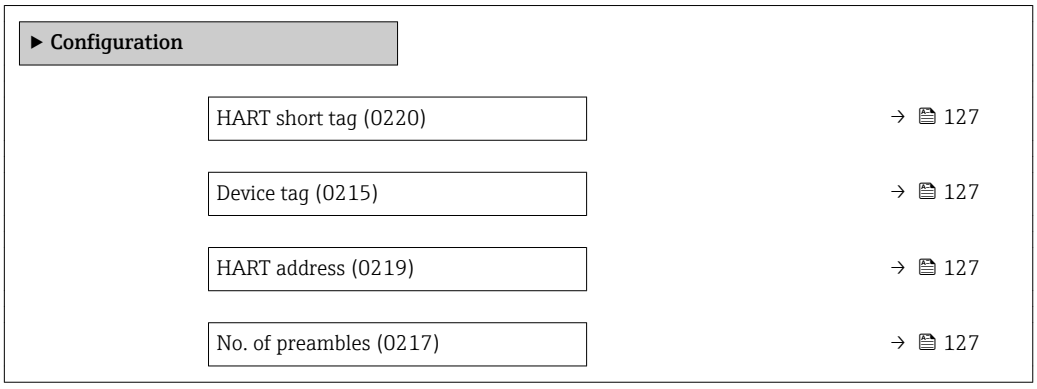
3.4.2 "HART output" submenu

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 to Z, 0 to 9 and certain special characters (e.g. punctuation marks, @, %).

Factory setting PROMASS

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 Promass

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

Additional information *Description*

For addressing in a HART Multidrop network, the **Fixed current** option must be set in the **Current span** parameter (→ 88) (current output 1).

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

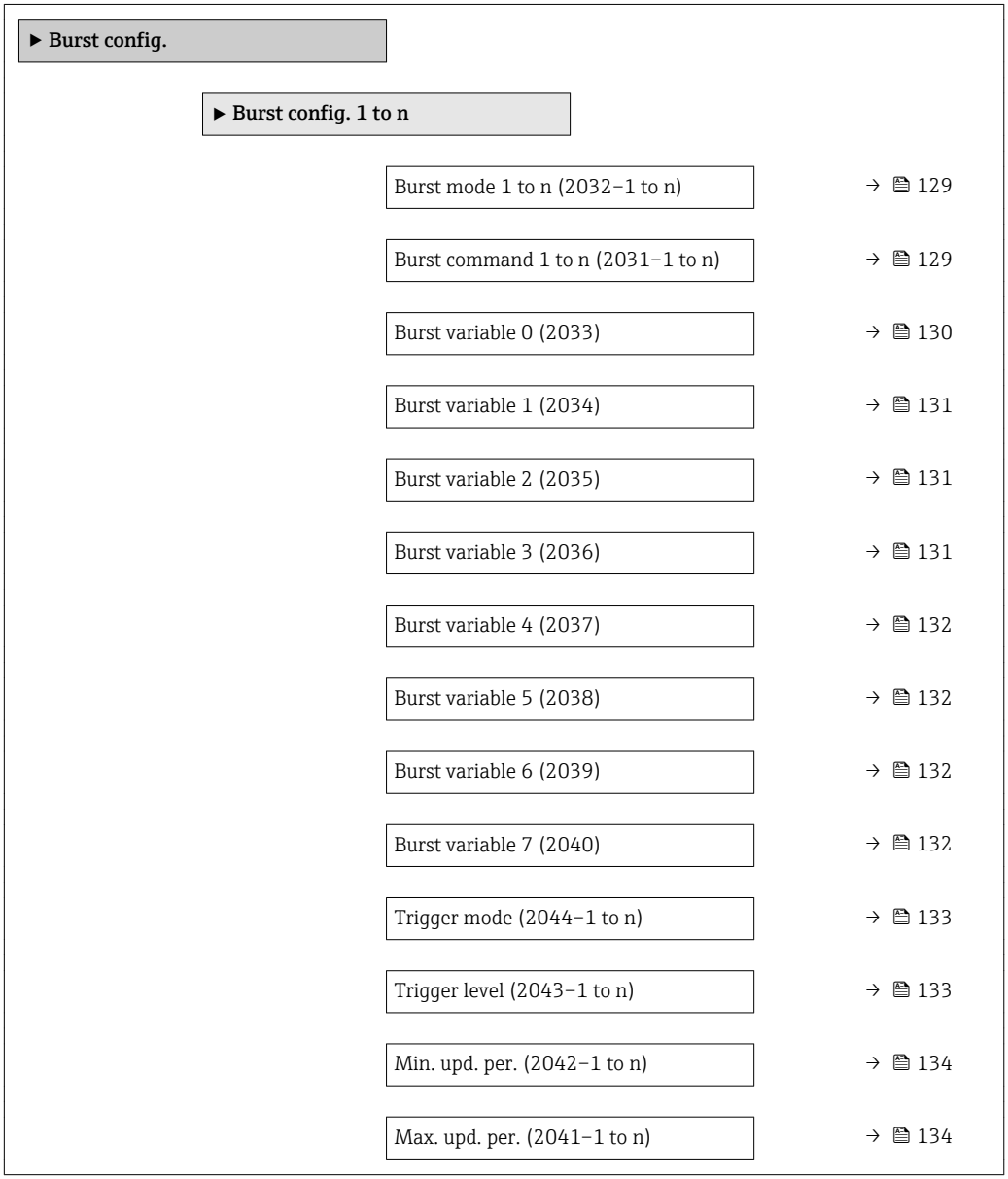
Factory setting 5

Additional information *User entry*

As every modem component can "swallow" a byte, 2-byte preambles at least must be defined.

"Burst configuration 1 to n" submenu

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to n



Burst mode 1 to n

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst mode 1 to n (2032–1 to n)

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 n

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst command 1 to n (2031–1 to n)

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 *Selection*
- 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:
- Mass flow
- Volume flow
- Correct.vol.flow
- Density
- Ref.density
- Temperature
- Carr. pipe temp. *
- Electronic temp.
- Oscil. damping
- Oscil. frequency
- Osc. ampl. 0
- Signal asymmetry
- Totalizer 1…3
- External press.
- Percent Of Range
- Measur. curr.
- Primary var (PV)
- Second.var(SV)
- Tertiary var(TV)
- Quaterna.var(QV)

Detailed description of the options **Oscil. frequency, Oscil. amplitude, Oscil. damping** and **Signal asymmetry**: **Assign curr.** parameter (→ 87)

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 (→ 86).

Burst variable 0

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 0 (2033)

Description For HART command 9 and 33: select the HART device variable or the process variable.

Selection
- Mass flow
- Volume flow
- Correct.vol.flow
- Density
- Ref.density
- Temperature
- Carr. pipe temp. *
- Electronic temp.
- Oscil. damping
- Oscil. frequency
- Osc. ampl. 0
- Signal asymmetry
- Totalizer 1
- Totalizer 2
- Totalizer 3
- External press.

* Visibility depends on order options or device settings

- Percent Of Range
- Measur. curr.
- Primary var (PV)
- Second.var(SV)
- Tertiary var(TV)
- Quaterna.var(QV)
- Not used

Factory setting Mass flow

Additional information *Selection*

The **Not used** option is set if a burst message is not configured.

Detailed description of the options **Oscil. frequency, Oscil. amplitude, Oscil. damping** and **Signal asymmetry**: **Assign curr.** parameter (→ 87)

Burst variable 1

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 1 (2034)

Description For HART command 9 and 33: select the HART device variable or the process variable.

Selection See the **Burst variable 0** parameter (→ 130).

Factory setting Not used

Burst variable 2

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 2 (2035)

Description For HART command 9 and 33: select the HART device variable or the process variable.

Selection See the **Burst variable 0** parameter (→ 130).

Factory setting Not used

Burst variable 3

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 3 (2036)

Description For HART command 9 and 33: select the HART device variable or the process variable.

Selection See the **Burst variable 0** parameter (→ 130).

Factory setting Not used

Burst variable 4

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 4 (2037)

Description For HART command 9: select the HART device variable or the process variable.

Selection See the **Burst variable 0** parameter (→ 130).

Factory setting Not used

Burst variable 5

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 5 (2038)

Description For HART command 9: select the HART device variable or the process variable.

Selection See the **Burst variable 0** parameter (→ 130).

Factory setting Not used

Burst variable 6

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 6 (2039)

Description For HART command 9: select the HART device variable or the process variable.

Selection See the **Burst variable 0** parameter (→ 130).

Factory setting Not used

Burst variable 7

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Burst variable 7 (2040)

Description For HART command 9: select the HART device variable or the process variable.

Selection See the **Burst variable 0** parameter (→ 130).

Factory setting Not used

Trigger mode

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Trigger mode (2044–1 to n)

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 per** parameter (→ 134).
- Window
  The message is sent if the specified measured value has changed by the value in the **Trigger level** parameter (→ 133).
- Rising
  The message is sent if the specified measured value exceeds the value in the **Trigger level** parameter (→ 133).
- Falling
  The message is sent if the specified measured value drops below the value in the **Trigger level** parameter (→ 133).
- On change
  The message is sent if a measured value changes in the burst message.

Trigger level

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Trigger level (2043–1 to n)

Description For entering the burst trigger value.

User entry Positive floating-point number

Additional information *Description*

Together with the option selected in the **Trigger mode** parameter (→ 133) the burst trigger value determines the time of burst message X.

Min. upd. per.

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Min. upd. per. (2042–1 to n)

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. upd. per.

Navigation Expert → Communication → HART output → Burst config. → Burst config. 1 to n → Max. upd. per. (2041–1 to n)

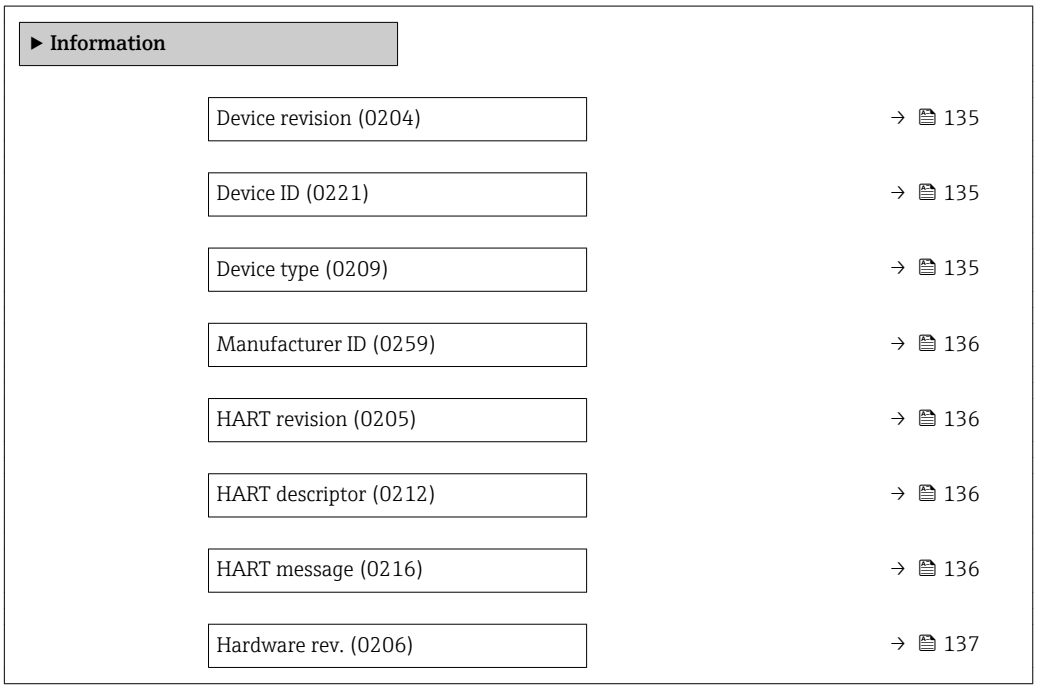
Description Use this function to enter the maximum time span between two burst commands of burst message X.

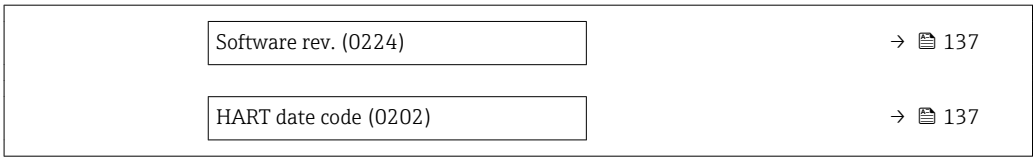
User entry Positive integer

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 Displays the device revision with which the device is registered with the HART Communication Foundation.

User interface 2-digit hexadecimal number

Factory setting 0x05

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 0x54 (for Promass 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 Promass 200

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 Promass 200

Hardware rev.

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 rev.

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 5

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.

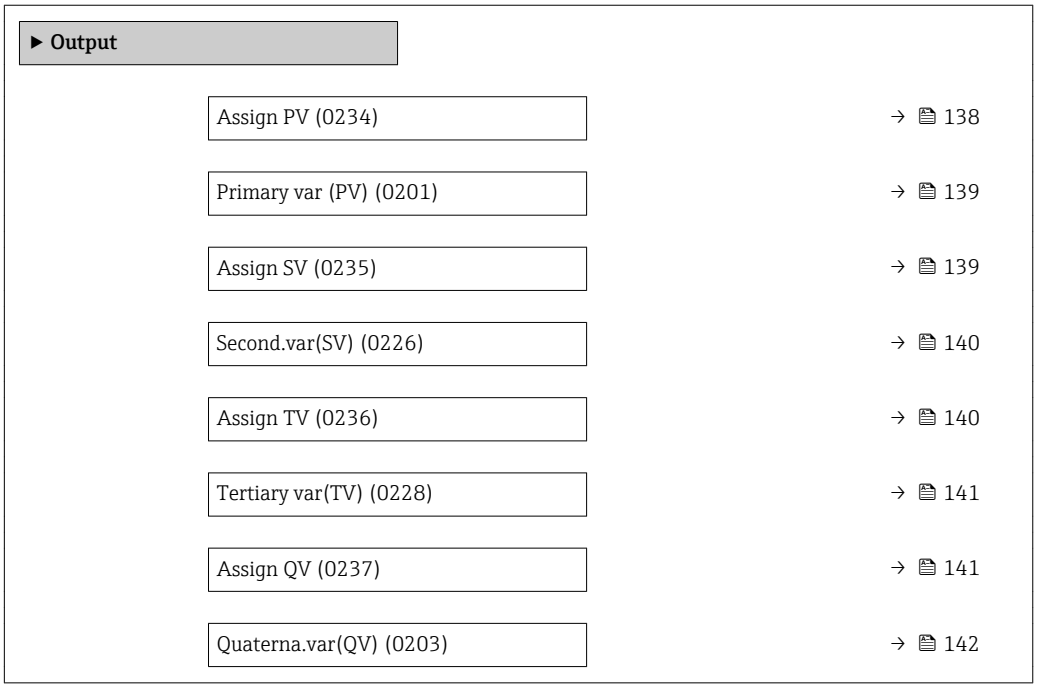
User entry Date entry format: yyyy-mm-dd

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
- Mass flow
- Volume flow
- Correct.vol.flow
- Density
- Ref.density
- Temperature
- Carr. pipe temp. *
- Electronic temp.
- Oscil. frequency
- Oscil. amplitude
- Oscil. damping
- Signal asymmetry

Factory setting Mass flow

Additional information *Selection*

Detailed description of the options **Oscil. frequency, Oscil. amplitude, Oscil. damping** and **Signal asymmetry**: **Assign curr.** parameter (→ 87)

* Visibility depends on order options or device settings

Primary var (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 (→ 138).

Dependency

The unit of the displayed measured value is taken from the **System units** submenu (→ 50).

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
- Mass flow
- Correct.vol.flow
- Density
- Ref.density
- Temperature
- Carr. pipe temp. *
- Electronic temp.
- Oscil. damping
- Oscil. frequency
- Osc. ampl. 0
- Signal asymmetry
- Totalizer 1
- Totalizer 2
- Totalizer 3
- External press.

Factory setting Totalizer 1

Additional information

Selection

Detailed description of the options **Oscil. frequency, Oscil. amplitude, Oscil. damping** and **Signal asymmetry**: **Assign curr.** parameter (→ 87)

* Visibility depends on order options or device settings

Second.var(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 Signed floating-point number

Additional information

User interface

The measured value displayed depends on the process variable selected in the **Assign SV** parameter (→ 139).

Dependency

The unit of the displayed measured value is taken from the **System units** submenu (→ 50).

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
- Mass flow
- Correct.vol.flow
- Density
- Ref.density
- Temperature
- Carr. pipe temp. *
- Electronic temp.
- Oscil. damping
- Oscil. frequency
- Osc. ampl. 0
- Signal asymmetry
- Totalizer 1
- Totalizer 2
- Totalizer 3
- External press.

Factory setting Density

Additional information

Selection

Detailed description of the options **Oscil. frequency, Oscil. amplitude, Oscil. damping** and **Signal asymmetry**: **Assign curr.** parameter (→ 87)

* Visibility depends on order options or device settings

Tertiary var(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 Positive floating-point number

Additional information

User interface

The measured value displayed depends on the process variable selected in the **Assign TV** parameter (→ 140).

Dependency

The unit of the displayed measured value is taken from the **System units** submenu (→ 50).

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
- Mass flow
- Correct.vol.flow
- Density
- Ref.density
- Temperature
- Carr. pipe temp. *
- Electronic temp.
- Oscil. damping
- Oscil. frequency
- Osc. ampl. 0
- Signal asymmetry
- Totalizer 1
- Totalizer 2
- Totalizer 3
- External press.

Factory setting Temperature

Additional information

Selection

Detailed description of the options **Oscil. frequency, Oscil. amplitude, Oscil. damping** and **Signal asymmetry**: **Assign curr.** parameter (→ 87)

* Visibility depends on order options or device settings

Quaterna.var(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 0 to 99 999.9999 °C

Additional information

User interface

The measured value displayed depends on the process variable selected in the **Assign QV** parameter (→ 141).

Dependency

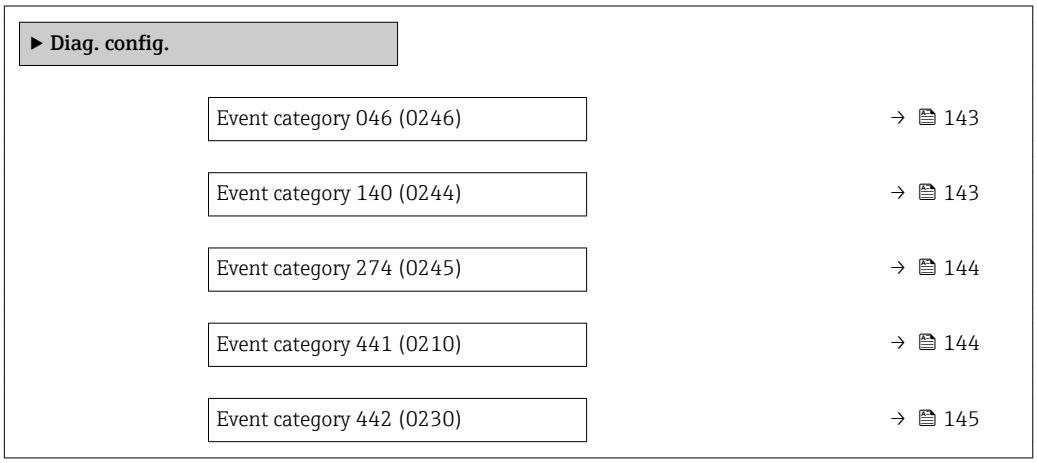
The unit of the displayed measured value is taken from the **System units** submenu (→ 50).

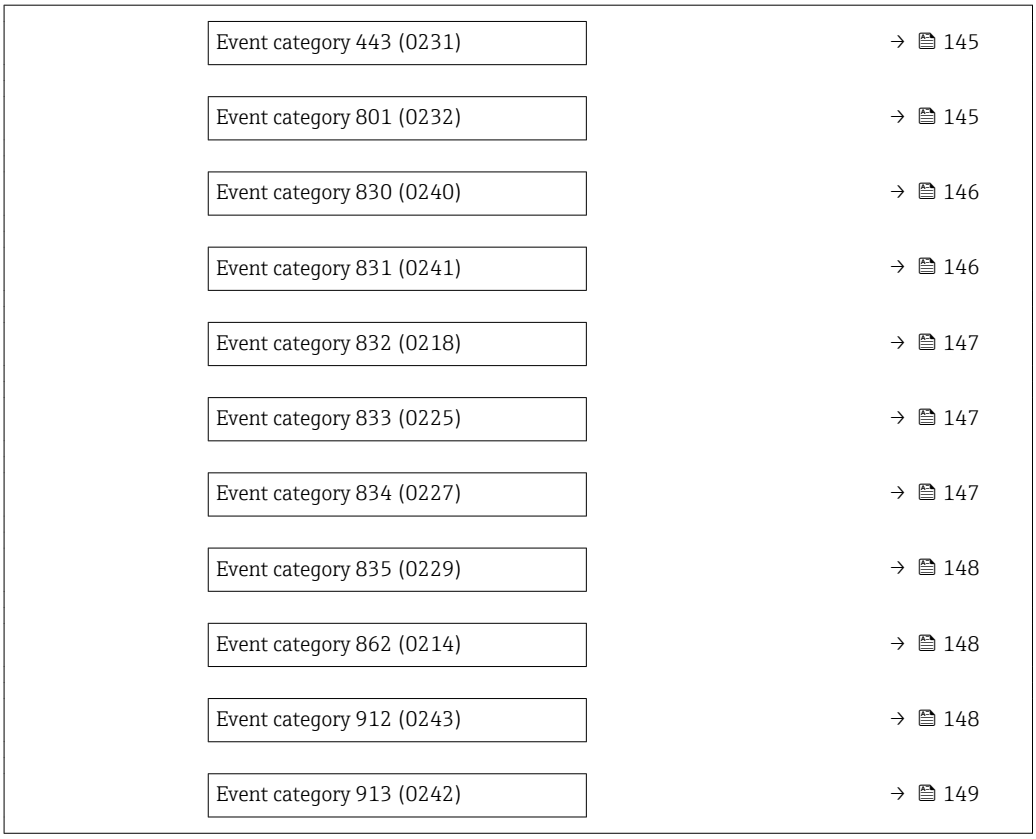
3.4.3 "Diag. config." submenu

For a list of all the diagnostic events, see the Operating Instructions for the device → 7

Assign a category to the particular diagnostic event:
- **Failure (F)** option
  A device error has occurred. The measured value is no longer valid.
- **Funct. check (C)** option
  The device is in service mode (e.g. during a simulation).
- **Out of spec. (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)
- **Mainten. req.(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 046 (Sensor limit)

Navigation Expert → Communication → Diag. config. → Event category 046 (0246)

Description Use this function to select a category for the diagnostic message **046 Sensor limit**.

Selection
- Failure (F)
- Funct. check (C)
- Out of spec. (S)
- Mainten. req.(M)
- No effect (N)

Factory setting Out of spec. (S)

Additional information For a detailed description of the event categories available for selection:

Event category 140 (Sensor sig.asym.)

Navigation Expert → Communication → Diag. config. → Event category 140 (0244)

Description Use this function to select a category for the diagnostic message **140 Sensor sig.asym.**.

Selection
- Failure (F)
- Funct. check (C)
- Out of spec. (S)
- Mainten. req.(M)
- No effect (N)

Factory setting Out of spec. (S)

Additional information For a detailed description of the event categories available for selection:

Event category 274 (Main electronic)

Navigation Expert → Communication → Diag. config. → Event category 274 (0245)

Description Use this function to select a category for the diagnostic message **274 Main electronic**.

Selection
- Failure (F)
- Funct. check (C)
- Out of spec. (S)
- Mainten. req.(M)
- No effect (N)

Factory setting Out of spec. (S)

Additional information For a detailed description of the event categories available for selection:

Event category 441 (Curr.output 1 to n)

Navigation Expert → Communication → Diag. config. → Event category 441 (0210)

Description Use this function to select a category for the diagnostic message **441 Curr.output 1 to n**.

Selection
- Failure (F)
- Funct. check (C)
- Out of spec. (S)
- Mainten. req.(M)
- No effect (N)

Factory setting Out of spec. (S)

Additional information *Selection*

For a detailed description of the event categories available for selection:

Event category 442 (Freq. 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 Freq. output**.

Selection
- Failure (F)
- Funct. check (C)
- Out of spec. (S)
- Mainten. req.(M)
- No effect (N)

Factory setting Out of spec. (S)

Additional information *Selection*

For a detailed description of the event categories available for selection:

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)
- Funct. check (C)
- Out of spec. (S)
- Mainten. req.(M)
- No effect (N)

Factory setting Out of spec. (S)

Additional information *Selection*

For a detailed description of the event categories available for selection:

Event category 801 (Supply voltage)

Navigation Expert → Communication → Diag. config. → Event category 801 (0232)

Description Use this function to select a category for the diagnostic message **801 Supply voltage**.

Selection
- Failure (F)
- Funct. check (C)
- Out of spec. (S)
- Mainten. req.(M)
- No effect (N)

Factory setting Out of spec. (S)

Additional information For a detailed description of the event categories available for selection:

Event category 830 (Sensor temp.)

Navigation Expert → Communication → Diag. config. → Event category 830 (0240)

Prerequisite If the carrier tube temperature is available (applies only to Promass F).

Description Use this function to select a category for the diagnostic message **830 Sensor temp.**.

Selection
- Failure (F)
- Funct. check (C)
- Out of spec. (S)
- Mainten. req.(M)
- No effect (N)

Factory setting Out of spec. (S)

Additional information For a detailed description of the event categories available for selection:

Event category 831 (Sensor temp.)

Navigation Expert → Communication → Diag. config. → Event category 831 (0241)

Prerequisite If the carrier tube temperature is available (applies only to Promass F).

Description Use this function to select a category for the diagnostic message **831 Sensor temp.**.

Selection
- Failure (F)
- Funct. check (C)
- Out of spec. (S)
- Mainten. req.(M)
- No effect (N)

Factory setting Out of spec. (S)

Additional information For a detailed description of the event categories available for selection:

Event category 832 (Electronic temp.)

Navigation Expert → Communication → Diag. config. → Event category 832 (0218)

Description Use this function to select a category for the diagnostic message **832 Electronic temp.**.

Selection
- Failure (F)
- Funct. check (C)
- Out of spec. (S)
- Mainten. req.(M)
- No effect (N)

Factory setting Out of spec. (S)

Additional information *Selection*

For a detailed description of the event categories available for selection:

Event category 833 (Electronic temp.)

Navigation Expert → Communication → Diag. config. → Event category 833 (0225)

Description Use this option to select a category for the diagnostic message **833 Electronic temp.**.

Selection
- Failure (F)
- Funct. check (C)
- Out of spec. (S)
- Mainten. req.(M)
- No effect (N)

Factory setting Out of spec. (S)

Additional information *Selection*

For a detailed description of the event categories available for selection:

Event category 834 (Process temp.)

Navigation Expert → Communication → Diag. config. → Event category 834 (0227)

Description Use this option to select a category for the diagnostic message **834 Process temp.**.

Selection
- Failure (F)
- Funct. check (C)
- Out of spec. (S)
- Mainten. req.(M)
- No effect (N)

Factory setting Out of spec. (S)

Additional information *Selection*

For a detailed description of the event categories available for selection:

Event category 835 (Process temp.)

Navigation Expert → Communication → Diag. config. → Event category 835 (0229)

Description Use this option to select a category for the diagnostic message **835 Process temp.**.

Selection
- Failure (F)
- Funct. check (C)
- Out of spec. (S)
- Mainten. req.(M)
- No effect (N)

Factory setting Out of spec. (S)

Additional information *Selection*

For a detailed description of the event categories available for selection:

Event category 862 (Empty pipe)

Navigation Expert → Communication → Diag. config. → Event category 862 (0214)

Description Use this option to select a category for the diagnostic message **862 Empty pipe**.

Selection
- Failure (F)
- Funct. check (C)
- Out of spec. (S)
- Mainten. req.(M)
- No effect (N)

Factory setting Out of spec. (S)

Additional information For a detailed description of the event categories available for selection:

Event category 912 (Medium inhomog.)

Navigation Expert → Communication → Diag. config. → Event category 912 (0243)

Description Use this function to select a category for the diagnostic message **912 Medium inhomog.**.

Selection
- Failure (F)
- Funct. check (C)
- Out of spec. (S)
- Mainten. req.(M)
- No effect (N)

Factory setting Out of spec. (S)

Additional information For a detailed description of the event categories available for selection:

Event category 913 (Medium unsuitab.)

Navigation Expert → Communication → Diag. config. → Event category 913 (0242)

Description Use this function to select a category for the diagnostic message **913 Medium unsuitab.**.

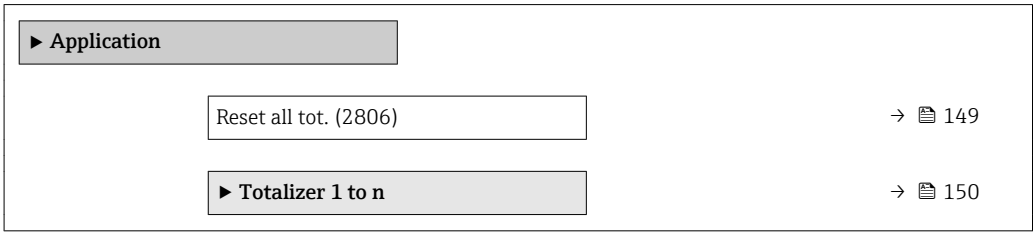
Selection
- Failure (F)
- Funct. check (C)
- Out of spec. (S)
- Mainten. req.(M)
- No effect (N)

Factory setting Out of spec. (S)

Additional information For a detailed description of the event categories available for selection:

3.5 "Application" submenu

Navigation Expert → Application



Reset all tot.

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

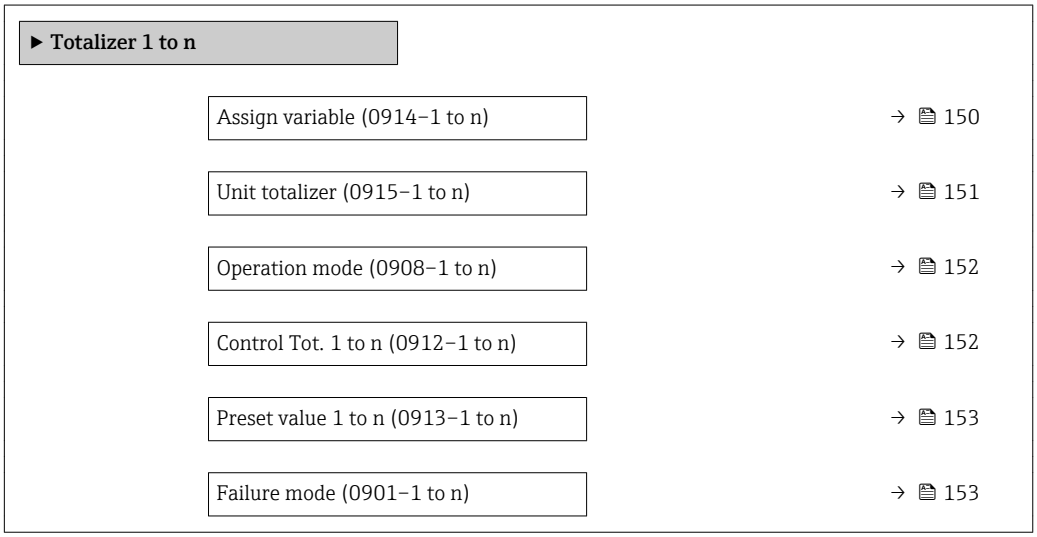
Factory setting Cancel

Additional information *Selection*

Options	Description
Cancel	No action is executed and the user exits the parameter.
Reset + totalize	Resets all totalizers to 0 and restarts the totaling process. This deletes all the flow values previously totalized.

3.5.1 "Totalizer 1 to n" submenu

Navigation Expert → Application → Totalizer 1 to n



Assign variable

Navigation Expert → Application → Totalizer 1 to n → Assign variable (0914–1 to n)

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

Selection
- Off
- Volume flow
- Mass flow
- Correct.vol.flow

Factory setting Mass flow

Additional information

Description

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

Selection

If the **Off** option is selected, only **Assign variable** parameter (→ 150) is still displayed in the **Totalizer 1 to n** submenu. All other parameters in the submenu are hidden.

Unit totalizer

Navigation

Expert → Application → Totalizer 1 to n → Unit totalizer (0915–1 to n)

Prerequisite

A process variable is selected in the **Assign variable** parameter (→ 150) of the **Totalizer 1 to n** submenu.

Description

Use this function to select the process variable unit for the Totalizer 1 to n (→ 150).

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)

Factory setting

Country-specific:
- l
- gal (us)

Additional information *Description*

The unit is selected separately for each totalizer. It is independent of the selection made in the **System units** submenu (→ 50).

Selection

The selection is dependent on the process variable selected in the **Assign variable** parameter (→ 150).

Operation mode

Navigation Expert → Application → Totalizer 1 to n → Operation mode (0908–1 to n)

Prerequisite A process variable is selected in the **Assign variable** parameter (→ 150) of the **Totalizer 1 to n** submenu.

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

Selection
- Net flow total
- Forward total
- Reverse total

Factory setting Net flow total

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

Control Tot. 1 to n

Navigation Expert → Application → Totalizer 1 to n → Control Tot. 1 to n (0912–1 to n)

Prerequisite A process variable is selected in the **Assign variable** parameter (→ 150) of the **Totalizer 1 to n** submenu.

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

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

Factory setting Totalize

Additional information *Selection*

Options	Description
Totalize	The totalizer is started or continues running.
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.
Reset + totalize	The totalizer is reset to 0 and the totaling process is restarted.
Preset+totalize	The totalizer is set to the defined start value from the **Preset value** parameter and the totaling process is restarted.
Hold	Totalizing is stopped.

Preset value 1 to n

Navigation Expert → Application → Totalizer 1 to n → Preset value 1 to n (0913–1 to n)

Prerequisite A process variable is selected in the **Assign variable** parameter (→ 150) of the **Totalizer 1 to n** submenu.

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

User entry Signed floating-point number

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

Additional information *User entry*

The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→ 151).

Example

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

Failure mode

Navigation Expert → Application → Totalizer 1 to n → Failure mode (0901–1 to n)

Prerequisite A process variable is selected in the **Assign variable** parameter (→ 150) of the **Totalizer 1 to n** submenu.

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

Selection
- Stop
- Actual value
- Last valid value

Factory setting Stop

Additional information *Description*

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

Selection

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

3.6 "Diagnostics" submenu

Navigation Expert → Diagnostics

▶ **Diagnostics**	
Actual diagnos. (0691)	→ 155
Prev.diagnostics (0690)	→ 155
Time fr. restart (0653)	→ 156
Operating time (0652)	→ 156
▶ **Diagnostic list**	→ 157
▶ **Event logbook**	→ 161
▶ **Device info**	→ 163
▶ **I/O module**	→ 167
▶ **Display module**	→ 168
▶ **Data logging**	→ 168
▶ **Min/max val.**	→ 174
▶ **Heartbeat**	→ 183
▶ **Simulation**	→ 183

Actual diagnos.

Navigation Expert → Diagnostics → Actual diagnos. (0691)

Prerequisite A diagnostic event has occurred.

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

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

Additional information

Display

Additional pending diagnostic messages can be viewed in the **Diagnostic list** submenu (→ 157).

Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the E key.

Example

For the display format:
⊗F271 Main electronic

Timestamp

Navigation Expert → Diagnostics → Timestamp

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

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

Additional information

Display

The diagnostic message can be viewed via the **Actual diagnos.** parameter (→ 155).

Example

For the display format:
24d12h13m00s

Prev.diagnostics

Navigation Expert → Diagnostics → Prev.diagnostics (0690)

Prerequisite Two diagnostic events have already occurred.

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

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

Additional information

Display

Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the E key.

Example

For the display format:
⊗F271 Main electronic

Timestamp

Navigation Expert → Diagnostics → Timestamp

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

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

Additional information

Display

The diagnostic message can be viewed via the **Prev.diagnostics** parameter (→ 155).

Example

For the display format:
24d12h13m00s

Time fr. 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.

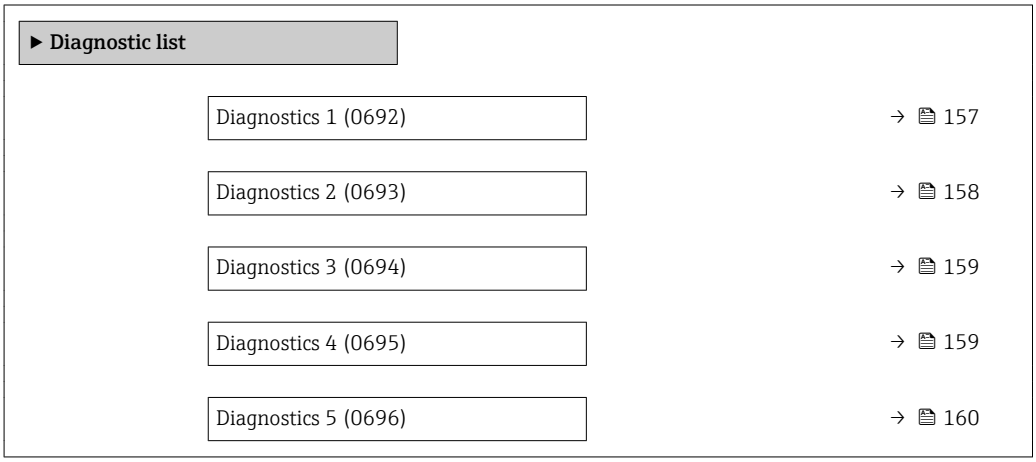
User interface Days (d), hours (h), minutes (m) and seconds (s)

Additional information *User interface*

The maximum number of days is 9999, which is equivalent to 27 years.

3.6.1 "Diagnostic list" submenu

Navigation Expert → Diagnostics → Diagnostic list



Diagnostics 1

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 1 (0692)

Description Displays the current diagnostics message with the highest priority.

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

Additional information *Display*

Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the E key.

Examples

For the display format:
- ⚠S442 Freq. output
- ⊗F276 I/O module

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

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

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

Additional information *Display*

The diagnostic message can be viewed via the **Diagnostics 1** parameter (→ 157).

Example

For the display format:
24d12h13m00s

Diagnostics 2

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 2 (0693)

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

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

Additional information *Display*

Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the E key.

Examples

For the display format:
- ⚠S442 Freq. output
- ⊗F276 I/O module

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

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

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

Additional information *Display*

The diagnostic message can be viewed via the **Diagnostics 2** parameter (→ 158).

Example

For the display format:
24d12h13m00s

Diagnostics 3

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 3 (0694)

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

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

Additional information *Display*

Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the E key.

Examples

For the display format:
- ⚠S442 Freq. output
- ⊗F276 I/O module

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

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

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

Additional information *Display*

The diagnostic message can be viewed via the **Diagnostics 3** parameter (→ 159).

Example

For the display format:
24d12h13m00s

Diagnostics 4

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 4 (0695)

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

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

Additional information *Display*

Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the E key.

Examples

For the display format:
- ⚠S442 Freq. output
- ⊗F276 I/O module

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

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

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

Additional information *Display*

The diagnostic message can be viewed via the **Diagnostics 4** parameter (→ 159).

Example

For the display format:
24d12h13m00s

Diagnostics 5

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 5 (0696)

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

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

Additional information *Display*

Via the local display: the time stamp and corrective measures referring to the cause of the diagnostic message can be accessed via the E key.

Examples

For the display format:
- ⚠S442 Freq. output
- ⊗F276 I/O module

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

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

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

Additional information *Display*

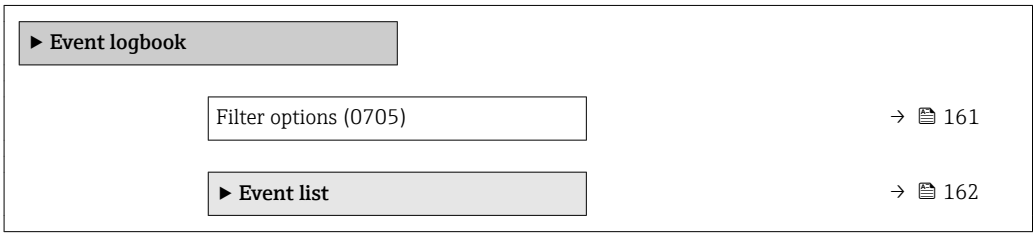
The diagnostic message can be viewed via the **Diagnostics 5** parameter (→ 160).

Example

For the display format:
24d12h13m00s

3.6.2 "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 event list of the local display.

Selection
- All
- Failure (F)
- Funct. check (C)
- Out of spec. (S)
- Mainten. req.(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

Filter options

Navigation Expert → Diagnostics → Event logbook → Filter options

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

Selection
- All
- Failure (F)
- Funct. check (C)
- Out of spec. (S)
- Mainten. req.(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

The **Event list** submenu is only displayed if operating via the local display.

If operating via the FieldCare operating tool, the event list can be read out with a separate FieldCare module.

Navigation Expert → Diagnostics → Event logbook → Event list

Event list

Navigation Expert → Diagnostics → Event logbook → Event list

Description Displays the history of event messages of the category selected in the **Filter options** parameter (→ 161).

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 **Extended HistoROM** application package (order option) 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 Freq. output
  ⊕ 01d04h12min30s

Additional information, such as remedial measures, can be retrieved via the E key.

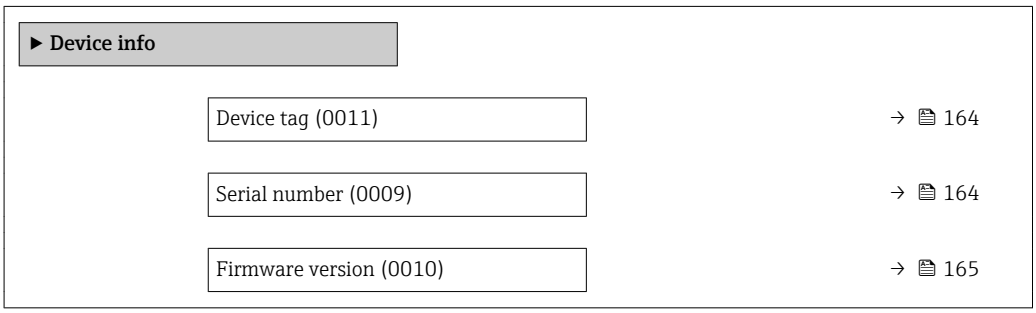
HistoROM

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

To order the **Extended HistoROM** application package, see the "Application packages" section of the "Technical Information" document

3.6.3 "Device info" submenu

Navigation Expert → Diagnostics → Device info



Device name (0013)	→ 165
Order code (0008)	→ 165
Ext. order cd. 1 (0023)	→ 166
Ext. order cd. 2 (0021)	→ 166
Ext. order cd. 3 (0022)	→ 166
Config. counter (0233)	→ 167
ENP version (0012)	→ 167

Device tag

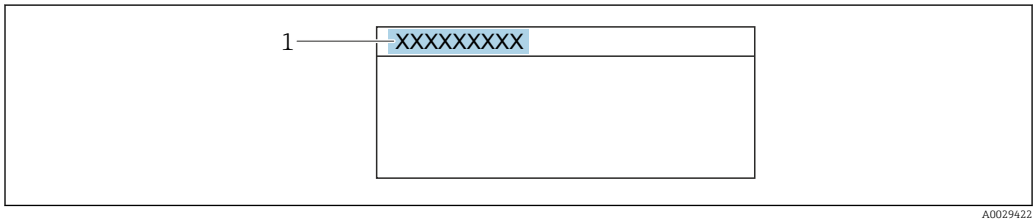
Navigation Expert → Diagnostics → Device info → Device tag (0011)

Description Displays 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 Promass

Additional information *Display*



1 Position of the header text on the display

The number of characters displayed depends on the characters used.

Serial number

Navigation Expert → Diagnostics → Device info → Serial number (0009)

Description Displays the serial number of the measuring device.

The number can 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 Displays the device firmware version installed.

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

Additional information *Display*

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

Device name

Navigation Expert → Diagnostics → Device info → Device name (0013)

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

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

Factory setting Promass 200

Order code

Navigation Expert → Diagnostics → Device info → Order code (0008)

Description Displays the device order code.

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

Additional information *Description*

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

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

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

Ext. order cd. 1

Navigation Expert → Diagnostics → Device info → Ext. order cd. 1 (0023)

Description Displays the first part of the extended order code.

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

User interface Character string

Additional information *Description*

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

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

Ext. order cd. 2

Navigation Expert → Diagnostics → Device info → Ext. order cd. 2 (0021)

Description Displays the second part of the extended order code.

User interface Character string

Additional information For additional information, see **Ext. order cd. 1** parameter (→ 166)

Ext. order cd. 3

Navigation Expert → Diagnostics → Device info → Ext. order cd. 3 (0022)

Description Displays the third part of the extended order code.

User interface Character string

Additional information For additional information, see **Ext. order cd. 1** parameter (→ 166)

Config. 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

ENP version

Navigation Expert → Diagnostics → Device info → ENP version (0012)

Description Displays the version of the electronic nameplate.

User interface Character string

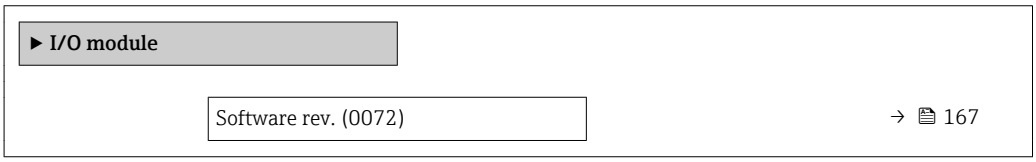
Factory setting 2.02.00

Additional information *Description*

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

3.6.4 "I/O module" submenu

Navigation Expert → Diagnostics → I/O module



Software rev.

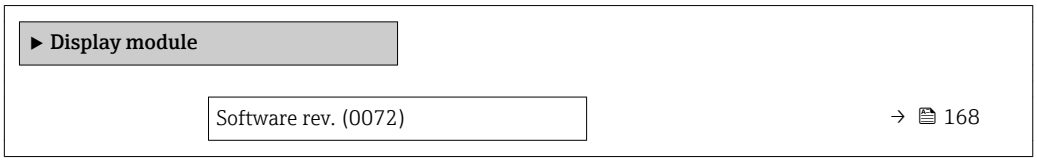
Navigation Expert → Diagnostics → I/O module → Software rev. (0072)

Description Use this function to display the software revision of the module.

User interface Positive integer

3.6.5 "Display module" submenu

Navigation Expert → Diagnostics → Display module



Software rev.

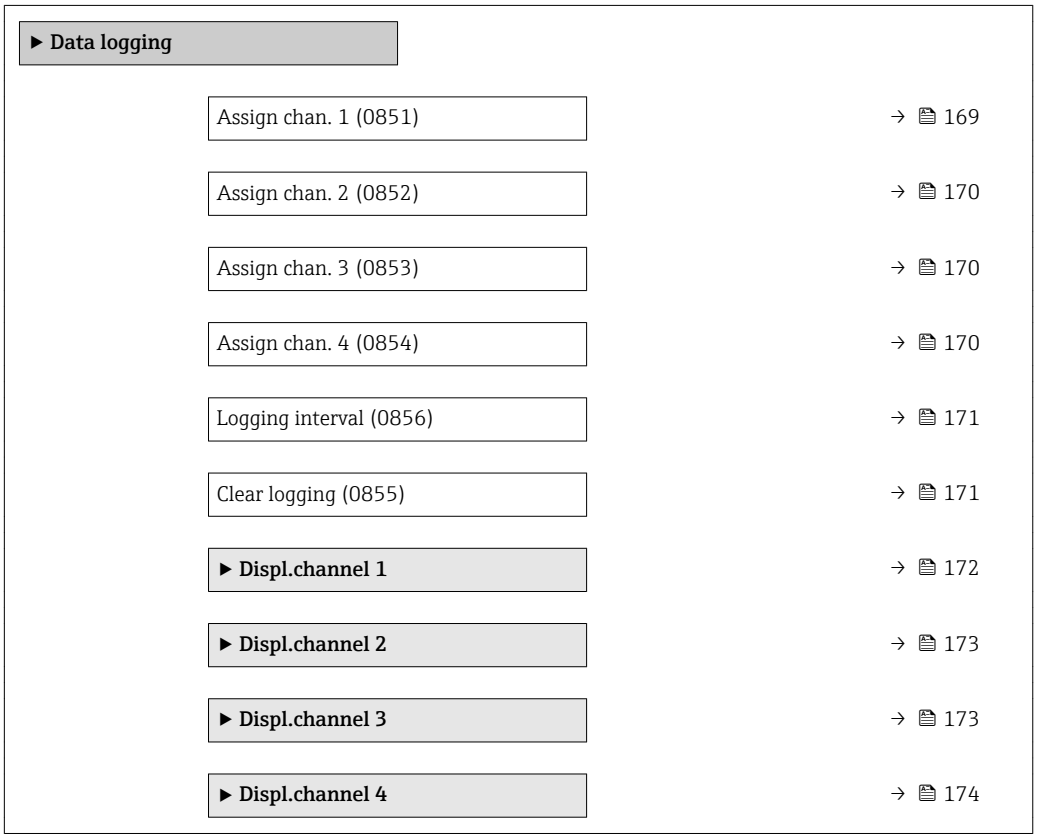
Navigation Expert → Diagnostics → Display module → Software rev. (0072)

Description Use this function to display the software revision of the module.

User interface Positive integer

3.6.6 "Data logging" submenu

Navigation Expert → Diagnostics → Data logging



Assign chan. 1

Navigation 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 **SW option overv.** parameter (→ 41).

Description Use this function to select a process variable for the data logging channel.

Selection
- Off
- Mass flow
- Volume flow
- Correct.vol.flow
- Density
- Ref.density
- Temperature
- Carr. pipe temp. *
- Electronic temp.
- Oscil. frequency
- Oscil. amplitude
- Oscil. damping
- Signal asymmetry
- Curr.output 1

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.

Selection

Detailed description of the options **Oscil. frequency, Oscil. amplitude, Oscil. damping** and **Signal asymmetry**: **Assign curr.** parameter (→ 87)

* Visibility depends on order options or device settings

Assign chan. 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 **SW option overv.** parameter (→ 41).

Description Options for the assignment of a process variable to the data logging channel.

Selection Picklist, see **Assign channel 1** parameter (→ 169)

Factory setting Off

Assign chan. 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 **SW option overv.** parameter (→ 41).

Description Options for the assignment of a process variable to the data logging channel.

Selection Picklist, see **Assign channel 1** parameter (→ 169)

Factory setting Off

Assign chan. 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 **SW option overv.** parameter (→ 41).

Description Options for the assignment of a process variable to the data logging channel.

Selection Picklist, see **Assign channel 1** parameter (→ 169)

Factory setting Off

Logging interval

Navigation Expert → Diagnostics → Data logging → Logging interval (0856)

Prerequisite The **Extended HistoROM** application package is available.

The software options currently enabled are displayed in the **SW option overv.** parameter (→ 41).

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 T_{log} 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

Navigation Expert → Diagnostics → Data logging → Clear logging (0855)

Prerequisite The **Extended HistoROM** application package is available.

The software options currently enabled are displayed in the **SW option overv.** parameter (→ 41).

Description Use this function to clear the entire logging data.

Selection
- Cancel
- Clear data

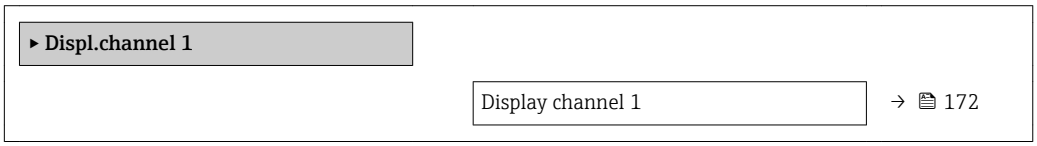
Factory setting Cancel

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.

"Displ.channel 1" submenu

Navigation Expert → Diagnostics → Data logging → Displ.channel 1



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 **SW option overv.** parameter (→ 41).

One of the following options is selected in the **Assign chan. 1** parameter (→ 169):
- Mass flow
- Volume flow
- Correct.vol.flow
- Density
- Ref.density
- Temperature
- Carr. pipe temp. *
- Electronic temp.
- Oscil. frequency
- Oscil. amplitude
- Oscil. damping
- Signal asymmetry
- Curr.output 1

Description Displays the measured value trend for the logging channel in the form of a chart.

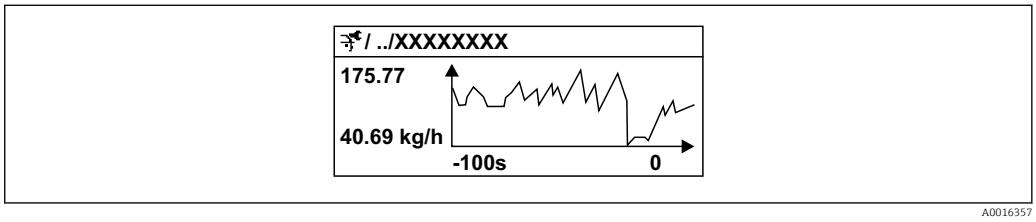
* Visibility depends on order options or device settings

Additional information

Prerequisite

Detailed description of the options **Oscil. frequency, Oscil. amplitude, Oscil. damping** and **Signal asymmetry**: **Assign curr.** parameter (→ 87)

Description

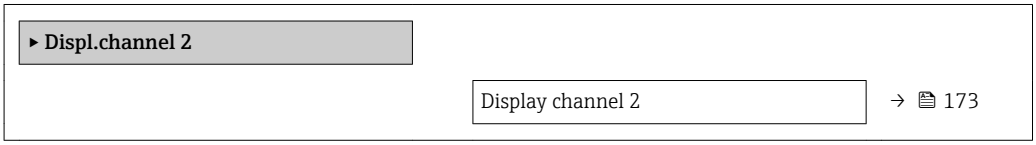


9 *Chart of a measured value trend*

- 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.

"Displ.channel 2" submenu

Navigation Expert → Diagnostics → Data logging → Displ.channel 2



Display channel 2

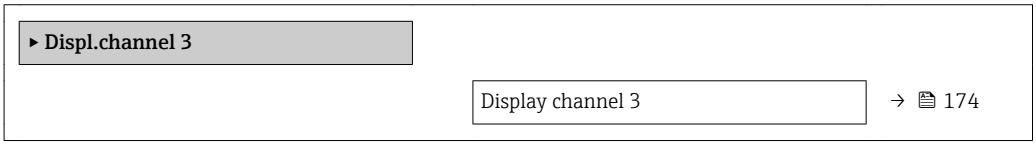
Navigation Expert → Diagnostics → Data logging → Displ.channel 2

Prerequisite A process variable is defined in the **Assign chan. 2** parameter.

Description See the **Display channel 1** parameter → 172

"Displ.channel 3" submenu

Navigation Expert → Diagnostics → Data logging → Displ.channel 3



Display channel 3

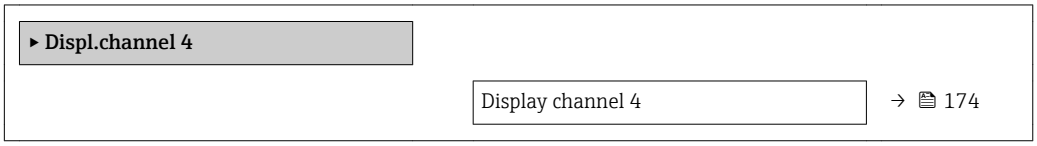
Navigation Expert → Diagnostics → Data logging → Displ.channel 3

Prerequisite A process variable is defined in the **Assign chan. 3** parameter.

Description See the **Display channel 1** parameter → 172

"Displ.channel 4" submenu

Navigation Expert → Diagnostics → Data logging → Displ.channel 4



Display channel 4

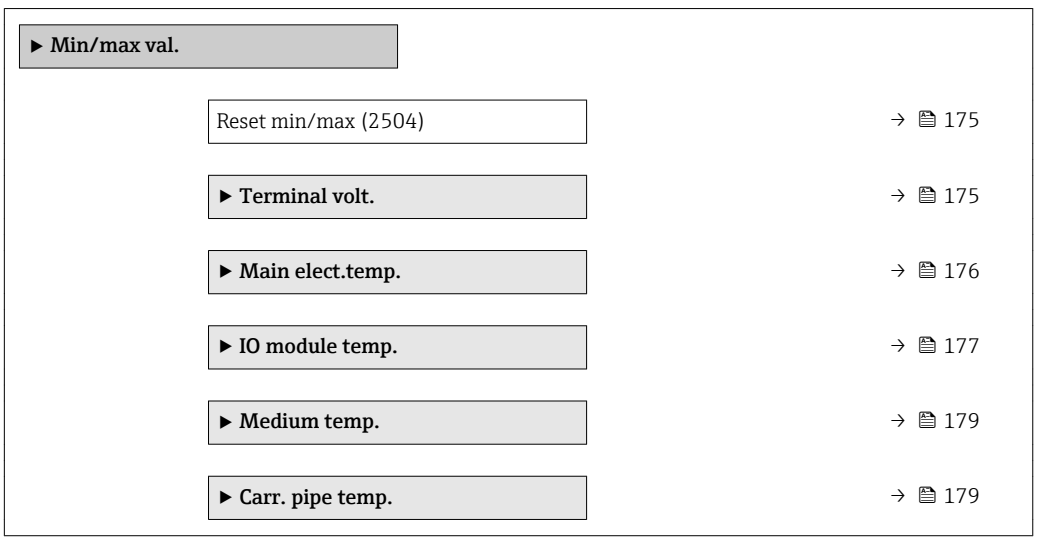
Navigation Expert → Diagnostics → Data logging → Displ.channel 4

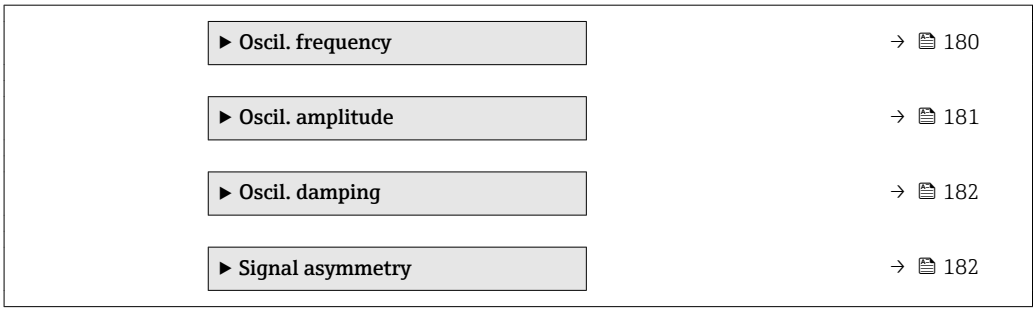
Prerequisite A process variable is defined in the **Assign chan. 4** parameter.

Description See the **Display channel 1** parameter → 172

3.6.7 "Min/max val." submenu

Navigation Expert → Diagnostics → Min/max val.





Reset min/max

Navigation Expert → Diagnostics → Min/max val. → Reset min/max (2504)

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

Selection
- Cancel
- Terminal volt. 1
- IO module temp.
- Oscil. amplitude
- Oscil. damping
- Oscil. frequency
- Signal asymmetry

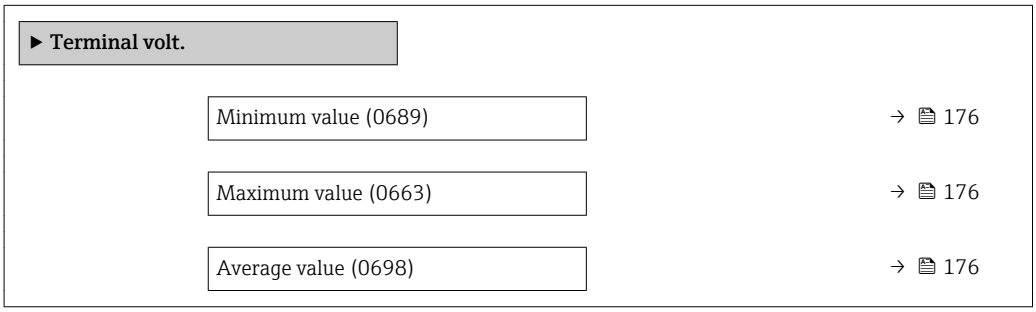
Factory setting Cancel

Additional information *Options*

Detailed description of the options **Oscil. frequency, Oscil. amplitude, Oscil. damping** and **Signal asymmetry**: **Assign curr.** parameter (→ 87)

"Terminal volt." 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

"Main elect.temp." submenu

Navigation Expert → Diagnostics → Min/max val. → Main elect.temp.

▶ Main elect.temp.		
	Minimum value (2457)	→ 177
	Maximum value (2456)	→ 177

Minimum value

Navigation Expert → Diagnostics → Min/max val. → Main elect.temp. → Minimum value (2457)

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

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 57)

Maximum value

Navigation Expert → Diagnostics → Min/max val. → Main elect.temp. → Maximum value (2456)

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

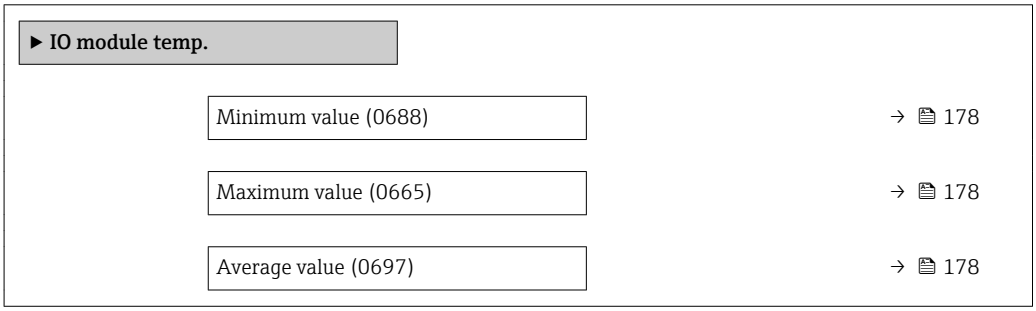
User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 57)

"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 Displays 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 (→ 57)

Maximum value

Navigation Expert → Diagnostics → Min/max val. → IO module temp. → Maximum value (0665)

Description Displays 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 (→ 57)

Average value

Navigation Expert → Diagnostics → Min/max val. → IO module temp. → Average value (0697)

Description Displays the average value of all previously measured temperature values of the I/O electronics module.

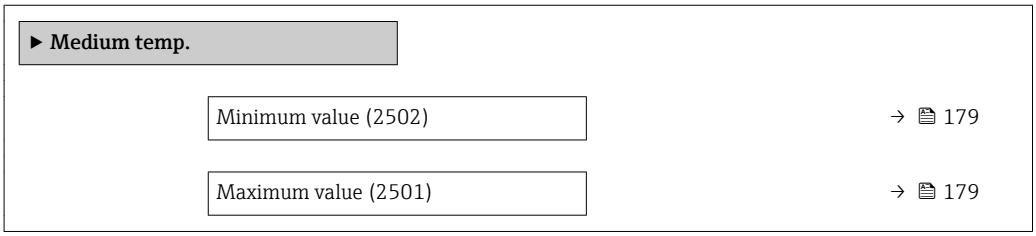
User interface −1 273.15 to 726.85 °C

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 57)

"Medium temp." submenu

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



Minimum value

Navigation Expert → Diagnostics → Min/max val. → Medium temp. → Minimum value (2502)

Description Displays the lowest previously measured medium temperature value.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 57)

Maximum value

Navigation Expert → Diagnostics → Min/max val. → Medium temp. → Maximum value (2501)

Description Displays the highest previously measured medium temperature value.

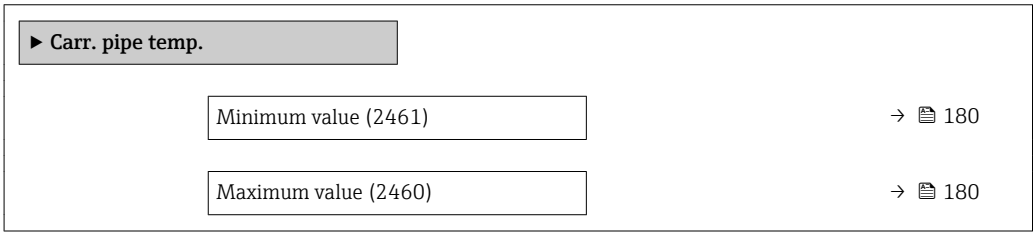
User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 57)

"Carr. pipe temp." submenu

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



Minimum value

Navigation Expert → Diagnostics → Min/max val. → Carr. pipe temp. → Minimum value (2461)

Prerequisite If the carrier tube temperature is available (applies only to Promass F).

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

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 57)

Maximum value

Navigation Expert → Diagnostics → Min/max val. → Carr. pipe temp. → Maximum value (2460)

Prerequisite If the carrier tube temperature is available (applies only to Promass F).

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

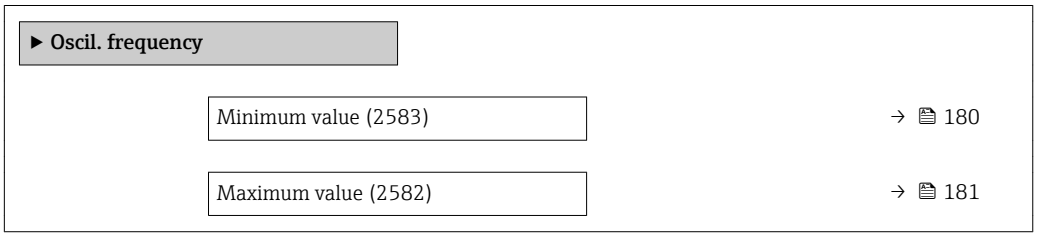
User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 57)

"Oscil. frequency" submenu

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



Minimum value

Navigation Expert → Diagnostics → Min/max val. → Oscil. frequency → Minimum value (2583)

Description Displays the lowest previously measured oscillation frequency.

User interface Signed floating-point number

Maximum value

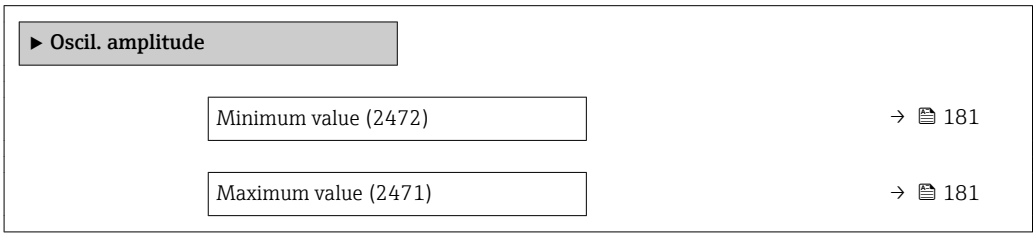
Navigation Expert → Diagnostics → Min/max val. → Oscil. frequency → Maximum value (2582)

Description Displays the highest previously measured oscillation frequency.

User interface Signed floating-point number

"Oscil. amplitude" submenu

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



Minimum value

Navigation Expert → Diagnostics → Min/max val. → Oscil. amplitude → Minimum value (2472)

Description Displays the lowest previously measured oscillation amplitude.

User interface Signed floating-point number

Maximum value

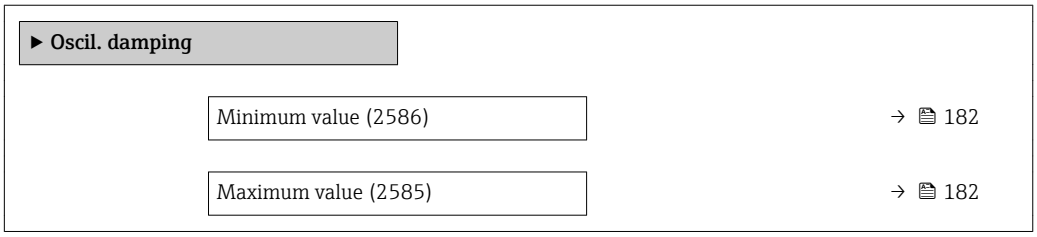
Navigation Expert → Diagnostics → Min/max val. → Oscil. amplitude → Maximum value (2471)

Description Displays the highest previously measured oscillation amplitude.

User interface Signed floating-point number

"Oscil. damping" submenu

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



Minimum value

Navigation Expert → Diagnostics → Min/max val. → Oscil. damping → Minimum value (2586)

Description Displays the lowest previously measured oscillation damping.

User interface Signed floating-point number

Maximum value

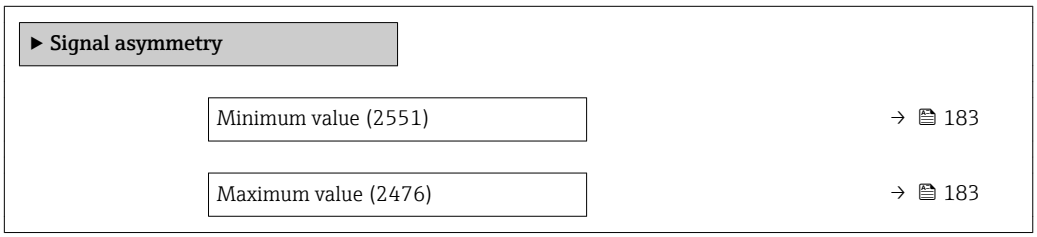
Navigation Expert → Diagnostics → Min/max val. → Oscil. damping → Maximum value (2585)

Description Displays the highest previously measured oscillation damping.

User interface Signed floating-point number

"Signal asymmetry" submenu

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



Minimum value

Navigation Expert → Diagnostics → Min/max val. → Signal asymmetry → Minimum value (2551)

Description Displays the lowest previously measured signal asymmetry.

User interface Signed floating-point number

Maximum value

Navigation Expert → Diagnostics → Min/max val. → Signal asymmetry → Maximum value (2476)

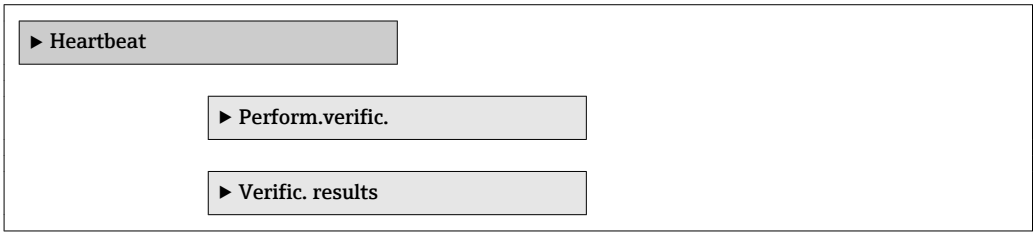
Description Displays the highest previously measured signal asymmetry.

User interface Signed floating-point number

3.6.8 "Heartbeat" submenu

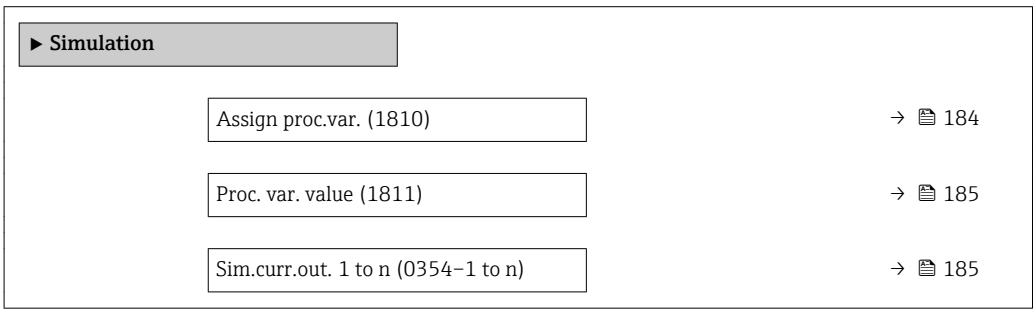
For detailed information on the parameter descriptions for the **Heartbeat Verification+Monitoring**application package, refer to the Special Documentation for the device → 7

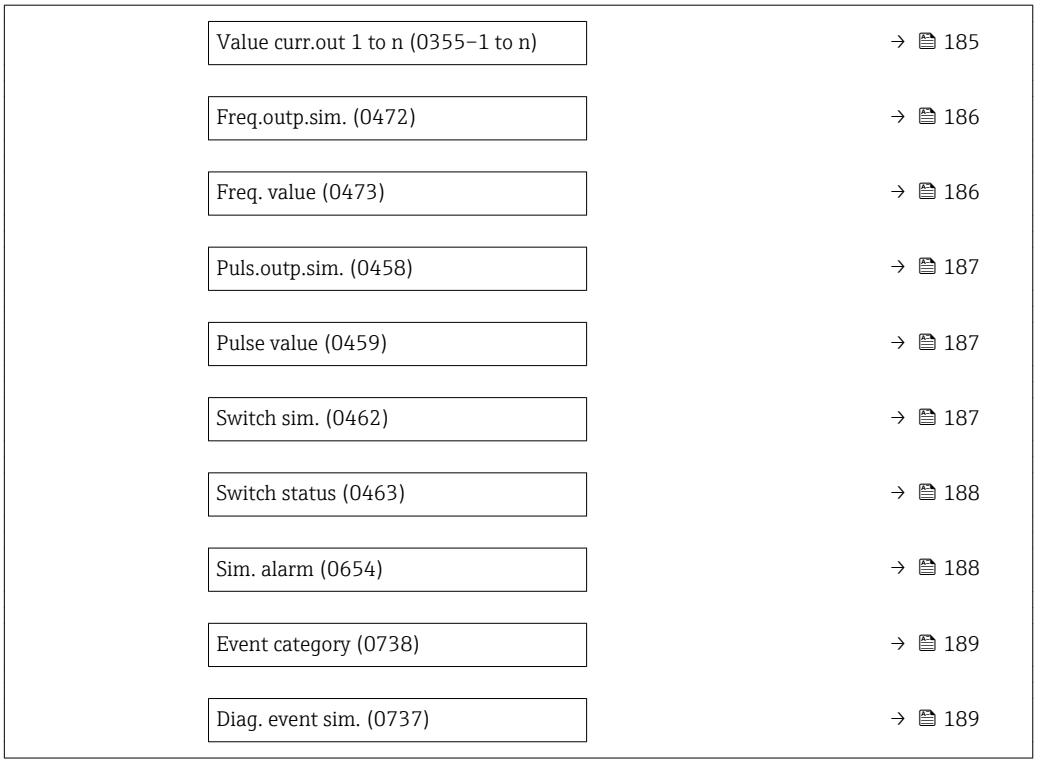
Navigation Expert → Diagnostics → Heartbeat



3.6.9 "Simulation" submenu

Navigation Expert → Diagnostics → Simulation





Assign proc.var.

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
- Mass flow
- Volume flow
- Correct.vol.flow
- Density
- Ref.density
- Temperature

Factory setting Off

Additional information *Description*

The simulation value of the process variable selected is defined in the **Proc. var. value** parameter (→ 185).

Proc. var. value

Navigation Expert → Diagnostics → Simulation → Proc. var. value (1811)

Prerequisite A process variable is selected in the **Assign proc.var.** parameter (→ 184).

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 (→ 50).

Sim.curr.out. 1 to n

Navigation Expert → Diagnostics → Simulation → Sim.curr.out. 1 to n (0354–1 to n)

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 defined in the **Value curr.out 1 to n** parameter.

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.

Value curr.out 1 to n

Navigation Expert → Diagnostics → Simulation → Value curr.out 1 to n (0355–1 to n)

Prerequisite In the **Sim.curr.out. 1 to n** 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

Additional information *Dependency*

The input range is dependent on the option selected in the **Current span** parameter (→ 88).

Freq.outp.sim.

Navigation Expert → Diagnostics → Simulation → Freq.outp.sim. (0472)

Prerequisite In the **Operating mode** parameter (→ 102), the **Frequency** option is selected.

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 **Freq. value** parameter (→ 186).

Selection
- Off
  Frequency simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.
- On
  Frequency simulation is active.

Freq. value

Navigation Expert → Diagnostics → Simulation → Freq. value (0473)

Prerequisite In the **Freq.outp.sim.** parameter (→ 186), the **On** option is selected.

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 1250.0 Hz

Puls.outp.sim.

Navigation Expert → Diagnostics → Simulation → Puls.outp.sim. (0458)

Prerequisite In the **Operating mode** parameter (→ 102), the **Pulse** option is selected.

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-count. val.

Factory setting Off

Additional information

Description

The desired simulation value is defined in the **Pulse value** parameter (→ 187).

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 (→ 105).
- Down-count. val.
  The pulses specified in the **Pulse value** parameter (→ 187) are output.

Pulse value

Navigation Expert → Diagnostics → Simulation → Pulse value (0459)

Prerequisite In the **Puls.outp.sim.** parameter (→ 187), the **Down-count. val.** option is selected.

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

Switch sim.

Navigation Expert → Diagnostics → Simulation → Switch sim. (0462)

Prerequisite In the **Operating mode** parameter (→ 102), the **Switch** option is selected.

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 (→ 188).

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 In the **Switch sim.** parameter (→ 187) **Switch sim. 1 to n** parameter **Switch sim. 1 to n** parameter, the **On** option is selected.

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

Additional information *Selection*
- 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.

Sim. alarm

Navigation Expert → Diagnostics → Simulation → Sim. alarm (0654)

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

Selection
- Off
- On

Factory setting Off

Additional information *Description*

The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.

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 **Diag. event sim.** parameter (→ 189).

Selection
- Sensor
- Electronics
- Configuration
- Process

Factory setting Process

Diag. event sim.

Navigation Expert → Diagnostics → Simulation → Diag. event sim. (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 **Event category** parameter (→ 189).

4 Country-specific factory settings

4.1 SI units

Not valid for USA and Canada.

4.1.1 System units

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

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

Nominal diameter [mm]	[kg/h]
1	4
2	20
4	90
8	400
15	1 300
25	3 600
40	9 000
50	14 000
80	36 000

4.1.3 Output current span

Current output 1	4 to 20 mA NAMUR
Current output 2	4 to 20 mA NAMUR

4.1.4 Pulse value

Nominal diameter [mm]	(~ 2 pulses/s at 2 m/s) [kg/p]
1	0.001
2	0.01
4	0.01
8	0.1
15	0.1
25	1
40	1
50	10
80	10

4.1.5 On value low flow cut off

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

Nominal diameter [mm]	On-value for liquid [kg/h]
1	0.08
2	0.4
4	1.8
8	8
15	26
25	72
40	180
50	300
80	720

Nominal diameter [mm]	On-value for gas [kg/h]
1	0.02
2	0.1
4	0.45
8	2
15	6.5
25	18
40	45
50	75
80	180

4.2 US units

Only valid for USA and Canada.

4.2.1 System units

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

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

Nominal diameter [in]	[lb/min]
1/24	0.15
1/12	0.75
1/8	3.3
3/8	15
½	50
1	130
1½	330
2	515
3	1320

4.2.3 Output current span

Current output 1	4 to 20 mA US
Current output 2	4 to 20 mA US

4.2.4 Pulse value

Nominal diameter [in]	(~ 2 pulses/s at 2.0 m/s) [lb/p]
1/24	0.002
1/12	0.02
1/8	0.02
3/8	0.2
½	0.2
1	2

Nominal diameter [in]	(~ 2 pulses/s at 2.0 m/s) [lb/p]
1½	2
2	20
3	20

4.2.5 On value low flow cut off

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

Nominal diameter [in]	On-value for liquid [lb/min]
1/24	0.003
1/12	0.015
1/8	0.066
3/8	0.3
½	1
1	2.6
1½	6.6
2	11
3	26

Nominal diameter [in]	On-value for gas [lb/min]
1/24	0.001
1/12	0.004
1/8	0.016
3/8	0.075
½	0.25
1	0.65
1½	1.65
2	2.75
3	6.5

5 Explanation of abbreviated units

5.1 SI units

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

5.2 US units

Process variable	Units	Explanation
Density	lb/ft³, lb/gal (us)	Pound/cubic foot, pound/gallon
	lb/bbl (us;liq.), lb/bbl (us;beer), lb/bbl (us;oil), lb/bbl (us;tank)	Pound/volume unit
Pressure	psi a	Pounds per square inch (absolute)

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

5.3 Imperial units

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

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