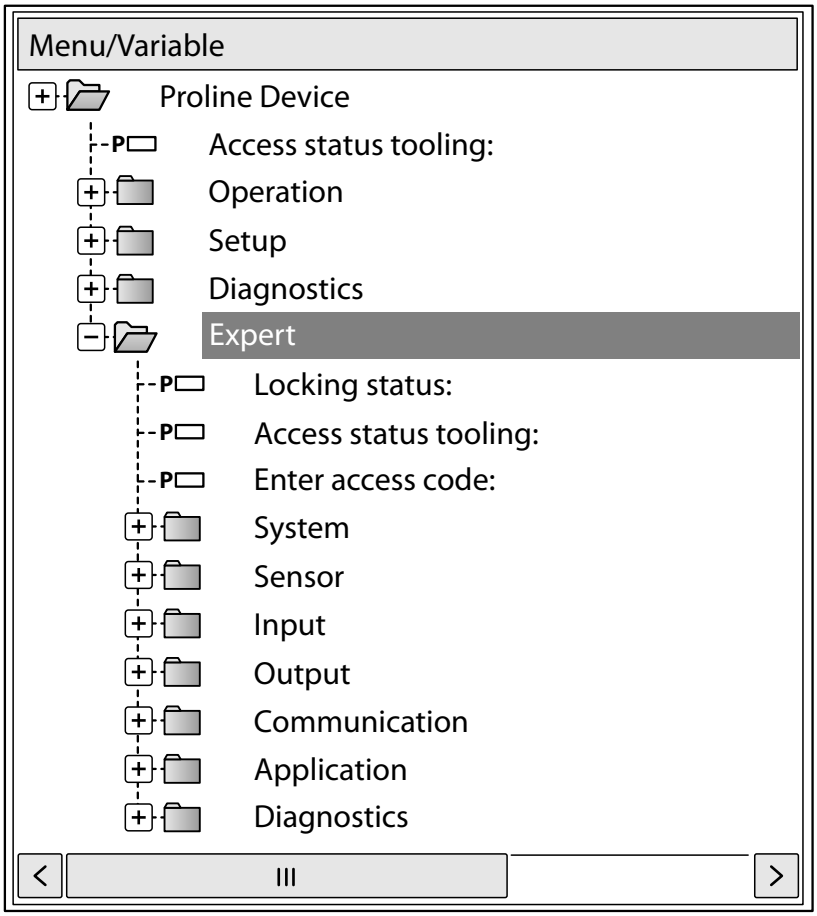
GP01032D/06/EN/01.15
71302091

Valid as of version
01.00.zz (Device firmware)

Description of Device Parameters
Proline t-mass T 150
HART

Thermal Mass Flowmeter



Endress+Hauser
People for Process Automation

Table of contents

1 Document information

1.1 Document function

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

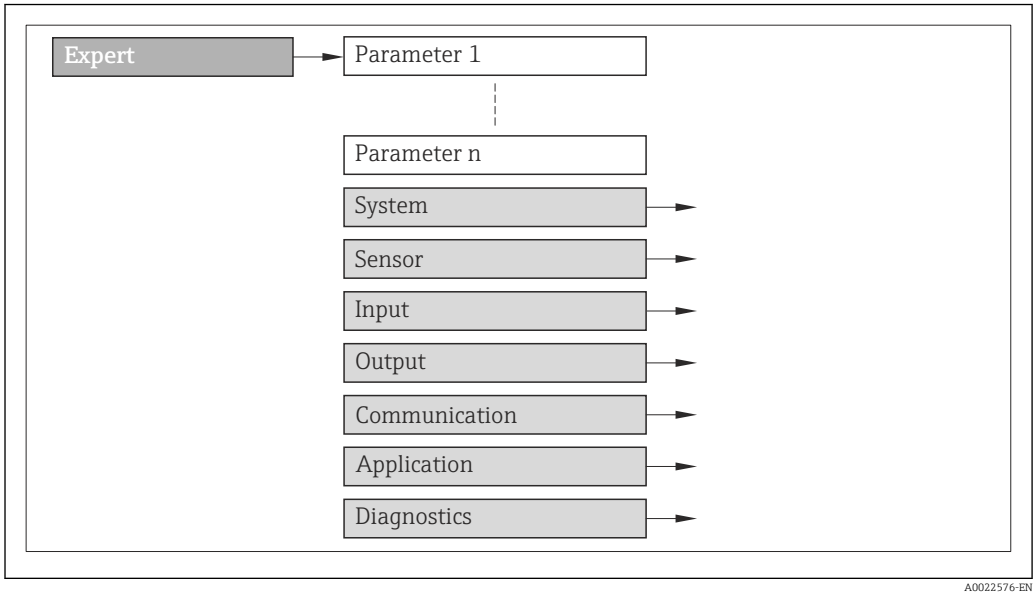
1.2 Target group

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

1.3 Using this document

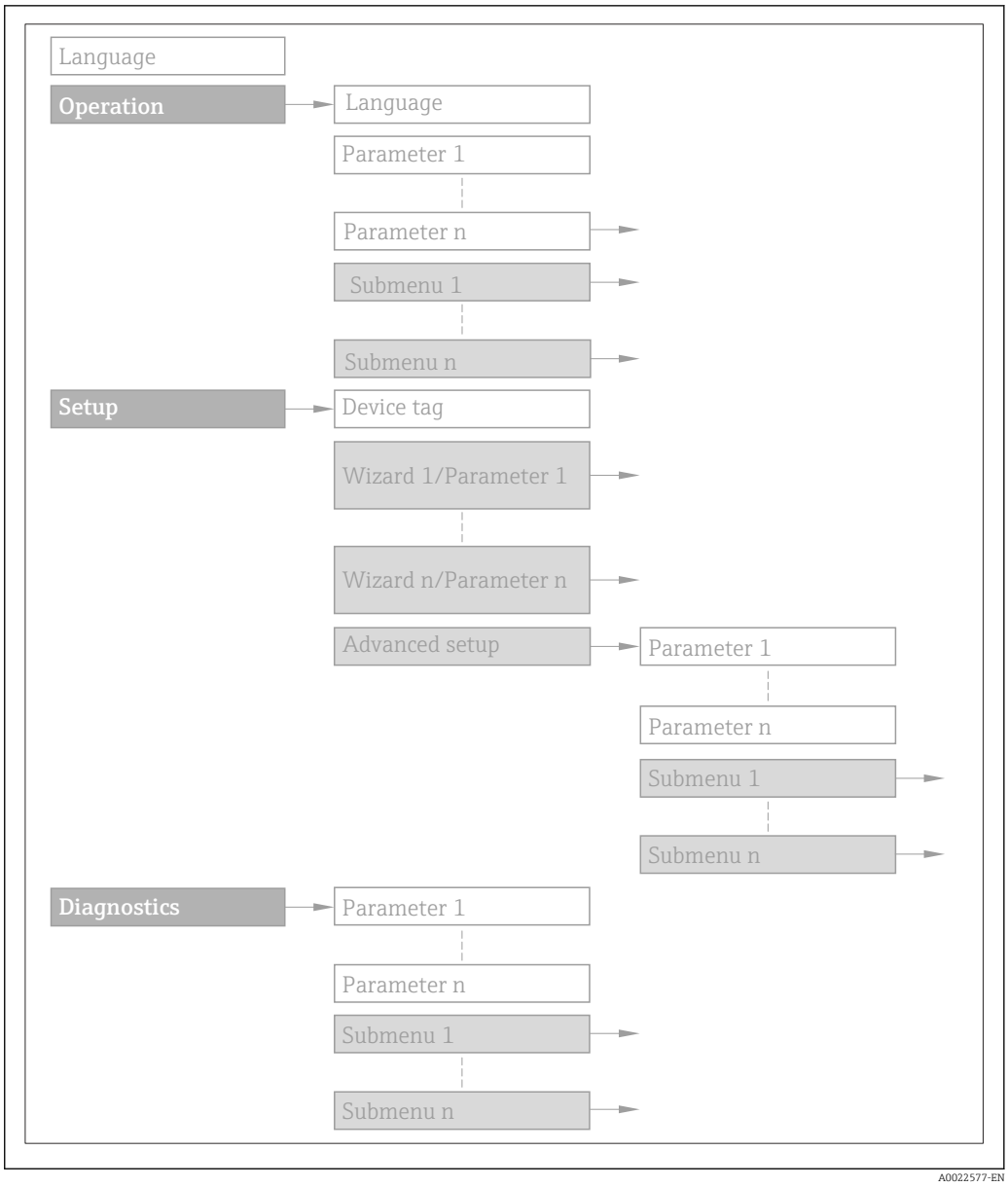
1.3.1 Information on the document structure

This document lists the submenus and their parameters according to the structure of the **Expert** menu (→ 8) menu that are available once the **"Operator" user role** or the **"Maintenance" user role** is enabled.



1 Sample graphic

For information on the arrangement of the parameters according to the structure of the **Operation** menu, **Setup** menu, **Diagnostics** menu (→ 112), along with a brief description, see the Operating Instructions for the device.



2 Sample graphic

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

1.3.2 Structure of a parameter description

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

Complete parameter name	Write-protected parameter =

Navigation
- Navigation path to the parameter via the local display (direct access code)
- Navigation path to the parameter via the operating tool

The names of the menus, submenus and parameters are abbreviated to the form in which they appear on the display and in the operating tool.

Prerequisite
The parameter is only available under these specific conditions

Description
Description of the parameter function

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

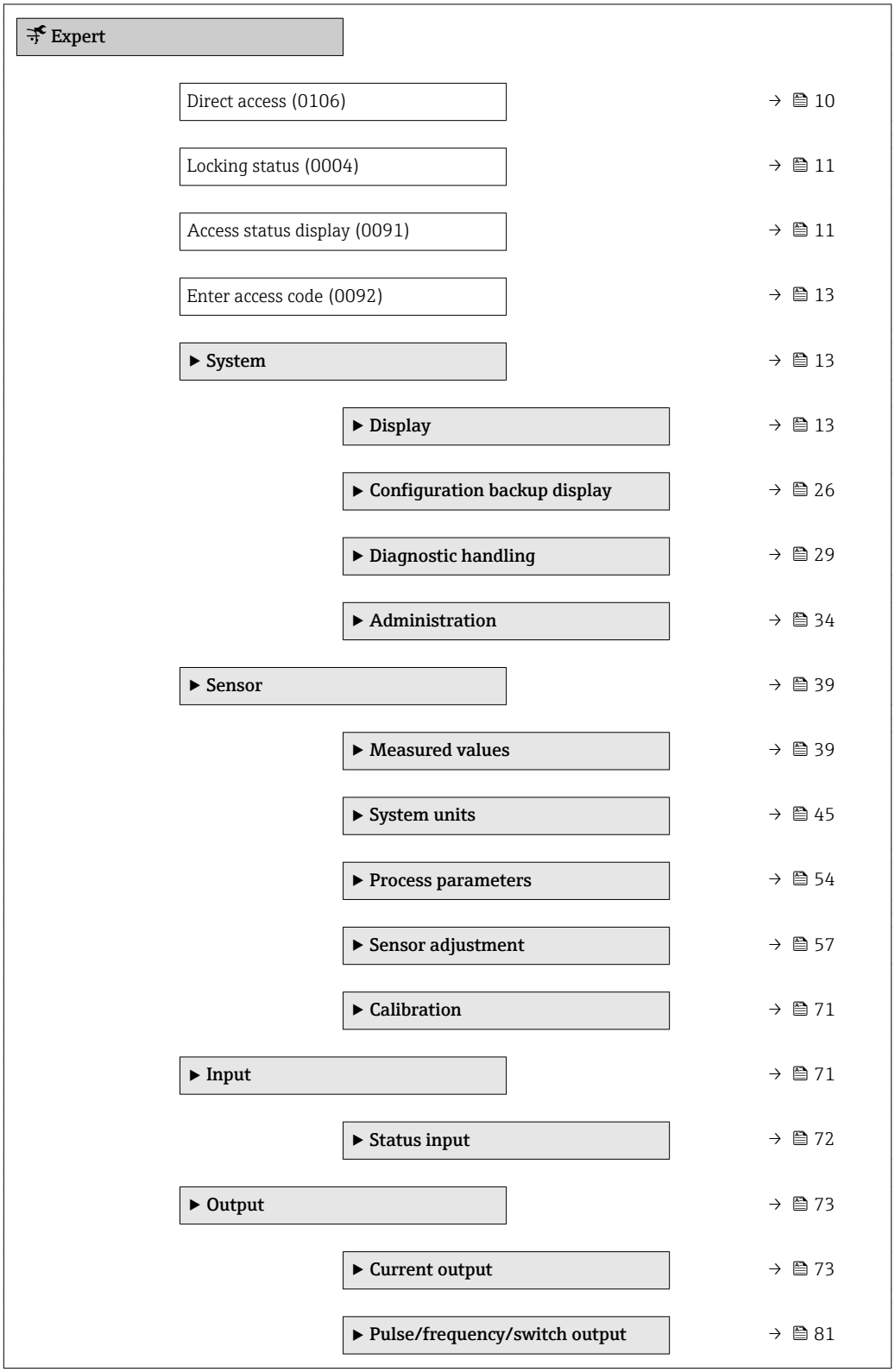
Symbol	Meaning
	Tip Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
	Operation via local display
	Operation via operating tool
	Write-protected parameter

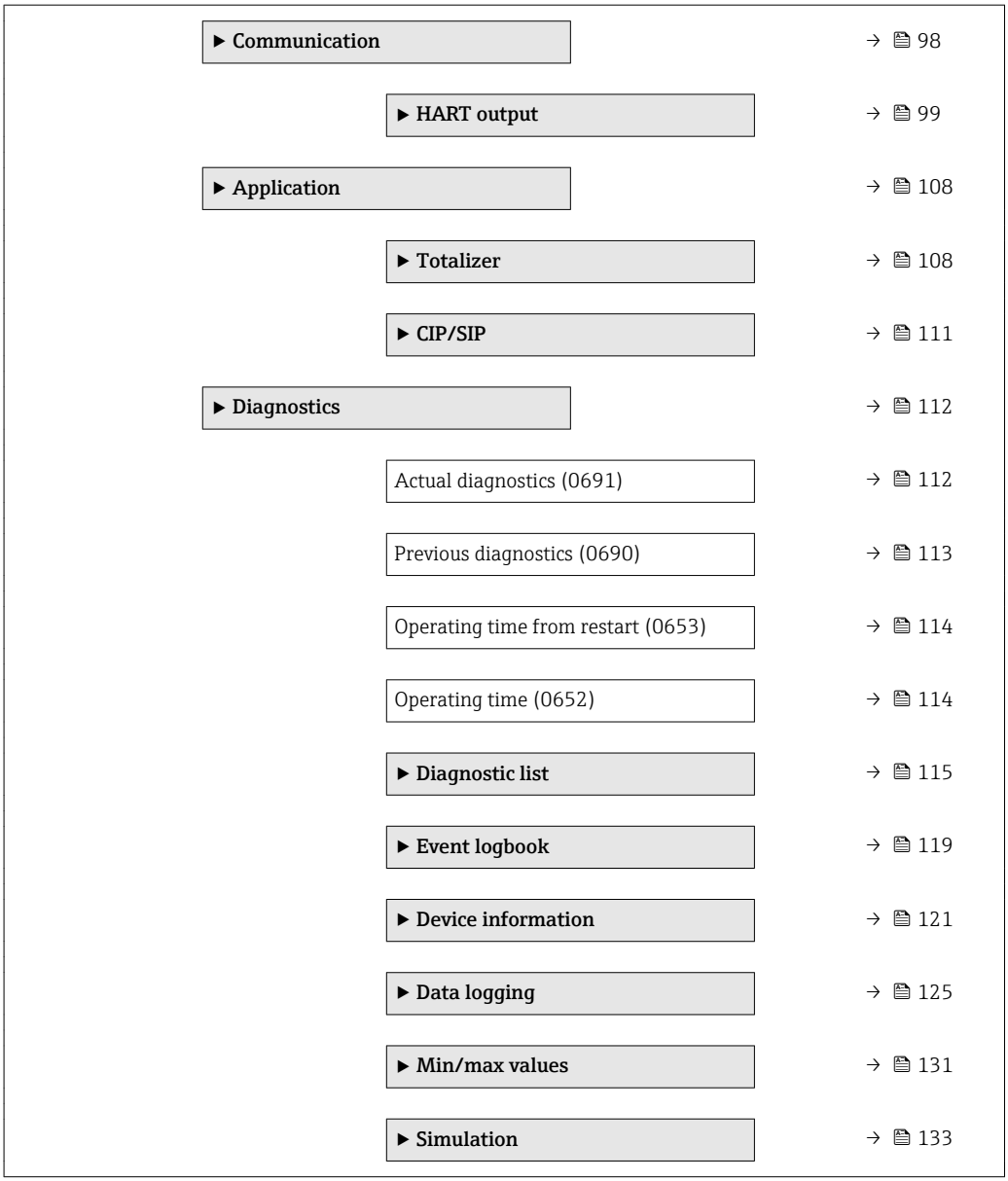
1.4.2 Symbols in graphics

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

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.




▶ Communication → 98
▶ HART output → 99
▶ Application → 108
▶ Totalizer → 108
▶ CIP/SIP → 111
▶ Diagnostics → 112
Actual diagnostics (0691) → 112
Previous diagnostics (0690) → 113
Operating time from restart (0653) → 114
Operating time (0652) → 114
▶ Diagnostic list → 115
▶ Event logbook → 119
▶ Device information → 121
▶ Data logging → 125
▶ Min/max values → 131
▶ Simulation → 133

3 Description of device parameters

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

Direct access

Navigation Expert → Direct access (0106)

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

User entry 0 to 65 535

Additional information *User entry*

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

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

Locking status

Navigation Expert → Locking status (0004)

Description Use this function to view the active write protection.

User interface
- Hardware locked
- Temporarily locked

Additional information *User interface*

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

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

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

"Hardware locked" option (priority 1)

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

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

"Temporarily locked" option (priority 2)

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

Access status display

Navigation Expert → Access stat.disp (0091)

Prerequisite A local display is provided.

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

User interface
- Operator
- Maintenance

Factory setting
Operator

Additional information
Description

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

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

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

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

User interface

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

Access status tooling

Navigation
Expert → Access stat.tool (0005)

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

User interface
- Operator
- Maintenance

Factory setting
Maintenance

Additional information
Description

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

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

Display

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

Enter access code

Navigation Expert → Ent. access code (0092)

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

User entry 0 to 9 999

Enter access code

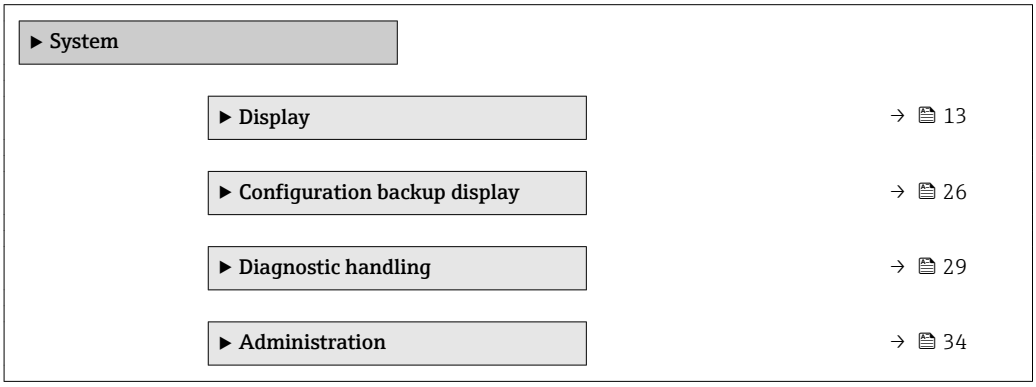
Navigation Expert → Ent. access code (0003)

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

User entry 0 to 9 999

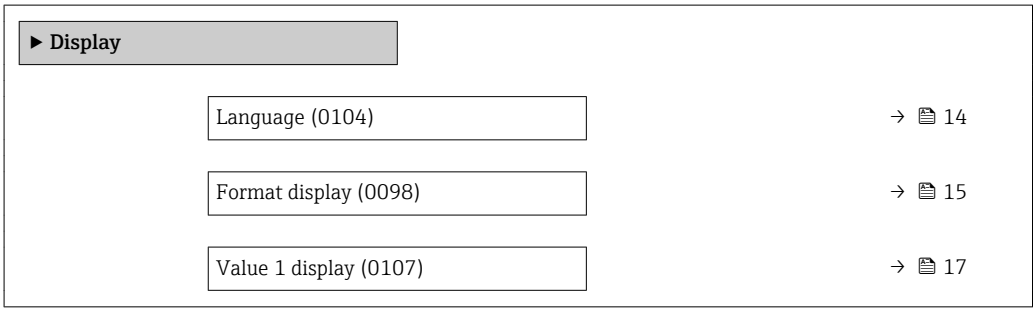
3.1 "System" submenu

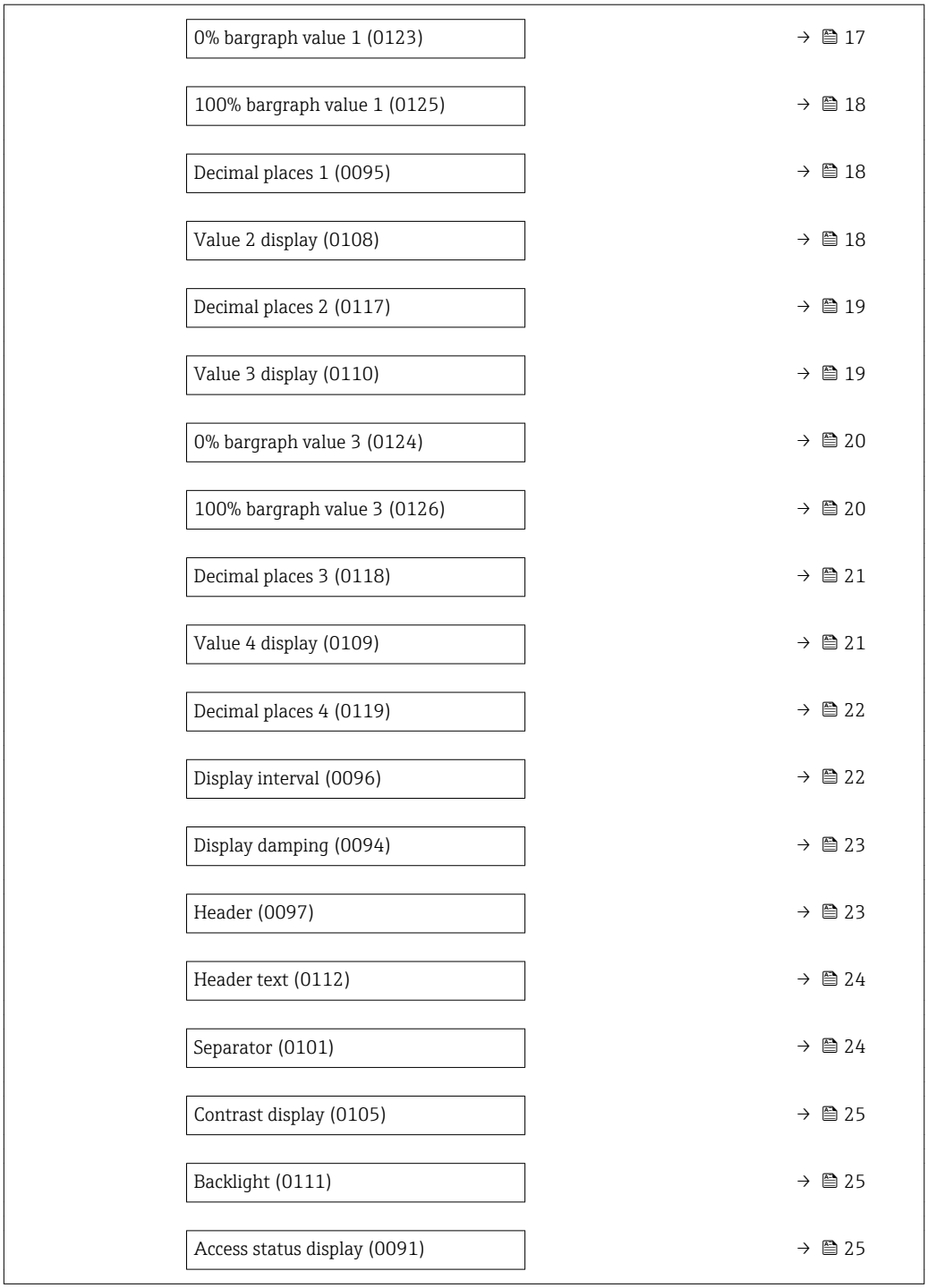
Navigation Expert → System



3.1.1 "Display" submenu

Navigation Expert → System → Display





Language

Navigation Expert → System → Display → Language (0104)

Prerequisite A local display is provided.

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

Selection

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

Factory setting

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

Format display

Navigation

Expert → System → Display → Format display (0098)

Prerequisite

A local display is provided.

Description

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

Selection

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

Factory setting

1 value, max. size

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.

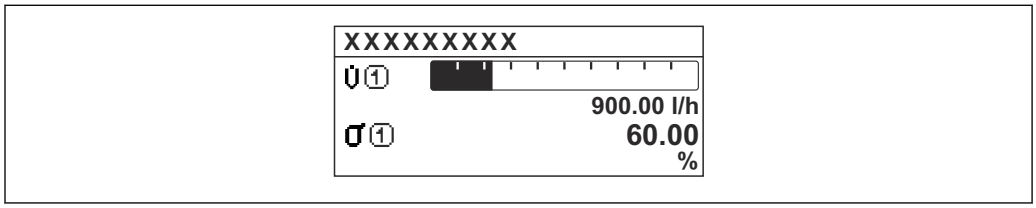
- The **Value 1 display** parameter (→ 17) to **Value 4 display** parameter (→ 21) are used to specify which measured values are shown on the local display and in what order.
- If more measured values are specified than the display mode selected permits, then the values alternate on the device display. The display time until the next change is configured via the **Display interval** parameter (→ 22).

* Visibility depends on order options or device settings

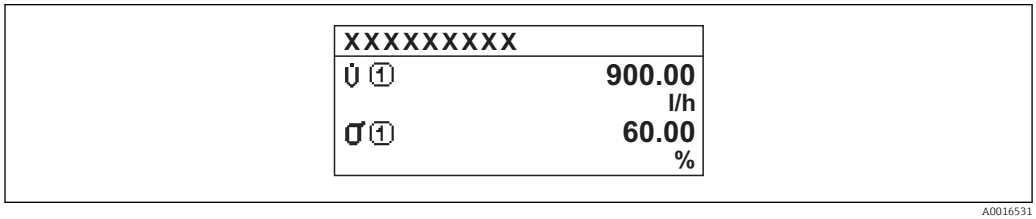
Possible measured values shown on the local display:

"1 value, max. size" option

"1 bargraph + 1 value" option

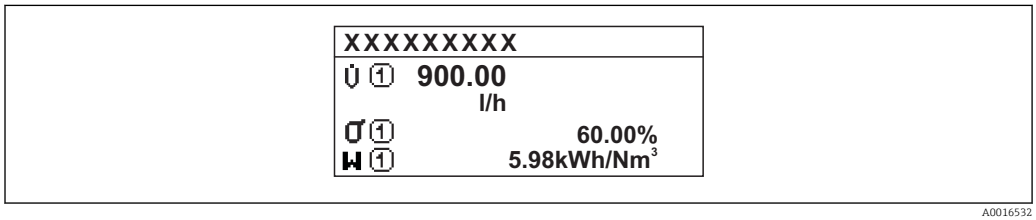


"2 values" option

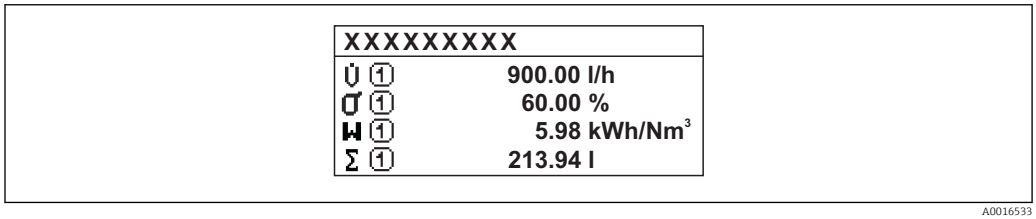


3

"1 value large + 2 values" option



"4 values" option



Value 1 display

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

Prerequisite A local display is provided.

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

Selection
- Volume flow
- Mass flow
- Temperature
- Totalizer 1
- Current output

Factory setting Volume flow

Additional information

Description

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

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

Selection

The unit of the displayed measured value is taken from the **System units** submenu (→ 45).

0% bargraph value 1

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

Prerequisite A local display is provided.

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

User entry Signed floating-point number

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

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 (→ 45).

100% bargraph value 1

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

Prerequisite A local display is provided.

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

User entry Signed floating-point number

Factory setting Depends on country and nominal diameter → 140

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 (→ 45).

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.

Selection

The unit of the displayed measured value is taken from the **System units** submenu (→ 45).

Decimal places 2

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

Prerequisite A measured value is specified in the **Value 2 display** parameter (→ 18).

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

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

Factory setting x.xx

Additional information

Description

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

Value 3 display

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

Prerequisite A local display is provided.

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

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

Factory setting None

Additional information

Description

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

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

Selection

The unit of the displayed measured value is taken from the **System units** submenu (→ 45).

0% bargraph value 3

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

Prerequisite A selection has been made in the **Value 3 display** parameter (→ 19).

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 l/h
- 0 gal/min (us)

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 (→ 45).

100% bargraph value 3

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

Prerequisite A selection was made in the **Value 3 display** parameter (→ 19).

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 (→ 45).

Decimal places 3

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

Prerequisite A measured value is specified in the **Value 3 display** parameter (→ 19).

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

Selection

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

Factory setting x.xx

Additional information

Description

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

Value 4 display

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

Prerequisite A local display is provided.

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

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

Factory setting None

Additional information

Description

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

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

Selection

The unit of the displayed measured value is taken from the **System units** submenu (→ 45).

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 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*

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

Header

Navigation Expert → System → Display → Header (0097)

Prerequisite A local display is provided.

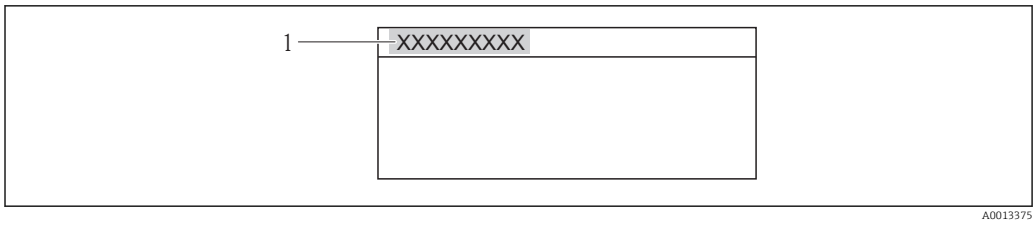
Description Use this function to select the contents of the header of the local display.

Selection
- Device tag
- Free text

Factory setting Device tag

Additional information *Description*

The header text only appears during normal operation.



1 Position of the header text on the display

Selection

- Device tag
  Is defined in the **Device tag** parameter (→ 122).
- Free text
  Is defined in the **Header text** parameter (→ 24).

Header text

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

Prerequisite The **Free text** option is selected in the **Header** parameter (→ 23).

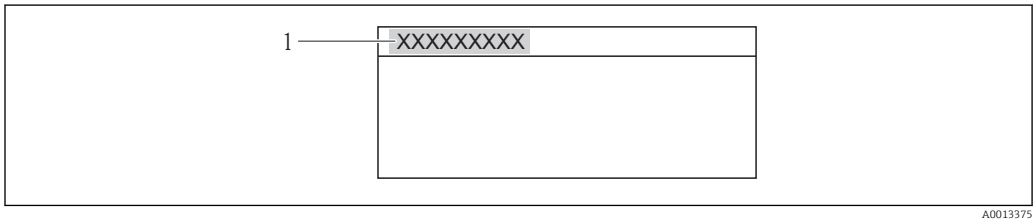
Description Use this function to enter a customer-specific text for the header of the local display.

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 50 %

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
- Disabled
- Enabled

Factory setting Disabled

Access status display

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 **Enter access code** parameter (→ 13).

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

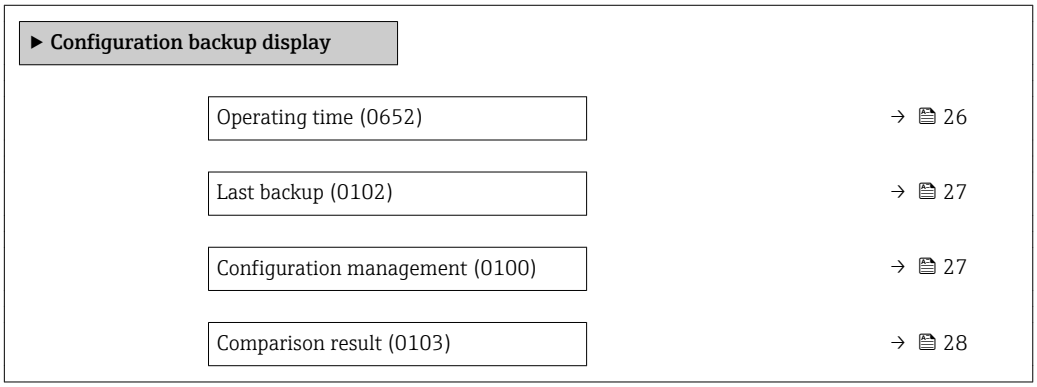
If additional write protection is active, this restricts the current access authorization even further. The write protection status can be viewed via the **Locking status** parameter (→ 11).

Display

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

3.1.2 "Configuration backup display" submenu

Navigation Expert → System → Conf.backup disp



Operating time

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

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

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

Additional information
User interface

The maximum number of days is 9999, which is equivalent to 27 years.

Last backup

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

Prerequisite A local display is provided.

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

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

Configuration management

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

Prerequisite A local display is provided.

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

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

Factory setting Cancel

Additional information

Description

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

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

Selection

- Cancel
  No action is executed and the user exits the parameter.
- Execute backup
  - A backup copy of the current device configuration in the HistoROM is saved to the display module of the device. The backup copy includes the transmitter data of the device.
  - The following message appears on local display: Backup active, please wait!
- Restore
  - The last backup copy of the device configuration is copied from the display module to the HistoROM of the device. The backup copy comprises the transmitter data of the device.
  - The following message appears on local display: Restore active! Do not interrupt power supply!

- Duplicate
  - The transmitter configuration from another device is duplicated to the device using the display module.
  - The following message appears on local display: Copy active! Do not interrupt power supply!
- Compare
  - The device configuration saved in the display module is compared to the current device configuration of the HistoROM.
  - The following message appears on local display: Comparing files
  - The result can be viewed in **Comparison result** parameter (→ 🖹 28).
- Clear backup data
  - The backup copy of the device configuration is deleted from the display module of the device.
  - The following message appears on local display: Deleting file

HistoROM

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

Backup state

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

Prerequisite A local display is provided.

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

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

Factory setting None

Comparison result

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

Prerequisite A local display is provided.

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

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

Factory setting Check not done

Additional information *Description*

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

Selection

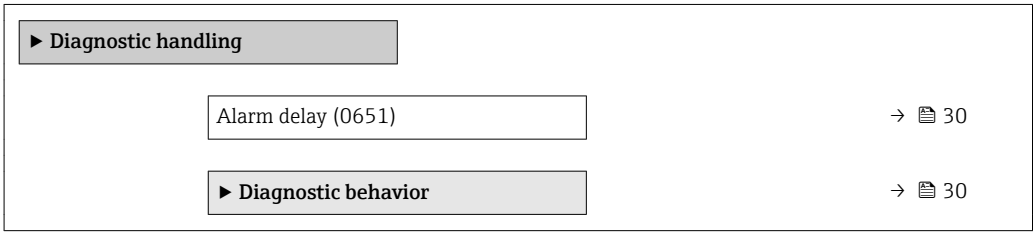
- Settings identical
  - The current device configuration of the HistoROM is identical to the backup copy in the display module.
  - If the transmitter configuration of another device has been copied to the device via the display module and the **Duplicate** option in the **Configuration management**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

HistoROM

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

3.1.3 "Diagnostic handling" submenu

Navigation Expert → System → Diagn. handling



Alarm delay

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

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

The diagnostic message is reset without a time delay.

User entry 0 to 60 s

Factory setting 0 s

Additional information

"Diagnostic behavior" submenu

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

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

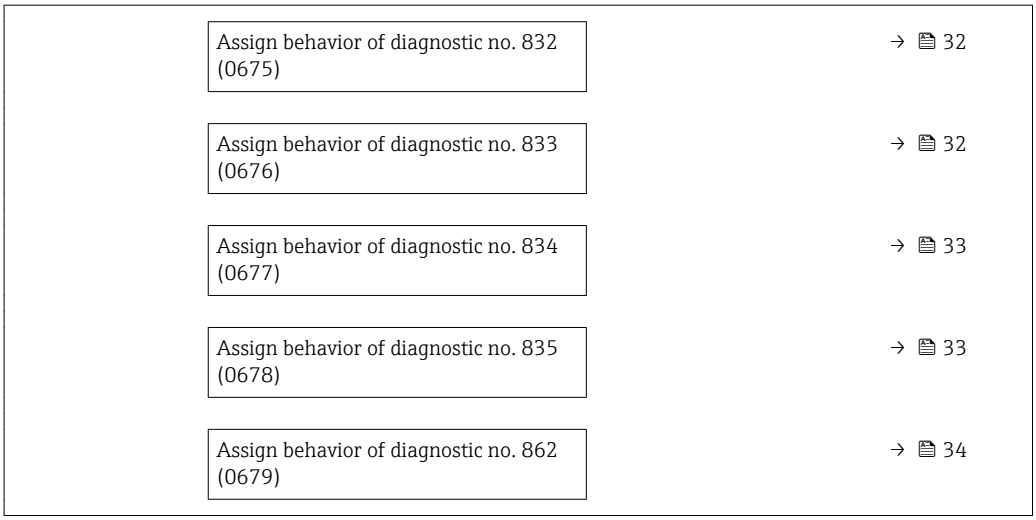
Options	Description
Alarm	The device stops measurement. The signal outputs and totalizers assume the defined alarm condition. A diagnostic message is generated.
Warning	The device continues to measure. The signal outputs and totalizers are not affected. A diagnostic message is generated.
Logbook entry only	The device continues to measure. The diagnostic message is displayed only in the **Event logbook** submenu (→ 119) (**Event list** submenu (→ 120)) 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.

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

▶ **Diagnostic behavior**

- Assign behavior of diagnostic no. 441 (0657) → 31
- Assign behavior of diagnostic no. 442 (0658) → 31
- Assign behavior of diagnostic no. 443 (0659) → 32



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

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

Description Option for changing the diagnostic behavior of the diagnostic message **441 Current output 1**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see → 30

Assign behavior of diagnostic no. 442 (Frequency output)

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

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

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

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see → 30

Assign behavior of diagnostic no. 443 (Pulse output)

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

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

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

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see → 30

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

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

Description Option for changing the diagnostic behavior of the diagnostic message **832 Electronic temperature too high**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see → 30

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

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

Description Option for changing the diagnostic behavior of the diagnostic message **833 Electronic temperature too low**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see → 30

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

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

Description Option for changing the diagnostic behavior of the diagnostic message **834 Process temperature too high**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see → 30

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

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

Description Option for changing the diagnostic behavior of the diagnostic message **835 Process temperature too low**.

Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Warning

Additional information For a detailed description of the options available, see → 30

Assign behavior of diagnostic no. 862 (Empty pipe)

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

Description Use this function to change the diagnostic behavior of the diagnostic message **862 Empty pipe**.

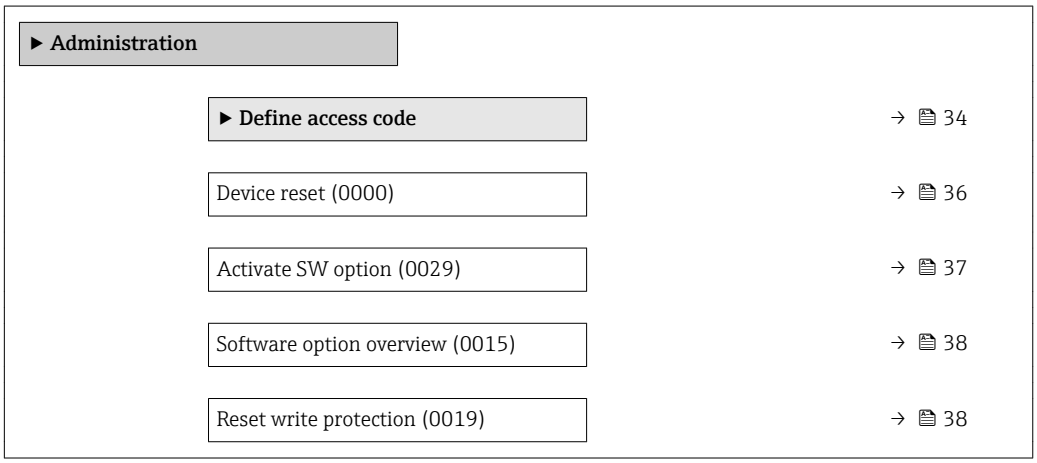
Selection
- Off
- Alarm
- Warning
- Logbook entry only

Factory setting Off

Additional information For a detailed description of the options available, see → 30

3.1.4 "Administration" submenu

Navigation Expert → System → Administration

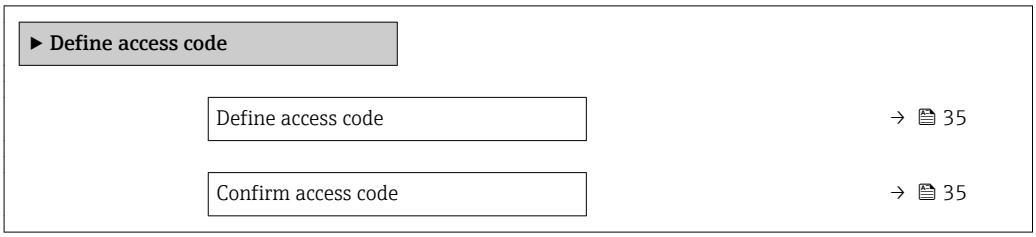


"Define access code" wizard

The **Define access code** wizard (→ 34) is only available when operating via the local display.

If operating via the operating tool, the **Define access code** parameter (→ 36) can be found directly in the **Administration** submenu. There is no **Confirm access code** parameter if the device is operated via the operating tool.

Navigation Expert → System → Administration → Def. access code



Define access code

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

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

User entry 0 to 9 999

Factory setting 0

Additional information

Description

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

On the local display, the symbol in front of a parameter indicates that the parameter is write-protected.

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

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 access code

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

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

User entry 0 to 9 999

Factory setting 0

Additional parameters in the "Administration" submenu

Define access code

Navigation Expert → System → Administration → Def. access code

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

User entry 0 to 9 999

Factory setting 0

Additional information

Description

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

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

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 factory defaults
- To delivery settings
- Restart device

Factory setting Cancel

Additional information

"Cancel" option

No action is executed and the user exits the parameter.

"To factory defaults" option

Every parameter is reset to its factory setting.

"To delivery settings" option

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

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

"Restart device" option

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

Activate SW option

Navigation Expert → System → Administration → Activate SW opt. (0029)

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

User entry 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 **Software option overview** parameter (→ 38).

↳ 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 **Software option overview** parameter (→ 38).

Software option overview

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

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

User interface
- Extended HistoROM
- 4-20 mA HART output
- Pulse/frequency/switch output
- Status input

Additional information

Description

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

"Extended HistoROM" option

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

"4-20 mA HART output" option

Order code for "Output; input"
- Option A "4-20mA HART"
- Option B "4-20mA HART, pul./freq./switch output"
- Option Q "4-20mA HART, pul./freq./switch; status input"

"Pulse/frequency/switch output" option

Order code for "Output; input"
- Option B "4-20mA HART, pul./freq./switch output"
- Option K "Pulse/freq./switch output"
- Option Q "4-20mA HART, pul./freq./switch; status input"

"Status input" option

Order code for "Output; input", option Q "4-20mA HART, pul./freq./switch; status input"

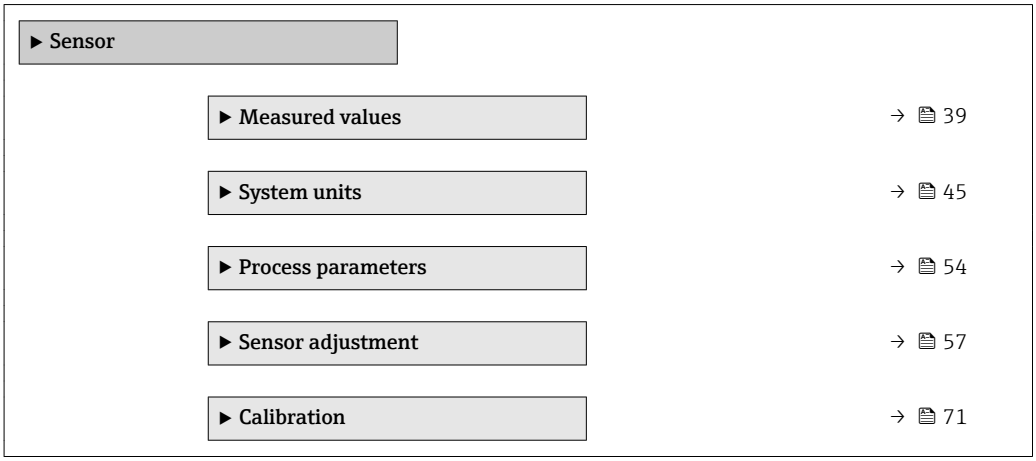
Reset write protection

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

Description The functionality of this parameter is not available for the t-mass 150 measuring device.

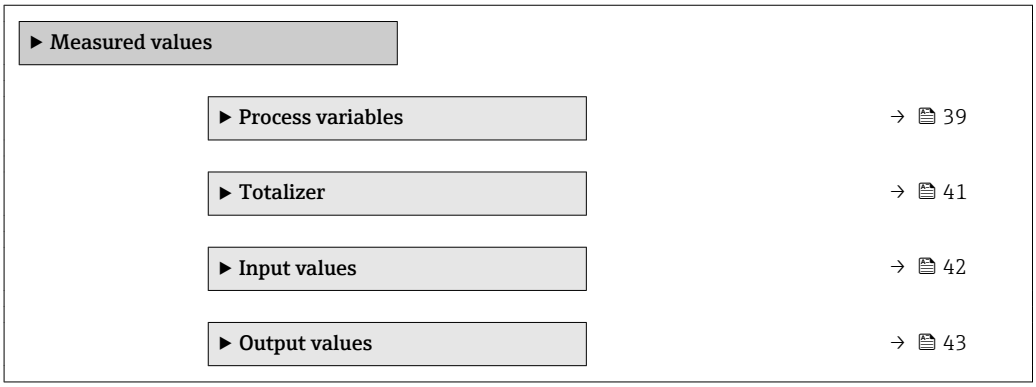
3.2 "Sensor" submenu

Navigation Expert → Sensor



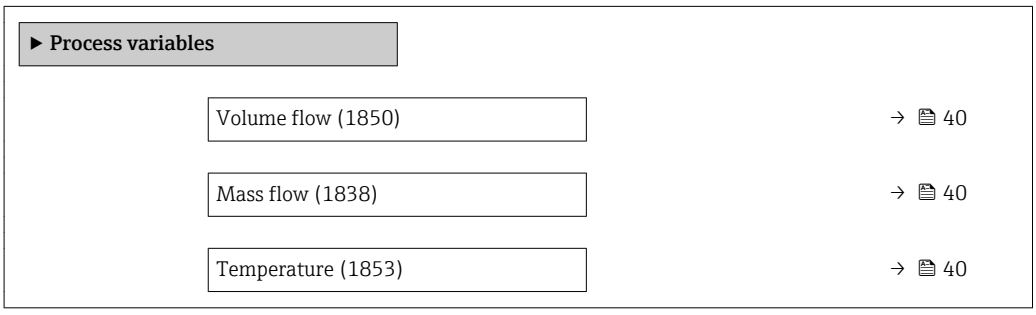
3.2.1 "Measured values" submenu

Navigation Expert → Sensor → Measured val.



"Process variables" submenu

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



Volume flow

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

Prerequisite
The following conditions are met:
- The **Enabled** option is selected in the **Operating mode** parameter (→ 59).
- The **Volume flow** option is selected in the **Flow reference in use** parameter (→ 60).

Description Displays the volume flow that is currently measured.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Volume flow unit** parameter (→ 45)

Mass flow

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

Prerequisite
The following conditions are met:
- The **Enabled** option is selected in the **Operating mode** parameter (→ 59).
- The **Mass flow** option is selected in the **Flow reference in use** parameter (→ 60).

Description Displays the mass flow that is currently measured.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Mass flow unit** parameter (→ 48)

Temperature

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

Description Displays the temperature currently measured.

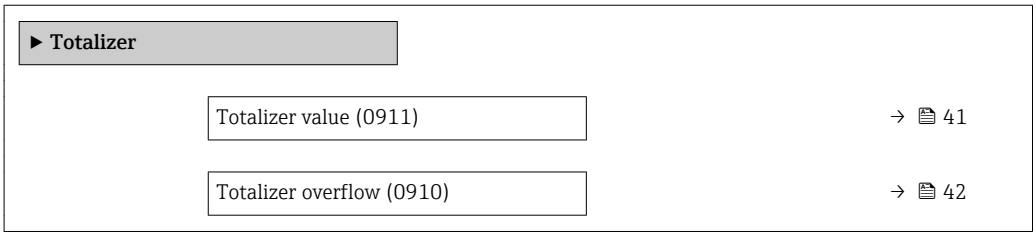
User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 49)

"Totalizer" submenu

Navigation Expert → Sensor → Measured val. → Totalizer



Totalizer value

Navigation Expert → Sensor → Measured val. → Totalizer → Totalizer val. (0911)

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 108) of the **Totalizer** submenu:
- Volume flow
- Mass 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 **Totalizer overflow** parameter (→ 42) if the display range is exceeded.

In the event of an error, the totalizer adopts the mode defined in the **Failure mode** parameter (→ 111).

User interface

The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→ 109).

Example

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

Totalizer overflow

Navigation Expert → Sensor → Measured val. → Totalizer → Tot. overflow (0910)

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 108) of the **Totalizer** submenu:
- Volume flow
- Mass flow

Description Displays the current totalizer overflow.

User interface Integer with sign

Additional information

Description

If the current totalizer reading has more than 7 digits, which is the maximum value range of the operating tool that can be displayed, 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 value** parameter (→ 41)

Display

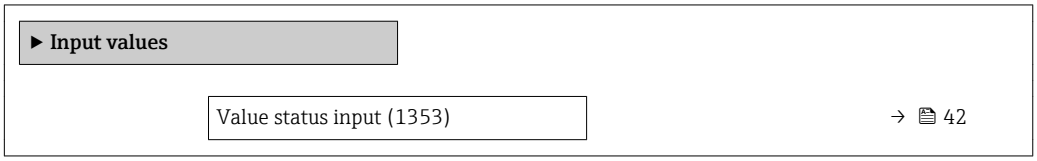
The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→ 109).

Example

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

"Input values" submenu

Navigation Expert → Sensor → Measured val. → Input values



Value status input

Navigation Expert → Sensor → Measured val. → Input values → Val. status inp. (1353)

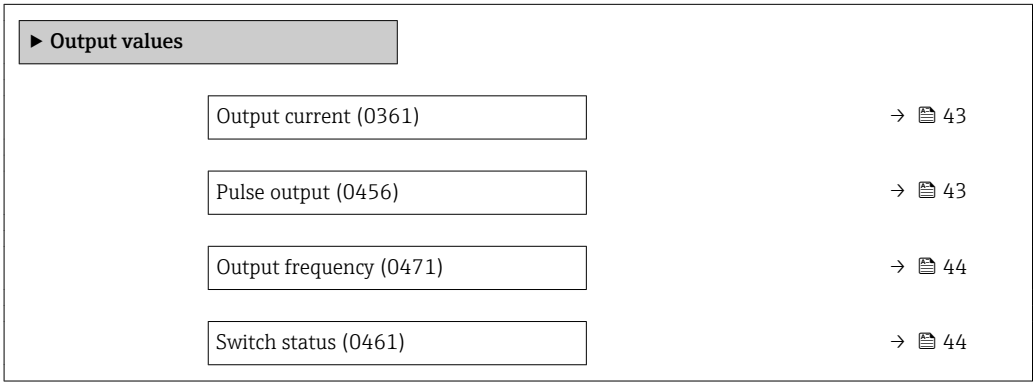
Prerequisite For the following order code:
"Output; input", option Q "4-20mA HART, pul./freq./switch; status input"

Description Displays the current input signal level.

User interface
- High
- Low

"Output values" submenu

Navigation Expert → Sensor → Measured val. → Output values



Output current

Navigation Expert → Sensor → Measured val. → Output values → Output curr. (0361)

Description Displays the actual calculated value of the output current.

User interface 3.59 to 22.5 mA

Pulse output

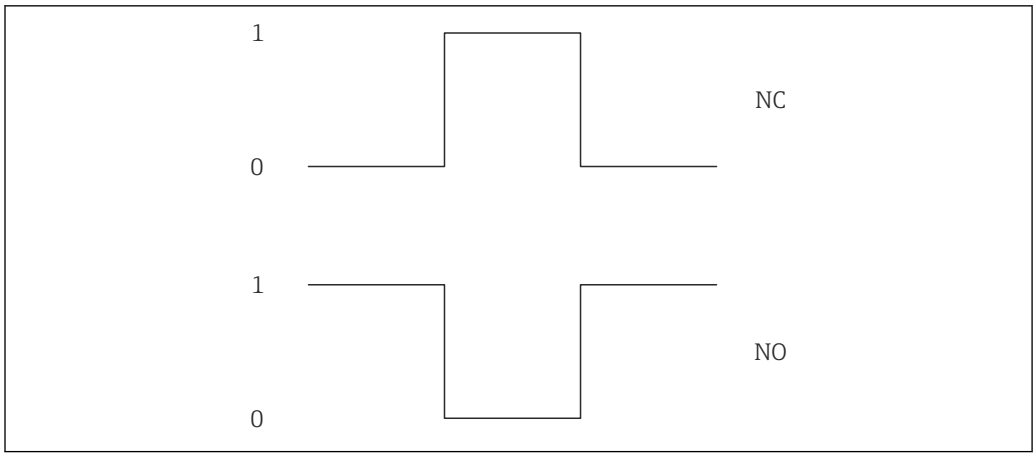
Navigation Expert → Sensor → Measured val. → Output values → Pulse output (0456)

Prerequisite In the **Operating mode** parameter (→ 83), the **Pulse** option is selected.

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 (→ 85) and **Pulse width** parameter (→ 85) 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 Normally closed
NO Normally opened

The output behavior can be reversed via the **Invert output signal** parameter (→ 🖹 98) 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 (→ 🖹 86)) can be configured.

Output frequency

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

Prerequisite In the **Operating mode** parameter (→ 🖹 83), the **Frequency** option is selected.

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

User interface 0.0 to 1250.0 Hz

Switch status

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

Prerequisite In the **Operating mode** parameter (→ 🖹 83), the **Switch** option is selected.

Description Displays the current switch status of the status output.

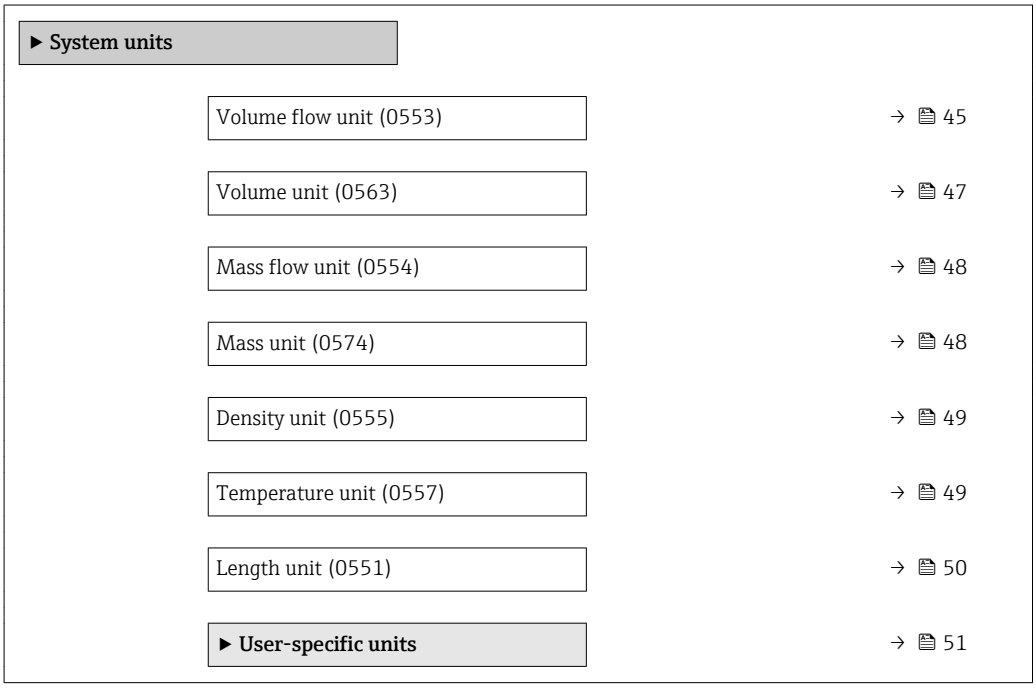
User interface
- Open
- Closed

Additional information *Selection*

- Open
  The switch output is not conductive.
- Closed
  The switch output is conductive.

3.2.2 "System units" submenu

Navigation Expert → Sensor → System units



Volume flow unit

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

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

Selection

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

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

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;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
- **Volume flow** parameter (→ 40)

Selection

For an explanation of the abbreviated units: → 143

Customer-specific units

The unit for the customer-specific volume is specified in the **User volume text** parameter (→ 51).

Volume unit

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

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

Selection

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

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

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

Custom-specific units
User vol.

Factory setting

Country-specific:
- l
- gal (us)

Additional information

Selection

For an explanation of the abbreviated units: → 143

Customer-specific units

The unit for the customer-specific volume is specified in the **User volume text** parameter (→ 51).

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

Imperial units
- LTon/s
- LTon/min
- LTon/h
- LTon/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 (→ 40)

Selection

For an explanation of the abbreviated units: → 143

Customer-specific units

The unit for the customer-specific mass is specified in the **User mass text** parameter (→ 52).

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

Imperial units
LTon

Custom-specific units
User mass

Factory setting

Country-specific:
- kg
- lb

Additional information

Selection

For an explanation of the abbreviated units: → 143

Customer-specific units

The unit for the customer-specific mass is specified in the **User mass text** parameter (→ 52).

Density unit

Navigation

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

Description

Use this function to select the unit for the density.

Selection

SI units
- g/cm³
- kg/dm³
- kg/l
- kg/m³

US units
lb/ft³

Factory setting

Country-specific:
- kg/m³
- lb/ft³

Additional information

Selection

For an explanation of the abbreviated units: → 143

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:
- **Temperature** parameter (→ 40)
- **Maximum value** parameter (→ 131)
- **Minimum value** parameter (→ 131)
- **Maximum value** parameter (→ 132)
- **Minimum value** parameter (→ 132)

Selection

For an explanation of the abbreviated units: → 143

Length unit

Navigation

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

Description

Use this function to select the unit of length.

Selection

SI units
- mm
- m

US units
- in
- ft

Factory setting

Country-specific:
- mm
- in

Additional information

Effect

The selected unit applies for:
- **Insertion depth** parameter (→ 58)
- **Pipe inner diameter** parameter
- **Mounting set height** parameter (→ 58)
- **Pipe wall thickness** parameter (→ 57)

Selection

For an explanation of the abbreviated units: → 143

Date/time format

Navigation

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

Description

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

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

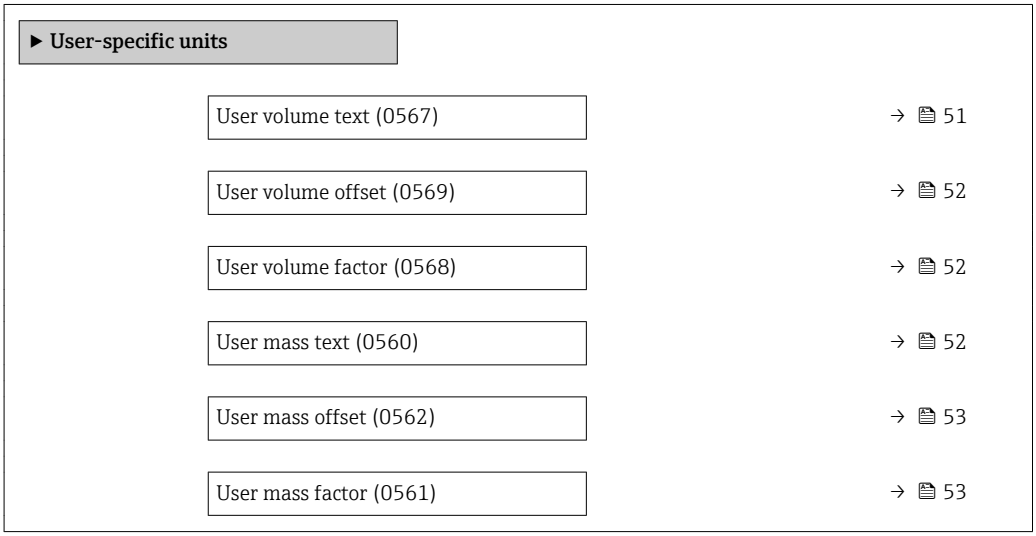
Factory setting
dd.mm.yy hh:mm

Additional information
Selection

For an explanation of the abbreviated units: → 143

"User-specific units" submenu

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



User volume text

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

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

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

Factory setting
User vol.

Additional information *Result*

The defined unit is shown as an option in the choose list of the following parameters:
- **Volume flow unit** parameter (→ 45)
- **Volume unit** parameter (→ 47)

Example

If the text GLAS is entered, the choose list of the **Volume flow unit** parameter (→ 45) shows the following options:
- GLAS/s
- GLAS/min
- GLAS/h
- GLAS/d

User volume offset

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

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

User entry Signed floating-point number

Factory setting 0

Additional information *Description*

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

User volume factor

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

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

User entry Signed floating-point number

Factory setting 1.0

User mass text

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

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

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

Factory setting User mass

Additional information *Result*

The defined unit is shown as an option in the choose list of the following parameters:
- **Mass flow unit** parameter (→ 48)
- **Mass unit** parameter (→ 48)

Example

If the text GLAS is entered, the following options are displayed in the picklist for the **Mass flow unit** parameter (→ 48):
- GLAS/s
- GLAS/min
- GLAS/h
- GLAS/d

User mass offset

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

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

User entry Signed floating-point number

Factory setting 0

Additional information *Description*

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

User mass factor

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

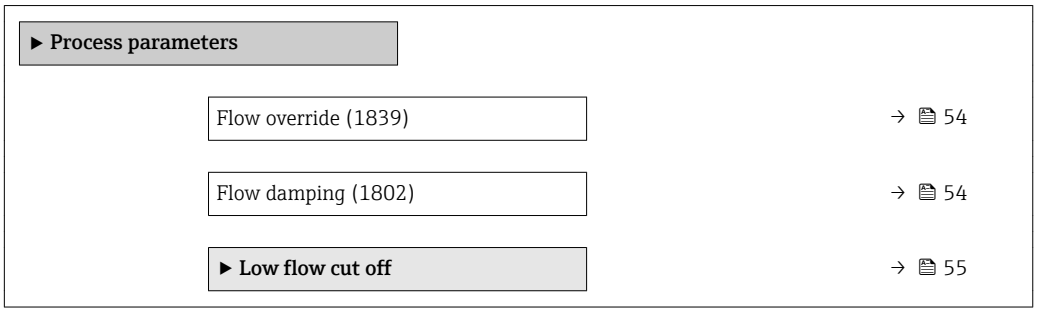
Description Use this function to enter a quantity factor (without time) for the user-specific mass and mass flow unit.

User entry Signed floating-point number

Factory setting 1.0

3.2.3 "Process parameters" submenu

Navigation Expert → Sensor → Process param.



Flow override

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

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

Selection
- Off
- On

Factory setting Off

Additional information *Result*

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

Description

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

Flow damping

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

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

User entry 0 to 999.9 s

Factory setting 0 s

Additional information *User entry*

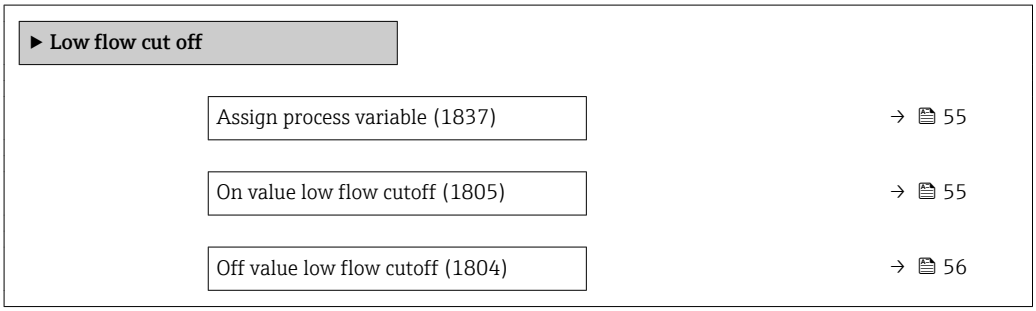
- Value = 0: no damping
- Value > 0: damping is increased

Result

The damping affects the following variables of the device:
- Outputs → 73
- Low flow cut off → 55
- Totalizers → 108

"Low flow cut off" submenu

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



Assign process variable

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

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

Selection
- Off
- Volume flow
- Mass flow

Factory setting Volume flow

On value low flow cutoff

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

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 55):
- Volume flow
- Mass flow

Description Use this function to enter a switch-on value for low flow cut off. Low flow cut off is activated if the value entered is not equal to 0 → 56.

User entry Signed floating-point number

Factory setting Depends on country and nominal diameter → 140

Additional information *Dependency*

The unit depends on the process variable selected in the **Assign process variable** parameter (→ 55).

Off value low flow cutoff

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

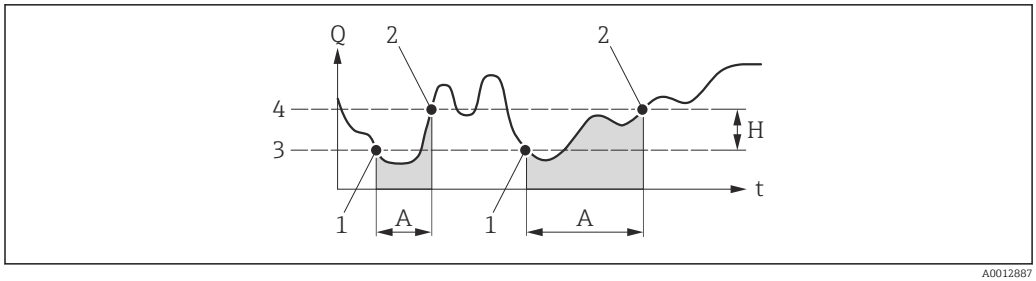
Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 55):
- Volume flow
- Mass flow

Description Use this function to enter a switch-off value for low flow cut off. The off value is entered as a positive hysteresis from the on value→ 55.

User entry 0 to 100.0 %

Factory setting 50 %

Additional information *Example*

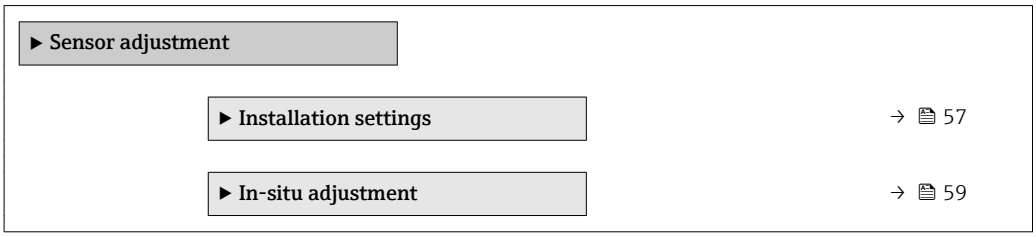


A0012887

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

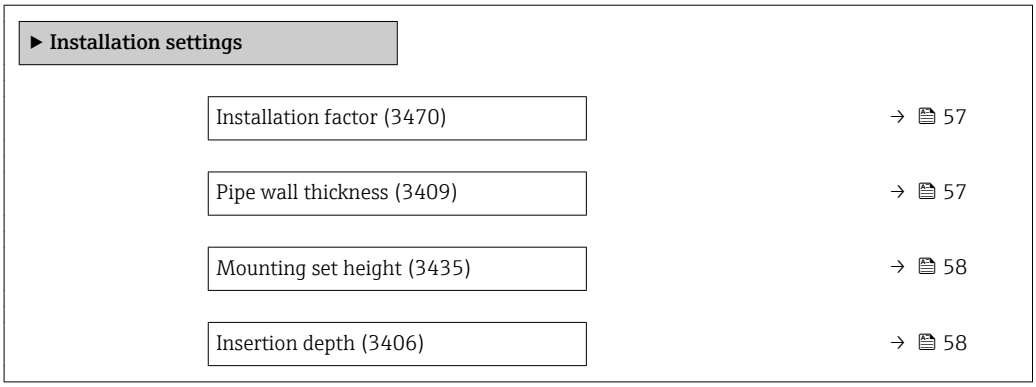
3.2.4 "Sensor adjustment" submenu

Navigation Expert → Sensor → Sensor adjustm.



"Installation settings" submenu

Navigation Expert → Sensor → Sensor adjustm. → Install.settings



Installation factor

Navigation Expert → Sensor → Sensor adjustm. → Install.settings → Install. factor (3470)

Prerequisite The **Disabled** option is selected in the **Operating mode** parameter (→ 59) parameter.

Description Use this function to enter the installation factor.

User entry 0 to 9 999

Factory setting 1

Pipe wall thickness

Navigation Expert → Sensor → Sensor adjustm. → Install.settings → Wall thickness (3409)

Prerequisite The sensor is an insert version.

Description Use this function to enter the pipe wall thickness.

User entry 2 to 999.9 mm

Factory setting 4.5 mm

Additional information *Dependency*

The unit is taken from the **Length unit** parameter (→ 50)

Mounting set height

Navigation Expert → Sensor → Sensor adjustm. → Install.settings → Mounting set ht. (3435)

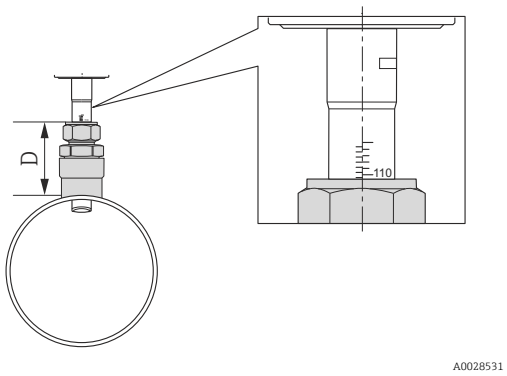
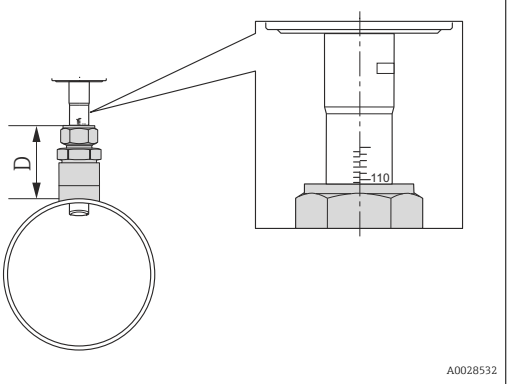
Prerequisite The sensor is an insert version.

Description Use this function to enter the mounting set height.

User entry 0 to 999 mm

Factory setting 106 mm

Additional information *Description*

Welding nozzle with compression fitting	Threadolet
	
D Mounting set height: nozzle height (incl. coupling)	*D Mounting set height: nozzle height (incl. coupling)*

For more detailed information on determining the mounting set height, please see the Operating Instructions for the device, section "Insertion depth"

Dependency

The unit is taken from the **Length unit** parameter (→ 50)

Insertion depth

Navigation Expert → Sensor → Sensor adjustm. → Install.settings → Insertion depth (3406)

Prerequisite The sensor is an insert version.

Description Displays the calculated insertion depth of the sensor.

User interface 0 to 999 000 mm

Factory setting 50 mm

Additional information *Description*

Fixed insertion depth 8 mm (0.31 in) ±2 mm (0.08 in)

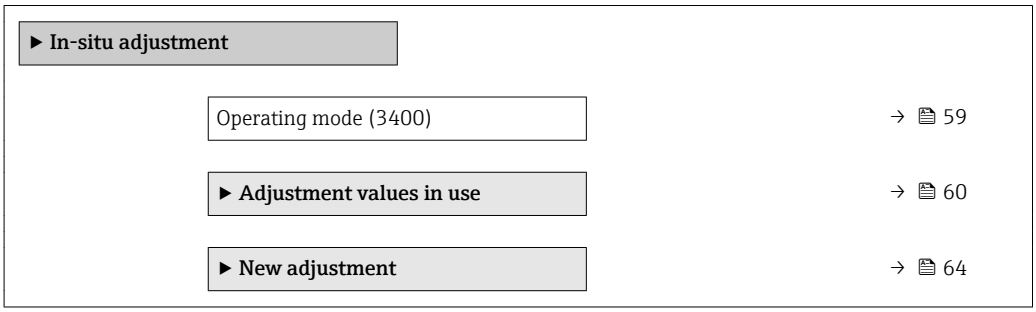
For more detailed information on determining the insertion depth, please see the Operating Instructions for the device, section "Insertion depth"

Dependency

The unit is taken from the **Length unit** parameter (→ 50)

"In-situ adjustment" submenu

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust.



Operating mode

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → Operating mode (3400)

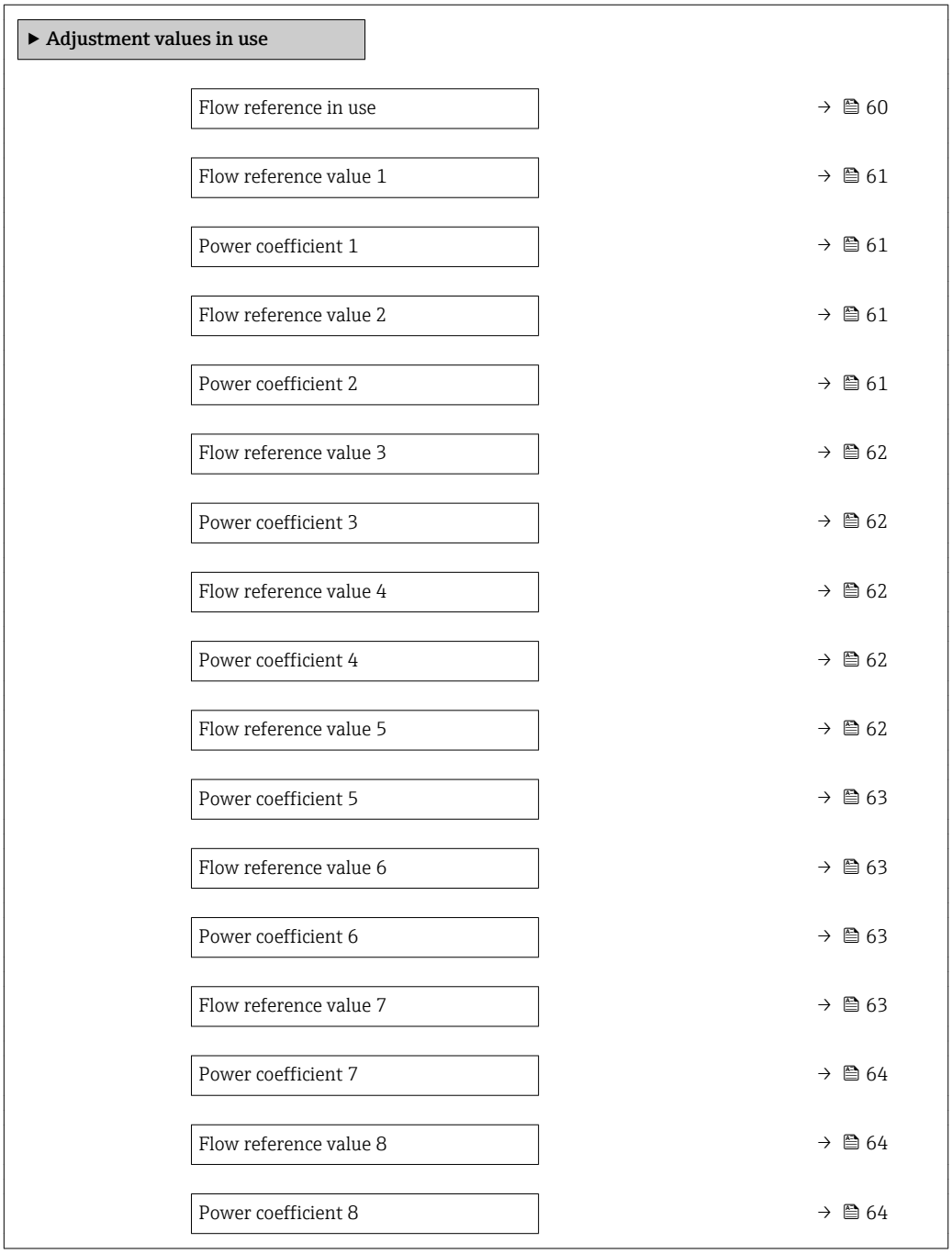
Description Use this function to activate/deactivate in-situ adjustment.

Selection
- Disabled
- Enabled

Factory setting Disabled

"Adjustment values in use" submenu

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use



Flow reference in use

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Flow ref. in use (3440)

Description Use this function to select the flow reference value used.

User interface
- Volume flow
- Mass flow

Factory setting Volume flow

Flow reference value 1

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Flow ref. val. 1 (3401)

Description Displays the Flow reference value 1 (→ 61) defined for the adjustment.

User interface Signed floating-point number

Power coefficient 1

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Power coeff. 1 (3425)

Description Displays the Power coefficient 1 defined for the adjustment.

User interface Positive floating-point number

Flow reference value 2

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Flow ref. val. 2 (3418)

Description Displays the Flow reference value 2 defined for the adjustment.

User interface Signed floating-point number

Power coefficient 2

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Power coeff. 2 (3426)

Description Displays the Power coefficient 2 defined for the adjustment.

User interface Positive floating-point number

Flow reference value 3

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Flow ref. val. 3 (3419)

Description Displays the Flow reference value 3 defined for the adjustment.

User interface Signed floating-point number

Power coefficient 3

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Power coeff. 3 (3427)

Description Displays the Power coefficient 3 defined for the adjustment.

User interface Positive floating-point number

Flow reference value 4

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Flow ref. val. 4 (3420)

Description Displays the Flow reference value 4 defined for the adjustment.

User interface Signed floating-point number

Power coefficient 4

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Power coeff. 4 (3428)

Description Displays the Power coefficient 4 defined for the adjustment.

User interface Positive floating-point number

Flow reference value 5

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Flow ref. val. 5 (3421)

Description Displays the Flow reference value 5 defined for the adjustment.

User interface Signed floating-point number

Power coefficient 5

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Power coeff. 5 (3429)

Description Displays the Power coefficient 5 defined for the adjustment.

User interface Positive floating-point number

Flow reference value 6

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Flow ref. val. 6 (3422)

Description Displays the Flow reference value 6 defined for the adjustment.

User interface Signed floating-point number

Power coefficient 6

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Power coeff. 6 (3430)

Description Displays the Power coefficient 6 defined for the adjustment.

User interface Positive floating-point number

Flow reference value 7

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Flow ref. val. 7 (3423)

Description Displays the Flow reference value 7 defined for the adjustment.

User interface Signed floating-point number

Power coefficient 7

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Power coeff. 7 (3431)

Description Displays the Power coefficient 7 defined for the adjustment.

User interface Positive floating-point number

Flow reference value 8

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Flow ref. val. 8 (3424)

Description Displays the Flow reference value 8 defined for the adjustment.

User interface Signed floating-point number

Power coefficient 8

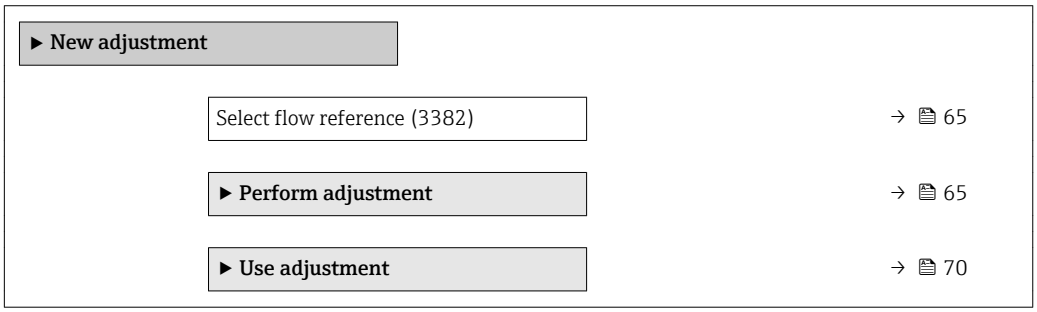
Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → Values in use → Power coeff. 8 (3432)

Description Displays the Power coefficient 8 defined for the adjustment.

User interface Positive floating-point number

"New adjustment" submenu

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment



Select flow reference

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Select flow ref. (3382)

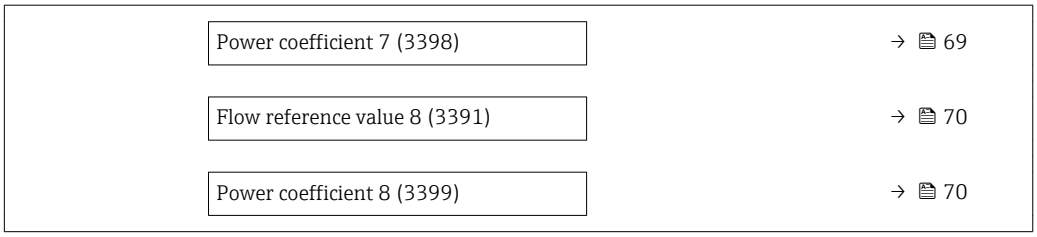
Description Use this function to select the process variable used as flow reference value for the adjustment.

Selection
- Volume flow
- Mass flow

Factory setting Volume flow

"Perform adjustment" submenu

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Perform adjust.



Clear values

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Perform adjust. → Clear values (3529)

Description Use this function to delete the existing adjustment values.

Selection
- Cancel
- Clear values

Factory setting Cancel

Flow reference value 1

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Perform adjust. → Flow ref. val. 1 (3384)

Description Use this function to enter a flow rate used as reference for flow point 1.

User entry Signed floating-point number

Factory setting 0 l/h

Power coefficient 1

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Perform adjust. → Power coeff. 1 (3392)

Description Displays the automatically assigned power coefficient 1 which is directly proportional to the flow: heater power/measured temperature difference.

User interface Positive floating-point number

Flow reference value 2

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Perform adjust. → Flow ref. val. 2 (3385)

Description Use this function to enter a flow rate used as reference for flow point 2.

User entry Signed floating-point number

Factory setting 0 l/h

Power coefficient 2

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Perform adjust. → Power coeff. 2 (3393)

Description Displays the automatically assigned power coefficient 2 which is directly proportional to the flow: heater power/measured temperature difference.

User interface Positive floating-point number

Flow reference value 3

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Perform adjust. → Flow ref. val. 3 (3386)

Description Use this function to enter a flow rate used as reference for flow point 3.

User entry Signed floating-point number

Factory setting 0 l/h

Power coefficient 3

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Perform adjust. → Power coeff. 3 (3394)

Description Displays the automatically assigned power coefficient 3 which is directly proportional to the flow: heater power/measured temperature difference.

User interface Positive floating-point number

Flow reference value 4

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Perform adjust. → Flow ref. val. 4 (3387)

Description Use this function to enter a flow rate used as reference for flow point 4.

User entry Signed floating-point number

Factory setting 0 l/h

Power coefficient 4

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Perform adjust. → Power coeff. 4 (3395)

Description Displays the automatically assigned power coefficient 4 which is directly proportional to the flow: heater power/measured temperature difference.

User interface Positive floating-point number

Flow reference value 5

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Perform adjust. → Flow ref. val. 5 (3388)

Description Use this function to enter a flow rate used as reference for flow point 5.

User entry Signed floating-point number

Factory setting 0 l/h

Power coefficient 5

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Perform adjust. → Power coeff. 5 (3396)

Description Displays the automatically assigned power coefficient 5 which is directly proportional to the flow: heater power/measured temperature difference.

User interface Positive floating-point number

Flow reference value 6

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Perform adjust. → Flow ref. val. 6 (3389)

Description Use this function to enter a flow rate used as reference for flow point 6.

User entry Signed floating-point number

Factory setting 0 l/h

Power coefficient 6

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Perform adjust. → Power coeff. 6 (3397)

Description Displays the automatically assigned power coefficient 6 which is directly proportional to the flow: heater power/measured temperature difference.

User interface Positive floating-point number

Flow reference value 7

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Perform adjust. → Flow ref. val. 7 (3390)

Description Use this function to enter a flow rate used as reference for flow point 7.

User entry Signed floating-point number

Factory setting 0 l/h

Power coefficient 7

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Perform adjust. → Power coeff. 7 (3398)

Description Displays the automatically assigned power coefficient 7 which is directly proportional to the flow: heater power/measured temperature difference.

User interface Positive floating-point number

Flow reference value 8

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Perform adjust. → Flow ref. val. 8 (3391)

Description Use this function to enter a flow rate used as reference for flow point 8.

User entry Signed floating-point number

Factory setting 0 l/h

Power coefficient 8

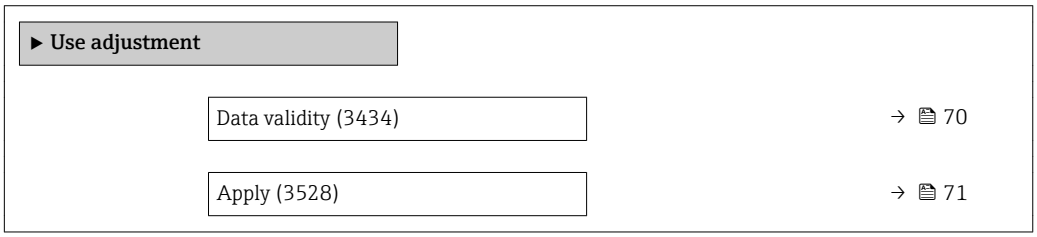
Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Perform adjust. → Power coeff. 8 (3399)

Description Displays the automatically assigned power coefficient 8 which is directly proportional to the flow: heater power/measured temperature difference.

User interface Positive floating-point number

"Use adjustment" submenu

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Use adjustment



Data validity

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Use adjustment → Data validity (3434)

Description Displays whether the performed adjustment is usable.

User interface
- Ok
- Too few points
- Invalid pair of values
- Values too close
- Out of range

Apply

Navigation Expert → Sensor → Sensor adjustm. → In-situ adjust. → New adjustment → Use adjustment → Apply (3528)

Prerequisite In the **Data validity** parameter (→ 70) the **Ok** option is displayed.

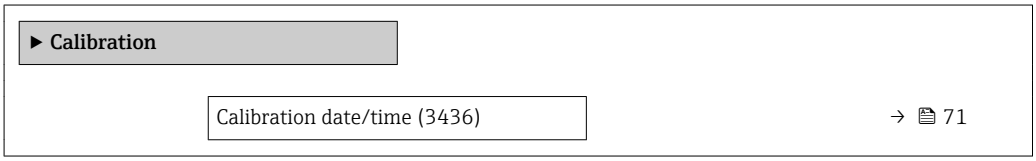
Description Use this function to select whether the new adjustment values are to be used.

Selection
- Cancel
- Ok

Factory setting Cancel

3.2.5 "Calibration" submenu

Navigation Expert → Sensor → Calibration



Calibration date/time

Navigation Expert → Sensor → Calibration → Cal date/time (3436)

Description Displays the date of the last factory calibration of the measuring device.

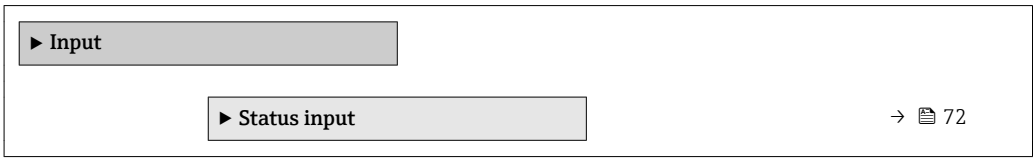
User interface Format: dd.mm.yyyy

Additional information *Description*

The date remains unchanged in the case of onsite calibration.

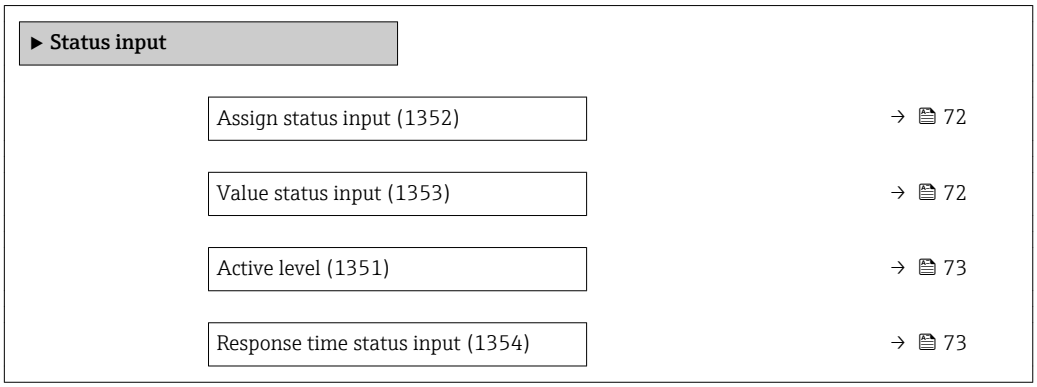
3.3 "Input" submenu

Navigation Expert → Input



3.3.1 "Status input" submenu

Navigation Expert → Input → Status input



Assign status input

Navigation Expert → Input → Status input → Assign stat.inp. (1352)

Description Use this function to select the function for the status input.

Selection
- Off
- Reset totalizer 1
- Flow override
- CIP/SIP mode

Factory setting Off

Value status input

Navigation Expert → Input → Status input → Val. status inp. (1353)

Prerequisite For the following order code:
"Output; input", option Q "4-20mA HART, pul./freq./switch; status input"

Description Displays the current input signal level.

User interface
- High
- Low

Active level

Navigation Expert → Input → Status input → Active level (1351)

Description Use this function to determine the input signal level at which the assigned function is activated.

Selection
- High
- Low

Factory setting High

Response time status input

Navigation Expert → Input → Status input → Response time (1354)

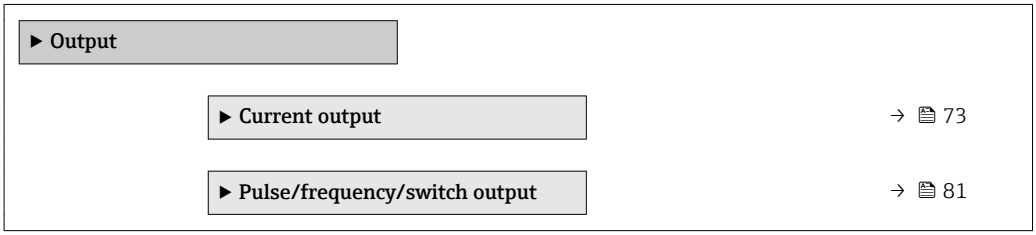
Description Use this function to enter the minimum time period for which the input signal level must be present before the selected function is activated.

User entry 5 to 200 ms

Factory setting 50 ms

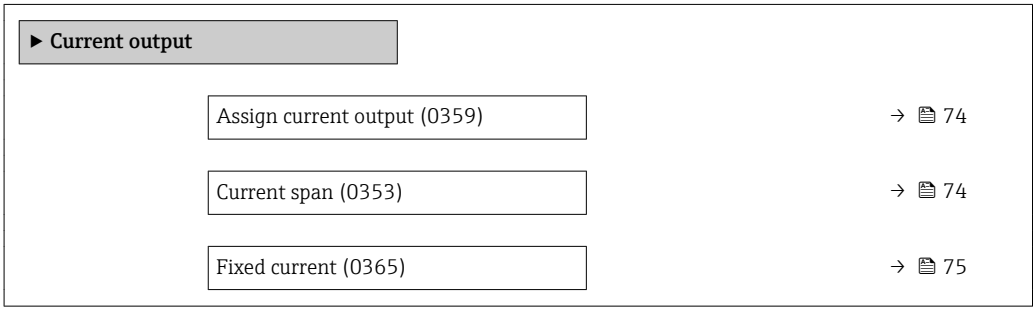
3.4 "Output" submenu

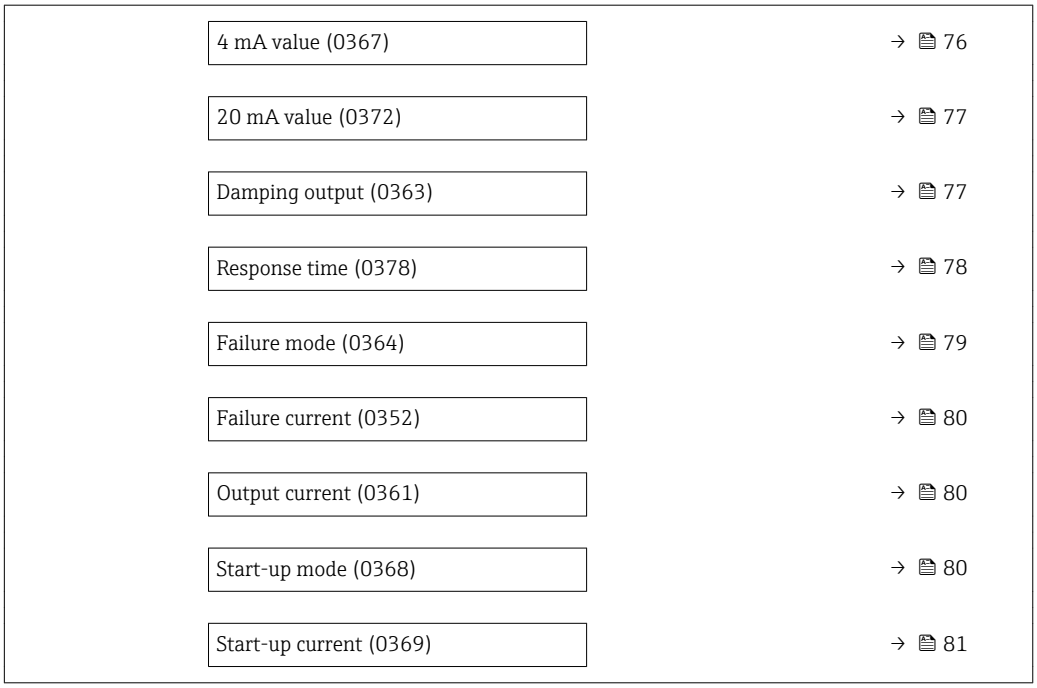
Navigation Expert → Output



3.4.1 "Current output 1" submenu

Navigation Expert → Output → Curr.output 1





Assign current output

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

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

Selection
- Volume flow
- Mass flow
- Temperature

Factory setting Volume flow

Current span

Navigation Expert → Output → Curr.output → 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

Additional information

Description

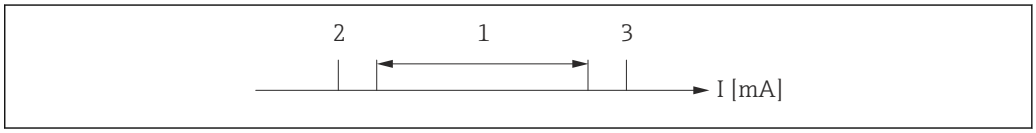
- In the event of a device alarm, the current output adopts the value specified in the **Failure mode** parameter (→ 79).
- If the measured value is outside the measuring range, the diagnostic message ⚠**S441 Current output 1** is displayed.
- The measuring range is specified via the **4 mA value** parameter (→ 76) and **20 mA value** parameter (→ 77).

"Fixed current" option

The current value is set via the **Fixed current** parameter (→ 75).

Example

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



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

Selection

Selection	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 Current output 1** is displayed.

Fixed current

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

Prerequisite In the **Current span** parameter (→ 74), the **Fixed current** option is selected.

Description Use this function to enter a constant current value for the current output.

User entry 3.59 to 22.5 mA

Factory setting 4 mA

Additional information

Example

This setting can be used for HART multidrop, for example.

4 mA value

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

Prerequisite One of the following options is selected in the **Current span** parameter (→ 74):
- 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 0 l/h

Additional information

Description

Positive and negative values are permitted depending on the process variable assigned in the **Assign current output** parameter (→ 74). 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 (→ 77).

Dependency

The unit depends on the process variable selected in the **Assign current output** parameter (→ 74).

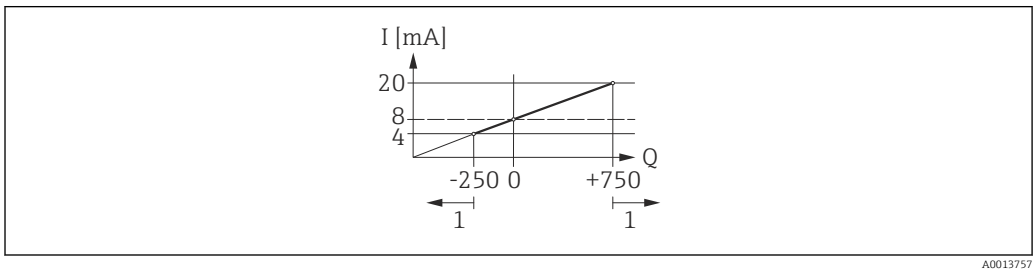
Current output behavior

The current output behaves differently depending on the settings configured in the following parameters:
- Current span (→ 74)
- Failure mode (→ 79)

Configuration examples

A configuration example and its effect on the current output is explained in the following section.

Configuration example
In Forward flow
- **4 mA value** parameter (→ 76) = not equal to zero flow (e.g. −250 m^3/h)
- **20 mA value** parameter (→ 77) = 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 (→ 76) and **20 mA value** parameter (→ 77). If the effective

flow exceeds or falls below this operational range, the diagnostic message ⚠**S441 Current output 1** is displayed.

20 mA value

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

Prerequisite One of the following options is selected in the **Current span** parameter (→ 74):
- 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 → 140

Additional information

Description

Positive and negative values are permitted depending on the process variable assigned in the **Assign current output** parameter (→ 74). 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 (→ 76).

Dependency

The unit depends on the process variable selected in the **Assign current output** parameter (→ 74).

Example

- Value assigned to 4 mA = −250 m^3/h
- Value assigned to 20 mA = +750 m^3/h
- Calculated current value = 8 mA (at zero flow)

Configuration examples

Pay attention to the configuration examples for **4 mA value** parameter (→ 76).

Damping output

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

Prerequisite One of the following options is selected in the **Assign current output** parameter (→ 74):
- Volume flow
- Mass flow
- Temperature

One of the following options is selected in the **Current span** parameter (→ 74):
- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

Description

Use this function to enter the reaction time of the current output signal to fluctuations in the measured value caused by process conditions.

User entry

0.0 to 999.9 s

Factory setting

1.0 s

Additional information

User entry

Use this function to enter a time constant:
- If a low time constant is entered, the current output reacts particularly quickly to fluctuating measured variables.
- On the other hand, the current output reacts more slowly if a high time constant is entered.

Response time

Navigation

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

Prerequisite

One of the following options is selected in the **Assign current output** parameter (→ 74):
- Volume flow
- Mass flow
- Temperature

One of the following options is selected in the **Current span** parameter (→ 74):
- 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 → 77
  and
- Depending on the measured variable assigned to the output.
  Flow damping

Failure mode

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

Prerequisite

One of the following options is selected in the **Assign current output** parameter (→ 74):
- Volume flow
- Mass flow
- Temperature

One of the following options is selected in the **Current span** parameter (→ 74):
- 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 (→ 74).

"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 (→ 74).

"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 (→ 80).

Failure current

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

Prerequisite In the **Failure mode** parameter (→ 79), the **Defined value** option is selected.

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 current 1

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

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 → Start-up mode (0368)

Prerequisite In the **Current span** parameter (→ 74), one of the following options is selected:
- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

Description Use this function to select the current value that the current output adopts during the device start-up phase as long as no measured value is present.

Selection
- Min.
- Max.
- Defined value

Factory setting Min.

Additional information

"Min." option

The current output adopts the value of the lower level for signal on alarm.

The signal on alarm level is defined via the **Current span** parameter (→ 74).

"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 (→ 74).

"Defined value" option

The current output outputs a defined current value.

The current value is defined via the **Start-up current** parameter (→ 81).

Start-up current

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

Prerequisite The **Defined value** option is selected in the **Start-up mode** parameter (→ 80).

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

3.4.2 "Pulse/frequency/switch output" submenu

Navigation Expert → Output → PFS output

▶ **Pulse/frequency/switch output**	
Operating mode (0469)	→ 83
Assign pulse output (0460)	→ 84
Value per pulse (0455)	→ 85
Pulse width (0452)	→ 85
Failure mode (0480)	→ 86
Pulse output (0456)	→ 87

Assign frequency output (0478)	→ 87
Minimum frequency value (0453)	→ 88
Maximum frequency value (0454)	→ 88
Measuring value at minimum frequency (0476)	→ 89
Measuring value at maximum frequency (0475)	→ 89
Damping output (0477)	→ 90
Response time (0491)	→ 90
Failure mode (0451)	→ 91
Failure frequency (0474)	→ 91
Output frequency (0471)	→ 92
Switch output function (0481)	→ 92
Assign diagnostic behavior (0482)	→ 92
Assign limit (0483)	→ 93
Switch-on value (0466)	→ 95
Switch-off value (0464)	→ 95
Assign status (0485)	→ 96
Switch-on delay (0467)	→ 96
Switch-off delay (0465)	→ 97
Failure mode (0486)	→ 97
Switch status (0461)	→ 97
Invert output signal (0470)	→ 98

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.

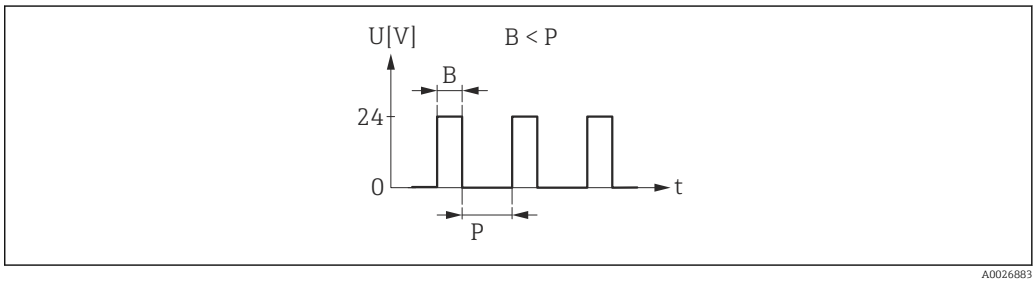
Selection
- Pulse
- Frequency
- Switch

Factory setting Pulse

Additional information *"Pulse" option*

Quantity-dependent pulse with configurable pulse width
- Whenever a specific volume or mass 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

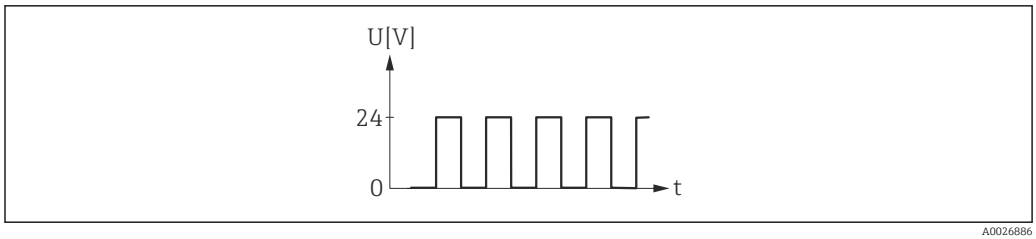


4 Quantity-proportional pulse (pulse value) with pulse width to be configured

B Pulse width entered
P Pauses between the individual pulses

"Frequency" option

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

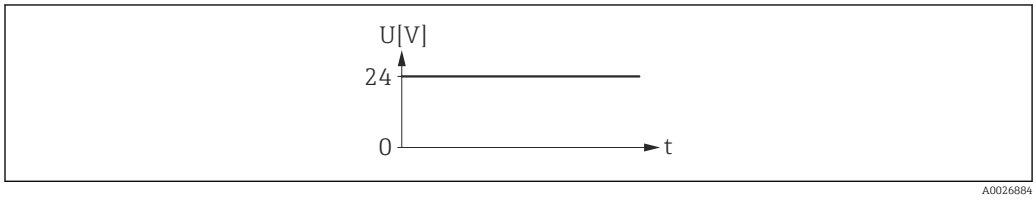


5 Flow-proportional frequency output

"Switch" option

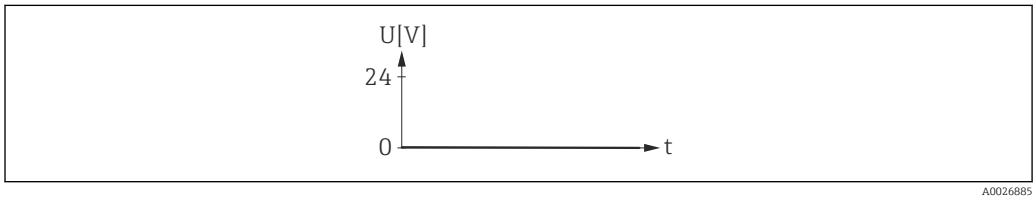
Contact for displaying a condition (e.g. alarm or warning if a limit value is reached)

Example
Alarm response without alarm



6 No alarm, high level

Example
Alarm response in case of alarm



7 Alarm, low level

Assign pulse output

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

Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 83) parameter.

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

Selection
- Off
- Volume flow
- Mass 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 (→ 83) and one of the following options is selected in the **Assign pulse output** parameter (→ 84):
- Volume flow
- Mass flow

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 → 140

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)

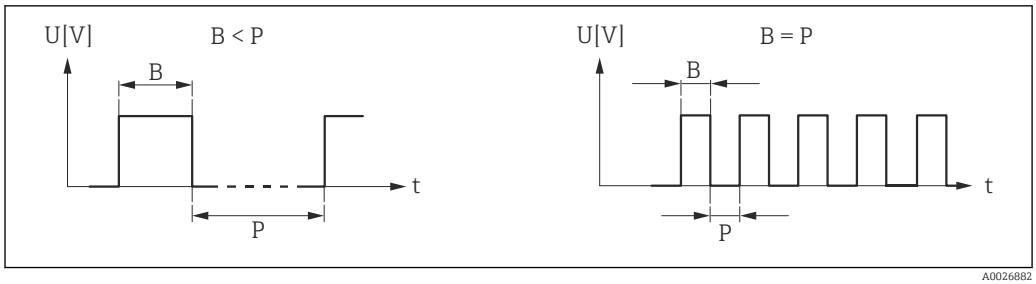
Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 83) and one of the following options is selected in the **Assign pulse output** parameter (→ 84):
- Volume flow
- Mass flow

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

User entry 0.5 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 $f_{max} = 1 / (2 \times \text{pulse width})$.
- The interval between two pulses lasts at least as long as the set pulse width.
- The maximum flow is defined by $Q_{max} = f_{max} \times \text{pulse value}$.
- If the flow exceeds these limit values, the measuring device displays the diagnostic message ⚠**S443 Pulse output 1 to n**.



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

Failure mode

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

Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 83) and one of the following options is selected in the **Assign pulse output** parameter (→ 84):
- Volume flow
- Mass flow

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)

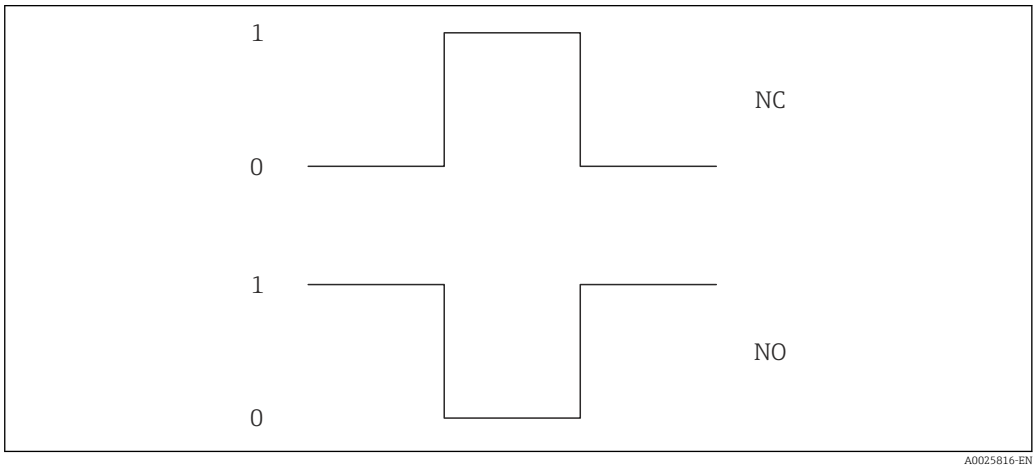
Prerequisite In the **Operating mode** parameter (→ 83), the **Pulse** option is selected.

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 (→ 85) and **Pulse width** parameter (→ 85) 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 output signal** parameter (→ 98) 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 (→ 86)) can be configured.

Assign frequency output

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

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 83) parameter.

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

Selection
- Off
- Volume flow
- Mass flow
- Temperature

Factory setting Off

Minimum frequency value

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

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 83) and one of the following options is selected in the **Assign frequency output** parameter (→ 87):
- Volume flow
- Mass flow
- Temperature

Description Use this function to enter the start value frequency.

User entry 0.0 to 1 000.0 Hz

Factory setting 0.0 Hz

Maximum frequency value

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

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 83) and one of the following options is selected in the **Assign frequency output** parameter (→ 87):
- Volume flow
- Mass flow
- Temperature

Description Use this function to enter the end value frequency.

User entry 0.0 to 1 000.0 Hz

Factory setting 1 000.0 Hz

Measuring value at minimum frequency

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

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 83) and one of the following options is selected in the **Assign frequency output** parameter (→ 87):
- Volume flow
- Mass flow
- Temperature

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 frequency output** parameter (→ 87).

Measuring value at maximum frequency

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

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 83) and one of the following options is selected in the **Assign frequency output** parameter (→ 87):
- Volume flow
- Mass flow
- Temperature

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 frequency output** parameter (→ 87).

Damping output

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

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 83) and one of the following options is selected in the **Assign frequency output** parameter (→ 87):
- Volume flow
- Mass flow
- Temperature

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

User entry 0 to 999.9 s

Factory setting 0.0 s

Additional information *Description*

Use this function to enter a time constant (PT1 element) for frequency output damping. 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 The **Frequency** option is selected in the **Operating mode** parameter (→ 83) and one of the following options is selected in the **Assign frequency output** parameter (→ 87):
- Volume flow
- Mass flow
- Temperature

Description Displays the response time. This specifies how quickly the pulse/frequency/switch output reaches the measured value change of 63 % of 100 % of the measured value change.

User interface Positive floating-point number

Additional information *Description*

The response time is made up of the time specified for the following dampings:
- Damping of pulse/frequency/switch output → 77
  and
- Depending on the measured variable assigned to the output.
  Flow damping

Failure mode

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

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 83) and one of the following options is selected in the **Assign frequency output** parameter (→ 87):
- Volume flow
- Mass flow
- Temperature

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 frequency (→ 91) 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 frequency

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

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 83) and one of the following options is selected in the **Assign frequency output** parameter (→ 87):
- Volume flow
- Mass flow
- Temperature

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 1250.0 Hz

Factory setting 0.0 Hz

Output frequency

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

Prerequisite In the **Operating mode** parameter (→ 83), the **Frequency** option is selected.

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

User interface 0.0 to 1 250.0 Hz

Switch output function

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

Prerequisite In the **Operating mode** parameter (→ 83) the **Switch** option is selected.

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

Selection
- Off
- On
- Diagnostic behavior
- Limit
- 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).
- Diagnostic 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.
- Status
  Indicates the device status depending on whether empty pipe detection or low flow cut off is selected.

Assign diagnostic behavior

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

Prerequisite
- The **Switch** option is selected in the **Operating mode** parameter (→ 83).
- The **Diagnostic behavior** option is selected in the **Switch output function** parameter (→ 92).

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.

Options
- 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 (→ 83) parameter.
- The **Limit** option is selected in the **Switch output function** parameter (→ 92) parameter.

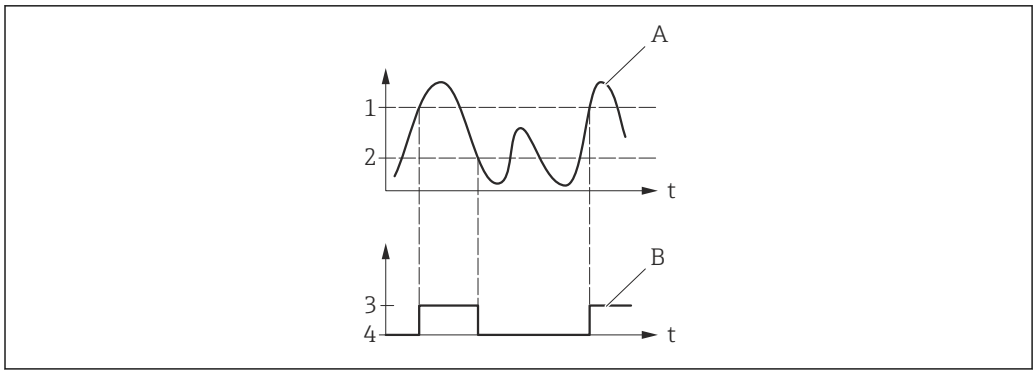
Description Use this function to select a process variable for the limit function.

Selection
- Volume flow
- Mass flow
- Temperature
- Totalizer 1

Factory setting Volume flow

Additional information *Description*

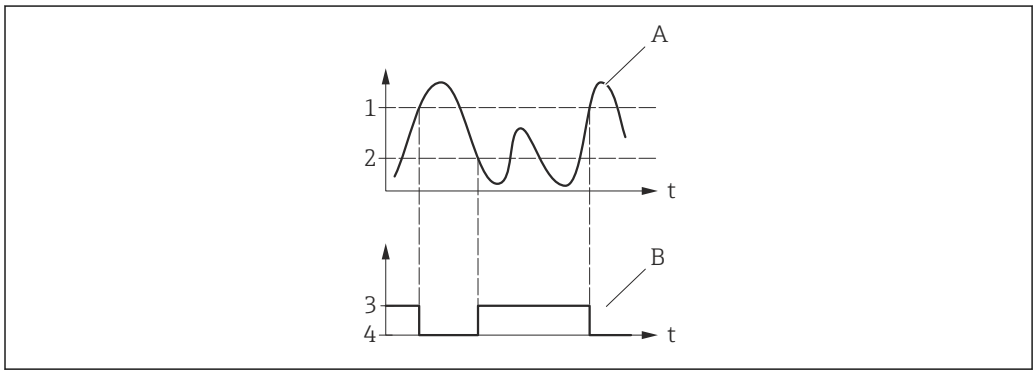
Behavior of status output when Switch-on value > Switch-off value:
- Process variable > Switch-on value: transistor is conductive
- Process variable < Switch-off value: transistor is non-conductive



A0026891

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

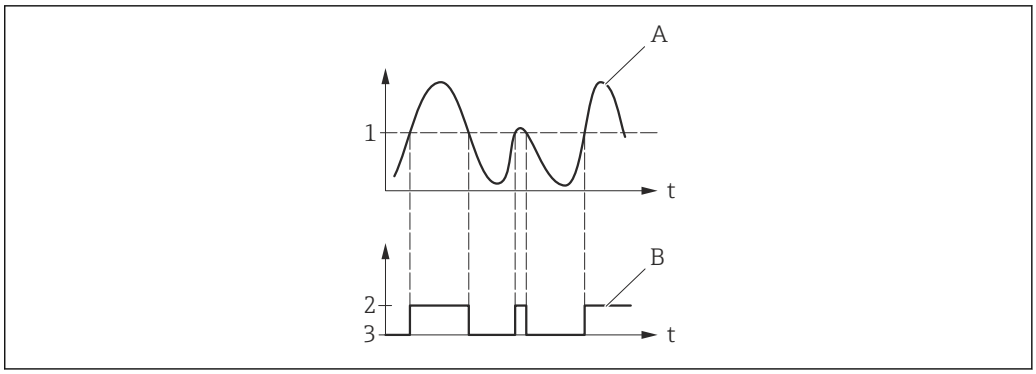
Behavior of status output when Switch-on value < Switch-off value:
- Process variable < Switch-on value: transistor is conductive
- Process variable > Switch-off value: transistor is non-conductive



A0026892

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
- The **Switch** option is selected in the **Operating mode** parameter (→ 83).
- The **Limit** option is selected in the **Switch output function** parameter (→ 92).

Description Use this function to enter the measured value for the switch-on point.

User entry Signed floating-point number

Factory setting 0 l/h

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 (→ 93).

Switch-off value

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

Prerequisite
- The **Switch** option is selected in the **Operating mode** parameter (→ 83).
- The **Limit** option is selected in the **Switch output function** parameter (→ 92).

Description Use this function to enter the measured value for the switch-off point.

User entry Signed floating-point number

Factory setting 0 l/h

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 (→ 93).

Assign status

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

Prerequisite
- The **Switch** option is selected in the **Operating mode** parameter (→ 83).
- The **Status** option is selected in the **Switch output function** parameter (→ 92).

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

Selection
- Partially filled pipe detection
- Low flow cut off

Factory setting Low flow cut off

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 (→ 83).
- The **Limit** option is selected in the **Switch output function** parameter (→ 92).

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 (→ 83).
- The **Limit** option is selected in the **Switch output function** parameter (→ 92).

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 (→ 83).

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 output signal

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

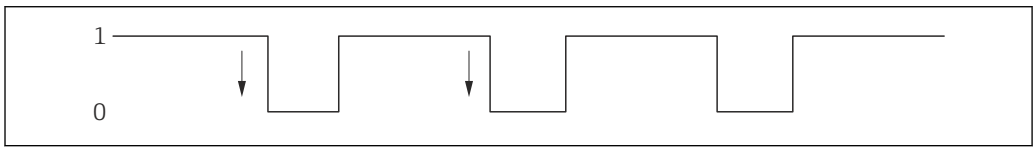
Description Use this function to select whether to invert the output signal.

Selection
- No
- Yes

Factory setting No

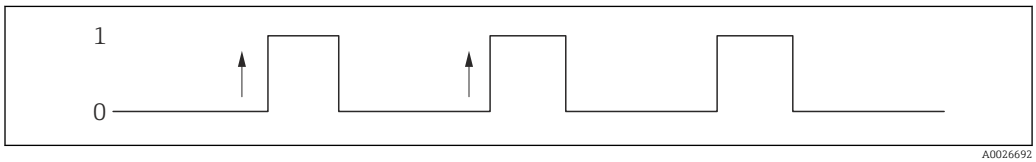
Additional information *Selection*

No option (passive - negative)



A0026693

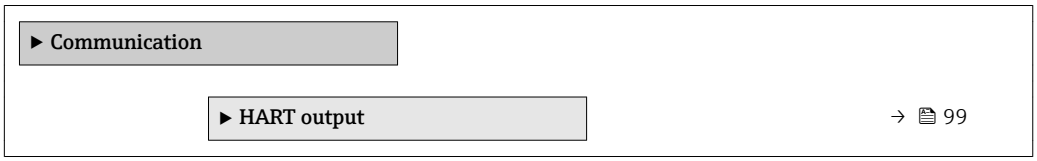
Yes option (passive - positive)



A0026692

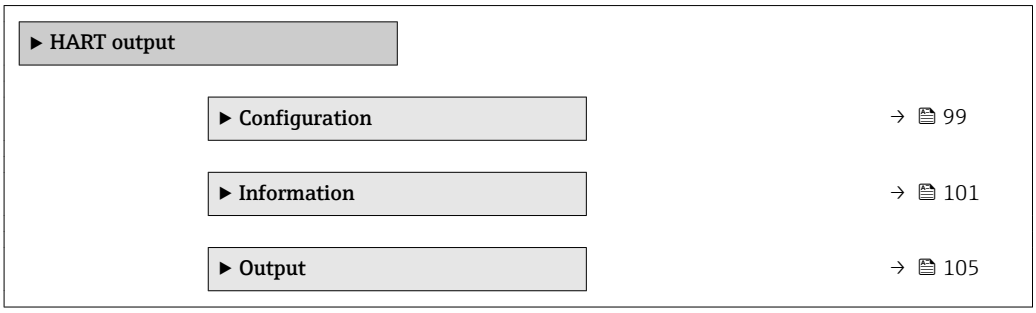
3.5 "Communication" submenu

Navigation Expert → Communication



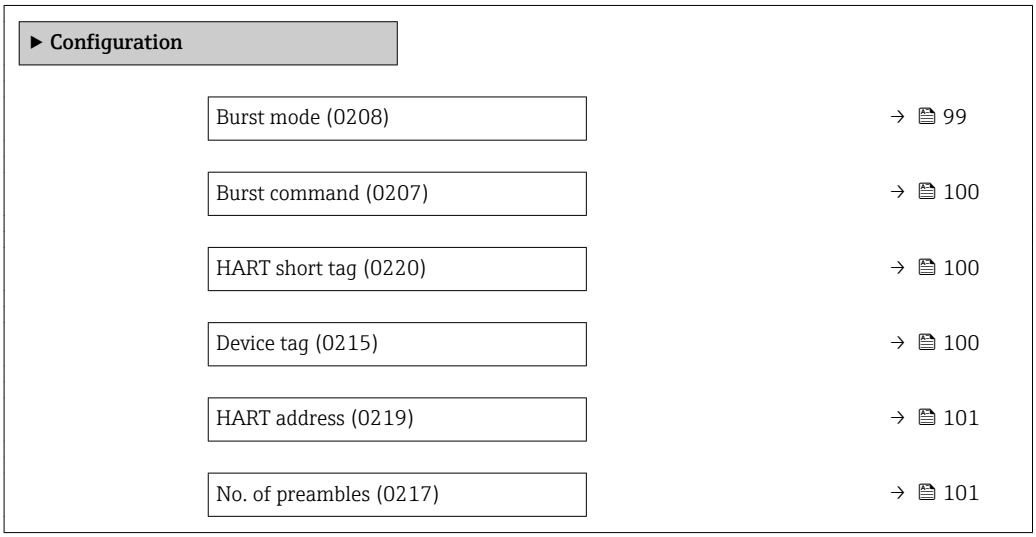
3.5.1 "HART output" submenu

Navigation Expert → Communication → HART output



"Configuration" submenu

Navigation Expert → Communication → HART output → Configuration



Burst mode

Navigation Expert → Communication → HART output → Configuration → Burst mode (0208)

Description Use this function to select whether to activate or deactivate the HART burst mode for burst message X.

Selection
- Off
- On

Factory setting Off

Additional information *Selection*
- 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

Navigation Expert → Communication → HART output → Configuration → Burst command (0207)

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
  Command 33: Read out the dynamic HART variables including the related unit.

HART short tag

Navigation Expert → Communication → HART output → Configuration → HART short tag (0220)

Description Use this function to enter a brief description for the measuring point. This can be edited and displayed via HART protocol or using the local display.

User entry Max. 8 characters: A-Z, 0-9 and certain special characters (e.g. punctuation marks, @, %).

Factory setting T-MASS

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 t-mass

HART address

Navigation Expert → Communication → HART output → Configuration → HART address (0219)

Description Use this function to enter the address via which the data exchange takes place via HART protocol.

User entry 0 to 63

Factory setting 0

No. of preambles

Navigation Expert → Communication → HART output → Configuration → No. of preambles (0217)

Description Use this function to enter the number of preambles in the HART protocol.

User entry 2 to 20

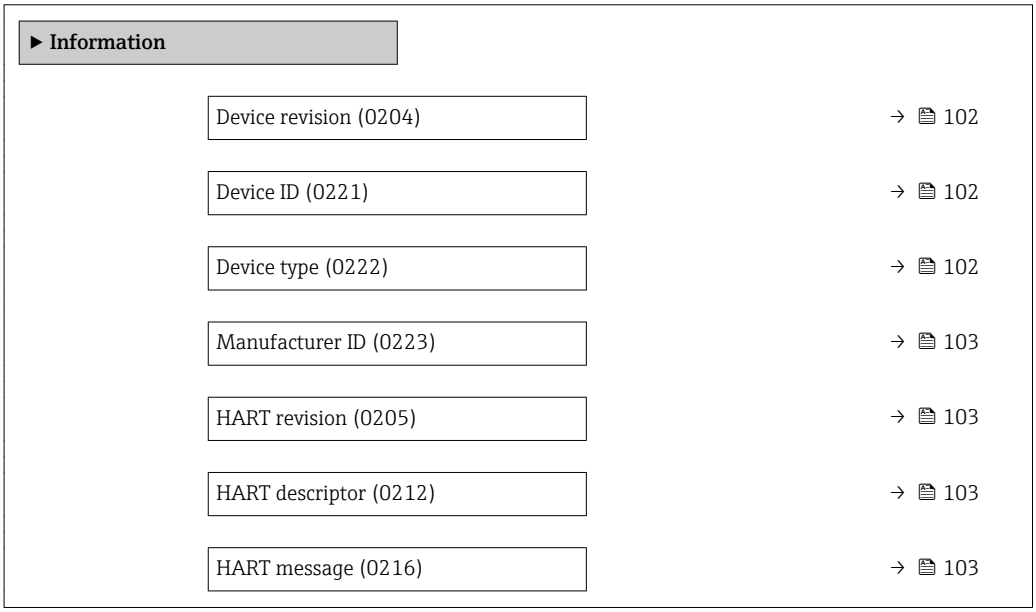
Factory setting 5

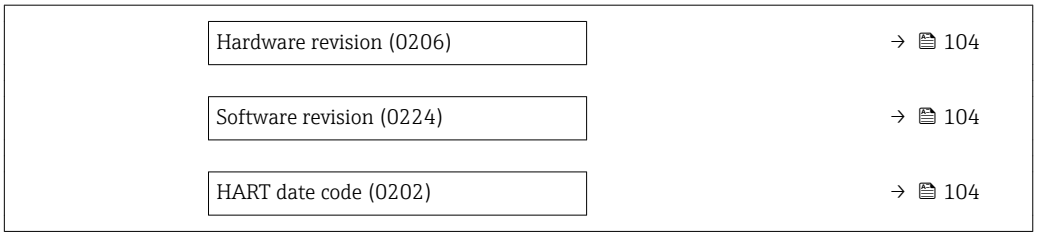
Additional information *User entry*

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

"Information" submenu

Navigation Expert → Communication → HART output → Information





Device revision

Navigation Expert → Communication → HART output → Information → Device revision (0204)

Description Use this function to view the device revision with which the device is registered with the HART Communication Foundation.

User interface 2-digit hexadecimal number

Factory setting 0x01

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 (0222)

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 0x68 (for t-mass T 150)

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 (0223)

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 6

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 t-mass L T 150

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 t-mass L T 150

Hardware revision

Navigation Expert → Communication → HART output → Information → Hardware rev. (0206)

Description Displays the hardware revision of the measuring device.

User interface 0 to 255

Factory setting 1

Software revision

Navigation Expert → Communication → HART output → Information → Software rev. (0224)

Description Displays the software revision of the measuring device.

User interface 0 to 255

Factory setting 1

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.

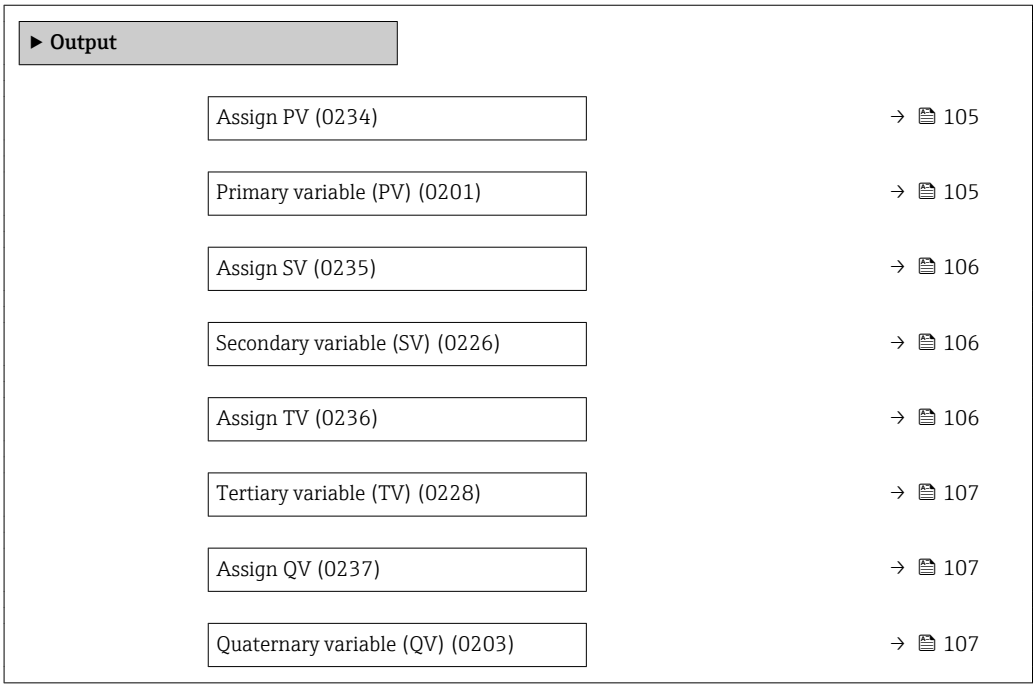
User entry Date entry format: yyyy-mm-dd

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
- Volume flow
- Mass flow
- Temperature

Factory setting Volume flow

Primary variable (PV)

Navigation Expert → Communication → HART output → Output → Primary var (PV) (0201)

Description Displays the current measured value of the primary dynamic variable (PV).

User interface Signed floating-point number

Additional information

User interface

The measured value displayed depends on the process variable selected in the **Assign PV** parameter (→ 105).

Dependency

The unit of the displayed measured value is taken from the **System units** submenu (→ 45).

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
- Temperature
- Totalizer

Factory setting Totalizer

Secondary variable (SV)

Navigation Expert → Communication → HART output → Output → Second.var(SV) (0226)

Description Displays the current measured value of the secondary dynamic variable (SV).

User interface Signed floating-point number

Additional information

User interface

The measured value displayed depends on the process variable selected in the **Assign SV** parameter (→ 106).

Dependency

The unit of the displayed measured value is taken from the **System units** submenu (→ 45).

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
- Temperature
- Totalizer

Factory setting Temperature

Tertiary variable (TV)

Navigation Expert → Communication → HART output → Output → Tertiary var(TV) (0228)

Description Displays the current measured value of the tertiary dynamic variable (TV).

User interface 0 to 99 999.9999 °C

Additional information

User interface

The measured value displayed depends on the process variable selected in the **Assign TV** parameter (→ 106).

Dependency

The unit of the displayed measured value is taken from the **System units** submenu (→ 45).

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
- Temperature
- Totalizer

Factory setting Totalizer

Quaternary variable (QV)

Navigation Expert → Communication → HART output → Output → Quaterna.var(QV) (0203)

Description Displays the current measured value of the quaternary dynamic variable (QV).

User interface Signed floating-point number

Additional information

User interface

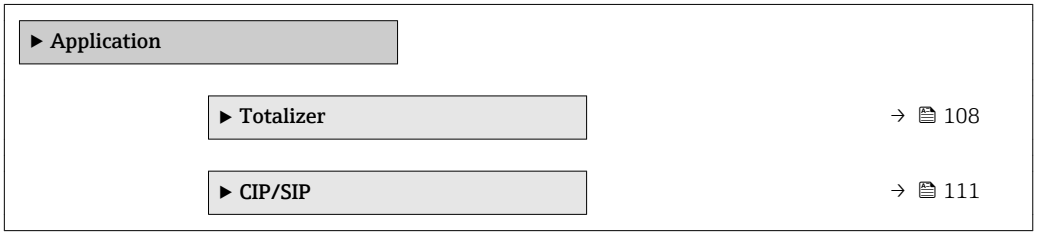
The measured value displayed depends on the process variable selected in the **Assign QV** parameter (→ 107).

Dependency

The unit of the displayed measured value is taken from the **System units** submenu (→ 45).

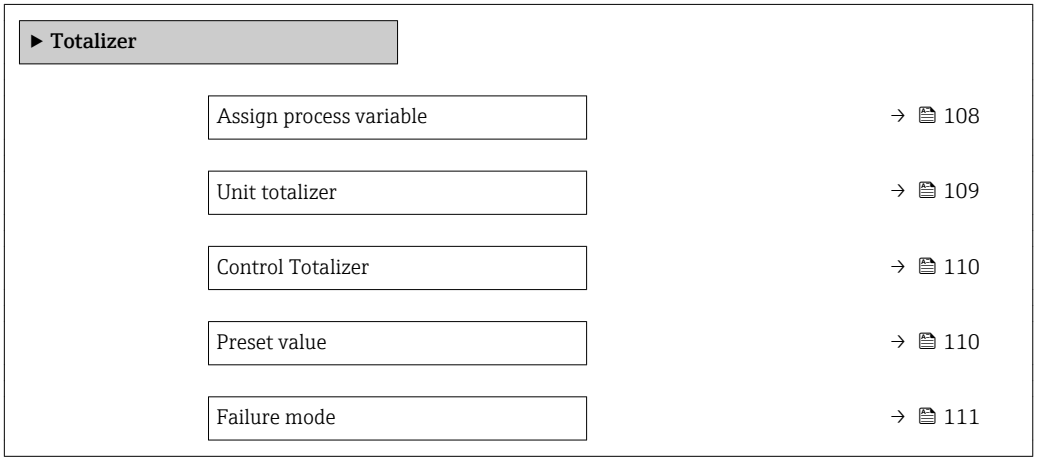
3.6 "Application" submenu

Navigation Expert → Application



3.6.1 "Totalizer" submenu

Navigation Expert → Application → Totalizer



Assign process variable

Navigation Expert → Application → Totalizer → Assign variable (0914)

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

Selection
- Off
- Volume flow
- Mass flow

Factory setting Volume flow

Additional information *Description*

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

Selection

If the **Off** option is selected, only **Assign process variable** parameter (→ 108) is still displayed in the **Totalizer** submenu. All other parameters in the submenu are hidden.

Unit totalizer

Navigation Expert → Application → Totalizer → Unit totalizer (0915)

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 108)**Totalizer** submenu:
- Volume flow
- Mass flow

Description Use this function to select the unit for the process variable for Totalizer (→ 41).

Selection

SI units
- g
- kg
- t

US units
- oz
- lb
- STon

Imperial units
LTon

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;oil)

Custom-specific units
User vol.

Factory setting Country-specific:
- m^3
- ft^3

Additional information *Selection*

The selection is independent of the process variable selected in the **Assign process variable** parameter (→ 108).

Control Totalizer

Navigation Expert → Application → Totalizer → Control Tot. (0912)

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 108) of the **Totalizer** submenu:
- Volume flow
- Mass flow

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

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

Factory setting Totalize

Additional information *Selection*
- Totalize
  The totalizer is started or continues totalizing with the current counter reading.
- Reset + hold
  The totaling process is stopped and the totalizer is reset to 0.
- Preset + hold
  The totaling process is stopped and the totalizer is set to its defined start value from the **Preset value** parameter (→ 110).
- 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 (→ 110) and the totaling process is restarted.

Preset value

Navigation Expert → Application → Totalizer → Preset value (0913)

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 108) of the **Totalizer** submenu:
- Volume flow
- Mass flow

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

User entry Signed floating-point number

Factory setting 0 m^3

Additional information *User entry*

The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→ 109).

Example

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

Failure mode

Navigation Expert → Application → Totalizer → Failure mode (0901)

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 108) of the **Totalizer** submenu:
- Volume flow
- Mass flow

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

Selection
- Stop
- Actual value
- Last valid value

Factory setting Stop

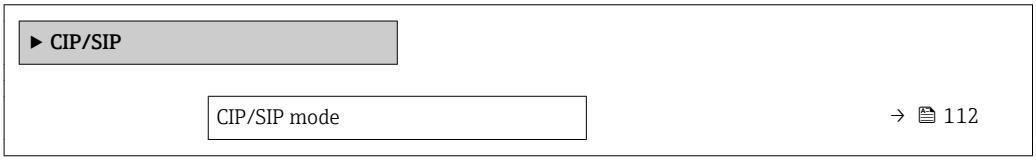
Additional information *Description*

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

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

3.6.2 "CIP/SIP" submenu

Navigation Expert → Application → CIP/SIP



CIP/SIP mode

Navigation Expert → Application → CIP/SIP → CIP/SIP mode (3536)

Description Use this function to activate and deactivate CIP/SIP mode.

Selection
- Off
- On

Factory setting Off

Additional information SIP process: max. +130 °C (+266 °F) for one hour max.

3.7 "Diagnostics" submenu

Navigation Expert → Diagnostics

Actual diagnostics

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 (→ 115).

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 failure

Timestamp

Navigation Expert → Diagnostics → Timestamp

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

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

Additional information *Display*

The diagnostic message can be viewed via the **Actual diagnostics** parameter (→ 112).

Example

For the display format:
24d12h13m00s

Previous 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 failure

Timestamp

Navigation Expert → Diagnostics → Timestamp

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

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

Additional information *Display*

The diagnostic message can be viewed via the **Previous diagnostics** parameter (→ 113).

Example

For the display format:
24d12h13m00s

Operating time from restart

Navigation Expert → Diagnostics → Time fr. restart (0653)

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

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

Operating time

Navigation Expert → Diagnostics → Operating time (0652)

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

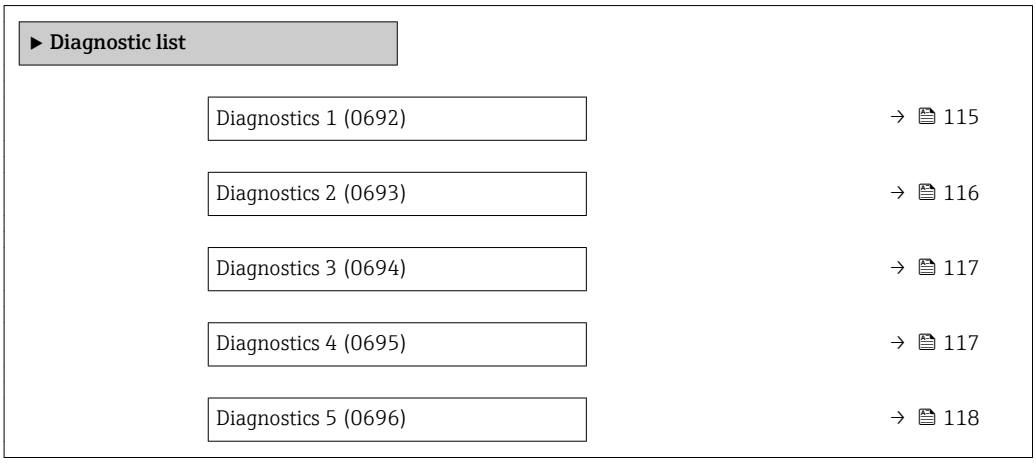
User interface Days (d), hours (h), minutes (m) and seconds (s)

Additional information *User interface*

The maximum number of days is 9999, which is equivalent to 27 years.

3.7.1 "Diagnostic list" submenu

Navigation Expert → Diagnostics → Diagnostic list



Diagnostics 1

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 1 (0692)

Description 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 Frequency output
- ⊗F276 I/O module failure

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

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

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

Additional information *Display*

The diagnostic message can be viewed via the **Diagnostics 1** parameter (→ 115).

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 Frequency output
- ⊗F276 I/O module failure

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

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

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

Additional information *Display*

The diagnostic message can be viewed via the **Diagnostics 2** parameter (→ 116).

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 Frequency output
- ⊗F276 I/O module failure

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

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

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

Additional information *Display*

The diagnostic message can be viewed via the **Diagnostics 3** parameter (→ 117).

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 Frequency output
- ⊗F276 I/O module failure

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

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

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

Additional information *Display*

The diagnostic message can be viewed via the **Diagnostics 4** parameter (→ 117).

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 Frequency output
- ⊗F276 I/O module failure

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

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

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

Additional information *Display*

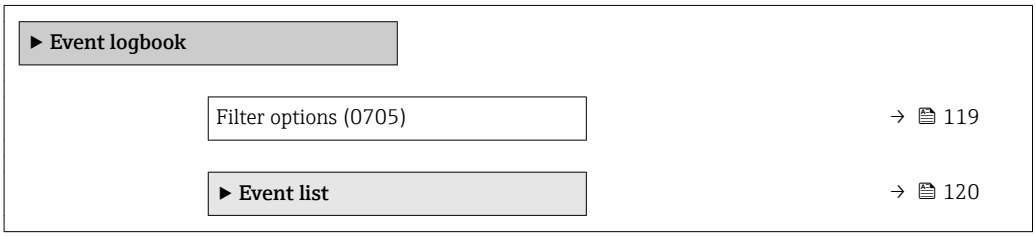
The diagnostic message can be viewed via the **Diagnostics 5** parameter (→ 118).

Example

For the display format:
24d12h13m00s

3.7.2 "Event logbook" submenu

Navigation Expert → Diagnostics → Event logbook



Filter options

Navigation Expert → Diagnostics → Event logbook → Filter options (0705)

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

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

Factory setting All

Additional information *Description*

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

Filter options

Navigation Expert → Diagnostics → Event logbook → Filter options

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

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

Factory setting All

Additional information *Description*

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

"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 (→ 119).

User interface
- For a "Category I" event message
  Information event, short message, symbol for event recording and operating time when error occurred
- For a "Category F, C, S, M" event message (status signal)
  Diagnostics code, short message, symbol for event recording and operating time when error occurred

Additional information

Description

A maximum of 20 event messages are displayed in chronological order.

If the advanced HistoROM function is enabled in the device, the event list can contain up to 100 entries.

The following symbols indicate whether an event has occurred or has ended:
- ⊕: Occurrence of the event
- ⊖: End of the event

Examples

For the display format:
- I1091 Configuration modified
  ⊕ 24d12h13m00s
- ⚠S442 Frequency output
  ⊕ 01d04h12min30s

Additional information, such as remedial measures, can be retrieved via the E key.

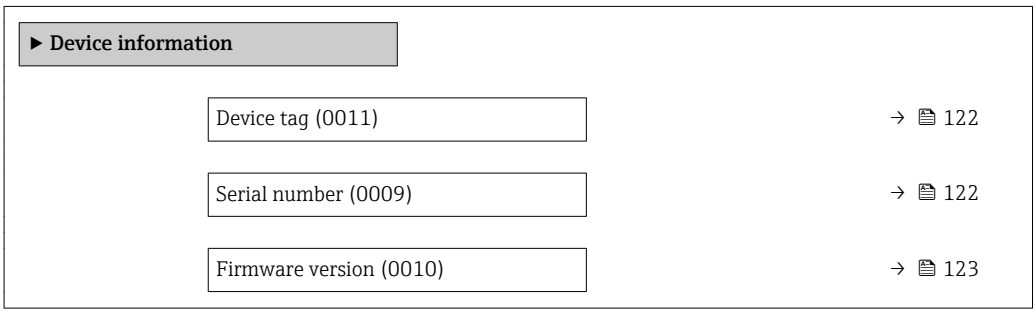
HistoROM

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

To order the **HistoROM advanced capabilities** application package, see the "Accessories" section of the "Technical Information" document.

3.7.3 "Device information" submenu

Navigation Expert → Diagnostics → Device info



Device name (0013)	→ 123
Order code (0008)	→ 123
Extended order code 1 (0023)	→ 124
Extended order code 2 (0021)	→ 124
Extended order code 3 (0022)	→ 124
ENP version (0012)	→ 124
Configuration counter (0233)	→ 125

Device tag

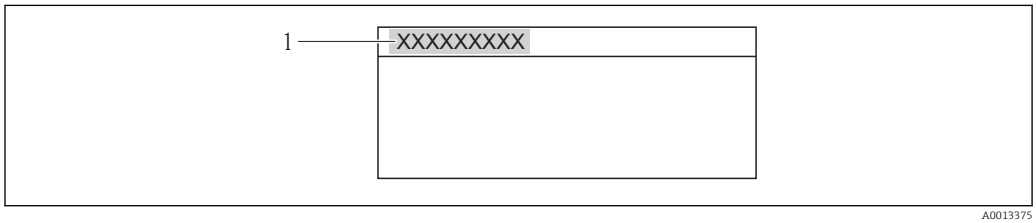
Navigation Expert → Diagnostics → Device info → Device tag (0011)

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 t-mass L T 150

Additional information *User interface*



8 Header text

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

Additional information *Description*

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

Firmware version

Navigation Expert → Diagnostics → Device info → Firmware version (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 t-mass T 150

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.

Extended order code 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.

Extended order code 2

Navigation Expert → Diagnostics → Device info → Ext. order cd. 2 (0021)

Description For displaying the second part of the extended order code.

User interface Character string

Additional information For additional information, see **Extended order code 1** parameter (→ 124)

Extended order code 3

Navigation Expert → Diagnostics → Device info → Ext. order cd. 3 (0022)

Description For displaying the third part of the extended order code.

User interface Character string

Additional information For additional information, see **Extended order code 1** parameter (→ 124)

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.

Configuration counter

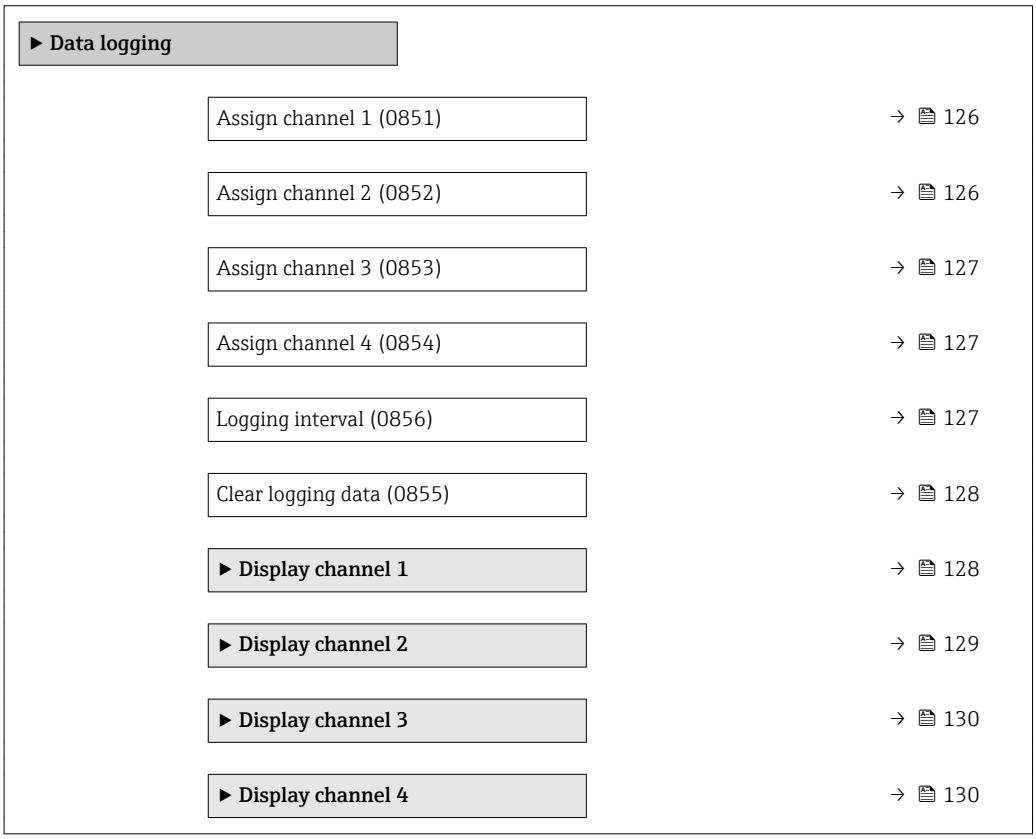
Navigation Expert → Diagnostics → Device info → Config. counter (0233)

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

User interface 0 to 65 535

3.7.4 "Data logging" submenu

Navigation Expert → Diagnostics → Data logging



Assign channel 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 **Software option overview** parameter (→ 38).

Description Use this function to select a process variable for the data logging channel.

Selection
- Off
- Volume flow
- Mass flow
- Temperature
- Current output

Factory setting Off

Additional information *Description*

A total of 1000 measured values can be logged. This means:
- 1000 data points if 1 logging channel is used
- 500 data points if 2 logging channels are used
- 333 data points if 3 logging channels are used
- 250 data points if 4 logging channels are used

Once the maximum number of data points is reached, the oldest data points in the data log are cyclically overwritten in such a way that the last 1000, 500, 333 or 250 measured values are always in the log (ring memory principle).

The log contents are cleared if the option selected is changed.

Assign channel 2

Navigation Expert → Diagnostics → Data logging → Assign chan. 2 (0852)

Prerequisite The **Extended HistoROM** application package is available.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 38).

Description Options for the assignment of a process variable to the data logging channel.

Selection Picklist, see **Assign channel 1** parameter (→ 126)

Factory setting Off

Assign channel 3

Navigation Expert → Diagnostics → Data logging → Assign chan. 3 (0853)

Prerequisite The **Extended HistoROM** application package is available.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 38).

Description Options for the assignment of a process variable to the data logging channel.

Selection Picklist, see **Assign channel 1** parameter (→ 126)

Factory setting Off

Assign channel 4

Navigation Expert → Diagnostics → Data logging → Assign chan. 4 (0854)

Prerequisite The **Extended HistoROM** application package is available.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 38).

Description Options for the assignment of a process variable to the data logging channel.

Selection Picklist, see **Assign channel 1** parameter (→ 126)

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 **Software option overview** parameter (→ 38).

Description Use this function to enter the logging interval t_{log} for data logging.

User entry 1.0 to 3 600.0 s

Factory setting 10.0 s

Additional information

Description

This defines the interval between the individual data points in the data log, and thus the maximum loggable process time T_{log}:
- If 1 logging channel is used: $T_{log} = 1000 \times t_{log}$
- If 2 logging channels are used: $T_{log} = 500 \times t_{log}$
- If 3 logging channels are used: $T_{log} = 333 \times t_{log}$
- If 4 logging channels are used: $T_{log} = 250 \times t_{log}$

Once this time elapses, the oldest data points in the data log are cyclically overwritten such that a time of Tlog always remains in the memory (ring memory principle).

The log contents are cleared if the length of the logging interval is changed.

Example

If 1 logging channel is used:
- $T_{log} = 1000 \times 1$ s = 1 000 s ≈15 min
- $T_{log} = 1000 \times 10$ s = 10 000 s ≈ 3 h
- $T_{log} = 1000 \times 80$ s = 80 000 s ≈ 1 d
- $T_{log} = 1000 \times 3\,600$ s = 3 600 000 s ≈ 41 d

Clear logging data

Navigation Expert → Diagnostics → Data logging → Clear logging (0855)

Prerequisite The **Extended HistoROM** application package is available.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 38).

Description Option to clear the entire logging data.

Selection
- Cancel
- Clear data

Factory setting Cancel

Additional information

Selection
- Cancel
  The data is not cleared. All the data is retained.
- Clear data
  The logging data is cleared. The logging process starts from the beginning.

"Display channel 1" submenu

Navigation Expert → Diagnostics → Data logging → Displ.channel 1

Display channel 1

Navigation Expert → Diagnostics → Data logging → Displ.channel 1

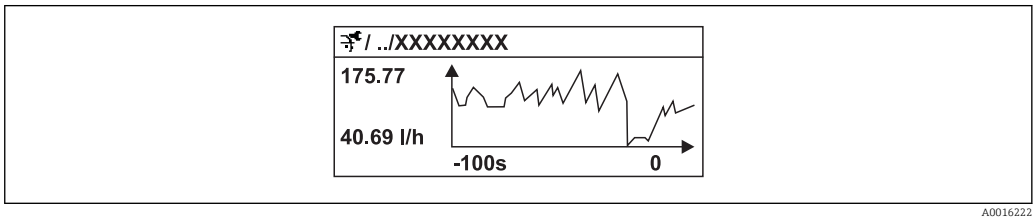
Prerequisite The **Extended HistoROM** application package is available.

The software options currently enabled are displayed in the **Software option overview** parameter (→ 38).

One of the following options is selected in the **Assign channel 1** parameter (→ 126):
- Volume flow
- Mass flow
- Temperature
- Current output

Description Displays the measured value trend for the logging channel in the form of a chart.

Additional information *Description*

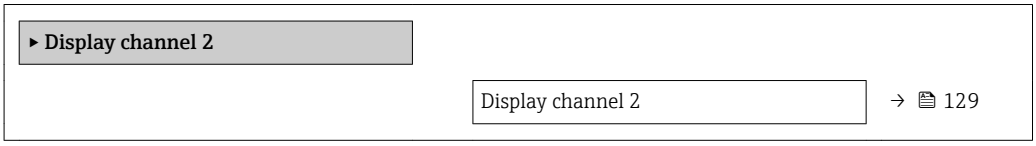


A0016222

- x-axis: depending on the number of channels selected displays 250 to 1000 measured values of a process variable.
- y-axis: displays the approximate measured value span and constantly adapts this to the ongoing measurement.

"Display channel 2" submenu

Navigation Expert → Diagnostics → Data logging → Displ.channel 2



Display channel 2

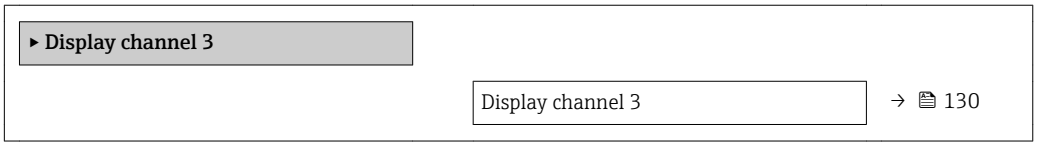
Navigation Expert → Diagnostics → Data logging → Displ.channel 2

Prerequisite A process variable is defined in the **Assign channel 2** parameter.

Description See the **Display channel 1** parameter → 129

"Display channel 3" submenu

Navigation Expert → Diagnostics → Data logging → Displ.channel 3



Display channel 3

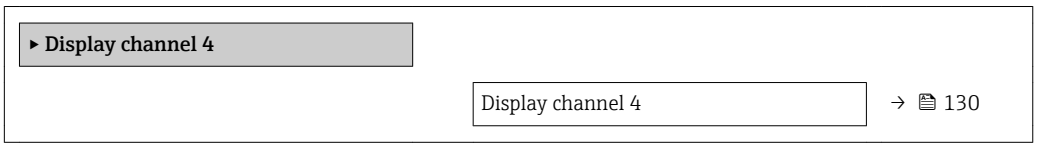
Navigation Expert → Diagnostics → Data logging → Displ.channel 3

Prerequisite A process variable is defined in the **Assign channel 3** parameter.

Description See the **Display channel 1** parameter → 129

"Display channel 4" submenu

Navigation Expert → Diagnostics → Data logging → Displ.channel 4



Display channel 4

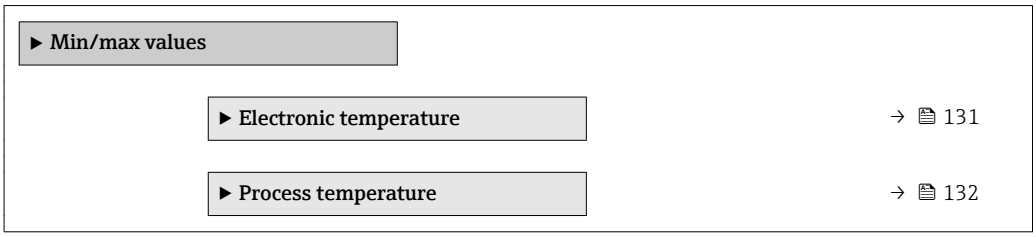
Navigation Expert → Diagnostics → Data logging → Displ.channel 4

Prerequisite A process variable is defined in the **Assign channel 4** parameter.

Description See the **Display channel 1** parameter → 129

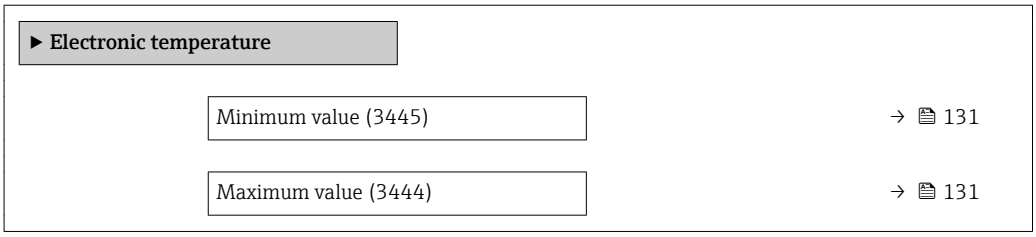
3.7.5 "Min/max values" submenu

Navigation Expert → Diagnostics → Min/max val.



"Electronic temperature" submenu

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



Minimum value

Navigation Expert → Diagnostics → Min/max val. → Electronic temp. → Minimum value (3445)

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

User interface −273.15 to 726.75 °C

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 49)

Maximum value

Navigation Expert → Diagnostics → Min/max val. → Electronic temp. → Maximum value (3444)

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

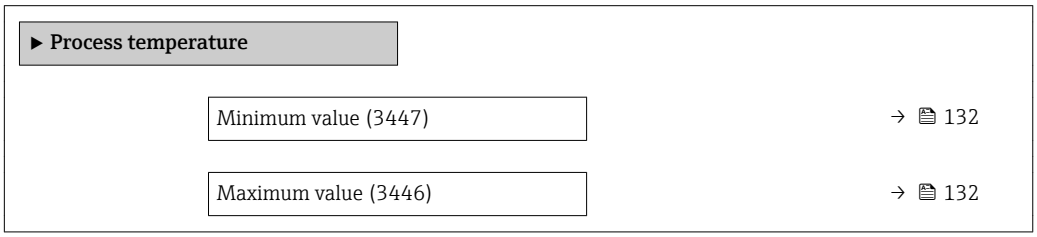
User interface −273.15 to 726.75 °C

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 49)

"Process temperature" submenu

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



Minimum value

Navigation Expert → Diagnostics → Min/max val. → Process temp. → Minimum value (3447)

Description Displays the lowest previously measured process temperature.

User interface −273.15 to 726.75 °C

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 49)

Maximum value

Navigation Expert → Diagnostics → Min/max val. → Process temp. → Maximum value (3446)

Description Displays the highest previously measured process temperature.

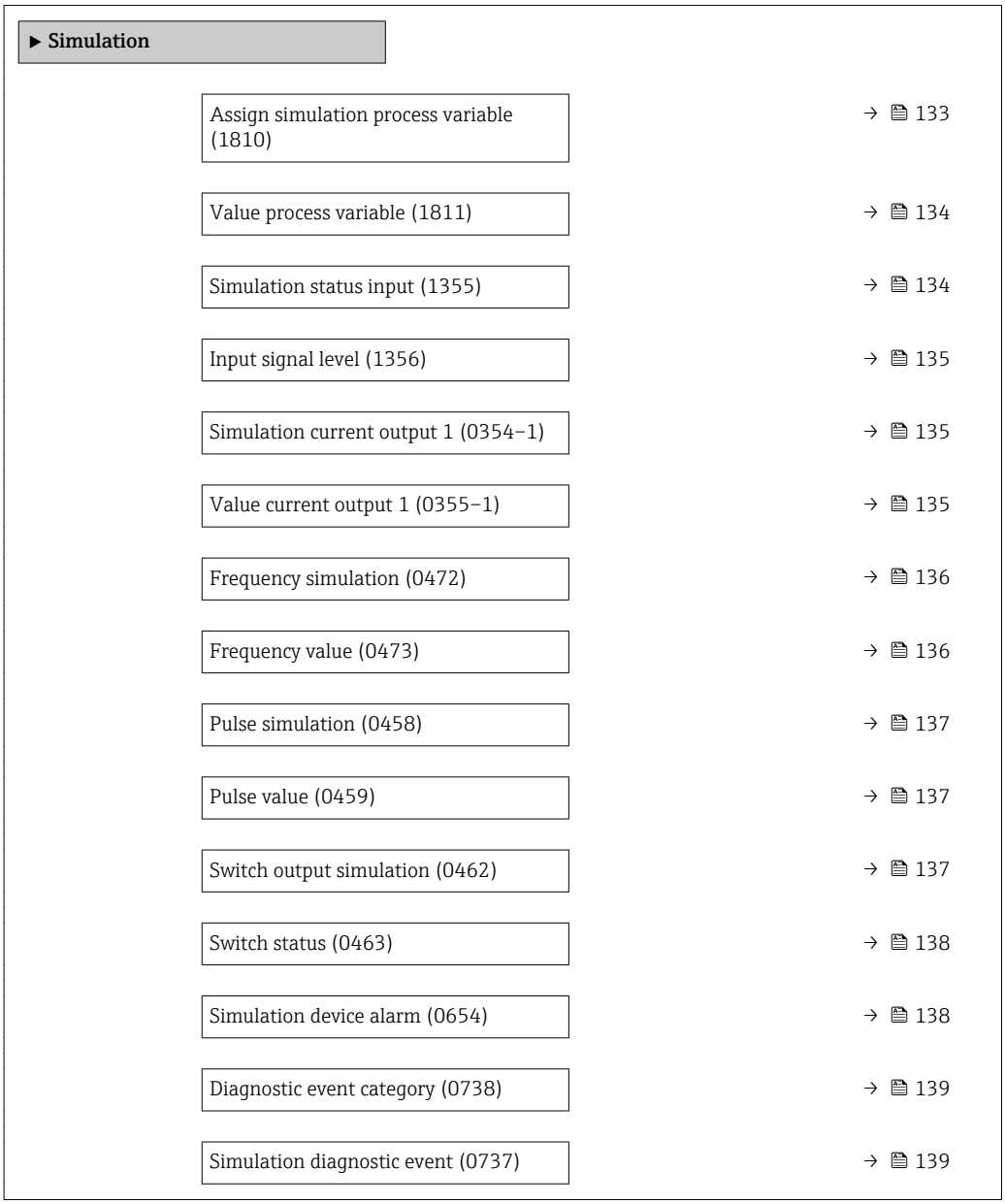
User interface −273.15 to 726.75 °C

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 49)

3.7.6 "Simulation" submenu

Navigation Expert → Diagnostics → Simulation



Assign simulation process variable

Navigation Expert → Diagnostics → Simulation → Assign proc.var. (1810)

Description Use this function to select a process variable for the simulation process that is activated. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.

Selection
- Off
- Volume flow
- Mass flow
- Temperature

Factory setting Off

Additional information *Description*

The simulation value of the process variable selected is defined in the **Value process variable** parameter (→ 134).

Value process variable

Navigation Expert → Diagnostics → Simulation → Value proc. var. (1811)

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 (→ 45).

Simulation status input

Navigation Expert → Diagnostics → Simulation → Sim. status inp. (1355)

Prerequisite For the following order code:
"Output; input", option Q "4-20mA HART, pul./freq./switch; status input"

Description Use this function to switch simulation of the status input on and off. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.

Selection
- Off
- On

Factory setting Off

Additional information *Description*

The desired simulation value is defined in the **Input signal level** parameter (→ 135).

Selection

- Off
  Simulation for the status input is switched off. The device is in normal measuring mode or another process variable is being simulated.
- On
  Simulation for the status input is active.

Input signal level

Navigation Expert → Diagnostics → Simulation → Signal level (1356)

Prerequisite In the **Simulation status input** parameter (→ 134), the **On** option is selected.

Description Use this function to select the signal level for the simulation of the status input. In this way, users can verify the correct configuration of the status input and the correct function of upstream feed-in units.

Selection
- High
- Low

Factory setting High

Simulation current output 1

Navigation Expert → Diagnostics → Simulation → Sim.curr.out. 1 (0354–1)

Description Use this function to switch simulation of the current output on and off. The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.

Selection
- Off
- On

Factory setting Off

Additional information *Description*

The desired simulation value is specified in the **Value current output 1** parameter (→ 135).

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 current output 1

Navigation Expert → Diagnostics → Simulation → Value curr.out 1 (0355–1)

Prerequisite In the **Simulation current output 1** 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

Frequency simulation

Navigation Expert → Diagnostics → Simulation → Frequency sim. (0472)

Prerequisite In the **Operating mode** parameter (→ 83), 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 **Frequency value** parameter (→ 136).

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.

Frequency value

Navigation Expert → Diagnostics → Simulation → Freq. value (0473)

Prerequisite In the **Frequency simulation** parameter (→ 136), 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

Factory setting 0.0 Hz

Pulse simulation

Navigation Expert → Diagnostics → Simulation → Pulse sim. (0458)

Prerequisite In the **Operating mode** parameter (→ 83), 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-counting value

Factory setting Off

Additional information

Description

The desired simulation value is defined in the **Pulse value** parameter (→ 137).

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 (→ 85).
- Down-counting value
  The pulses specified in the **Pulse value** parameter (→ 137) are output.

Pulse value

Navigation Expert → Diagnostics → Simulation → Pulse value (0459)

Prerequisite In the **Pulse simulation** parameter (→ 137), the **Down-counting value** 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 output simulation

Navigation Expert → Diagnostics → Simulation → Switch sim. (0462)

Prerequisite In the **Operating mode** parameter (→ 83), 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 (→ 138).

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 output simulation** parameter (→ 137), 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

Factory setting Open

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.

Simulation device 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.

Diagnostic event category

Navigation Expert → Diagnostics → Simulation → Event category (0738)

Description Use this function to select the category of the diagnostic events that are displayed for the simulation in the **Simulation diagnostic event** parameter (→ 139).

Selection
- Sensor
- Electronics
- Configuration
- Process

Factory setting Sensor

Simulation diagnostic event

Navigation Expert → Diagnostics → Simulation → Sim. diag. event (0737)

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

Selection
- Off
- Diagnostic event picklist (depends on the category selected)

Factory setting Off

Additional information *Description*

For the simulation, you can choose from the diagnostic events of the category selected in the **Diagnostic event category** parameter (→ 139).

4 Country-specific factory settings

4.1 SI units

Not valid for USA and Canada.

4.1.1 System units

Volume flow	l/h
Volume	l
Mass flow	kg/h
Mass	kg
Density	kg/m³
Temperature	°C
Length	mm

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

t-mass T

DN [mm]	[l/h]
50	35200
150	317000

4.1.3 Output current span

Current output 1	4 to 20 mA NAMUR

4.1.4 Pulse value

t-mass T

Nominal diameter [mm]	[l]
50	1
150	100

4.1.5 On value low flow cut off

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

t-mass T

Nominal diameter [mm]	[l/h]
50	352
150	3 170

4.2 US units

Only valid for USA and Canada.

4.2.1 System units

Volume flow	gal/min (us)
Volume	gal (us)
Mass flow	lb/min
Mass	lb
Density	lb/ft³
Temperature	°F
Length	in

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

t-mass T

DN [in]	[gal(us)/h]
2	9 300
6	84 000

4.2.3 Output current span

Current output 1	4 to 20 mA US

4.2.4 Pulse value

t-mass T

Nominal diameter [in]	[gal(us)]
2	5
6	50

4.2.5 On value low flow cut off

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

t-mass T

Nominal diameter [in]	[gal(us)/h]
2	93
6	840

5 Explanation of abbreviated units

5.1 SI units

Process variable	Units	Explanation
Density	g/cm³	Gram/volume unit
	kg/l, kg/dm³, kg/m³	Kilogram/volume unit
Length	mm, m	Millimeter, meter
Mass	g, kg, t	Gram, kilogram, metric ton
Mass flow	g/s, g/min, g/h, g/d	Gram/time unit
	kg/s, kg/min, kg/h, kg/d	Kilogram/time unit
	t/s, t/min, t/h, t/d	Metric ton/time unit
Temperature	°C, K	Celsius, Kelvin
Volume	cm³, dm³, m³	Cubic centimeter, cubic decimeter, cubic meter
	ml, l, hl, Ml Mega	Milliliter, liter, hectoliter, megaliter
Volume flow	cm³/s, cm³/min, cm³/h, cm³/d	Cubic centimeter/time unit
	dm³/s, dm³/min, dm³/h, dm³/d	Cubic decimeter/time unit
	m³/s, m³/min, m³/h, m³/d	Cubic meter/time unit
	ml/s, ml/min, ml/h, ml/d	Milliliter/time unit
	l/s, l/min, l/h, l/d	Liter/time unit
	hl/s, hl/min, hl/h, hl/d	Hectoliter/time unit
	Ml/s, Ml/min, Ml/h, Ml/d	Megaliter/time unit
Time	s, m, h, d, y	Second, minute, hour, day, year

5.2 US units

Process variable	Units	Explanation
Density	lb/ft³	Pound/cubic foot
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
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

Process variable	Units	Explanation
	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
Mass	LTon	Long ton
Mass flow	LTon/s, LTon/min, LTon/h, LTon/d	Long ton/time unit
Volume	gal (imp), Mgal (imp)	Gallon, mega gallon
	bbl (imp;oil)	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;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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