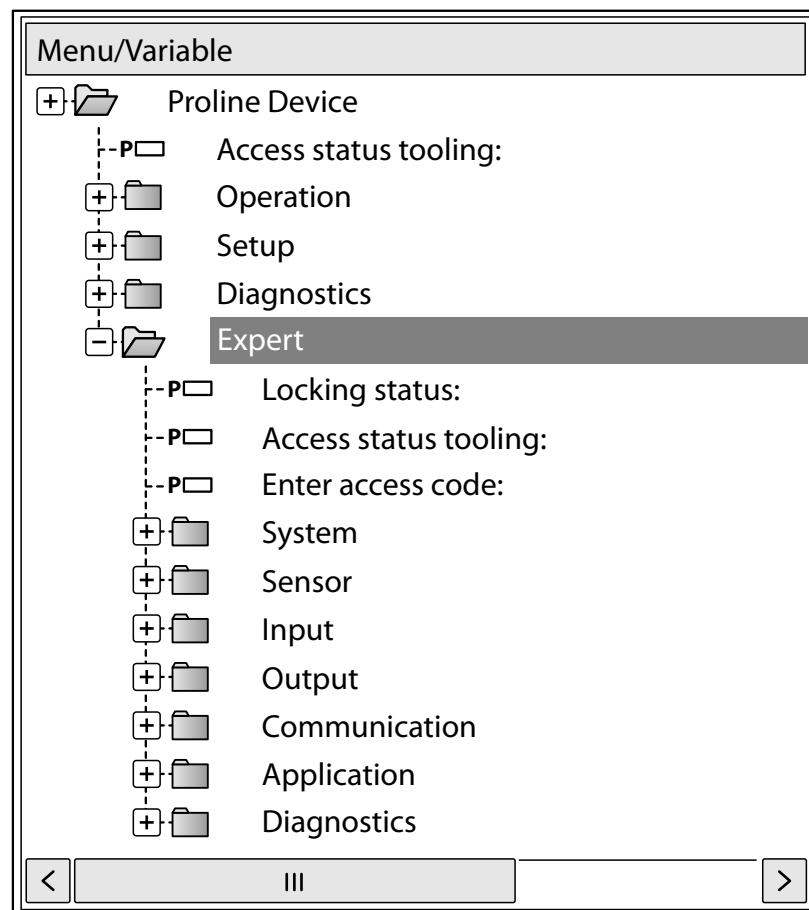


# Description of Device Parameters

## Proline Cubemass 100

## HART

Coriolis flowmeter





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# 1 Document information

## 1.1 Document function

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

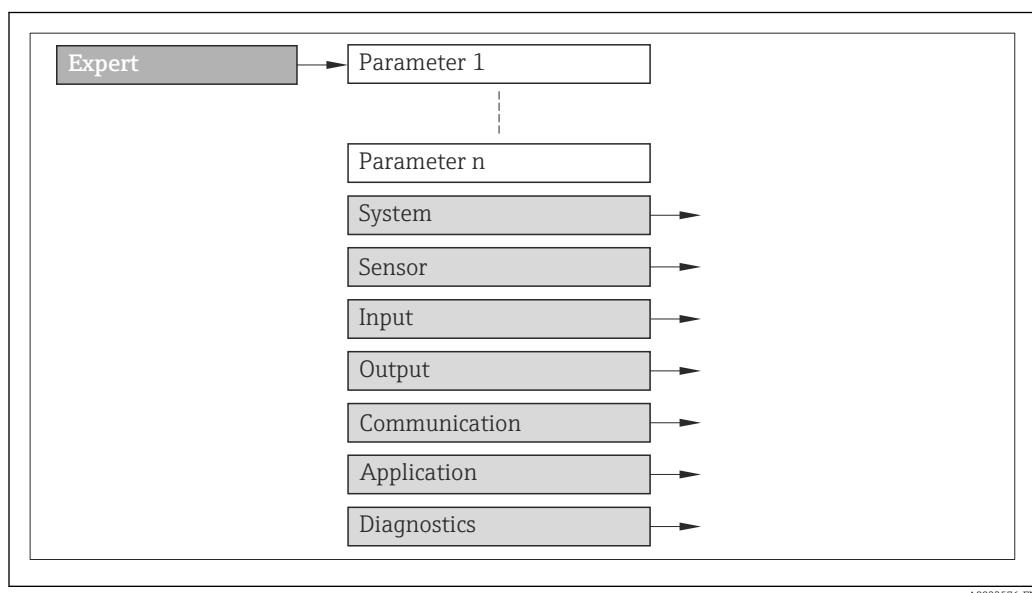
## 1.2 Target group

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

## 1.3 Using this document

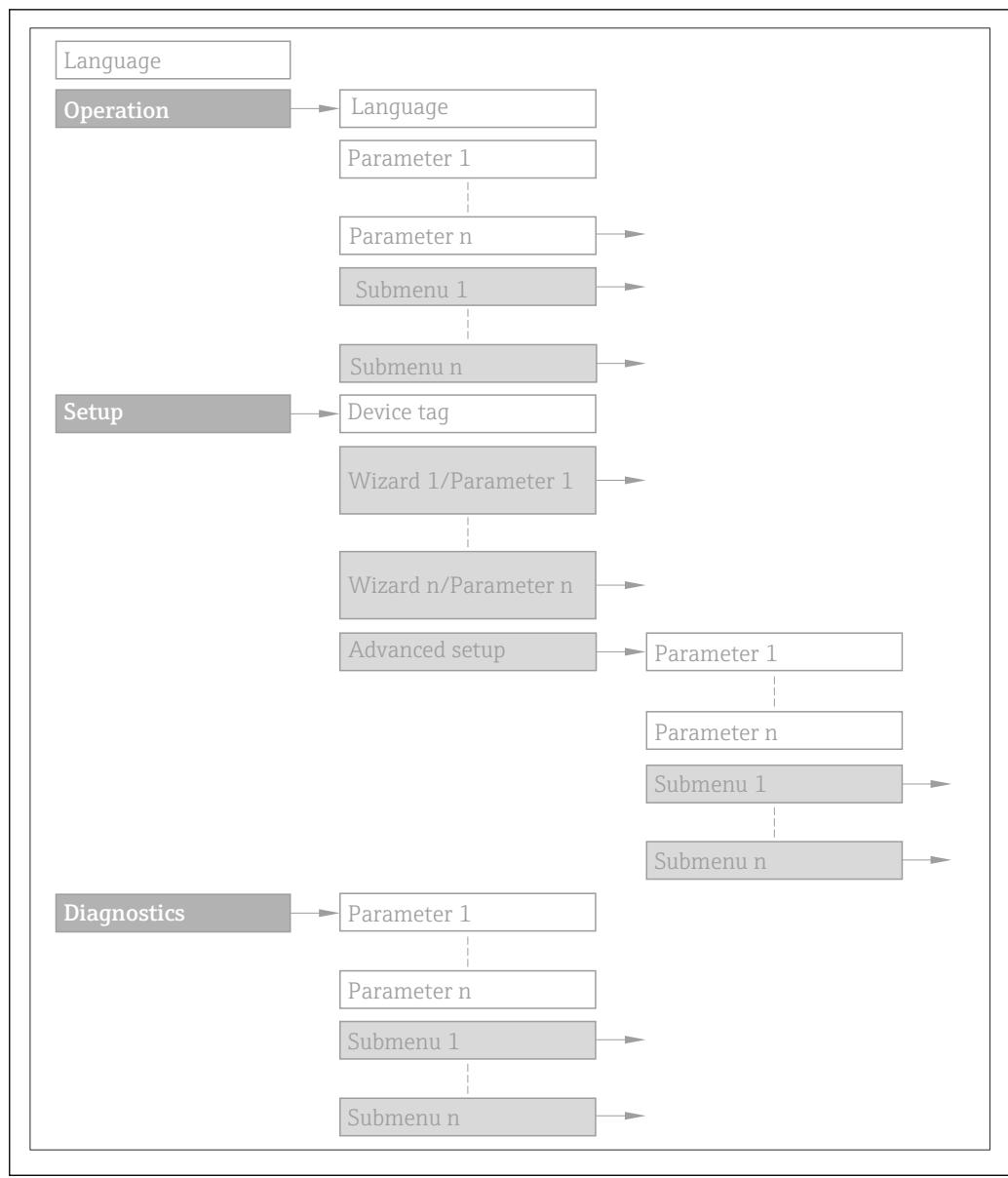
### 1.3.1 Information on the document structure

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



 1 *Sample graphic*

 For information on the arrangement of the parameters according to the structure of the **Operation** menu, **Setup** menu, **Diagnostics** menu (→  159), 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 = 
<b>Navigation</b>	 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.
<b>Prerequisite</b>	The parameter is only available under these specific conditions
<b>Description</b>	Description of the parameter function
<b>Options</b>	List of the individual options for the parameter <ul style="list-style-type: none"> <li>▪ Option 1</li> <li>▪ Option 2</li> </ul>
<b>User entry</b>	Input range for the parameter
<b>User interface</b>	Display value/data for the parameter
<b>Factory setting</b>	Default setting ex works
<b>Additional information</b>	Additional explanations (e.g. in examples): <ul style="list-style-type: none"> <li>▪ On individual options</li> <li>▪ On display values/data</li> <li>▪ On the input range</li> <li>▪ On the factory setting</li> <li>▪ On the parameter function</li> </ul>

## 1.4 Symbols used

### 1.4.1 Symbols for certain types of information

Symbol	Meaning
	<b>Tip</b> 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.

<b>Expert</b>	
Direct access	→ <a href="#">10</a>
Locking status	→ <a href="#">11</a>
Access status display	→ <a href="#">11</a>
Access status tooling	→ <a href="#">12</a>
Enter access code	→ <a href="#">13</a>
<b>System</b>	→ <a href="#">13</a>
▶ Display	→ <a href="#">13</a>
▶ Diagnostic handling	→ <a href="#">30</a>
▶ Administration	→ <a href="#">27</a>
<b>Sensor</b>	→ <a href="#">40</a>
▶ Measured values	→ <a href="#">40</a>
▶ System units	→ <a href="#">49</a>
▶ Process parameters	→ <a href="#">64</a>
▶ Measurement mode	→ <a href="#">72</a>
▶ External compensation	→ <a href="#">74</a>
▶ Calculated values	→ <a href="#">76</a>
▶ Sensor adjustment	→ <a href="#">79</a>
▶ Calibration	→ <a href="#">85</a>
▶ Supervision	→ <a href="#">86</a>

▶ Output	→  87
▶ Current output 1	→  87
▶ Pulse/frequency/switch output 1	→  100
▶ Communication	→  123
▶ HART input	→  123
▶ HART output	→  128
▶ Web server	→  144
▶ Diagnostic configuration	→  147
▶ Application	→  153
Reset all totalizers	→  154
▶ Totalizer 1 to 3	→  154
▶ Concentration	→  159
▶ Diagnostics	→  159
Actual diagnostics	→  160
Previous diagnostics	→  161
Operating time from restart	→  161
Operating time	→  162
▶ Diagnostic list	→  162
▶ Event logbook	→  166
▶ Device information	→  168
▶ Min/max values	→  172
▶ Heartbeat	→  178
▶ Simulation	→  178

### 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.

⚡ Expert	
Direct access	→ ↗ 10
Locking status	→ ↗ 11
Access status display	→ ↗ 11
Access status tooling	→ ↗ 12
Enter access code	→ ↗ 13
▶ System	→ ↗ 13
▶ Sensor	→ ↗ 40
▶ Output	→ ↗ 87
▶ Communication	→ ↗ 123
▶ Application	→ ↗ 153
▶ Diagnostics	→ ↗ 159

#### Direct access



##### Navigation

⌚ Expert → Direct access

##### Prerequisite

There is a local display with operating elements.

##### 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

**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

**Prerequisite**

A local display is provided.

**Description**

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

User interface	<ul style="list-style-type: none"><li>▪ Operator</li><li>▪ Maintenance</li></ul>
Factory setting	Operator
Additional information	<p><i>Description</i></p> <p>If the -symbol appears in front of a parameter, it cannot be modified via the local display with the current access authorization.</p> <p> The access authorization can be modified via the <b>Enter access code</b> parameter.</p> <p> For information on the <b>Enter access code</b> parameter, see the "Disabling write protection via access code" section of the Operating Instructions for the device</p> <p> If additional write protection is active, this restricts the current access authorization even further. The write protection status can be viewed via the <b>Locking status</b> parameter (→  11).</p>
	<p><i>User interface</i></p> <p> 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.</p>

---

## Access status tooling

---

Navigation	  Expert → Access stat.tool
Description	Use this function to view the access authorization to the parameters via the operating tool.
User interface	<ul style="list-style-type: none"><li>▪ Operator</li><li>▪ Maintenance</li></ul>
Factory setting	Maintenance
Additional information	<p><i>Description</i></p> <p> The access authorization can be modified via the <b>Enter access code</b> parameter.</p> <p> If additional write protection is active, this restricts the current access authorization even further. The write protection status can be viewed via the <b>Locking status</b> parameter (→  11).</p>
	<p><i>Display</i></p> <p> 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.</p>

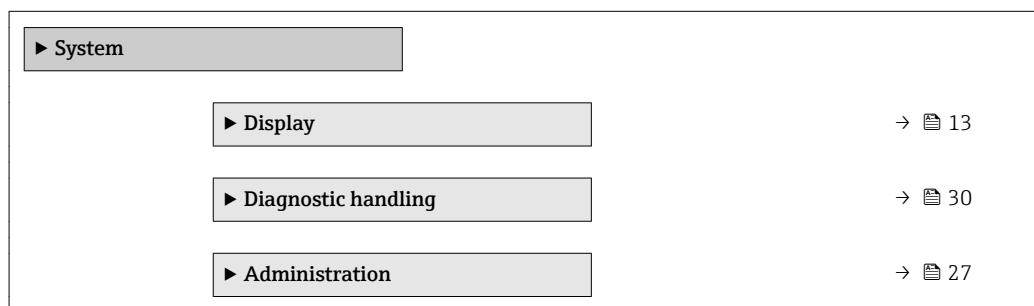
**Enter access code****Navigation**
 Expert → Ent. access code
**Description**

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

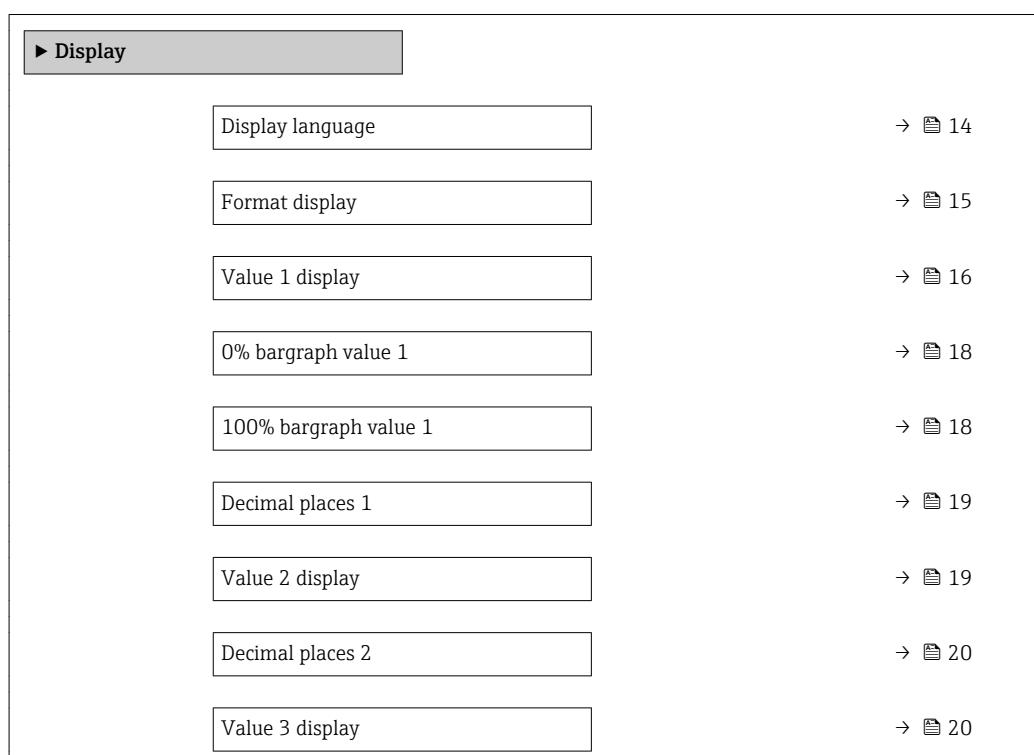
**User entry**

0 to 9 999

### 3.1 "System" submenu

*Navigation*
 Expert → System


#### 3.1.1 "Display" submenu

*Navigation*
 Expert → System → Display


0% bargraph value 3	→  21
100% bargraph value 3	→  21
Decimal places 3	→  22
Value 4 display	→  22
Decimal places 4	→  23
Display interval	→  23
Display damping	→  23
Header	→  24
Header text	→  24
Separator	→  25
Contrast display	→  25
Backlight	→  26
Access status display	→  26

## Display language

### Navigation

Expert → System → Display → Display language

### 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) \*

\* Visibility depends on order options or device settings

- 한국어 (Korean) \*
- Bahasa Indonesia \*
- tiếng Việt (Vietnamese) \*
- čeština (Czech) \*

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

## Format display

**Navigation**  Expert → System → Display → Format display

**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 (→ 16)...**Value 4 display** parameter (→ 22) parameters are used to specify which measured values are shown on the display and in which order.
- If more measured values are specified than the display mode selected permits, then the values alternate on the device display. The display time until the next change is configured using the **Display interval** parameter (→ 23) parameter.

Possible measured values shown on the local display:

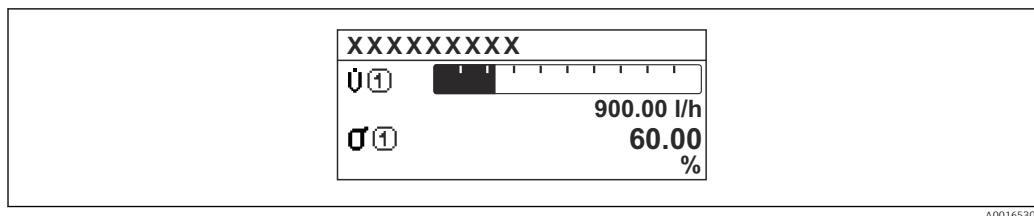
"1 value, max. size" option



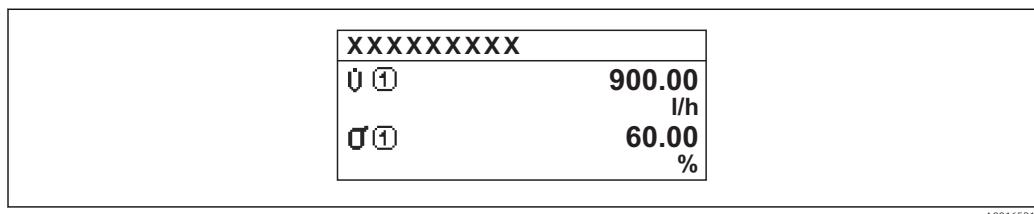
A0016529

\* Visibility depends on order options or device settings

"1 bargraph + 1 value" option

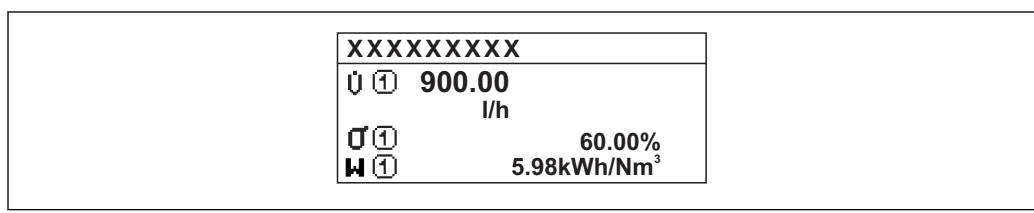


"2 values" option

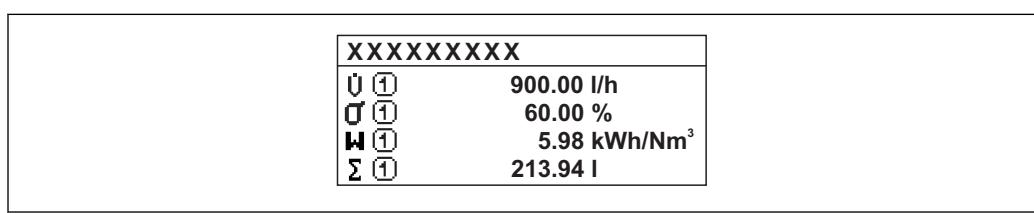


3

"1 value large + 2 values" option



"4 values" option



## Value 1 display



### Navigation

Expert → System → Display → Value 1 display

### 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

- Mass flow
- Volume flow
- Corrected volume flow

- Target mass flow \*
- Carrier mass flow \*
- Density
- Reference density
- Concentration \*
- Temperature
- Carrier pipe temperature \*
- Electronic temperature
- Oscillation frequency 0
- Frequency fluctuation 0 \*
- Oscillation amplitude 0 \*
- Frequency fluctuation 0
- Oscillation damping 0
- Tube damping fluctuation 0
- Signal asymmetry
- Exciter current 0
- None
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Current output 1

**Factory setting** Mass flow

**Additional information** *Description*

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

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

*Selection*

 The unit of the displayed measured value is taken from the **System units** submenu (→ 49).

- Oscillation frequency

Displays the current oscillation frequency of the measuring tubes. This frequency depends on the density of the medium.

- Oscillation amplitude

Displays the relative oscillation amplitude of the measuring tubes in relation to the preset value. This value is 100 % under optimum conditions. The value can decrease in the event of low 4 to 20 mA loop currents and/or difficult media (two-phase, high viscosity or high gas velocity).

- Oscillation damping

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

- Signal asymmetry

Displays the relative difference between the oscillation amplitude at the inlet and outlet of the sensor. The measured value is the result of production tolerances of the sensor coils and should remain constant over the life time of a sensor.

\* Visibility depends on order options or device settings

## 0% bargraph value 1



### Navigation

Expert → System → Display → 0% bargraph 1

### Prerequisite

A local display is provided.

### Description

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

### User entry

Signed floating-point number

### Factory setting

Country-specific:

- 0 kg/h
- 0 lb/min

### 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 (→ 49).

## 100% bargraph value 1



### Navigation

Expert → System → Display → 100% bargraph 1

### 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 → 186

### 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 (→ 49).

---

**Decimal places 1**

<b>Navigation</b>	Expert → System → Display → Decimal places 1
<b>Prerequisite</b>	A measured value is specified in the <b>Value 1 display</b> parameter (→ 16).
<b>Description</b>	Use this function to select the number of decimal places for measured value 1.
<b>Selection</b>	<ul style="list-style-type: none"><li>■ X</li><li>■ X.X</li><li>■ X.XX</li><li>■ X.XXX</li><li>■ X.XXXX</li></ul>
<b>Factory setting</b>	X.XX
<b>Additional information</b>	<i>Description</i> 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**

<b>Navigation</b>	Expert → System → Display → Value 2 display
<b>Prerequisite</b>	A local display is provided.
<b>Description</b>	Use this function to select one of the measured values to be shown on the local display.
<b>Selection</b>	Picklist, see <b>Value 1 display</b> parameter (→ 16)
<b>Factory setting</b>	None
<b>Additional information</b>	<i>Description</i> 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 <b>Format display</b> parameter (→ 15) is used to specify how many measured values are displayed simultaneously and how. <i>Selection</i> The unit of the displayed measured value is taken from the <b>System units</b> submenu (→ 49).

## Decimal places 2



**Navigation** Expert → System → Display → Decimal places 2

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

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

**Selection**

- x
- x.x
- x.xx
- x.xxx
- xxxxx

**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

**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 (→ 16)

**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 (→ 49).

## 0% bargraph value 3



<b>Navigation</b>	Expert → System → Display → 0% bargraph 3
<b>Prerequisite</b>	A selection has been made in the <b>Value 3 display</b> parameter (→ 20).
<b>Description</b>	Use this function to enter the 0% bar graph value to be shown on the display for the measured value 3.
<b>User entry</b>	Signed floating-point number
<b>Factory setting</b>	Country-specific: ■ 0 kg/h ■ 0 lb/min
<b>Additional information</b>	<i>Description</i> The <b>Format display</b> parameter (→ 15) is used to specify that the measured value is to be displayed as a bar graph.  <i>User entry</i> The unit of the displayed measured value is taken from the <b>System units</b> submenu (→ 49).

## 100% bargraph value 3



<b>Navigation</b>	Expert → System → Display → 100% bargraph 3
<b>Prerequisite</b>	An option has been selected in the <b>Value 3 display</b> parameter (→ 20).
<b>Description</b>	Use this function to enter the 100% bar graph value to be shown on the display for the measured value 3.
<b>User entry</b>	Signed floating-point number
<b>Factory setting</b>	0
<b>Additional information</b>	<i>Description</i> The <b>Format display</b> parameter (→ 15) is used to specify that the measured value is to be displayed as a bar graph.  <i>User entry</i> The unit of the displayed measured value is taken from the <b>System units</b> submenu (→ 49).

## Decimal places 3



### Navigation

Expert → System → Display → Decimal places 3

### Prerequisite

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

### Description

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

### Selection

- X
- X.X
- X.XX
- X.XXX
- X.XXXX

### Factory setting

X.XX

### Additional information

#### Description

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

## Value 4 display



### Navigation

Expert → System → Display → Value 4 display

### 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 (→ [16](#))

### 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 (→ [49](#)).

---

**Decimal places 4**

---

**Navigation**

Expert → System → Display → Decimal places 4

**Prerequisite**

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

**Description**

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

**Selection**

- X
- X.X
- X.XX
- X.XXX
- X.XXXX

**Factory setting**

X.XX

**Additional information***Description*

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

---

**Display interval**

---

**Navigation**

Expert → System → Display → Display interval

**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 (→ [16](#))...**Value 4 display** parameter (→ [22](#)) are used to specify which measured values are shown on the display.  
■ The display format of the displayed measured values is specified using the **Format display** parameter (→ [15](#)).

---

**Display damping**

---

**Navigation**

Expert → System → Display → Display damping

**Prerequisite**

A local display is provided.

<b>Description</b>	Use this function to enter the reaction time of the local display to fluctuations in the measured value caused by process conditions.
<b>User entry</b>	0.0 to 999.9 s
<b>Factory setting</b>	0.0 s
<b>Additional information</b>	<p><i>User entry</i></p> <p>A time constant is entered:</p> <ul style="list-style-type: none"> <li>▪ If a low time constant is entered, the display reacts particularly quickly to fluctuating measured variables.</li> <li>▪ On the other hand, the display reacts more slowly if a high time constant is entered.</li> </ul>

---

## Header

**Navigation**

Expert → System → Display → Header

**Prerequisite**

A local display is provided.

**Description**

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

**Selection**

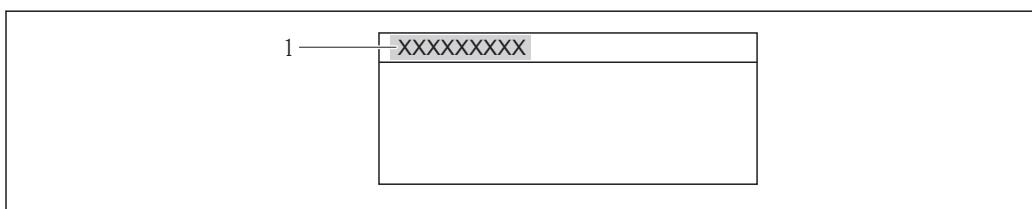
- Device tag
- Free text

**Factory setting**

Device tag

**Additional information***Description*

The header text only appears during normal operation.



A0013375

1 Position of the header text on the display

*Selection*

- Device tag  
Is defined in the **Device tag** parameter (→ 168).
- Free text  
Is defined in the **Header text** parameter (→ 24).

---

## Header text

**Navigation**

Expert → System → Display → Header text

**Prerequisite**

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

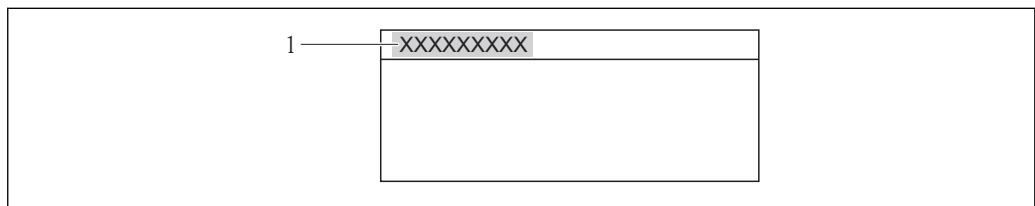
**Description** Use this function to enter a customer-specific text for the header of the local display.

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

**Factory setting** -----

**Additional information** *Description*

The header text only appears during normal operation.



A0013375

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

**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

**Prerequisite** A local display is provided.

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

**User entry** 20 to 80 %

**Factory setting** Depends on the display

**Additional information**

*Set the contrast via the push-buttons:*

- Brighter: Press and hold down the keys simultaneously.
- Darker: Press and hold down the keys simultaneously.

---

**Backlight****Navigation**

Expert → System → Display → Backlight

**Prerequisite**

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

**Description**

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

**Selection**

- Disable
- Enable

**Factory setting**

Enable

---

**Access status display****Navigation**

Expert → System → Display → Access stat.disp

**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.

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

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

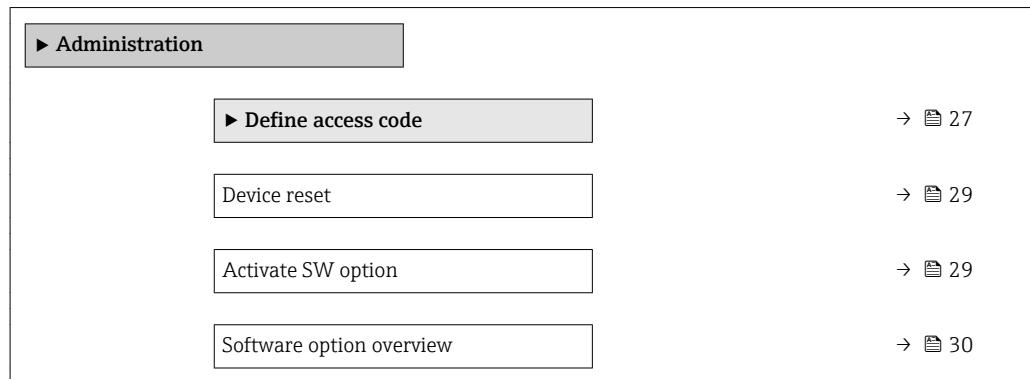
**User interface**

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

### 3.1.2 "Administration" submenu

*Navigation*

Expert → System → Administration

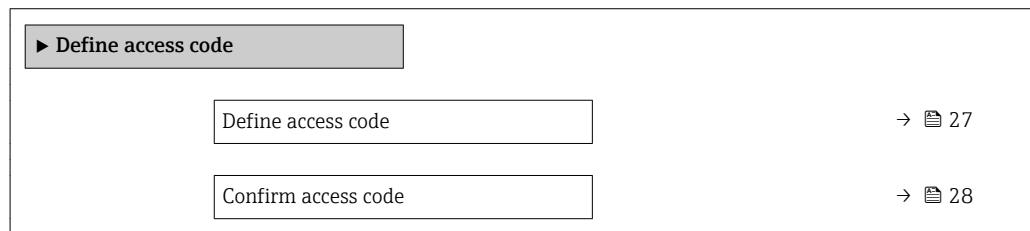


#### "Define access code" wizard

**i** The **Define access code** wizard is only available if operating using the local display. If you are operating using the operating tool, the **Define access code** parameter (→ 28) is directly in the **Administration** submenu. The **Confirm access code** parameter is not available if you are operating using 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.

**i** 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.

**i** If you lose the access code, please contact your Endress+Hauser Sales Center.

*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**

<b>Navigation</b>	Expert → System → Administration → Def. access code → Confirm code
<b>Description</b>	Enter the defined release code a second time to confirm the release code.
<b>User entry</b>	0 to 9 999
<b>Factory setting</b>	0

---

**Additional parameters in the "Administration" submenu**

---

**Define access code**

<b>Navigation</b>	Expert → System → Administration → Def. access code
<b>Description</b>	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.
<b>User entry</b>	0 to 9 999
<b>Factory setting</b>	0
<b>Additional information</b>	<i>Description</i> 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 <b>Enter access code</b> parameter. If you lose the access code, please contact your Endress+Hauser Sales Center.

*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

**Description**

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

**Selection**

- Cancel
- To delivery settings
- Restart device

**Factory setting**

Cancel

**Additional information***"Cancel" option*

No action is executed and the user exits the parameter.

*"To delivery settings" option*

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

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

*"Restart device" option*

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

**Activate SW option****Navigation**

Expert → System → Administration → Activate SW opt.

**Description**

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

**User entry**

Max. 10-digit string consisting of numbers.

**Factory setting**

0

**Additional information***User entry*

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

**NOTICE!** This activation code varies depending on the measuring device and the software option. If an incorrect or invalid code is entered, this can result in the loss of software options that are already been activated. After commissioning the measuring device: in this

parameter only enter activation codes which Endress+Hauser has provided (e.g. when a new software option was ordered). If an incorrect or invalid activation code is entered, enter the activation code from the parameter protocol again and contact your Endress+Hauser sales organization, quoting the serial number of your device.

*Example for a software option*

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

---

## Software option overview

---

### Navigation

Expert → System → Administration → SW option overv.

### Description

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

### User interface

- Heartbeat Verification
- Heartbeat Monitoring
- Concentration

### Additional information

#### Description

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

*"Heartbeat Verification" option and "Heartbeat Monitoring" option*

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

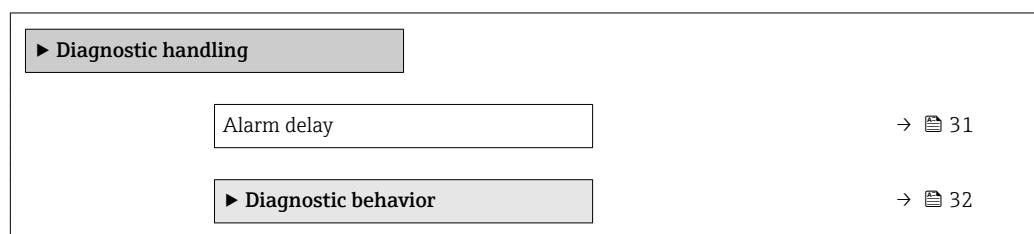
*"Concentration" option*

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

### 3.1.3 "Diagnostic handling" submenu

#### Navigation

Expert → System → Diagn. handling



---

**Alarm delay****Navigation**

Expert → System → Diagn. handling → Alarm delay

**Description**

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



The diagnostic message is reset without a time delay.

**User entry**

0 to 60 s

**Factory setting**

0 s

**Additional information***Description*

This setting affects the following diagnostic messages:

- 046 Sensor limit exceeded
- 140 Sensor signal
- 144 Measuring error too high
- 190 Special event 1
- 191 Special event 5
- 192 Special event 9
- 830 Sensor temperature too high
- 831 Sensor temperature too low
- 832 Electronic temperature too high
- 833 Electronic temperature too low
- 834 Process temperature too high
- 835 Process temperature too low
- 843 Process limit
- 862 Partly filled pipe
- 910 Tubes not oscillating
- 912 Medium inhomogeneous
- 913 Medium unsuitable
- 944 Monitoring failed
- 990 Special event 4
- 991 Special event 8
- 992 Special event 12

### "Diagnostic behavior" submenu

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

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

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

- **Off** option

The device continues to measure. The diagnostic event is ignored; it is neither entered into the Event logbook, nor is a diagnostic message generated.

- **Alarm** option

The device continues to measure. The signal outputs assume the specified alarm condition. A diagnostic message is generated.

- **Warning** option

The device continues to measure. A diagnostic message is generated.

- **Logbook entry only** option

The device continues to measure. The diagnostic message is entered in the **Event logbook** submenu (→ 166) (**Event list** submenu (→ 167)) only and is not displayed in alternation with the measured value display.

*Navigation*

  Expert → System → Diagn. handling → Diagn. behavior

 Diagnostic behavior	
<a href="#">Assign behavior of diagnostic no. 441</a>	→ 33
<a href="#">Assign behavior of diagnostic no. 442</a>	→ 33
<a href="#">Assign behavior of diagnostic no. 443</a>	→ 34
<a href="#">Assign behavior of diagnostic no. 140</a>	→ 34
<a href="#">Assign behavior of diagnostic no. 046</a>	→ 34
<a href="#">Assign behavior of diagnostic no. 144</a>	→ 35
<a href="#">Assign behavior of diagnostic no. 832</a>	→ 35
<a href="#">Assign behavior of diagnostic no. 833</a>	→ 35
<a href="#">Assign behavior of diagnostic no. 834</a>	→ 36
<a href="#">Assign behavior of diagnostic no. 835</a>	→ 36
<a href="#">Assign behavior of diagnostic no. 912</a>	→ 36
<a href="#">Assign behavior of diagnostic no. 913</a>	→ 37
<a href="#">Assign behavior of diagnostic no. 944</a>	→ 37
<a href="#">Assign behavior of diagnostic no. 948</a>	→ 38

Assign behavior of diagnostic no. 192	→  38
Assign behavior of diagnostic no. 274	→  38
Assign behavior of diagnostic no. 392	→  39
Assign behavior of diagnostic no. 592	→  39
Assign behavior of diagnostic no. 992	→  39

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

**Navigation**

Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 441

**Description**

Use this function to change 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 → 32

## Assign behavior of diagnostic no. 442 (Frequency output)

**Navigation**

Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 442

**Prerequisite**

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

**Description**

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

**Selection**

- Off
- Alarm
- Warning
- Logbook entry only

**Factory setting**

Warning

**Additional information**

For a detailed description of the options available, see → 32

---

**Assign behavior of diagnostic no. 443 (Pulse output)**

---



**Navigation** Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 443

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

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

- Selection**
- Off
  - Alarm
  - Warning
  - Logbook entry only

**Factory setting** Warning

**Additional information** For a detailed description of the options available, see → 32

---

**Assign behavior of diagnostic no. 140 (Sensor signal)**

---



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

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

- Selection**
- Off
  - Alarm
  - Warning
  - Logbook entry only

**Factory setting** Warning

**Additional information** For a detailed description of the options available, see → 32

---

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

---



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

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

- Selection**
- Off
  - Alarm
  - Warning
  - Logbook entry only

**Factory setting** Warning

**Additional information**For a detailed description of the options available, see → [32](#)**Assign behavior of diagnostic no. 144 (Measuring error too high)****Navigation**

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

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

- Off
- Alarm
- Warning
- Logbook entry only

**Factory setting**

Alarm

**Additional information**For a detailed description of the options available, see → [32](#)**Assign behavior of diagnostic no. 832 (Electronic temperature too high)****Navigation**

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

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

- Off
- Alarm
- Warning
- Logbook entry only

**Factory setting**

Warning

**Additional information**For a detailed description of the options available, see → [32](#)**Assign behavior of diagnostic no. 833 (Electronic temperature too low)****Navigation**

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

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

- Off
- Alarm
- Warning
- Logbook entry only

**Factory setting** Warning

**Additional information**  For a detailed description of the options available, see → [32](#)

---

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



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

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

**Selection**

- Off
- Alarm
- Warning
- Logbook entry only

**Factory setting** Warning

**Additional information**  For a detailed description of the options available, see → [32](#)

---

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



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

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

**Selection**

- Off
- Alarm
- Warning
- Logbook entry only

**Factory setting** Warning

**Additional information**  For a detailed description of the options available, see → [32](#)

---

### Assign behavior of diagnostic no. 912 (Medium inhomogeneous)



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

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

<b>Selection</b>	<ul style="list-style-type: none"><li>■ Off</li><li>■ Alarm</li><li>■ Warning</li><li>■ Logbook entry only</li></ul>
<b>Factory setting</b>	Warning
<b>Additional information</b>	 For a detailed description of the options available, see → <a href="#">32</a>

---

#### Assign behavior of diagnostic no. 913 (Medium unsuitable)



<b>Navigation</b>	 Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 913
<b>Description</b>	Use this function to change the diagnostic behavior of the diagnostic message <b>913 Medium unsuitable</b> .
<b>Selection</b>	<ul style="list-style-type: none"><li>■ Off</li><li>■ Alarm</li><li>■ Warning</li><li>■ Logbook entry only</li></ul>
<b>Factory setting</b>	Warning
<b>Additional information</b>	 For a detailed description of the options available, see → <a href="#">32</a>

---

#### Assign behavior of diagnostic no. 944 (Monitoring failed)



<b>Navigation</b>	 Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 944
<b>Description</b>	Use this function to change the diagnostic behavior of the diagnostic message <b>944 Monitoring failed</b> .
<b>Selection</b>	<ul style="list-style-type: none"><li>■ Off</li><li>■ Alarm</li><li>■ Warning</li><li>■ Logbook entry only</li></ul>
<b>Factory setting</b>	Warning
<b>Additional information</b>	 For a detailed description of the options available, see → <a href="#">32</a>

---

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

---



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

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

**Selection**

- Off
- Alarm
- Warning
- Logbook entry only

**Factory setting** Warning

**Additional information** For a detailed description of the options available, see → 32

---

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

---



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

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

**Selection**

- Off
- Alarm
- Warning
- Logbook entry only

**Factory setting** Warning

**Additional information** For a detailed description of the options available, see → 32

---

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

---



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

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

**Selection**

- Off
- Alarm
- Warning
- Logbook entry only

**Factory setting** Warning

**Additional information** For a detailed description of the options available, see → 32

---

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

---



<b>Navigation</b>	Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 392
<b>Description</b>	Use this function to change the diagnostic behavior of the diagnostic message <b>392 Special event 10</b> .
<b>Selection</b>	<ul style="list-style-type: none"><li>▪ Off</li><li>▪ Alarm</li><li>▪ Warning</li><li>▪ Logbook entry only</li></ul>
<b>Factory setting</b>	Warning
<b>Additional information</b>	For a detailed description of the options available, see → <a href="#">32</a>

---

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

---



<b>Navigation</b>	Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 592
<b>Description</b>	Use this function to change the diagnostic behavior of the diagnostic message <b>592 Special event 11</b> .
<b>Selection</b>	<ul style="list-style-type: none"><li>▪ Off</li><li>▪ Alarm</li><li>▪ Warning</li><li>▪ Logbook entry only</li></ul>
<b>Factory setting</b>	Warning
<b>Additional information</b>	For a detailed description of the options available, see → <a href="#">32</a>

---

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

---



<b>Navigation</b>	Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 992
<b>Description</b>	Use this function to change the diagnostic behavior of the diagnostic message <b>992 Special event 12</b> .
<b>Selection</b>	<ul style="list-style-type: none"><li>▪ Off</li><li>▪ Alarm</li><li>▪ Warning</li><li>▪ Logbook entry only</li></ul>
<b>Factory setting</b>	Warning

**Additional information**For a detailed description of the options available, see → [32](#)

## 3.2 "Sensor" submenu

*Navigation*

Expert → Sensor

▶ Sensor	
▶ Measured values	→ <a href="#">40</a>
▶ System units	→ <a href="#">49</a>
▶ Process parameters	→ <a href="#">64</a>
▶ Measurement mode	→ <a href="#">72</a>
▶ External compensation	→ <a href="#">74</a>
▶ Calculated values	→ <a href="#">76</a>
▶ Sensor adjustment	→ <a href="#">79</a>
▶ Calibration	→ <a href="#">85</a>
▶ Supervision	→ <a href="#">86</a>

### 3.2.1 "Measured values" submenu

*Navigation*

Expert → Sensor → Measured val.

▶ Measured values	
▶ Process variables	→ <a href="#">41</a>
▶ Totalizer	→ <a href="#">45</a>
▶ Output values	→ <a href="#">46</a>

**"Process variables" submenu***Navigation*

Expert → Sensor → Measured val. → Process variab.

<b>► Process variables</b>	
Mass flow	→  41
Volume flow	→  41
Corrected volume flow	→  42
Density	→  42
Reference density	→  42
Temperature	→  43
Pressure value	→  43
Concentration	→  43
Target mass flow	→  44
Carrier mass flow	→  44

**Mass flow****Navigation**

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

**Description**

Use this function to view the mass flow currently measured.

**User interface**

Signed floating-point number

**Additional information**

*Dependency*

The unit is taken from the **Mass flow unit** parameter (→ 49).

**Volume flow****Navigation**

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

**Description**

Displays the volume flow currently calculated.

**User interface**

Signed floating-point number

**Additional information***Dependency*

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

---

**Corrected volume flow**

---

**Navigation**

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

**Description**

Displays the corrected volume flow currently measured.

**User interface**

Signed floating-point number

**Additional information***Dependency*

The unit is taken from the **Corrected volume flow unit** parameter (→ 53)

---

**Density**

---

**Navigation**

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

**Description**

Displays the density currently measured.

**User interface**

Signed floating-point number

**Additional information***Dependency*

The unit is taken from the **Density unit** parameter (→ 55)

---

**Reference density**

---

**Navigation**

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

**Description**

Displays the reference density currently calculated.

**User interface**

Signed floating-point number

**Additional information***Dependency*

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

---

## Temperature

---

<b>Navigation</b>	  Expert → Sensor → Measured val. → Process variab. → Temperature
<b>Description</b>	Displays the medium temperature currently measured.
<b>User interface</b>	Signed floating-point number
<b>Additional information</b>	<i>Dependency</i>  The unit is taken from the <b>Temperature unit</b> parameter (→  56)

---

## Pressure value

---

<b>Navigation</b>	  Expert → Sensor → Measured val. → Process variab. → Pressure value
<b>Description</b>	Displays the fixed or external pressure value.
<b>User interface</b>	Signed floating-point number
<b>Additional information</b>	<i>Dependency</i>  The unit is taken from the <b>Pressure unit</b> parameter (→  57)

---

## Concentration

---

<b>Navigation</b>	  Expert → Sensor → Measured val. → Process variab. → Concentration
<b>Prerequisite</b>	For the following order code: "Application package", option ED "Concentration"
	 The software options currently enabled are displayed in the <b>Software option overview</b> parameter (→  30).
<b>Description</b>	Displays the concentration currently calculated.
<b>User interface</b>	Signed floating-point number
<b>Additional information</b>	<i>Dependency</i>  The unit is taken from the <b>Concentration unit</b> parameter.

---

## Target mass flow

---

<b>Navigation</b>	  Expert → Sensor → Measured val. → Process variab. → Target mass flow
<b>Prerequisite</b>	With the following conditions: <ul style="list-style-type: none"><li>▪ Order code for "Application package", option ED "Concentration"</li><li>▪ The <b>WT-%</b> option or the <b>User conc.</b> option is selected in the <b>Concentration unit</b> parameter.  The software options currently enabled are displayed in the <b>Software option overview</b> parameter (→  30).</li></ul>
<b>Description</b>	Displays the mass flow currently measured for the target medium.
<b>User interface</b>	Signed floating-point number
<b>Additional information</b>	<i>Dependency</i>  The unit is taken from the <b>Mass flow unit</b> parameter (→  49)

---

## Carrier mass flow

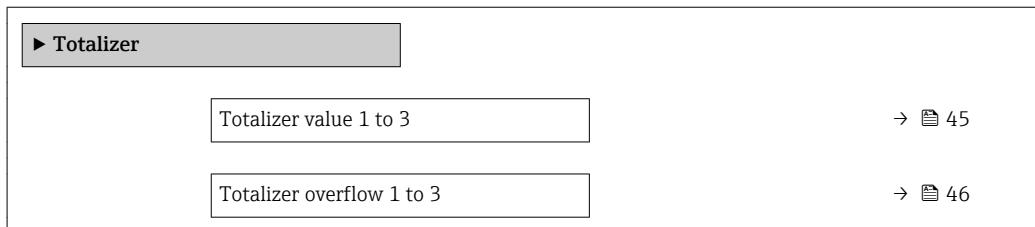
---

<b>Navigation</b>	  Expert → Sensor → Measured val. → Process variab. → Carrier mass fl.
<b>Prerequisite</b>	With the following conditions: <ul style="list-style-type: none"><li>▪ Order code for "Application package", option ED "Concentration"</li><li>▪ The <b>WT-%</b> option or the <b>User conc.</b> option is selected in the <b>Concentration unit</b> parameter.  The software options currently enabled are displayed in the <b>Software option overview</b> parameter (→  30).</li></ul>
<b>Description</b>	Displays the mass flow currently measured for the carrier medium.
<b>User interface</b>	Signed floating-point number
<b>Additional information</b>	<i>Dependency</i>  The unit is taken from the <b>Mass flow unit</b> parameter (→  49)

## Totalizer

### Navigation

Expert → Sensor → Measured val. → Totalizer



### Totalizer value 1 to 3



#### Navigation

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

#### Prerequisite

One of the following options is selected in the **Assign process variable** parameter (→ 154) of the **Totalizer 1 to 3** submenu:

- Volume flow
- Mass flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*

#### Description

Displays the current totalizer reading.

#### User interface

Signed floating-point number

#### Additional information

##### Description

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

In the event of an error, the totalizer adopts the mode defined in the **Failure mode** parameter (→ 158).

##### User interface

The value of the process variable totalized since measuring began can be positive or negative. This depends on the settings in the **Totalizer operation mode** parameter (→ 156).

The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→ 155).

##### Example

Calculation of the current totalizer reading when the value exceeds the 7-digit display range:

- Value in the **Totalizer value 1** parameter:  $196\,845.7 \text{ m}^3$
- Value in the **Totalizer overflow 1** parameter:  $1 \cdot 10^6$  (1 overflow) =  $1\,000\,000 \text{ [m}^3]$
- Current totalizer reading:  $1\,196\,845.7 \text{ m}^3$

\* Visibility depends on order options or device settings

**Totalizer overflow 1 to 3****Navigation**

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

**Prerequisite**

One of the following options is selected in the **Assign process variable** parameter (→ [154](#)) of the **Totalizer 1 to 3** submenu:

- Volume flow
- Mass flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*

**Description**

Displays the current totalizer overflow.

**User interface**

Integer with sign

**Additional information***Description*

If the current reading has more than 7 digits, which is the maximum value range that can be displayed, the value above this range is given as an overflow. The current totalizer value is therefore the sum of the overflow value and the totalizer value from the **Totalizer value 1 to 3** parameter.

*User interface*

The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→ [155](#)).

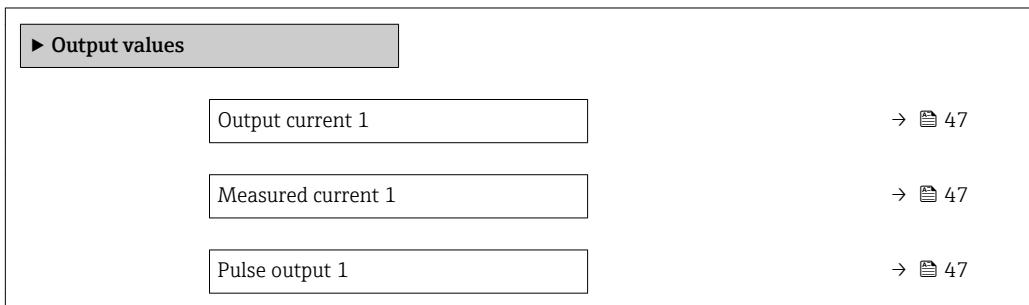
*Example*

Calculation of the current totalizer reading when the value exceeds the 7-digit display range:

- Value in the **Totalizer value 1** parameter: 196 845.7 m<sup>3</sup>
- Value in the **Totalizer overflow 1** parameter:  $2 \cdot 10^6$  (2 overflows) = 2 000 000 [m<sup>3</sup>]
- Current totalizer reading: 2 196 845.7 m<sup>3</sup>

**"Output values" submenu****Navigation**

Expert → Sensor → Measured val. → Output values



\* Visibility depends on order options or device settings

Output frequency 1	→ <a href="#">48</a>
Switch status 1	→ <a href="#">48</a>

## Output current 1

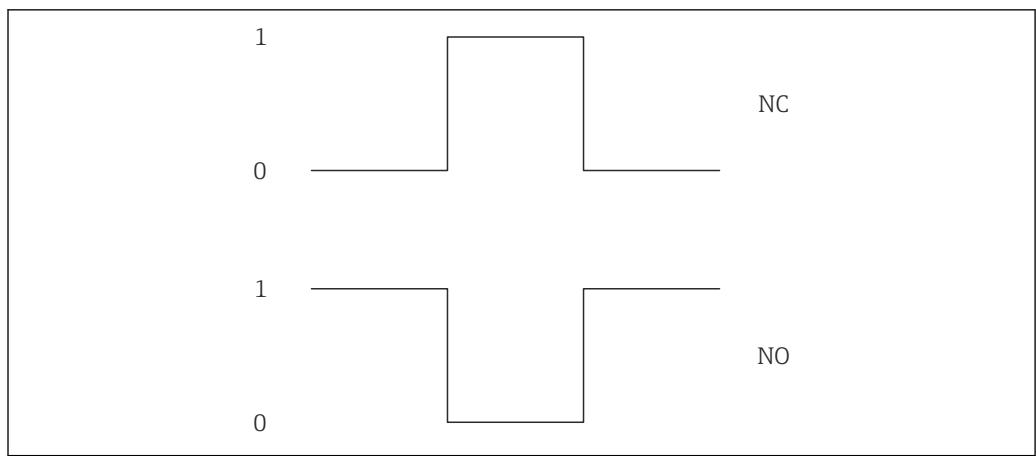
<b>Navigation</b>	  Expert → Sensor → Measured val. → Output values → Output curr. 1
<b>Description</b>	Displays the actual calculated value of the output current.
<b>User interface</b>	3.59 to 22.5 mA

## Measured current 1

<b>Navigation</b>	  Expert → Sensor → Measured val. → Output values → Measur. curr. 1
<b>Description</b>	Use this function to display the actual measured value of the output current.
<b>User interface</b>	0 to 30 mA

## Pulse output 1

<b>Navigation</b>	  Expert → Sensor → Measured val. → Output values → Pulse output 1
<b>Prerequisite</b>	The <b>Pulse</b> option is selected in the <b>Operating mode</b> parameter (→ <a href="#">102</a> ).
<b>Description</b>	Displays the pulse frequency currently output.
<b>User interface</b>	Positive floating-point number
<b>Additional information</b>	<b>Description</b> <ul style="list-style-type: none"><li>■ The pulse output is an open collector output.</li><li>■ 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.</li><li>■ The <b>Value per pulse</b> parameter (→ <a href="#">104</a>) and the <b>Pulse width</b> parameter (→ <a href="#">104</a>) can be used to define the value (i.e. the amount of the measured value that corresponds to a pulse) and the duration of the pulse.</li></ul>



A0025816-EN

- 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 (→ 122), i.e. the transistor does not conduct for the duration of the pulse.

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

## Output frequency 1

<b>Navigation</b>	Expert → Sensor → Measured val. → Output values → Output freq. 1
<b>Prerequisite</b>	In the <b>Operating mode</b> parameter (→ 102), the <b>Frequency</b> option is selected.
<b>Description</b>	Displays the actual value of the output frequency which is currently measured.
<b>User interface</b>	0.0 to 12 500.0 Hz

## Switch status 1

<b>Navigation</b>	Expert → Sensor → Measured val. → Output values → Switch status 1
<b>Prerequisite</b>	In the <b>Operating mode</b> parameter (→ 102), the <b>Switch</b> option is selected.
<b>Description</b>	Displays the current switch status of the status output.
<b>User interface</b>	<ul style="list-style-type: none"> <li>▪ Open</li> <li>▪ Closed</li> </ul>

**Additional information***User interface*

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

**3.2.2 "System units" submenu***Navigation*
 Expert → Sensor → System units

► System units	
Mass flow unit	→  49
Mass unit	→  50
Volume flow unit	→  51
Volume unit	→  53
Corrected volume flow unit	→  53
Corrected volume unit	→  54
Density unit	→  55
Reference density unit	→  56
Temperature unit	→  56
Pressure unit	→  57
Date/time format	→  57
► User-specific units	
	→  58

**Mass flow unit****Navigation**
 Expert → Sensor → System units → Mass flow unit
**Description**

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

**Selection**

- |                 |                 |
|-----------------|-----------------|
| <i>SI units</i> | <i>US units</i> |
| ■ g/s           | ■ oz/s          |
| ■ g/min         | ■ oz/min        |
| ■ g/h           | ■ oz/h          |
| ■ g/d           | ■ oz/d          |
| ■ kg/s          | ■ lb/s          |
| ■ kg/min        | ■ lb/min        |
| ■ kg/h          | ■ lb/h          |
| ■ kg/d          | ■ lb/d          |
| ■ t/s           | ■ STon/s        |
| ■ t/min         | ■ STon/min      |
| ■ t/h           | ■ STon/h        |
| ■ t/d           | ■ STon/d        |

*Custom-specific units*

- User mass/s
- User mass/min
- User mass/h
- User mass/d

**Factory setting**

Country-specific:

- kg/h
- lb/min

**Additional information***Effect*

The selected unit applies for:

**Mass flow** parameter (→ 41)*Selection*

 For an explanation of the abbreviated units: → 189

*Customer-specific units*

 The unit for the customer-specific mass is specified in the **User mass text** parameter (→ 59).

---

**Mass unit****Navigation**

  Expert → Sensor → System units → Mass unit

**Description**

Use this function to select the unit for the mass.

**Selection**

- |                 |                 |
|-----------------|-----------------|
| <i>SI units</i> | <i>US units</i> |
| ■ g             | ■ oz            |
| ■ kg            | ■ lb            |
| ■ t             | ■ STon          |

*Custom-specific units*

User mass

**Factory setting**

Country-specific:

- kg
- lb

**Additional information***Selection*

For an explanation of the abbreviated units: → 189

*Customer-specific units*

The unit for the customer-specific mass is specified in the **User mass text** parameter  
(→ 59).

---

**Volume flow unit****Navigation**

Expert → Sensor → System units → Volume flow unit

**Description**

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

**Selection***SI units*

- cm<sup>3</sup>/s
- cm<sup>3</sup>/min
- cm<sup>3</sup>/h
- cm<sup>3</sup>/d
- dm<sup>3</sup>/s
- dm<sup>3</sup>/min
- dm<sup>3</sup>/h
- dm<sup>3</sup>/d
- m<sup>3</sup>/s
- m<sup>3</sup>/min
- m<sup>3</sup>/h
- m<sup>3</sup>/d
- ml/s
- ml/min
- ml/h
- ml/d
- l/s
- l/min
- l/h
- l/d
- hl/s
- hl/min
- hl/h
- hl/d
- Ml/s
- Ml/min
- Ml/h
- Ml/d

*US units*

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

*Imperial units*

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

*Custom-specific units*

- User vol./s
- User vol./min
- User vol./h
- User vol./d

**Factory setting***Country-specific:*

- l/h
- gal/min (us)

**Additional information***Effect*

The selected unit applies for:

**Volume flow parameter** (→  41)

*Selection*

 For an explanation of the abbreviated units: →  189

*Customer-specific units*

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

**Volume unit****Navigation**

 Expert → Sensor → System units → Volume unit

**Description**

Use this function to select the unit for the volume.

**Selection***SI units*

- cm<sup>3</sup>
- dm<sup>3</sup>
- m<sup>3</sup>
- ml
- l
- hl
- Ml Mega

*US units*

- af
- ft<sup>3</sup>
- fl oz (us)
- gal (us)
- kgal (us)
- Mgal (us)
- bbl (us;oil)
- bbl (us;liq.)
- bbl (us;beer)
- bbl (us;tank)

*Imperial units*

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

*Custom-specific units*

User vol.

**Factory setting**

Country-specific:

- l
- gal (us)

**Additional information***Selection*

 For an explanation of the abbreviated units: → 189

*Customer-specific units*

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

**Corrected volume flow unit****Navigation**

 Expert → Sensor → System units → Cor.volflow unit

**Description**

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

**Selection**

- | <i>SI units</i>        | <i>US units</i>         |
|------------------------|-------------------------|
| ■ NI/s                 | ■ Sft <sup>3</sup> /s   |
| ■ NI/min               | ■ Sft <sup>3</sup> /min |
| ■ NI/h                 | ■ Sft <sup>3</sup> /h   |
| ■ NI/d                 | ■ Sft <sup>3</sup> /d   |
| ■ Nm <sup>3</sup> /s   | ■ Sgal/s (us)           |
| ■ Nm <sup>3</sup> /min | ■ Sgal/min (us)         |
| ■ Nm <sup>3</sup> /h   | ■ Sgal/h (us)           |
| ■ Nm <sup>3</sup> /d   | ■ Sgal/d (us)           |
| ■ Sm <sup>3</sup> /s   | ■ Sbbl/s (us;liq.)      |
| ■ Sm <sup>3</sup> /min | ■ Sbbl/min (us;liq.)    |
| ■ Sm <sup>3</sup> /h   | ■ Sbbl/h (us;liq.)      |
| ■ Sm <sup>3</sup> /d   | ■ Sbbl/d (us;liq.)      |

*Custom-specific units*

- UserCrVol./s
- UserCrVol./min
- UserCrVol./h
- UserCrVol./d

**Factory setting**

Country-specific:

- NI/h
- Sft<sup>3</sup>/min

**Additional information***Effect*

The selected unit applies for:

**Corrected volume flow parameter** (→  42)*Selection*

 For an explanation of the abbreviated units: →  189

---

**Corrected volume unit****Navigation**
  Expert → Sensor → System units → Corr. vol. unit
**Description**

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

**Selection**

- | <i>SI units</i>   | <i>US units</i>    | <i>Imperial units</i> |
|-------------------|--------------------|-----------------------|
| ■ NI              | ■ Sft <sup>3</sup> | Sgal (imp)            |
| ■ Nm <sup>3</sup> | ■ Sgal (us)        |                       |
| ■ Sm <sup>3</sup> | ■ Sbbl (us;liq.)   |                       |

*Custom-specific units*

UserCrVol.

**Factory setting**

Country-specific:

- NI
- Sft<sup>3</sup>

**Additional information***Selection*

For an explanation of the abbreviated units: → [189](#)

**Density unit****Navigation**

Expert → Sensor → System units → Density unit

**Description**

Use this function to select the unit for the density.

**Selection***SI units*

- g/cm<sup>3</sup>
- g/m<sup>3</sup>
- kg/dm<sup>3</sup>
- kg/l
- kg/m<sup>3</sup>
- SD4°C
- SD15°C
- SD20°C
- SG4°C
- SG15°C
- SG20°C

*US units*

- lb/ft<sup>3</sup>
- lb/gal (us)
- lb/bbl (us;liq.)
- lb/bbl (us;beer)
- lb/bbl (us;oil)
- lb/bbl (us;tank)

*Imperial units*

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

*Custom-specific units*

User dens.

**Factory setting**

Country-specific:

- kg/l
- lb/ft<sup>3</sup>

**Additional information***Effect*

The selected unit applies for:

**Density** parameter (→ [42](#))

*Selection*

- SD = specific density

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

- SG = specific gravity

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



For an explanation of the abbreviated units: → [189](#)

*Customer-specific units*

The unit for the customer-specific density is specified in the **User density text** parameter (→ [62](#)).

---

**Reference density unit****Navigation**

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

**Description**

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

**Selection**

SI units	US units
■ kg/Nm <sup>3</sup>	lb/Sft <sup>3</sup>
■ kg/Nl	
■ g/Scm <sup>3</sup>	
■ kg/Sm <sup>3</sup>	

**Factory setting**

Country-dependent

- kg/Nl
- lb/Sft<sup>3</sup>

**Additional information***Effect*

The selected unit applies for:

- **External reference density** parameter (→ [77](#))
- **Fixed reference density** parameter (→ [77](#))
- **Reference density** parameter (→ [42](#))

*Selection*

For an explanation of the abbreviated units: → [189](#)

---

**Temperature unit****Navigation**

Expert → Sensor → System units → Temperature unit

**Description**

Use this function to select the unit for the temperature.

**Selection**

SI units	US units
■ °C	■ °F
■ K	■ °R

**Factory setting**

Country-specific:

- °C
- °F

**Additional information***Effect*

The selected unit applies for:

- **Maximum value** parameter (→ [173](#))
- **Minimum value** parameter (→ [173](#))
- **Maximum value** parameter (→ [174](#))
- **Minimum value** parameter (→ [174](#))
- **Maximum value** parameter (→ [175](#))
- **Minimum value** parameter (→ [175](#))
- **External temperature** parameter (→ [75](#))
- **Reference temperature** parameter (→ [77](#))
- **Temperature** parameter (→ [43](#))

*Selection*For an explanation of the abbreviated units: → [189](#)**Pressure unit****Navigation**

Expert → Sensor → System units → Pressure unit

**Description**

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

**Selection***SI units*

- Pa a
- kPa a
- MPa a
- bar
- Pa g
- kPa g
- MPa g
- bar g

*US units*

- psi a
- psi g

*Custom-specific units*

User pres.

**Factory setting**

Country-specific:

- bar a
- psi a

**Additional information***Effect*

The unit is taken from the:

- **Pressure value** parameter (→ [43](#))
- **External pressure** parameter (→ [75](#))
- **Pressure value** parameter (→ [75](#))

*Selection*For an explanation of the abbreviated units: → [189](#)**Date/time format****Navigation**

Expert → Sensor → System units → Date/time format

**Description**

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

**Selection**

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

**Factory setting**

dd.mm.yy hh:mm

**Additional information***Selection*For an explanation of the abbreviated units: → [189](#)**"User-specific units" submenu***Navigation*

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

► User-specific units	
User mass text	→ <a href="#">59</a>
User mass offset	→ <a href="#">59</a>
User mass factor	→ <a href="#">59</a>
User volume text	→ <a href="#">60</a>
User volume offset	→ <a href="#">60</a>
User volume factor	→ <a href="#">61</a>
User corrected volume text	→ <a href="#">61</a>
User corrected volume offset	→ <a href="#">61</a>
User corrected volume factor	→ <a href="#">62</a>
User density text	→ <a href="#">62</a>
User density offset	→ <a href="#">62</a>
User density factor	→ <a href="#">62</a>
User pressure text	→ <a href="#">63</a>
User pressure offset	→ <a href="#">63</a>
User pressure factor	→ <a href="#">63</a>

**User mass text**

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

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

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

**Factory setting** User mass

**Additional information** *Description*

- The defined unit is shown as an option in the choose list of the following parameters:
  - **Mass flow unit** parameter (→ 49)
  - **Mass unit** parameter (→ 50)

*Example*

If the text CENT for "centner" is entered, the choose list of the **Mass flow unit** parameter (→ 49) shows the following options:

- CENT/s
- CENT/min
- CENT/h
- CENT/d

**User mass offset**

**Navigation** Expert → Sensor → System units → User-spec. units → Mass offset

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

**User entry** Signed floating-point number

**Factory setting** 0

**Additional information** *Description*

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

**User mass factor**

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

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

**User entry** Signed floating-point number

**Factory setting** 1.0

**Additional information** *Example*

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

---

## User volume text



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

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

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

**Factory setting** User vol.

**Additional information** *Result*

The defined unit is shown as an option in the choose list of the following parameters:

- **Volume flow unit** parameter (→ [51](#))
- **Volume unit** parameter (→ [53](#))

*Example*

If the text GLAS is entered, the choose list of the **Volume flow unit** parameter (→ [51](#)) 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

**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

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

**User entry** Signed floating-point number

**Factory setting** 1.0

**User corrected volume text**

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

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

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

**Factory setting** UserCrVol.

**Additional information***Result*

- The defined unit is shown as an option in the choose list of the following parameters:
- **Corrected volume flow unit** parameter (→ [53](#))
  - **Corrected volume unit** parameter (→ [54](#))

*Example*

If the text GLAS is entered, the choose list of the **Corrected volume flow unit** parameter (→ [53](#)) shows the following options:

- GLAS/s
- GLAS/min
- GLAS/h
- GLAS/d

**User corrected volume offset**

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

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

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

**User entry** Signed floating-point number

**Factory setting** 0

**User corrected volume factor**

<b>Navigation</b>	Expert → Sensor → System units → User-spec. units → Cor.vol. factor
<b>Description</b>	Use this function to enter a quantity factor (without time) for the user-specific corrected volume unit and corrected volume flow unit.
<b>User entry</b>	Signed floating-point number
<b>Factory setting</b>	1.0

**User density text**

<b>Navigation</b>	Expert → Sensor → System units → User-spec. units → Density text
<b>Description</b>	Use this function to enter a text or the user-specific unit of density.
<b>User entry</b>	Max. 10 characters such as letters, numbers or special characters (@, %, /)
<b>Factory setting</b>	User dens.
<b>Additional information</b>	<i>Result</i> The defined unit is shown as an option in the choose list of the <b>Density unit</b> parameter (→  55).
	<i>Example</i> Enter text “CE_L” for centners per liter

**User density offset**

<b>Navigation</b>	Expert → Sensor → System units → User-spec. units → Density offset
<b>Description</b>	Use this function to enter the zero point shift for the user-specific density unit. Value in user-specific unit = (factor × value in base unit) + offset
<b>User entry</b>	Signed floating-point number
<b>Factory setting</b>	0

**User density factor**

<b>Navigation</b>	Expert → Sensor → System units → User-spec. units → Density factor
<b>Description</b>	Use this function to enter a quantity factor for the user-specific density unit.

**User entry** Signed floating-point number

**Factory setting** 1.0

---

### User pressure text

---



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

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

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

**Factory setting** User pres.

**Additional information** *Result*



The defined unit is shown as an option in the choose list of the **Pressure unit** parameter (→ 57).

---

### User pressure offset

---



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

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

**User entry** Signed floating-point number

**Factory setting** 0

---

### User pressure factor

---



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

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

**User entry** Signed floating-point number

**Factory setting** 1.0

**Additional information** *Example*

1 Dyn/cm<sup>2</sup> = 0.1 Pa → 10 Dyn/cm<sup>2</sup> = 1 Pa → user entry: 10

### 3.2.3 "Process parameters" submenu

*Navigation*

Expert → Sensor → Process param.

▶ Process parameters	
Flow damping	→ <a href="#">64</a>
Density damping	→ <a href="#">64</a>
Temperature damping	→ <a href="#">65</a>
Flow override	→ <a href="#">65</a>
▶ Low flow cut off	→ <a href="#">66</a>
▶ Partially filled pipe detection	→ <a href="#">69</a>

#### Flow damping



*Navigation*

Expert → Sensor → Process param. → Flow damping

**Description**

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

**User entry**

0 to 100.0 s

**Factory setting**

0 s

**Additional information**

*Effect*

- i** The damping affects the following variables of the device:
- Outputs → [87](#)
  - Low flow cut off → [66](#)
  - Totalizer → [154](#)

*User entry*

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

#### Density damping



*Navigation*

Expert → Sensor → Process param. → Density damping

**Description**

Use this function to enter the time constant for density damping.

**User entry** 0 to 999.9 s

**Factory setting** 0 s

---

## Temperature damping

---



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

**Description** Use this function to enter a temperature damping time in seconds.

**User entry** 0 to 999.9 s

**Factory setting** 0 s

---

## Flow override

---



**Navigation** Expert → Sensor → Process param. → Flow override

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

**Selection**

- Off
- On

**Factory setting** Off

**Additional information** *Effect*

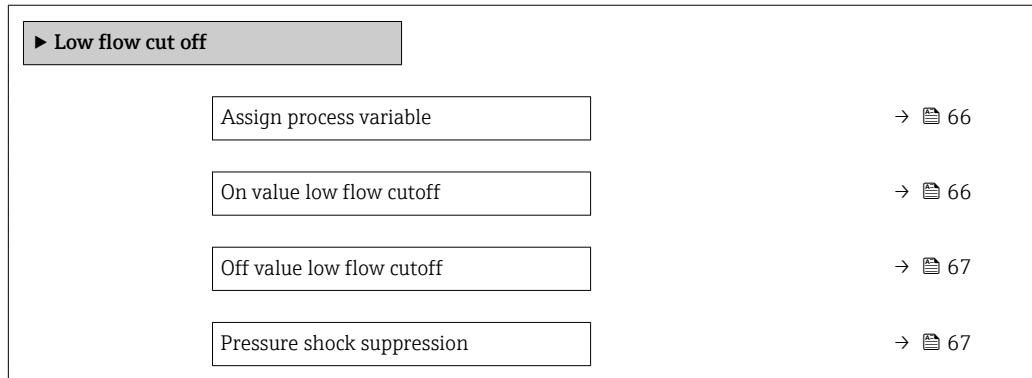


This setting affects all the functions and outputs of the measuring device.

*Description*

**Flow override is active**

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

**"Low flow cut off" submenu****Navigation** Expert → Sensor → Process param. → Low flow cut off**Assign process variable****Navigation** Expert → Sensor → Process param. → Low flow cut off → Assign variable**Description**

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

**Selection**

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

**Factory setting**

Mass flow

**On value low flow cutoff****Navigation** Expert → Sensor → Process param. → Low flow cut off → On value**Prerequisite**

One of the following options is selected in the **Assign process variable** parameter (→ [66](#)):

- Mass flow
- Volume flow
- Corrected volume flow

**Description**

Use this function to enter a switch-on value for low flow cut off. Low flow cut off is activated if the value entered is not equal to 0 or pressure shock suppression is active → [67](#).

**User entry**

Positive floating-point number

**Factory setting**

Depends on country and nominal diameter → [187](#)

**Additional information***Dependency*

 The unit depends on the process variable selected in the **Assign process variable** parameter (→ 66).

**Off value low flow cutoff****Navigation**

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

**Prerequisite**

One of the following options is selected in the **Assign process variable** parameter (→ 66):

- Mass flow
- Volume flow
- Corrected volume flow

**Description**

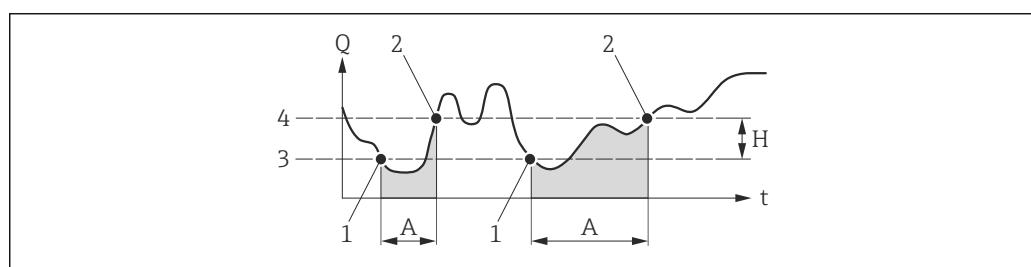
Use this function to enter a switch-off value for low flow cut off. The off value is entered as a positive hysteresis from the on value → 66.

**User entry**

0 to 100.0 %

**Factory setting**

50 %

**Additional information***Example*

A0012887

- |          |                                 |
|----------|---------------------------------|
| <i>Q</i> | Flow                            |
| <i>t</i> | Time                            |
| <i>H</i> | Hysteresis                      |
| <i>A</i> | Low flow cut off active         |
| 1        | Low flow cut off is activated   |
| 2        | Low flow cut off is deactivated |
| 3        | On value entered                |
| 4        | Off value entered               |

**Pressure shock suppression****Navigation**

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

**Prerequisite**

One of the following options is selected in the **Assign process variable** parameter (→ 66):

- Mass flow
- Volume flow
- Corrected volume flow

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

**User entry** 0 to 100 s

**Factory setting** 0 s

**Additional information** *Description*

**Pressure shock suppression is enabled**

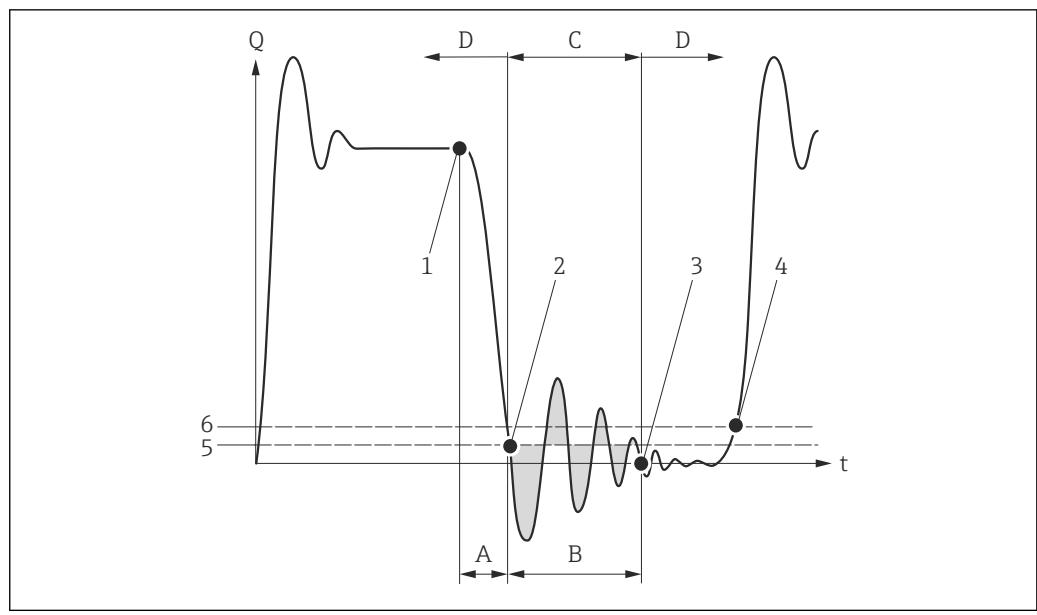
- Prerequisite:
  - Flow rate < on-value of low flow cut off
  - or
  - Changing the flow direction
- Output values
  - Current output: outputs the current corresponding to zero flow.
  - Flow displayed: 0
  - Totalizer: the totalizers are pegged at the last correct value

**Pressure shock suppression is disabled**

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

*Example*

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



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

### "Partially filled pipe detection" submenu

*Navigation*

Expert → Sensor → Process param. → Partial pipe det

<b>► Partially filled pipe detection</b>	
Assign process variable	→ 70
Low value partial filled pipe detection	→ 70
High value partial filled pipe detection	→ 70
Response time part. filled pipe detect.	→ 71
Maximum damping partial filled pipe det.	→ 71

**Assign process variable****Navigation**

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

**Description**

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

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

**Selection**

- Off
- Density
- Reference density

**Factory setting**

Off

**Low value partial filled pipe detection****Navigation**

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

**Prerequisite**

One of the following options is selected in the **Assign process variable** parameter (→ 70):

- Density
- Reference density

**Description**

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

**User entry**

Signed floating-point number

**Factory setting**

200

**Additional information**

*User entry*

The lower limit value must be less than the upper limit value defined in the **High value partial filled pipe detection** parameter (→ 70).

The unit is dependent on the process variable selected in the **Assign process variable** parameter.

*Limit value*

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

**High value partial filled pipe detection****Navigation**

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

**Prerequisite**

One of the following options is selected in the **Assign process variable** parameter (→ 70):

- Density
- Reference density

<b>Description</b>	Use this function to enter an upper limit value to enable detection of empty or partially filled measuring tubes. If the measured density exceeds this value, detection is enabled.
<b>User entry</b>	Signed floating-point number
<b>Factory setting</b>	6 000
<b>Additional information</b>	<p><i>User entry</i></p> <p>The upper limit value must be greater than the lower limit value defined in the <b>Low value partial filled pipe detection</b> parameter (→ 70).</p> <p> The unit is dependent on the process variable selected in the <b>Assign process variable</b> parameter.</p> <p><i>Limit value</i></p> <p> If the displayed value is outside the limit value, the measuring device displays the diagnostic message <b>△S862 Partly filled pipe</b>.</p>

## Response time part. filled pipe detect.



<b>Navigation</b>	 Expert → Sensor → Process param. → Partial pipe det → Response time
<b>Prerequisite</b>	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 70): <ul style="list-style-type: none"> <li>■ Density</li> <li>■ Reference density</li> </ul>
<b>Description</b>	Enter the minimum length of time (debouncing time) the signal must be present for the diagnostic message <b>△S862 Partly filled pipe</b> to be triggered if the measuring pipe is empty or partially full.
<b>User entry</b>	0 to 100 s
<b>Factory setting</b>	1 s

## Maximum damping partial filled pipe det.



<b>Navigation</b>	 Expert → Sensor → Process param. → Partial pipe det → Max. damping
<b>Prerequisite</b>	One of the following options is selected in the <b>Assign process variable</b> parameter (→ 70): <ul style="list-style-type: none"> <li>■ Density</li> <li>■ Reference density</li> </ul>
<b>Description</b>	Use this function to enter a damping value to enable detection of empty or partially filled measuring tubes.
<b>User entry</b>	Positive floating-point number
<b>Factory setting</b>	0

**Additional information****Description**

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

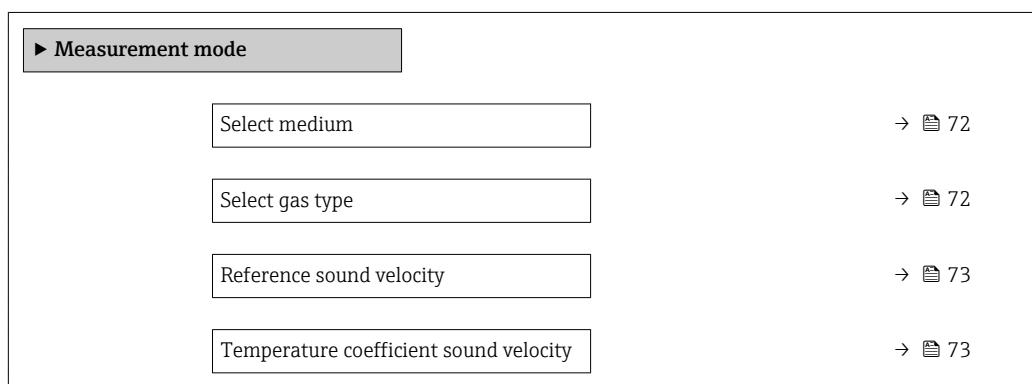
**User entry**

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

### 3.2.4 "Measurement mode" submenu

**Navigation**

Expert → Sensor → Measurement mode



---

**Select medium****Navigation**

Expert → Sensor → Measurement mode → Select medium

**Description**

Use this function to select the type of medium.

**Selection**

- Liquid
- Gas

**Factory setting**

Liquid

---

**Select gas type****Navigation**

Expert → Sensor → Measurement mode → Select gas type

**Prerequisite**

The **Gas** option is selected in the **Select medium** parameter (→ 72).

**Description**

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

**Selection**

- Air
- Ammonia NH<sub>3</sub>
- Argon Ar
- Sulfur hexafluoride SF<sub>6</sub>
- Oxygen O<sub>2</sub>
- Ozone O<sub>3</sub>
- Nitrogen oxide NO<sub>x</sub>
- Nitrogen N<sub>2</sub>
- Nitrous oxide N<sub>2</sub>O
- Methane CH<sub>4</sub>
- Hydrogen H<sub>2</sub>
- Helium He
- Hydrogen chloride HCl
- Hydrogen sulfide H<sub>2</sub>S
- Ethylene C<sub>2</sub>H<sub>4</sub>
- Carbon dioxide CO<sub>2</sub>
- Carbon monoxide CO
- Chlorine Cl<sub>2</sub>
- Butane C<sub>4</sub>H<sub>10</sub>
- Propane C<sub>3</sub>H<sub>8</sub>
- Propylene C<sub>3</sub>H<sub>6</sub>
- Ethane C<sub>2</sub>H<sub>6</sub>
- Others

**Factory setting**Methane CH<sub>4</sub>**Reference sound velocity****Navigation**

Expert → Sensor → Measurement mode → Sound velocity

**Prerequisite**The **Others** option is selected in the **Select gas type** parameter (→ 72).**Description**

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

**User entry**

1 to 99 999.9999 m/s

**Factory setting**

0 m/s

**Temperature coefficient sound velocity****Navigation**

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

**Prerequisite**The **Others** option is selected in the **Select gas type** parameter (→ 72).**Description**

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

**User entry**

Positive floating-point number

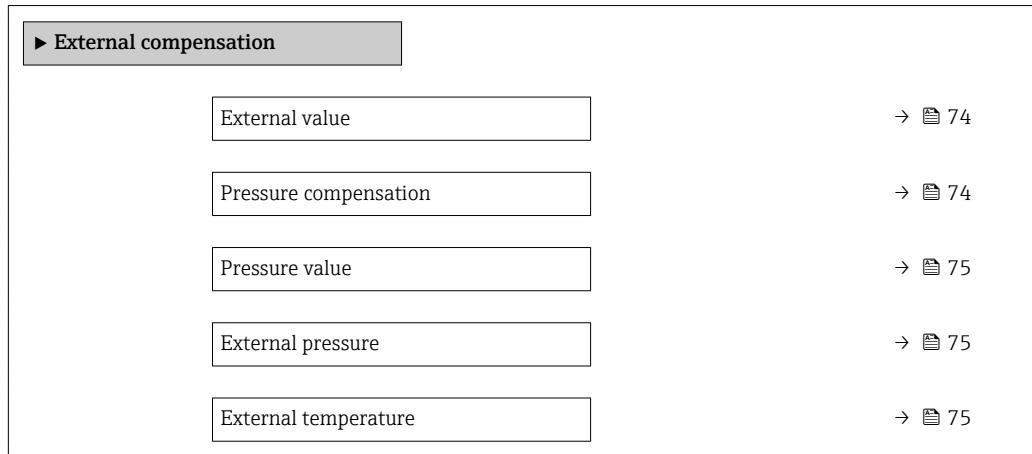
**Factory setting**

0 (m/s)/K

### 3.2.5 "External compensation" submenu

Navigation

Expert → Sensor → External comp.



---

#### External value



Navigation

Expert → Sensor → External comp. → External value

Description

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

Selection

- Off
- Pressure
- Temperature

Factory setting

Off

---

#### Pressure compensation



Navigation

Expert → Sensor → External comp. → Pressure compen.

Prerequisite

The **Gas** option is selected in the **Select medium** parameter (→ 72).

Description

Use this function select the type of pressure compensation.

Selection

- Off
- Fixed value
- External value

Factory setting

Off

---

**Pressure value**

<b>Navigation</b>	Expert → Sensor → External comp. → Pressure value
<b>Prerequisite</b>	The <b>Fixed value</b> option is selected in the <b>Pressure compensation</b> parameter (→ <a href="#">74</a> ).
<b>Description</b>	Use this function to enter a value for the process pressure that is used for pressure correction.
<b>User entry</b>	Positive floating-point number
<b>Factory setting</b>	0 bar
<b>Additional information</b>	<i>User entry</i> The unit is taken from the <b>Pressure unit</b> parameter (→ <a href="#">57</a> )

---

**External pressure**

<b>Navigation</b>	Expert → Sensor → External comp. → External press.
<b>Prerequisite</b>	The <b>External value</b> option is selected in the <b>Pressure compensation</b> parameter (→ <a href="#">74</a> ).
<b>Description</b>	Use this function to enter an external pressure value.
<b>User interface</b>	Positive floating-point number
<b>Factory setting</b>	0 bar
<b>Additional information</b>	<i>User entry</i> The unit is taken from the <b>Pressure unit</b> parameter (→ <a href="#">57</a> )

---

**External temperature**

<b>Navigation</b>	Expert → Sensor → External comp. → External temp.
<b>Prerequisite</b>	The <b>Temperature</b> option is selected in the <b>External value</b> parameter (→ <a href="#">74</a> ).
<b>Description</b>	Use this function to enter the external temperature.
<b>User entry</b>	-273.15 to 99 999 °C
<b>Factory setting</b>	0 °C

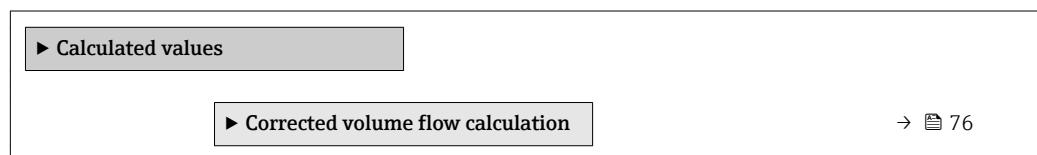
**Additional information****Description**

The unit is taken from the **Temperature unit** parameter (→ [56](#))

### 3.2.6 "Calculated values" submenu

**Navigation**

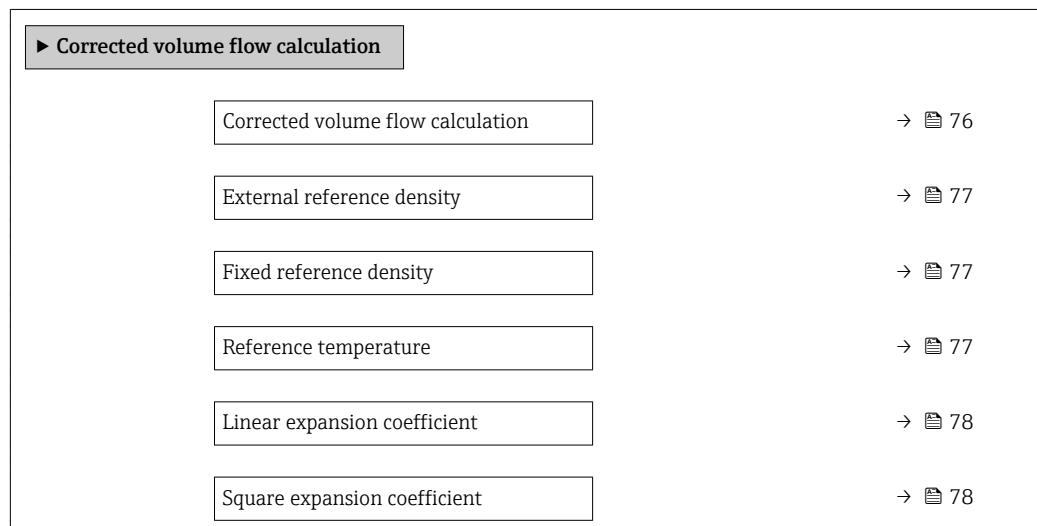
Expert → Sensor → Calculated value



#### "Corrected volume flow calculation" submenu

**Navigation**

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



---

#### Corrected volume flow calculation

**Navigation**

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

**Description**

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

**Selection**

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

**Factory setting**

Calculated reference density

---

**External reference density**

---

<b>Navigation</b>	  Expert → Sensor → Calculated value → Corr. vol.flow. → Ext. ref.density
<b>Description</b>	Use this function to enter the external reference density.
<b>User entry</b>	Floating point number with sign
<b>Factory setting</b>	0 kg/Nl

---

**Fixed reference density**

---



<b>Navigation</b>	  Expert → Sensor → Calculated value → Corr. vol.flow. → Fix ref.density
<b>Prerequisite</b>	In the <b>Corrected volume flow calculation</b> parameter (→ 76) the <b>Fixed reference density</b> option is selected.
<b>Description</b>	Use this function to enter a fixed value for the reference density.
<b>User entry</b>	Positive floating-point number
<b>Factory setting</b>	1 kg/Nl
<b>Additional information</b>	<i>Dependency</i>
	 The unit is taken from the <b>Reference density unit</b> parameter (→ 56)

---

**Reference temperature**

---



<b>Navigation</b>	  Expert → Sensor → Calculated value → Corr. vol.flow. → Ref. temperature
<b>Prerequisite</b>	In the <b>Corrected volume flow calculation</b> parameter (→ 76) the <b>Calculated reference density</b> option is selected.
<b>Description</b>	Use this function to enter a reference temperature for calculating the reference density.
<b>User entry</b>	-273.15 to 99 999 °C
<b>Factory setting</b>	Country-specific: ■ +20 °C ■ +68 °F
<b>Additional information</b>	<i>Dependency</i>
	 The unit is taken from the <b>Temperature unit</b> parameter (→ 56)

*Reference density calculation*

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

A0023403

- $\rho_n$ : reference density
- $\rho$ : fluid density currently measured
- $t$ : fluid temperature currently measured
- $t_N$ : reference temperature at which the reference density is calculated (e.g. 20 °C)
- $\Delta t$ :  $t - t_N$
- $\alpha$ : linear expansion coefficient of the fluid, unit = [1/K]; K = Kelvin
- $\beta$ : square expansion coefficient of the fluid, unit = [1/K<sup>2</sup>]

**Linear expansion coefficient****Navigation**
 Expert → Sensor → Calculated value → Corr. vol.flow. → Linear exp coeff
**Prerequisite**

In the **Corrected volume flow calculation** parameter (→ 76) the **Calculated reference density** option is selected.

**Description**

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

**User entry**

Signed floating-point number

**Factory setting**

0.0

**Square expansion coefficient****Navigation**
 Expert → Sensor → Calculated value → Corr. vol.flow. → Square exp coeff
**Description**

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

**User entry**

Signed floating-point number

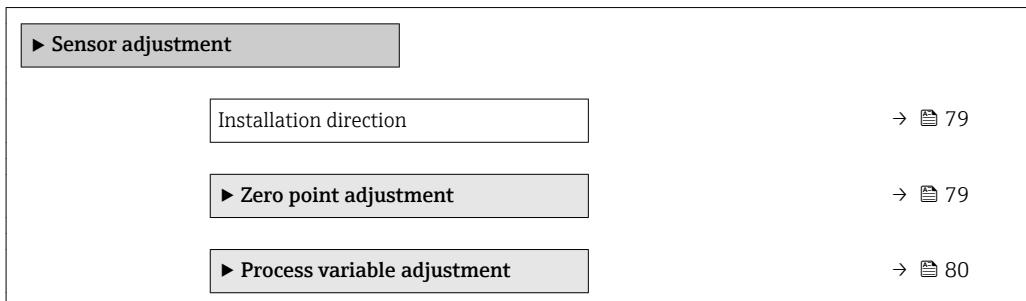
**Factory setting**

0.0

### 3.2.7 "Sensor adjustment" submenu

*Navigation*

Expert → Sensor → Sensor adjustm.



#### Installation direction

**Navigation**

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

**Description**

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

**Selection**

- Flow in arrow direction
- Flow against arrow direction

**Factory setting**

Flow in arrow direction

**Additional information**

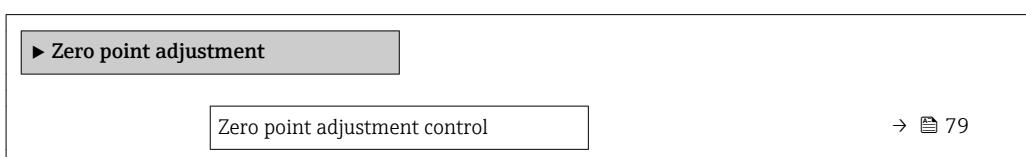
*Description*

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

#### "Zero point adjustment" submenu

*Navigation*

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



#### Zero point adjustment control

**Navigation**

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

**Description**

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

Note conditions .

**Selection**

- Cancel
- Busy
- Zero point adjust failure
- Start

**Factory setting**

Cancel

**Additional information***Description*

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

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

The progress of the process is indicated.

**User interface**

0 to 100 %

**"Process variable adjustment" submenu***Navigation*
 Expert → Sensor → Sensor adjustm. → Variable adjust

► Process variable adjustment	
Mass flow offset	→  81
Mass flow factor	→  81
Volume flow offset	→  81
Volume flow factor	→  82
Density offset	→  82
Density factor	→  82
Corrected volume flow offset	→  83
Corrected volume flow factor	→  83

Reference density offset	→  83
Reference density factor	→  84
Temperature offset	→  84
Temperature factor	→  84

**Mass flow offset**

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

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

**User entry** Signed floating-point number

**Factory setting** 0 kg/s

**Additional information** *Description*

Corrected value = (factor × value) + offset

**Mass flow factor**

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

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

**User entry** Positive floating-point number

**Factory setting** 1

**Additional information** *Description*

Corrected value = (factor × value) + offset

**Volume flow offset**

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

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

---

<b>User entry</b>	Signed floating-point number
<b>Factory setting</b>	0 m <sup>3</sup> /s
<b>Additional information</b>	<i>Description</i>  Corrected value = (factor × value) + offset

---

## Volume flow factor



<b>Navigation</b>	  Expert → Sensor → Sensor adjustm. → Variable adjust → Vol. flow factor
<b>Description</b>	Use this function to enter a quantity factor (without time) for the volume flow. This multiplication factor is applied over the volume flow range.
<b>User entry</b>	Positive floating-point number
<b>Factory setting</b>	1
<b>Additional information</b>	<i>Description</i>  Corrected value = (factor × value) + offset

---

## Density offset



<b>Navigation</b>	  Expert → Sensor → Sensor adjustm. → Variable adjust → Density offset
<b>Description</b>	Use this function to enter the zero point shift for the density trim. The density unit on which the shift is based is kg/m <sup>3</sup> .
<b>User entry</b>	Signed floating-point number
<b>Factory setting</b>	0 kg/m <sup>3</sup>
<b>Additional information</b>	<i>Description</i>  Corrected value = (factor × value) + offset

---

## Density factor



<b>Navigation</b>	  Expert → Sensor → Sensor adjustm. → Variable adjust → Density factor
<b>Description</b>	Use this function to enter a quantity factor for the density. This multiplication factor is applied over the density range.
<b>User entry</b>	Positive floating-point number

**Factory setting** 1**Additional information** *Description*

Corrected value = (factor × value) + offset

---

**Corrected volume flow offset** **Navigation** Expert → Sensor → Sensor adjustm. → Variable adjust → Corr. vol offset**Description** Use this function to enter the zero point shift for the corrected volume flow trim. The corrected volume flow unit on which the shift is based is 1 Nm<sup>3</sup>/s.**User entry** Signed floating-point number**Factory setting** 0 Nm<sup>3</sup>/s**Additional information** *Description*

Corrected value = (factor × value) + offset

---

**Corrected volume flow factor** **Navigation** Expert → Sensor → Sensor adjustm. → Variable adjust → Corr. vol factor**Description** Use this function to enter a quantity factor (without time) for the corrected volume flow. This multiplication factor is applied over the corrected volume flow range.**User entry** Positive floating-point number**Factory setting** 1**Additional information** *Description*

Corrected value = (factor × value) + offset

---

**Reference density offset** **Navigation** Expert → Sensor → Sensor adjustm. → Variable adjust → Ref.dens. offset**Description** Use this parameter to enter the zero point shift for the reference density trim. The reference density unit on which the shift is based is 1 kg/Nm<sup>3</sup>.**User entry** Signed floating-point number**Factory setting** 0 kg/Nm<sup>3</sup>

**Additional information***Description*

Corrected value = (factor × value) + offset

**Reference density factor****Navigation**

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

**Description**

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

**User entry**

Positive floating-point number

**Factory setting**

1

**Additional information***Description*

Corrected value = (factor × value) + offset

**Temperature offset****Navigation**

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

**Description**

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

**User entry**

Signed floating-point number

**Factory setting**

0 K

**Additional information***Description*

Corrected value = (factor × value) + offset

**Temperature factor****Navigation**

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

**Description**

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

**User entry**

Positive floating-point number

**Factory setting**

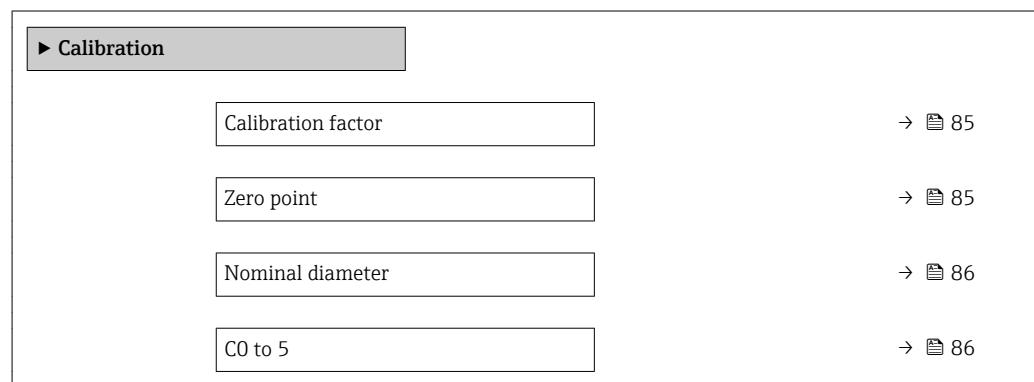
1

**Additional information***Description*

Corrected value = (factor × value) + offset

**3.2.8 "Calibration" submenu***Navigation*

Expert → Sensor → Calibration

**Calibration factor****Navigation**

Expert → Sensor → Calibration → Cal. factor

**Description**

Displays the current calibration factor for the sensor.

**User interface**

Signed floating-point number

**Factory setting**

Depends on nominal diameter and calibration.

**Zero point****Navigation**

Expert → Sensor → Calibration → Zero point

**Description**

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

**User entry**

Signed floating-point number

**Factory setting**

Depends on nominal diameter and calibration.

---

**Nominal diameter**

---

**Navigation**  Expert → Sensor → Calibration → Nominal diameter

**Description** Displays the nominal diameter of the sensor.

**User interface** DNxx / x"

**Factory setting** Depends on the size of the sensor

**Additional information** *Description*

 The value is also specified on the sensor nameplate.

---

**C0 to 5**

---

**Navigation**  Expert → Sensor → Calibration → C0 to 5

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

**User interface** Signed floating-point number

**Factory setting** 0

**Additional information** *Description*

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

### 3.2.9 "Supervision" submenu

**Navigation**  Expert → Sensor → Supervision



---

**Limit value measuring tube damping**

---



**Navigation**  Expert → Sensor → Supervision → Limit tube damp.

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

**User entry** Positive floating-point number

**Factory setting** Positive floating-point number

**Additional information** *Limit value*

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

### 3.3 "Output" submenu

*Navigation*

Expert → Output

▶ Output	
▶ Current output 1	→ <a href="#">87</a>
▶ Pulse/frequency/switch output 1	→ <a href="#">100</a>

#### 3.3.1 "Current output 1" submenu

*Navigation*

Expert → Output → Curr.output 1

▶ Current output 1	
Assign current output	→ <a href="#">88</a>
Current span	→ <a href="#">88</a>
Fixed current	→ <a href="#">89</a>
0/4 mA value	→ <a href="#">90</a>
20 mA value	→ <a href="#">91</a>
Measuring mode	→ <a href="#">92</a>
Damping output	→ <a href="#">96</a>
Response time	→ <a href="#">97</a>
Failure mode	→ <a href="#">98</a>
Failure current	→ <a href="#">99</a>
Output current 1	→ <a href="#">100</a>
Measured current 1	→ <a href="#">100</a>

## Assign current output



### Navigation

Expert → Output → Curr.output 1 → Assign curr.

### Description

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

Detailed description of the options **Oscillation frequency**, **Oscillation amplitude**, **Oscillation damping** and **Signal asymmetry**: **Value 1 display** parameter (→ 16)

### Selection

- Off
- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*
- Density
- Reference density \*
- Concentration \*
- Temperature
- Carrier pipe temperature \*
- Electronic temperature
- Oscillation frequency 0 \*
- Oscillation amplitude 0 \*
- Frequency fluctuation 0
- Oscillation damping 0
- Tube damping fluctuation 0
- Signal asymmetry
- Exciter current 0

### Factory setting

Mass flow

## Current span



### Navigation

Expert → Output → Curr.output 1 → Current span

### Description

The selection specifies the operational range for the process value and the upper and lower level for signal on alarm.

### Selection

- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA
- 0...20 mA
- Fixed current

### Factory setting

Country-specific:

- 4...20 mA NAMUR
- 4...20 mA US

\* Visibility depends on order options or device settings

**Additional information***Description*

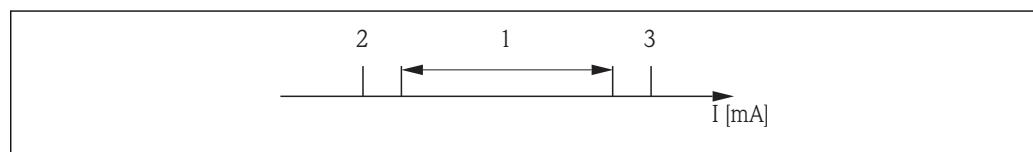
- In the event of an error, the current output outputs the value defined in the **Failure mode** parameter (→ 98).
- If the measured value is outside the measuring range, the diagnostic message **△S441 Current output 1** is output.
- The measuring range is defined via the **0/4 mA value** parameter (→ 90) and **20 mA value** parameter (→ 91).

*"Fixed current" option*

The current value is permanently fixed via the **Fixed current** parameter (→ 89).

*Example*

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



A0013316

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

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

- If the flow exceeds or drops below the upper or lower signal on alarm level, the diagnostic message **△S441 Current output 1** is output.

**Fixed current****Navigation**

Expert → Output → Curr.output 1 → Fixed current

**Prerequisite**

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

**Description**

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

**User entry**

$3.59^{-3}$  to  $22.5^{-3}$  mA

**Factory setting**

22.5 mA

**Additional information***Example*

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

**0/4 mA value****Navigation**

Expert → Output → Curr.output 1 → 0/4 mA value

**Prerequisite**

In the **Current span** parameter (→ 88), one of the following options is selected:

- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

**Description**

Use this function to enter a value for the 4 mA current.

**User entry**

Signed floating-point number

**Factory setting**

Country-specific:

- 0 kg/h
- 0 lb/min

**Additional information***Description*

Positive and negative values are permitted depending on the process variable assigned in the **Assign current output** parameter (→ 88). 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 (→ 91).

*Dependency*

The unit depends on the process variable selected in the **Assign current output** parameter (→ 88).

*Current output behavior*

The current output behaves differently depending on the settings configured in the following parameters:

- Current span (→ 88)
- Measuring mode (→ 92)
- Failure mode (→ 98)

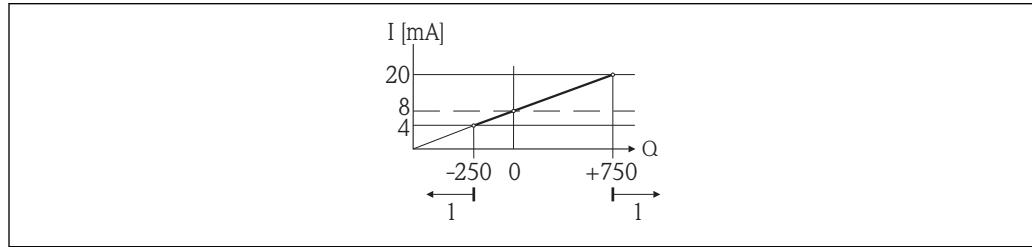
*Configuration examples*

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

**Configuration example A**

Measuring mode with **Forward flow** option

- **0/4 mA value** parameter (→ 90) = not equal to zero flow (e.g. -250 m<sup>3</sup>/h)
- **20 mA value** parameter (→ 91) = not equal to zero flow (e.g. +750 m<sup>3</sup>/h)
- Calculated current value = 8 mA at zero flow

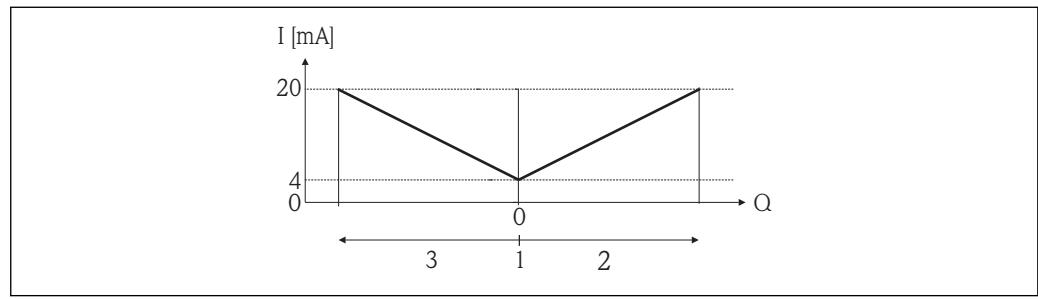


Q    Flow  
I    Current  
1    Measuring range is exceeded or undershot

The working range of the measuring device is defined by entering the values for the **0/4 mA value** parameter (→ 90) and **20 mA value** parameter (→ 91). If the effective flow exceeds or drops below this working range, the diagnostic message **△S441 Current output 1** is output.

### Configuration example B

Measuring mode with **Forward/Reverse flow** option



A0013758

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

The current output signal is independent of the direction of flow (absolute amount of the measured variable). The values for the **0/4 mA value** parameter (→ 90) and **20 mA value** parameter (→ 91) must have the same sign. The value for the **20 mA value** parameter (→ 91) (e.g. reverse flow) corresponds to the mirrored value for the **20 mA value** parameter (→ 91) (e.g. forward flow).

### Configuration example C

Measuring mode with **Reverse flow compensation** option

If flow is characterized by severe fluctuations (e.g. when using Piston pumps), flow components outside of the measuring range are buffered, balanced and output after a maximum delay of 60 s → 92.

---

## 20 mA value



### Navigation

Expert → Output → Curr.output 1 → 20 mA value

### Prerequisite

In the **Current span** parameter (→ 88), one of the following options is selected:

- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

### Description

Enter a value for the 20 mA current.

### User entry

Signed floating-point number

### Factory setting

Depends on country and nominal diameter → 186

### Additional information

#### Description

Positive and negative values are permitted depending on the process variable assigned in the **Assign current output** parameter (→ 88). In addition, the value can be greater than or smaller than the value assigned for the 4 mA current in the **0/4 mA value** parameter (→ 90).

### Dependency

 The unit depends on the process variable selected in the **Assign current output** parameter (→ 88).

### Example

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

If the **Forward/Reverse flow** option is selected in the **Measuring mode** parameter (→ 92), different signs cannot be entered for the values of the **0/4 mA value** parameter (→ 90) and **20 mA value** parameter (→ 91). The diagnostic message **△S441 Current output 1** is displayed.

### Configuration examples

## Measuring mode



### Navigation

  Expert → Output → Curr.output 1 → Measuring mode

### Prerequisite

One of the following options is selected in the **Assign current output** parameter (→ 88):

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*
- Density
- Reference density \*
- Concentration \*
- Temperature
- Carrier pipe temperature \*
- Electronic temperature
- Oscillation frequency 0
- Oscillation amplitude 0 \*
- Frequency fluctuation 0
- Oscillation damping 0
- Tube damping fluctuation 0
- Signal asymmetry
- Exciter current 0

 Detailed description of the options **Oscillation frequency**, **Oscillation amplitude**, **Oscillation damping** and **Signal asymmetry**: **Value 1 display** parameter (→ 16)

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

- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

### Description

Use this function to select the measuring mode for the current output.

\* Visibility depends on order options or device settings

**Selection**

- Forward flow
- Forward/Reverse flow
- Reverse flow compensation

**Factory setting**

Forward flow

**Additional information***Description*

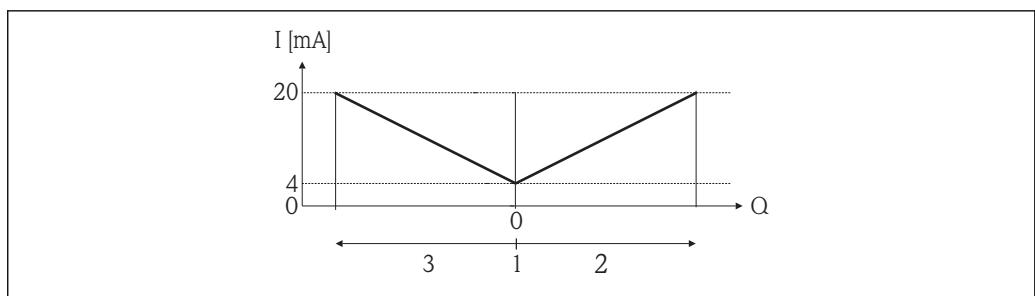
**i** The process variable that is assigned to the current output via the **Assign current output** parameter (→ 88) is displayed below the parameter.

*"Forward flow" option*

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

The flow components outside the scaled measuring range are taken into account for signal output as follows:

- Both values are defined such that they are not equal to zero flow e.g.:
  - 4 mA current value = -5 m<sup>3</sup>/h
  - 20 mA current value = 10 m<sup>3</sup>/h
- If the effective flow rate exceeds or falls below this measuring range, the diagnostic message **△S441 Current output 1** is output.

*"Forward/Reverse flow" option*

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

- The current output signal is independent of the direction of flow (absolute amount of the measured variable). The values for the **4 mA value** parameter (→ 90) and **20 mA value** parameter (→ 91) must have the same sign.
- The value for the **20 mA value** parameter (→ 91) (e.g. reverse flow) corresponds to the mirrored value for the **20 mA value** parameter (→ 91) (e.g. forward flow).

*"Reverse flow compensation" option*

If flow is characterized by severe fluctuations (e.g. when using reciprocating pumps), flow components outside of the measuring range are buffered, balanced and output after a maximum delay of 60 s.

If buffering cannot be processed within approx. 60 s, the diagnostic message **△S441 Current output 1** is displayed.

Under certain plant conditions, flow values can aggregate in the buffer, for example in the case of prolonged and unwanted fluid reverse flow. However, this buffer is reset in all relevant programming adjustments which affect the current output.

*Examples of how the current output behaves*

### Example 1

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

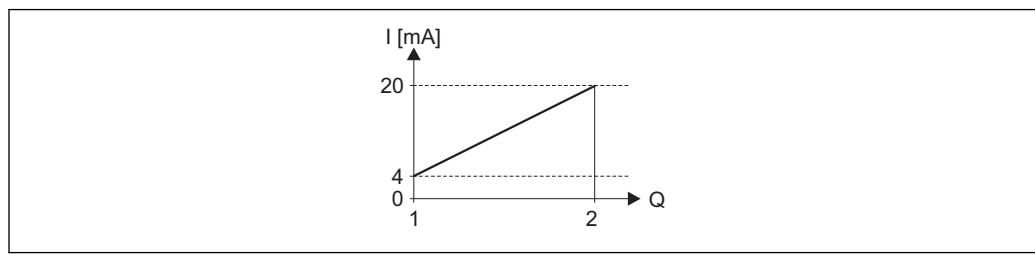


Fig 4 Measuring range

$I$  Current

$Q$  Flow

1 Lower range value (value assigned to 4 mA current)

2 Upper range value (value assigned to 20 mA current)

With the following flow response:

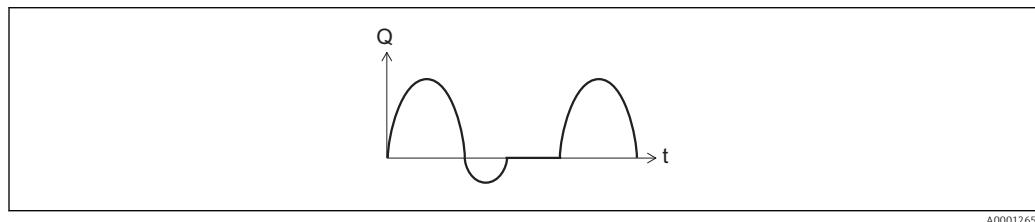


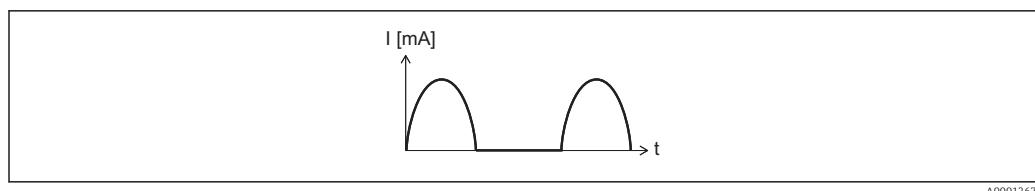
Fig 5 Flow response

$Q$  Flow

$t$  Time

With **Forward flow** option

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

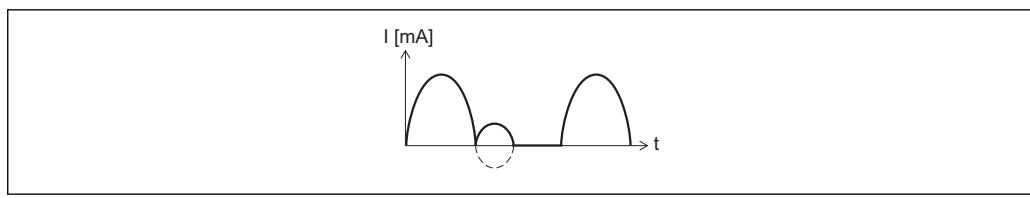


$I$  Current

$t$  Time

With **Forward/Reverse flow** option

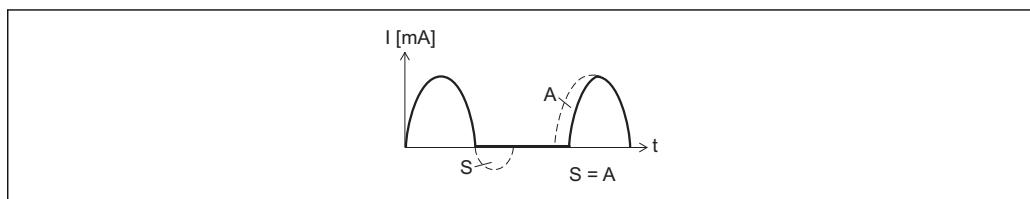
The current output signal is independent of the direction of flow.



*I* Current  
*t* Time

#### With Reverse flow compensation option

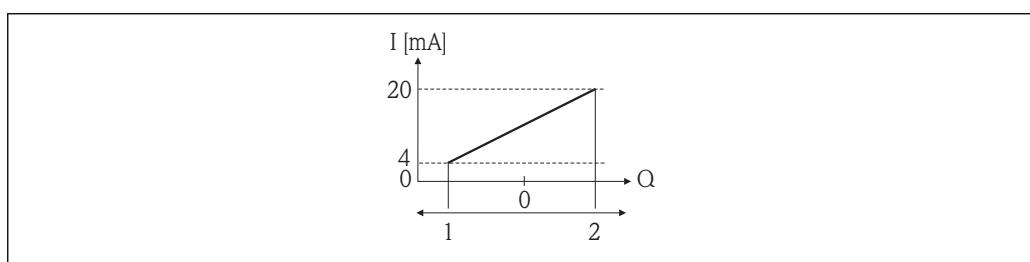
Flow components outside the span are buffered, balanced and output after a maximum delay of 60 s.



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

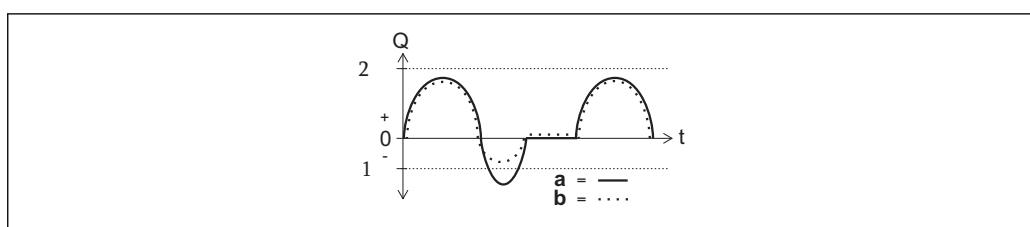
#### Example 2

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



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

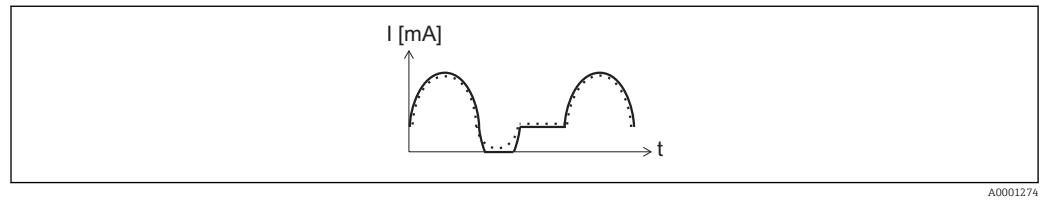
With flow a (—) outside, b (---) inside the measuring range



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

### With **Forward flow** option

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



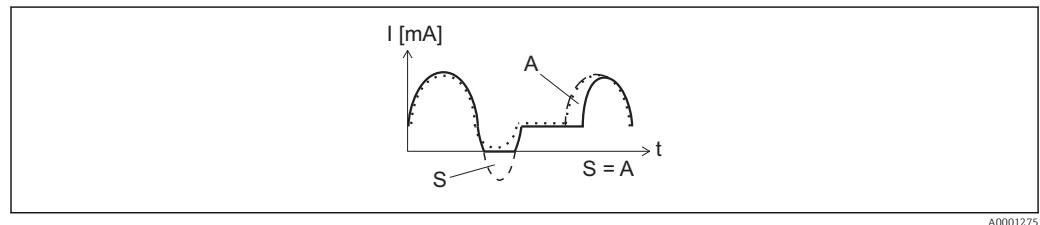
*I*      Current  
*t*      Time

### With **Forward/Reverse flow** option

This selection is not possible in this case as the values for the **4 mA value** parameter (→ 90) and **20 mA value** parameter (→ 91) have different signs.

### With **Reverse flow compensation** option

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



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

---

## Damping output



### Navigation

Expert → Output → Curr.output 1 → Damping out.

### Prerequisite

One of the following options is selected in the **Assign current output** parameter (→ 88):

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*
- Density
- Reference density \*
- Concentration \*
- Temperature
- Carrier pipe temperature \*
- Electronic temperature

\* Visibility depends on order options or device settings

- Oscillation frequency 0
- Oscillation amplitude 0 \*
- Frequency fluctuation 0
- Oscillation damping 0
- Tube damping fluctuation 0
- Signal asymmetry
- Exciter current 0

 Detailed description of the options **Oscillation frequency**, **Oscillation amplitude**, **Oscillation damping** and **Signal asymmetry**: Value 1 display parameter (→  16)

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

- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

#### Description

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

#### User entry

0.0 to 999.9 s

#### Factory setting

1.0 s

#### Additional information

*User entry*

Use this function to enter a time constant:

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

## Response time

#### Navigation

  Expert → Output → Curr.output 1 → Response time

#### Prerequisite

One of the following options is selected in the **Assign current output** parameter (→  88):

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*
- Density
- Reference density \*
- Concentration \*
- Temperature
- Carrier pipe temperature \*
- Electronic temperature
- Oscillation frequency 0
- Oscillation amplitude 0 \*
- Frequency fluctuation 0
- Oscillation damping 0

\* Visibility depends on order options or device settings

- Tube damping fluctuation 0
- Signal asymmetry
- Exciter current 0

 Detailed description of the options **Oscillation frequency**, **Oscillation amplitude**, **Oscillation damping** and **Signal asymmetry**: Value 1 display parameter (→ [16](#))

One of the following options is selected in the **Current span** parameter (→ [88](#)):

- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

#### Description

Displays the response time. This specifies how quickly the current output reaches the measured value change of 63 % of 100 % of the measured value change.

#### User interface

Positive floating-point number

#### Additional information

##### Description

 The response time is made up of the time specified for the following dampings:

- Current output damping → [96](#)  
and
- Depending on the measured variable assigned to the output.  
Flow damping  
or

## Failure mode



#### Navigation

 Expert → Output → Curr.output 1 → Failure mode

#### Prerequisite

In the **Assign current output** parameter (→ [88](#)), one of the following options is selected:

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*
- Density
- Reference density \*
- Concentration \*
- Temperature
- Carrier pipe temperature \*
- Electronic temperature
- Oscillation frequency 0
- Oscillation amplitude 0 \*
- Frequency fluctuation 0
- Oscillation damping 0
- Tube damping fluctuation 0
- Signal asymmetry
- Exciter current 0

 Detailed description of the options **Oscillation frequency**, **Oscillation amplitude**, **Oscillation damping** and **Signal asymmetry**: Value 1 display parameter (→ [16](#))

\* Visibility depends on order options or device settings

In the **Current span** parameter (→ 88), one of the following options is selected:

- 4...20 mA NAMUR
- 4...20 mA US
- 4...20 mA

**Description** Use this function to select the value of the current output in the event of an alarm condition.

**Selection**

- Min.
- Max.
- Last valid value
- Actual value
- Defined value

**Factory setting** Max.

**Additional information** *Description*

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

*"Min." option*

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

 The signal on alarm level is defined via the **Current span** parameter (→ 88).

*"Max." option*

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

 The signal on alarm level is defined via the **Current span** parameter (→ 88).

*"Last valid value" option*

The current output is based on the last measured value that was valid before the error occurred.

*"Actual value" option*

The current output is based on the actual measured value on the basis of the current flow measurement; the error is ignored.

*"Defined value" option*

The current output adopts a defined measured value.

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

---

## Failure current



**Navigation**  Expert → Output → Curr.output 1 → Failure current

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

**Description** Use this function to enter a fixed value that the current output adopts in an alarm condition.

**User entry**                    3.59<sup>-3</sup> to 22.5<sup>-3</sup> mA

**Factory setting**            22.5 mA

---

### Output current 1

---

**Navigation**                  Expert → Output → Curr.output 1 → Output curr. 1

**Description**                    Use this function to view the actual calculated value of the output current.

**User interface**            3.59 to 22.5 mA

**Factory setting**            3.59 mA

---

### Measured current 1

---

**Navigation**                  Expert → Output → Curr.output 1 → Measur. curr. 1

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

**User interface**            0 to 30 mA

### 3.3.2 "Pulse/frequency/switch output" submenu

*Navigation*                  Expert → Output → PFS output

 Pulse/frequency/switch output 1	
Operating mode	→  102
Assign pulse output	→  103
Value per pulse	→  104
Pulse width	→  104
Measuring mode	→  105
Failure mode	→  106
Pulse output 1	→  107
Assign frequency output	→  108

Minimum frequency value	→  108
Maximum frequency value	→  109
Measuring value at minimum frequency	→  110
Measuring value at maximum frequency	→  110
Measuring mode	→  111
Damping output	→  112
Response time	→  113
Failure mode	→  114
Failure frequency	→  115
Output frequency 1	→  115
Switch output function	→  116
Assign diagnostic behavior	→  116
Assign limit	→  117
Switch-on value	→  119
Switch-off value	→  119
Assign flow direction check	→  120
Assign status	→  120
Switch-on delay	→  121
Switch-off delay	→  121
Failure mode	→  121
Switch status 1	→  122
Invert output signal	→  122

**Operating mode****Navigation**

Expert → Output → PFS output 1 → Operating mode

**Description**

Use this function to select the operating mode of the output as a pulse, frequency or switch output.

**Selection**

- Pulse
- Frequency
- Switch

**Factory setting**

Pulse

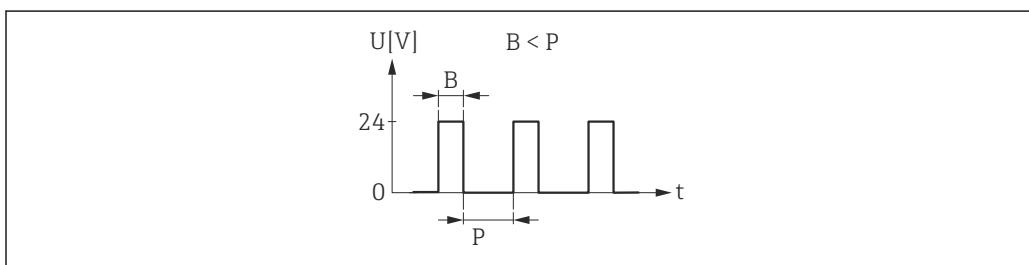
**Additional information***"Pulse" option*

Quantity-dependent pulse with configurable pulse width

- Whenever a specific mass, volume, corrected volume, target mass or carrier 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**

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



A0026883

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

B Pulse width entered

P Pauses between the individual pulses

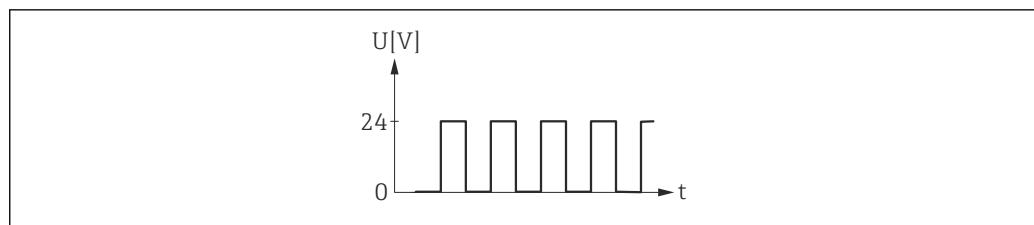
*"Frequency" option*

Flow-proportional frequency output with 1:1 on/off ratio

An output frequency is output that is proportional to the value of a process variable, such as mass flow, volume flow, corrected volume flow, target mass flow, carrier mass flow, density, reference density, concentration, temperature, carrier tube temperature, electronic temperature, vibration frequency, frequency variation, oscillation amplitude, oscillation damping, tube damping fluctuation, signal asymmetry or excitation current.

**Example**

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



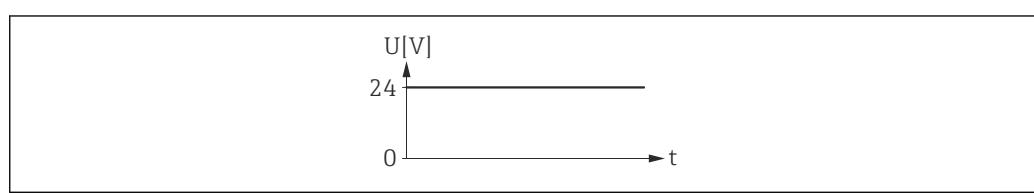
8 Flow-proportional frequency output

#### "Switch" option

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

##### Example

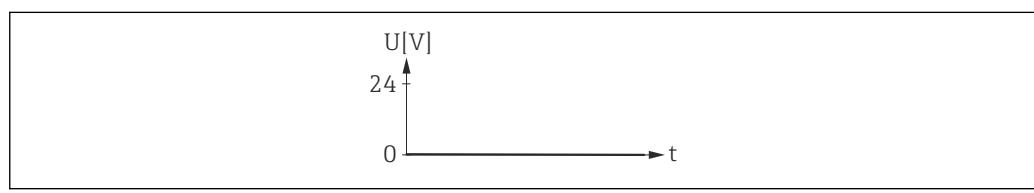
Alarm response without alarm



9 No alarm, high level

##### Example

Alarm response in case of alarm



10 Alarm, low level

---

## Assign pulse output



### Navigation

Expert → Output → PFS output 1 → Assign pulse

### Prerequisite

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

### Description

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

### Selection

- Off
- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow <sup>\*</sup>
- Carrier mass flow <sup>\*</sup>

### Factory setting

Off

\* Visibility depends on order options or device settings

**Value per pulse****Navigation**

Expert → Output → PFS output 1 → Value per pulse

**Prerequisite**

The **Pulse** option is selected in the **Operating mode** parameter (→ 102), and one of the following options is selected in the **Assign pulse output** parameter (→ 103):

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier 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 → 186

**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 1 → Pulse width

**Prerequisite**

In the **Operating mode** parameter (→ 102), the **Pulse** option is selected and one of the following options is selected in the **Assign pulse output** parameter (→ 103):

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*

**Description**

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

**User entry**

0.05 to 2 000 ms

**Factory setting**

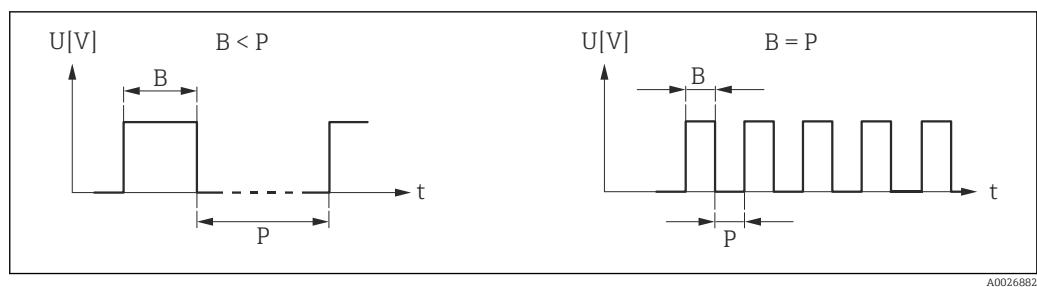
100 ms

**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 2**.

\* Visibility depends on order options or device settings



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

#### Example

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

The pulse width is not relevant for **Automatic pulse** option.

## Measuring mode



### Navigation

Expert → Output → PFS output 1 → Measuring mode

### Prerequisite

The **Pulse** option is selected in the **Operating mode** parameter (→ 102), and one of the following options is selected in the **Assign pulse output** parameter (→ 103):

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*

### Description

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

### Selection

- Forward flow
- Forward/Reverse flow
- Reverse flow
- Reverse flow compensation

### Factory setting

Forward flow

\* Visibility depends on order options or device settings

**Additional information***Selection*

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

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

*Examples*

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

**Failure mode****Navigation**

 Expert → Output → PFS output 1 → Failure mode

**Prerequisite**

In the **Operating mode** parameter (→ 102), the **Pulse** option is selected and one of the following options is selected in the **Assign pulse output** parameter (→ 103):

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow <sup>\*</sup>
- Carrier mass flow <sup>\*</sup>

**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 fault.

*Options*

- 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

\* Visibility depends on order options or device settings

**Actual value** option is only recommended if it can be guaranteed that all possible alarm conditions will not affect the measurement quality.

## Pulse output 1

### Navigation

Expert → Output → PFS output 1 → Pulse output 1

### Prerequisite

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

### Description

Displays the pulse frequency currently output.

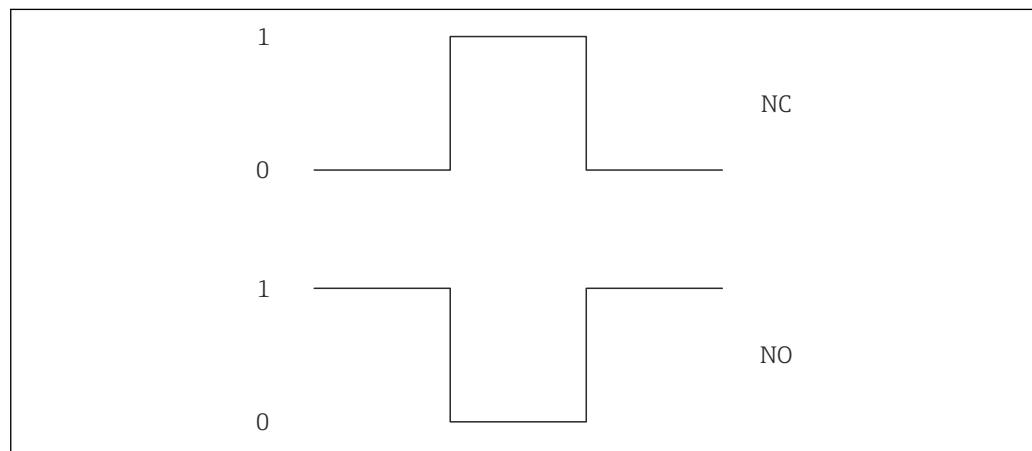
### User interface

Positive floating-point number

### Additional information

#### Description

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



A0025816-EN

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 (→ 122), i.e. the transistor does not conduct for the duration of the pulse.

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

## Assign frequency output



### Navigation

Expert → Output → PFS output 1 → Assign freq.

### Prerequisite

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

### Description

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



Detailed description of the options **Oscillation frequency**, **Oscillation amplitude**, **Oscillation damping** and **Signal asymmetry**: Value 1 display parameter (→ 16)

### Selection

- Off
- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*
- Density
- Reference density
- Concentration \*
- Temperature
- Carrier pipe temperature \*
- Electronic temperature
- Oscillation frequency 0
- Frequency fluctuation 0
- Oscillation amplitude 0 \*
- Oscillation damping 0
- Tube damping fluctuation 0
- Signal asymmetry
- Exciter current 0

### Factory setting

Off

## Minimum frequency value



### Navigation

Expert → Output → PFS output 1 → Min. freq. value

### Prerequisite

The **Frequency** option is selected in the **Operating mode** parameter (→ 102), and one of the following options is selected in the **Assign frequency output** parameter (→ 108):

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*
- Density
- Reference density
- Concentration \*
- Temperature
- Carrier pipe temperature \*
- Electronic temperature
- Oscillation frequency 0

\* Visibility depends on order options or device settings

- Frequency fluctuation 0
- Oscillation amplitude 0 \*
- Oscillation damping 0
- Tube damping fluctuation 0
- Signal asymmetry
- Exciter current 0

 Detailed description of the options **Oscillation frequency**, **Oscillation amplitude**, **Oscillation damping** and **Signal asymmetry**: Value 1 display parameter (→ 16)

**Description** Use this function to enter the start value frequency.

**User entry** 0.0 to 10 000.0 Hz

**Factory setting** 0.0 Hz

### Maximum frequency value



**Navigation**  Expert → Output → PFS output 1 → Max. freq. value

**Prerequisite** The **Frequency** option is selected in the **Operating mode** parameter (→ 102), and one of the following options is selected in the **Assign frequency output** parameter (→ 108):

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*
- Density
- Reference density \*
- Concentration \*
- Temperature
- Carrier pipe temperature \*
- Electronic temperature
- Oscillation frequency 0
- Frequency fluctuation 0
- Oscillation amplitude 0 \*
- Oscillation damping 0
- Tube damping fluctuation 0
- Signal asymmetry
- Exciter current 0

 Detailed description of the options **Oscillation frequency**, **Oscillation amplitude**, **Oscillation damping** and **Signal asymmetry**: Value 1 display parameter (→ 16)

**Description** Use this function to enter the end value frequency.

**User entry** 0.0 to 10 000.0 Hz

**Factory setting** 10 000.0 Hz

\* Visibility depends on order options or device settings

**Measuring value at minimum frequency****Navigation**

Expert → Output → PFS output 1 → Val. at min.freq

**Prerequisite**

The **Frequency** option is selected in the **Operating mode** parameter (→ 102), and one of the following options is selected in the **Assign frequency output** parameter (→ 108):

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*
- Density
- Reference density
- Concentration \*
- Temperature
- Carrier pipe temperature \*
- Electronic temperature
- Oscillation frequency 0
- Frequency fluctuation 0
- Oscillation amplitude 0 \*
- Oscillation damping 0
- Tube damping fluctuation 0
- Signal asymmetry
- Exciter current 0

Detailed description of the options **Oscillation frequency**, **Oscillation amplitude**, **Oscillation damping** and **Signal asymmetry**. Value 1 display parameter (→ 16)

**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 (→ 108).

**Measuring value at maximum frequency****Navigation**

Expert → Output → PFS output 1 → Val. at max.freq

**Prerequisite**

The **Frequency** option is selected in the **Operating mode** parameter (→ 102), and one of the following options is selected in the **Assign frequency output** parameter (→ 108):

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*

\* Visibility depends on order options or device settings

- Density
- Reference density \*
- Concentration \*
- Temperature
- Carrier pipe temperature \*
- Electronic temperature
- Oscillation frequency 0
- Frequency fluctuation 0
- Oscillation amplitude 0 \*
- Oscillation damping 0
- Tube damping fluctuation 0
- Signal asymmetry
- Exciter current 0

 Detailed description of the options **Oscillation frequency**, **Oscillation amplitude**, **Oscillation damping** and **Signal asymmetry**: Value 1 display parameter (→ 16)

**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 (→ 108).

## Measuring mode



**Navigation**  Expert → Output → PFS output 1 → Measuring mode

**Prerequisite** The **Frequency** option is selected in the **Operating mode** parameter (→ 102), and one of the following options is selected in the **Assign frequency output** parameter (→ 108):

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*
- Density
- Reference density \*
- Concentration \*
- Temperature
- Carrier pipe temperature \*
- Electronic temperature
- Oscillation frequency 0
- Frequency fluctuation 0
- Oscillation amplitude 0 \*

\* Visibility depends on order options or device settings

- Oscillation damping 0
- Tube damping fluctuation 0
- Signal asymmetry
- Exciter current 0

**i** Detailed description of the options **Oscillation frequency**, **Oscillation amplitude**, **Oscillation damping** and **Signal asymmetry**: Value 1 display parameter (→ 16)

**Description**

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

**Selection**

- Forward flow
- Forward/Reverse flow
- Reverse flow compensation

**Factory setting**

Forward flow

**Additional information**

*Selection*

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

*Examples*

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

**Damping output****Navigation**

Expert → Output → PFS output 1 → Damping out.

**Prerequisite**

The **Frequency** option is selected in the **Operating mode** parameter (→ 102), and one of the following options is selected in the **Assign frequency output** parameter (→ 108):

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*
- Density
- Reference density \*
- Concentration \*
- Temperature
- Carrier pipe temperature \*
- Electronic temperature
- Oscillation frequency 0
- Frequency fluctuation 0
- Oscillation amplitude 0 \*
- Oscillation damping 0
- Tube damping fluctuation 0
- Signal asymmetry
- Exciter current 0

**i** Detailed description of the options **Oscillation frequency**, **Oscillation amplitude**, **Oscillation damping** and **Signal asymmetry**: Value 1 display parameter (→ 16)

\* Visibility depends on order options or device settings

<b>Description</b>	Use this function to enter the reaction time of the output signal to fluctuations in the measured value.
<b>User entry</b>	0 to 999.9 s
<b>Factory setting</b>	0.0 s
<b>Additional information</b>	<p><i>Description</i></p> <p>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.</p>

## Response time

<b>Navigation</b>	Expert → Output → PFS output 1 → Response time
<b>Prerequisite</b>	The <b>Frequency</b> option is selected in the <b>Operating mode</b> parameter (→ 102), and one of the following options is selected in the <b>Assign frequency output</b> parameter (→ 108): <ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> <li>■ Target mass flow *</li> <li>■ Carrier mass flow *</li> <li>■ Density</li> <li>■ Reference density *</li> <li>■ Concentration *</li> <li>■ Temperature</li> <li>■ Carrier pipe temperature *</li> <li>■ Electronic temperature</li> <li>■ Oscillation frequency 0</li> <li>■ Frequency fluctuation 0</li> <li>■ Oscillation amplitude 0 *</li> <li>■ Oscillation damping 0</li> <li>■ Tube damping fluctuation 0</li> <li>■ Signal asymmetry</li> <li>■ Exciter current 0</li> </ul>
	Detailed description of the options <b>Oscillation frequency</b> , <b>Oscillation amplitude</b> , <b>Oscillation damping</b> and <b>Signal asymmetry</b> : Value 1 display parameter (→ 16)
<b>Description</b>	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.
<b>User interface</b>	Positive floating-point number
<b>Additional information</b>	<p><i>Description</i></p> <p> The response time is made up of the time specified for the following dampings:</p> <ul style="list-style-type: none"> <li>■ Damping of pulse/frequency/switch output → 96 and</li> <li>■ Depending on the measured variable assigned to the output. Flow damping</li> </ul>

\* Visibility depends on order options or device settings

**Failure mode****Navigation**

Expert → Output → PFS output 1 → Failure mode

**Prerequisite**

The **Frequency** option is selected in the **Operating mode** parameter (→ 102), and one of the following options is selected in the **Assign frequency output** parameter (→ 108):

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*
- Density
- Reference density
- Concentration \*
- Temperature
- Carrier pipe temperature \*
- Electronic temperature
- Oscillation frequency 0
- Frequency fluctuation 0
- Oscillation amplitude 0 \*
- Oscillation damping 0
- Tube damping fluctuation 0
- Signal asymmetry
- Exciter current 0

Detailed description of the options **Oscillation frequency**, **Oscillation amplitude**, **Oscillation damping** and **Signal asymmetry**: **Value 1 display** parameter (→ 16)

**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 fault is ignored.
- Defined value  
In the event of a device alarm, the frequency output continues on the basis of a predefined value. This Failure frequency (→ 115) replaces the current measured value and the alarm can be bypassed in this way. The actual measurement is switched off for the duration of the 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.

\* Visibility depends on order options or device settings

**Failure frequency****Navigation**

Expert → Output → PFS output 1 → Failure freq.

**Prerequisite**

The **Frequency** option is selected in the **Operating mode** parameter (→ 102), and one of the following options is selected in the **Assign frequency output** parameter (→ 108):

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*
- Density
- Reference density
- Concentration \*
- Temperature
- Carrier pipe temperature \*
- Electronic temperature
- Oscillation frequency 0
- Frequency fluctuation 0
- Oscillation amplitude 0 \*
- Oscillation damping 0
- Tube damping fluctuation 0
- Signal asymmetry
- Exciter current 0

Detailed description of the options **Oscillation frequency**, **Oscillation amplitude**, **Oscillation damping** and **Signal asymmetry**: Value 1 display parameter (→ 16)

**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 12 500.0 Hz

**Factory setting**

0.0 Hz

**Output frequency 1****Navigation**

Expert → Output → PFS output 1 → Output freq. 1

**Prerequisite**

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

**Description**

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

**User interface**

0.0 to 12 500.0 Hz

\* Visibility depends on order options or device settings

## Switch output function



**Navigation** Expert → Output → PFS output 1 → Switch out funct

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

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

**Selection**

- Off
- On
- Diagnostic behavior
- Limit
- Flow direction check
- Status

**Factory setting** Off

**Additional information** *Options*

- 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.
- Flow direction check  
Indicates the flow direction (forward or reverse flow).
- Status  
Indicates the device status depending on whether empty pipe detection or low flow cut off is selected.

## Assign diagnostic behavior



**Navigation** Expert → Output → PFS output 1 → Assign diag. beh

**Prerequisite**

- The **Switch** option is selected in the **Operating mode** parameter (→ 102).
- The **Diagnostic behavior** option is selected in the **Switch output function** parameter (→ 116).

**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 1 → Assign limit

**Prerequisite**

- The **Switch** option is selected in the **Operating mode** parameter (→ 102).
- The **Limit** option is selected in the **Switch output function** parameter (→ 116).

**Description**

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



Detailed description of the options **Oscillation frequency**, **Oscillation amplitude**, **Oscillation damping** and **Signal asymmetry: Value 1 display** parameter (→ 16)

**Selection**

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*
- Density
- Reference density \*
- Concentration \*
- Temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Measuring tube damping

**Factory setting**

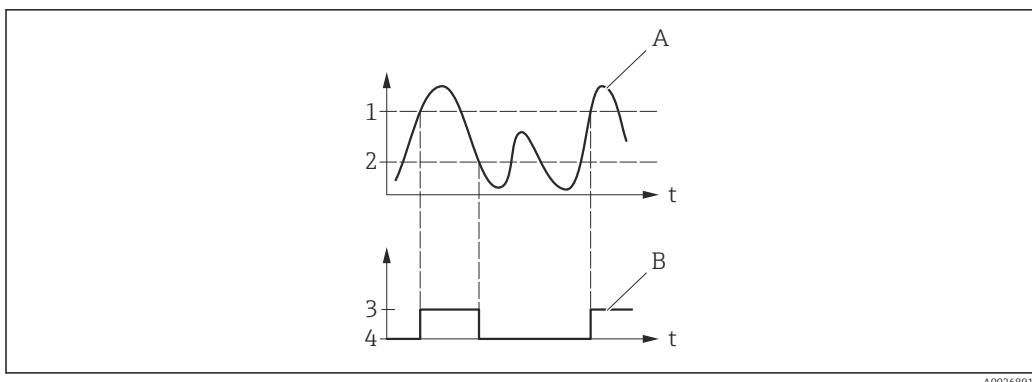
Mass flow

**Additional information***Description*

Behavior of status output when Switch-on value > Switch-off value:

- Process variable > Switch-on value: transistor is conductive
- Process variable < Switch-off value: transistor is non-conductive

\* Visibility depends on order options or device settings

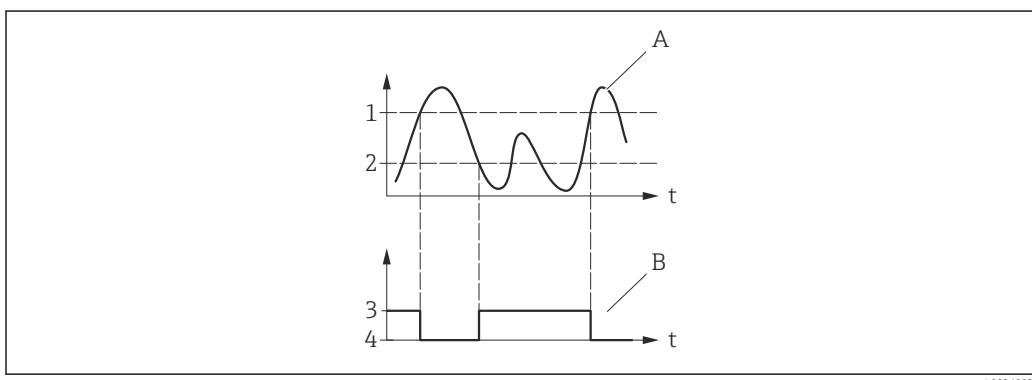


A0026891

- 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

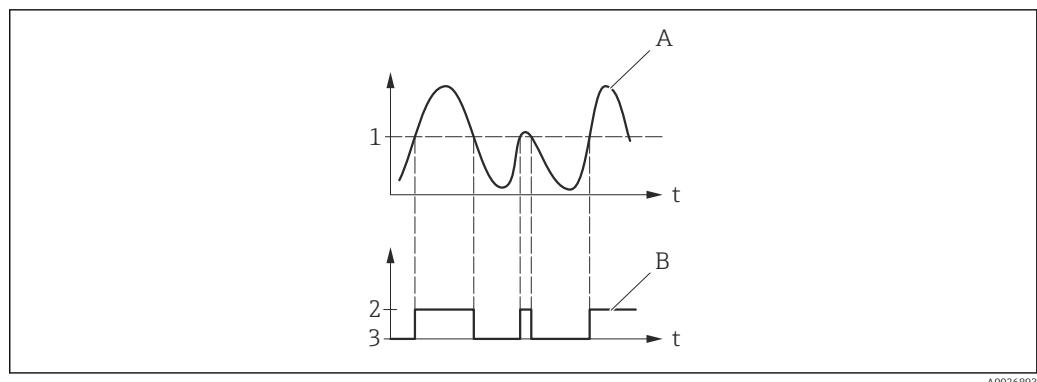


A0026892

- 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 1 → Switch-on value

### Prerequisite

- The **Switch** option is selected in the **Operating mode** parameter (→ 102).
- The **Limit** option is selected in the **Switch output function** parameter (→ 116).

### Description

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

### User entry

Signed floating-point number

### Factory setting

Country-specific:

- 0 m<sup>3</sup>/h
- 0 ft<sup>3</sup>/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 (→ 117).

## Switch-off value



### Navigation

Expert → Output → PFS output 1 → Switch-off value

### Prerequisite

- The **Switch** option is selected in the **Operating mode** parameter (→ 102).
- The **Limit** option is selected in the **Switch output function** parameter (→ 116).

<b>Description</b>	Use this function to enter the measured value for the switch-off point.
<b>User entry</b>	Signed floating-point number
<b>Factory setting</b>	Country-specific: ■ 0 m <sup>3</sup> /h ■ 0 ft <sup>3</sup> /h
<b>Additional information</b>	<p><i>Description</i></p> <p>Use this function to enter the limit value for the switch-off value (process variable &lt; switch-off value = open, non-conductive).</p> <p> When using a hysteresis: Switch-on value &gt; Switch-off value.</p> <p><i>Dependency</i></p> <p> The unit depends on the process variable selected in the <b>Assign limit</b> parameter (→ 117).</p>

## Assign flow direction check



<b>Navigation</b>	 Expert → Output → PFS output 1 → Assign dir.check
<b>Prerequisite</b>	<ul style="list-style-type: none"> <li>■ The <b>Switch</b> option is selected in the <b>Operating mode</b> parameter (→ 102).</li> <li>■ The <b>Flow direction check</b> option is selected in the <b>Switch output function</b> parameter (→ 116).</li> </ul>
<b>Description</b>	Use this function to select a process variable for monitoring the flow direction.
<b>Selection</b>	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> </ul>
<b>Factory setting</b>	Mass flow

## Assign status



<b>Navigation</b>	 Expert → Output → PFS output 1 → Assign status
<b>Prerequisite</b>	<ul style="list-style-type: none"> <li>■ The <b>Switch</b> option is selected in the <b>Operating mode</b> parameter (→ 102).</li> <li>■ The <b>Status</b> option is selected in the <b>Switch output function</b> parameter (→ 116).</li> </ul>
<b>Description</b>	Use this function to select a device status for the switch output.
<b>Selection</b>	<ul style="list-style-type: none"> <li>■ Partially filled pipe detection</li> <li>■ Low flow cut off</li> </ul>
<b>Factory setting</b>	Partially filled pipe detection

**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 1 → Switch-on delay

**Prerequisite**

- The **Switch** option is selected in the **Operating mode** parameter (→ 102).
- The **Limit** option is selected in the **Switch output function** parameter (→ 116).

**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 1 → Switch-off delay

**Prerequisite**

- The **Switch** option is selected in the **Operating mode** parameter (→ 102).
- The **Limit** option is selected in the **Switch output function** parameter (→ 116).

**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 1 → Failure mode

**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 1****Navigation**
 Expert → Output → PFS output 1 → Switch status 1
**Prerequisite**

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

**Description**

Displays the current switch status of the status output.

**User interface**

- Open
- Closed

**Additional information***User interface*

## ■ Open

The switch output is not conductive.

## ■ Closed

The switch output is conductive.

**Invert output signal****Navigation**
 Expert → Output → PFS output 1 → Invert outp.sig.
**Description**

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

**Selection**

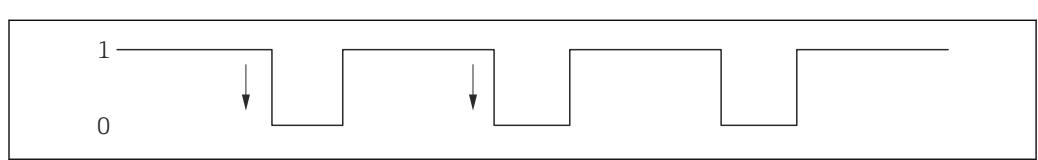
- No
- Yes

**Factory setting**

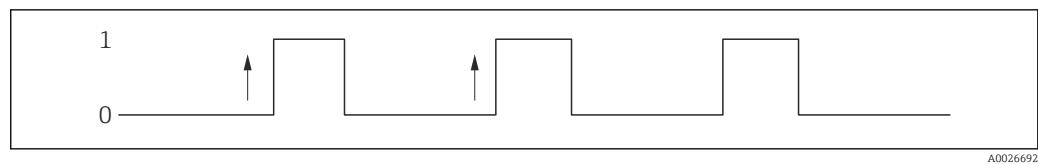
No

**Additional information***Selection*

**No** option (passive - negative)



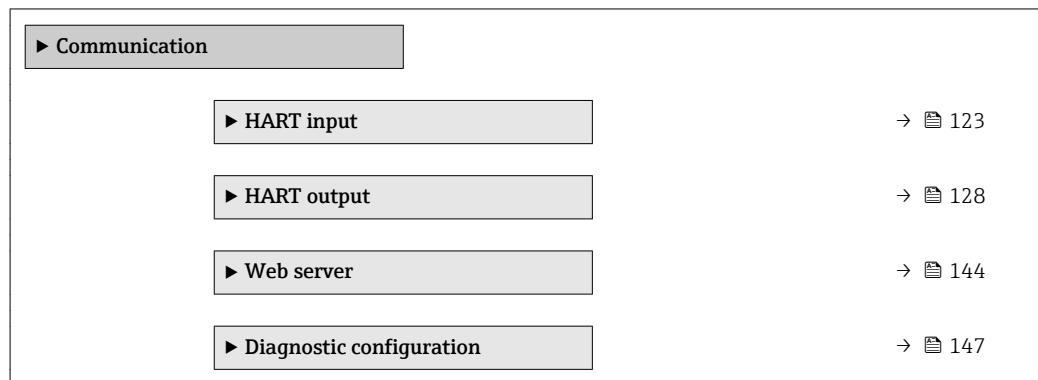
**Yes** option (passive - positive)



## 3.4 "Communication" submenu

*Navigation*

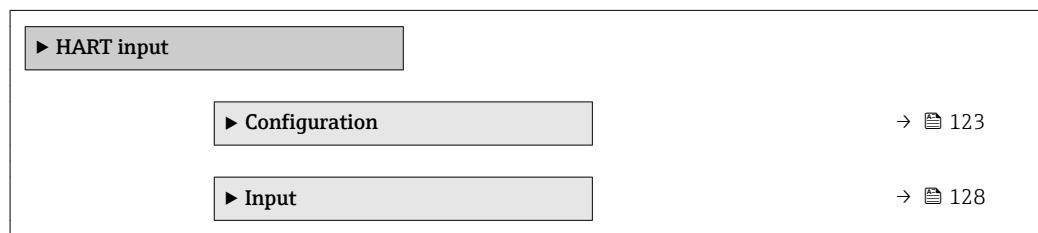
Expert → Communication



### 3.4.1 "HART input" submenu

*Navigation*

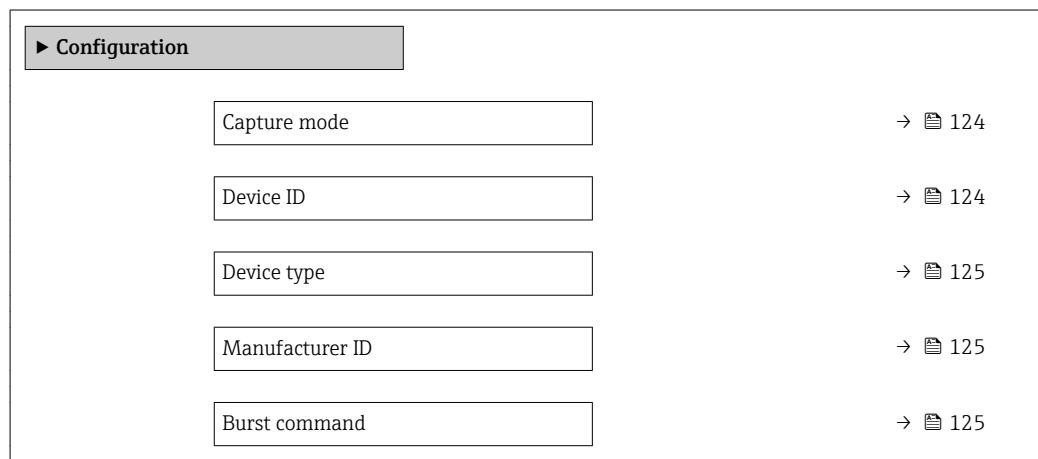
Expert → Communication → HART input



#### "Configuration" submenu

*Navigation*

Expert → Communication → HART input → Configuration



Slot number	→  126
Timeout	→  126
Failure mode	→  127
Failure value	→  127

**Capture mode****Navigation**

Expert → Communication → HART input → Configuration → Capture mode

**Description**

Use this function to select the capture mode via burst or master communication.

**Selection**

- Off
- Burst network
- Master network

**Factory setting**

Off

**Additional information***"Burst network" option*

The device records data transmitted via burst in the network.

An external pressure sensor must also be in burst mode.

*"Master network" option*

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

**Device ID****Navigation**

Expert → Communication → HART input → Configuration → Device ID

**Prerequisite**

The **Master network** option is selected in the **Capture mode** parameter (→ 124).

**Description**

Use this function to enter the device ID of the HART slave device whose data are to be recorded.

**User entry**

6-digit value:

- Via local operation: enter as hexadecimal or decimal number
- Via operating tool: enter as decimal number

**Factory setting**

0

**Additional information**

In addition to the device ID and manufacturer ID, the device type is part of the unique ID. Each HART device is uniquely identified by the unique device ID.

**Device type****Navigation**

Expert → Communication → HART input → Configuration → Device type

**Prerequisite**

The **Master network** option is selected in the **Capture mode** parameter (→ 124).

**Description**

Use this function to enter the device type of the HART slave device whose data are to be recorded.

**User entry**

4-digit hexadecimal number

**Factory setting**

0x1138

**Additional information**

In addition to the device ID and manufacturer ID, the device type is part of the unique ID. Each HART device is uniquely identified by the unique device ID.

**Manufacturer ID****Navigation**

Expert → Communication → HART input → Configuration → Manufacturer ID

**Prerequisite**

The **Master network** option is selected in the **Capture mode** parameter (→ 124).

**Description**

Use this function to enter the manufacturer ID of the HART slave device whose data are to be recorded.

**User entry**

2-digit value:

- Via local operation: enter as hexadecimal or decimal number
- Via operating tool: enter as decimal number

**Factory setting**

0

**Additional information**

In addition to the device ID and manufacturer ID, the device type is part of the unique ID. Each HART device is uniquely identified by the unique device ID.

**Burst command****Navigation**

Expert → Communication → HART input → Configuration → Burst command

**Prerequisite**

The **Burst network** option or the **Master network** option are selected in the **Capture mode** parameter (→ 124).

**Description**

Use this function to select the burst command to be recorded.

<b>Selection</b>	<ul style="list-style-type: none"> <li>■ Command 1</li> <li>■ Command 3</li> <li>■ Command 9</li> <li>■ Command 33</li> </ul>
<b>Factory setting</b>	Command 1
<b>Additional information</b>	<p><i>Selection</i></p> <ul style="list-style-type: none"> <li>■ Command 1 Use this function to capture the primary variable.</li> <li>■ Command 3 Use this function to capture the dynamic HART variables and the current.</li> <li>■ Command 9 Use this function to capture the dynamic HART variables including the associated status.</li> <li>■ Command 33 Use this function to capture the dynamic HART variables including the associated unit.</li> </ul>

<b>Slot number</b>	
<b>Navigation</b>	  Expert → Communication → HART input → Configuration → Slot number
<b>Prerequisite</b>	The <b>Burst network</b> option or the <b>Master network</b> option is selected in the <b>Capture mode</b> parameter (→  124).
<b>Description</b>	Use this function to enter the position of the process variable to be recorded in the burst command.
<b>User entry</b>	1 to 4
<b>Factory setting</b>	1
<b>Additional information</b>	<i>User entry</i>

Slot	Command			
	1	3	9	33
1	PV	PV	HART variable (slot 1)	HART variable (slot 1)
2	-	SV	HART variable (slot 2)	HART variable (slot 2)
3	-	TV	HART variable (slot 3)	HART variable (slot 3)
4	-	QV	HART variable (slot 4)	HART variable (slot 4)

<b>Timeout</b>	
<b>Navigation</b>	  Expert → Communication → HART input → Configuration → Timeout
<b>Prerequisite</b>	In the <b>Capture mode</b> parameter (→  124), the <b>Burst network</b> option or <b>Master network</b> option is selected.
<b>Description</b>	Use this function to enter the maximum permitted interval between two HART frames.

<b>User entry</b>	1 to 120 s
<b>Factory setting</b>	5 s
<b>Additional information</b>	<p><i>Description</i></p> <p> If the interval is exceeded, the measuring device displays the diagnostic message <b>xF410 Data transfer</b>.</p>

---

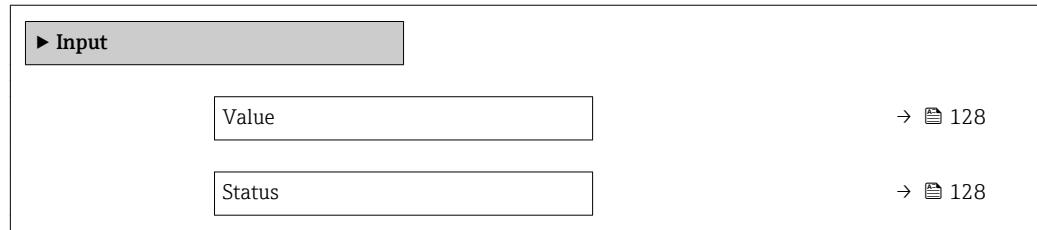
## Failure mode

<b>Navigation</b>	 Expert → Communication → HART input → Configuration → Failure mode
<b>Prerequisite</b>	In the <b>Capture mode</b> parameter (→ 124), the <b>Burst network</b> option or <b>Master network</b> option is selected.
<b>Description</b>	Use this function to select the device behavior if no data are recorded within the maximum permitted interval.
<b>Selection</b>	<ul style="list-style-type: none"> <li>■ Alarm</li> <li>■ Last valid value</li> <li>■ Defined value</li> </ul>
<b>Factory setting</b>	Alarm
<b>Additional information</b>	<p><i>Options</i></p> <ul style="list-style-type: none"> <li>■ Alarm An error message is set.</li> <li>■ Last valid value The last valid measured value is used.</li> <li>■ Defined value A user-defined measured value is used: (<b>Failure value</b> parameter (→ 127)).</li> </ul>

---

## Failure value

<b>Navigation</b>	 Expert → Communication → HART input → Configuration → Failure value
<b>Prerequisite</b>	The following conditions are met: <ul style="list-style-type: none"> <li>■ In the <b>Capture mode</b> parameter (→ 124), the <b>Burst network</b> option or <b>Master network</b> option is selected.</li> <li>■ In the <b>Failure mode</b> parameter (→ 127), the <b>Defined value</b> option is selected.</li> </ul>
<b>Description</b>	Use this function to enter the measured value to be used if no data are recorded within the maximum permitted interval.
<b>User entry</b>	Signed floating-point number
<b>Factory setting</b>	0

**"Input" submenu****Navigation**
 Expert → Communication → HART input → Input
**Value****Navigation**
 Expert → Communication → HART input → Input → Value
**Description**

Displays the value of the device variable recorded by the HART input.

**User interface**

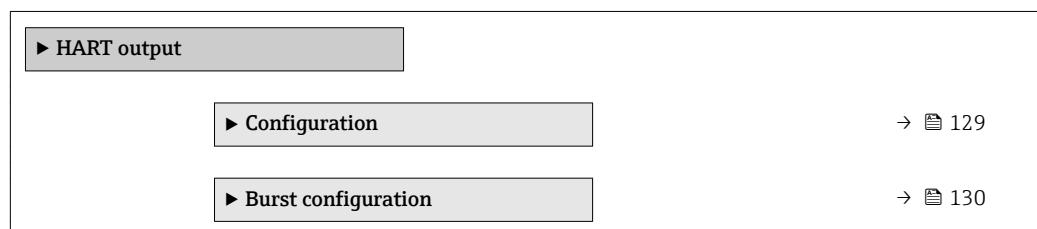
0 to 99 999.9999 °C

**Additional information***Dependency*
 The unit is taken from the **Temperature unit** parameter (→ [56](#))
**Status****Navigation**
 Expert → Communication → HART input → Input → Status
**Description**

Displays the value of the device variable recorded by the HART input in accordance with the HART specification.

**User interface**

- Manual/Fixed
- Good
- Poor accuracy
- Bad

**3.4.2 "HART output" submenu****Navigation**
 Expert → Communication → HART output


► Information → 137

► Output → 140

### "Configuration" submenu

#### *Navigation*

Expert → Communication → HART output → Configuration

► Configuration

HART short tag → 129

Device tag → 129

HART address → 130

No. of preambles → 130

## HART short tag



#### **Navigation**

Expert → Communication → HART output → Configuration → HART short tag

#### **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**

PROMASS

## Device tag



#### **Navigation**

Expert → Communication → HART output → Configuration → Device tag

#### **Description**

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

#### **User entry**

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

#### **Factory setting**

Promass

**HART address****Navigation**

Expert → Communication → HART output → Configuration → HART address

**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

**Description**

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

**User entry**

2 to 20

**Factory setting**

5

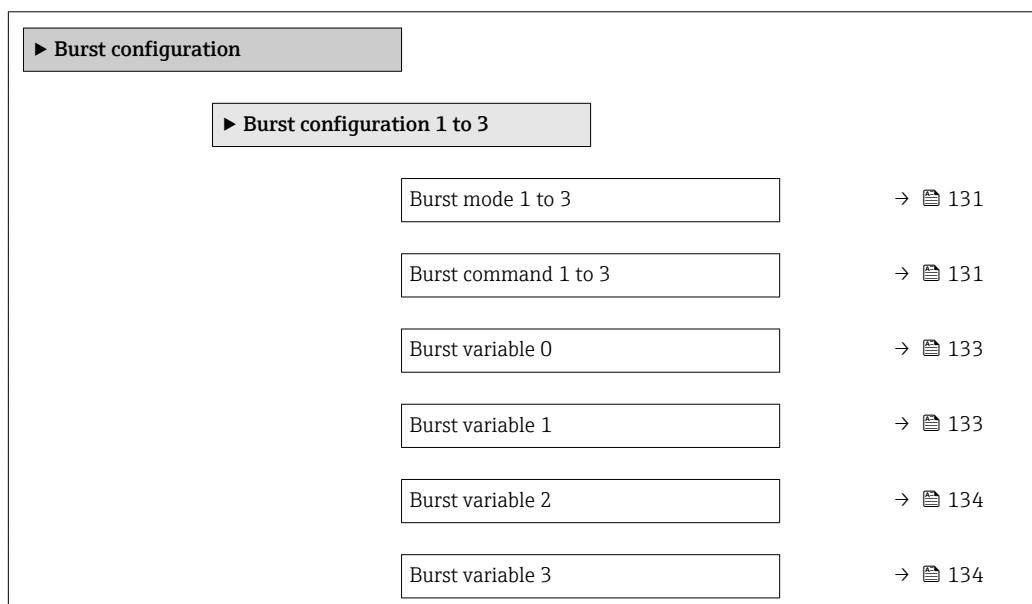
**Additional information**

*User entry*

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

**"Burst configuration" submenu****Navigation**

Expert → Communication → HART output → Burst config.  
→ Burst config. 1 to 3



Burst variable 4	→ <a href="#">134</a>
Burst variable 5	→ <a href="#">134</a>
Burst variable 6	→ <a href="#">135</a>
Burst variable 7	→ <a href="#">135</a>
Burst trigger mode	→ <a href="#">135</a>
Burst trigger level	→ <a href="#">136</a>
Min. update period	→ <a href="#">136</a>
Max. update period	→ <a href="#">137</a>

**Burst mode 1 to 3****Navigation**

Expert → Communication → HART output → Burst config. → Burst config. 1 to 3  
→ Burst mode 1 to 3

**Description**

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

**Selection**

- Off
- On

**Factory setting**

Off

**Additional information***Options*

- Off  
The measuring device transmits data only when requested by the HART master.
- On  
The measuring device transmits data regularly without being requested.

**Burst command 1 to 3****Navigation**

Expert → Communication → HART output → Burst config. → Burst config. 1 to 3  
→ Burst command 1 to 3

**Description**

Use this function to select the HART command that is sent to the HART master.

**Selection**

- Command 1
- Command 2
- Command 3
- Command 9
- Command 33
- Command 48

**Factory setting** Command 2

**Additional information** *Selection*

- Command 1  
Read out the primary variable.
- Command 2  
Read out the current and the main measured value as a percentage.
- Command 3  
Read out the dynamic HART variables and the current.
- Command 9  
Read out the dynamic HART variables including the related status.
- Command 33  
Read out the dynamic HART variables including the related unit.
- Command 48  
Read out the complete device diagnostics.

*"Command 33" option*

The HART device variables are defined via Command 107.

The following measured variables (HART device variables) can be read out:

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*
- Density
- Reference density \*
- Concentration \*
- Temperature
- Totalizer 1...3
- Pressure
- HART input
- Percent Of Range
- Measured current
- Primary variable (PV)
- Secondary variable (SV)
- Tertiary variable (TV)
- Quaternary variable (QV)

 Detailed description of the options **Oscillation frequency**, **Oscillation amplitude**, **Oscillation damping** and **Signal asymmetry: Value 1 display** parameter (→ 16)

*Commands*

 Information about the defined details of the command: HART specifications

 The measured variables (HART device variables) are assigned to the dynamic variables in the **Output** submenu (→ 87).

\* Visibility depends on order options or device settings

**Burst variable 0**

<b>Navigation</b>	Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Burst variable 0
<b>Description</b>	For HART command 9 and 33: select the HART device variable or the process variable.
<b>Selection</b>	<ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Volume flow</li> <li>■ Corrected volume flow</li> <li>■ Target mass flow <sup>*</sup></li> <li>■ Carrier mass flow</li> <li>■ Density</li> <li>■ Reference density <sup>*</sup></li> <li>■ Concentration <sup>*</sup></li> <li>■ Temperature</li> <li>■ Totalizer 1</li> <li>■ Totalizer 2</li> <li>■ Totalizer 3</li> <li>■ Pressure</li> <li>■ HART input</li> <li>■ Percent Of Range</li> <li>■ Measured current</li> <li>■ Primary variable (PV)</li> <li>■ Secondary variable (SV)</li> <li>■ Tertiary variable (TV)</li> <li>■ Quaternary variable (QV)</li> <li>■ Not used</li> </ul>
<b>Factory setting</b>	Volume flow
<b>Additional information</b>	<p><i>Selection</i></p> Detailed description of the options <b>Oscillation frequency</b> , <b>Oscillation amplitude</b> , <b>Oscillation damping</b> and <b>Signal asymmetry</b> : Value 1 display parameter (→  16)

**Burst variable 1**

<b>Navigation</b>	Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Burst variable 1
<b>Description</b>	For HART command 9 and 33: select the HART device variable or the process variable.
<b>Selection</b>	See the <b>Burst variable 0</b> parameter (→  133).
<b>Factory setting</b>	Not used

\* Visibility depends on order options or device settings

**Burst variable 2**

<b>Navigation</b>	Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Burst variable 2
<b>Description</b>	For HART command 9 and 33: select the HART device variable or the process variable.
<b>Selection</b>	See the <b>Burst variable 0</b> parameter (→  133).

**Burst variable 3**

<b>Navigation</b>	Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Burst variable 3
<b>Description</b>	For HART command 9 and 33: select the HART device variable or the process variable.
<b>Selection</b>	See the <b>Burst variable 0</b> parameter (→  133).
<b>Factory setting</b>	Not used

**Burst variable 4**

<b>Navigation</b>	Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Burst variable 4
<b>Description</b>	For HART command 33: select the HART device variable or the process variable.
<b>Selection</b>	See the <b>Burst variable 0</b> parameter (→  133).
<b>Factory setting</b>	Not used

**Burst variable 5**

<b>Navigation</b>	Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Burst variable 5
<b>Description</b>	For HART command 33: select the HART device variable or the process variable.
<b>Selection</b>	See the <b>Burst variable 0</b> parameter (→  133).
<b>Factory setting</b>	Not used

**Burst variable 6**

<b>Navigation</b>	Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Burst variable 6
<b>Description</b>	For HART command 33: select the HART device variable or the process variable.
<b>Selection</b>	See the <b>Burst variable 0</b> parameter (→  133).

**Burst variable 7**

<b>Navigation</b>	Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Burst variable 7
<b>Description</b>	For HART command 33: select the HART device variable or the process variable.
<b>Selection</b>	See the <b>Burst variable 0</b> parameter (→  133).
<b>Factory setting</b>	Not used

**Burst trigger mode**

<b>Navigation</b>	Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Trigger mode
<b>Description</b>	Use this function to select the event that triggers burst message X.
<b>Selection</b>	<ul style="list-style-type: none"><li>■ Continuous</li><li>■ Window</li><li>■ Rising</li><li>■ Falling</li><li>■ On change</li></ul>
<b>Factory setting</b>	Continuous

**Additional information***Options*

- Continuous  
The message is sent continuously, at least at intervals corresponding to the time frame specified in the **Burst min period** parameter (→ 136).
- Window  
The message is sent if the specified measured value has changed by the value in the **Burst trigger level** parameter (→ 136).
- Rising  
The message is sent if the specified measured value exceeds the value in the **Burst trigger level** parameter (→ 136).
- Falling  
The message is sent if the specified measured value drops below the value in the **Burst trigger level** parameter (→ 136).
- On change  
The message is sent if a measured value changes in the burst message.

---

**Burst trigger level**

---

**Navigation**

Expert → Communication → HART output → Burst config. → Burst config. 1 to 3  
→ Trigger level

**Description**

For entering the burst trigger value.

**User entry**

Positive floating-point number

**Additional information***Description*

Together with the option selected in the **Burst trigger mode** parameter (→ 135) the burst trigger value determines the time of burst message X.

---

**Min. update period**

---

**Navigation**

Expert → Communication → HART output → Burst config. → Burst config. 1 to 3  
→ Min. upd. per.

**Description**

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

**User entry**

Positive integer

**Factory setting**

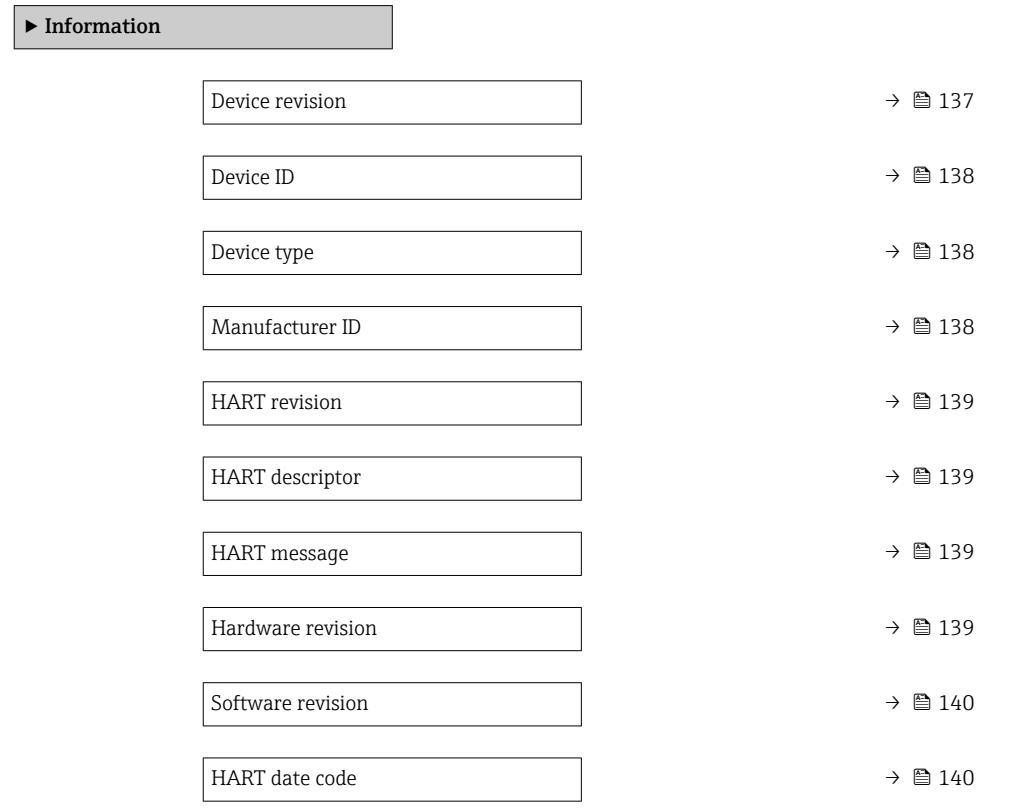
1 000 ms

**Max. update period**

<b>Navigation</b>	 Expert → Communication → HART output → Burst config. → Burst config. 1 to 3 → Max. upd. per.
<b>Description</b>	Use this function to enter the maximum time span between two burst commands of burst message X.
<b>User entry</b>	Positive integer
<b>Factory setting</b>	2 000 ms

**"Information" submenu**

*Navigation*       Expert → Communication → HART output → Information



Item	Page Number
Device revision	→ 137
Device ID	→ 138
Device type	→ 138
Manufacturer ID	→ 138
HART revision	→ 139
HART descriptor	→ 139
HART message	→ 139
Hardware revision	→ 139
Software revision	→ 140
HART date code	→ 140

**Device revision**

<b>Navigation</b>	 Expert → Communication → HART output → Information → Device revision
<b>Description</b>	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** 2

**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

**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

**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** 0x4A (for Promass 100)

**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

**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

**Description** Use this function to display the HART protocol revision of the measuring device.

**User interface** 5 to 7

**Factory setting** 7

---

#### HART descriptor

---

**Navigation**  Expert → Communication → HART output → Information → HART descriptor

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

**User entry** Max. 16 characters such as letters, numbers or special characters (e.g. @, %, /)

**Factory setting** Promass 100

---

#### HART message

---

**Navigation**  Expert → Communication → HART output → Information → HART message

**Description** Use this function to enter a HART message which is sent via the HART protocol when requested by the master.

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

**Factory setting** Promass 100

---

#### Hardware revision

---

**Navigation**  Expert → Communication → HART output → Information → Hardware rev.

**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.

**Description** Displays the software revision of the measuring device.

**User interface** 0 to 255

**Factory setting** 2

**HART date code**

**Navigation**  Expert → Communication → HART output → Information → HART date code

**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

 Output	
Assign PV	→  141
Primary variable (PV)	→  141
Assign SV	→  142
Secondary variable (SV)	→  142
Assign TV	→  142
Tertiary variable (TV)	→  143
Assign QV	→  143
Quaternary variable (QV)	→  144

**Assign PV****Navigation**

Expert → Communication → HART output → Output → Assign PV

**Description**

Use this function to select a measured variable (HART device variable) for the primary dynamic variable (PV).

**Selection**

- Off
- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*
- Density
- Reference density \*
- Concentration \*
- Temperature
- Carrier pipe temperature \*
- Electronic temperature
- Oscillation frequency 0
- Oscillation amplitude 0 \*
- Frequency fluctuation 0
- Oscillation damping 0
- Tube damping fluctuation 0
- Signal asymmetry
- Exciter current 0

**Additional information***Selection*

Detailed description of the options **Oscillation frequency**, **Oscillation amplitude**, **Oscillation damping** and **Signal asymmetry**: Value 1 display parameter (→ 16)

**Primary variable (PV)****Navigation**

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

**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 (→ 141).

*Dependency*

The unit of the displayed measured value is taken from the **System units** submenu (→ 49).

\* Visibility depends on order options or device settings

**Assign SV****Navigation**

Expert → Communication → HART output → Output → Assign SV

**Description**

Use this function to select a measured variable (HART device variable) for the secondary dynamic variable (SV).

**Selection**

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*
- Density
- Reference density
- Concentration \*
- Temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3

**Secondary variable (SV)****Navigation**

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

**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 (→ 142).

*Dependency*

The unit of the displayed measured value is taken from the **System units** submenu (→ 49).

**Assign TV****Navigation**

Expert → Communication → HART output → Output → Assign TV

**Description**

Use this function to select a measured variable (HART device variable) for the tertiary (third) dynamic variable (TV).

**Selection**

- Mass flow
- Volume flow
- Corrected volume flow

\* Visibility depends on order options or device settings

- Target mass flow <sup>\*</sup>
- Carrier mass flow <sup>\*</sup>
- Density
- Reference density
- Concentration <sup>\*</sup>
- Temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3

---

### Tertiary variable (TV)

---

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

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

**User interface** Positive floating-point number

**Additional information** *User interface*

The measured value displayed depends on the process variable selected in the **Assign TV** parameter (→  142).

*Dependency*

 The unit of the displayed measured value is taken from the **System units** submenu (→  49).

---

### Assign QV

---



**Navigation**  Expert → Communication → HART output → Output → Assign QV

**Description** Use this function to select a measured variable (HART device variable) for the quaternary (fourth) dynamic variable (QV).

**Selection**

- Mass flow
- Volume flow
- Corrected volume flow
- Target mass flow <sup>\*</sup>
- Carrier mass flow <sup>\*</sup>
- Density
- Reference density <sup>\*</sup>
- Concentration <sup>\*</sup>
- Temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3

---

\* Visibility depends on order options or device settings

---

**Quaternary variable (QV)**


---

**Navigation**  Expert → Communication → HART output → Output → Quatern.var(QV)

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

**User interface** 0 to 99 999.9999 °C

**Additional information** *User interface*

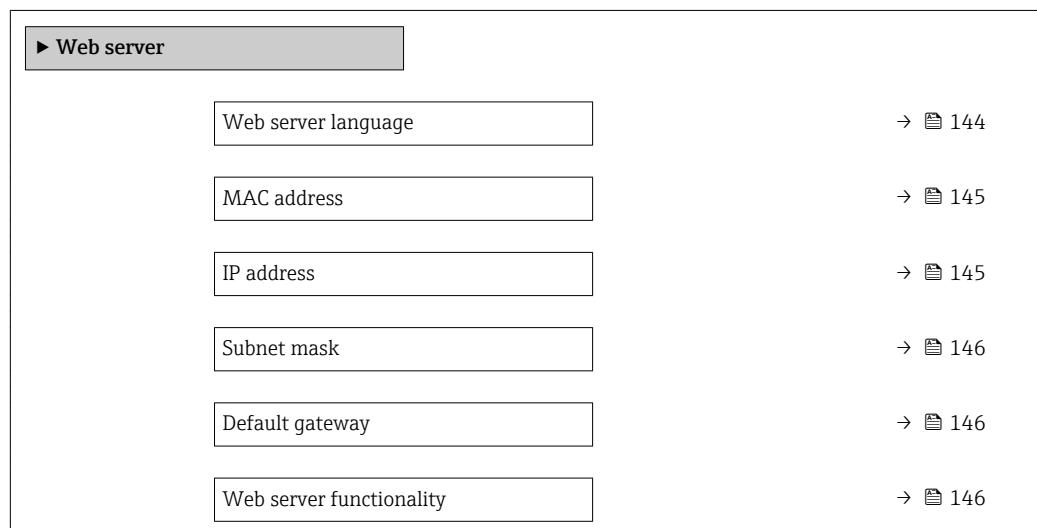
The measured value displayed depends on the process variable selected in the **Assign QV** parameter (→  143).

*Dependency*

 The unit of the displayed measured value is taken from the **System units** submenu (→  49).

### 3.4.3 "Web server" submenu

**Navigation**  Expert → Communication → Web server




---

**Web server language**


---

**Navigation**  Expert → Communication → Web server → Webserv.language

**Description** Use this function to select the web server language setting.

---

<b>Selection</b>	<ul style="list-style-type: none"> <li>■ English *</li> <li>■ Deutsch *</li> <li>■ Français *</li> <li>■ Español *</li> <li>■ Italiano</li> <li>■ Nederlands *</li> <li>■ Portuguesa *</li> <li>■ Polski *</li> <li>■ русский язык (Russian) *</li> <li>■ Svenska *</li> <li>■ Türkçe *</li> <li>■ 中文 (Chinese) *</li> <li>■ 日本語 (Japanese) *</li> <li>■ 한국어 (Korean) *</li> <li>■ العربية (Arabic) *</li> <li>■ Bahasa Indonesia *</li> <li>■ ภาษาไทย (Thai) *</li> <li>■ tiếng Việt (Vietnamese) *</li> <li>■ čeština (Czech) *</li> </ul>
<b>Factory setting</b>	English

---

## MAC address

---

<b>Navigation</b>	  Expert → Communication → Web server → MAC Address
<b>Description</b>	Displays the MAC <sup>1)</sup> address of the measuring device.
<b>User interface</b>	Unique 12-digit character string comprising letters and numbers
<b>Factory setting</b>	Each measuring device is given an individual address.
<b>Additional information</b>	<p><i>Example</i></p> <p>For the display format 00:07:05:10:01:5F</p>

---

## IP address

---

<b>Navigation</b>	  Expert → Communication → Web server → IP address
<b>Description</b>	Displays the IP address of the Web server of the measuring device.
<b>User interface</b>	4 octet: 0 to 255 (in the particular octet)
<b>Factory setting</b>	192.168.1.212

---

\* Visibility depends on order options or device settings  
1) Media Access Control

**Subnet mask**

**Navigation** Expert → Communication → Web server → Subnet mask

**Description** Displays the subnet mask.

**User interface** 4 octet: 0 to 255 (in the particular octet)

**Factory setting** 255.255.255.0

**Default gateway**

**Navigation** Expert → Communication → Web server → Default gateway

**Description** Displays the default gateway.

**User interface** 4 octet: 0 to 255 (in the particular octet)

**Factory setting** 0.0.0.0

**Web server functionality**

**Navigation** Expert → Communication → Web server → Webserver funct.

**Description** Use this function to switch the Web server on and off.

**Selection**  
■ Off  
■ On

**Factory setting** On

### 3.4.4 "Diagnostic configuration" submenu

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

 Assign a category to the particular diagnostic event:

▪ **Failure (F)** option

A device error has occurred. The measured value is no longer valid.

▪ **Function check (C)** option

The device is in service mode (e.g. during a simulation).

▪ **Out of specification (S)** option

The device is being operated:

- Outside its technical specification limits (e.g. outside the process temperature range)

- Outside of the configuration carried out by the user (e.g. maximum flow in parameter 20 mA value)

▪ **Maintenance required (M)** option

Maintenance is required. The measured value is still valid.

▪ **No effect (N)** option

Has no effect on the condensed status.

Navigation



Expert → Communication → Diag. config.

► Diagnostic configuration	
Event category 046	→  148
Event category 140	→  148
Event category 274	→  148
Event category 441	→  149
Event category 442	→  149
Event category 443	→  149
Event category 832	→  150
Event category 830	→  150
Event category 831	→  151
Event category 833	→  151
Event category 834	→  151
Event category 835	→  152
Event category 862	→  152
Event category 912	→  153
Event category 913	→  153

**Event category 046 (Sensor limit exceeded)****Navigation**

Expert → Communication → Diag. config. → Event category 046

**Description**

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

**Selection**

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

**Factory setting**

Out of specification (S)

**Additional information**

For a detailed description of the options available for selection: → [147](#)

**Event category 140 (Sensor signal)****Navigation**

Expert → Communication → Diag. config. → Event category 140

**Description**

Use this function to select a category for the diagnostic message **140 Sensor signal**.

**Selection**

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

**Factory setting**

Out of specification (S)

**Additional information**

For a detailed description of the options available for selection: → [147](#)

**Event category 274 (Main electronic failure)****Navigation**

Expert → Communication → Diag. config. → Event category 274

**Description**

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

**Selection**

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

**Factory setting**

Out of specification (S)

**Additional information**For a detailed description of the options available for selection: → [147](#)**Event category 441 (Current output 1)****Navigation**

Expert → Communication → Diag. config. → Event category 441

**Description**Use this function to select the category assigned to diagnostic message **441 Current output 1**.**Selection**

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

**Factory setting**

Out of specification (S)

**Additional information**For a detailed description of the options available for selection: → [147](#)**Event category 442 (Frequency output)****Navigation**

Expert → Communication → Diag. config. → Event category 442

**Prerequisite**

The pulse/frequency/switch output is available.

**Description**Use this function to select the category assigned to diagnostic message **442 Frequency output**.**Selection**

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

**Factory setting**

Out of specification (S)

**Additional information**For a detailed description of the options available for selection: → [147](#)**Event category 443 (Pulse output)****Navigation**

Expert → Communication → Diag. config. → Event category 443

**Prerequisite**

The pulse/frequency/switch output is available.

**Description**Use this function to select the category assigned to diagnostic message **443 Pulse output**.

**Selection**

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

**Factory setting**

Out of specification (S)

**Additional information**

 For a detailed description of the options available for selection: → [147](#)

---

**Event category 832 (Electronic temperature too high)****Navigation**

 Expert → Communication → Diag. config. → Event category 832

**Description**

Use this function to select the category assigned to diagnostic message **832 Electronic temperature too high**.

**Selection**

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

**Factory setting**

Out of specification (S)

**Additional information**

 For a detailed description of the options available for selection: → [147](#)

---

**Event category 830 (Sensor temperature too high)****Navigation**

 Expert → Communication → Diag. config. → Event category 830

**Prerequisite**

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

**Description**

Use this function to assign a category to the diagnostic message **830 Sensor temperature too high**.

**Selection**

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

**Factory setting**

Out of specification (S)

**Additional information**

 For a detailed description of the options available for selection: → [147](#)

---

**Event category 831 (Sensor temperature too low)**

---

**Navigation**

Expert → Communication → Diag. config. → Event category 831

**Prerequisite**

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

**Description**

Use this function to assign a category to the diagnostic message **831 Sensor temperature too low**.

**Selection**

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

**Factory setting**

Out of specification (S)

**Additional information**

For a detailed description of the options available for selection: → [147](#)

---

**Event category 833 (Electronic temperature too low)**

---

**Navigation**

Expert → Communication → Diag. config. → Event category 833

**Description**

Use this function to select the category assigned to diagnostic message **833 Electronic temperature too low**.

**Selection**

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

**Factory setting**

Out of specification (S)

**Additional information**

For a detailed description of the options available for selection: → [147](#)

---

**Event category 834 (Process temperature too high)**

---

**Navigation**

Expert → Communication → Diag. config. → Event category 834

**Description**

Use this function to select a category for the diagnostic message **834 Process temperature too high**.

**Selection**

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

**Factory setting**

Out of specification (S)

**Additional information**

 For a detailed description of the options available for selection: → [147](#)

---

**Event category 835 (Process temperature too low)****Navigation**

 Expert → Communication → Diag. config. → Event category 835

**Description**

Use this function to select a category for the diagnostic message **835 Process temperature too low**.

**Selection**

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

**Factory setting**

Out of specification (S)

**Additional information**

 For a detailed description of the options available for selection: → [147](#)

---

**Event category 862 (Empty pipe)****Navigation**

 Expert → Communication → Diag. config. → Event category 862

**Description**

Use this function to select the category assigned to diagnostic message **862 Empty pipe**.

**Selection**

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

**Factory setting**

Out of specification (S)

**Additional information**

 For a detailed description of the options available for selection: → [147](#)

**Event category 912 (Medium inhomogeneous)****Navigation**

Expert → Communication → Diag. config. → Event category 912

**Description**

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

**Selection**

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

**Factory setting**

Out of specification (S)

**Additional information**

For a detailed description of the options available for selection: → [147](#)

**Event category 913 (Medium unsuitable)****Navigation**

Expert → Communication → Diag. config. → Event category 913

**Description**

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

**Selection**

- Failure (F)
- Function check (C)
- Out of specification (S)
- Maintenance required (M)
- No effect (N)

**Factory setting**

Out of specification (S)

**Additional information**

For a detailed description of the options available for selection: → [147](#)

### 3.5 "Application" submenu

*Navigation*

Expert → Application

<b>Application</b>	
Reset all totalizers	→ <a href="#">154</a>
<b>Totalizer 1 to 3</b>	→ <a href="#">154</a>
<b>Concentration</b>	→ <a href="#">159</a>

## Reset all totalizers

<b>Navigation</b>	Expert → Application → Reset all tot.
<b>Description</b>	Use this function to reset all totalizers to the value <b>0</b> and restart the totaling process. This deletes all the flow values previously totalized.
<b>Selection</b>	<ul style="list-style-type: none"> <li>■ Cancel</li> <li>■ Reset + totalize</li> </ul>
<b>Factory setting</b>	Cancel
<b>Additional information</b>	<p><i>Selection</i></p> <ul style="list-style-type: none"> <li>■ Cancel No action is executed and the user exits the parameter.</li> <li>■ Reset + totalize All totalizers are reset to 0 and the totaling process is restarted.</li> </ul>

### 3.5.1 "Totalizer 1 to 3" submenu

*Navigation* Expert → Application → Totalizer 1 to 3

► Totalizer 1 to 3	
Assign process variable	→  154
Unit totalizer	→  155
Totalizer operation mode	→  156
Control Totalizer 1 to 3	→  157
Preset value 1 to 3	→  158
Failure mode	→  158

## Assign process variable



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

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

<b>Selection</b>	<ul style="list-style-type: none"> <li>■ Off</li> <li>■ Volume flow</li> <li>■ Mass flow</li> </ul>
------------------	---

	<ul style="list-style-type: none"> <li>■ Corrected volume flow *</li> <li>■ Target mass flow *</li> <li>■ Carrier mass flow *</li> </ul>
<b>Factory setting</b>	Mass flow
<b>Additional information</b>	<p><i>Description</i></p> <p> If the option selected is changed, the device resets the totalizer to 0.</p>
	<p><i>Selection</i></p> <p>If the <b>Off</b> option is selected, only <b>Assign process variable</b> parameter (→ 154) is still displayed in the <b>Totalizer 1 to 3</b> submenu. All other parameters in the submenu are hidden.</p>

---

**Unit totalizer**

**Navigation**  Expert → Application → Totalizer 1 to 3 → Unit totalizer

**Prerequisite** One of the following options is selected in the **Assign process variable** parameter (→ 154) of the **Totalizer 1 to 3** submenu:

- Volume flow
- Mass flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*

**Description** Use this function to select the unit for the process variable of totalizer 1-3.

<b>Selection</b>	<i>SI units</i>	<i>US units</i>
	<ul style="list-style-type: none"> <li>■ g</li> <li>■ kg</li> <li>■ t</li> </ul>	<ul style="list-style-type: none"> <li>■ oz</li> <li>■ lb</li> <li>■ STon</li> </ul>

*Custom-specific units*  
User mass

or

---

\* Visibility depends on order options or device settings

*SI units*

- cm<sup>3</sup>
- dm<sup>3</sup>
- m<sup>3</sup>
- ml
- l
- hl
- Ml Mega

*US units*

- af
- ft<sup>3</sup>
- fl oz (us)
- gal (us)
- kgal (us)
- Mgal (us)
- bbl (us;liq.)
- bbl (us;beer)
- bbl (us;oil)
- bbl (us;tank)

*Imperial units*

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

*Custom-specific units*  
User vol.

or

*SI units*

- NI
- Nm<sup>3</sup>
- Sl
- Sm<sup>3</sup>

*US units*

- Sft<sup>3</sup>
- Sgal (us)
- Sbbl (us;liq.)

*Imperial units*  
Sgal (imp)

*Custom-specific units*  
UserCrVol.

#### Factory setting

Country-specific:

- kg
- lb

#### Additional information

##### Description

 The unit is selected separately for each totalizer. The unit is independent of the option selected in the **System units** submenu (→ 49).

##### Selection

The selection depends on the process variable selected in the **Assign process variable** parameter (→ 154).

## Totalizer operation mode



#### Navigation

 Expert → Application → Totalizer 1 to 3 → Operation mode

#### Prerequisite

One of the following options is selected in the **Assign process variable** parameter (→ 154) of the **Totalizer 1 to 3** submenu:

- Volume flow
- Mass flow
- Corrected volume flow
- Target mass flow \*
- Carrier mass flow \*

#### Description

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

\* Visibility depends on order options or device settings

---

<b>Selection</b>	<ul style="list-style-type: none"> <li>■ Net flow total</li> <li>■ Forward flow total</li> <li>■ Reverse flow total</li> </ul>
<b>Factory setting</b>	Net flow total
<b>Additional information</b>	<p><i>Selection</i></p> <ul style="list-style-type: none"> <li>■ Net flow total Positive and negative flow values are totalized and balanced against one another. Net flow is registered in the flow direction.</li> <li>■ Forward flow total Only the flow in the forward flow direction is totalized.</li> <li>■ Reverse flow total Only the flow against the forward flow direction is totalized (= reverse flow total).</li> </ul>

---

## Control Totalizer 1 to 3

---

<b>Navigation</b>	 Expert → Application → Totalizer 1 to 3 → Control Tot. 1 to 3
<b>Prerequisite</b>	One of the following options is selected in the <b>Assign process variable</b> parameter (→ <a href="#">154</a> ) of the <b>Totalizer 1 to 3</b> submenu: <ul style="list-style-type: none"> <li>■ Volume flow</li> <li>■ Mass flow</li> <li>■ Corrected volume flow</li> <li>■ Target mass flow <sup>*</sup></li> <li>■ Carrier mass flow <sup>*</sup></li> </ul>
<b>Description</b>	Use this function to select the control of totalizer value 1-3.
<b>Selection</b>	<ul style="list-style-type: none"> <li>■ Totalize</li> <li>■ Reset + hold</li> <li>■ Preset + hold</li> <li>■ Reset + totalize</li> <li>■ Preset + totalize</li> </ul>
<b>Factory setting</b>	Totalize
<b>Additional information</b>	<p><i>Selection</i></p> <ul style="list-style-type: none"> <li>■ Totalize The totalizer is started or continues totalizing with the current counter reading.</li> <li>■ Reset + hold The totaling process is stopped and the totalizer is reset to 0.</li> <li>■ Preset + hold The totaling process is stopped and the totalizer is set to its defined start value from the <b>Preset value</b> parameter (→ <a href="#">158</a>).</li> <li>■ Reset + totalize The totalizer is reset to 0 and the totaling process is restarted.</li> <li>■ Preset + totalize The totalizer is set to the defined start value in <b>Preset value</b> parameter (→ <a href="#">158</a>) and the totaling process is restarted.</li> </ul>

---

\* Visibility depends on order options or device settings

---

**Preset value 1 to 3**

---

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

One of the following options is selected in the **Assign process variable** parameter (→  154) of the **Totalizer 1 to 3** submenu:

- Volume flow
- Mass flow
- Corrected volume flow
- Target mass flow <sup>\*</sup>
- Carrier mass flow <sup>\*</sup>

**Description**

Use this function to enter a start value for totalizer 1-3.

**User entry**

Signed floating-point number

**Factory setting**

Country-specific:

- 0 kg
- 0 lb

**Additional information**

*User entry*

 The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→  155).

*Example*

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

---

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

One of the following options is selected in the **Assign process variable** parameter (→  154) of the **Totalizer 1 to 3** submenu:

- Volume flow
- Mass flow
- Corrected volume flow
- Target mass flow <sup>\*</sup>
- Carrier mass flow <sup>\*</sup>

**Description**

Use this function to select how a totalizer behaves in an alarm condition.

**Selection**

- Stop
- Actual value
- Last valid value

**Factory setting**

Stop

---

\* Visibility depends on order options or device settings

**Additional information***Description*

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

*Selection*

## ■ Stop

Totalizing is stopped in an alarm condition.

## ■ Actual value

The totalizer continues to count based on the actual measured value; the error is ignored.

## ■ Last valid value

The totalizer continues to count based on the last valid measured value before the error occurred.

**3.5.2 "Concentration" submenu**

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

*Navigation*

Expert → Application → Concentration

► Concentration

**3.6 "Diagnostics" submenu***Navigation*

Expert → Diagnostics

► Diagnostics

Actual diagnostics

→ 160

Previous diagnostics

→ 161

Operating time from restart

→ 161

Operating time

→ 162

► Diagnostic list

→ 162

► Event logbook

→ 166

► Device information

→ 168

► Min/max values

→ 172

► Heartbeat	→  178
► Simulation	→  178

---

## Actual diagnostics

---

**Navigation** Expert → Diagnostics → Actual diagnos.

**Prerequisite** A diagnostic event has occurred.

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

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

**Additional information** *User interface*

Additional pending diagnostic messages can be displayed in the **Diagnostic list** submenu (→ 162).

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

*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** *User interface*

The diagnostic message can be displayed via the **Actual diagnostics** parameter (→ 160).

*Example*

For the display format:

24d12h13m00s

---

## Previous diagnostics

---

<b>Navigation</b>	 Expert → Diagnostics → Prev.diagnostics
<b>Prerequisite</b>	Two diagnostic events have already occurred.
<b>Description</b>	Displays the diagnostic message that occurred before the current message.
<b>User interface</b>	Symbol for diagnostic behavior, diagnostic code and short message.
<b>Additional information</b>	<i>User interface</i>  Information on what is causing the diagnostic message, and remedy measures, can be viewed by pressing the  -button.  <i>Example</i> For the display format:  F271 Main electronic failure

---

## Timestamp

---

<b>Navigation</b>	 Expert → Diagnostics → Timestamp
<b>Description</b>	Displays the operating time when the last diagnostic message before the current message occurred.
<b>User interface</b>	Days (d), hours (h), minutes (m) and seconds (s)
<b>Additional information</b>	<i>User interface</i>  The diagnostic message can be displayed via the <b>Previous diagnostics</b> parameter (→  161).  <i>Example</i> For the display format: 24d12h13m00s

---

## Operating time from restart

---

<b>Navigation</b>	 Expert → Diagnostics → Time fr. restart
<b>Description</b>	Use this function to display the time the device has been in operation since the last device restart.
<b>User interface</b>	Days (d), hours (h), minutes (m) and seconds (s)

---

## Operating time

---

**Navigation**  Expert → Diagnostics → Operating time

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

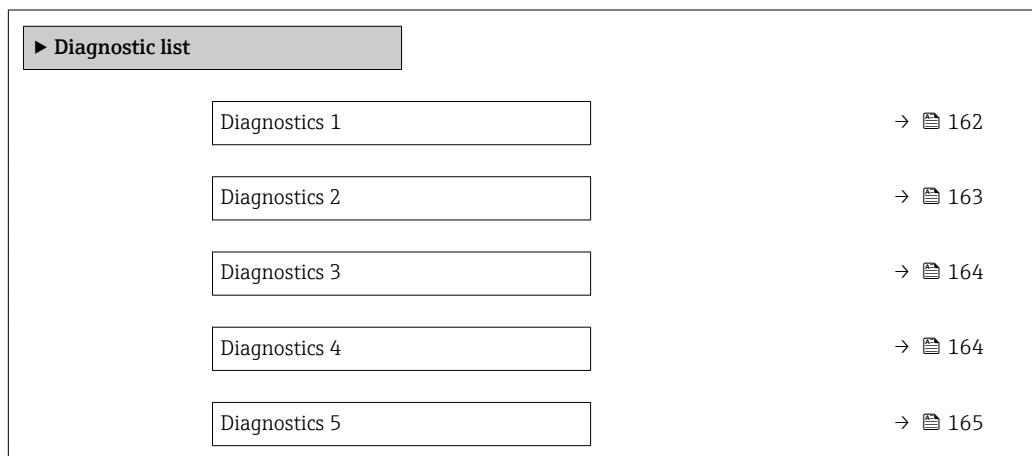
**User interface** Days (d), hours (h), minutes (m) and seconds (s)

**Additional information** *User interface*

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

### 3.6.1 "Diagnostic list" submenu

*Navigation*  Expert → Diagnostics → Diagnostic list



---

## Diagnostics 1

---

**Navigation**  Expert → Diagnostics → Diagnostic list → Diagnostics 1

**Description** Use this function to display the current diagnostics message with the highest priority.

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

**Additional information** *Examples*

For the display format:

-  F271 Main electronic failure
-  F276 I/O module failure

---

**Timestamp**

---

**Navigation**

Expert → Diagnostics → Diagnostic list → Timestamp

**Description**

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

**User interface**

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

**Additional information**

*User interface*

 The diagnostic message can be displayed via the **Diagnostics 1** parameter (→  162).

*Example*

For the display format:

24d12h13m00s

---

**Diagnostics 2**

---

**Navigation**

Expert → Diagnostics → Diagnostic list → Diagnostics 2

**Description**

Use this function to display the current diagnostics message with the second-highest priority.

**User interface**

Symbol for diagnostic behavior, diagnostic code and short message.

**Additional information**

*Examples*

For the display format:

-  F271 Main electronic failure
-  F276 I/O module failure

---

**Timestamp**

---

**Navigation**

Expert → Diagnostics → Diagnostic list → Timestamp

**Description**

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

**User interface**

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

**Additional information**

*User interface*

 The diagnostic message can be displayed via the **Diagnostics 2** parameter (→  163).

*Example*

For the display format:

24d12h13m00s

---

## Diagnostics 3

---

<b>Navigation</b>	  Expert → Diagnostics → Diagnostic list → Diagnostics 3
<b>Description</b>	Use this function to display the current diagnostics message with the third-highest priority.
<b>User interface</b>	Symbol for diagnostic behavior, diagnostic code and short message.
<b>Additional information</b>	<i>Examples</i> For the display format: <ul style="list-style-type: none"><li>▪  F271 Main electronic failure</li><li>▪  F276 I/O module failure</li></ul>

---

## Timestamp

---

<b>Navigation</b>	 Expert → Diagnostics → Diagnostic list → Timestamp
<b>Description</b>	Displays the operating time when the diagnostic message with the third-highest priority occurred.
<b>User interface</b>	Days (d), hours (h), minutes (m) and seconds (s)
<b>Additional information</b>	<i>User interface</i>  The diagnostic message can be displayed via the <b>Diagnostics 3</b> parameter (→  164).  <i>Example</i> For the display format: 24d12h13m00s

---

## Diagnostics 4

---

<b>Navigation</b>	  Expert → Diagnostics → Diagnostic list → Diagnostics 4
<b>Description</b>	Use this function to display the current diagnostics message with the fourth-highest priority.
<b>User interface</b>	Symbol for diagnostic behavior, diagnostic code and short message.
<b>Additional information</b>	<i>Examples</i> For the display format: <ul style="list-style-type: none"><li>▪  F271 Main electronic failure</li><li>▪  F276 I/O module failure</li></ul>

---

**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**

*User interface*

 The diagnostic message can be displayed via the **Diagnostics 4** parameter (→  164).

*Example*

For the display format:

24d12h13m00s

---

**Diagnostics 5**

---

**Navigation**

  Expert → Diagnostics → Diagnostic list → Diagnostics 5

**Description**

Use this function to display the current diagnostics message with the fifth-highest priority.

**User interface**

Symbol for diagnostic behavior, diagnostic code and short message.

**Additional information**

*Examples*

For the display format:

-  F271 Main electronic failure
-  F276 I/O module failure

---

**Timestamp**

---

**Navigation**

 Expert → Diagnostics → Diagnostic list → Timestamp

**Description**

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

**User interface**

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

**Additional information**

*User interface*

 The diagnostic message can be displayed via the **Diagnostics 5** parameter (→  165).

*Example*

For the display format:

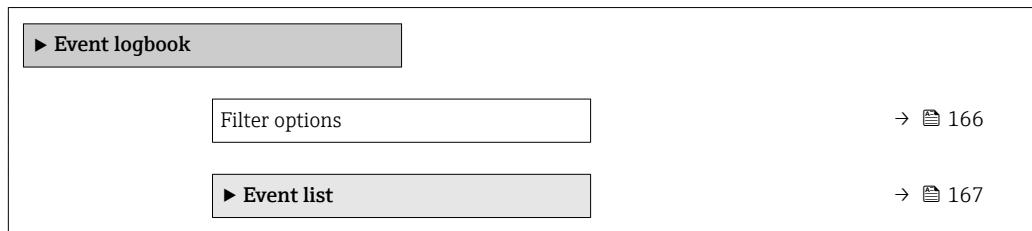
24d12h13m00s

### 3.6.2 "Event logbook" submenu

Navigation



Expert → Diagnostics → Event logbook



#### Filter options



Navigation



Expert → Diagnostics → Event logbook → Filter options

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.

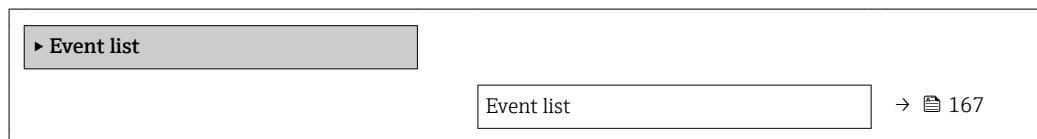
Selection

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

<b>Factory setting</b>	All
<b>Additional information</b>	<p><i>Description</i></p> <p><b>i</b> The status signals are categorized in accordance with VDI/VDE 2650 and NAMUR Recommendation NE 107:</p> <ul style="list-style-type: none"> <li>■ F = Failure</li> <li>■ C = Function Check</li> <li>■ S = Out of Specification</li> <li>■ M = Maintenance Required</li> </ul>

### "Event list" submenu

*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 (→ 166).

**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
- F271 Main electronic failure  
 01d04h12min30s

*HistoROM*

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

### 3.6.3 "Device information" submenu

Navigation

Expert → Diagnostics → Device info

► Device information	
Device tag	→ 168
Serial number	→ 169
Firmware version	→ 169
Device name	→ 169
Order code	→ 170
Extended order code 1	→ 170
Extended order code 2	→ 170
Extended order code 3	→ 171
Configuration counter	→ 171
ENP version	→ 171

---

#### Device tag

---

Navigation

Expert → Diagnostics → Device info → Device tag

Description

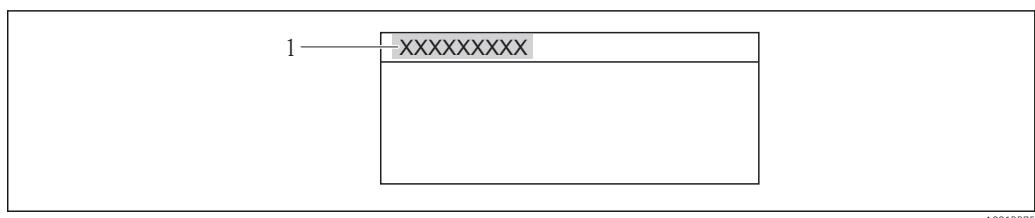
Displays a unique name for the measuring point so it can be identified quickly within the plant. The name is displayed in the header.

User interface

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

Factory setting

Promass 100

**Additional information***User interface*

A0013375

**11 Header text**

The number of characters displayed depends on the characters used.

---

**Serial number**

---

**Navigation**

Expert → Diagnostics → Device info → Serial number

**Description**

Displays the serial number of the measuring device.

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

**User interface**

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

**Additional information***Description* **Uses of the serial number**

- To identify the measuring device quickly, e.g. when contacting Endress+Hauser.
- To obtain specific information on the measuring device using the Device Viewer:  
[www.endress.com/deviceviewer](http://www.endress.com/deviceviewer)

---

**Firmware version**

---

**Navigation**

Expert → Diagnostics → Device info → Firmware version

**Description**

Displays the device firmware version installed.

**User interface**

Character string in the format xx.yy

**Factory setting**

01.01

---

**Device name**

---

**Navigation**

Expert → Diagnostics → Device info → Device name

**Description**

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

---

User interface	Promass 100
----------------	-------------

---

Order code	
------------	---

---

Navigation	  Expert → Diagnostics → Device info → Order code
------------	---

---

Description	Displays the device order code.
-------------	---------------------------------

---

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

---

Additional information	<i>Description</i>
------------------------	--------------------

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

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

 **Uses of the order code**

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

---

Extended order code 1	
-----------------------	---

---

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

---

Description	Displays the first part of the extended order code.
-------------	---

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

---

User interface	Character string
----------------	------------------

---

Additional information	<i>Description</i>
------------------------	--------------------

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

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

---

Extended order code 2	
-----------------------	---

---

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

---

Description	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 (→ 170)

---

### Extended order code 3



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

**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 (→ 170)

---

### Configuration counter

**Navigation** Expert → Diagnostics → Device info → Config. counter

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

**User interface** 0 to 65 535

---

### ENP version

**Navigation** Expert → Diagnostics → Device info → ENP version

**Description** Displays the version of the electronic nameplate.

**User interface** Character string

**Factory setting** 2.02.00

**Additional information** *Description*

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

### 3.6.4 "Min/max values" submenu

Navigation

 Expert → Diagnostics → Min/max val.

▶ Min/max values	
Reset min/max values	→  172
▶ Electronic temperature	→  173
▶ Medium temperature	→  174
▶ Carrier pipe temperature	→  174
▶ Oscillation frequency	→  175
▶ Oscillation amplitude	→  176
▶ Oscillation damping	→  177
▶ Signal asymmetry	→  177

#### Reset min/max values



Navigation

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

Description

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

Selection

- Cancel
- Oscillation amplitude
- Oscillation amplitude 1 \*
- Oscillation damping
- Torsion oscillation damping \*
- Oscillation frequency
- Torsion oscillation frequency \*
- Signal asymmetry

Factory setting

Cancel

Additional information

Selection

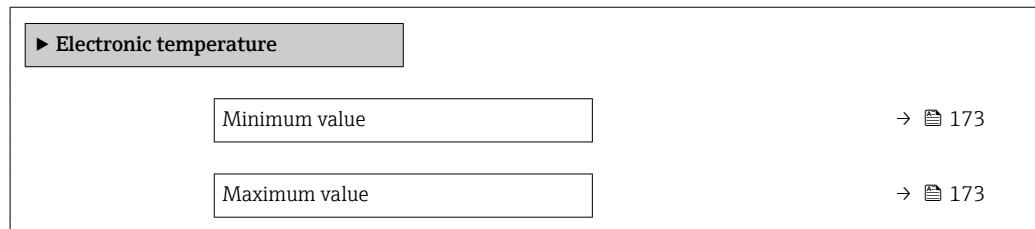
 Detailed description of the options **Oscillation frequency**, **Oscillation amplitude**, **Oscillation damping** and **Signal asymmetry**: Value 1 display parameter (→  16)

\* Visibility depends on order options or device settings

### "Electronic temperature" submenu

#### Navigation

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



---

### Minimum value

---

#### Navigation

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

#### Description

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

#### User interface

Signed floating-point number

#### Additional information

*Dependency*

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

---

### Maximum value

---

#### Navigation

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

#### Description

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

#### User interface

Signed floating-point number

#### Additional information

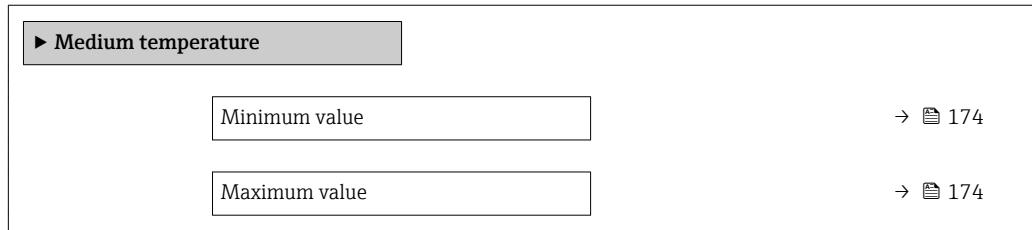
*Dependency*

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

### "Medium temperature" submenu

#### Navigation

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



---

### Minimum value

---

#### Navigation

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

#### Description

Displays the lowest previously measured medium temperature value.

#### User interface

Signed floating-point number

#### Additional information

##### *Dependency*

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

---

### Maximum value

---

#### Navigation

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

#### Description

Displays the highest previously measured medium temperature value.

#### User interface

Signed floating-point number

#### Additional information

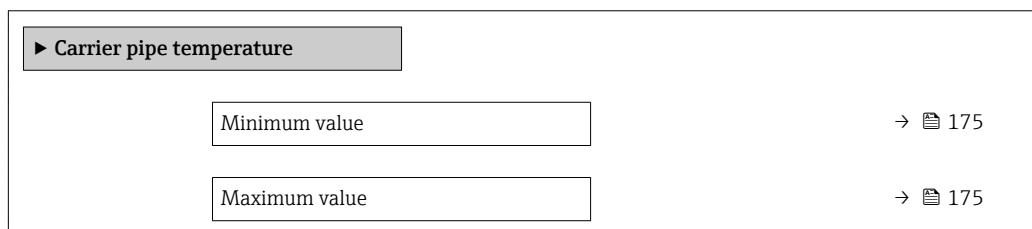
##### *Dependency*

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

### "Carrier pipe temperature" submenu

#### Navigation

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



---

**Minimum value**

---

<b>Navigation</b>	◀ ▶ Expert → Diagnostics → Min/max val. → Carr. pipe temp. → Minimum value
<b>Prerequisite</b>	Order code for "Application package", option EB "Heartbeat Verification + Monitoring"
<b>Description</b>	Displays the lowest previously measured temperature value of the carrier pipe.
<b>User interface</b>	Signed floating-point number
<b>Additional information</b>	<i>Dependency</i>
	 The unit is taken from the <b>Temperature unit</b> parameter (→ <a href="#">56</a> )

---

**Maximum value**

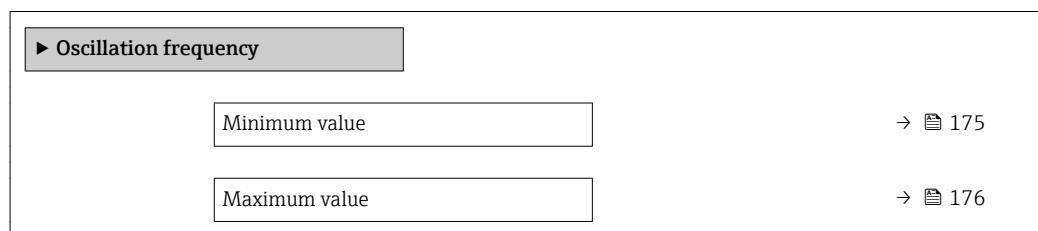
---

<b>Navigation</b>	◀ ▶ Expert → Diagnostics → Min/max val. → Carr. pipe temp. → Maximum value
<b>Prerequisite</b>	Order code for "Application package", option EB "Heartbeat Verification + Monitoring"
<b>Description</b>	Displays the highest previously measured temperature value of the carrier pipe.
<b>User interface</b>	Signed floating-point number
<b>Additional information</b>	<i>Dependency</i>
	 The unit is taken from the <b>Temperature unit</b> parameter (→ <a href="#">56</a> )

---

**"Oscillation frequency" submenu**

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



---

**Minimum value**

---

<b>Navigation</b>	◀ ▶ Expert → Diagnostics → Min/max val. → Oscil. frequency → Minimum value
<b>Description</b>	Displays the lowest previously measured oscillation frequency.

---

User interface	Signed floating-point number
----------------	------------------------------

---

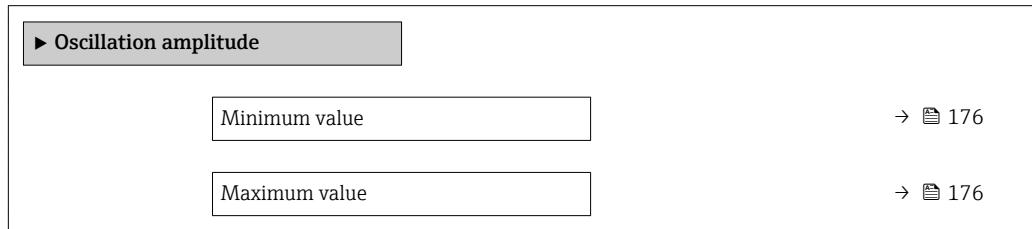
## Maximum value

---

Navigation	  Expert → Diagnostics → Min/max val. → Oscil. frequency → Maximum value
Description	Displays the highest previously measured oscillation frequency.
User interface	Signed floating-point number

### "Oscillation amplitude" submenu

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



---

## Minimum value

---

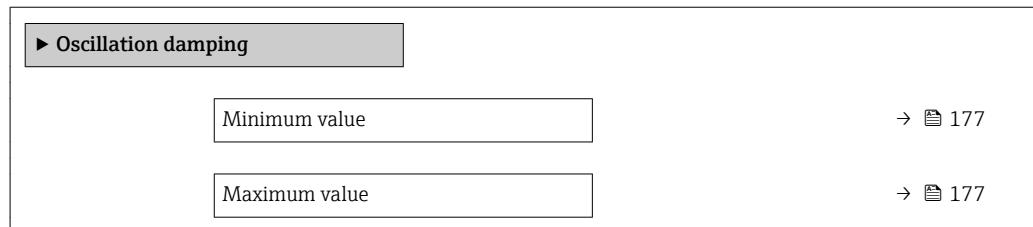
Navigation	  Expert → Diagnostics → Min/max val. → Oscil. amplitude → Minimum value
Description	Displays the lowest previously measured oscillation amplitude.
User interface	Signed floating-point number

---

## Maximum value

---

Navigation	  Expert → Diagnostics → Min/max val. → Oscil. amplitude → Maximum value
Description	Displays the highest previously measured oscillation amplitude.
User interface	Signed floating-point number

**"Oscillation damping" submenu****Navigation** Expert → Diagnostics → Min/max val. → Oscil. damping

---

**Minimum value**

---

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

Displays the lowest previously measured oscillation damping.

**User interface**

Signed floating-point number

---

**Maximum value**

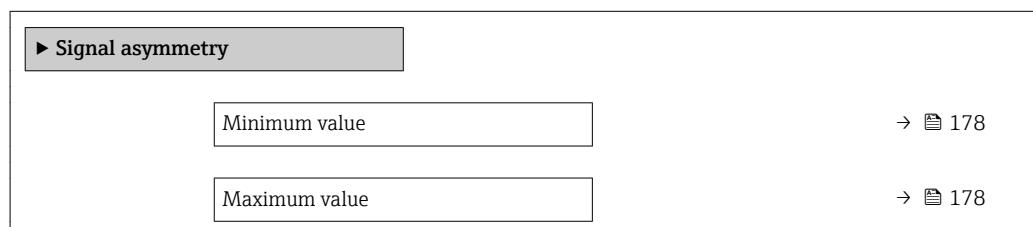
---

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

Displays the highest previously measured oscillation damping.

**User interface**

Signed floating-point number

**"Signal asymmetry" submenu****Navigation** Expert → Diagnostics → Min/max val. → Signal asymmetry

**Minimum value**

<b>Navigation</b>	Expert → Diagnostics → Min/max val. → Signal asymmetry → Minimum value
<b>Description</b>	Displays the lowest previously measured signal asymmetry.
<b>User interface</b>	Signed floating-point number

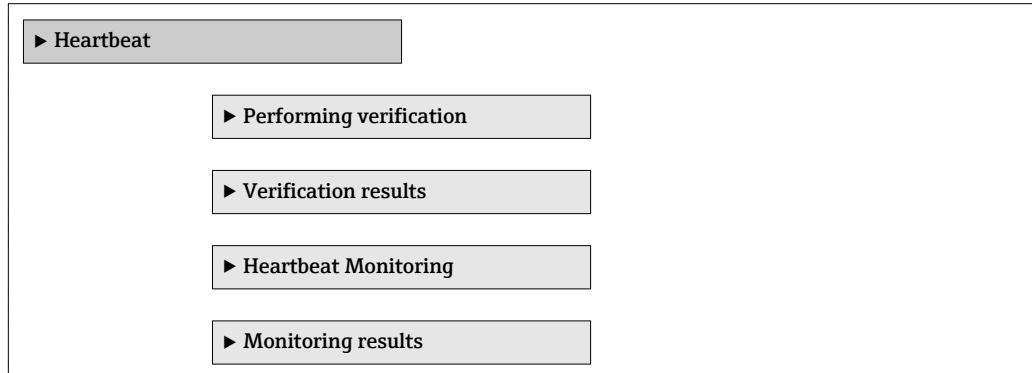
**Maximum value**

<b>Navigation</b>	Expert → Diagnostics → Min/max val. → Signal asymmetry → Maximum value
<b>Description</b>	Displays the highest previously measured signal asymmetry.
<b>User interface</b>	Signed floating-point number

### 3.6.5 "Heartbeat" submenu

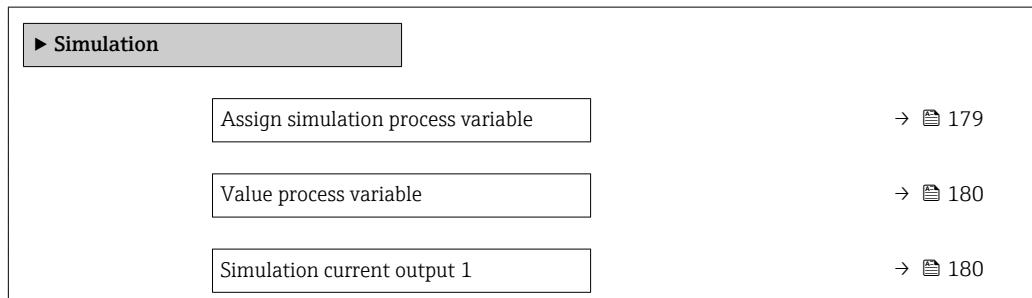
 For detailed information on the parameter descriptions of the **Heartbeat Verification** application package, see the Special Documentation for the device

*Navigation*       Expert → Diagnostics → Heartbeat



### 3.6.6 "Simulation" submenu

*Navigation*       Expert → Diagnostics → Simulation



Value current output 1	→  181
Frequency simulation 1	→  181
Frequency value 1	→  182
Pulse simulation 1	→  182
Pulse value 1	→  183
Switch output simulation 1	→  183
Switch status 1	→  183
Simulation device alarm	→  184
Diagnostic event category	→  184
Simulation diagnostic event	→  185

## Assign simulation process variable

**Navigation**

Expert → Diagnostics → Simulation → Assign proc.var.

**Description**

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

**Selection**

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

**Factory setting**

Off

**Additional information***Description*

The simulation value of the selected process variable is specified in the **Value process variable** parameter (→ 180).

\* Visibility depends on order options or device settings

**Value process variable****Navigation**

Expert → Diagnostics → Simulation → Value proc. var.

**Prerequisite**

One of the following options is selected in the **Assign simulation process variable** parameter (→ 179):

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

**Description**

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

**User entry**

Depends on the process variable selected

**Factory setting**

0

**Additional information**

*User entry*

The unit of the displayed measured value is taken from the **System units** submenu (→ 49).

**Simulation current output 1****Navigation**

Expert → Diagnostics → Simulation → Sim.curr.out. 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 (→ 181).

\* Visibility depends on order options or device settings

*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

**Prerequisite**

The **On** option is selected in the **Simulation current output 1** parameter.

**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<sup>-3</sup> to 22.5<sup>-3</sup> mA

**Frequency simulation 1****Navigation**

Expert → Diagnostics → Simulation → Frequency sim. 1

**Prerequisite**

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

**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 specified in the **Frequency value** parameter (→ 182).

*Selection*

## ■ Off

Current simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.

## ■ On

Current simulation is active.

**Frequency value 1****Navigation**

Expert → Diagnostics → Simulation → Freq. value 1

**Prerequisite**

The **On** option is selected in the **Frequency simulation** parameter (→ 181).

**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 12 500.0 Hz

**Factory setting**

0.0 Hz

**Pulse simulation 1****Navigation**

Expert → Diagnostics → Simulation → Pulse sim. 1

**Prerequisite**

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

**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 specified in the **Pulse value** parameter (→ 183).

**Selection**

- Off  
Pulse simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.
- Fixed value  
Pulses with the pulse width specified in the **Pulse width** parameter (→ 104) are output continuously.
- Down-counting value  
The pulses specified in the **Pulse value** parameter (→ 183) are output.

---

**Pulse value 1****Navigation**

Expert → Diagnostics → Simulation → Pulse value 1

**Prerequisite**

In the **Pulse simulation** parameter (→ 182), 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 1****Navigation**

Expert → Diagnostics → Simulation → Switch sim. 1

**Prerequisite**

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

**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 specified in the **Switch status** parameter (→ 183).

*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 1****Navigation**

Expert → Diagnostics → Simulation → Switch status 1

**Prerequisite**

The **On** option is selected in the **Switch output simulation** parameter (→ 183).

**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.

---

<b>Selection</b>	<ul style="list-style-type: none"><li>■ Open</li><li>■ Closed</li></ul>
<b>Factory setting</b>	Open
<b>Additional information</b>	<i>Options</i> <ul style="list-style-type: none"><li>■ Open Switch simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.</li><li>■ Closed Switch simulation is active.</li></ul>

---

## Simulation device alarm



<b>Navigation</b>	Expert → Diagnostics → Simulation → Sim. alarm
<b>Description</b>	Use this function to switch the device alarm on and off.
<b>Selection</b>	<ul style="list-style-type: none"><li>■ Off</li><li>■ On</li></ul>
<b>Factory setting</b>	Off
<b>Additional information</b>	<i>Description</i> <p>In this way, users can verify the correct adjustment of the current output and the correct function of downstream switching units.</p> <p>The display alternates between the measured value and a diagnostic message of the "Function check" category (C) while simulation is in progress.</p>

---

## Diagnostic event category

<b>Navigation</b>	Expert → Diagnostics → Simulation → Event category
<b>Description</b>	Use this function to select the category of the diagnostic events that are displayed for the simulation in the <b>Simulation diagnostic event</b> parameter (→  185).
<b>Selection</b>	<ul style="list-style-type: none"><li>■ Sensor</li><li>■ Electronics</li><li>■ Configuration</li><li>■ Process</li></ul>
<b>Factory setting</b>	Process

---

## Simulation diagnostic event

---

**Navigation**

Expert → Diagnostics → Simulation → Sim. diag. event

**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 (→ 184).

## 4 Country-specific factory settings

### 4.1 SI units

**i** Not valid for USA and Canada.

#### 4.1.1 System units

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

#### 4.1.2 Full scale values

**i** The factory settings apply to the following parameters:

- 20 mA value (full scale value of the current output)
- 100% bar graph value 1

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

#### 4.1.3 Output current span

Current output 1	4 to 20 mA NAMUR
------------------	------------------

#### 4.1.4 Pulse value

Nominal diameter [mm]	(~ 2 pulse/s at 2 m/s) [kg/p]
1	0.001
2	0.01
4	0.01
6	0.1

#### 4.1.5 On value low flow cut off

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

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

Nominal diameter [mm]	Switch-on value for gas [kg/h]
1	0.02
2	0.1
4	0.45
6	1

### 4.2 US units

 Only valid for USA and Canada.

#### 4.2.1 System units

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

#### 4.2.2 Full scale values

 The factory settings apply to the following parameters:

- 20 mA value (full scale value of the current output)
- 100% bar graph value 1

Nominal diameter [in]	[lb/min]
1/24	0.15
1/12	0.75
1/8	3.3
1/4	7.4

### 4.2.3 Output current span

Current output 1	4 to 20 mA US
------------------	---------------

### 4.2.4 Pulse value

Nominal diameter [in]	(~ 2 pulse/s at 2.0 m/s) [lb/p]
1/24	0.002
1/12	0.02
1/8	0.02
1/4	0.2

### 4.2.5 On value low flow cut off

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

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

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

## 5 Explanation of abbreviated units

### 5.1 SI units

Process variable	Units	Explanation
Density	g/cm <sup>3</sup> , g/m <sup>3</sup>	Gram/volume unit
	kg/dm <sup>3</sup> , kg/l, kg/m <sup>3</sup>	Kilogram/volume unit
	SD4°C, SD15°C, SD20°C	Specific density: The specific density is the ratio of the density of the fluid to the density of water at a water temperature of 4 °C (39 °F), 15 °C (59 °F), 20 °C (68 °F).
	SG4°C, SG15°C, SG20°C	Specific gravity: The specific gravity is the ratio of the density of the fluid to the density of water at a water temperature of 4 °C (39 °F), 15 °C (59 °F), 20 °C (68 °F).
Pressure	Pa a, kPa a, MPa a	Pascal, kilopascal, megapascal (absolute)
	bar	Bar
	Pa g, kPa g, MPa g	Pascal, kilopascal, megapascal (relative/gauge)
	bar g	Bar (relative/gauge)
Mass	g, kg, t	Gram, kilogram, metric ton
Mass flow	g/s, g/min, g/h, g/d	Gram/time unit
	kg/s, kg/min, kg/h, kg/d	Kilogram/time unit
	t/s, t/min, t/h, t/d	Metric ton/time unit
Reference density	kg/Nm <sup>3</sup> , kg/Nl, g/Scm <sup>3</sup> , kg/Sm <sup>3</sup>	Kilogram, gram/standard volume unit
Corrected volume	Nl, Nm <sup>3</sup> , Sm <sup>3</sup>	Normal liter, normal cubic meter, standard cubic meter
Corrected volume flow	Nl/s, Nl/min, Nl/h, Nl/d	Normal liter/time unit
	Nm <sup>3</sup> /s, Nm <sup>3</sup> /min, Nm <sup>3</sup> /h, Nm <sup>3</sup> /d	Normal cubic meter/time unit
	Sm <sup>3</sup> /s, Sm <sup>3</sup> /min, Sm <sup>3</sup> /h, Sm <sup>3</sup> /d	Standard cubic meter/time unit
Temperature	°C, K	Celsius, Kelvin
Volume	cm <sup>3</sup> , dm <sup>3</sup> , m <sup>3</sup>	Cubic centimeter, cubic decimeter, cubic meter
	ml, l, hl, Ml Mega	Milliliter, liter, hectoliter, megaliter
Volume flow	cm <sup>3</sup> /s, cm <sup>3</sup> /min, cm <sup>3</sup> /h, cm <sup>3</sup> /d	Cubic centimeter/time unit
	dm <sup>3</sup> /s, dm <sup>3</sup> /min, dm <sup>3</sup> /h, dm <sup>3</sup> /d	Cubic decimeter/time unit
	m <sup>3</sup> /s, m <sup>3</sup> /min, m <sup>3</sup> /h, m <sup>3</sup> /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/ft <sup>3</sup> , lb/gal (us)	Pound/cubic foot, pound/gallon
	lb/bbl (us;liq.), lb/bbl (us;beer), lb/bbl (us;oil), lb/bbl (us;tank)	Pound/volume unit

Process variable	Units	Explanation
Pressure	psi a	Pounds per square inch (absolute)
	psi g	Pounds per square inch (gauge)
Mass	oz, lb, STon	Ounce, pound, standard ton
Mass flow	oz/s, oz/min, oz/h, oz/d	Ounce/time unit
	lb/s, lb/min, lb/h, lb/d	Pound/time unit
	STon/s, STon/min, STon/h, STon/d	Standard ton/time unit
Reference density	lb/Sft <sup>3</sup>	Weight unit/standard volume unit
Corrected volume	Sft <sup>3</sup> , Sgal (us), Sbbl (us;liq.)	Standard cubic foot, standard gallon, standard barrel
Corrected volume flow	Sft <sup>3</sup> /s, Sft <sup>3</sup> /min, Sft <sup>3</sup> /h, Sft <sup>3</sup> /d	Standard cubic foot/time unit
	Sgal/s (us), Sgal/min (us), Sgal/h (us), Sgal/d (us)	Standard gallon/time unit
	Sbbl/s (us;liq.), Sbbl/min (us;liq.), Sbbl/h (us;liq.), Sbbl/d (us;liq.)	Barrel/time unit (normal liquids)
Temperature	°F, °R	Fahrenheit, Rankine
Volume	af	Acre foot
	ft <sup>3</sup>	Cubic foot
	fl oz (us), gal (us), kgal (us), Mgal (us)	Fluid ounce, gallon, kilogallon, million gallon
	bbl (us;liq.), bbl (us;beer), bbl (us;oil), bbl (us;tank)	Barrel (normal liquids), barrel (beer), barrel (petrochemicals), barrel (filling tanks)
Volume flow	af/s, af/min, af/h, af/d	Acre foot/time unit
	ft <sup>3</sup> /s, ft <sup>3</sup> /min, ft <sup>3</sup> /h, ft <sup>3</sup> /d	Cubic foot/time unit
	fl oz/s (us), fl oz/min (us), fl oz/h (us), fl oz/d (us)	Fluid ounce/time unit
	gal/s (us), gal/min (us), gal/h (us), gal/d (us)	Gallon/time unit
	kgal/s (us), kgal/min (us), kgal/h (us), kgal/d (us)	Kilogallon/time unit
	Mgal/s (us), Mgal/min (us), Mgal/h (us), Mgal/d (us)	Million gallon/time unit
	bbl/s (us;liq.), bbl/min (us;liq.), bbl/h (us;liq.), bbl/d (us;liq.)	Barrel/time unit (normal liquids) Normal liquids: 31.5 gal/bbl
	bbl/s (us;beer), bbl/min (us;beer), bbl/h (us;beer), bbl/d (us;beer)	Barrel /time unit (beer) Beer: 31.0 gal/bbl
	bbl/s (us;oil), bbl/min (us;oil), bbl/h (us;oil), bbl/d (us;oil)	Barrel/time unit (petrochemicals) Petrochemicals: 42.0 gal/bbl
	bbl/s (us;tank), bbl/min (us;tank), bbl/h (us;tank), bbl/d (us;tank)	Barrel/time unit (filling tank) Filling tanks: 55.0 gal/bbl
Time	s, m, h, d, y	Second, minute, hour, day, year
	am, pm	Ante meridiem ( before midday), post meridiem (after midday)

### 5.3 Imperial units

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

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