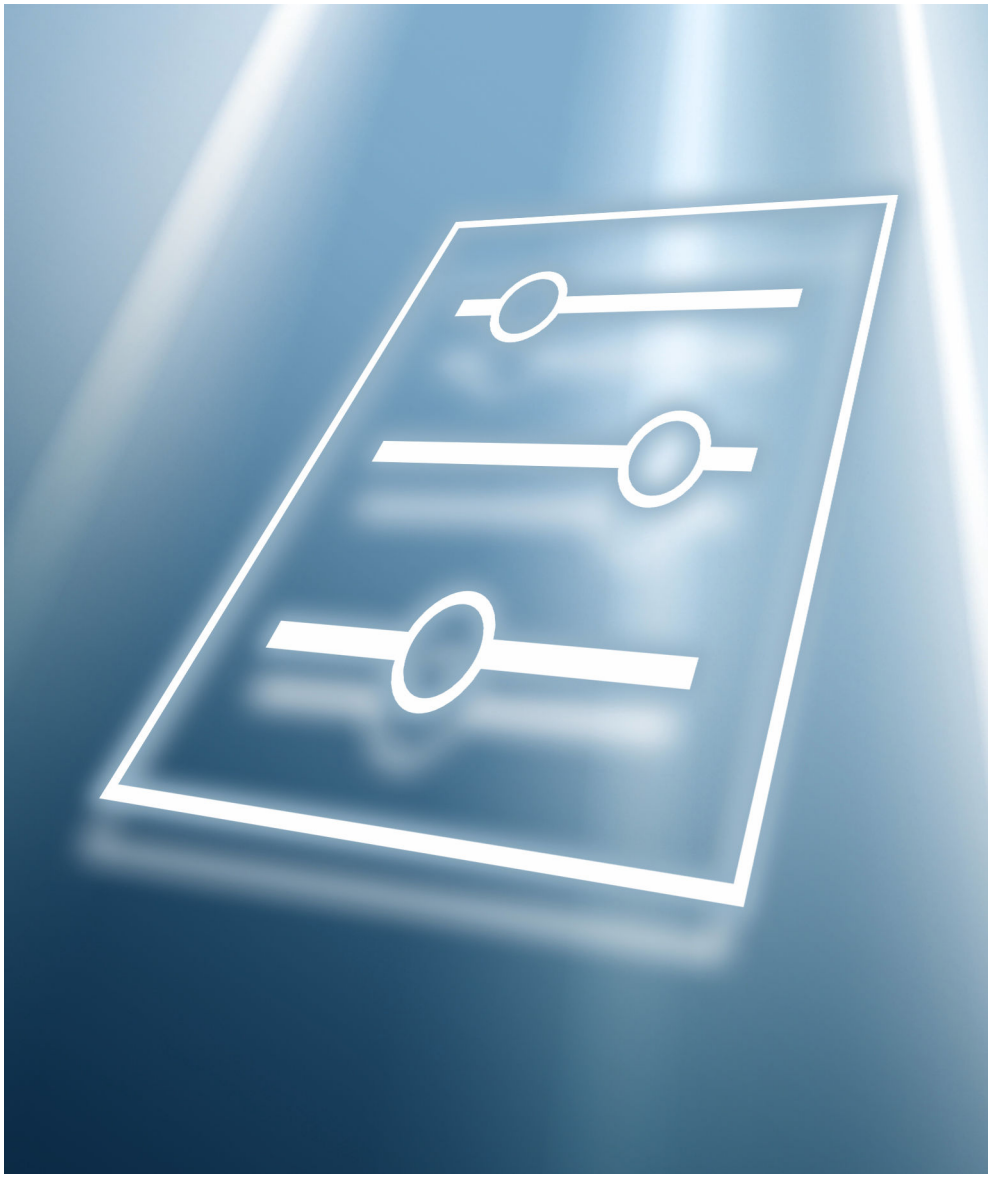
GP01219D/06/EN/01.24-00
71658059
2024-08-15

Valid as of version
04.00.zz (Device firmware)



# Description of Device Parameters
# **Dosimass**

Coriolis flowmeter



Endress+Hauser
People for Process Automation

# Table of contents

# 1 About this document

## 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 operating menus.

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

## 1.2 Target group

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

## 1.3 Using this document

### 1.3.1 Symbols

#### Types of information

- ✓✓ Preferred procedures, processes or actions
- ✓ Permitted procedures, processes or actions
- ✗ Forbidden procedures, processes or actions
- ℹ Additional information
- Reference to documentation
- Reference to page
- Reference to graphic

### 1.3.2 Information on the document structure

The parameters of all the operating menus and the commissioning wizard are described in this document.

- **Guidance** menu with the **Commissioning** wizard (→ 6), which guides the user automatically through all the device parameters that are required for commissioning
- **Application** menu (→ 42)
- **Diagnostics** menu (→ 28)
- **System** menu (→ 86)

### 1.3.3 Structure of a parameter description

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

| **Complete parameter name** | Write-protected parameter = |
|---|---|

| | |
|---|---|
| **Navigation** | Navigation path to the parameter via the operating tool<br>The names of the menus, submenus and parameters are abbreviated to the form in which they appear on the display and in the operating tool. |
| **Prerequisite** | The parameter is only available under these specific conditions |
| **Description** | Description of the parameter function |
| **Selection** | List of the individual options for the parameter<br>▪ Option 1<br>▪ Option 2 |
| **User entry** | Input range for the parameter |
| **User interface** | Display value/data for the parameter |
| **Additional information** | Additional explanations (e.g. in examples):<br>▪ On individual options<br>▪ On display values/data<br>▪ On the input range<br>▪ On the parameter function |

## 1.4 Related documentation

| | |
|---|---|
| Technical information | Overview of the device with the most important technical data. |
| Operating instructions | All the information that is required in the various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal as well as the technical data and dimensions. |
| Sensor Brief Operating Instructions | Incoming acceptance, transport, storage and mounting of the device. |
| Transmitter Brief Operating Instructions | Electrical connection and commissioning of the device. |
| Description of Parameters | Detailed explanation of the menus and parameters. |
| Safety Instructions | Documents for the use of the device in hazardous areas. |
| Special Documentation | Documents with more detailed information on specific topics. |
| Installation Instructions | Installation of spare parts and accessories. |

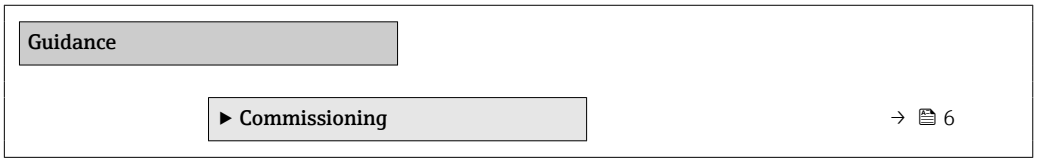
The related documentation is available online:

| | |
|---|---|
| Device Viewer | On the www.endress.com/deviceviewer website, enter the serial number of the device: nameplate |
| Endress+Hauser Operations App | ▶ Scan the Data Matrix code: nameplate<br>▶ Enter the serial number of the device: nameplate |

# 2 "Guidance" menu

Main functions for use – from fast and safe commissioning to guided support during operation.

*Navigation* Guidance



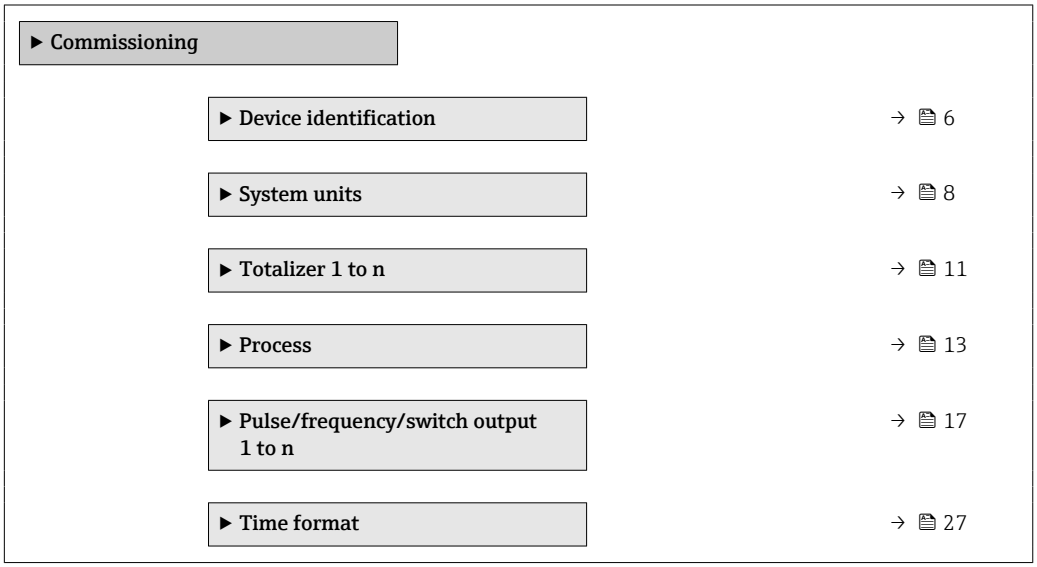

## 2.1 "Commissioning" wizard

Complete this wizard to commission the device.

For each parameter, enter the appropriate value or select the appropriate option.

NOTE
If you exit the wizard before completing all required parameters, the changes you have made will be saved. For this reason, the device may then be in an undefined state!
In this case, a reset to the default settings is recommended.

*Navigation* Guidance → Commissioning




### 2.1.1 Device identification

*Navigation* Guidance → Commissioning → Device ident.

**Device tag**

**Navigation** Guidance → Commissioning → Device ident. → Device tag

**Description** Enter a unique designation for the measuring point to be able to easily identify it within the plant.

**User entry** Character string comprising numbers, letters and special characters (32)

## Serial number

**Navigation** Guidance → Commissioning → Device ident. → Serial number

**Description** Displays the serial number of the measuring device. The serial number is also provided on the nameplate of the sensor and of the transmitter.

The serial number can also be used to retrieve further device-related information and documentation via the Operations app or the Device Viewer on the Endress+Hauser website.

**User interface** Character string comprising numbers, letters and special characters

## Firmware version

**Navigation** Guidance → Commissioning → Device ident. → Firmware version

**Description** Displays the device firmware version installed.

**User interface** Character string comprising numbers, letters and special characters

## Device name

**Navigation** Guidance → Commissioning → Device ident. → Device name

**Description** Displays the name of the transmitter. The transmitter name is also provided on the nameplate of the transmitter.

**User interface** Character string comprising numbers, letters and special characters

### 2.1.2 System units

*Navigation* Guidance → Commissioning → System units

**Mass flow unit**

**Navigation** Guidance → Commissioning → System units → Mass flow unit

**Description** Select the mass flow unit.

**Selection**

| *SI units* | *US units* |
|---|---|
| ▪ 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 |

**Mass unit**

**Navigation** Guidance → Commissioning → System units → Mass unit

**Description** Select the mass unit.

**Selection**

| *SI units* | *US units* |
|---|---|
| ▪ g | ▪ oz |
| ▪ kg | ▪ lb |
| ▪ t | ▪ STon |

**Volume flow unit**

**Navigation** Guidance → Commissioning → System units → Volume flow unit

**Description** Select the volume flow unit.

**Selection**

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

*US units*
- af/s
- af/min
- af/h
- af/d
- $ft^3/s$
- $ft^3/min$
- $ft^3/h$
- $ft^3/d$
- fl oz/s (us)
- fl oz/min (us)
- fl oz/h (us)
- fl oz/d (us)
- gal/s (us)
- gal/min (us)
- gal/h (us)
- gal/d (us)
- 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)
- kgal/s (us)
- kgal/min (us)
- kgal/h (us)
- kgal/d (us)

*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)

**Additional information**

*Options*

For an explanation of the abbreviated units: → 97

## Volume unit

**Navigation** Guidance → Commissioning → System units → Volume unit

**Description** Select the volume unit.

**Selection**

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

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

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

**Additional information**

*Selection*

For an explanation of the abbreviated units: → 97

## Density unit

**Navigation**

Guidance → Commissioning → System units → Density unit

**Description**

Select the density unit.

**Selection**

*SI units*
- $g/cm^3$
- $g/m^3$
- g/ml
- kg/l
- $kg/dm^3$
- $kg/m^3$
- SD4°C
- SD15°C
- SD20°C
- SG4°C
- SG15°C
- SG20°C

*US units*
- $lb/ft^3$
- 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)

**Additional information**

*Options*

For an explanation of the abbreviated units: → 97

## Temperature unit

**Navigation**

Guidance → Commissioning → System units → Temperature unit

**Description**

Select the temperature unit.

**Selection**

*SI units*
- °C
- K

*US units*
- °F
- °R

**Additional information** *Selection*

For an explanation of the abbreviated units: → 97

### 2.1.3 Totalizer 1 to n

*Navigation* Guidance → Commissioning → Totalizer 1 to n

**Assign process variable**

**Navigation** Guidance → Commissioning → Totalizer 1 to n → AssignVariab. 1 to n

**Description** Select a process variable to activate the totalizer.

If the process variable is changed or the totalizer deactivated, the totalizer is reset to "0".

**Selection**
- Off
- Volume flow
- Mass flow

**Process variable unit**

**Navigation** Guidance → Commissioning → Totalizer 1 to n → VariableUnit 1 to n

**Description** Select the unit for the process variable of the totalizer.

**Selection**

*SI units*
- g *
- kg *
- t *

*US units*
- oz *
- lb *
- STon *

* Visibility depends on order options or device settings

or

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

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

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

* Visibility depends on order options or device settings

or

*Other units*
None *

* Visibility depends on order options or device settings

## Totalizer operation mode

**Navigation** Guidance → Commissioning → Totalizer 1 to n → Operat. mode 1 to n

**Description** Select the totalizer operation mode, e.g. only totalize forward flow or only totalize reverse flow.

**Selection**
- Net
- Forward
- Reverse

**Additional information** *Selection*
- **Net** option
  The flow values in the forward and reverse flow directions are totalized and netted against each other. Net flow is recorded in the flow direction.
- **Forward** option
  Only the flow in the forward flow direction is totalized.
- **Reverse** option
  Only the flow in the reverse flow direction is totalized (= reverse flow quantity).

## Totalizer failure behavior

**Navigation** Guidance → Commissioning → Totalizer 1 to n → FailureBehav. 1 to n

**Description** Specify how the totalizer should behave in the event of a device alarm.

**Selection**
- Hold
- Continue
- Last valid value + continue

**Additional information** *Selection*
- **Hold** option
  The totalizer is stopped in the event of a device alarm.
- **Continue** option
  The totalizer continues to totalize based on the current value measured; the device alarm is ignored.
- **Last valid value + continue** option
  The totalizer continues to totalize based on the last valid value measured before the device alarm occurred.

### 2.1.4 Process

*Navigation* Guidance → Commissioning → Process

**Flow damping**

**Navigation** Guidance → Commissioning → Process → Flow damping

**Description** Enter a time constant for flow damping.
Value = 0: No damping
Value > 0: Damping increases

Damping is implemented by means of a proportional transmission behavior with first order delay (PT1 element).

**User entry** 0 to 99.9 s

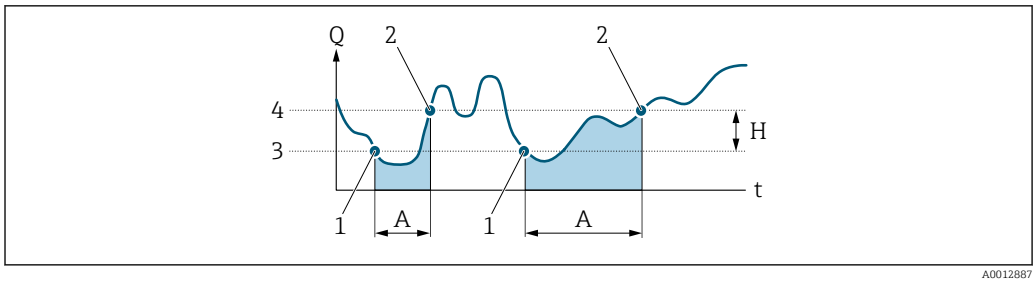
**Low flow cutoff**

**Navigation** Guidance → Commissioning → Process → Low flow cutoff

**Description** Select a process variable for low flow cutoff to activate low flow cutoff.

**Selection**
- Off
- Mass flow
- Volume flow

**Additional information** Description




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

## On value low flow cutoff

**Navigation** Guidance → Commissioning → Process → On value

**Description** Enter on value to switch on low flow cutoff.

Value = 0: No low flow cutoff
Value > 0: Low flow cutoff is activated

**User entry** Positive floating-point number

## Off value low flow cutoff

**Navigation** Guidance → Commissioning → Process → Off value

**Description** Enter off value to switch off low flow cutoff. The off value is entered as a positive hysteresis with respect to the on value.

**User entry** 0 to 100.0 %

## Pressure shock suppression

**Navigation** Guidance → Commissioning → Process → Pres. shock sup.

**Description**

Enter a time span for signal suppression (= pressure shock suppression active), for example to prevent the device from registering flow movements in the pipe when a valve is closed.

Pressure schock suppression is activated when the flow rate drops below the on value for low flow cutoff.

Values reported when pressure shock suppression is active:

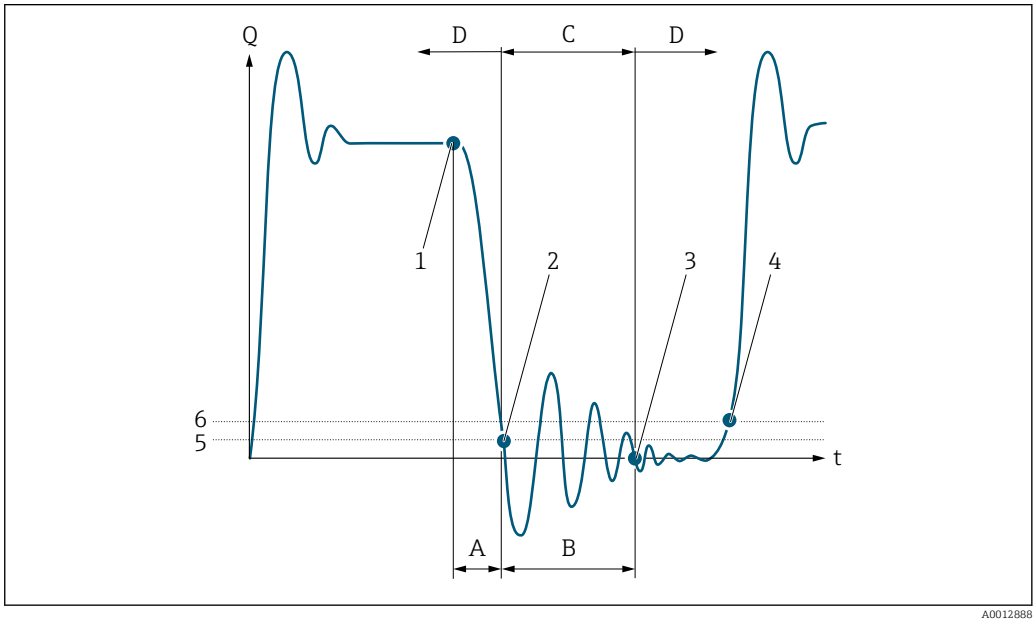
Flow: 0
Totalizer: Last valid value

Pressure shock suppression is deactivated when the time span specified has elapsed and the flow rate exceeds the off value for low flow cutoff.

**User entry** 0 to 100 s

**Additional information** *Example*

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




A0012888

*Q Flow*
*t Time*
*A After run*
*B Pressure shock*
*C Pressure shock suppression active according to 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 current flow value is processed and displayed again.*
*5 On value for low flow cut off*
*6 Off value for low flow cut off*

## Partially filled pipe detection

**Navigation** Guidance → Commissioning → Process → Partial pipe det

**Description** Select a process variable to activate detection of an empty or partially filled pipe.

Due to low density, deactivate partially filled pipe detection for a gas.

**Selection**
- Off
- Density

## Low value partial filled pipe detection

**Navigation** Guidance → Commissioning → Process → Low value

**Prerequisite** A process variable has been selected in the **Assign process variable** parameter in the **Empty pipe detection** submenu.

**Description** Enter the lower limit value for the selected process variable. If the measured value drops below the limit value, diagnostic message "862 Partly filled pipe" is generated.

The lower limit value must be lower than the upper limit value ("High value partial filled pipe detection" parameter).

**User entry** Signed floating-point number

## High value partial filled pipe detection

**Navigation** Guidance → Commissioning → Process → High value

**Prerequisite** A process variable has been selected in the **Assign process variable** parameter in the **Empty pipe detection** submenu.

**Description** Enter the upper limit value for the selected process variable. If the measured value exceeds the limit value, diagnostic message "862 Partly filled pipe" is generated.

**User entry** Signed floating-point number

### 2.1.5 Pulse/frequency/switch output 1 to n

*Navigation* Guidance → Commissioning → PFS output 1 to n

**Operating mode**

**Navigation** Guidance → Commissioning → PFS output 1 to n → Operating mode

**Description** Select the operating mode for the output.

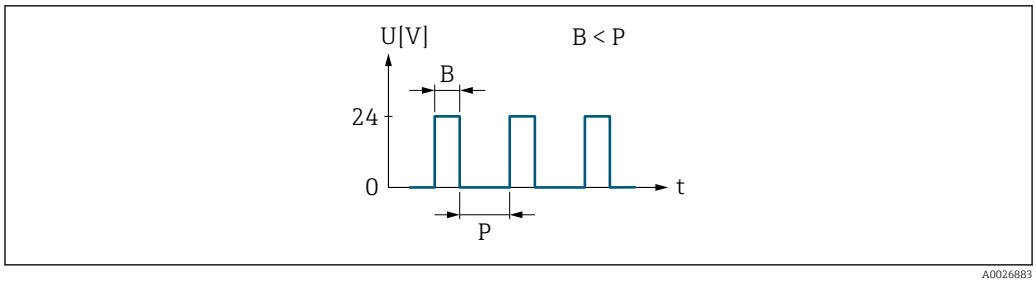
**Selection**
- Off
- Pulse
- Automatic pulse
- Frequency
- Switch

**Additional information** *Selection*

- **Pulse** option
  Quantitatively proportional pulse with pulse width to be configured. Whenever the pulse value for the specified process variable is reached, a pulse is emitted, the duration of which is set within the "Pulse width" parameter.
  The process variable for the pulse output is specified in the "Assign pulse output " parameter.
- **Automatic pulse** option
  Quantitatively proportional pulse with a fixed 1:1 ratio of pulse-to-interval. Whenever the pulse value for the specified process variable is reached, a pulse is emitted.
  The process variable for the pulse output is specified in the "Assign pulse output " parameter.
- **Frequency** option
  The output frequency is proportional to the value for the process variable assigned, with a pulse-to-interval ratio of 1:1.
  The process variable for the frequency output is specified in the "Assign frequency output" parameter.
- **Switch** option
  Indicates when the state of the device changes, e.g. when a specified limit value is reached or an alarm or warning is triggered.
  The switch output can be in one of two states: either it is conductive or it is non-conductive.
  When the function assigned to the switch output is triggered, the switch output will depending on the output configuration either be continuously conductive or continuously non-conductive.

*"Pulse" option*

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




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

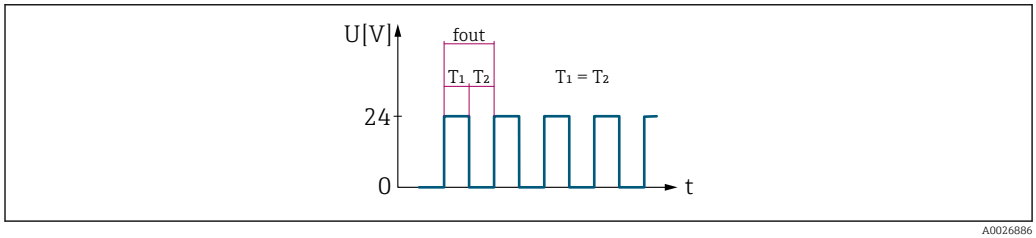
*B Pulse width entered*
*P Pauses between the individual pulses*

*"Frequency" option*

**Example**
- Flow rate Q approx. 100 g/s
- Min. frequency ($f_{min}$) 0 Hz
- Max. frequency ($f_{max}$) 1000 Hz
- Flow rate at min. frequency ($Q_{min}$) 0 g/s
- Flow rate at max. frequency ($Q_{max}$) 1000 g/s
- Output frequency ($f_{out}$) approx. 100 Hz

$\mathbf{f_{out}} = f_{min} + Q \times [(f_{max} - f_{min})/(Q_{max} - Q_{min})] =$

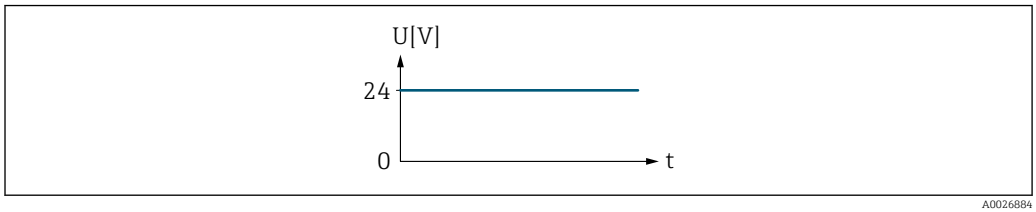
0 Hz + 100 g/s × [(1000 Hz - 0 Hz)/(1000 g/s - 0 g/s )] = **100 Hz**




*2 Flow-proportional frequency output*

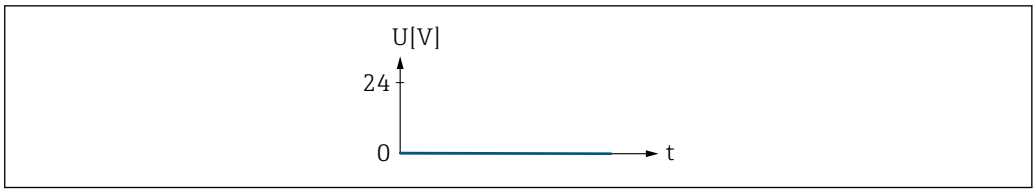
*"Switch" option*

**Example**
Alarm response without alarm




*3 No alarm, high level*

**Example**
Alarm response in case of alarm




4 *Alarm, low level*

## Assign frequency output

**Navigation** Guidance → Commissioning → PFS output 1 to n → Assign freq.

**Description** Select a process variable for the frequency output.

**Selection**
- Off
- Mass flow
- Volume flow
- Density
- Temperature
- Exciter current 0
- Oscillation frequency 0
- Oscillation amplitude 0
- Frequency fluctuation 0
- Oscillation damping 0
- Oscillation damping fluctuation 0
- Signal asymmetry

## Minimum frequency value

**Navigation** Guidance → Commissioning → PFS output 1 to n → Min. freq. value

**Description** Enter the frequency to report for the lower range value of the measured value range.

The lower range value for the measured value range that corresponds to the minimum frequency is specified in the "Measuring value at minimum frequency" parameter.

**User entry** 0.0 to 10 000.0 Hz

### Measuring value at minimum frequency

**Navigation** Guidance → Commissioning → PFS output 1 to n → Val. at min.freq

**Description** Enter the lower range value for the measured value range.

Depending on the setting selected for the "Measuring mode" parameter, the value specified for this parameter and the "Measuring value at maximum frequency" parameter must have the same algebraic sign or not.

As a rule, the lower range value is scaled to be lower than the upper range value. As a result, the behavior of the frequency output is proportional to the process variable assigned. If the lower range value is scaled to be higher than the upper range value, then the behavior of the frequency output will be inversely proportional to the process variable assigend.

**User entry** Signed floating-point number

### Maximum frequency value

**Navigation** Guidance → Commissioning → PFS output 1 to n → Max. freq. value

**Description** Enter the frequency to report for the upper range value of the measured value range.

The upper range value for the measured value range that corresponds to the maximum frequency is specified in the "Measuring value at maximum frequency" parameter.

**User entry** 0.0 to 10 000.0 Hz

### Measuring value at maximum frequency

**Navigation** Guidance → Commissioning → PFS output 1 to n → Val. at max.freq

**Description** Enter upper range value for the measured value range.

**User entry** Signed floating-point number

### Failure mode

**Navigation** Guidance → Commissioning → PFS output 1 to n → Failure mode

**Description** Specify how the output should behave in the event of a device alarm.

For safety reasons, it is recommended that the behavior of the output in the event of a device alarm be predefined.

**Selection**
- Actual value
- Defined value
- 0 Hz

**Additional information** *Selection*
- **Actual value** option
  The frequency output continues to report the actual flow rate measured. The fault condition is ignored.
- **Defined value** option
  The frequency output reports the value specified.
  The value is specified in the "Failure frequency" parameter.
- **0 Hz** option
  The frequency output reports 0 Hz.

## Failure frequency

**Navigation** Guidance → Commissioning → PFS output 1 to n → Failure freq.

**Description** Enter the value for the "Defined value" option in the "Failure mode" parameter.

**User entry** 0.0 to 10 000.0 Hz

## Assign pulse output

**Navigation** Guidance → Commissioning → PFS output 1 to n → Assign pulse

**Description** Select the process variable for the pulse output.

**Selection**
- Off
- Mass flow
- Volume flow

## Pulse width

**Navigation** Guidance → Commissioning → PFS output 1 to n → Pulse width

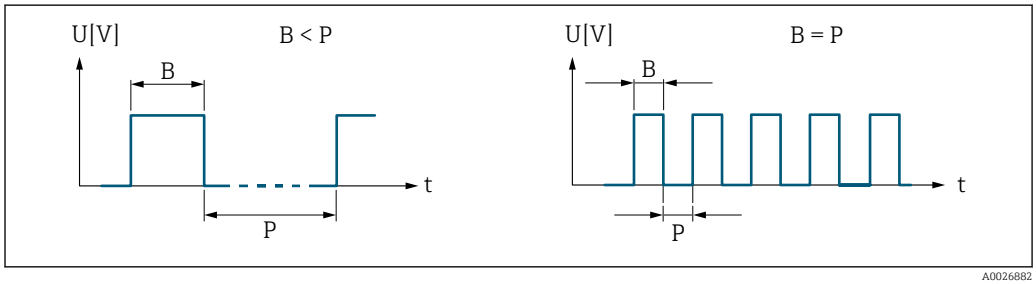
**Description** Specify the duration of a pulse.

The maximum pulse rate is defined by fmax = 1 / (2 × pulse width). The interval between two pulses (P) is at least as long as the specified pulse width (B).
The maximum flow is defined by Qmax = fmax × pulse value. If the flow exceeds these limit values, the measuring device displays the diagnostic message "443 Pulse output saturated".

Example:
Pulse value: 0.1 g
Pulse width: 0.1 ms
fmax: 1 / (2 × 0.1 ms) = 5 kHz
Qmax: 5 kHz × 0.1 g = 0.5 kg/s

**User entry** 0.05 to 2 000 ms

**Additional information** *Description*




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

## Value per pulse

**Navigation** Guidance → Commissioning → PFS output 1 to n → Value per pulse

**Description** Enter the measured value that corresponds to one pulse.

The lower the value, the better the resolution and the higher the pulse frequency.

**User entry** Signed floating-point number

## Switch output function

**Navigation** Guidance → Commissioning → PFS output 1 to n → Switch out funct

**Description** Assign a function to the switch output.

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

**Additional information** *Selection*
- **Off** option
  The switch output is permanently switched off (open, non-conductive).
- **On** option
  The switch output is permanently switched on (closed, conductive).
- **Diagnostic behavior** option
  The switch output is switched on (closed, conductive), if there is a pending diagnostic event of the assigned behavioral category.
- **Limit** option
  The switch output is switched on (closed, conductive), if the limit value specified for the process variable is reached.
- **Flow direction check** option
  The switch output is switched on (closed, conductive), when the flow direction changes (forward or reverse flow).
- **Status** option
  The switch output is switched on (closed, conductive) to indicate the status for the selected device function ("Assign status" parameter).

## Assign diagnostic behavior

**Navigation** Guidance → Commissioning → PFS output 1 to n → Assign diag. beh

**Description** The switch output is switched on (closed, conductive), if there is a pending diagnostic event of the assigned behavioral category.

**Selection**
- Alarm
- Alarm or warning
- Warning

**Additional information** *Selection*
- **Alarm** option
  The switch output is only switched on for diagnostic events of the "Alarm" category.
- **Alarm or warning** option
  The switch output is switched on for diagnostic events of the "Alarm" or "Warning" category.
- **Warning** option
  The switch output is only switched on for diagnostic events of the "Warning" category.

## Assign limit

**Navigation** Guidance → Commissioning → PFS output 1 to n → Assign limit

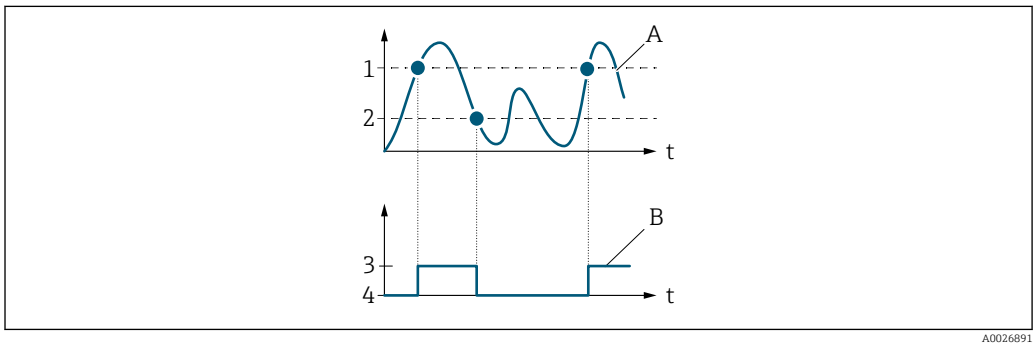
**Description** Select the process variable to monitor in case the specified limit value is exceeded. If a limit value for the selected process variable is exceeded, the output is switched on.

**Selection**
- Off
- Mass flow
- Volume flow
- Density
- Temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Oscillation damping

**Additional information**

*Switch-on point > switch-off point*

Behavior of the status output if switch-on point > switch-off point:
- Process variable > switch-on point: transistor is conductive
- Process variable < switch-off point: transistor is not conductive

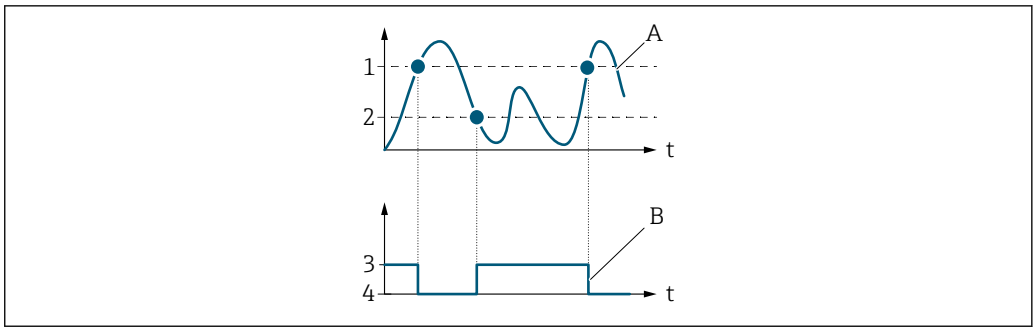



A0026891

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

*Switch-on point < switch-off point*

Behavior of the status output if switch-on point < switch-off point:
- Process variable < switch-on point: transistor is conductive
- Process variable > switch-off point: transistor is not conductive

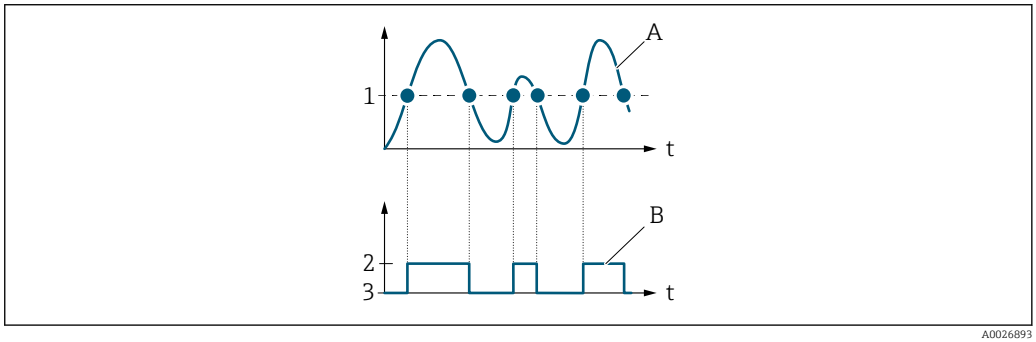



A0026892

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

*Switch-on point = switch-off point*

Behavior of the status output if switch-on point = switch-off point:
- Process variable > switch-on point: transistor is conductive
- Process variable < switch-off point: transistor is not conductive




A0026893

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

## Switch-on value

**Navigation** Guidance → Commissioning → PFS output 1 to n → Switch-on value

**Description** Enter the limit value for the switch-on point (process variable > switch-on value = closed, conductive).

To use a hysteresis: Switch-on point > Switch-off point.

**User entry** Signed floating-point number

### Switch-off value

**Navigation** Guidance → Commissioning → PFS output 1 to n → Switch-off value

**Description** Enter the limit value for the switch-off point (process variable < switch-off value = open, non-conductive).

To use a hysteresis: Switch-on point > Switch-off point.

**User entry** Signed floating-point number

### Switch-on delay

**Navigation** Guidance → Commissioning → PFS output 1 to n → Switch-on delay

**Description** Enter delay before the switch output is switched on.

**User entry** 0.0 to 100.0 s

### Switch-off delay

**Navigation** Guidance → Commissioning → PFS output 1 to n → Switch-off delay

**Description** Enter delay before the switch output is switched off.

**User entry** 0.0 to 100.0 s

### Assign status

**Navigation** Guidance → Commissioning → PFS output 1 to n → Assign status

**Description** Select the device function for which to report the status.

If the switch-on point for the selected device function is reached, the output is switched on (closed and conductive). Otherwise, the output is non-conductive.

The output behavior can be inverted in the "Invert output signal" parameter, i.e. in this case the output will be non-conductive when switched on and conductive when switched off. The "Invert output signal" parameter is not available for all devices.

**Selection**
- Partially filled pipe detection
- Low flow cutoff

**Failure mode**

**Navigation** Guidance → Commissioning → PFS output 1 to n → Failure mode

**Description** Specify how the output should behave in the event of a device alarm.

For safety reasons, it is recommended that the behavior of the output in the event of a device alarm be predefined.

**Selection**
- Actual status
- Open
- Closed

**Additional information** *Selection*
- **Actual status** option
  The switch output continues to report the actual state of the switch output based on the function assigned ("Switch output function" parameter). The fault condition is ignored.
- **Open** option
  In the event of a device alarm, the switch output's transistor is set to "non-conductive".

## 2.1.6 Time format

*Navigation* Guidance → Commissioning → Time format

**Time format**

**Navigation** Guidance → Commissioning → Time format → Time format

**Description** Select the time format.

**Selection**
- 24 h
- 12 h AM/PM

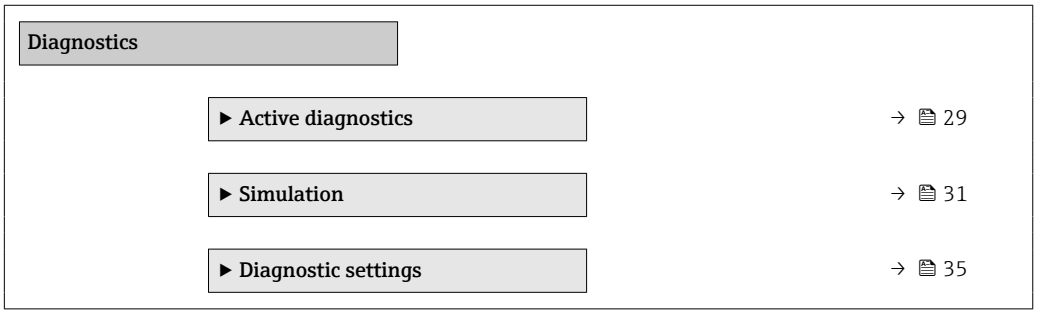
**Additional information** *Selection*

For an explanation of the abbreviated units: → 97

# 3 "Diagnostics" menu

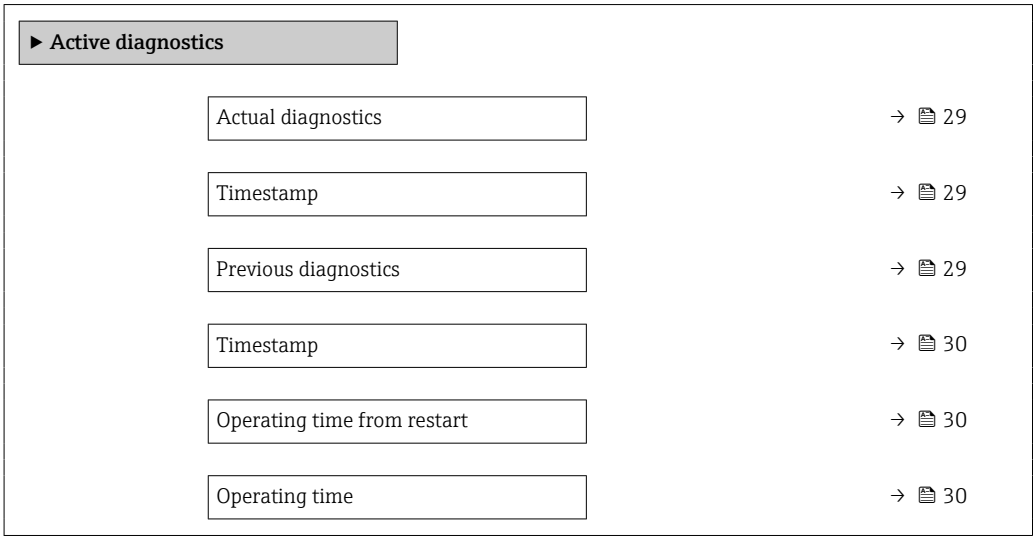
Troubleshooting and preventive maintenance – settings for device behavior during process and device events as well as assistance and measures for diagnostic purposes.

*Navigation* Diagnostics



## 3.1 Active diagnostics

*Navigation* Diagnostics → Active diagnos.




### Actual diagnostics

**Navigation** Diagnostics → Active diagnos. → Actual diagnos.

**Prerequisite** A diagnostic event has occurred.

**Description** Displays the currently active diagnostic message.

If there is more than one pending diagnostic event, the message for the diagnostic event with the highest priority is displayed.

**User interface** Positive integer

### Timestamp

**Navigation** Diagnostics → Active diagnos. → Timestamp

**Description** Displays the timestamp for the currently active diagnostic message.

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

### Previous diagnostics

**Navigation** Diagnostics → Active diagnos. → Prev.diagnostics

**Prerequisite** At least two diagnostic events have already occurred.

**Description** Displays the diagnostic message for the last diagnostic event that has ended.

**User interface** Positive integer

### Timestamp

**Navigation** Diagnostics → Active diagnos. → Timestamp

**Description** Displays the timestamp of the diagnostic message generated for the last diagnostic event that has ended.

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

### Operating time from restart

**Navigation** Diagnostics → Active diagnos. → Time fr. restart

**Description** Indicates how long the device has been in operation since the last time the device was restarted.

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

### Operating time

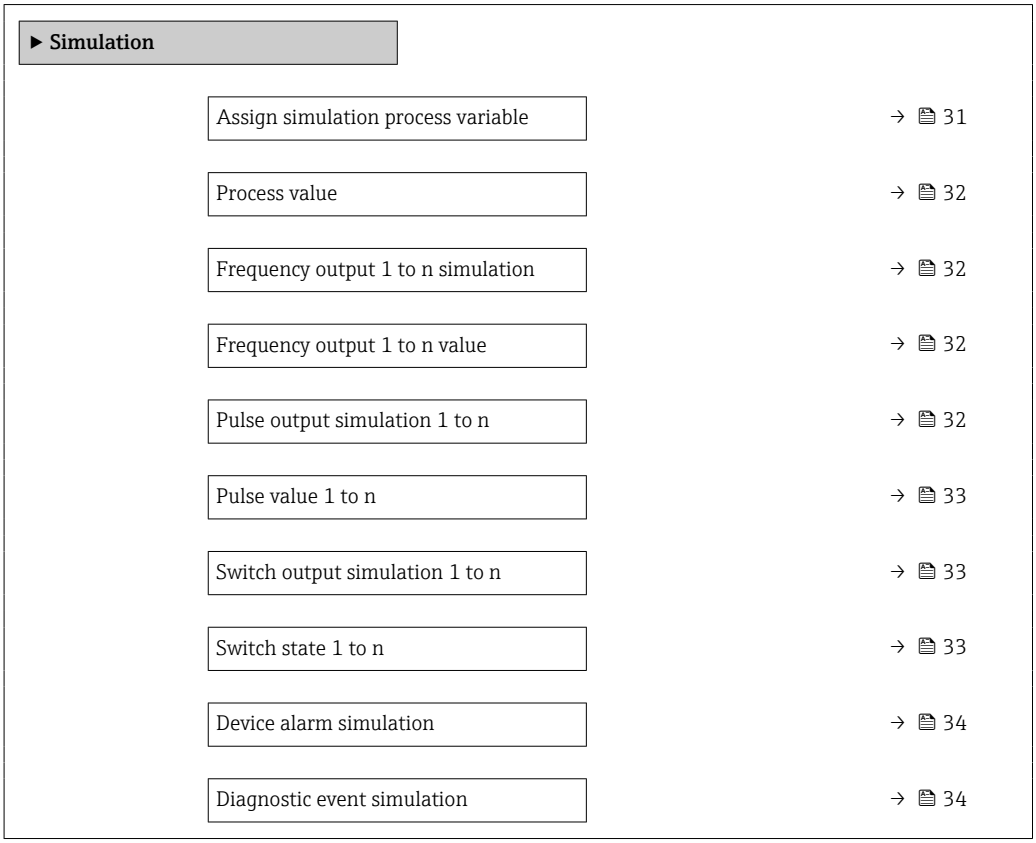
**Navigation** Diagnostics → Active diagnos. → Operating time

**Description** Indicates how long the device has been in operation.

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

## 3.2 Simulation

*Navigation* Diagnostics → Simulation




### Assign simulation process variable

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

**Description** Select a process variable to activate the simulation.

**Selection**
- Off
- Mass flow
- Volume flow
- Density
- Temperature

**Additional information** *Description*

The display alternates between the measured value and a diagnostics message of the "function check" category (C) when simulation is active.

### Process value

**Navigation** Diagnostics → Simulation → Process value

**Description** Enter the process value to simulate.
The unit is set in the "System units" menu.

**User entry** Signed floating-point number

### Frequency output simulation

**Navigation** Diagnostics → Simulation → Freq.outp 1 to n sim.

**Description** Switch simulation of the frequency output on or off.

**Selection**
- Off
- On

**Additional information** *Description*
The display alternates between the measured value and a diagnostics message of the "function check" category (C) when simulation is active.

### Frequency output value

**Navigation** Diagnostics → Simulation → Freq.outp 1 to n val.

**Description** Enter the frequency to simulate.

**User entry** 0.0 to 10 000.0 Hz

### Pulse output simulation

**Navigation** Diagnostics → Simulation → Puls.outp.sim. 1 to n

**Description** Switch simulation of the pulse output on or off.

**Selection**
- Off
- Fixed value
- Down-counting value

**Additional information** *Selection*

- **Fixed value** option
  Pulses are emitted continuously with the pulse width specified in the "Pulse width" parameter.
- **Down-counting value** option
  The number of pulses specified in the "Pulse value " parameter are emitted.

*Description*

The display alternates between the measured value and a diagnostics message of the "function check" category (C) when simulation is active.

## Pulse value

**Navigation** Diagnostics → Simulation → Pulse value 1 to n

**Description** Enter the number of pulses to simulate.

**User entry** 0 to 65 535

## Switch output simulation

**Navigation** Diagnostics → Simulation → Switch sim. 1 to n

**Description** Switch simulation of the switch output on or off.

**Selection**
- Off
- On

**Additional information** *Description*

The display alternates between the measured value and a diagnostics message of the "function check" category (C) when simulation is active.

## Switch state

**Navigation** Diagnostics → Simulation → Switch state 1 to n

**Description** Select the switch state to simulate.

**Selection**
- Open
- Closed

**Additional information** *Selection*

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

## Device alarm simulation

**Navigation** Diagnostics → Simulation → Dev. alarm sim.

**Description** Switch the device alarm simulation on or off.

While simulation is in progress, a diagnostic message of the Function Check (C) category is displayed.

**Selection**

- Off
- On

## Diagnostic event simulation

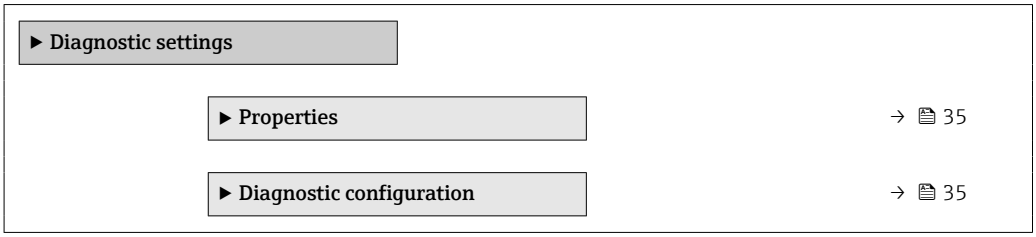
**Navigation** Diagnostics → Simulation → Diagnostic event

**Description** Select the diagnostic event to simulate.

**Selection** Off

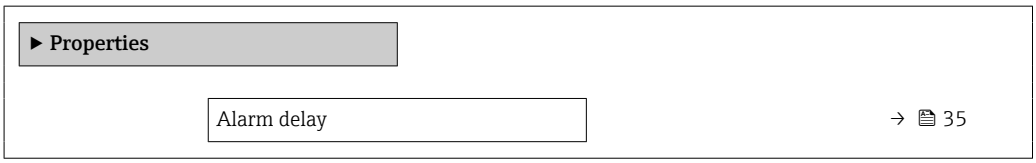
## 3.3 Diagnostic settings

*Navigation* Diagnostics → Diag. settings




### 3.3.1 Properties

*Navigation* Diagnostics → Diag. settings → Properties




**Alarm delay**

**Navigation** Diagnostics → Diag. settings → Properties → Alarm delay

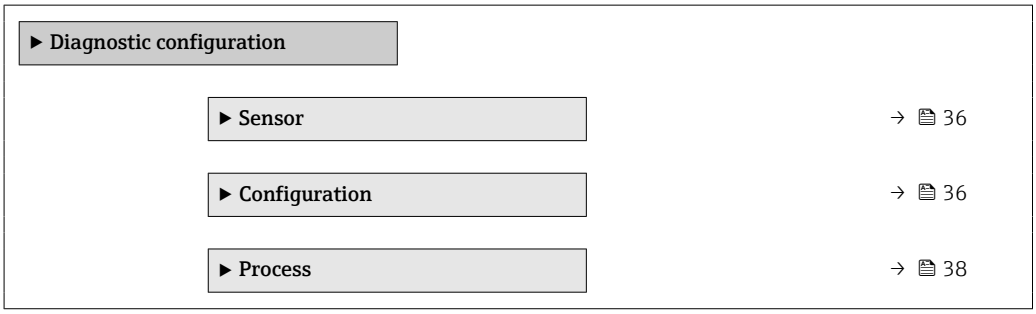
**Description** Enter a delay to suppress momentarily pending diagnostic messages.

Only applies to diagnostic events that allow for a delay before the diagnostic message is generated.

**User entry** 0 to 60 s

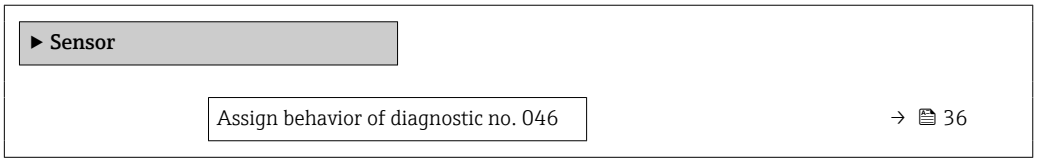
### 3.3.2 Diagnostic configuration

*Navigation* Diagnostics → Diag. settings → Diag. config.



### Sensor

*Navigation* Diagnostics → Diag. settings → Diag. config. → Sensor




## Assign behavior of diagnostic no. 046

**Navigation** Diagnostics → Diag. settings → Diag. config. → Sensor → Diagnostic no. 046

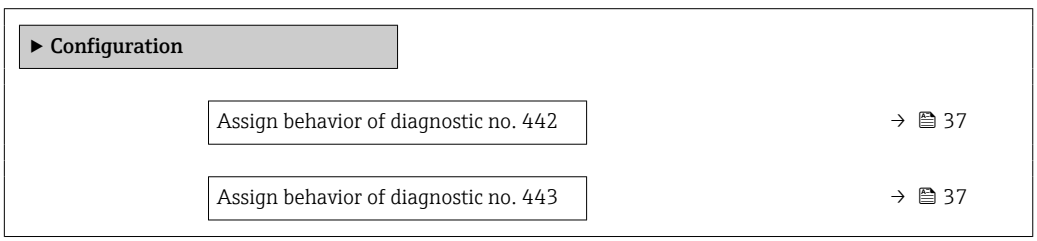
**Description** Select behavior for diagnostic event "046 Sensor limit exceeded".

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

**Additional information** *Selection*
- **Off** option
  The diagnostic event is ignored and no diagnostic message is generated or logged.
- **Alarm** option
  The device stops measuring. The signal outputs and totalizers assume the specified alarm condition. A diagnostic message is generated.
- **Warning** option
  The device continues measuring. The signal outputs and totalizers are not affected. A diagnostic message is generated.
- **Logbook entry only** option
  The device continues measuring. The diagnostic message is only displayed in the "Event logbook" submenu and does not alternate with the standard operational information displayed.

### Configuration

*Navigation* Diagnostics → Diag. settings → Diag. config. → Configuration



### Assign behavior of diagnostic no. 442

**Navigation** Diagnostics → Diag. settings → Diag. config. → Configuration → Diagnostic no. 442

**Description** Select behavior for diagnostic event "442 Frequency output faulty".

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

**Additional information** *Selection*
- **Off** option
  The diagnostic event is ignored and no diagnostic message is generated or logged.
- **Alarm** option
  The device stops measuring. The signal outputs and totalizers assume the specified alarm condition. A diagnostic message is generated.
- **Warning** option
  The device continues measuring. The signal outputs and totalizers are not affected. A diagnostic message is generated.
- **Logbook entry only** option
  The device continues measuring. The diagnostic message is only displayed in the "Event logbook" submenu and does not alternate with the standard operational information displayed.

### Assign behavior of diagnostic no. 443

**Navigation** Diagnostics → Diag. settings → Diag. config. → Configuration → Diagnostic no. 443

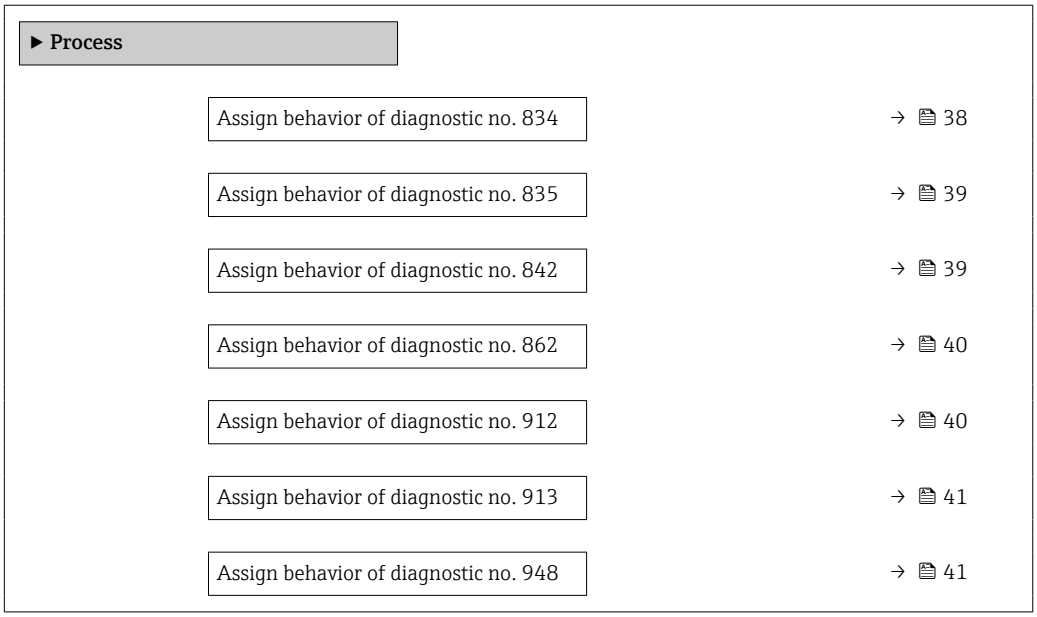
**Description** Select behavior for diagnostic event "443 Pulse output faulty".

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

**Additional information** *Selection*
- **Off** option
  The diagnostic event is ignored and no diagnostic message is generated or logged.
- **Alarm** option
  The device stops measuring. The signal outputs and totalizers assume the specified alarm condition. A diagnostic message is generated.
- **Warning** option
  The device continues measuring. The signal outputs and totalizers are not affected. A diagnostic message is generated.
- **Logbook entry only** option
  The device continues measuring. The diagnostic message is only displayed in the "Event logbook" submenu and does not alternate with the standard operational information displayed.

### Process

*Navigation* Diagnostics → Diag. settings → Diag. config. → Process




## Assign behavior of diagnostic no. 834

**Navigation** Diagnostics → Diag. settings → Diag. config. → Process → Diagnostic no. 834

**Description** Select behavior for diagnostic event "834 Process temperature too high".

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

**Additional information** *Selection*
- **Off** option
  The diagnostic event is ignored and no diagnostic message is generated or logged.
- **Alarm** option
  The device stops measuring. The signal outputs and totalizers assume the specified alarm condition. A diagnostic message is generated.
- **Warning** option
  The device continues measuring. The signal outputs and totalizers are not affected. A diagnostic message is generated.
- **Logbook entry only** option
  The device continues measuring. The diagnostic message is only displayed in the "Event logbook" submenu and does not alternate with the standard operational information displayed.

### Assign behavior of diagnostic no. 835

**Navigation** Diagnostics → Diag. settings → Diag. config. → Process → Diagnostic no. 835

**Description** Select behavior for diagnostic event "835 Process temperature too low".

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

**Additional information** *Selection*
- **Off** option
  The diagnostic event is ignored and no diagnostic message is generated or logged.
- **Alarm** option
  The device stops measuring. The signal outputs and totalizers assume the specified alarm condition. A diagnostic message is generated.
- **Warning** option
  The device continues measuring. The signal outputs and totalizers are not affected. A diagnostic message is generated.
- **Logbook entry only** option
  The device continues measuring. The diagnostic message is only displayed in the "Event logbook" submenu and does not alternate with the standard operational information displayed.

### Assign behavior of diagnostic no. 842

**Navigation** Diagnostics → Diag. settings → Diag. config. → Process → Diagnostic no. 842

**Description** Select behavior for diagnostic event "842 Process value below limit".

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

**Additional information** *Selection*
- **Off** option
  The diagnostic event is ignored and no diagnostic message is generated or logged.
- **Alarm** option
  The device stops measuring. The signal outputs and totalizers assume the specified alarm condition. A diagnostic message is generated.
- **Warning** option
  The device continues measuring. The signal outputs and totalizers are not affected. A diagnostic message is generated.
- **Logbook entry only** option
  The device continues measuring. The diagnostic message is only displayed in the "Event logbook" submenu and does not alternate with the standard operational information displayed.

## Assign behavior of diagnostic no. 862

**Navigation** Diagnostics → Diag. settings → Diag. config. → Process → Diagnostic no. 862

**Description** Select behavior for diagnostic event "862 Partly filled pipe".

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

**Additional information** *Selection*
- **Off** option
  The diagnostic event is ignored and no diagnostic message is generated or logged.
- **Alarm** option
  The device stops measuring. The signal outputs and totalizers assume the specified alarm condition. A diagnostic message is generated.
- **Warning** option
  The device continues measuring. The signal outputs and totalizers are not affected. A diagnostic message is generated.
- **Logbook entry only** option
  The device continues measuring. The diagnostic message is only displayed in the "Event logbook" submenu and does not alternate with the standard operational information displayed.

## Assign behavior of diagnostic no. 912

**Navigation** Diagnostics → Diag. settings → Diag. config. → Process → Diagnostic no. 912

**Description** Select behavior for diagnostic event "912 Medium inhomogeneous".

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

**Additional information** *Selection*
- **Off** option
  The diagnostic event is ignored and no diagnostic message is generated or logged.
- **Alarm** option
  The device stops measuring. The signal outputs and totalizers assume the specified alarm condition. A diagnostic message is generated.
- **Warning** option
  The device continues measuring. The signal outputs and totalizers are not affected. A diagnostic message is generated.
- **Logbook entry only** option
  The device continues measuring. The diagnostic message is only displayed in the "Event logbook" submenu and does not alternate with the standard operational information displayed.

### Assign behavior of diagnostic no. 913

**Navigation** Diagnostics → Diag. settings → Diag. config. → Process → Diagnostic no. 913

**Description** Select behavior for diagnostic event "913 Medium unsuitable".

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

**Additional information** *Selection*
- **Off** option
  The diagnostic event is ignored and no diagnostic message is generated or logged.
- **Alarm** option
  The device stops measuring. The signal outputs and totalizers assume the specified alarm condition. A diagnostic message is generated.
- **Warning** option
  The device continues measuring. The signal outputs and totalizers are not affected. A diagnostic message is generated.
- **Logbook entry only** option
  The device continues measuring. The diagnostic message is only displayed in the "Event logbook" submenu and does not alternate with the standard operational information displayed.

### Assign behavior of diagnostic no. 948

**Navigation** Diagnostics → Diag. settings → Diag. config. → Process → Diagnostic no. 948

**Description** Select behavior for diagnostic event "948 Oscillation damping too high".

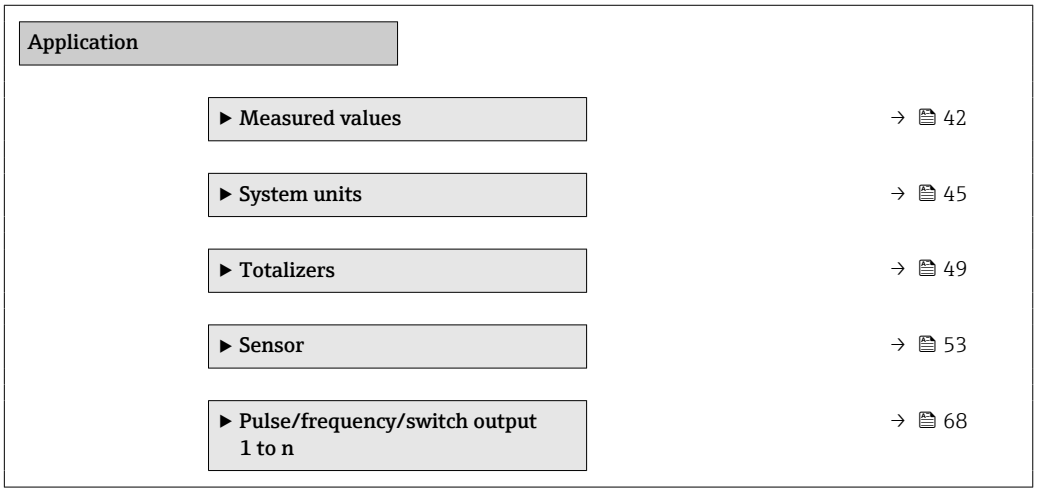
**Selection**
- Off
- Alarm
- Warning
- Logbook entry only

**Additional information** *Selection*
- **Off** option
  The diagnostic event is ignored and no diagnostic message is generated or logged.
- **Alarm** option
  The device stops measuring. The signal outputs and totalizers assume the specified alarm condition. A diagnostic message is generated.
- **Warning** option
  The device continues measuring. The signal outputs and totalizers are not affected. A diagnostic message is generated.
- **Logbook entry only** option
  The device continues measuring. The diagnostic message is only displayed in the "Event logbook" submenu and does not alternate with the standard operational information displayed.

# 4 "Application" menu

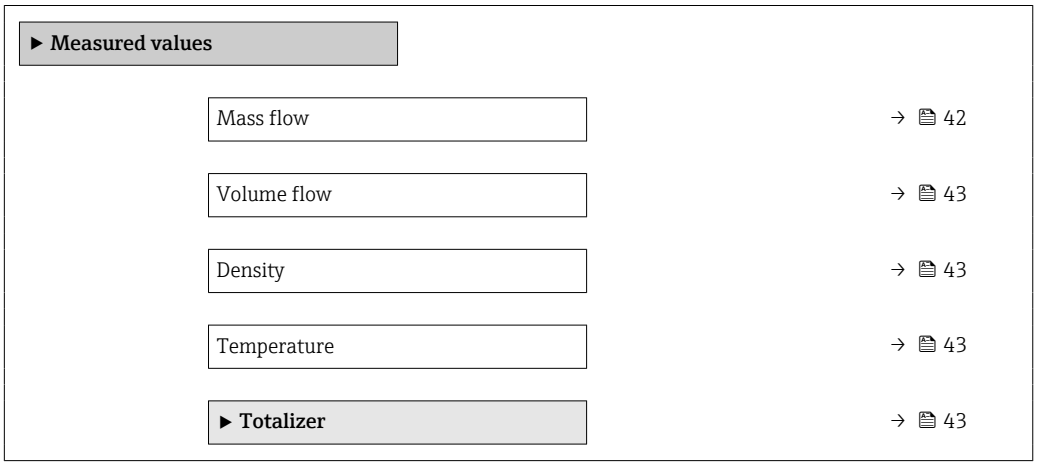
Targeted optimization to the application – comprehensive device settings from sensor technology to system integration for optimum application adaptation.

*Navigation* Application




## 4.1 Measured values

*Navigation* Application → Measured values




### Mass flow

**Navigation** Application → Measured values → Mass flow

**Description** Displays the mass flow measured.

The unit is set in the "System units" menu.

**User interface** Signed floating-point number

**Volume flow**

**Navigation** Application → Measured values → Volume flow

**Description** Displays the volume flow measured.
The unit is set in the "System units" menu.

**User interface** Signed floating-point number

**Density**

**Navigation** Application → Measured values → Density

**Description** Displays the density measured.
The unit is set in the "System units" menu.

**User interface** Positive floating-point number

**Temperature**

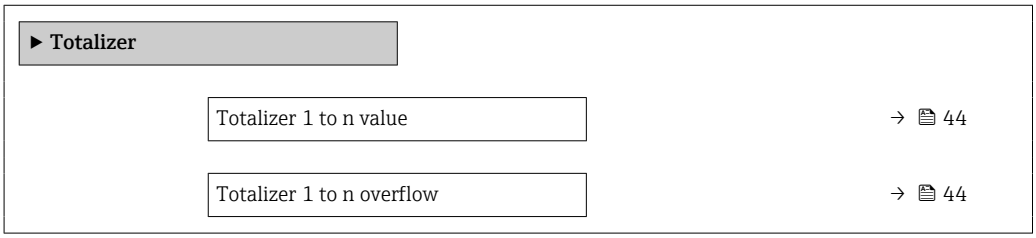
**Navigation** Application → Measured values → Temperature

**Description** Displays the medium temperature measured.
The unit is set in the "System units" menu.

**User interface** Positive floating-point number

### 4.1.1 Totalizer

*Navigation* Application → Measured values → Totalizer



## Totalizer value

**Navigation** Application → Measured values → Totalizer → Tot. 1 to n value

**Prerequisite** A process variable has been selected in the **Assign process variable** parameter in the **Totalizer 1 to n** submenu.

**Description** Displays the totalizer counter since the last reset.

This parameter can only display figures up to 7 digits. If the counter exceeds this range, the overflow is displayed in the "Totalizer overflow " parameter.

Example:

Value of "Totalizer value" parameter: 1,968,457 $m^3$
Value of "Totalizer overflow " parameter: 1 × 10^7 (1 overflow) = 10,000,000 $m^3$
Counter (total): 11,968,457 $m^3$

In the event of a fault condition, the totalizer behaves as specified in the "Totalizer failure behavior" parameter.

**User interface** Signed floating-point number

## Totalizer overflow

**Navigation** Application → Measured values → Totalizer → Tot. 1 to n overflow

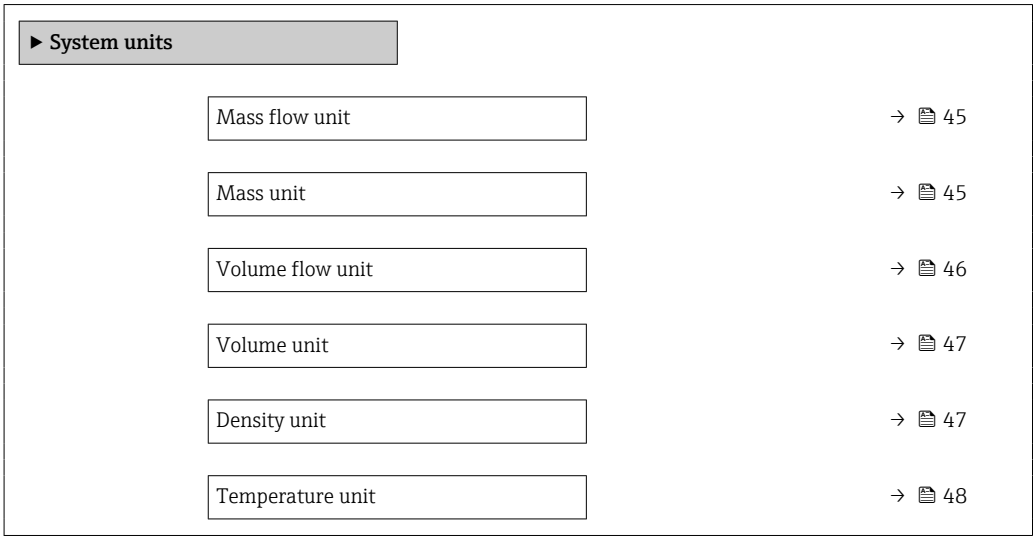
**Prerequisite** A process variable has been selected in the **Assign process variable** parameter in the **Totalizer 1 to n** submenu.

**Description** Displays the number of overflows for the totalizer counter ("Totalizer value" parameter).

**User interface** −32 000.0 to 32 000.0

## 4.2 System units

*Navigation* Application → System units




### Mass flow unit

**Navigation** Application → System units → Mass flow unit

**Description** Select the mass flow unit.

**Selection**

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

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

### Mass unit

**Navigation** Application → System units → Mass unit

**Description** Select the mass unit.

**Selection**

*SI units*
- g
- kg
- t

*US units*
- oz
- lb
- STon

## Volume flow unit

**Navigation** Application → System units → Volume flow unit

**Description** Select the volume flow unit.

**Selection**

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

*US units*
- af/s
- af/min
- af/h
- af/d
- $ft^3/s$
- $ft^3/min$
- $ft^3/h$
- $ft^3/d$
- fl oz/s (us)
- fl oz/min (us)
- fl oz/h (us)
- fl oz/d (us)
- gal/s (us)
- gal/min (us)
- gal/h (us)
- gal/d (us)
- 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)
- kgal/s (us)
- kgal/min (us)
- kgal/h (us)
- kgal/d (us)

*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)

**Additional information** *Options*

For an explanation of the abbreviated units: → 97

## Volume unit

**Navigation** Application → System units → Volume unit

**Description** Select the volume unit.

**Selection**

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

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

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

**Additional information** *Selection*

For an explanation of the abbreviated units: → 97

## Density unit

**Navigation** Application → System units → Density unit

**Description** Select the density unit.

**Selection**

*SI units*
- $g/cm^3$
- $g/m^3$
- g/ml
- kg/l
- $kg/dm^3$
- $kg/m^3$
- SD4°C
- SD15°C
- SD20°C
- SG4°C
- SG15°C
- SG20°C

*US units*
- $lb/ft^3$
- 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)

**Additional information** *Options*

For an explanation of the abbreviated units: → 97

## Temperature unit

**Navigation** Application → System units → Temperature unit

**Description** Select the temperature unit.

**Selection**

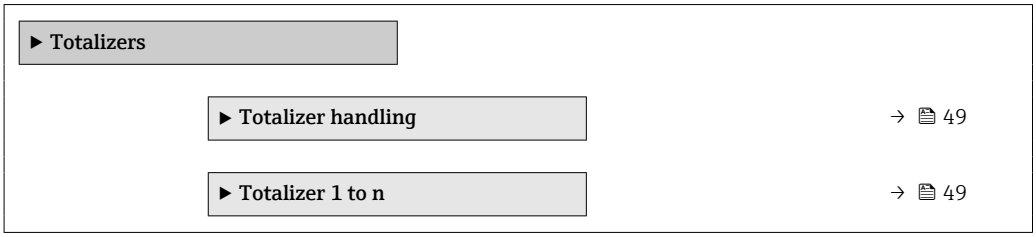
| *SI units* | *US units* |
| --- | --- |
| ▪ ℃ | ▪ ℉ |
| ▪ K | ▪ ℉R |

**Additional information** *Selection*

For an explanation of the abbreviated units: → 97

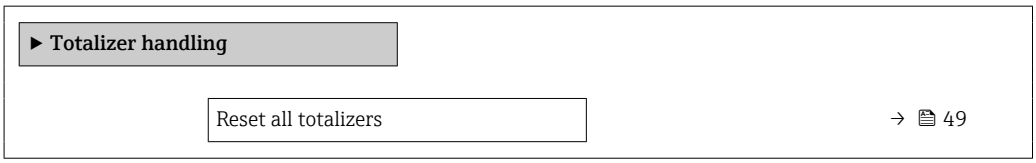
## 4.3 Totalizers

*Navigation* Application → Totalizers




### 4.3.1 Totalizer handling

*Navigation* Application → Totalizers → Totalizer




**Reset all totalizers**

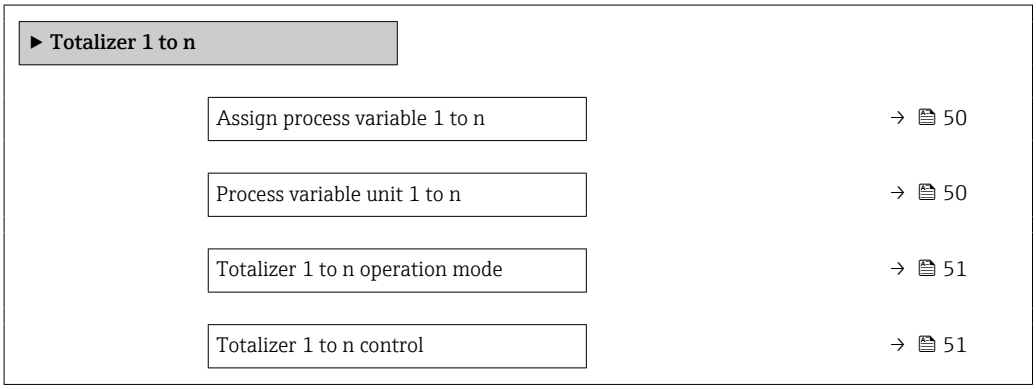
**Navigation** Application → Totalizers → Totalizer → Reset all tot.

**Description** Reset all totalizers to "0" and restart the totalizers. The counter readings are not logged prior to the reset.

**Selection**
- Cancel
- Reset + totalize

### 4.3.2 Totalizer 1 to n

*Navigation* Application → Totalizers → Totalizer 1 to n



| | |
|---|---|
| Preset value 1 to n | → 52 |
| Totalizer 1 to n failure behavior | → 52 |

## Assign process variable

**Navigation** Application → Totalizers → Totalizer 1 to n → AssignVariab. 1 to n

**Description** Select a process variable to activate the totalizer.

If the process variable is changed or the totalizer deactivated, the totalizer is reset to "0".

**Selection**
- Off
- Volume flow
- Mass flow

## Process variable unit

**Navigation** Application → Totalizers → Totalizer 1 to n → VariableUnit 1 to n

**Description** Select the unit for the process variable of the totalizer.

**Selection**

*SI units*
- g *
- kg *
- t *

*US units*
- oz *
- lb *
- STon *

* Visibility depends on order options or device settings

or

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

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

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

* Visibility depends on order options or device settings

or

*Other units*
None *

| | |
|---|---|
| * | Visibility depends on order options or device settings |

## Totalizer operation mode

**Navigation** Application → Totalizers → Totalizer 1 to n → Operat. mode 1 to n

**Description** Select the totalizer operation mode, e.g. only totalize forward flow or only totalize reverse flow.

**Selection**
- Net
- Forward
- Reverse

**Additional information** *Selection*
- **Net** option
  The flow values in the forward and reverse flow directions are totalized and netted against each other. Net flow is recorded in the flow direction.
- **Forward** option
  Only the flow in the forward flow direction is totalized.
- **Reverse** option
  Only the flow in the reverse flow direction is totalized (= reverse flow quantity).

## Totalizer control

**Navigation** Application → Totalizers → Totalizer 1 to n → Tot. 1 to n control

**Prerequisite** A process variable has been selected in the **Assign process variable** parameter in the **Totalizer 1 to n** submenu.

**Description** Operate the totalizer.

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

**Additional information** *Selection*
- **Totalize** option
  The totalizer is started or continues running.
- **Reset + hold** option
  The totalizer is reset to "0" and stopped.
- **Preset + hold** option
  The totalizer is stopped and set to the start value specified in the "Preset value " parameter.

- **Reset + totalize** option
  The totalizer is reset to "0" and restarted.
- **Preset + totalize** option
  The totalizer is stopped and set to the start value specified in the "Preset value " parameter.
- **Hold** option
  The totalizer is stopped.

## Preset value

**Navigation** Application → Totalizers → Totalizer 1 to n → Preset value 1 to n

**Prerequisite** A process variable has been selected in the **Assign process variable** parameter in the **Totalizer 1 to n** submenu.

**Description** Specify a start value for the totalizer.

**User entry** Signed floating-point number

**Additional information** *Description*

The unit of the selected process variable is specified for the totalizer in the **Unit totalizer** parameter (→ 11).

*Example*

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

## Totalizer failure behavior

**Navigation** Application → Totalizers → Totalizer 1 to n → FailureBehav. 1 to n

**Description** Specify how the totalizer should behave in the event of a device alarm.

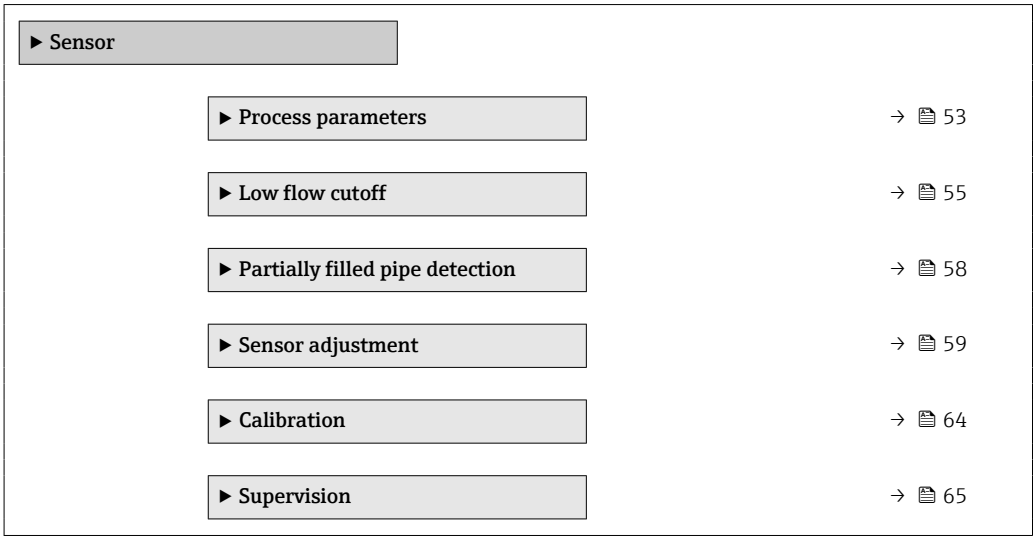
**Selection**
- Hold
- Continue
- Last valid value + continue

**Additional information** *Selection*

- **Hold** option
  The totalizer is stopped in the event of a device alarm.
- **Continue** option
  The totalizer continues to totalize based on the current value measured; the device alarm is ignored.
- **Last valid value + continue** option
  The totalizer continues to totalize based on the last valid value measured before the device alarm occurred.

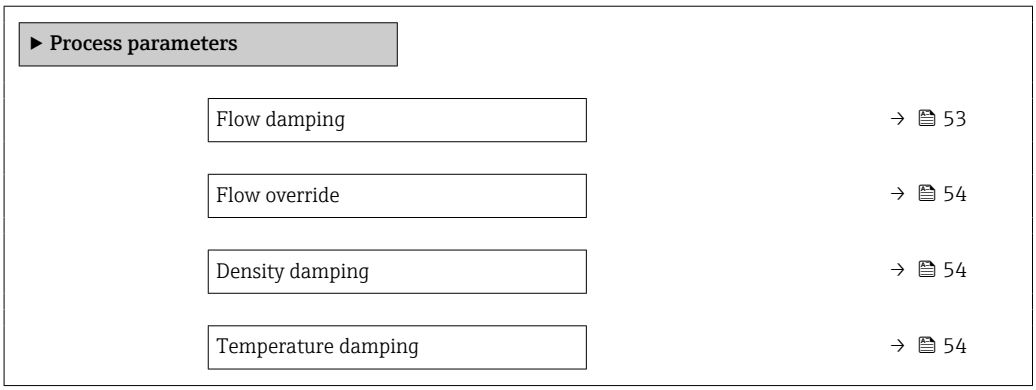
## 4.4 Sensor

*Navigation* Application → Sensor




### 4.4.1 Process parameters

*Navigation* Application → Sensor → Process param.




**Flow damping**

**Navigation** Application → Sensor → Process param. → Flow damping

**Description** Enter a time constant for flow damping.
Value = 0: No damping
Value > 0: Damping increases

Damping is implemented by means of a proportional transmission behavior with first order delay (PT1 element).

**User entry** 0 to 99.9 s

## Flow override

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

**Description** Reports the flow rate as zero until flow override is deactivated. Can be used for example when cleaning the pipeline.

**Selection**
- Off
- On

**Additional information**

*Selection*

**"On" option**
Activates flow override and the diagnostic message "453 Flow override active" is generated.

Values reported:
Flow variables: Zero
Other process variables: As measured
Totalizers: Stop totalizing

*Effect*

This setting affects all the functions of the measuring device.

Positive zero return is not relevant for most applications.

## Density damping

**Navigation** Application → Sensor → Process param. → Density damping

**Description** Enter a time constant for the damping applied to the value measured for density.
Value = 0: No damping
Value > 0: Damping increases

Damping is implemented by means of a proportional transmission behavior with first order delay (PT1 element).

**User entry** 0 to 999.9 s

## Temperature damping

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

**Description** Enter a time constant for the damping applied to the value measured for temperature.
Value = 0: No damping
Value > 0: Damping increases

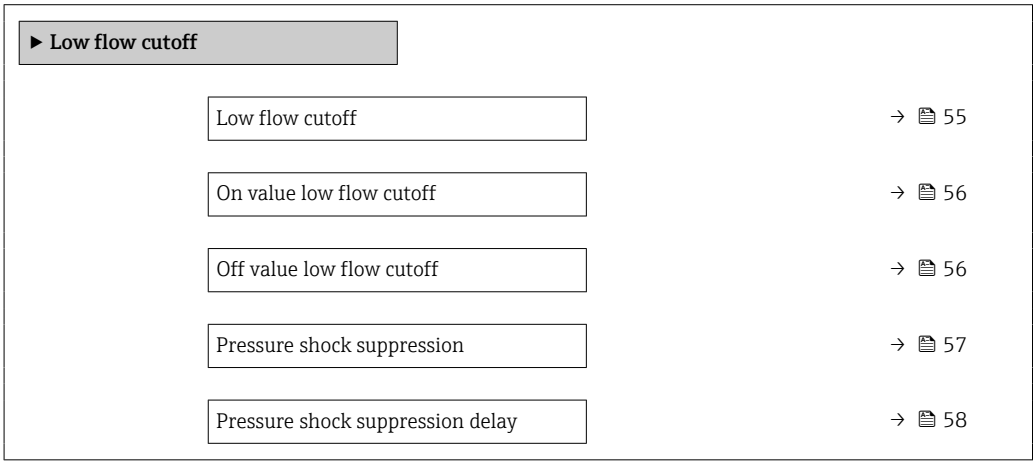
Damping is implemented by means of a proportional transmission behavior with first order delay (PT1 element).

**User entry** 0 to 999.9 s

### 4.4.2 Low flow cutoff

Low flow cut off is an important function for many applications to shut out inherent noise from the measuring device and the application in the lower measuring range. If the flow drops below a certain minimum value, the value is set to **0** so that the flow signal can be kept at the zero point between two batches.

*Navigation* Application → Sensor → Low flow cutoff



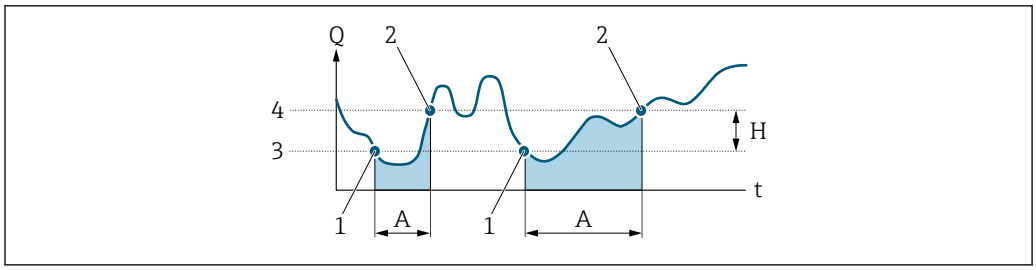

**Low flow cutoff**

**Navigation** Application → Sensor → Low flow cutoff → Low flow cutoff

**Description** Select a process variable for low flow cutoff to activate low flow cutoff.

**Selection**
- Off
- Mass flow
- Volume flow

**Additional information** Description




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

## On value low flow cutoff

**Navigation** Application → Sensor → Low flow cutoff → On value

**Description** Enter on value to switch on low flow cutoff.

Value = 0: No low flow cutoff
Value > 0: Low flow cutoff is activated

**User entry** Positive floating-point number

## Off value low flow cutoff

**Navigation** Application → Sensor → Low flow cutoff → Off value

**Description** Enter off value to switch off low flow cutoff. The off value is entered as a positive hysteresis with respect to the on value.

**User entry** 0 to 100.0 %

## Pressure shock suppression

**Navigation** Application → Sensor → Low flow cutoff → Pres. shock sup.

**Description**

Enter a time span for signal suppression (= pressure shock suppression active), for example to prevent the device from registering flow movements in the pipe when a valve is closed.

Pressure schock suppression is activated when the flow rate drops below the on value for low flow cutoff.

Values reported when pressure shock suppression is active:

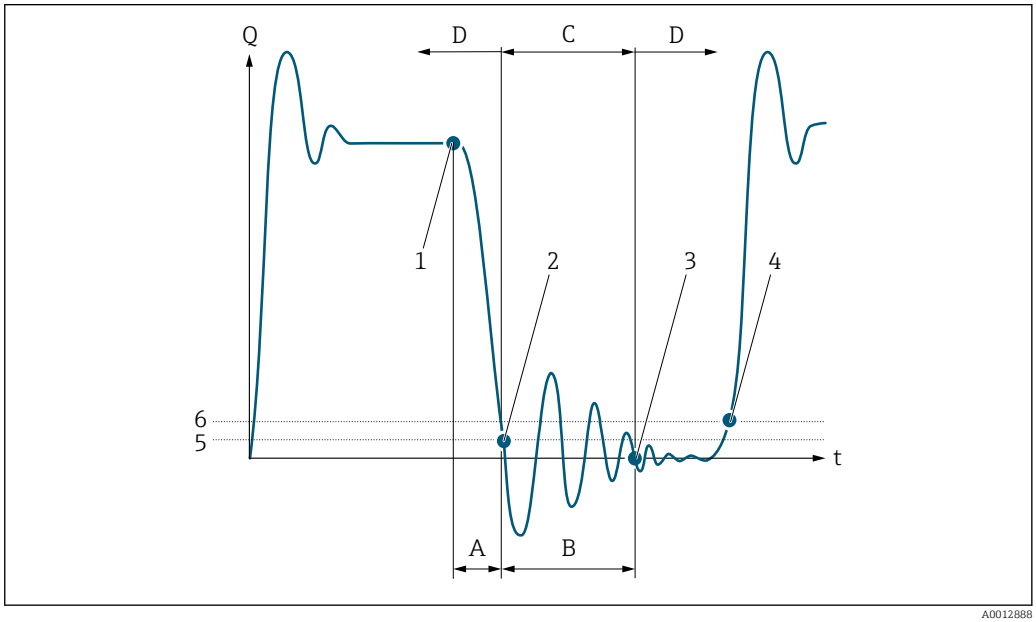
Flow: 0
Totalizer: Last valid value

Pressure shock suppression is deactivated when the time span specified has elapsed and the flow rate exceeds the off value for low flow cutoff.

**User entry** 0 to 100 s

**Additional information** *Example*

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




*Q Flow*
*t Time*
*A After run*
*B Pressure shock*
*C Pressure shock suppression active according to 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 current flow value is processed and displayed again.*
*5 On value for low flow cut off*
*6 Off value for low flow cut off*

**Pressure shock suppression delay**

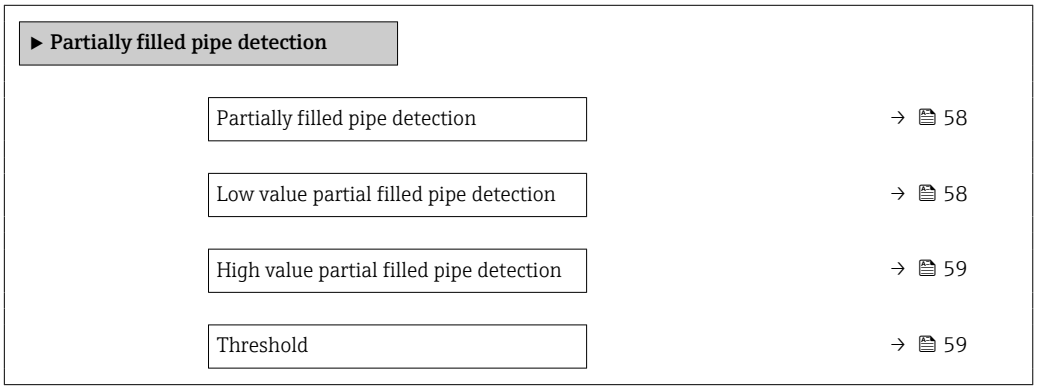
**Navigation** Application → Sensor → Low flow cutoff → PresShockSpDelay

**Description** If required, enter a delay until pressure shock suppression is activated to suppress a response to momentary low flow.

**User entry** Positive floating-point number

### 4.4.3 Partially filled pipe detection

*Navigation* Application → Sensor → Partial pipe det




**Partially filled pipe detection**

**Navigation** Application → Sensor → Partial pipe det → Partial pipe det

**Description** Select a process variable to activate detection of an empty or partially filled pipe.

Due to low density, deactivate partially filled pipe detection for a gas.

**Selection**
- Off
- Density

**Low value partial filled pipe detection**

**Navigation** Application → Sensor → Partial pipe det → Low value

**Prerequisite** A process variable has been selected in the **Assign process variable** parameter in the **Empty pipe detection** submenu.

**Description** Enter the lower limit value for the selected process variable. If the measured value drops below the limit value, diagnostic message "862 Partly filled pipe" is generated.

The lower limit value must be lower than the upper limit value ("High value partial filled pipe detection" parameter).

**User entry** Signed floating-point number

**High value partial filled pipe detection**

**Navigation** Application → Sensor → Partial pipe det → High value

**Prerequisite** A process variable has been selected in the **Assign process variable** parameter in the **Empty pipe detection** submenu.

**Description** Enter the upper limit value for the selected process variable. If the measured value exceeds the limit value, diagnostic message "862 Partly filled pipe" is generated.

**User entry** Signed floating-point number

**Threshold**

**Navigation** Application → Sensor → Partial pipe det → Threshold

**Description** Enter the threshold for oscillation damping. When oscillation damping exceeds the threshold, the pipe is detected as partially filled, the flow rate is reported as 0, and the diagnostic message "862 Partly filled pipe" is generated.

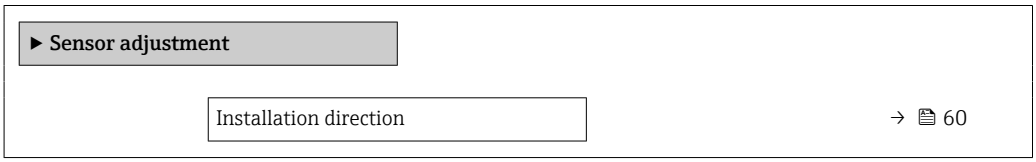
If the medium is inhomogeneous or contains air bubbles, oscillation damping of the measuring tubes increases. Oscillation damping also depends on application-specific variables, such as medium, nominal diameter, and sensor.

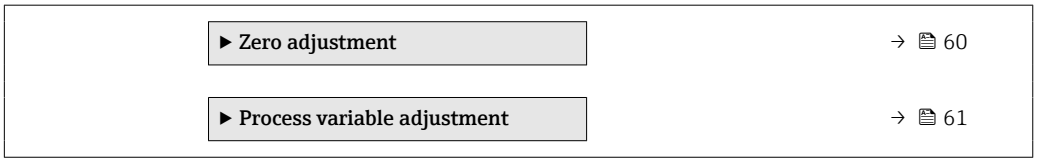
For a full tube, oscillation damping will typically be around 500. For a partially filled pipe, oscillation damping rises to > 5000. Therefore, a threshold of 2000 is recommended. If set to 0, partially filled pipe detection via oscillation damping is deactivated.

**User entry** Positive floating-point number

## 4.4.4 Sensor adjustment

*Navigation* Application → Sensor → Sensor adjustm.






## Installation direction

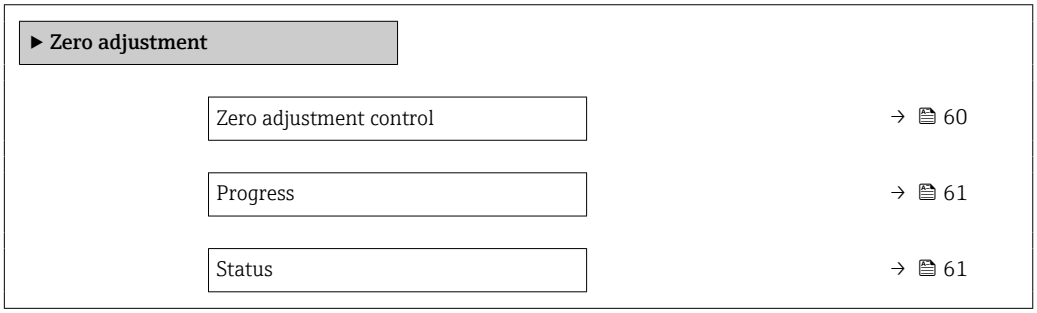
**Navigation** Application → Sensor → Sensor adjustm. → Install. direct.

**Description** Select the sign of the flow direction.

**Selection**
- Forward flow
- Reverse flow

### Zero adjustment

*Navigation* Application → Sensor → Sensor adjustm. → Zero adjustment




## Zero adjustment control

**Navigation** Application → Sensor → Sensor adjustm. → Zero adjustment → ZeroAdjustContr.

**Description** Start or cancel a zero point adjustment.

The following conditions must be met to perform a zero point adjustment successfully:

The actual flow rate must be 0.
The pressure must be at least 1.034 bar.

**Selection**
- Cancel
- Start

### Progress

**Navigation** Application → Sensor → Sensor adjustm. → Zero adjustment → Progress

**Description** Shows the progress of the process.

**User interface** 0 to 100 %

### Status

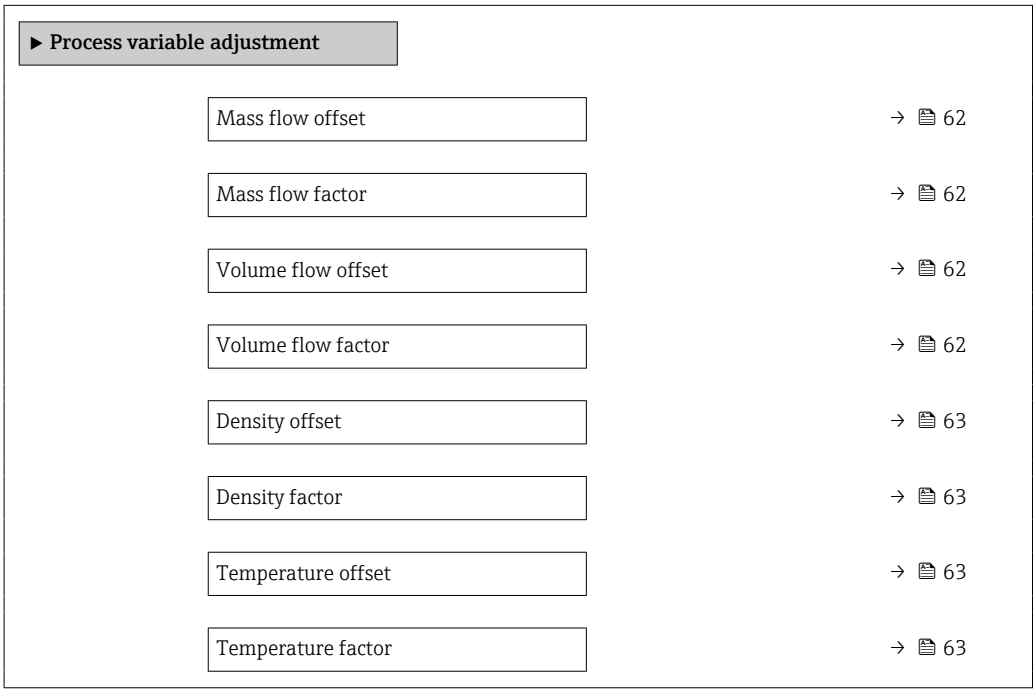
**Navigation** Application → Sensor → Sensor adjustm. → Zero adjustment → Status

**Description** Displays the status of the zero point adjustment.

**User interface**
- Busy
- Failed
- Done

## Process variable adjustment

*Navigation* Application → Sensor → Sensor adjustm. → Variable adjust



### Mass flow offset

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

**Description** Enter the offset by which to shift the zero point for mass flow in kg/s.

**User entry** Signed floating-point number

**Additional information** *Description*
Corrected value = (factor × value) + offset

### Mass flow factor

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

**Description** Enter the multiplication factor to apply to the mass flow value.

**User entry** Positive floating-point number

**Additional information** *Description*
Corrected value = (factor × value) + offset

### Volume flow offset

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

**Description** Enter the offset by which to shift the zero point for volume flow in m3/s.

**User entry** Signed floating-point number

**Additional information** *Description*
Corrected value = (factor × value) + offset

### Volume flow factor

**Navigation** Application → Sensor → Sensor adjustm. → Variable adjust → Vol. flow factor

**Description** Enter the multiplication factor to apply to the volume flow.

**User entry** Positive floating-point number

**Additional information** *Description*
Corrected value = (factor × value) + offset

### Density offset

**Navigation** Application → Sensor → Sensor adjustm. → Variable adjust → Density offset

**Description** Enter the offset by which to shift the zero point for density in kg/m3.

**User entry** Signed floating-point number

**Additional information** *Description*
Corrected value = (factor × value) + offset

### Density factor

**Navigation** Application → Sensor → Sensor adjustm. → Variable adjust → Density factor

**Description** Enter the multiplication factor to apply to the density value.

**User entry** Positive floating-point number

**Additional information** *Description*
Corrected value = (factor × value) + offset

### Temperature offset

**Navigation** Application → Sensor → Sensor adjustm. → Variable adjust → Temp. offset

**Description** Enter the offset by which to shift the zero point for temperature in K.

**User entry** Signed floating-point number

**Additional information** *Description*
Corrected value = (factor × value) + offset

### Temperature factor

**Navigation** Application → Sensor → Sensor adjustm. → Variable adjust → Temp. factor

**Description** Enter the multiplication factor to apply to the temperature value.

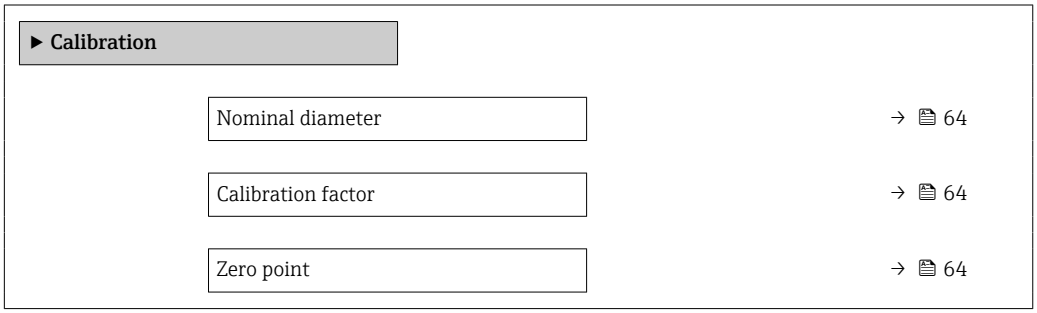
**User entry** Positive floating-point number

**Additional information** *Description*

Corrected value = (factor × value) + offset

## 4.4.5 Calibration

*Navigation* Application → Sensor → Calibration




### Nominal diameter

**Navigation** Application → Sensor → Calibration → Nominal diameter

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

**User interface** Character string comprising numbers, letters and special characters

### Calibration factor

**Navigation** Application → Sensor → Calibration → Cal. factor

**Description** Displays the current calibration factor for the sensor. The factory setting for the calibration factor can be found on the sensor's nameplate.

**User interface** Signed floating-point number

### Zero point

**Navigation** Application → Sensor → Calibration → Zero point

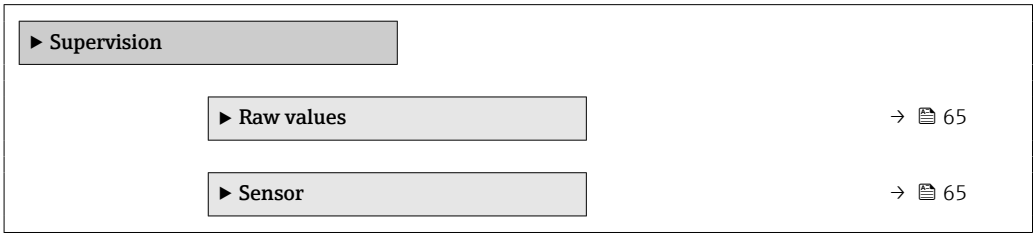
**Description** Displays the zero point correction value for the sensor.

Users logged on in the Service role have write access.

**User entry** Signed floating-point number

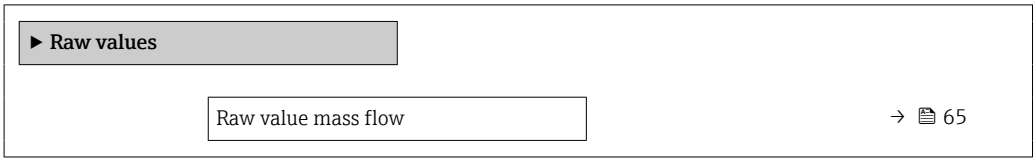
### 4.4.6 Supervision

*Navigation* Application → Sensor → Supervision




#### Raw values

*Navigation* Application → Sensor → Supervision → Raw values




**Raw value mass flow**

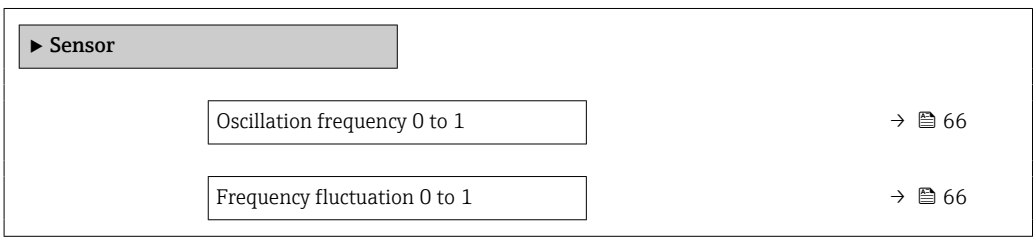
**Navigation** Application → Sensor → Supervision → Raw values → Raw mass flow

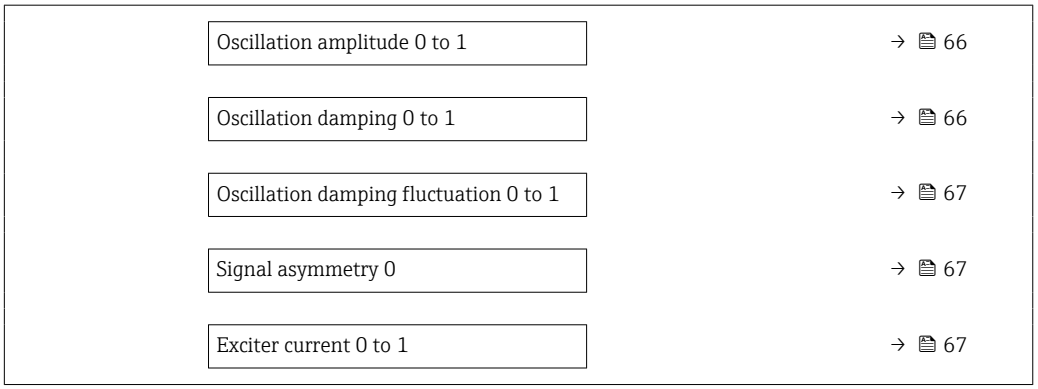
**Description** Displays the mass flow value before offset and factor correction, damping, low flow cut off and monitoring of a partially filled pipe. This value can be used to verify that the current zero point is within range.

**User interface** Signed floating-point number

#### Sensor

*Navigation* Application → Sensor → Supervision → Sensor






### Oscillation frequency 0 to 1

**Navigation** Application → Sensor → Supervision → Sensor → Osc. freq. 0 to 1

**Description** Displays the current oscillation frequency.

**User interface** Signed floating-point number

### Frequency fluctuation 0 to 1

**Navigation** Application → Sensor → Supervision → Sensor → Freq. fluct. 0 to 1

**Description** Displays the current frequency fluctuation.

**User interface** Signed floating-point number

### Oscillation amplitude 0 to 1

**Navigation** Application → Sensor → Supervision → Sensor → Osc. ampl. 0 to 1

**Description** Displays the oscillation amplitude of the sensor relative to the value under ideal conditions.

**User interface** Signed floating-point number

### Oscillation damping 0 to 1

**Navigation** Application → Sensor → Supervision → Sensor → Osc. damping 0 to 1

**Description** Displays the current oscillation damping. Oscillation damping is an indicator for the sensor's current demand for excitation power.

**User interface** Positive floating-point number

### Oscillation damping fluctuation 0 to 1

**Navigation** Application → Sensor → Supervision → Sensor → Osc.damp.fluct0 to 1

**Description** Displays the current fluctuation in oscillation damping.

**User interface** Signed floating-point number

### Signal asymmetry 0

**Navigation** Application → Sensor → Supervision → Sensor → Signal asymm. 0

**Description** Displays the relative difference between the signal amplitudes of the inlet sensor and the outlet sensor of the first oscillation mode.

**User interface** Signed floating-point number

### Exciter current 0 to 1

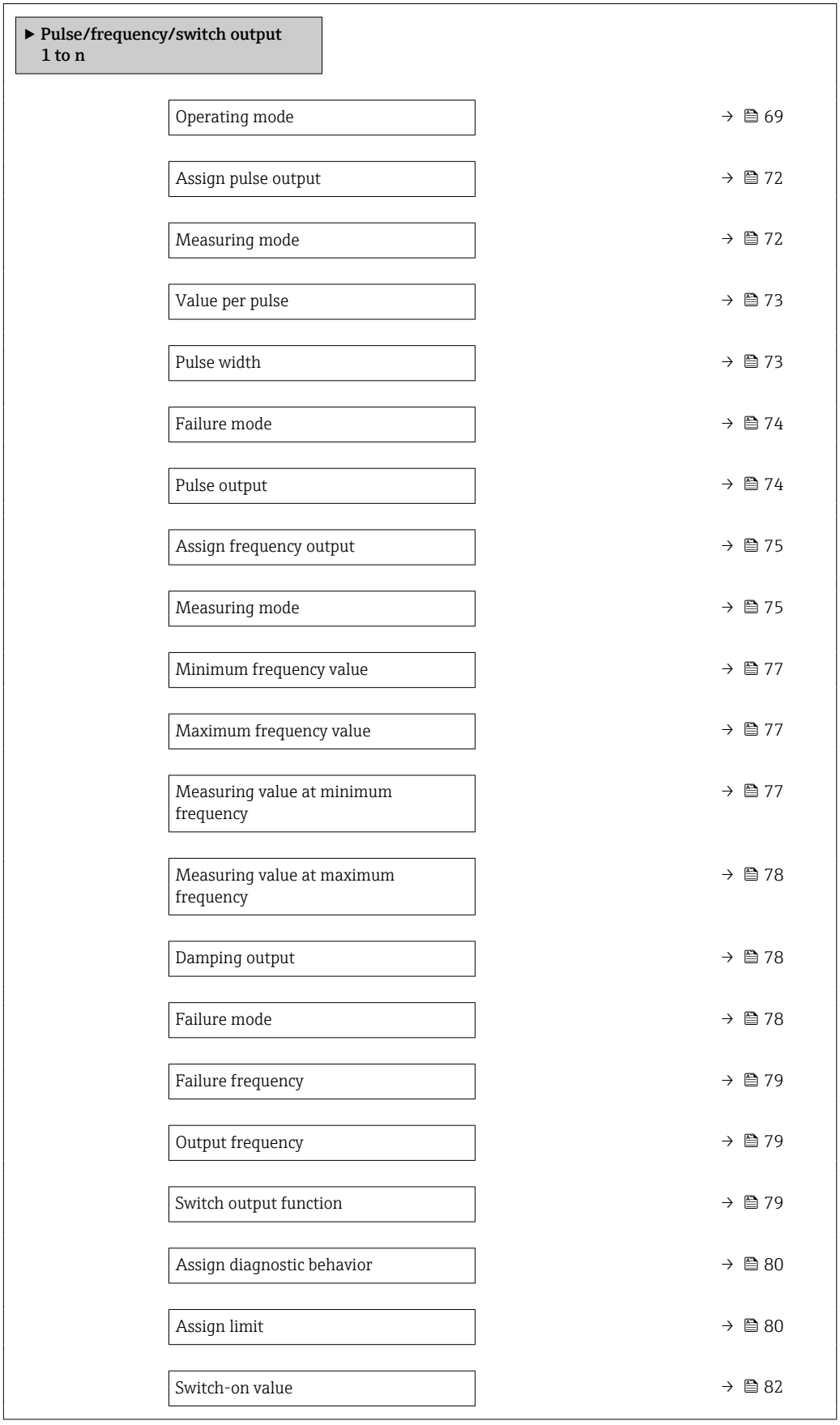
**Navigation** Application → Sensor → Supervision → Sensor → Exc. current 0 to 1

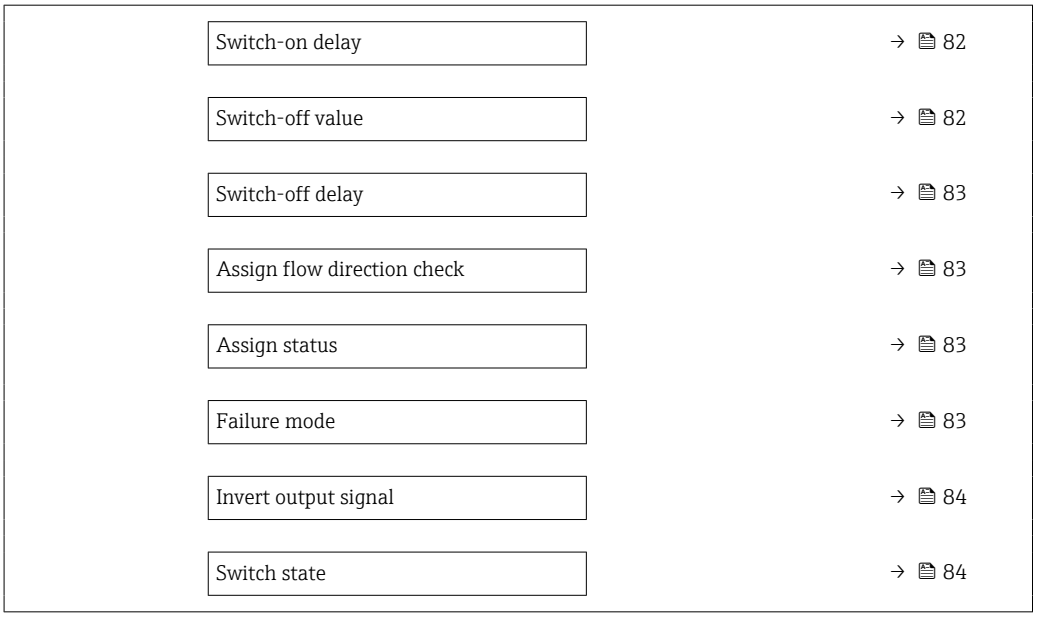
**Description** Displays the actual excitation current.

**User interface** Signed floating-point number

## 4.5 Pulse/frequency/switch output 1 to n

*Navigation* Application → PFS output 1 to n






## Operating mode

**Navigation** Application → PFS output 1 to n → Operating mode

**Description** Select the operating mode for the output.

**Selection**
- Off
- Pulse
- Automatic pulse
- Frequency
- Switch

**Additional information**

*Selection*

- **Pulse** option
  Quantitatively proportional pulse with pulse width to be configured. Whenever the pulse value for the specified process variable is reached, a pulse is emitted, the duration of which is set within the "Pulse width" parameter.
  The process variable for the pulse output is specified in the "Assign pulse output " parameter.
- **Automatic pulse** option
  Quantitatively proportional pulse with a fixed 1:1 ratio of pulse-to-interval. Whenever the pulse value for the specified process variable is reached, a pulse is emitted.
  The process variable for the pulse output is specified in the "Assign pulse output " parameter.
- **Frequency** option
  The output frequency is proportional to the value for the process variable assigned, with a pulse-to-interval ratio of 1:1.
  The process variable for the frequency output is specified in the "Assign frequency output" parameter.
- **Switch** option
  Indicates when the state of the device changes, e.g. when a specified limit value is reached or an alarm or warning is triggered.
  The switch output can be in one of two states: either it is conductive or it is non-conductive.
  When the function assigned to the switch output is triggered, the switch output will depending on the output configuration either be continuously conductive or continuously non-conductive.

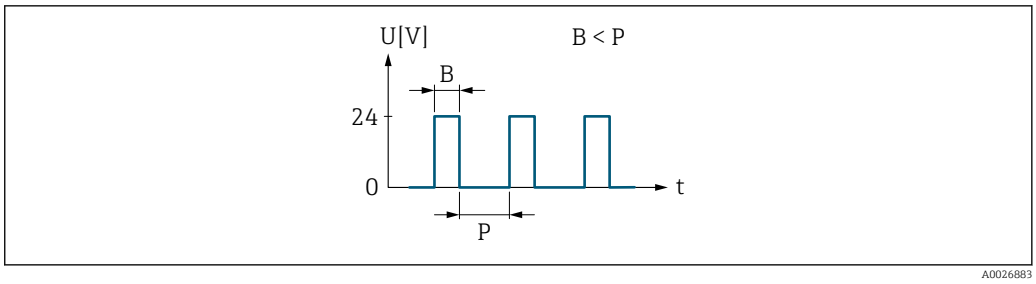
*"Off" option*

The pulse/frequency/switch output is not used.

*"Pulse" option*

Quantity-dependent pulse with configurable pulse width
- Whenever a specific mass or volume is reached (pulse value), a pulse is output, the duration of which was set previously (pulse width).
- The pulses are never shorter than the set duration.
- This option is used for most batching applications.
- Depending on the setting, it is important when using this option that the recording device is capable of detecting pulses transmitted at a pulse rate of 10 kHz.

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



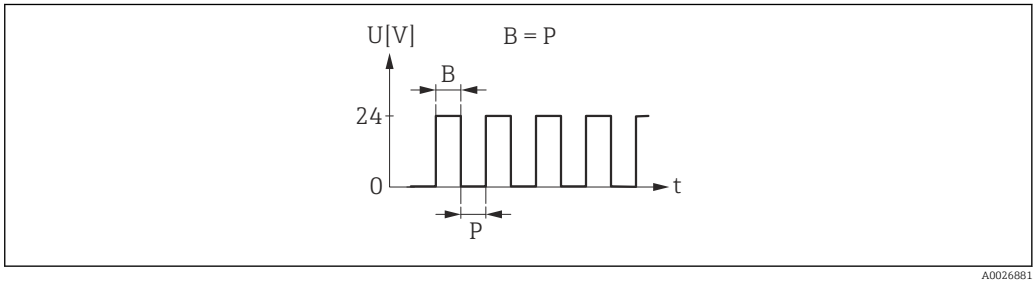

5 *Quantity-proportional pulse (pulse value) with pulse width to be configured*

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

*"Automatic pulse" option*

Quantity-proportional pulse with on/off ratio of 1:1
- This is used if the duration of the active pulse is not known.
- Whenever a specific mass or volume is reached (pulse value), a pulse with a on/off ratio of 1:1 is output.
- In this case, the pulse width is not relevant.
- When using this option, it is important that the recording device is capable of detecting pulses transmitted at a pulse rate of 10 kHz.

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



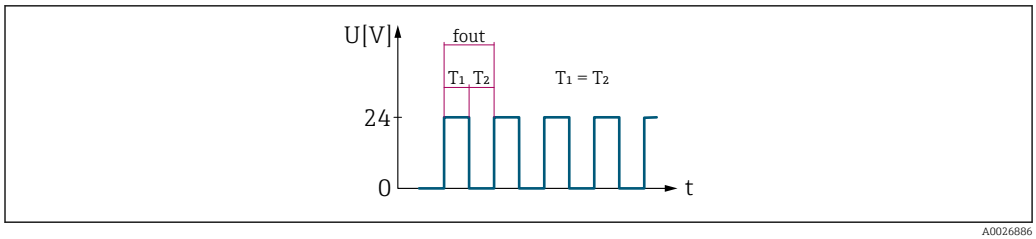

6 *Quantity-proportional pulse (pulse value) with automatic pulse width*

*B Automatic pulse width*
*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, density or temperature.
- Only this option can be used to output the density and temperature process variables.

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

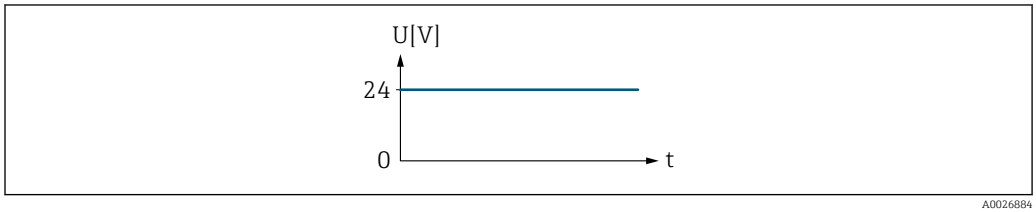



7 *Flow-proportional frequency output*

*"Switch" option*

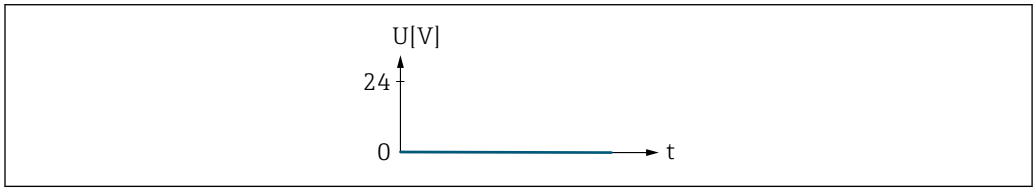
Contact for displaying a condition (e.g. alarm or warning if a limit value is reached)

Example
Alarm response without alarm




8 *No alarm, high level*

Example
Alarm response in case of alarm




9 *Alarm, low level*

## Assign pulse output

**Navigation** Application → PFS output 1 to n → Assign pulse

**Description** Select the process variable for the pulse output.

**Selection**
- Off
- Mass flow
- Volume flow

## Measuring mode

**Navigation** Application → PFS output 1 to n → Measuring mode

**Description** Select the measuring mode for the pulse output.

**Selection**
- Forward flow
- Forward/Reverse flow
- Reverse flow
- Reverse flow compensation

**Additional information** *Selection*
- **Forward flow** option
  Positive flow is reported, negative flow is not reported.
- **Forward/Reverse flow** option
  Both positive and negative flow are reported (absolute value), whereby no distinction is made between positive and negative flow.
- **Reverse flow** option
  Negative flow is reported, positive flow is not reported.
- **Reverse flow compensation** option
  Positive flow is reported. Negative flow quantities are buffered, processed, and reported after a maximum delay of 60 s.
  This option is used e.g. to compensate intermittent negative flow, which may occur in connection with positive displacement pumps as a result of wear and tear or high viscosity.

## Value per pulse

**Navigation** Application → PFS output 1 to n → Value per pulse

**Description** Enter the measured value that corresponds to one pulse.

The lower the value, the better the resolution and the higher the pulse frequency.

**User entry** Signed floating-point number

## Pulse width

**Navigation** Application → PFS output 1 to n → Pulse width

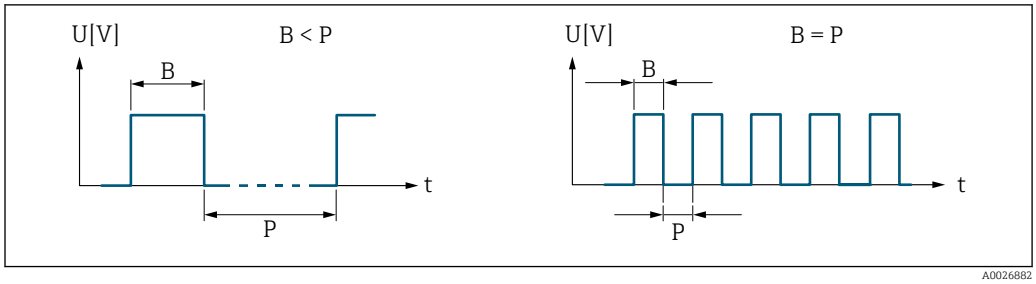
**Description** Specify the duration of a pulse.

The maximum pulse rate is defined by fmax = 1 / (2 × pulse width). The interval between two pulses (P) is at least as long as the specified pulse width (B).
The maximum flow is defined by Qmax = fmax × pulse value. If the flow exceeds these limit values, the measuring device displays the diagnostic message "443 Pulse output saturated".

Example:
Pulse value: 0.1 g
Pulse width: 0.1 ms
fmax: 1 / (2 × 0.1 ms) = 5 kHz
Qmax: 5 kHz × 0.1 g = 0.5 kg/s

**User entry** 0.05 to 2 000 ms

**Additional information** *Description*




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

## Failure mode

**Navigation** Application → PFS output 1 to n → Failure mode

**Description** Specify how the output should behave in the event of a device alarm.

For safety reasons, it is recommended that the behavior of the output in the event of a device alarm be predefined.

**Selection**
- Actual value
- No pulses

**Additional information** *Selection*

- **Actual value** option
  The pulse output continues to emit pulses based on the actual value measured. The fault condition is ignored.
  A device alarm indicates a serious malfunction that may impact measurement quality to the point that accuracy can no longer be ensured. This option is only recommended if the necessary safeguards are in place to ensure that no alarm condition impacts measurement quality.
- **No pulses** option
  In the event of a device alarm, no pulses are emitted.

## Pulse output

**Navigation** Application → PFS output 1 to n → Pulse output

**Description** Displays the frequency at which pulses are currently emitted.

The output behavior can be inverted in the "Invert output signal" parameter, i.e. in this case the transistor will be non-conductive for the duration of a pulse.
The "Invert output signal" parameter is not available for all devices.

**User interface** Positive floating-point number

## Assign frequency output

**Navigation** Application → PFS output 1 to n → Assign freq.

**Description** Select a process variable for the frequency output.

**Selection**
- Off
- Mass flow
- Volume flow
- Density
- Temperature
- Exciter current 0
- Oscillation frequency 0
- Oscillation amplitude 0
- Frequency fluctuation 0
- Oscillation damping 0
- Oscillation damping fluctuation 0
- Signal asymmetry

## Measuring mode

**Navigation** Application → PFS output 1 to n → Measuring mode

**Description** Select the measuring mode for the frequency output.

**Selection**
- Forward flow
- Forward/Reverse flow
- Reverse flow
- Reverse flow compensation

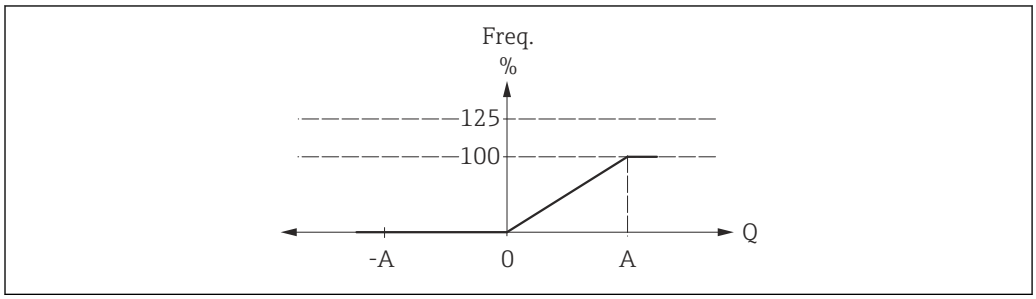
**Additional information** *Selection*

- **Forward flow** option
  Positive flow is reported, negative flow is not reported.
- **Forward/Reverse flow** option
  Both positive and negative flow are reported (absolute value), whereby no distinction is made between positive and negative flow.
- **Reverse flow** option
  Negative flow is reported, positive flow is not reported.
- **Reverse flow compensation** option
  Positive flow is reported. Negative flow quantities are buffered, processed, and reported after a maximum delay of 60 s.
  This option is used e.g. to compensate intermittent negative flow, which may occur in connection with positive displacement pumps as a result of wear and tear or high viscosity.

*"Forward flow" option*

The frequency output signal is proportional to the measured variable assigned. The measuring range is determined by the value that is assigned to the Measuring value at maximum frequency (A). The measured value for the minimum frequency is implicitly 0.

The flow components outside the scaled measuring range are taken into account for signal output as follows:
Measuring value at maximum frequency = 10 kg/h
- If the effective flow exceeds measured value A, the ⚠**S442 Frequency output 1 to n** diagnostic message is displayed. If the value is exceeded, the frequency remains at the maximum frequency, or at the failure frequency according to the configuration.
- If the value is undershot, i.e. negative flow occurs, 0 Hz is output and no diagnostic message is displayed.

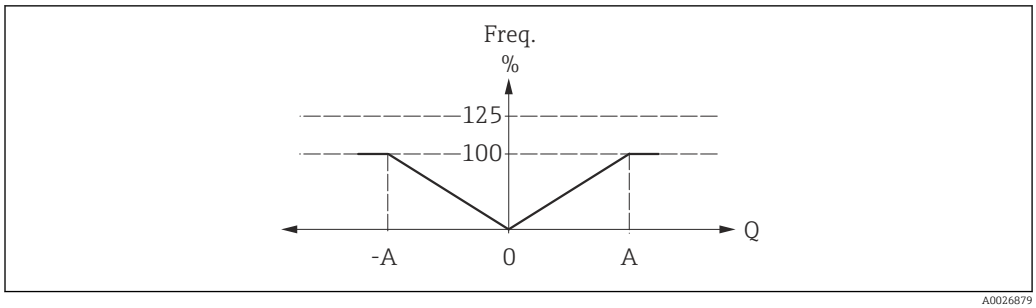



*A Measuring value at maximum frequency*

*"Forward/Reverse flow" option*

The frequency output signal is independent of the direction of flow (absolute amount of the measured variable). The flow direction can be output via the configurable switch outputs.

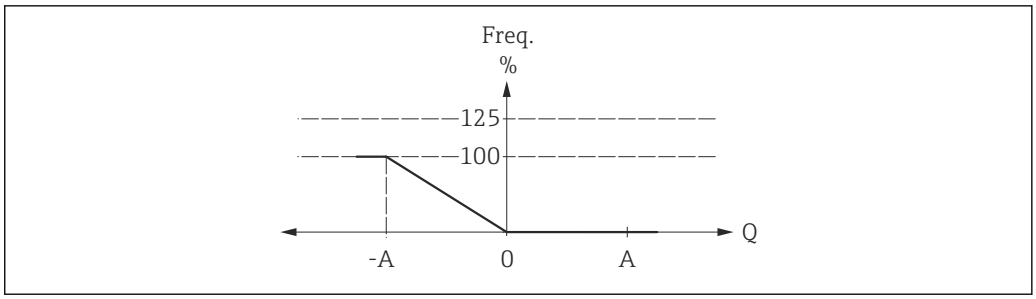
The flow components outside the scaled measuring range are taken into account for signal output as follows:
If the effective flow exceeds the absolute value A, the ⚠**S442 Frequency output 1 to n** diagnostic message is displayed. If the value is exceeded, the frequency remains at the maximum frequency, or at the failure frequency according to the configuration.




*A Measuring value at maximum frequency*

*"Reverse flow" option*

The flow components outside the scaled measuring range are taken into account for signal output as follows:
- If the effective flow drops below the value A (normally a negative value with reverse flow), the ⚠**S442 Frequency output 1 to n** diagnostic message is displayed. If the value is undershot, the frequency remains at the maximum frequency, or at the failure frequency according to the configuration.
- If the value is exceeded, i.e. positive flow occurs, 0 Hz is output and no diagnostic message is displayed.




*A Measuring value at maximum frequency*

## Minimum frequency value

**Navigation** Application → PFS output 1 to n → Min. freq. value

**Description** Enter the frequency to report for the lower range value of the measured value range.

The lower range value for the measured value range that corresponds to the minimum frequency is specified in the "Measuring value at minimum frequency" parameter.

**User entry** 0.0 to 10 000.0 Hz

## Maximum frequency value

**Navigation** Application → PFS output 1 to n → Max. freq. value

**Description** Enter the frequency to report for the upper range value of the measured value range.

The upper range value for the measured value range that corresponds to the maximum frequency is specified in the "Measuring value at maximum frequency" parameter.

**User entry** 0.0 to 10 000.0 Hz

## Measuring value at minimum frequency

**Navigation** Application → PFS output 1 to n → Val. at min.freq

**Description** Enter the lower range value for the measured value range.

Depending on the setting selected for the "Measuring mode" parameter, the value specified for this parameter and the "Measuring value at maximum frequency" parameter must have the same algebraic sign or not.

As a rule, the lower range value is scaled to be lower than the upper range value. As a result, the behavior of the frequency output is proportional to the process variable assigned. If the lower range value is scaled to be higher than the upper range value, then the behavior of the frequency output will be inversely proportional to the process variable assigend.

**User entry** Signed floating-point number

## Measuring value at maximum frequency

**Navigation** Application → PFS output 1 to n → Val. at max.freq

**Description** Enter upper range value for the measured value range.

**User entry** Signed floating-point number

## Damping output

**Navigation** Application → PFS output 1 to n → Damping out.

**Description** Enter a time constant to set the reaction time of the output signal to fluctuations in the measured value (PT1 element).

The smaller the time constant, the faster the output reacts to fluctuations in the measured value.
If the time constant is 0, damping is deactivated.

**User entry** 0 to 999.9 s

## Failure mode

**Navigation** Application → PFS output 1 to n → Failure mode

**Description** Specify how the output should behave in the event of a device alarm.

For safety reasons, it is recommended that the behavior of the output in the event of a device alarm be predefined.

**Selection**
- Actual value
- Defined value
- 0 Hz

**Additional information** *Selection*

- **Actual value** option
  The frequency output continues to report the actual flow rate measured. The fault condition is ignored.
- **Defined value** option
  The frequency output reports the value specified.
  The value is specified in the "Failure frequency" parameter.
- **0 Hz** option
  The frequency output reports 0 Hz.

### Failure frequency

**Navigation** Application → PFS output 1 to n → Failure freq.

**Description** Enter the value for the "Defined value" option in the "Failure mode" parameter.

**User entry** 0.0 to 10 000.0 Hz

### Output frequency

**Navigation** Application → PFS output 1 to n → Output freq.

**Description** Displays the frequency reported for the process value measured.

**User interface** 0.0 to 10 000.0 Hz

### Switch output function

**Navigation** Application → PFS output 1 to n → Switch out funct

**Description** Assign a function to the switch output.

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

**Additional information** *Selection*
- **Off** option
  The switch output is permanently switched off (open, non-conductive).
- **On** option
  The switch output is permanently switched on (closed, conductive).
- **Diagnostic behavior** option
  The switch output is switched on (closed, conductive), if there is a pending diagnostic event of the assigned behavioral category.
- **Limit** option
  The switch output is switched on (closed, conductive), if the limit value specified for the process variable is reached.
- **Flow direction check** option
  The switch output is switched on (closed, conductive), when the flow direction changes (forward or reverse flow).
- **Status** option
  The switch output is switched on (closed, conductive) to indicate the status for the selected device function ("Assign status" parameter).

## Assign diagnostic behavior

**Navigation** Application → PFS output 1 to n → Assign diag. beh

**Description** The switch output is switched on (closed, conductive), if there is a pending diagnostic event of the assigned behavioral category.

**Selection**
- Alarm
- Alarm or warning
- Warning

**Additional information** *Selection*
- **Alarm** option
  The switch output is only switched on for diagnostic events of the "Alarm" category.
- **Alarm or warning** option
  The switch output is switched on for diagnostic events of the "Alarm" or "Warning" category.
- **Warning** option
  The switch output is only switched on for diagnostic events of the "Warning" category.

## Assign limit

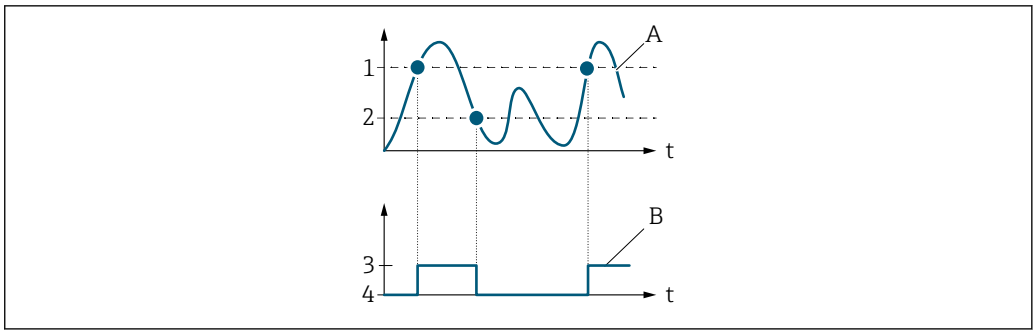
**Navigation** Application → PFS output 1 to n → Assign limit

**Description** Select the process variable to monitor in case the specified limit value is exceeded. If a limit value for the selected process variable is exceeded, the output is switched on.

**Selection**
- Off
- Mass flow
- Volume flow
- Density
- Temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Oscillation damping

**Additional information** *Switch-on point > switch-off point*

Behavior of the status output if switch-on point > switch-off point:
- Process variable > switch-on point: transistor is conductive
- Process variable < switch-off point: transistor is not conductive

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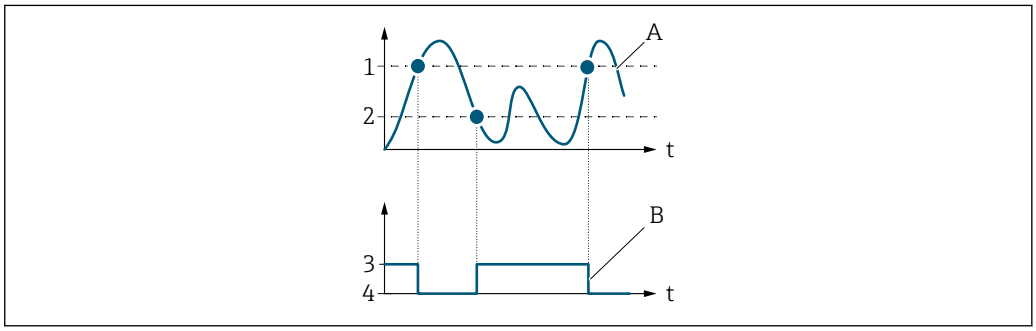
*1 Switch-on value*
*2 Switch-off value*
*3 Conductive*
*4 Non-conductive*
*A Process variable*
*B Status output*

*Switch-on point < switch-off point*

Behavior of the status output if switch-on point < switch-off point:
- Process variable < switch-on point: transistor is conductive
- Process variable > switch-off point: transistor is not conductive

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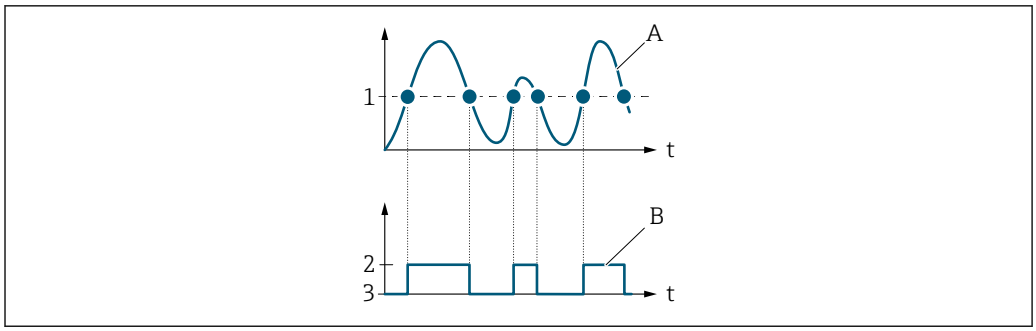
*1 Switch-on value*
*2 Switch-off value*
*3 Conductive*
*4 Non-conductive*
*A Process variable*
*B Status output*

*Switch-on point = switch-off point*

Behavior of the status output if switch-on point = switch-off point:
- Process variable > switch-on point: transistor is conductive
- Process variable < switch-off point: transistor is not conductive




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

## Switch-on value

**Navigation** Application → PFS output 1 to n → Switch-on value

**Description** Enter the limit value for the switch-on point (process variable > switch-on value = closed, conductive).

To use a hysteresis: Switch-on point > Switch-off point.

**User entry** Signed floating-point number

## Switch-on delay

**Navigation** Application → PFS output 1 to n → Switch-on delay

**Description** Enter delay before the switch output is switched on.

**User entry** 0.0 to 100.0 s

## Switch-off value

**Navigation** Application → PFS output 1 to n → Switch-off value

**Description** Enter the limit value for the switch-off point (process variable < switch-off value = open, non-conductive).

To use a hysteresis: Switch-on point > Switch-off point.

**User entry** Signed floating-point number

### Switch-off delay

**Navigation** Application → PFS output 1 to n → Switch-off delay

**Description** Enter delay before the switch output is switched off.

**User entry** 0.0 to 100.0 s

### Assign flow direction check

**Navigation** Application → PFS output 1 to n → Assign dir.check

**Description** Select a process variable for flow direction monitoring.

**Selection**
- Off
- Volume flow
- Mass flow

### Assign status

**Navigation** Application → PFS output 1 to n → Assign status

**Description** Select the device function for which to report the status.

If the switch-on point for the selected device function is reached, the output is switched on (closed and conductive). Otherwise, the output is non-conductive.

The output behavior can be inverted in the "Invert output signal" parameter, i.e. in this case the output will be non-conductive when switched on and conductive when switched off. The "Invert output signal" parameter is not available for all devices.

**Selection**
- Partially filled pipe detection
- Low flow cutoff

### Failure mode

**Navigation** Application → PFS output 1 to n → Failure mode

**Description** Specify how the output should behave in the event of a device alarm.

For safety reasons, it is recommended that the behavior of the output in the event of a device alarm be predefined.

**Selection**
- Actual status
- Open
- Closed

**Additional information** *Selection*

- **Actual status** option
  The switch output continues to report the actual state of the switch output based on the function assigned ("Switch output function" parameter). The fault condition is ignored.
- **Open** option
  In the event of a device alarm, the switch output's transistor is set to "non-conductive".

## Invert output signal

**Navigation** Application → PFS output 1 to n → Invert outp.sig.

**Description** Indicate whether to invert the output signal (Yes/No).

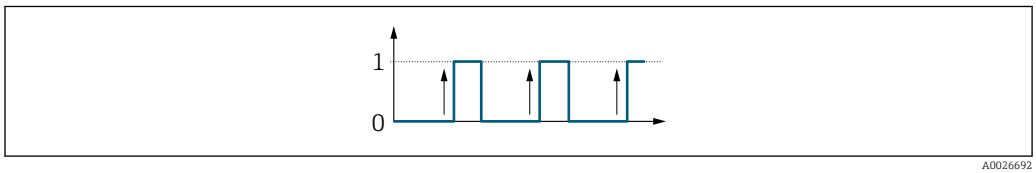
If the output signal is inverted, the output behavior is the reverse of its configuration. This setting does not apply to the frequency output.

**Selection**

- No
- Yes

**Additional information** *Selection*

**No** option (passive - negative)



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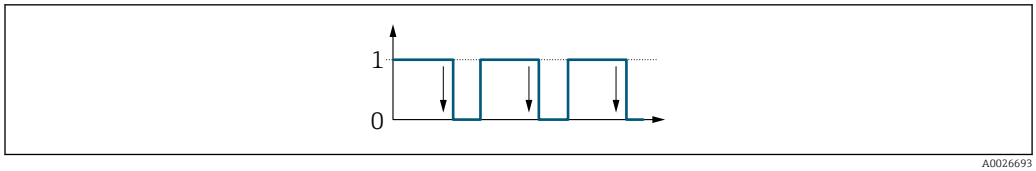
**Yes** option (passive - positive)



A0026693

## Switch state

**Navigation** Application → PFS output 1 to n → Switch state

**Description** Indicates the current switch state of the switch output.

**User interface**

- Open
- Closed

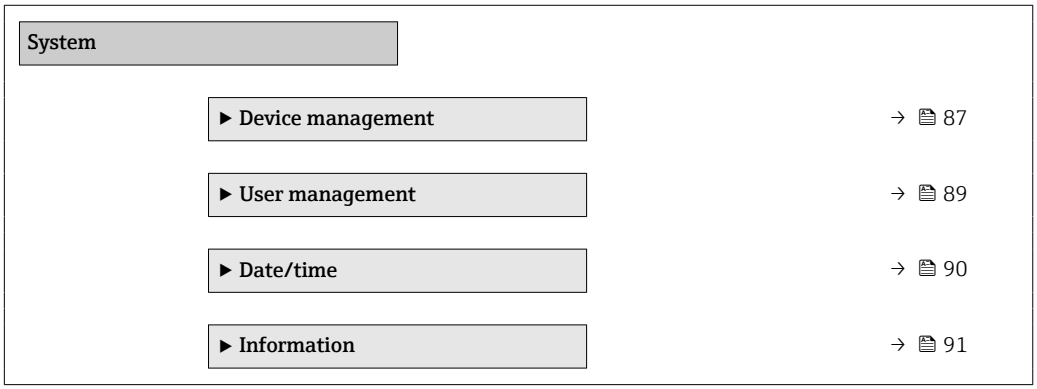
**Additional information** *User interface*

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

# 5 "System" menu

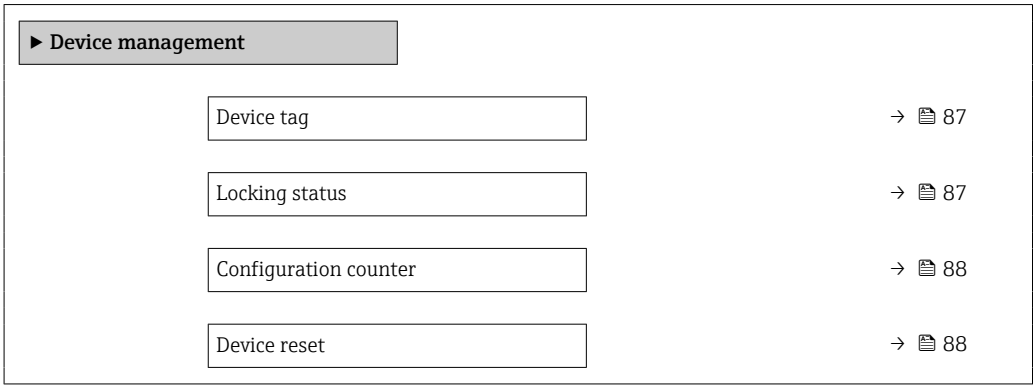
Overall device management and security settings – management of system settings and adaption to operational requirements.

*Navigation* System



## 5.1 Device management

*Navigation* System → Device manag.




### Device tag

**Navigation** System → Device manag. → Device tag

**Description** Enter a unique designation for the measuring point to be able to easily identify it within the plant.

**User entry** Character string comprising numbers, letters and special characters (32)

### Locking status

**Navigation** System → Device manag. → Locking status

**Description** Indicates the write protection with the highest priority that is currently active.

**User interface** Temporarily locked

**Additional information** *User interface*

**"Temporarily locked" option**
Due to internal procedures that are currently in progress (e.g. data upload/download, reset, etc.), write access to the parameters is temporarily locked.The parameters can be modified again, once the internal procedures are complete.

## Configuration counter

**Navigation** System → Device manag. → Config. counter

**Description**

Displays the counter for the number of times the device configuration has changed.

If the value for a static parameter changes, the counter increments by 1. This is to enable tracking different parameter versions.

When multiple parameters are changed simultaneously, e.g. when loading a configuration file into the device from an external source such as FieldCare, the counter may increment.

The counter cannot be reset. Nor is it reset to a default value on performing a device reset. Once the counter has incremented to 65535, it restarts at 1.

**User interface** 0 to 65 535

## Device reset

**Navigation** System → Device manag. → Device reset

**Description** Reset the device configuration - either entirely or in part - to a defined state.

**Selection**

- Cancel
- To delivery settings
- Restart device
- Restore S-DAT backup *
- Create T-DAT backup
- Restore T-DAT backup *

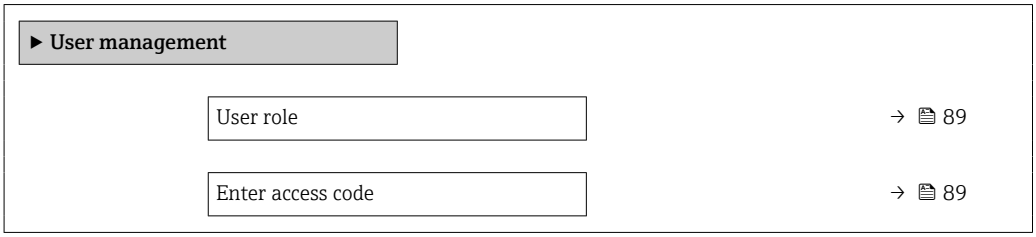
**Additional information** *Selection*

- **To delivery settings** option
  Every parameter for which a customer-specific default setting was ordered is reset to the customer-specific value. All other parameters are reset to the factory setting.
- **Restart device** option
  The restart resets every parameter with data stored in volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.
- **Restore S-DAT backup** option
  Restores the data that is saved on the S-DAT.
  This function can be used to resolve the memory issue "083 Memory content inconsistent" or to restore the S-DAT data when a new S-DAT has been installed.
- **Create T-DAT backup** option
  Creates T-DAT backup.
- **Restore T-DAT backup** option
  Restores the data saved on the T-DAT.
  This function can be used to resolve the memory issue "283 Memory content inconsistent" or to restore the T-DAT data when a new T-DAT has been installed.

* Visibility depends on order options or device settings

## 5.2 User management

*Navigation* System → User manag.




### User role

**Navigation** System → User manag. → User role

**Description** Displays the role the user is currently logged on in. The role determines the user's access rights for the parameters. The access rights can be changed via the "Enter access code" parameter.

**User interface**
- Operator
- Maintenance
- Service
- Production
- Development

**Additional information** *User interface*
- **Operator** option
  Provides only read access to parameters.
- **Maintenance** option
  Provides read and write access to parameters.
  For some parameters, the user must be logged on in the Service role to obtain write access.
- **Service** option
  Provides read and write access to Service parameters.

### Enter access code

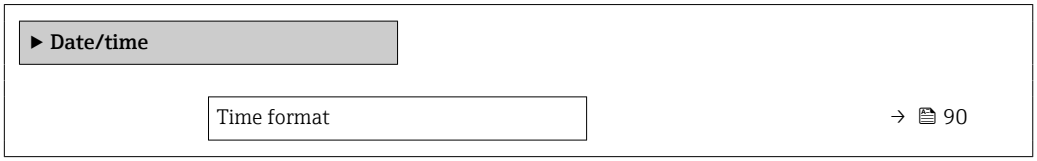
**Navigation** System → User manag. → Ent. access code

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

**User entry** Max. 16-digit character string comprising numbers, letters and special characters

## 5.3 Date/time

*Navigation* System → Date/time




### Time format

**Navigation** System → Date/time → Time format

**Description** Select the time format.

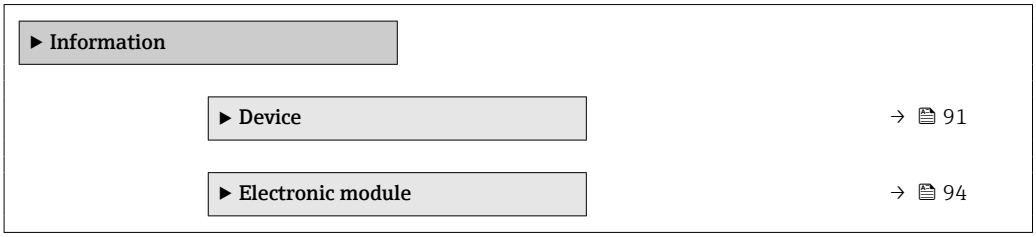
**Selection**
- 24 h
- 12 h AM/PM

**Additional information** *Selection*

For an explanation of the abbreviated units: → 97

## 5.4 Information

*Navigation* System → Information




### 5.4.1 Device

*Navigation* System → Information → Device


**Device name**

**Navigation** System → Information → Device → Device name

**Description** Displays the name of the transmitter. The transmitter name is also provided on the nameplate of the transmitter.

**User interface** Character string comprising numbers, letters and special characters

### Device tag

**Navigation** System → Information → Device → Device tag

**Description** Enter a unique designation for the measuring point to be able to easily identify it within the plant.

**User entry** Character string comprising numbers, letters and special characters (32)

### Serial number

**Navigation** System → Information → Device → Serial number

**Description** Displays the serial number of the measuring device. The serial number is also provided on the nameplate of the sensor and of the transmitter.

The serial number can also be used to retrieve further device-related information and documentation via the Operations app or the Device Viewer on the Endress+Hauser website.

**User interface** Character string comprising numbers, letters and special characters

### Order code

**Navigation** System → Information → Device → Order code

**Description** Displays the device order code.

The order code is used for instance to order a replacement or spare device or to verify that the device features specified on the order form match the shipping note.

**User interface** Character string comprising numbers, letters and special characters

### Firmware version

**Navigation** System → Information → Device → Firmware version

**Description** Displays the device firmware version installed.

**User interface** Character string comprising numbers, letters and special characters

### Extended order code 1

**Navigation** System → Information → Device → Ext. order cd. 1

**Description** Displays the first, second and/or third part of the extended order code.

Due to character length restrictions, the extended order code is split into a maximum of 3 parameters. The extended order code indicates for each feature in the product structure the selected option, thereby uniquely identifying the device model.

The extended order code can also be found on the nameplate.

**User interface** Character string comprising numbers, letters and special characters

### Extended order code 2

**Navigation** System → Information → Device → Ext. order cd. 2

**Description** Displays the first, second and/or third part of the extended order code.

Due to character length restrictions, the extended order code is split into a maximum of 3 parameters. The extended order code indicates for each feature in the product structure the selected option, thereby uniquely identifying the device model.

The extended order code can also be found on the nameplate.

**User interface** Character string comprising numbers, letters and special characters

### Extended order code 3

**Navigation** System → Information → Device → Ext. order cd. 3

**Description** Displays the first, second and/or third part of the extended order code.

Due to character length restrictions, the extended order code is split into a maximum of 3 parameters. The extended order code indicates for each feature in the product structure the selected option, thereby uniquely identifying the device model.

The extended order code can also be found on the nameplate.

**User interface** Character string comprising numbers, letters and special characters

### ENP version

**Navigation** System → Information → Device → ENP version

**Description** Displays the version of the electronic nameplate (ENP).

**User interface** Character string comprising numbers, letters and special characters

**Manufacturer**

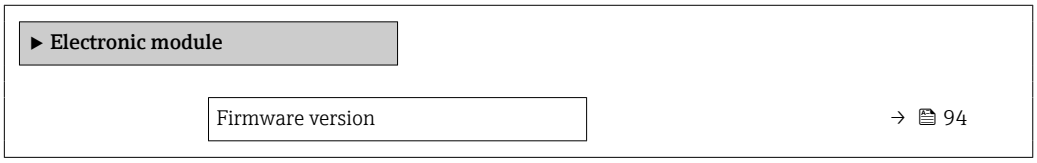
**Navigation** System → Information → Device → Manufacturer

**Description** Displays the manufacturer.

**User interface** Character string comprising numbers, letters and special characters

## 5.4.2 Electronic module

*Navigation* System → Information → Electr. module




**Firmware version**

**Navigation** System → Information → Electr. module → Firmware version

**Description** Displays the firmware version of the module.

**User interface** Positive integer

# 6 Country-specific factory settings

## 6.1 SI units

Not valid for USA and Canada.

### 6.1.1 System units

| | |
|---|---|
| **Mass** | g |
| **Mass flow** | g/s |
| **Volume** | ml |
| **Volume flow** | ml/s |
| **Density** | kg/l |
| **Temperature** | °C |

### 6.1.2 Pulse value

| Nominal diameter [mm] | [g/p] |
|---|---|
| 1 | 0.003 |
| 2 | 0.005 |
| 4 | 0.01 |
| 8 | 0.02 |
| 15 | 0.1 |
| 25 | 0.2 |
| 40 | 0.4 |

### 6.1.3 Switch-on point low flow cut off

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

| Nominal diameter [mm] | On-value low flow cut off for liquid [g/s] |
|---|---|
| 1 | 0.25 |
| 2 | 0.5 |
| 4 | 1 |
| 8 | 2 |
| 15 | 7 |
| 25 | 20 |
| 40 | 50 |

## 6.2 US units

Only valid for USA and Canada.

### 6.2.1 System units

| | |
|---|---|
| **Mass** | oz |
| **Mass flow** | oz/s |
| **Volume** | fl oz (us) |
| **Volume flow** | fl oz/s (us) |
| **Density** | g/cm³ |
| **Temperature** | °F |

### 6.2.2 Pulse value

| Nominal diameter [in] | [oz/p] |
|---|---|
| 1/24 | 0.0001 |
| 1/12 | 0.0002 |
| 1/8 | 0.0004 |
| 3/8 | 0.001 |
| 1/2 | 0.004 |
| 1 | 0.007 |
| 1 1/2 | 0.014 |

### 6.2.3 Switch-on point 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 [oz/s] |
|---|---|
| 1/24 | 0.01 |
| 1/12 | 0.02 |
| 1/8 | 0.04 |
| 3/8 | 0.08 |
| 1/2 | 0.25 |
| 1 | 0.7 |
| 1 1/2 | 1.7 |

# 7 Explanation of abbreviated units

## 7.1 SI units

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

## 7.2 US units

| Process variable | Units | Explanation |
|---|---|---|
| | lb/ft³, lb/gal (us) | Pound/cubic foot, pound/gallon |
| | lb/bbl (us;liq.), lb/bbl (us;beer), lb/bbl (us;oil), lb/bbl (us;tank) | Pound/volume unit |
| Pressure | psi a | Pounds per square inch (absolute) |
| | psi g | Pounds per square inch (gauge) |
| Mass | oz, lb, STon | Ounce, pound, standard ton |
| | 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 |
| | lb/Sft³ | Weight unit/standard volume unit |
| Corrected volume | Sft³, Sgal (us), Sbbl (us;liq.) | Standard cubic foot, standard gallon, standard barrel |
| | Sft³/s, Sft³/min, Sft³/h, Sft³/d | Standard cubic foot/time unit |

| Process variable | Units | Explanation |
|---|---|---|
| | 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) |
| | °F, °R | Fahrenheit, Rankine |
| Volume | af | Acre foot |
| | $ft^3$ | Cubic foot |
| | fl oz (us), gal (us), kgal (us), Mgal (us) | Fluid ounce, gallon, kilogallon, million gallon |
| | bbl (us;liq.), bbl (us;beer), bbl (us;oil), bbl (us;tank) | Barrel (normal liquids), barrel (beer), barrel (petrochemicals), barrel (filling tanks) |
| | af/s, af/min, af/h, af/d | Acre foot/time unit |
| | $ft^3$/s, $ft^3$/min, $ft^3$/h, $ft^3$/d | Cubic foot/time unit |
| | fl oz/s (us), fl oz/min (us), fl oz/h (us), fl oz/d (us) | Fluid ounce/time unit |
| | gal/s (us), gal/min (us), gal/h (us), gal/d (us) | Gallon/time unit |
| | 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)<br>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)<br>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)<br>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)<br>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) |

## 7.3 Imperial units

| Process variable | Units | Explanation |
|---|---|---|
| | lb/gal (imp), lb/bbl (imp;beer), lb/bbl (imp;oil) | Pound/volume unit |
| Corrected volume | Sgal (imp) | Standard gallon |
| | Sgal/s (imp), Sgal/min (imp), Sgal/h (imp), Sgal/d (imp) | Standard gallon/time unit |
| Volume | gal (imp), Mgal (imp) | Gallon, mega gallon |
| | bbl (imp;beer), bbl (imp;oil) | Barrel (beer), barrel (petrochemicals) |
| | gal/s (imp), gal/min (imp), gal/h (imp), gal/d (imp) | Gallon/time unit |
| | Mgal/s (imp), Mgal/min (imp), Mgal/h (imp), Mgal/d (imp) | Mega gallon/time unit |

| Process variable | Units | Explanation |
|---|---|---|
| | bbl/s (imp;beer), bbl/min (imp;beer), bbl/h (imp;beer), bbl/d (imp;beer) | Barrel /time unit (beer)<br>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)<br>Petrochemicals: 34.97 gal/bbl |
| Time | s, m, h, d, y | Second, minute, hour, day, year |
| | am, pm | Ante meridiem ( before midday), post meridiem (after midday) |

# Index

## U



## V



## W



## Z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