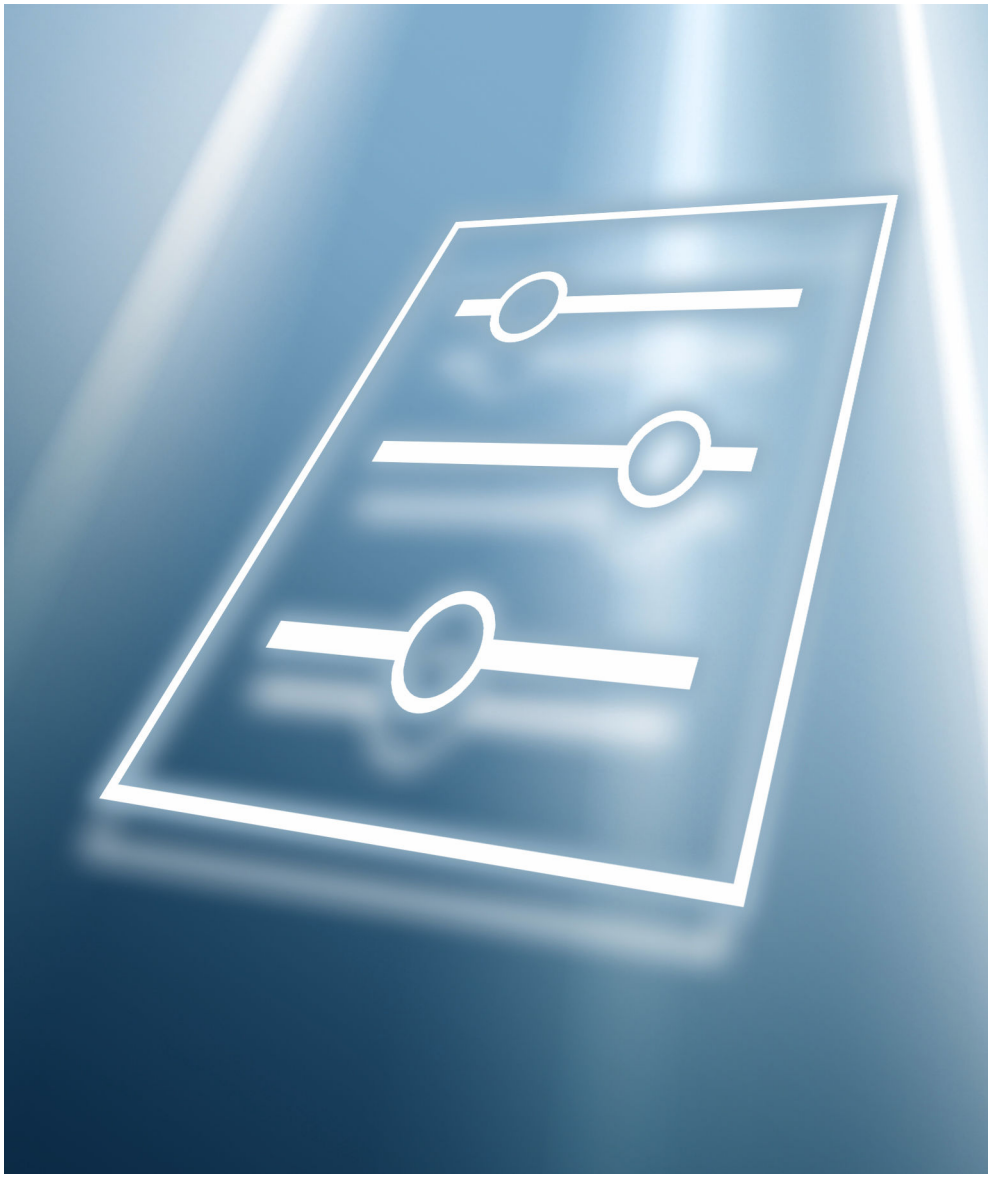
GP01216D/06/EN/01.24-00
71658085
2024-08-15

Valid as of version
01.00.zz (Device firmware)

Description of Device Parameters
Dosimass

Coriolis flowmeter
IO-Link



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 (→ 🖹 7), which guides the user automatically through all the device parameters that are required for commissioning
- **Application** menu (→ 🖹 47)
- **Diagnostics** menu (→ 🖹 29)
- **System** menu (→ 🖹 95)

1.3.3 Operation concept

Operation method	Operation via: ▪ SmartBlue app [1)] ▪ Commubox FXA291
Reliable operation	▪ Operation in local language ▪ Standardized operating concept on the device and in the SmartBlue app ▪ Write protection ▪ When electronics modules are replaced: configurations are transferred using the T-DAT Backup device memory. The device memory contains process data, device data and the event logbook. No reconfiguration is necessary.
Diagnostic behavior	Efficient diagnostic behavior increases measurement availability: ▪ Open troubleshooting measures via local display and SmartBlue app. ▪ Diverse simulation options ▪ Logbook of events that have occurred.

1) Optional via order code "Display; operation", options H, J or K

IO-Link

The device-specific parameters are configured via IO-Link. There are specific configuration or operating programs from different manufacturers available to the user for this purpose. The device description file (IODD) is provided for the device

IO-Link operating concept
Operator-oriented menu structure for user-specific tasks. Efficient diagnostic behavior increases measurement availability:
- Diagnostic messages
- Remedial measures
- Simulation options

IODD download
Two options for downloading the IODD:
- www.endress.com/download
- https://ioddfinder.io-link.com/

www.endress.com/download

1. Select "Device drivers".
2. Under "Type", select the "IO Device Description (IODD)" item.
3. Select "Product root".
4. Click "Search ".
   ↳ A list of search results is displayed.

Select and download the appropriate version.

https://ioddfinder.io-link.com/

1. Enter and select "Endress" as the manufacturer.
2. Select product name.
   ↳ A list of search results is displayed.

Select and download the appropriate version.

For detailed IO-Link information, see "IO-Link" Special Documentation on the device
→ 6

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

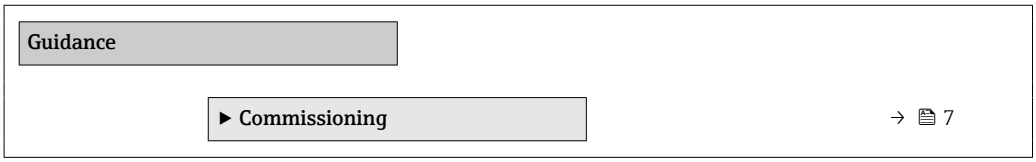
The related documentation is available online:

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 ▶ 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



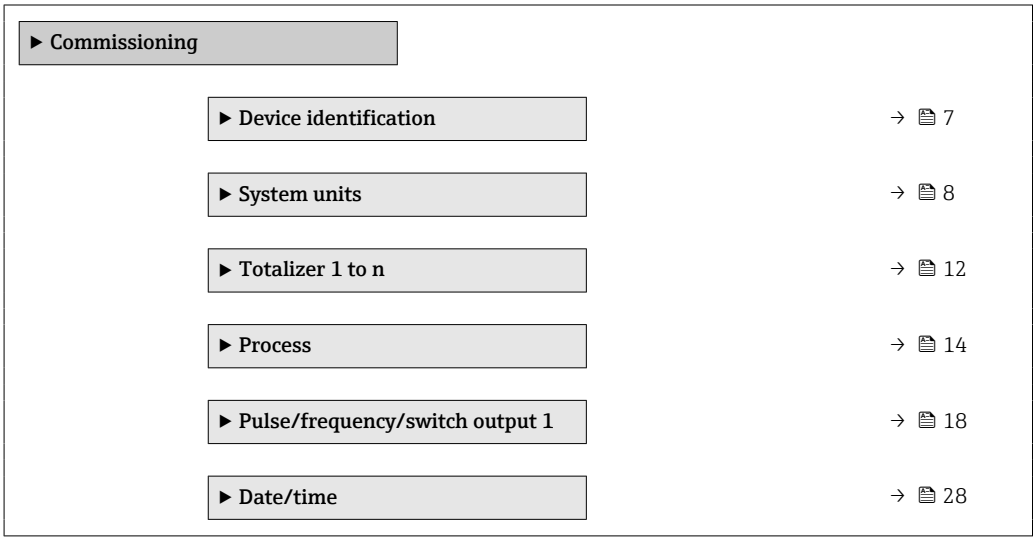
2.1 "Commissioning" wizard

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 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

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

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
- 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

Additional information

The IO-Link interface only offers the **kg/s** option.

Mass unit

Navigation

Guidance → Commissioning → System units → Mass unit

Description

Select the mass unit.

Selection

SI units
- g
- kg
- t

US units
- oz
- lb
- 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: → 106

The IO-Link interface only offers the **m^3/h** option.

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: → 106

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: → 106

The IO-Link interface only offers the **kg/m^3** option.

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: → 106

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

Additional information

Totalizer 1 is permanently set to and cannot be changed. Totalizers 2 and 3 can be changed.

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

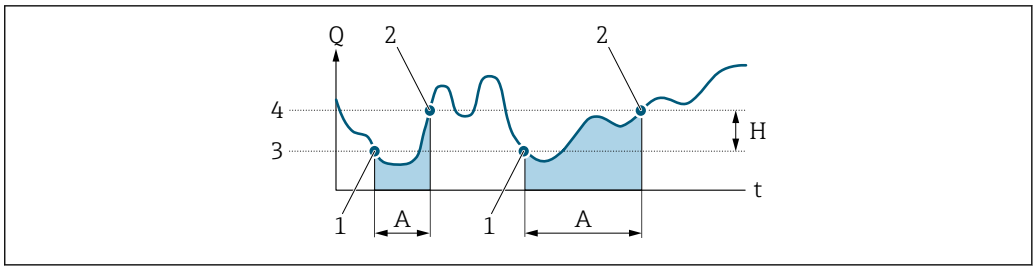
Low flow cutoff

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:

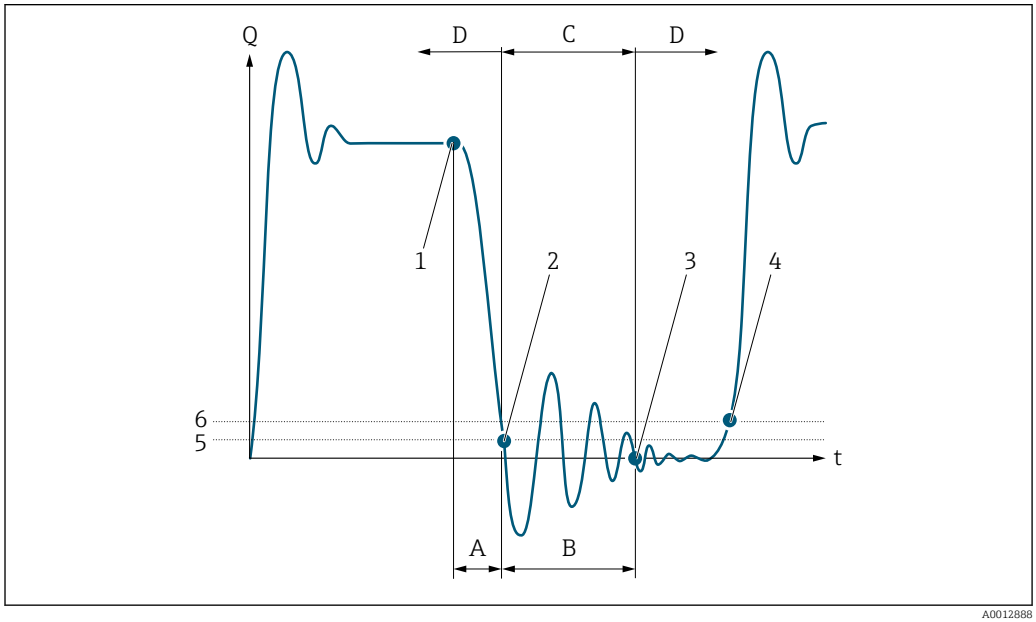
Flow: 0
Totalizer: Last valid value

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 → Operating mode

Description Select the operating mode for the output.

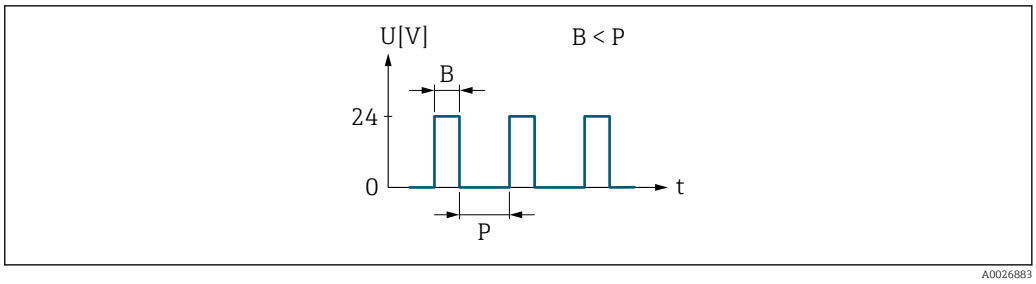
Selection
- Off
- Pulse
- Automatic pulse
- Frequency
- Switch

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*

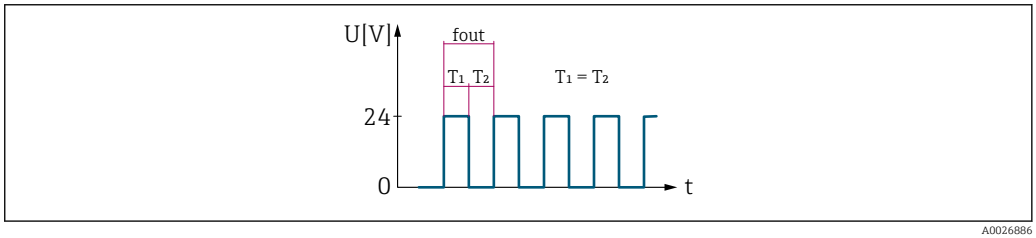
B *Pulse width entered*
P *Pauses between the individual pulses*

"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

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

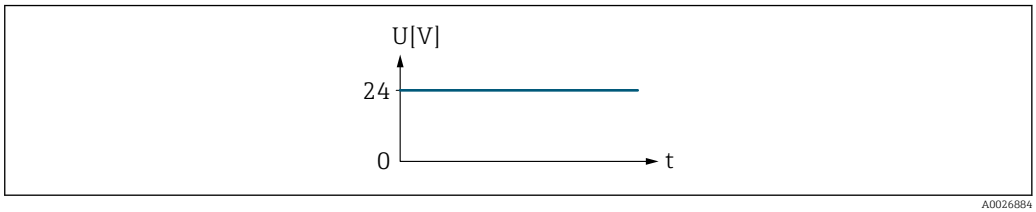
0 Hz + 100 g/s × [(1000 Hz - 0 Hz)/(1000 g/s - 0 g/s)] = **100 Hz**



2 *Flow-proportional frequency output*

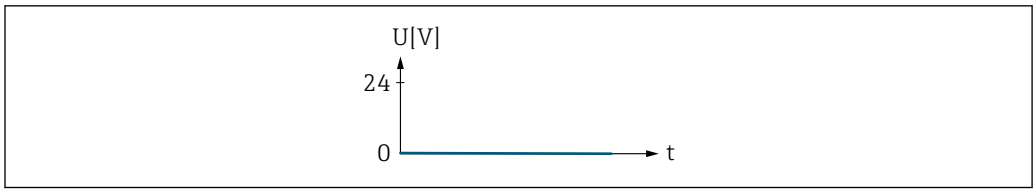
"Switch" option

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 → 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 → 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 → 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 → 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 → 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 → 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 → 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 → 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 → Pulse width

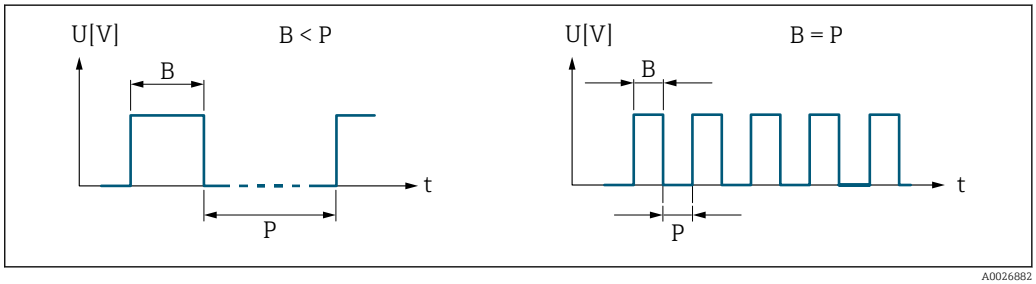
Description Specify the duration of a pulse.

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*



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B Pulse width entered
P Pauses between the individual pulses

Value per pulse

Navigation Guidance → Commissioning → PFS output 1 → 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 → 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 → 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 → Assign limit

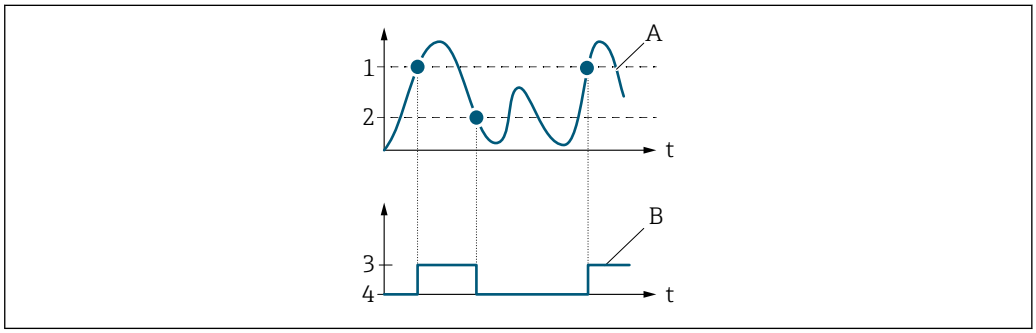
Description Select the process variable to monitor in case the specified limit value is exceeded. If a limit value for the selected process variable is exceeded, the output is switched on.

Selection
- Off
- Mass flow
- Volume flow
- Density
- Temperature
- 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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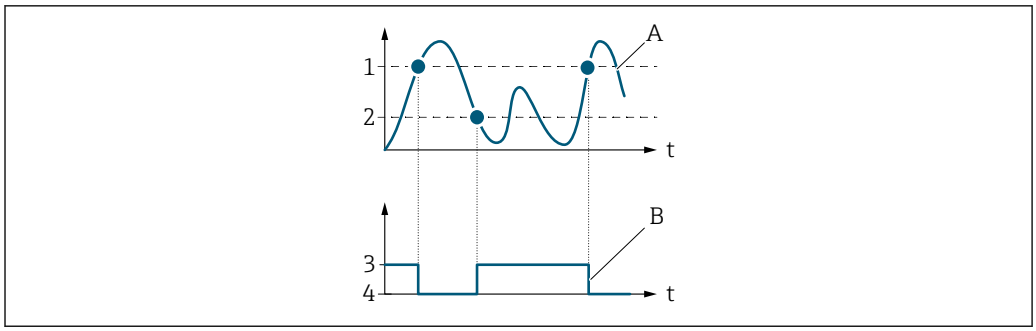
1 Switch-on value
2 Switch-off value
3 Conductive
4 Non-conductive
A Process variable
B Status output

Switch-on point < switch-off point

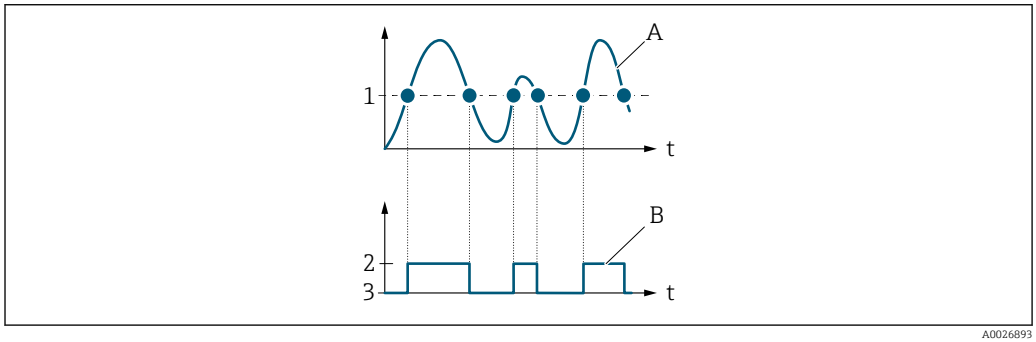
Behavior of the status output if switch-on point < switch-off point:
- Process variable < switch-on point: transistor is conductive
- Process variable > switch-off point: transistor is not conductive



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 Guidance → Commissioning → PFS output 1 → 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 → 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 → 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 → 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 → 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 → 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 → Date/time → Time format

Description Select the time format.

Selection
- 24 h
- 12 h AM/PM

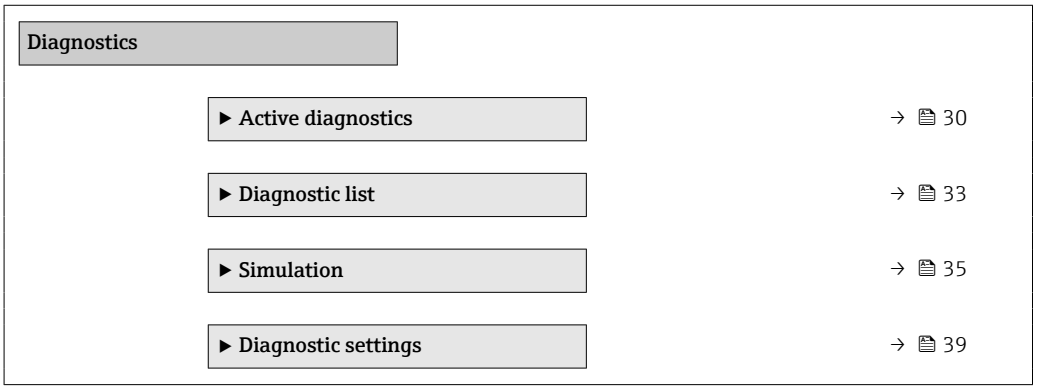
Additional information *Selection*

For an explanation of the abbreviated units: → 106

3 "Diagnostics" menu

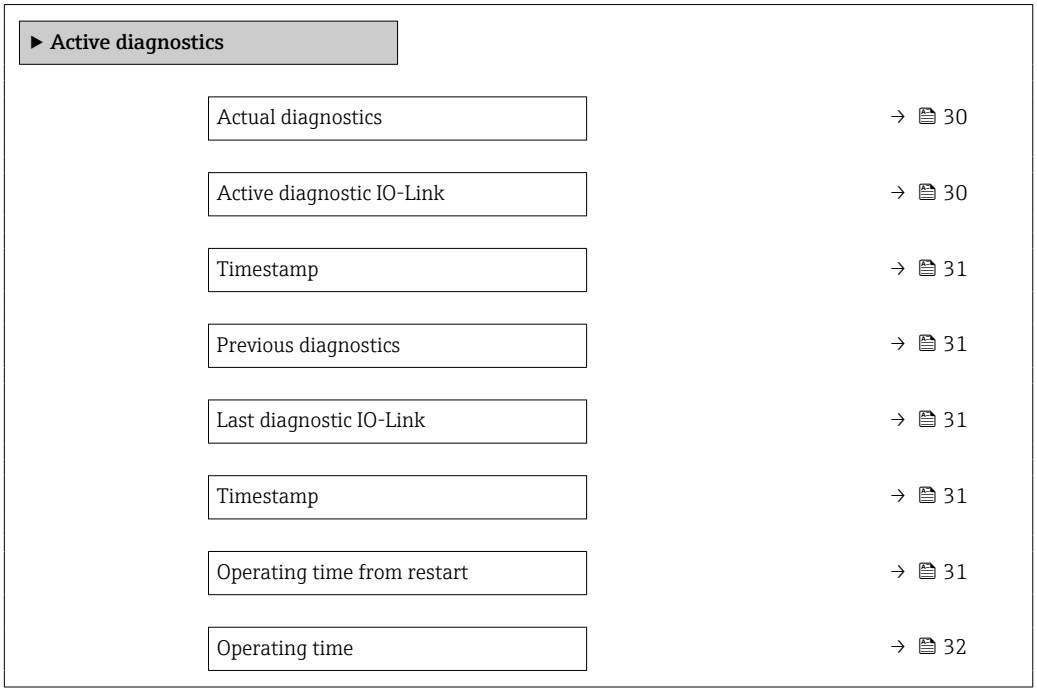
Troubleshooting and preventive maintenance – settings for device behavior during process and device events as well as assistance and measures for diagnostic purposes.

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

Active diagnostic IO-Link

Navigation Diagnostics → Active diagnos. → ActDiag IO-Link

Description Displays the IO-Link event code for the currently active diagnostic message. If there is more than one pending diagnostic event, the code for the diagnostic message with the highest priority is displayed.

User interface 0 to 65 535

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)

Last diagnostic IO-Link

Navigation Diagnostics → Active diagnos. → LastDiag IO-Link

Description Displays the IO-Link event code for the last diagnostic event that has ended.

User interface 0 to 65 535

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

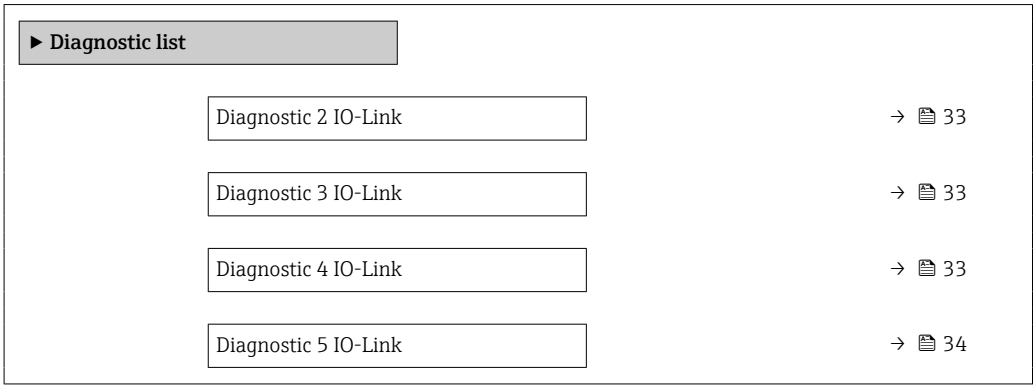
Navigation Diagnostics → Active diagnos. → Operating time

Description Indicates how long the device has been in operation.

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

3.2 Diagnostic list

Navigation Diagnostics → Diagnostic list



Diagnostic 2 IO-Link

Navigation Diagnostics → Diagnostic list → Diag. 2 IO-Link

Description Displays the IO-Link event code for the currently active diagnostic message with the second highest priority.

User interface 0 to 65 535

Diagnostic 3 IO-Link

Navigation Diagnostics → Diagnostic list → Diag. 3 IO-Link

Description Displays the IO-Link event code for the currently active diagnostic message with the third highest priority.

User interface 0 to 65 535

Diagnostic 4 IO-Link

Navigation Diagnostics → Diagnostic list → Diag. 4 IO-Link

Description Displays the IO-Link event code for the currently active diagnostic message with the fourth highest priority.

User interface 0 to 65 535

Diagnostic 5 IO-Link

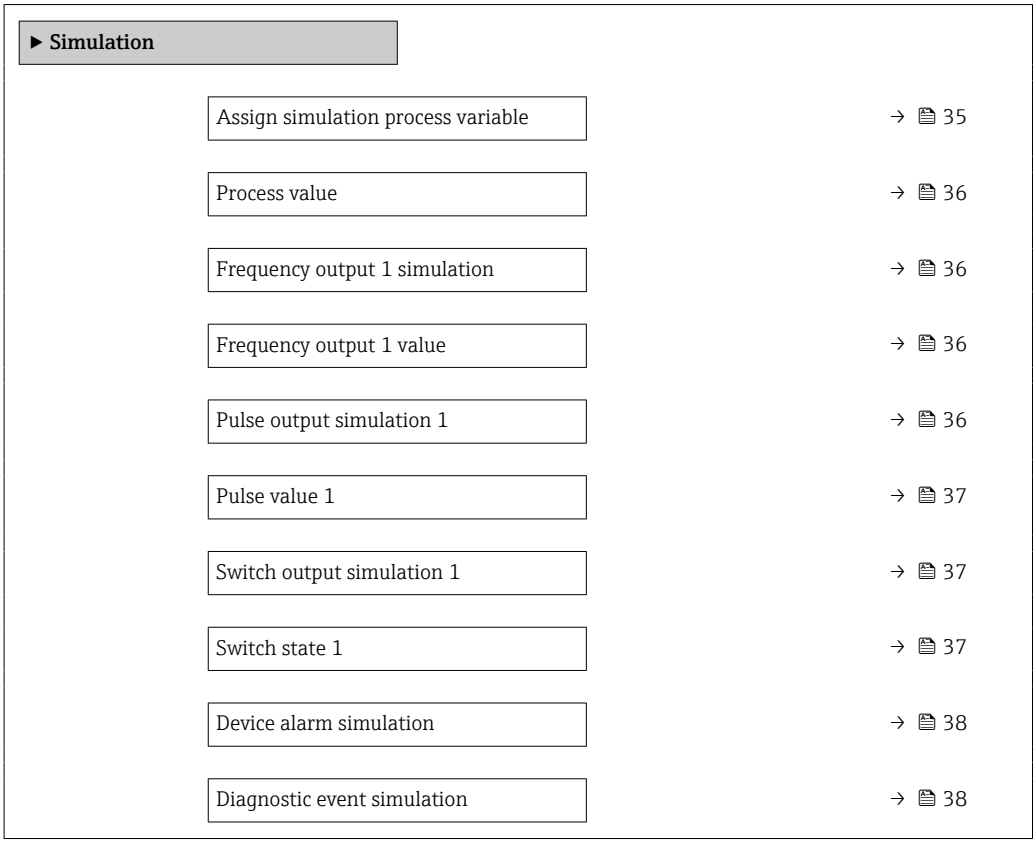
Navigation Diagnostics → Diagnostic list → Diag. 5 IO-Link

Description Displays the IO-Link event code for the currently active diagnostic message with the fifth highest priority.

User interface 0 to 65 535

3.3 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 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 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

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

Description Enter the number of pulses to simulate.

User entry 0 to 65 535

Switch output simulation

Navigation Diagnostics → Simulation → Switch sim. 1

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

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

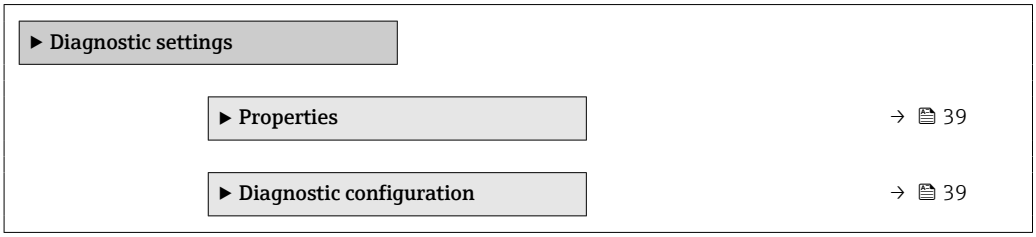
Navigation Diagnostics → Simulation → Diagnostic event

Description Select the diagnostic event to simulate.

Selection Off

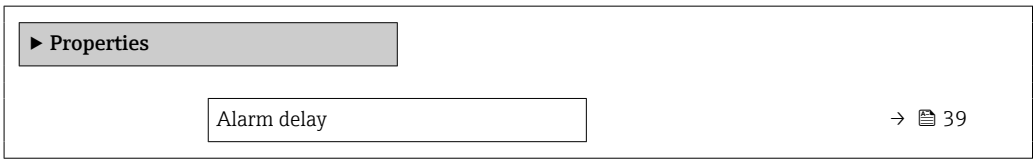
3.4 Diagnostic settings

Navigation Diagnostics → Diag. settings



3.4.1 Properties

Navigation Diagnostics → Diag. settings → Properties



Alarm delay

Navigation Diagnostics → Diag. settings → Properties → Alarm delay

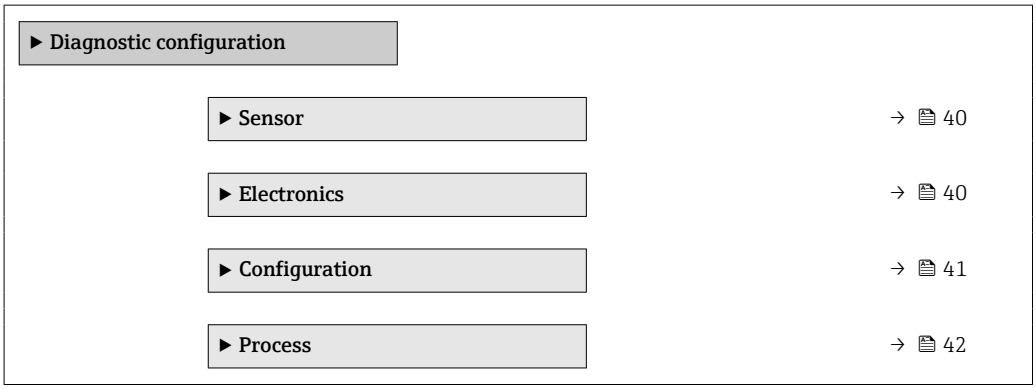
Description Enter a delay to suppress momentarily pending diagnostic messages.

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

User entry 0 to 60 s

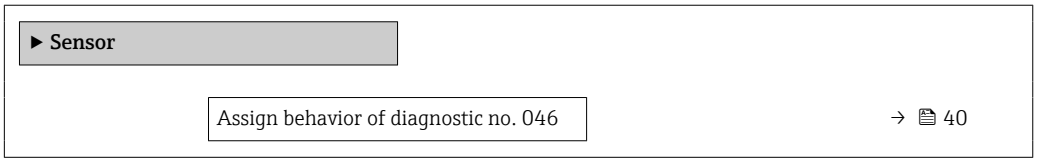
3.4.2 Diagnostic configuration

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

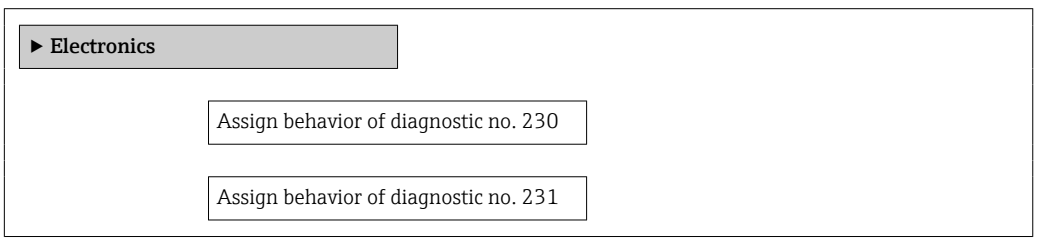
Description Select behavior for diagnostic event "046 Sensor limit exceeded".

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.

Electronics

Navigation Diagnostics → Diag. settings → Diag. config. → Electronics



Assign behavior of diagnostic no. 230

Navigation Diagnostics → Diag. settings → Diag. config. → Electronics → Diagnostic no. 230

Description Select behavior for diagnostic event "230 Date/time incorrect".

Selection
- Alarm
- Warning
- Logbook entry only

Assign behavior of diagnostic no. 231

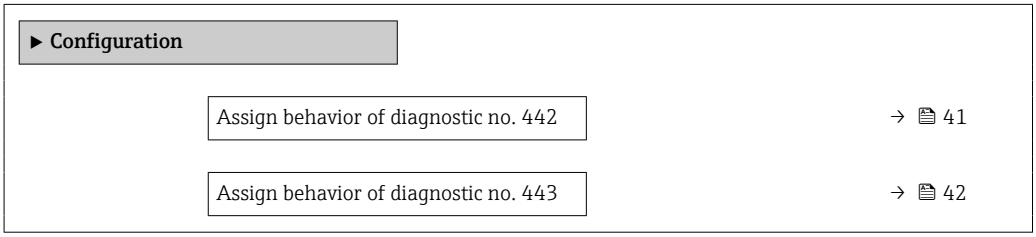
Navigation Diagnostics → Diag. settings → Diag. config. → Electronics → Diagnostic no. 231

Description Select behavior for diagnostic event "231 Date/time not available".

Selection
- Alarm
- Warning
- Logbook entry only

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

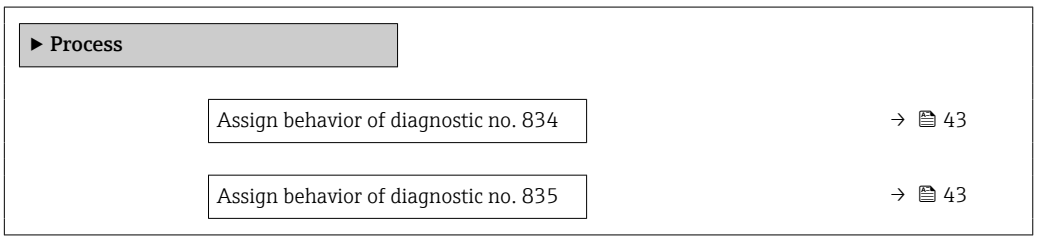
- Off
- Alarm
- Warning
- Logbook entry only

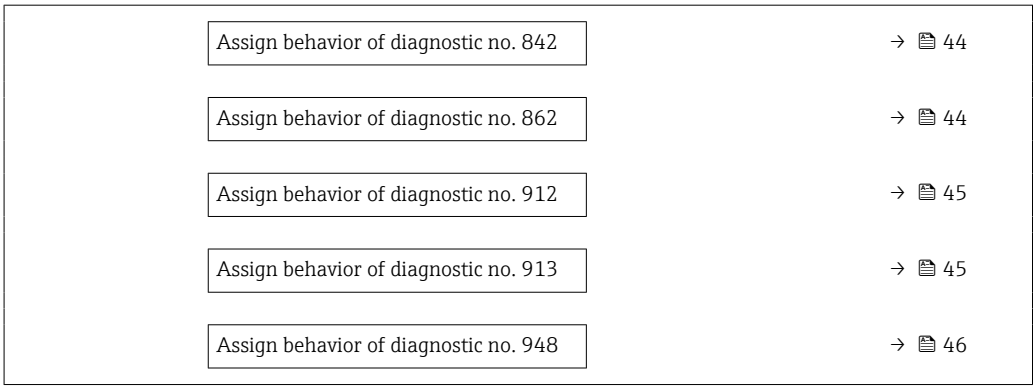
Additional information *Selection*

- **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

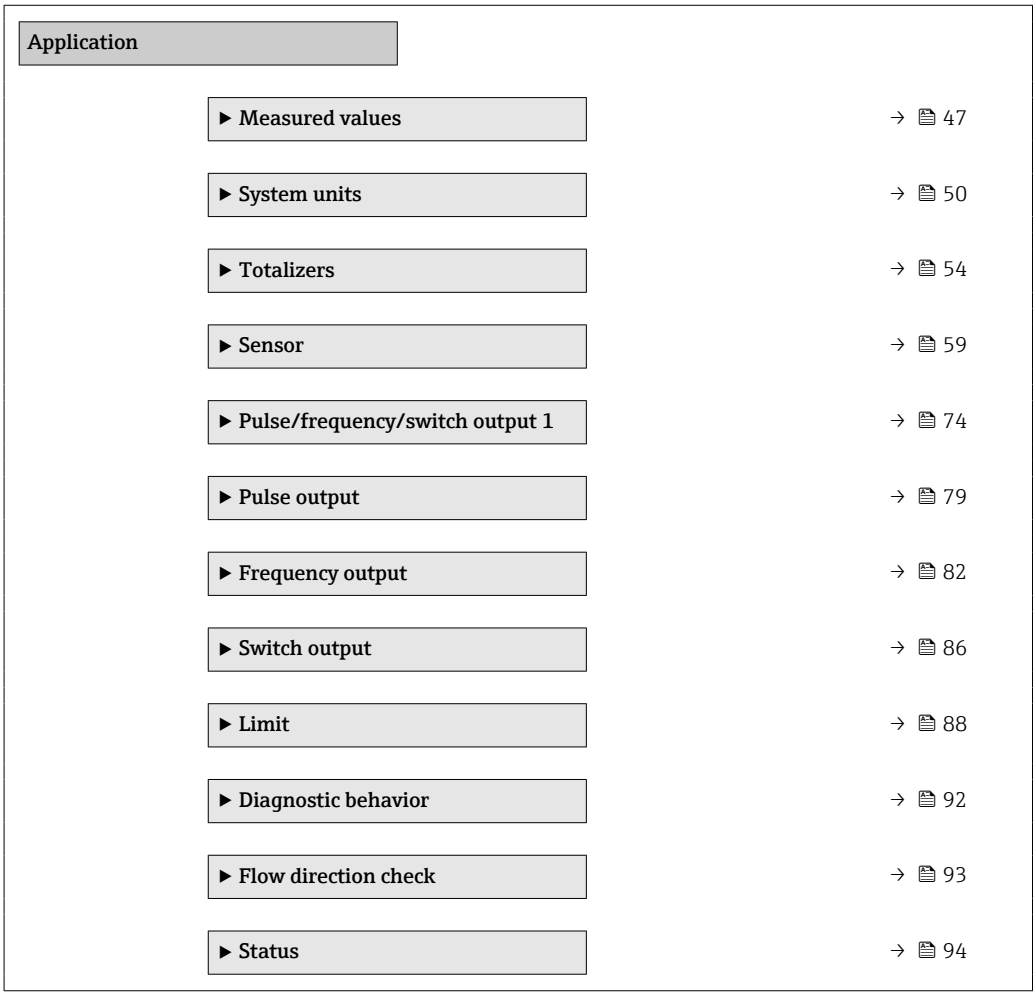
Additional information *Selection*

- **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

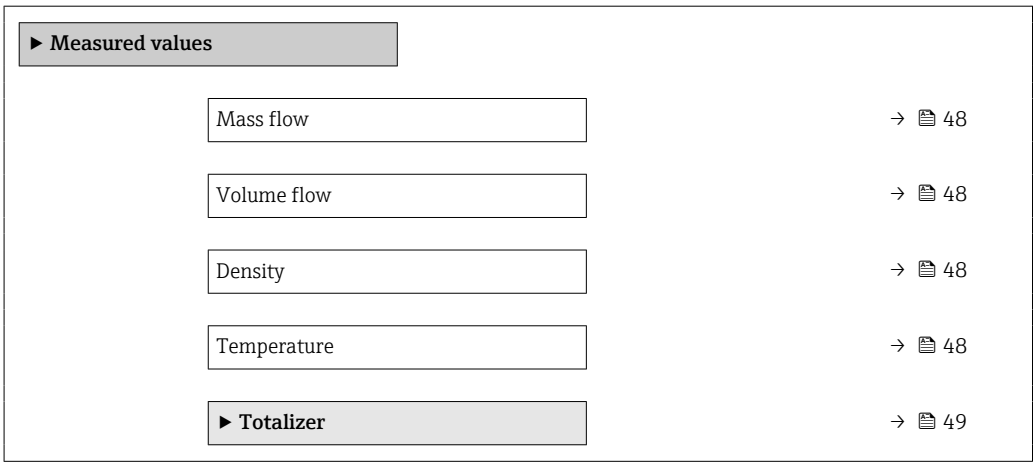
Targeted optimization to the application – comprehensive device settings from sensor technology to system integration for optimum application adaptation.

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

Additional information The IO-Link interface only offers the **kg/s** option.

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

Additional information The IO-Link interface only offers the **m^3/h** option.

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

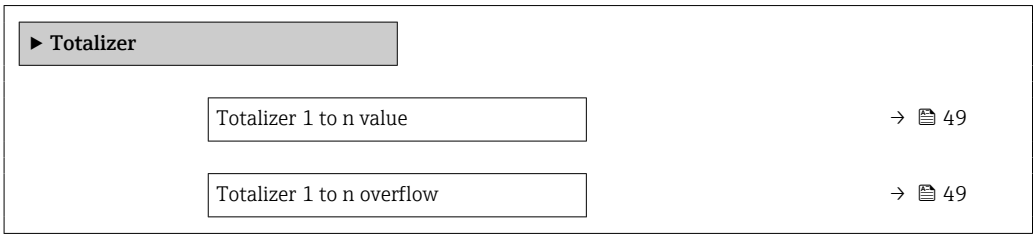
Navigation Application → Measured values → Temperature

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

Additional information Totalizer 1 is permanently set to and cannot be changed. Totalizers 2 and 3 can be changed.

Totalizer overflow

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

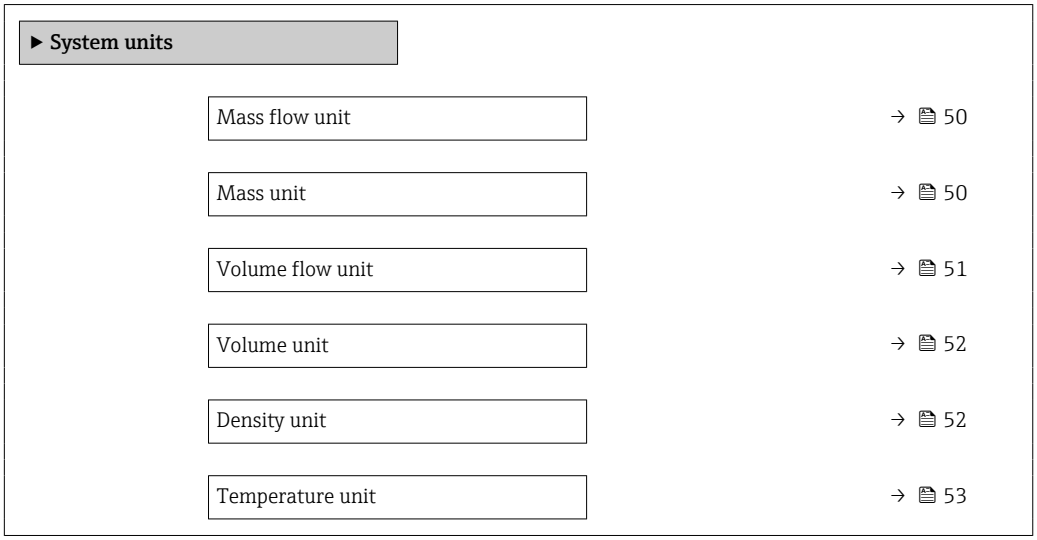
Prerequisite A process variable has been selected in the **Assign process variable** parameter in the **Totalizer 1 to n** submenu.

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

Additional information The IO-Link interface only offers the **kg/s** option.

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: → 106

The IO-Link interface only offers the **m³/h** option.

Volume unit

Navigation Application → System units → Volume unit

Description Select the volume unit.

Selection

SI units
- cm³
- dm³
- m³
- ml
- l
- hl
- Ml Mega

US units
- af
- ft³
- 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: → 106

Density unit

Navigation Application → System units → Density unit

Description Select the density unit.

Selection

SI units
- g/cm³
- g/m³
- g/ml
- kg/l
- kg/dm³
- kg/m³
- SD4°C
- SD15°C
- SD20°C
- SG4°C
- SG15°C
- SG20°C

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

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

Additional information *Options*

For an explanation of the abbreviated units: → 106

The IO-Link interface only offers the **kg/m³** option.

Temperature unit

Navigation Application → System units → Temperature unit

Description Select the temperature unit.

Selection

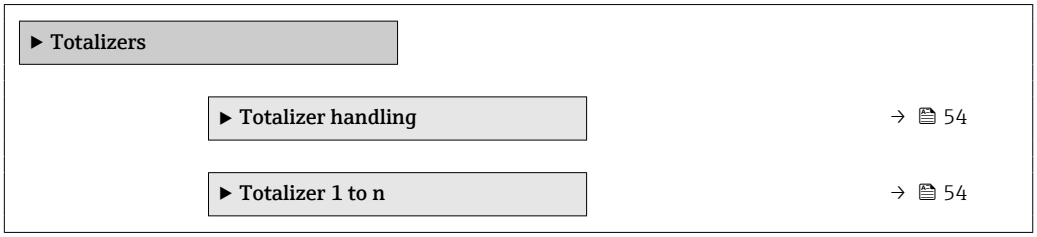
SI units	*US units*
▪ ℃	▪ ℉
▪ K	▪ ℉

Additional information *Selection*

For an explanation of the abbreviated units: → 106

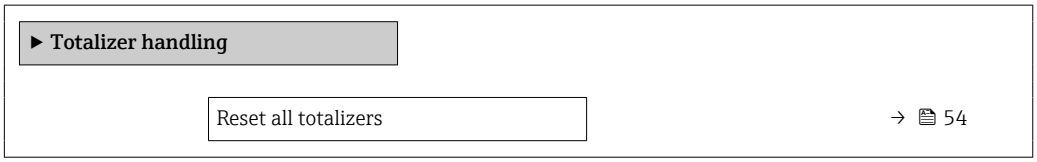
4.3 Totalizers

Navigation Application → Totalizers



4.3.1 Totalizer handling

Navigation Application → Totalizers → Totalizer



Reset all totalizers

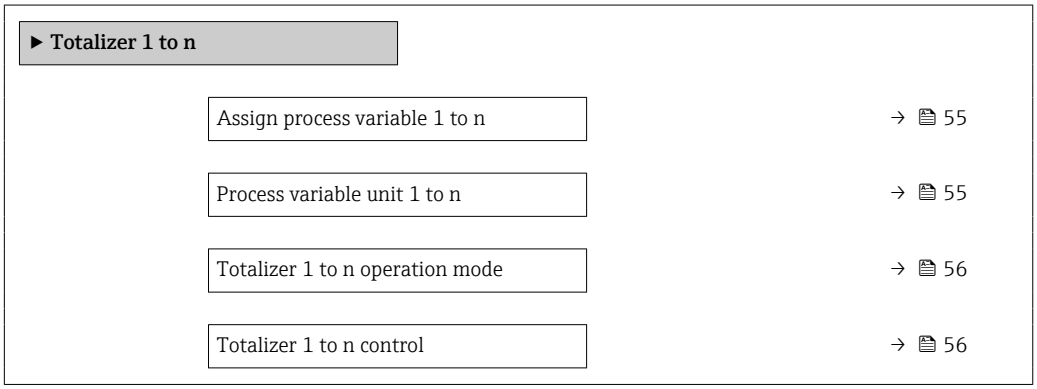
Navigation Application → Totalizers → Totalizer → Reset all tot.

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	→ 57
Totalizer 1 to n failure behavior	→ 57

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

Additional information

Totalizer 1 is permanently set to and cannot be changed. Totalizers 2 and 3 can be changed.

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
- 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.
- **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 (→ 12).

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

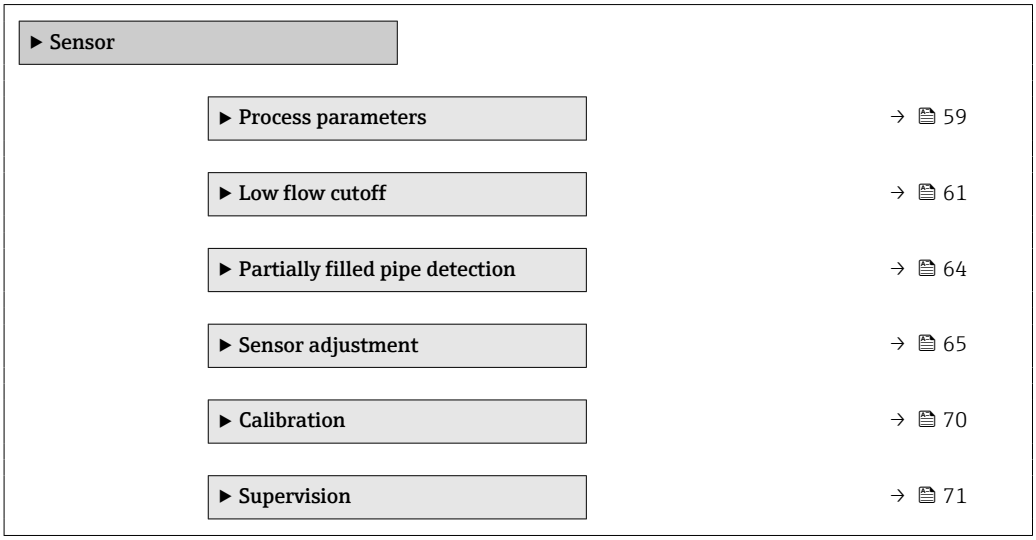
- Hold
- Continue
- Last valid value + continue

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.

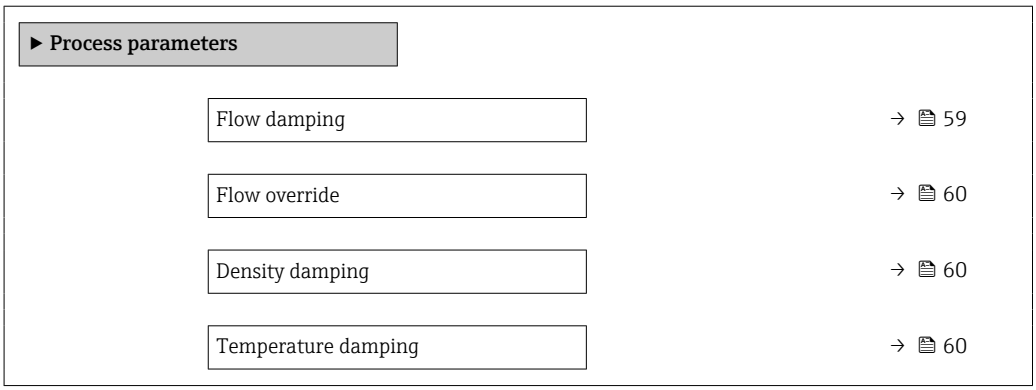
4.4 Sensor

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

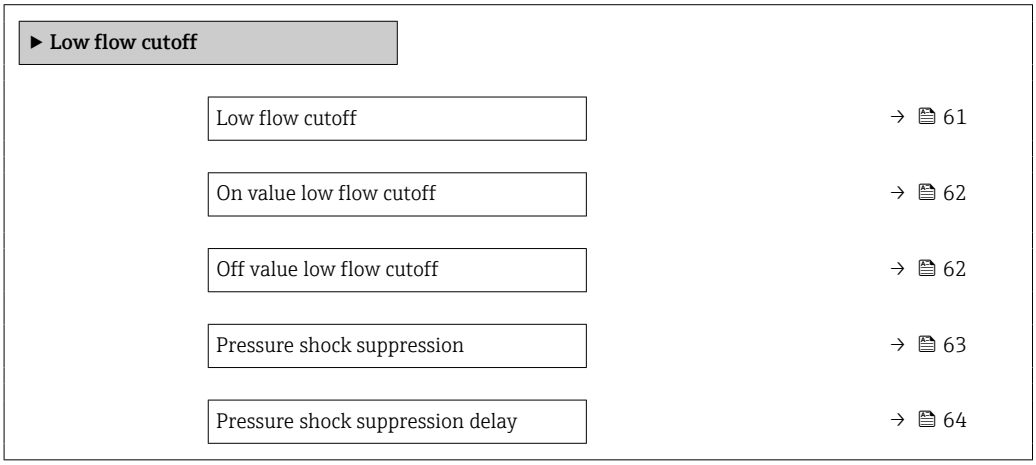
Damping is implemented by means of a proportional transmission behavior with first order delay (PT1 element).

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



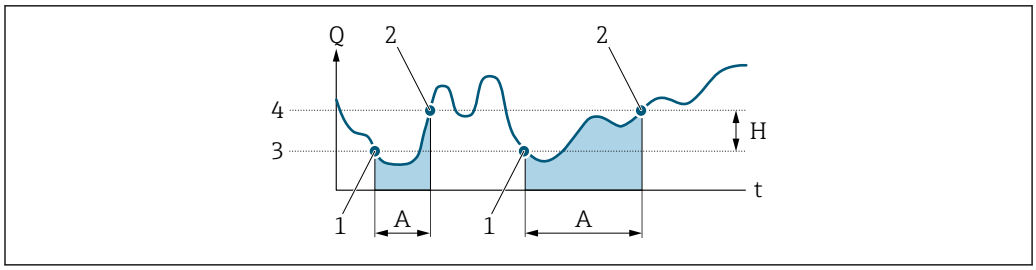
Low flow cutoff

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:

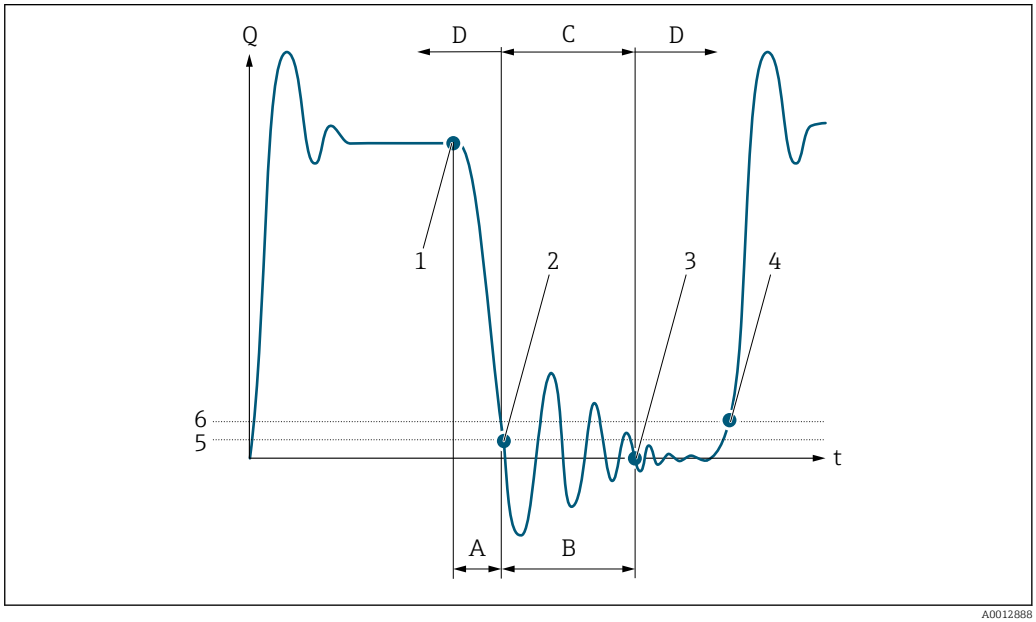
Flow: 0
Totalizer: Last valid value

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.



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

Pressure shock suppression delay

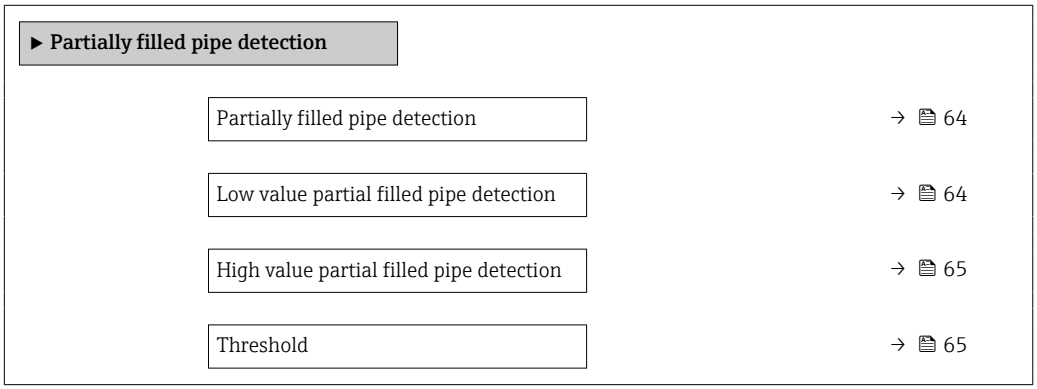
Navigation Application → Sensor → Low flow cutoff → PresShockSpDelay

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.

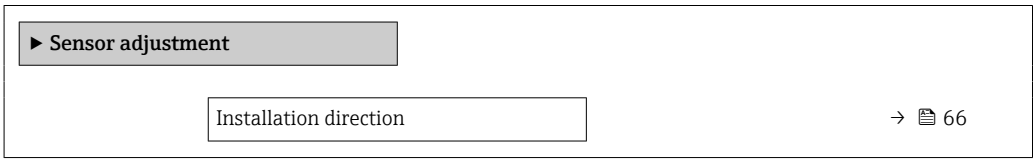
If the medium is inhomogeneous or contains air bubbles, oscillation damping of the measuring tubes increases. Oscillation damping also depends on application-specific variables, such as medium, nominal diameter, and sensor.

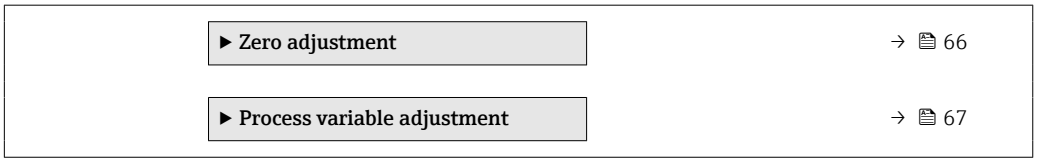
For a full tube, oscillation damping will typically be around 500. For a partially filled pipe, oscillation damping rises to > 5000. Therefore, a threshold of 2000 is recommended. If set to 0, partially filled pipe detection via oscillation damping is deactivated.

User entry Positive floating-point number

4.4.4 Sensor adjustment

Navigation Application → Sensor → Sensor adjustm.





Installation direction

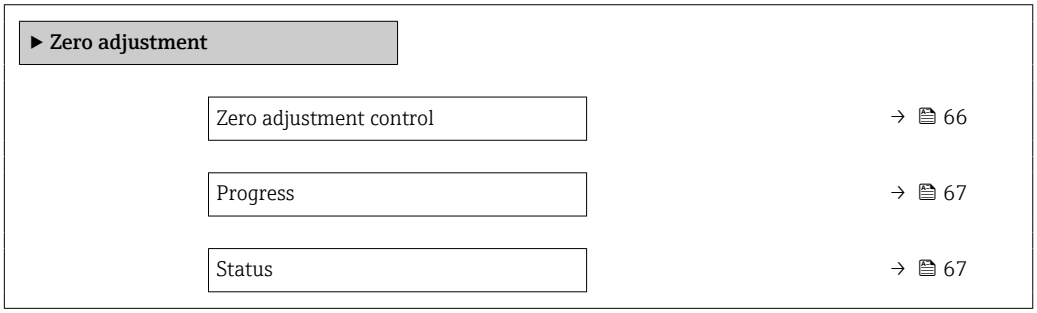
Navigation Application → Sensor → Sensor adjustm. → Install. direct.

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

► Process variable adjustment	
Mass flow offset	→ 68
Mass flow factor	→ 68
Volume flow offset	→ 68
Volume flow factor	→ 68
Density offset	→ 69
Density factor	→ 69
Temperature offset	→ 69
Temperature factor	→ 69

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.

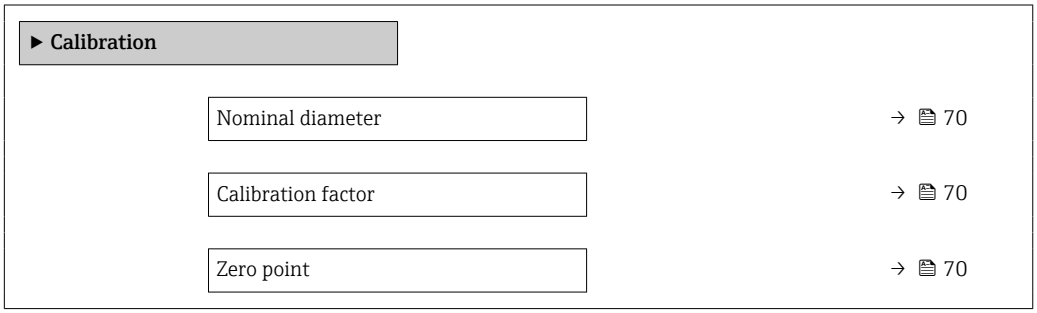
User entry Positive floating-point number

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

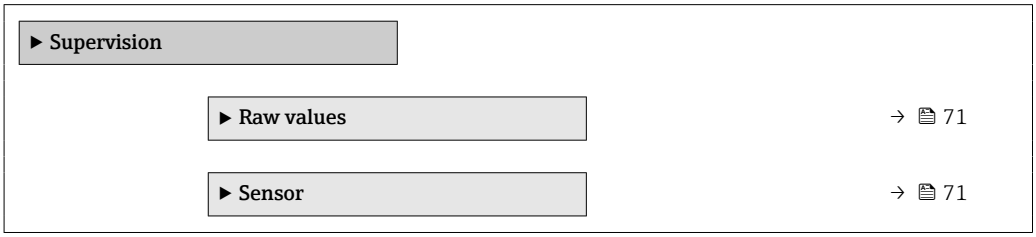
Description Displays the zero point correction value for the sensor.

Users logged on in the Service role have write access.

User entry Signed floating-point number

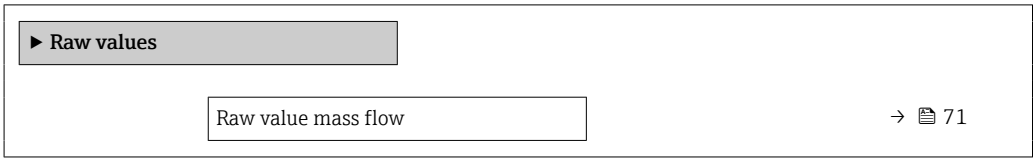
4.4.6 Supervision

Navigation Application → Sensor → Supervision



Raw values

Navigation Application → Sensor → Supervision → Raw values



Raw value mass flow

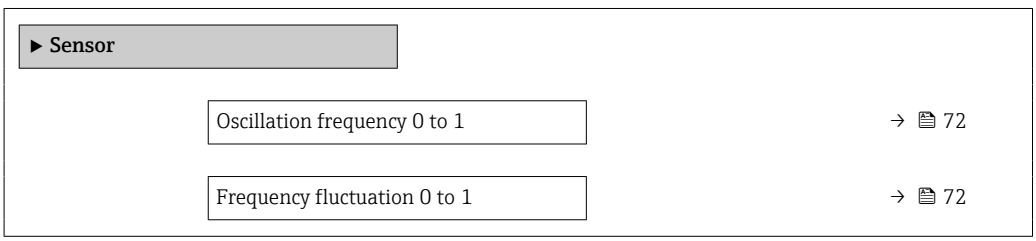
Navigation Application → Sensor → Supervision → Raw values → Raw mass flow

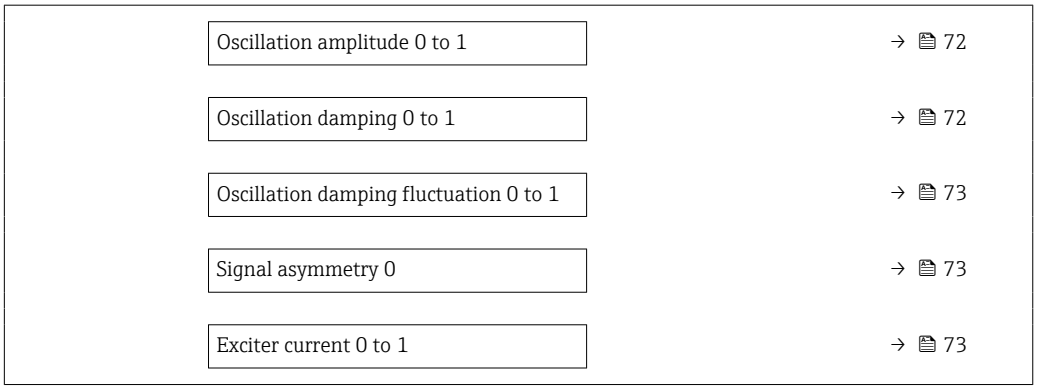
Description Displays the mass flow value before offset and factor correction, damping, low flow cut off and monitoring of a partially filled pipe. This value can be used to verify that the current zero point is within range.

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

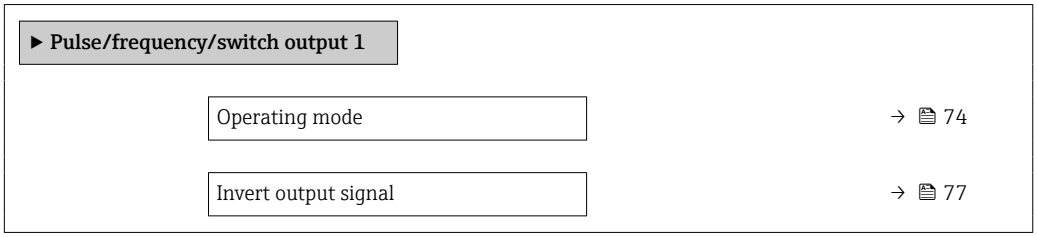
Navigation Application → Sensor → Supervision → Sensor → Exc. current 0 to 1

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 → 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.

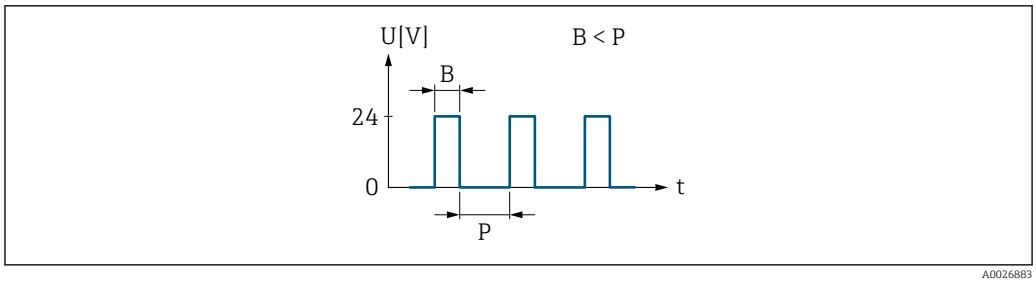
"Off" option

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



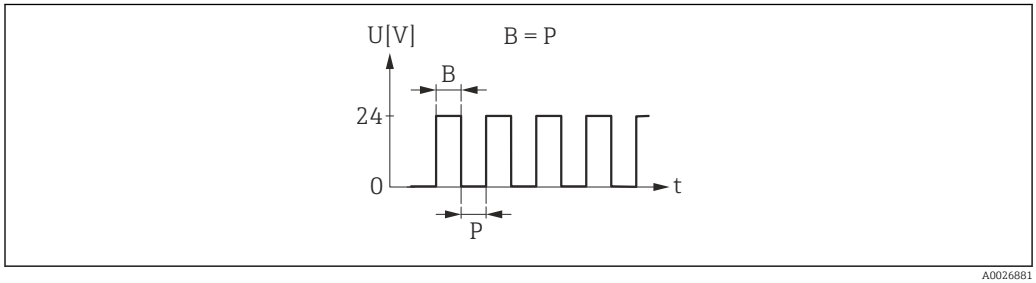
5 Quantity-proportional pulse (pulse value) with pulse width to be configured

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



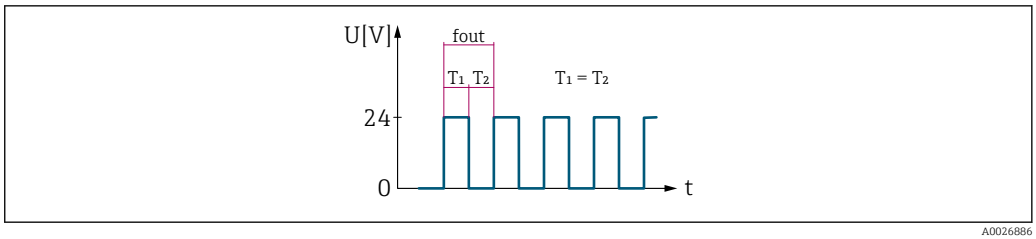
6 Quantity-proportional pulse (pulse value) with automatic pulse width

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

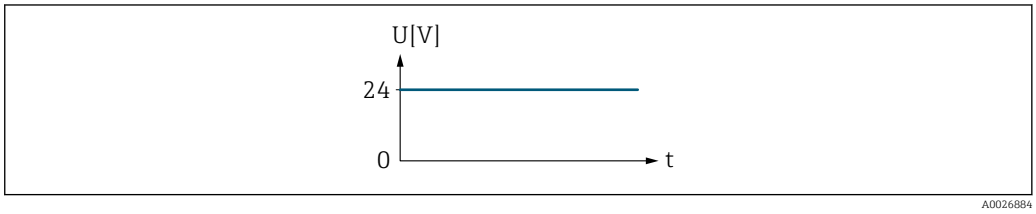


7 *Flow-proportional frequency output*

"Switch" option

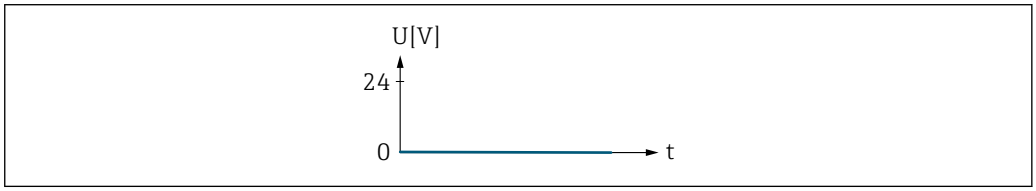
Contact for displaying a condition (e.g. alarm or warning if a limit value is reached)

Example
Alarm response without alarm



8 *No alarm, high level*

Example
Alarm response in case of alarm



9 *Alarm, low level*

Invert output signal

Navigation Application → PFS output 1 → Invert outp.sig.

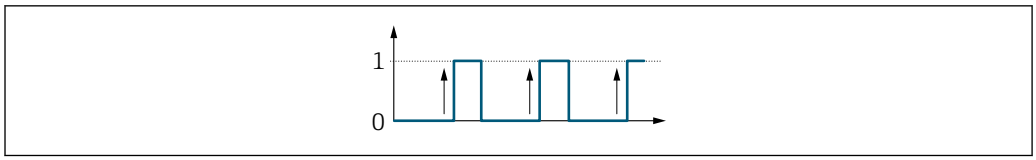
Description Indicate whether to invert the output signal (Yes/No).

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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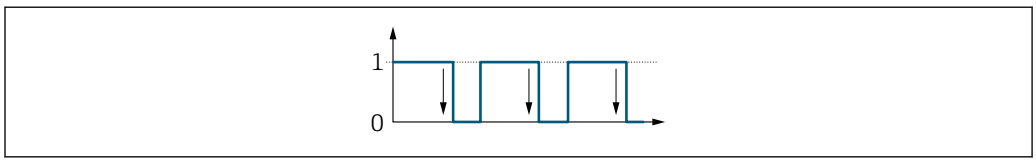
Yes option (passive - positive)



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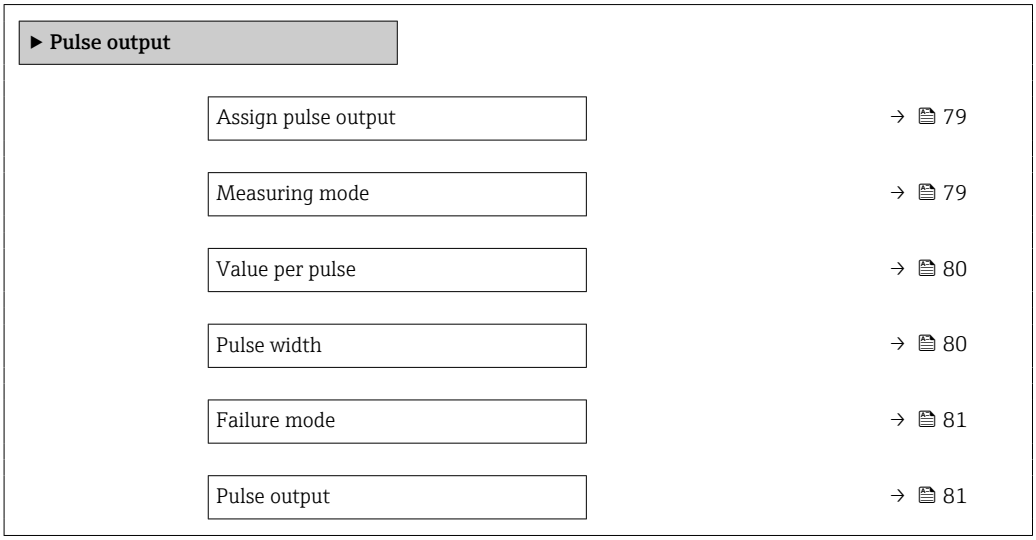
4.6 Pulse output

Navigation Application → Pulse output



Assign pulse output

Navigation Application → Pulse output → Assign pulse

Description Select the process variable for the pulse output.

Selection
- Off
- Mass flow
- Volume flow

Measuring mode

Navigation Application → Pulse output → 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 → Pulse output → 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 → Pulse output → Pulse width

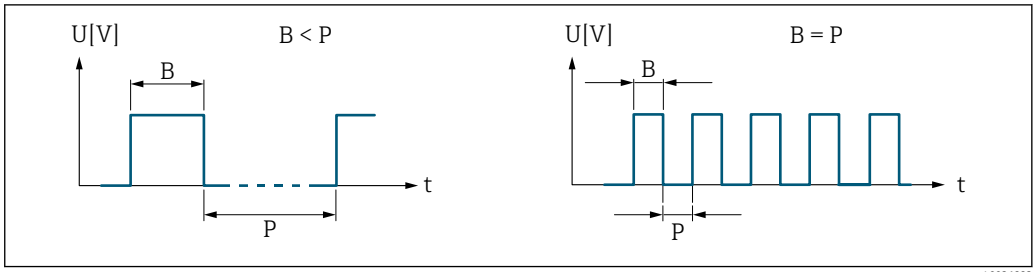
Description Specify the duration of a pulse.

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 → Pulse output → 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 → Pulse output → Pulse output

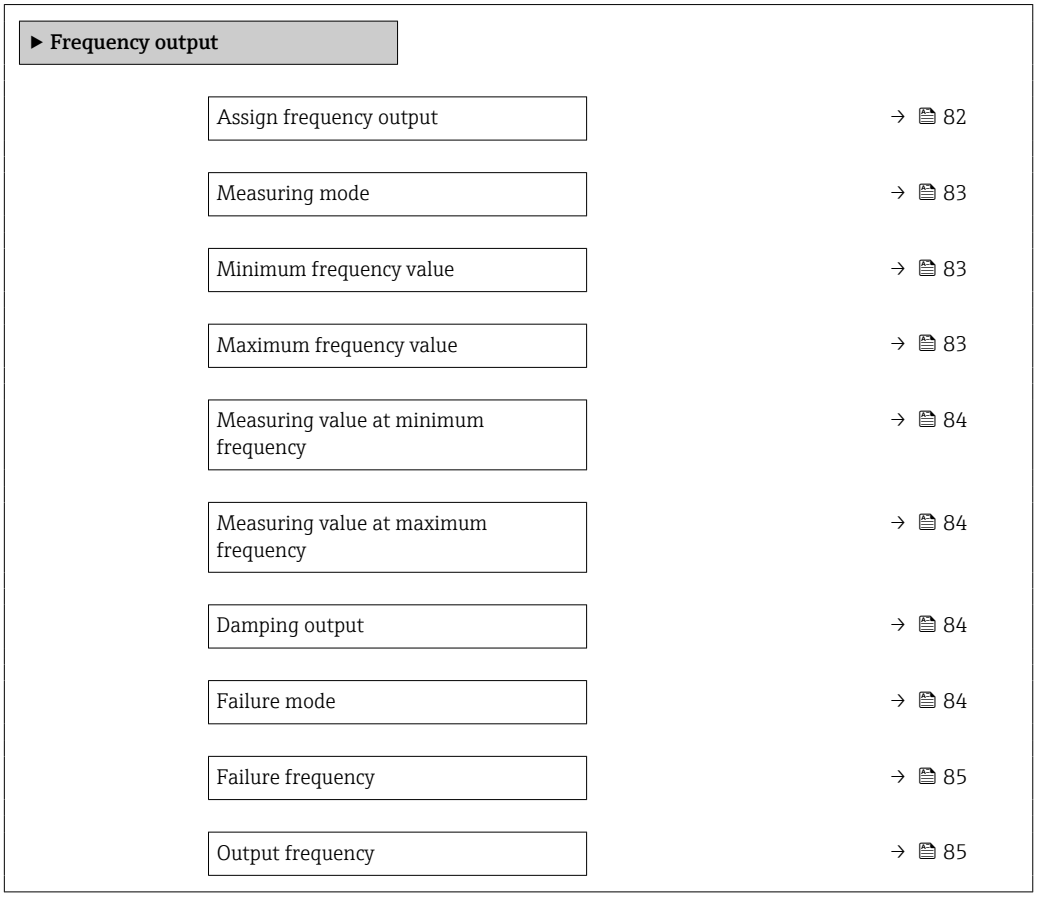
Description Displays the frequency at which pulses are currently emitted.

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

4.7 Frequency output

Navigation Application → Freq. output



Assign frequency output

Navigation Application → Freq. output → 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 → Freq. output → 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.

Minimum frequency value

Navigation Application → Freq. output → 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 → Freq. output → 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 → Freq. output → 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 → Freq. output → Val. at max.freq

Description Enter upper range value for the measured value range.

User entry Signed floating-point number

Damping output

Navigation Application → Freq. output → 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 → Freq. output → 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 → Freq. output → 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

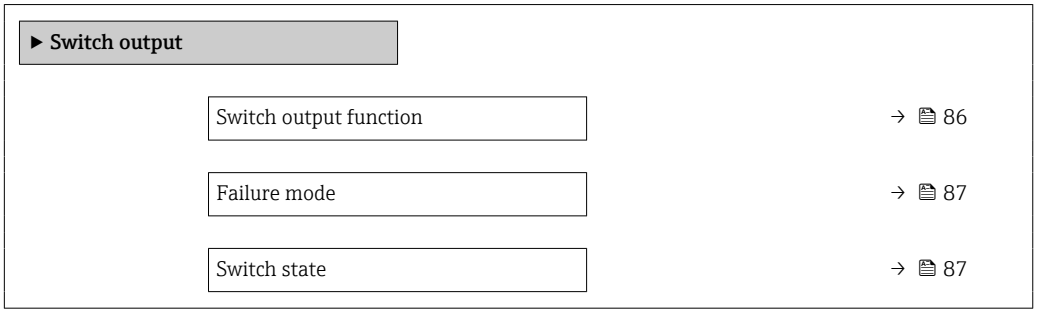
Navigation Application → Freq. output → Output freq.

Description Displays the frequency reported for the process value measured.

User interface 0.0 to 10 000.0 Hz

4.8 Switch output

Navigation Application → Switch output



Switch output function

Navigation Application → Switch output → 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).

Failure mode

Navigation Application → Switch output → 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".

Switch state

Navigation Application → Switch output → Switch state

Description Indicates the current switch state of the switch output.

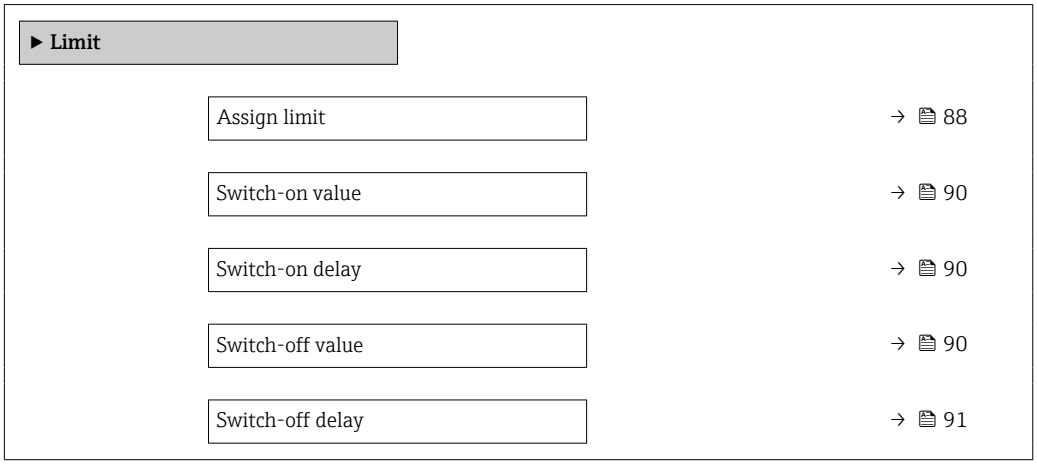
User interface
- Open
- Closed

Additional information *User interface*

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

4.9 Limit Switch output

Navigation Application → Limit



Assign limit

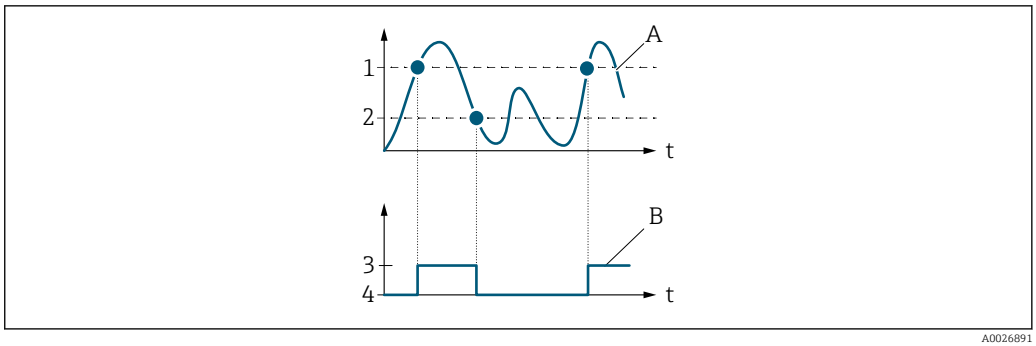
Navigation Application → Limit → Assign limit

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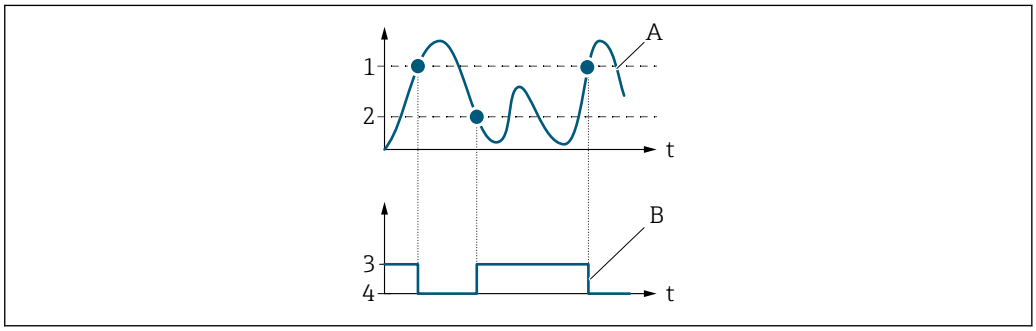
1 Switch-on value
2 Switch-off value
3 Conductive
4 Non-conductive
A Process variable
B Status output

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

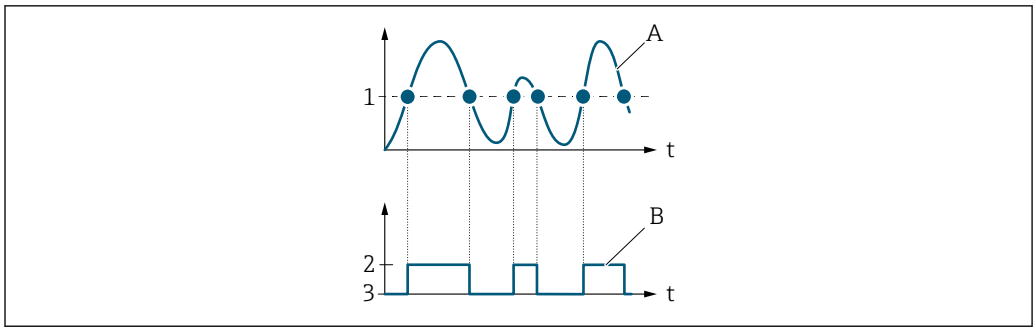


A0026892

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 Application → Limit → 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 → Limit → 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 → Limit → 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

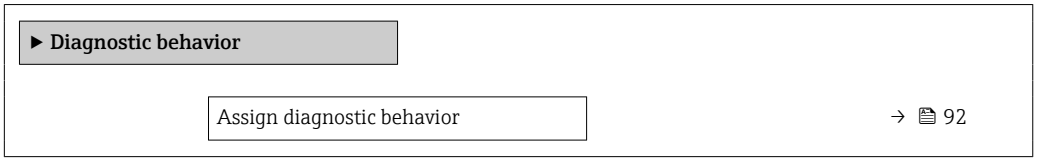
Navigation Application → Limit → Switch-off delay

Description Enter delay before the switch output is switched off.

User entry 0.0 to 100.0 s

4.10 Diagnostic behavior Switch output

Navigation Application → Diag. behavior



Assign diagnostic behavior

Navigation Application → Diag. behavior → Assign diag. beh

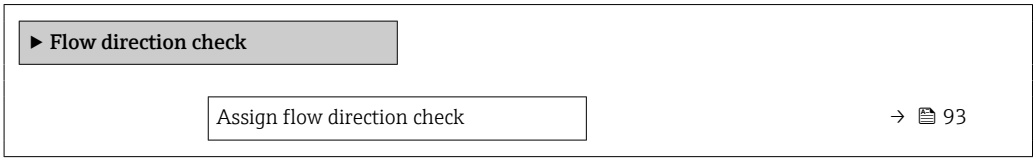
Description The switch output is switched on (closed, conductive), if there is a pending diagnostic event of the assigned behavioral category.

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.

4.11 Flow direction check Switch output

Navigation Application → Fl. direct.check



Assign flow direction check

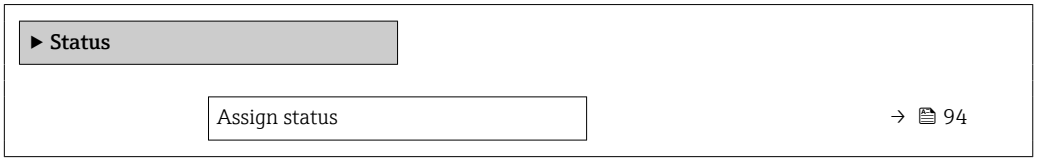
Navigation Application → Fl. direct.check → Assign dir.check

Description Select a process variable for flow direction monitoring.

Selection
- Off
- Volume flow
- Mass flow

4.12 Status Switch output

Navigation Application → Status



Assign status

Navigation Application → Status → 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.

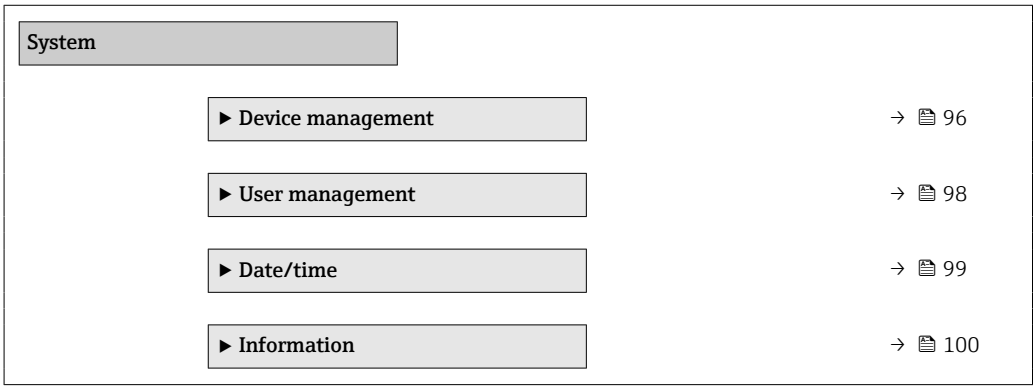
The output behavior can be inverted in the "Invert output signal" parameter, i.e. in this case the output will be non-conductive when switched on and conductive when switched off. The "Invert output signal" parameter is not available for all devices.

Selection
- Partially filled pipe detection
- Low flow cutoff

5 "System" menu

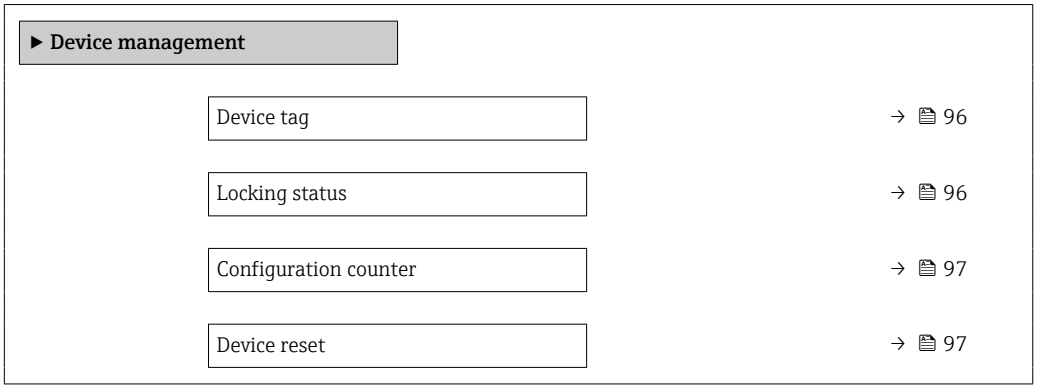
Overall device management and security settings – management of system settings and adaption to operational requirements.

Navigation System



5.1 Device management

Navigation System → Device manag.



Device tag

Navigation System → Device manag. → Device tag

Description Displays the name for the measuring point.

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 *

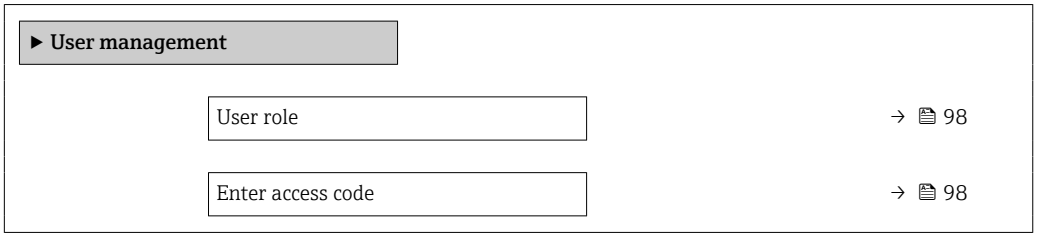
Additional information *Selection*

- **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

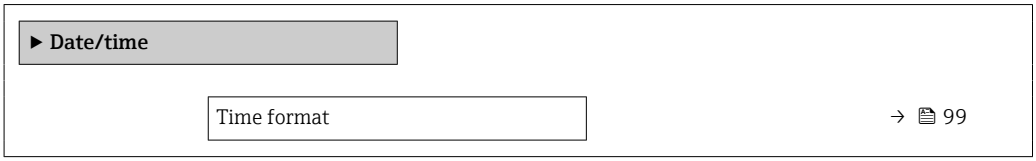
Navigation System → User manag. → Ent. access code

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.

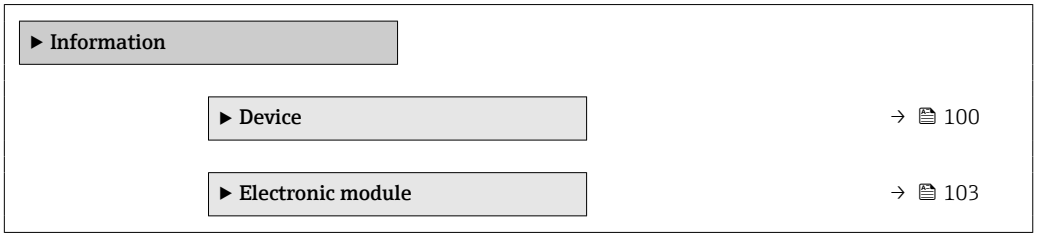
Selection
- 24 h
- 12 h AM/PM

Additional information *Selection*

For an explanation of the abbreviated units: → 106

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 Displays the name for the measuring point.

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

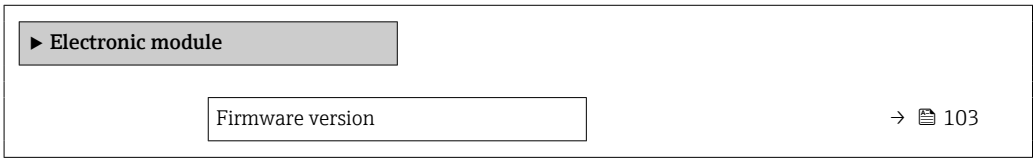
Navigation System → Information → Device → Manufacturer

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
½	0.004
1	0.007
1 ½	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
½	0.25
1	0.7
1 ½	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) Normal liquids: 31.5 gal/bbl
	bbl/s (us;beer), bbl/min (us;beer), bbl/h (us;beer), bbl/d (us;beer)	Barrel /time unit (beer) Beer: 31.0 gal/bbl
	bbl/s (us;oil), bbl/min (us;oil), bbl/h (us;oil), bbl/d (us;oil)	Barrel/time unit (petrochemicals) Petrochemicals: 42.0 gal/bbl
	bbl/s (us;tank), bbl/min (us;tank), bbl/h (us;tank), bbl/d (us;tank)	Barrel/time unit (filling tank) Filling tanks: 55.0 gal/bbl
Time	s, m, h, d, y	Second, minute, hour, day, year
	am, pm	Ante meridiem (before midday), post meridiem (after midday)

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) Beer: 36.0 gal/bbl
	bbl/s (imp;oil), bbl/min (imp;oil), bbl/h (imp;oil), bbl/d (imp;oil)	Barrel/time unit (petrochemicals) Petrochemicals: 34.97 gal/bbl
Time	s, m, h, d, y	Second, minute, hour, day, year
	am, pm	Ante meridiem (before midday), post meridiem (after midday)

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