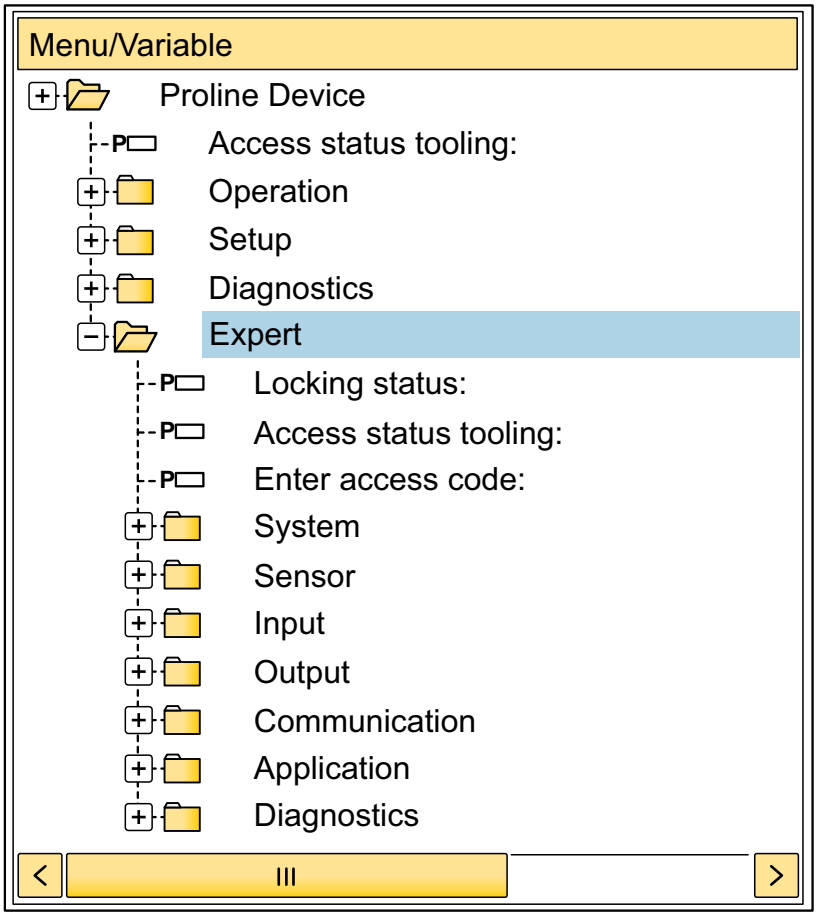
GP01050D/06/EN/02.19
71426481
2019-01-31

Valid as of version
03.00.zz (Device firmware)

Description of Device Parameters
Dosimass

Coriolis flowmeter



Endress+Hauser
People for Process Automation

Table of contents

1 About this document

1.1 Document function

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

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

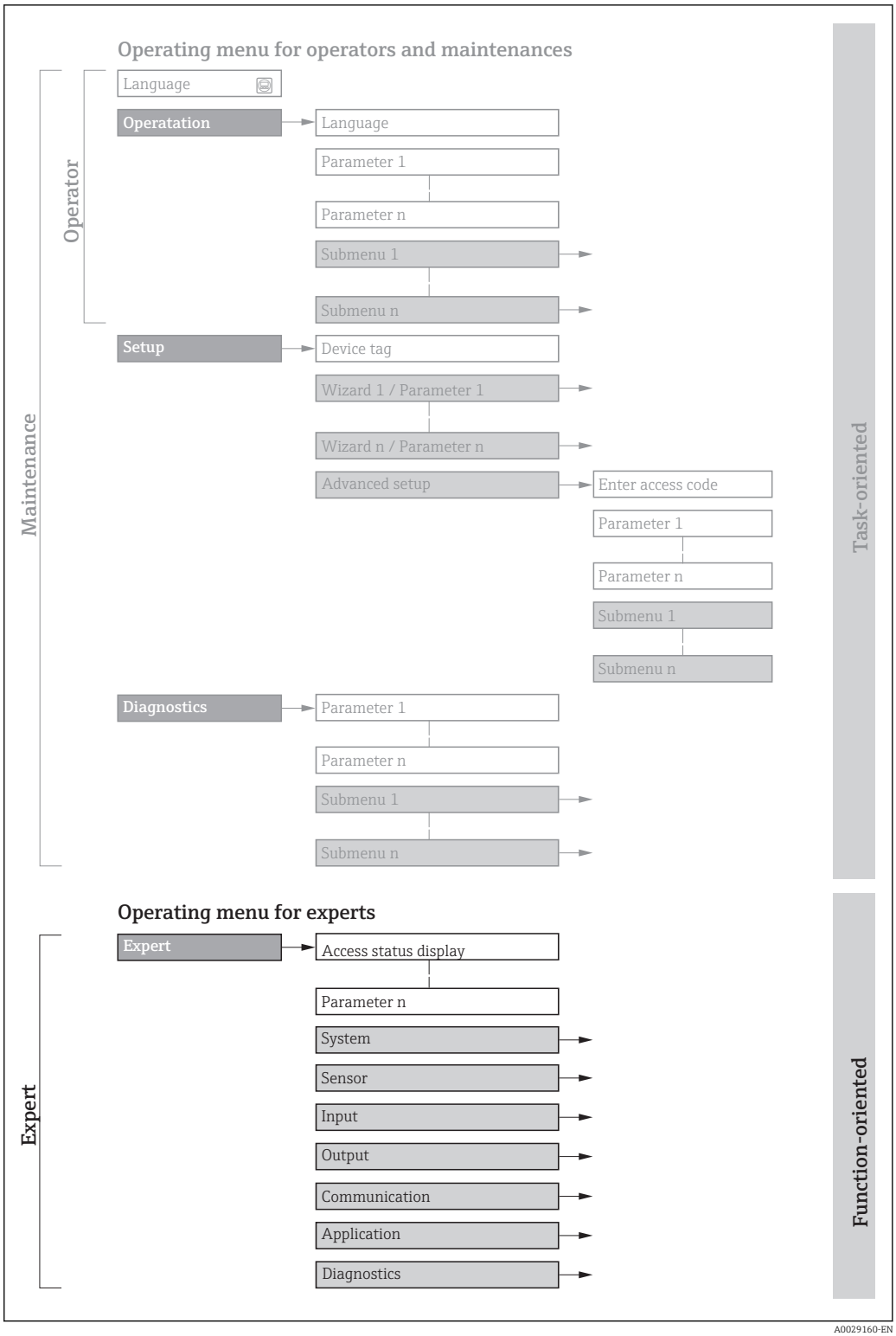
1.2 Target group

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

1.3 Using this document

1.3.1 Information on the document structure

The document lists the submenus and their parameters according to the structure from the **Expert** menu (→ 🖹 8), which is displayed when the **"Maintenance" user role** is enabled.



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

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

1.3.2 Structure of a parameter description

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

Complete parameter name	Write-protected parameter

Navigation	Navigation path to the parameter via the operating tool The names of the menus, submenus and parameters are displayed in abbreviated format.
Prerequisite	The parameter is only available under these specific conditions
Description	Description of the parameter function
Selection	List of the individual options for the parameter ▪ Option 1 ▪ Option 2
User entry	Input range for the parameter
User interface	Display value/data for the parameter
Factory setting	Default setting ex works
Additional information	Additional explanations (e.g. in examples): ▪ On individual options ▪ On display values/data ▪ On the input range ▪ On the factory setting ▪ On the parameter function

1.4 Symbols used

1.4.1 Symbols for certain types of information

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

1.4.2 Symbols in graphics

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

1.5 Documentation

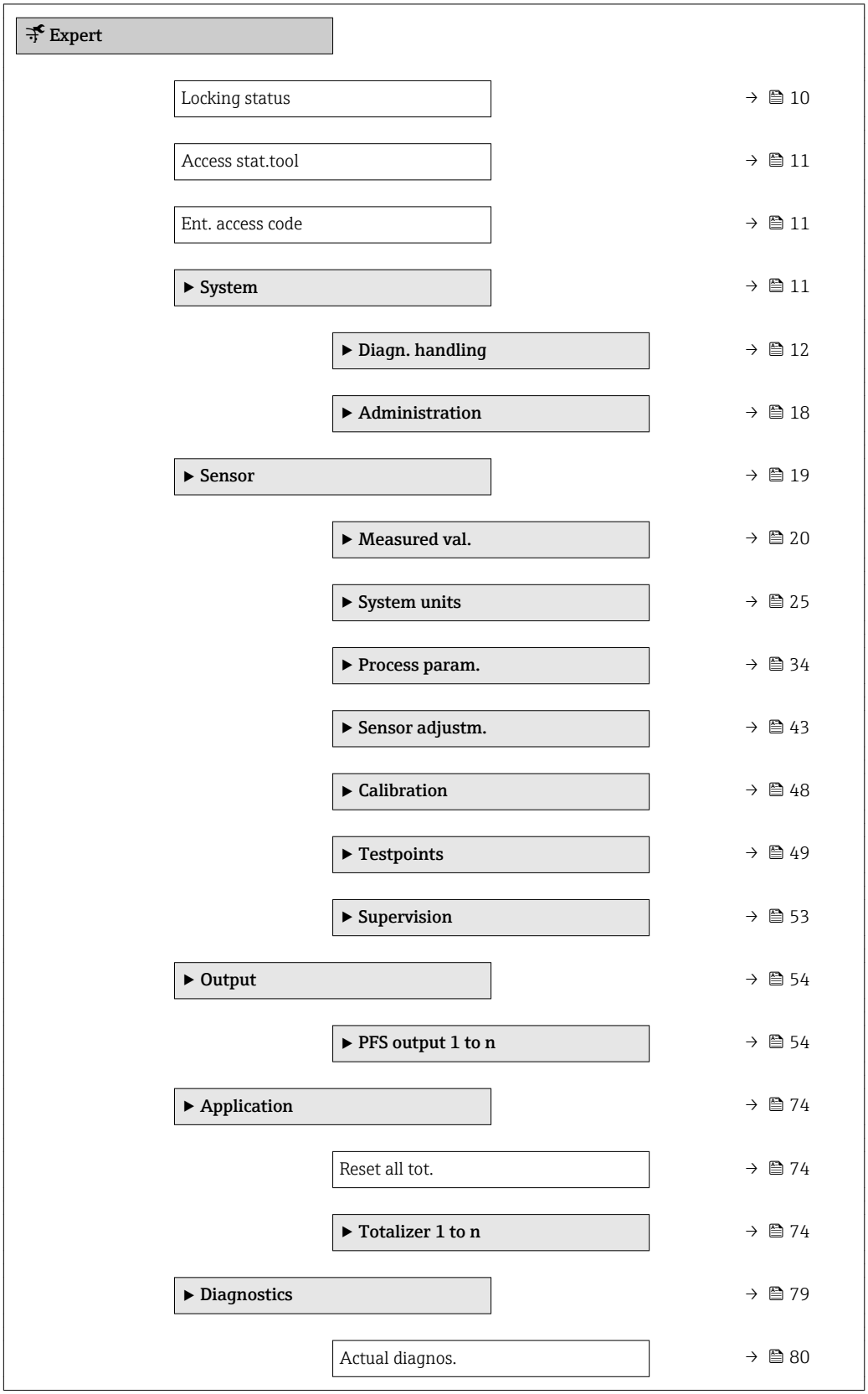
1.5.1 Standard documentation

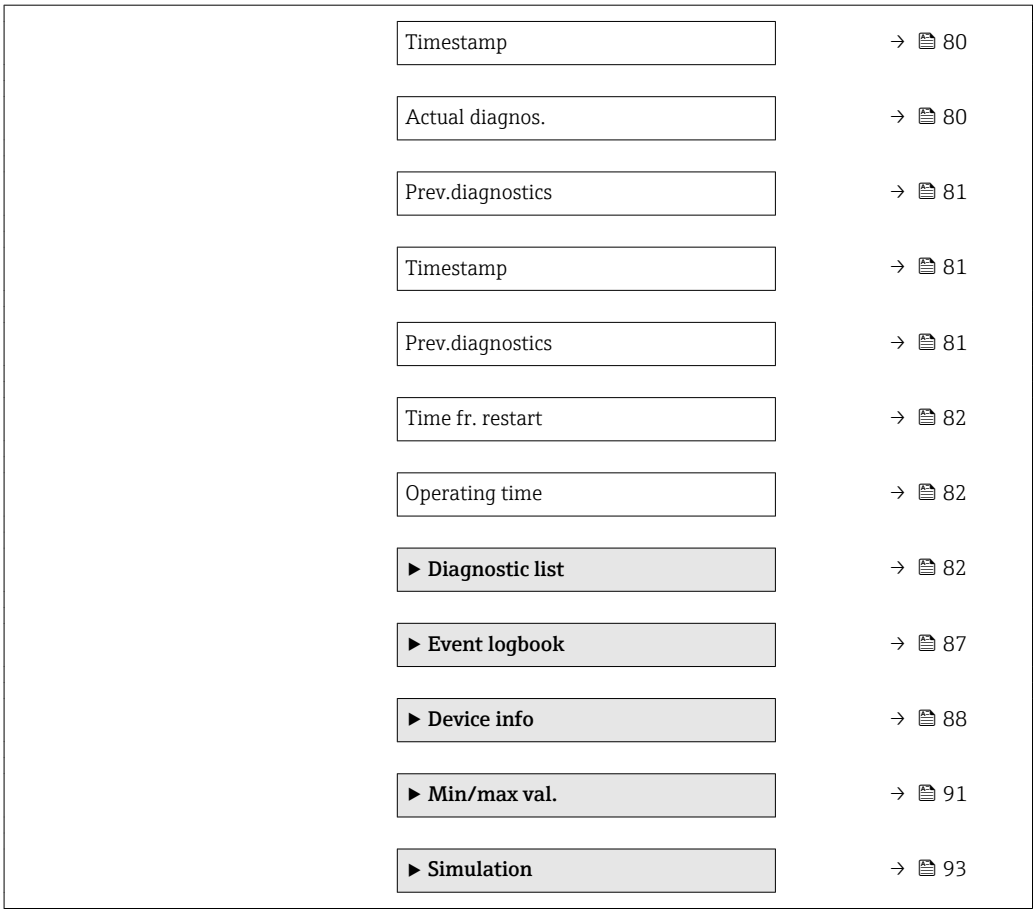
Operating Instructions

Measuring device	Documentation code
Dosimass	BA00097D

2 Overview of the Expert operating menu

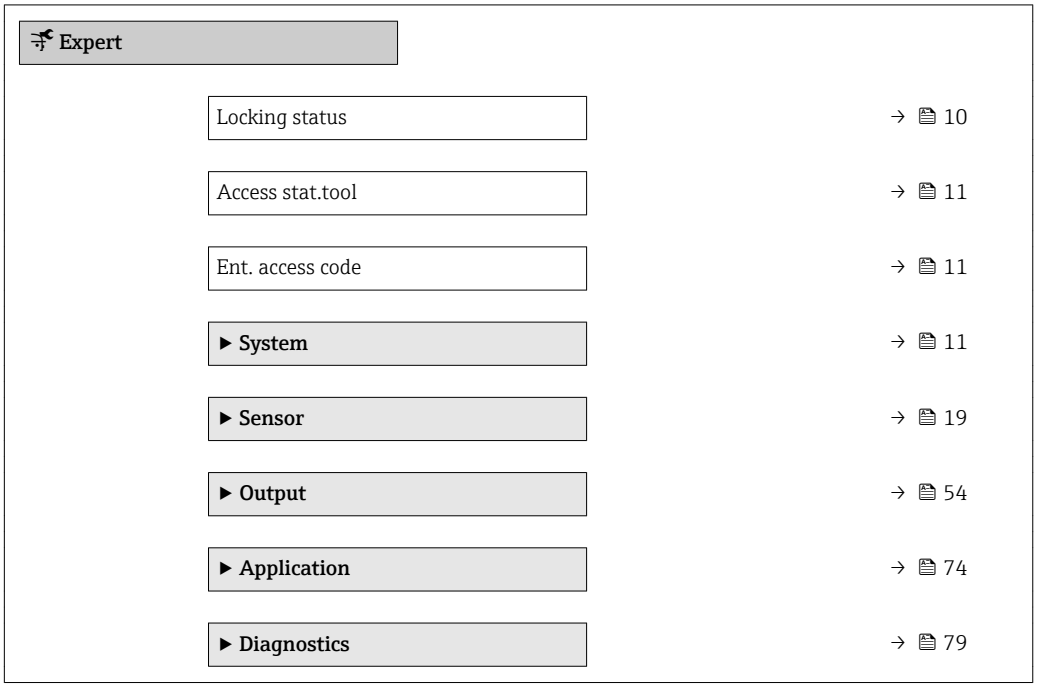
The following table provides an overview of the menu structure of the expert operating menu and its parameters. The page reference indicates where the associated description of the submenu or parameter can be found.




Timestamp
→ 80
Actual diagnos.
→ 80
Prev.diagnostics
→ 81
Timestamp
→ 81
Prev.diagnostics
→ 81
Time fr. restart
→ 82
Operating time
→ 82
▶ Diagnostic list
→ 82
▶ Event logbook
→ 87
▶ Device info
→ 88
▶ Min/max val.
→ 91
▶ Simulation
→ 93

3 Description of device parameters

In the following section, the parameters are listed according to the menu structure of the operating tool.



Locking status

Navigation Expert → Locking status

Description Displays the active write protection.

User interface Temp. locked

Additional information *Display*

If two or more types of write protection are active, all the active types of write protection are displayed in the operating tool.

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

Selection

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

Access stat.tool

Navigation Expert → Access stat.tool

Description Displays the access authorization to the parameters via the operating tool.

User interface
- Operator
- Maintenance

Factory setting Maintenance

Additional information *Description*

Access authorization can be modified via the **Ent. access code** parameter (→ 11).

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

Display

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

Ent. access code

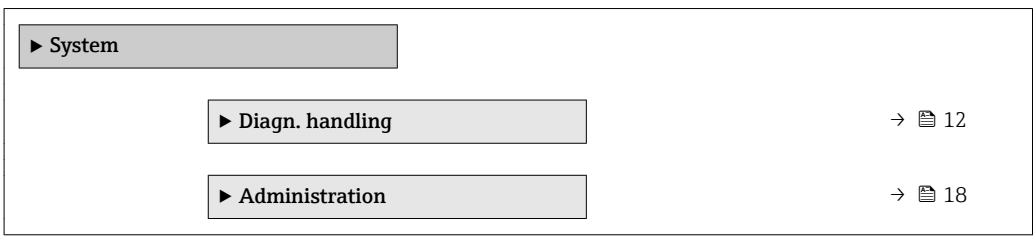
Navigation Expert → Ent. access code

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

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

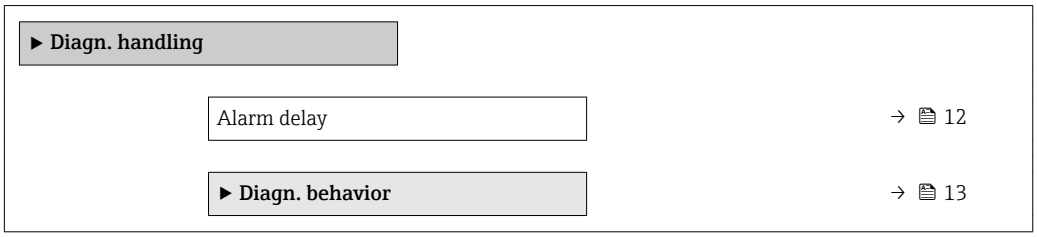
3.1 "System" submenu

Navigation Expert → System



3.1.1 "Diagn. handling" submenu

Navigation Expert → System → Diagn. handling



Alarm delay

Navigation Expert → System → Diagn. handling → Alarm delay

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

The diagnostic message is reset without a time delay.

User entry 0 to 60 s

Factory setting 0 s

Additional information *Description*

This setting affects the following diagnostic messages:
- 022 Sensor temp.
- 046 Sensor limit
- 062 Sensor connect.
- 082 Data storage
- 083 Memory content
- 140 Sensor signal
- 190 Special event 1
- 191 Special event 5
- 192 Special event 9
- 270 Main electronic
- 271 Main electronic
- 273 Main electronic
- 274 Main electronic
- 311 Electr. failure
- 442 Freq. output 1 to n
- 443 Pulse output 1 to n
- 453 Flow override
- 834 Process temp.
- 835 Process temp.
- 862 Partly filled
- 912 Medium inhomog.
- 913 Medium unsuitab.
- 948 Tube damp. high
- 990 Special event 4
- 992 Special event 12

"Diagn. behavior" submenu

Each item of diagnostic information is assigned a specific diagnostic behavior at the factory. The user can change this assignment for specific diagnostic information in the **Diagn. behavior** submenu (→ 13).

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

Options	Description
Alarm	The device stops measurement. The signal outputs and totalizers assume the defined alarm condition. A diagnostic message is generated.
Warning	The device continues to measure. The signal outputs and totalizers are not affected. A diagnostic message is generated.
Logbook only	The device continues to measure. The diagnostic message is entered only in the **Event logbook** submenu (→ 87).
Off	The diagnostic event is ignored, and no diagnostic message is generated or entered.

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

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

► **Diagn. behavior**

Diagnostic no. 140	→ 14
Diagnostic no. 046	→ 14
Diagnostic no. 834	→ 14
Diagnostic no. 835	→ 15
Diagnostic no. 912	→ 15
Diagnostic no. 913	→ 15
Diagnostic no. 192	→ 16
Diagnostic no. 274	→ 16
Diagnostic no. 392	→ 16
Diagnostic no. 442	→ 17
Diagnostic no. 443	→ 17
Diagnostic no. 592	→ 17
Diagnostic no. 992	→ 18

Diagnostic no. 140 (Sensor sig.asym.)

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

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

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 13→ 13

Diagnostic no. 046 (Sensor limit)

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

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

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 13→ 13

Diagnostic no. 834 (Process temp.)

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

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

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 13→ 13

Diagnostic no. 835 (Process temp.)

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

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

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 13→ 13

Diagnostic no. 912 (Medium inhomog.)

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

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

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 13→ 13

Diagnostic no. 913 (Medium unsuitab.)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 913

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

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 13→ 13

Diagnostic no. 192 (Special event 9)

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

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

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 13→ 13

Diagnostic no. 374 (Sensor electron.)

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

Description Option for changing the diagnostic behavior of the diagnostic message **374 Sensor electron.**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 13→ 13

Diagnostic no. 392 (Special event 10)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 392

Description Use this function to change the diagnostic behavior of the diagnostic message **392 Special event 10**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 13→ 13

Diagnostic no. 442 (Freq. output 1 to n)

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

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

Description Use this function to change the diagnostic behavior of the diagnostic message **442 Freq. output 1 to n**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 13→ 13

Diagnostic no. 443 (Pulse output 1 to n)

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

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

Description Use this function to change the diagnostic behavior of the diagnostic message **443 Pulse output 1 to n**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 13→ 13

Diagnostic no. 592 (Special event 11)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 592

Description Use this function to change the diagnostic behavior of the diagnostic message **592 Special event 11**.

Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 13→ 13

Diagnostic no. 992 (Special event 12)

Navigation Expert → System → Diagn. handling → Diagn. behavior → Diagnostic no. 992

Description Use this function to change the diagnostic behavior of the diagnostic message **992 Special event 12**.

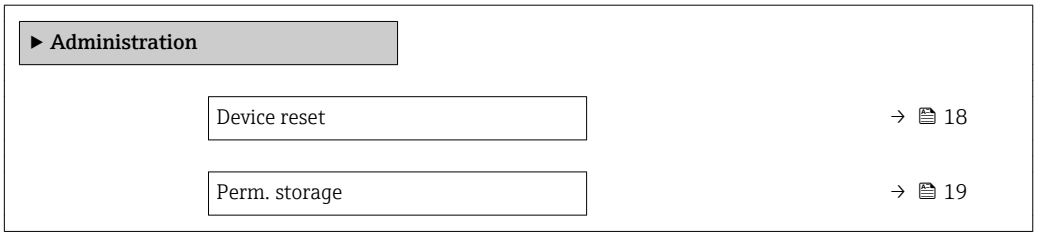
Selection
- Off
- Alarm
- Warning
- Logbook only

Factory setting Warning

Additional information Detailed description of the options available for selection: → 13→ 13

3.1.2 "Administration" submenu

Navigation Expert → System → Administration



Device reset

Navigation Expert → System → Administration → Device reset

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

Selection
- Cancel
- To delivery set.
- Restart device

Factory setting Cancel

Additional information *Selection*

Options	Description
Cancel	No action is executed and the user exits the parameter.
To delivery set.	All the parameters are reset to their factory settings.
Restart device	The restart resets every parameter whose data are in the volatile memory (RAM) to the factory setting (e.g. measured value data). The device configuration remains unchanged.

Perm. storage

Navigation Expert → System → Administration → Perm. storage

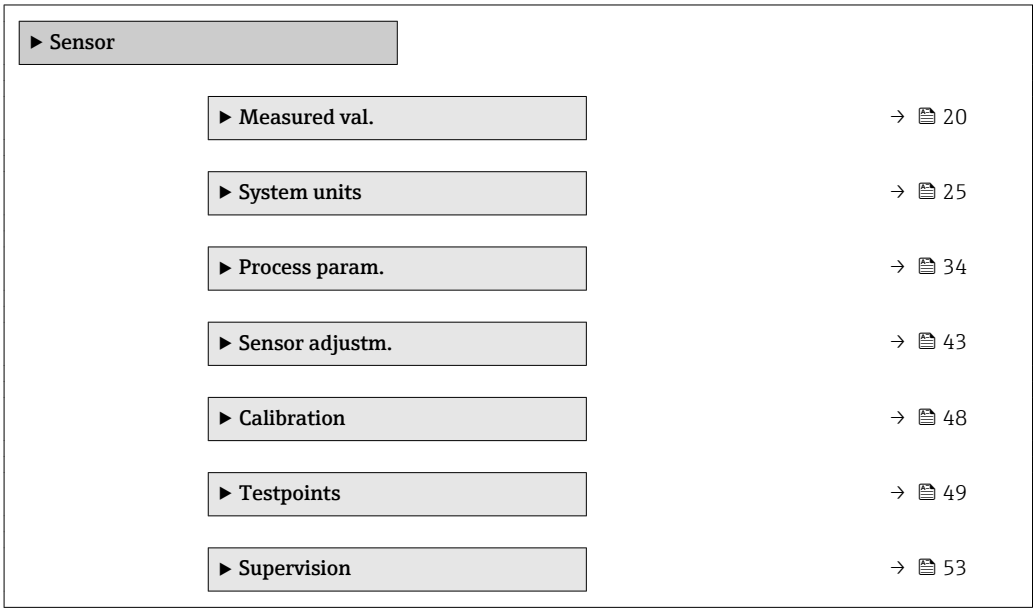
Description Use this function to switch permanent storage on and off.

Selection
- Off
- On

Factory setting On

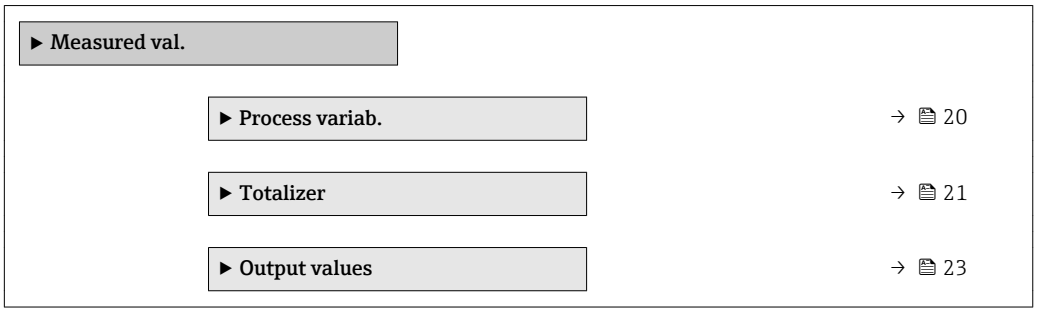
3.2 "Sensor" submenu

Navigation Expert → Sensor



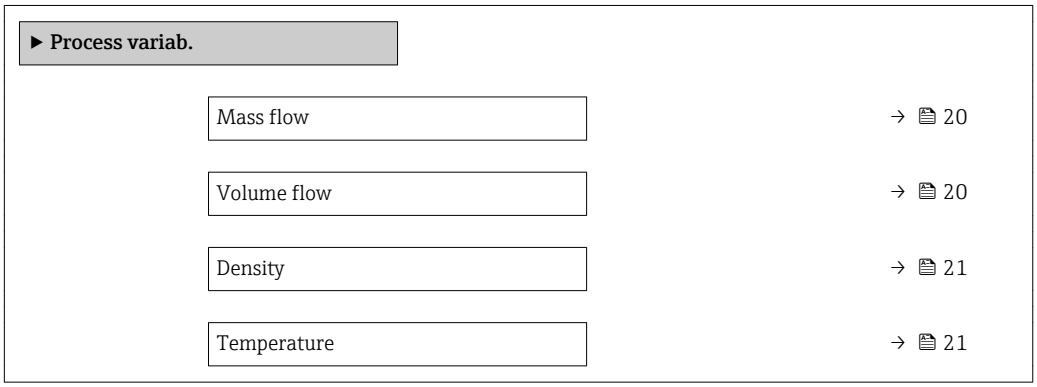
3.2.1 "Measured val." submenu

Navigation Expert → Sensor → Measured val.



"Process variab." submenu

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



Mass flow

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

Description Displays the mass flow that is currently measured.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Mass flow unit** parameter (→ 25)

Volume flow

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

Description Displays the volume flow currently calculated.

User interface Signed floating-point number

Additional information *Description*

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

Dependency

The unit is taken from the **Volume flow unit** parameter (→ 27)

Density

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

Description Displays the density currently measured.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Density unit** parameter (→ 30)

Temperature

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

Description Displays the medium temperature currently measured.

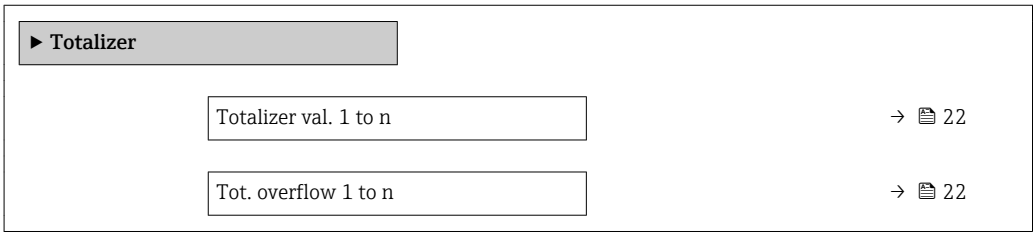
User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 30)

Totalizer

Navigation Expert → Sensor → Measured val. → Totalizer



Totalizer val. 1 to n

Navigation Expert → Sensor → Measured val. → Totalizer → Totalizer val. 1 to n

Prerequisite One of the following options is selected in the **Assign variable** parameter (→ 75) of the **Totalizer 1 to n** submenu:
- Volume flow
- Mass flow

Description Displays the current totalizer reading.

User interface Signed floating-point number

Additional information

Description

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

In the event of an error, the totalizer adopts the mode defined in the **Failure mode** parameter (→ 78).

Display

The value of the process variable totalized since measuring began can be positive or negative. This depends on the settings in the **Operation mode** parameter (→ 76).

The unit of the selected process variable is specified for the totalizer depending on the selection made in the **Assign variable** parameter (→ 75):
- **Volume flow** option: **Volume flow unit** parameter (→ 27)
- **Mass flow** option: **Mass flow unit** parameter (→ 25)

Example

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

Tot. overflow 1 to n

Navigation Expert → Sensor → Measured val. → Totalizer → Tot. overflow 1 to n

Prerequisite One of the following options is selected in the **Assign variable** parameter (→ 75) of the **Totalizer 1 to n** submenu:
- Volume flow
- Mass flow

Description Displays the current totalizer overflow.

User interface Integer with sign

Additional information

Description

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

Display

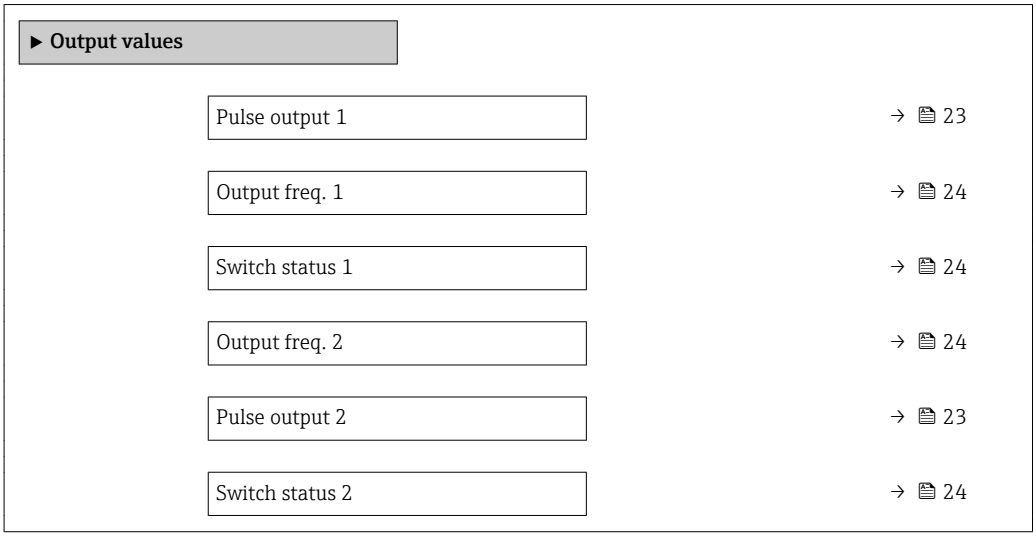
The unit of the selected process variable is specified for the totalizer depending on the selection made in the **Assign variable** parameter (→ 75):
- **Volume flow** option: **Volume flow unit** parameter (→ 27)
- **Mass flow** option: **Mass flow unit** parameter (→ 25)

Example

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

"Output values" submenu

Navigation Expert → Sensor → Measured val. → Output values



Pulse output

Navigation Expert → Sensor → Measured val. → Output values → Pulse output 1 to n

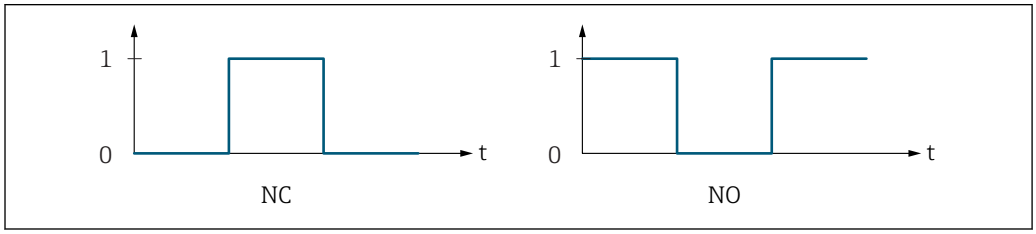
Prerequisite In the **Operating mode** parameter (→ 55), one of the following options is selected:
- Pulse
- Automatic pulse

Description Displays the pulse frequency currently output.

User interface Positive floating-point number

Additional information *Description*

- The pulse output is an open emitter output.
- This is configured at the factory in such a way that the transistor is conductive for the duration of the pulse (NO contact) and is safety-oriented.
- The **Value per pulse** parameter (→ 59) and **Pulse width** parameter (→ 59) (Operating mode (→ 55) Pulse) can be used to define the value (i.e. the measured value amount that corresponds to a pulse) and the duration of the pulse.



0 Non-conductive
1 Conductive
NC Normally closed
NO Normally opened

The output behavior can be reversed via the **Invert outp.sig.** parameter (→ 73) i.e. the transistor does not conduct for the duration of the pulse.

In addition, the behavior of the output in the event of an error (**Failure mode** parameter (→ 61)) can be configured.

The duration of the pulses must be defined as a function of the input card used. The pulse(s) must not exceed the maximum input frequency of the counter card.

Output freq.

Navigation Expert → Sensor → Measured val. → Output values → Output freq. 1 to n

Prerequisite In the **Operating mode** parameter (→ 55), the **Frequency** option is selected.

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

User interface 0.0 to 10 000.0 Hz

Switch status

Navigation Expert → Sensor → Measured val. → Output values → Switch status 1 to n

Prerequisite In the **Operating mode** parameter (→ 55), the **Switch** option is selected.

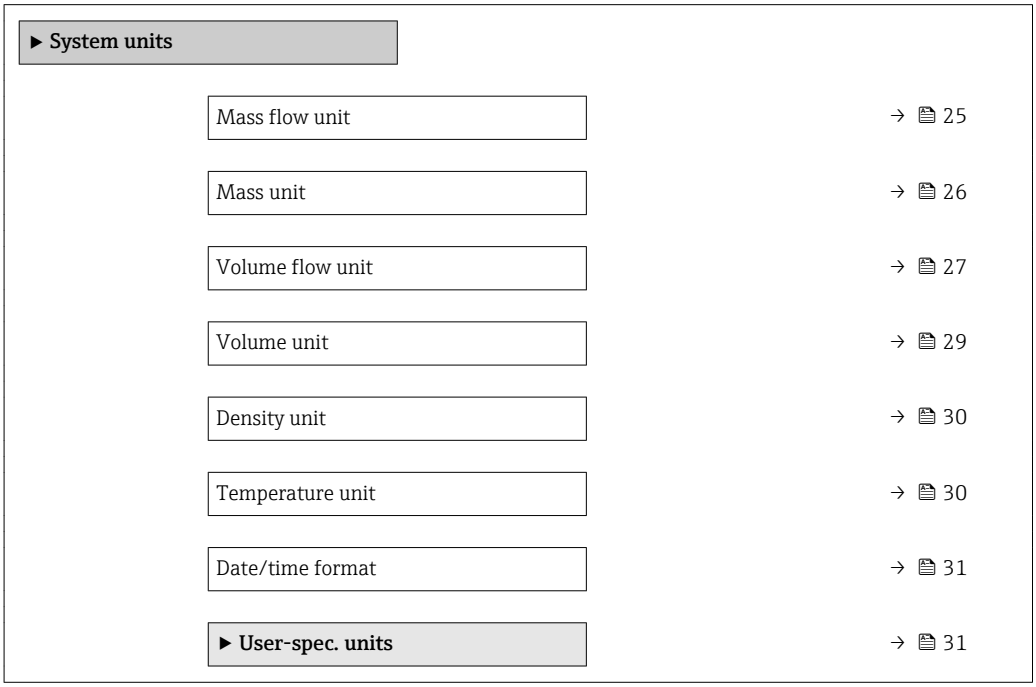
Description Displays the current switch status of the status output.

User interface

- Open
- Closed

3.2.2 "System units" submenu

Navigation Expert → Sensor → System units



Mass flow unit

Navigation Expert → Sensor → System units → Mass flow unit

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

Selection

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

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

Custom-specific units
- User mass/s
- User mass/min
- User mass/h
- User mass/d

Factory setting

Country-specific:
- g/s
- oz/s

Additional information

Result

The selected unit applies for:
- **RawMassFlow** parameter (→ 🖹 53)
- **Mass flow** parameter (→ 🖹 20)

Selection

For an explanation of the abbreviated units: → 🖹 97

Customer-specific units

The unit for the customer-specific mass is specified in the **Mass text** parameter (→ 🖹 32).

Mass unit

Navigation

Expert → Sensor → System units → Mass unit

Description

Use this function to select the unit for the mass.

Selection

SI units
- g
- kg
- t

US units
- oz
- lb
- STon

Custom-specific units

User mass

Factory setting

Country-specific:
- kg
- lb

Factory setting

Country-specific:
- g
- oz

Additional information

Selection

For an explanation of the abbreviated units: → 97

Customer-specific units

The unit for the customer-specific mass is specified in the **Mass text** parameter (→ 32).

Volume flow unit

Navigation

Expert → Sensor → System units → Volume flow unit

Description

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

Selection

SI units
- cm^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)
- kgal/s (us)
- kgal/min (us)
- kgal/h (us)
- kgal/d (us)
- Mgal/s (us)
- Mgal/min (us)
- Mgal/h (us)
- Mgal/d (us)
- bbl/s (us;liq.)
- bbl/min (us;liq.)
- bbl/h (us;liq.)
- bbl/d (us;liq.)
- bbl/s (us;beer)
- bbl/min (us;beer)
- bbl/h (us;beer)
- bbl/d (us;beer)
- bbl/s (us;oil)
- bbl/min (us;oil)
- bbl/h (us;oil)
- bbl/d (us;oil)
- bbl/s (us;tank)
- bbl/min (us;tank)
- bbl/h (us;tank)
- bbl/d (us;tank)

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

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

Factory setting

Country-specific:
- ml/s
- fl oz/s (us)

Additional information

Result

The selected unit applies for:
Volume flow parameter (→ 20)

Selection

For an explanation of the abbreviated units: → 97

Customer-specific units

The unit for the customer-specific volume is specified in the **Volume text** parameter (→ 33).

Volume unit

Navigation Expert → Sensor → System units → Volume unit

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

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)

Custom-specific units
User vol.

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

Factory setting Country-specific:
- ml
- fl oz (us)

Additional information

Selection

For an explanation of the abbreviated units: → 97

Customer-specific units

The unit for the customer-specific volume is specified in the **Volume text** parameter (→ 33).

Density unit

Navigation Expert → Sensor → System units → Density unit

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

Selection

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

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

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

Custom-specific units
User dens.

Factory setting Country-specific:
- kg/l
- g/cm³

Additional information

Result

The selected unit applies for:
Density parameter (→ 21)

Selection

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

For an explanation of the abbreviated units: → 97

Customer-specific units

The unit for the customer-specific density is specified in the **Density text** parameter (→ 33).

Temperature unit

Navigation Expert → Sensor → System units → Temperature unit

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

Selection

SI units
- °C
- K

US units
- °F
- °R

Factory setting

Country-specific:
- °C
- °F

Additional information

Result

The selected unit applies for:
- **Maximum value** parameter (→ 92)
- **Minimum value** parameter (→ 92)
- **Temperature** parameter (→ 21)

Selection

For an explanation of the abbreviated units: → 97

Date/time format

Navigation

Expert → Sensor → System units → Date/time format

Description

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

Selection

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

Factory setting

dd.mm.yy hh:mm

Additional information

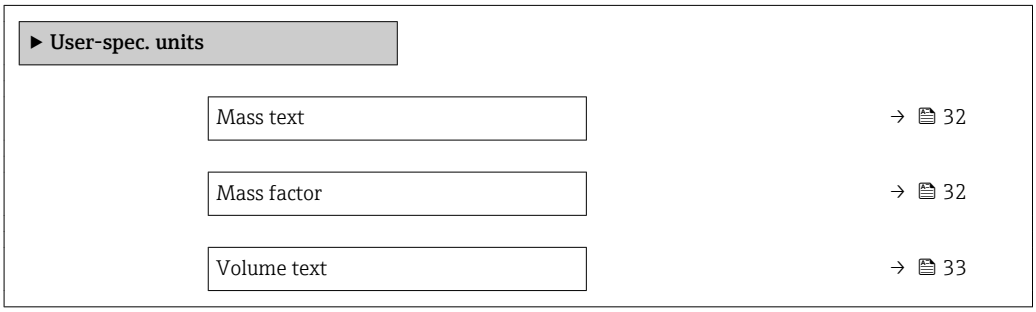
Selection

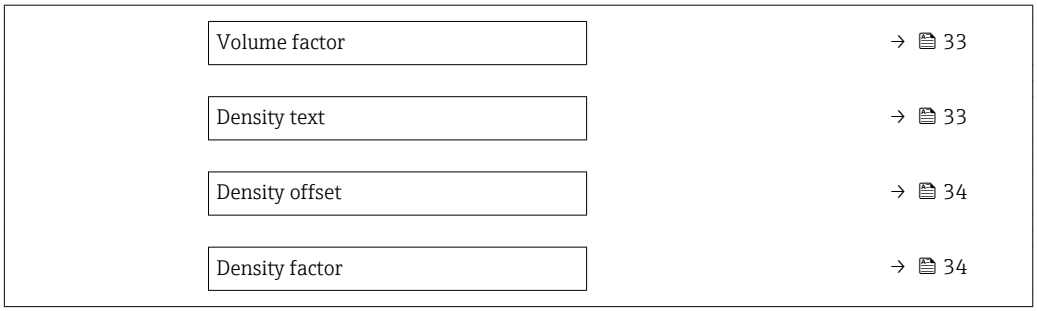
For an explanation of the abbreviated units: → 97

"User-spec. units" submenu

Navigation

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





Mass text

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

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

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

Factory setting User mass

Additional information *Result*

The defined unit is shown as an option in the choose list of the following parameters:
- **Mass flow unit** parameter (→ 25)
- **Mass unit** parameter (→ 26)

Example

If the text CENT for "centner" is entered, the following options are displayed in the picklist for the **Mass flow unit** parameter (→ 25):
- CENT/s
- CENT/min
- CENT/h
- CENT/d

Mass factor

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

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

User entry Signed floating-point number

Factory setting 1.0

Additional information *Example*

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

Volume text

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

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

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

Factory setting User vol.

Additional information *Result*

The defined unit is shown as an option in the choose list of the following parameters:
- **Volume flow unit** parameter (→ 27)
- **Volume unit** parameter (→ 29)

Example

If the text GLAS is entered, the choose list of the **Volume flow unit** parameter (→ 27) shows the following options:
- GLAS/s
- GLAS/min
- GLAS/h
- GLAS/d

Volume factor

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

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

User entry Signed floating-point number

Factory setting 1.0

Density text

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

Description Use this function to enter a text or the user-specific unit of density.

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

Factory setting User dens.

Additional information *Result*

The defined unit is shown as an option in the choose list of the **Density unit** parameter (→ 30).

Example

Enter text “CE_L” for centners per liter

Density offset

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

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

Value in user-specific unit = (factor × value in kg/m³) + offset

User entry Signed floating-point number

Factory setting 0

Density factor

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

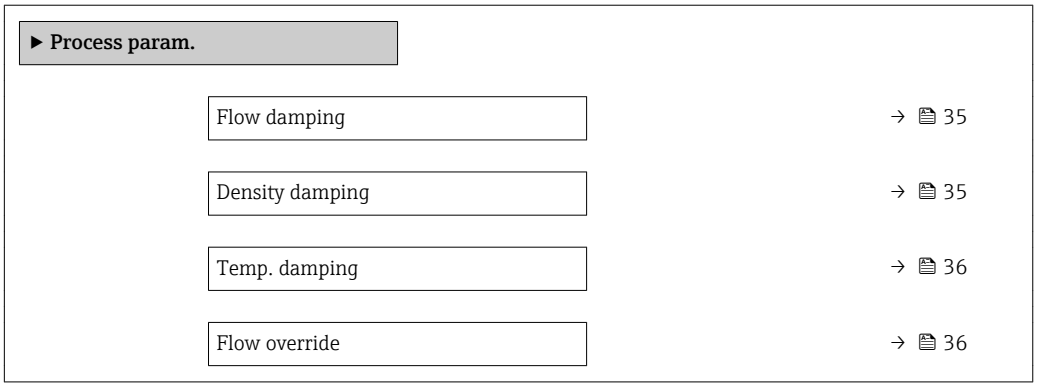
Description Use this function to enter a quantity factor for the user-specific density unit.

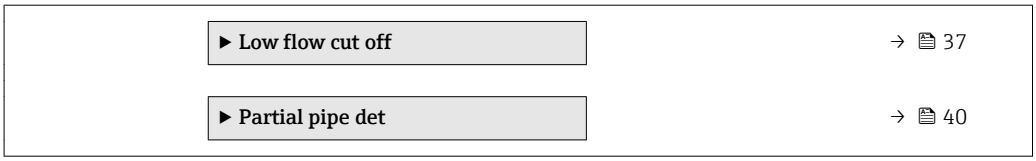
User entry Signed floating-point number

Factory setting 1.0

3.2.3 "Process param." submenu

Navigation Expert → Sensor → Process param.





Flow damping

Navigation Expert → Sensor → Process param. → Flow damping

Description Use this function to enter a time constant for flow damping (PT1 element). Reduction of the variability of the flow measured value (in relation to interference). For this purpose, the depth of the flow filter is adjusted: when the filter setting increases, the reaction time of the device also increases.

User entry 0 to 100.0 s

Factory setting 0 s

Additional information

Description

- The damping is performed by a PT1 element [1].
- Flow damping is not recommended (entry 0 s) for very short batches with a batch time t_{fill} < 5 s.

User entry

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

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

Result

The damping affects the following variables of the device:
- Outputs → 54
- Low flow cut off → 37
- Totalizer → 74

Density damping

Navigation Expert → Sensor → Process param. → Density damping

Description Use this function to enter a time constant for the damping (PT1 element) of the density measured value.

User entry 0 to 999.9 s

Factory setting 0 s

1) Proportional behavior with first-order lag

Additional information

Description

The damping is performed by a PT1 element [2].

Density damping is not relevant for most applications.

User entry

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

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

Temp. damping

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

Description Use this function to enter a time constant for the damping (PT1 element) of the temperature measured value.

User entry 0 to 999.9 s

Factory setting 0 s

Additional information

Description

The damping is performed by a PT1 element [3].

Temperature damping is not relevant for most applications.

User entry

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

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

Flow override

Navigation Expert → Sensor → Process param. → Flow override

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

Selection

- Off
- On

Factory setting Off

2) Proportional behavior with first-order lag
3) Proportional behavior with first-order lag

Additional information

Result

This setting affects all the functions of the measuring device.

Positive zero return is not relevant for most applications.

Description

The mass flow and therefore also the volume flow are set to **0**.

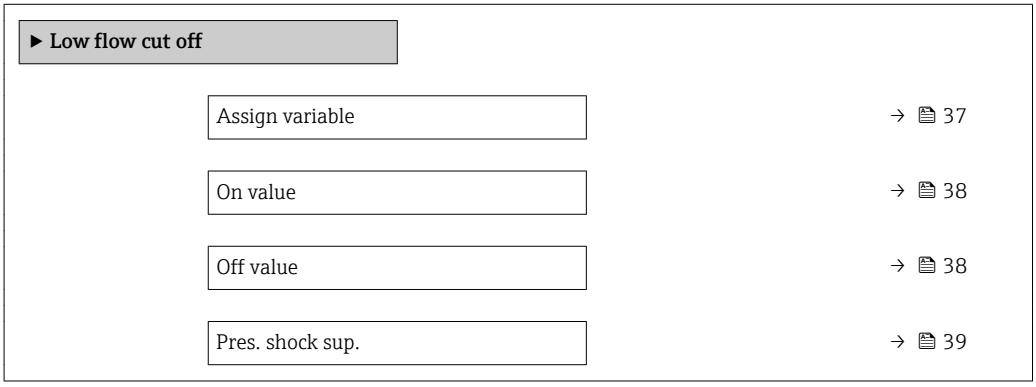
Flow override is active
- The diagnostic message diagnostic message ⚠**C453 Flow override** is displayed.
- Output values
  - Output: 0
  - Temperature: continues to be output
  - Totalizers 1-3: stop being totalized

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

"Low flow cut off" submenu

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



Assign variable

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

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

Selection
- Off
- Mass flow
- Volume flow

Factory setting Mass flow

Additional information *Description*

As soon as low flow cut off is activated, the mass flow and volume flow are forced to adopt the value 0, regardless of the option selected.

On value

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

Prerequisite A process variable is selected in the **Assign variable** parameter (→ 37).

Description Use this function to enter a switch-on value for low flow cut off. Low flow cut off is activated if the value entered is not equal to 0 → 38.

User entry Positive floating-point number

Factory setting For liquids: depends on country and nominal diameter → 95

Additional information *Dependency*

The unit depends on the process variable selected in the **Assign variable** parameter (→ 37).

Off value

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

Prerequisite A process variable is selected in the **Assign variable** parameter (→ 37).

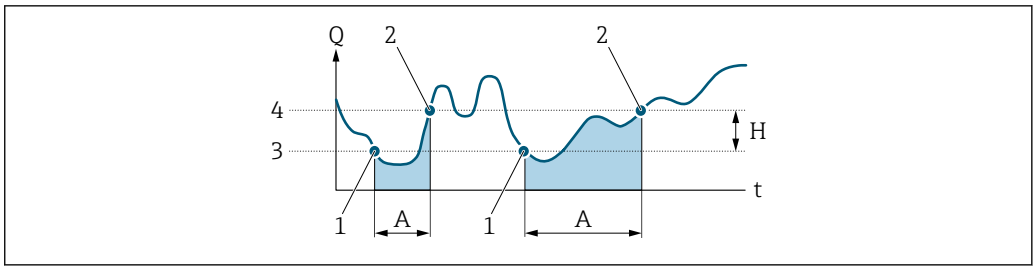
Description Use this function to enter a switch-off value for low flow cut off. The off value is entered as a positive hysteresis from the on value→ 38.

User entry 0 to 100.0 %

Factory setting 50 %

Additional information *Example*

- **On value** parameter (→ 38): 2 g/s
- **Off value** parameter (→ 38): 50 %
- Switch-off value: 3 g/s



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

Pres. shock sup.

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

Prerequisite A process variable is selected in the **Assign variable** parameter (→ 37).

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

User entry 0 to 100 s

Factory setting 0 s

Additional information

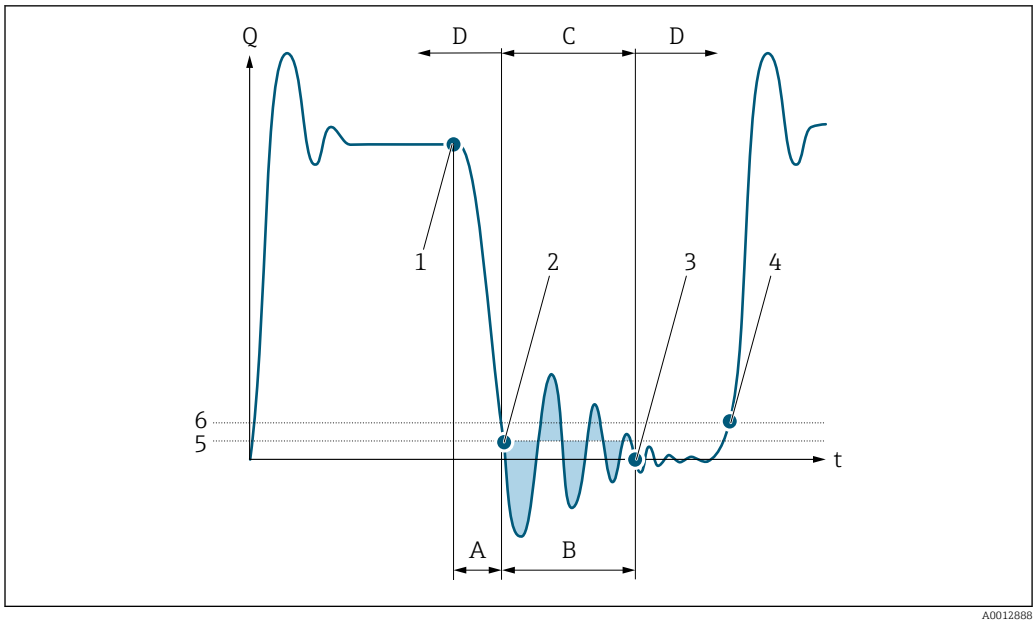
Description

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

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

Example

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



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

"Partial pipe det" submenu

Using density measurement, the measuring device can monitor whether the measuring pipe is empty or only partially filled. Therefore partially filled pipe monitoring is an important function for many applications.

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

▶ Partial pipe det	
Assign variable	→ 41
Low value	→ 41
High value	→ 41
Response time	→ 42
Max. damping	→ 42

Assign variable

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

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

Selection
- Off
- Density

Factory setting Off

Low value

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

Prerequisite A process variable is selected in the **Assign variable** parameter (→ 41).

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

User entry Signed floating-point number

Factory setting Country-specific:
- 200 kg/m³
- 12.5 lb/ft³

Additional information

User entry

The lower limit value must be less than the upper limit value defined in the **High value** parameter (→ 41).

The unit depends on the process variable selected in the **Assign variable** parameter (→ 41).

Limit value

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

High value

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

Prerequisite A process variable is selected in the **Assign variable** parameter (→ 41).

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

User entry Signed floating-point number

Factory setting

Country-specific:
- 6 000 kg/m³
- 374.6 lb/ft³

Additional information

Description

Not relevant to most applications.

User entry

The upper limit value must be greater than the lower limit value defined in the **Low value** parameter (→ 41).

The unit depends on the process variable selected in the **Assign variable** parameter (→ 41).

Limit value

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

Response time

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

Prerequisite A process variable is selected in the **Assign variable** parameter (→ 41).

Description Use this function to enter the minimum length of time (debouncing time) the signal must be present for the diagnostic message ⚠**S862 Partly filled** to be triggered if the measuring pipe is empty or partially full.

User entry 0 to 100 s

Factory setting 1 s

Max. damping

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

Prerequisite In the **Assign variable** parameter (→ 41), the **Density** option is selected.

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

User entry Positive floating-point number

Factory setting 0

Additional information

Description

If oscillation damping exceeds the specified value, the measuring device presumes that the pipe is partially filled and the flow signal is set to **0**. The measuring device displays the

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

Not relevant to most applications.

User entry

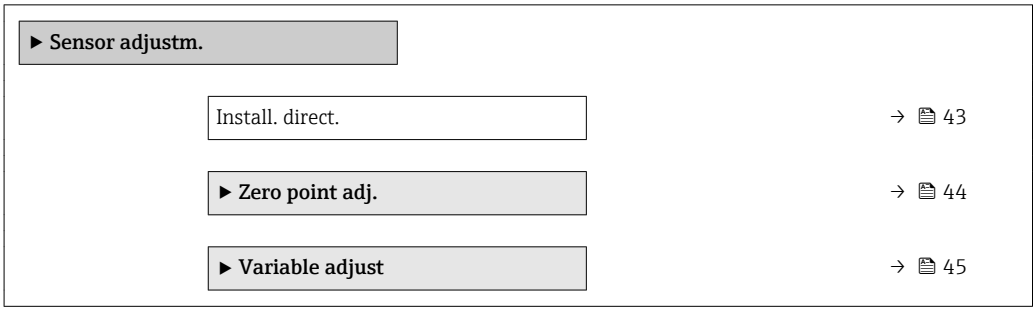
- Damping is disabled if **0** is entered (factory setting).
- Damping is enabled if the value entered is greater than **0**.
- The value entered depends on application-specific influence variables, such as the medium, nominal diameter, sensor etc.

Example

- If the pipe is filled normally the value of the oscillation damping is 500.
- If the pipe is partially filled the value of the oscillation damping is > 5000.
- A practical damping value would then be 2000: enter 2000 as the value.

3.2.4 "Sensor adjustm." submenu

Navigation Expert → Sensor → Sensor adjustm.



Install. direct.

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

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

Selection
- In arrow direct.
- Against arrow

Factory setting In arrow direct.

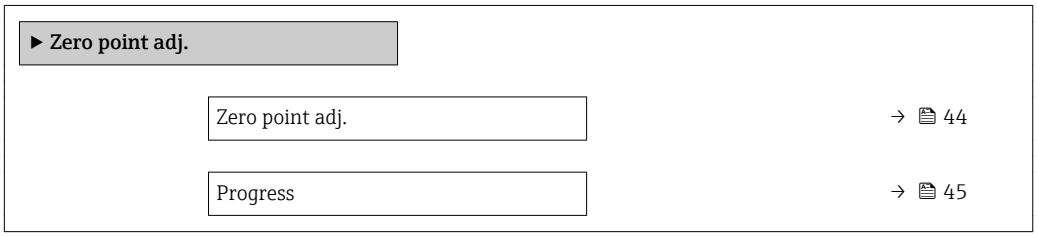
Additional information *Description*

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

"Zero point adj." submenu

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

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



Zero point adj.

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

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

Observe conditions → 44.

Selection
- Cancel
- Busy
- Zero adjust fail
- Start

Factory setting Cancel

Additional information *Description*

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

Progress

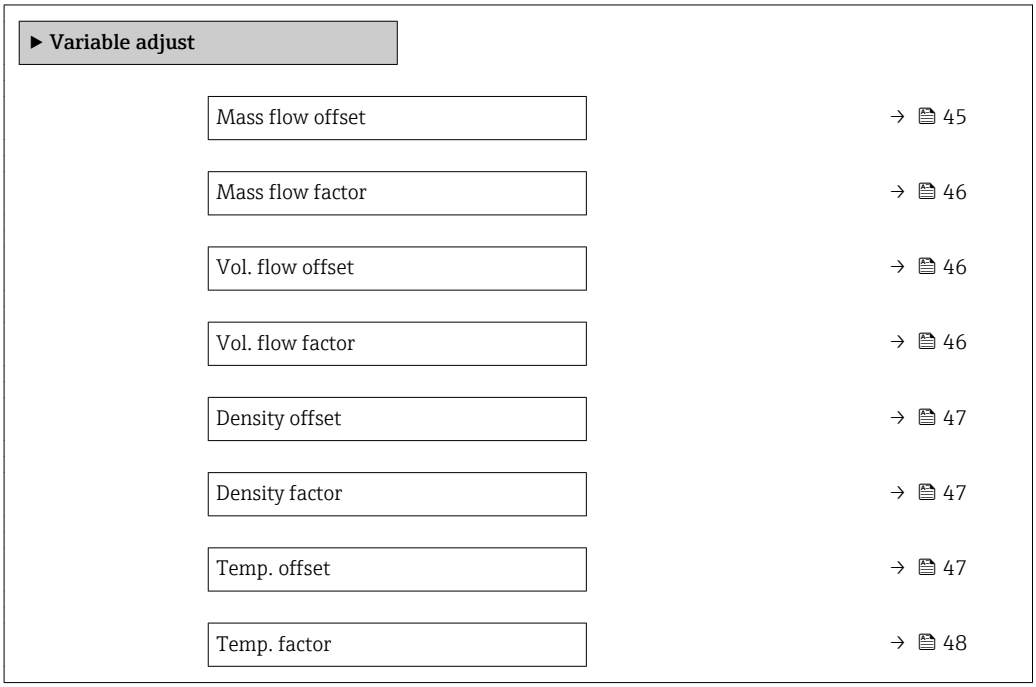
Navigation Expert → Sensor → Sensor adjustm. → Zero point adj. → Progress

Description The progress of the process is indicated.

User interface 0 to 100 %

"Variable adjust" submenu

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust



Mass flow offset

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

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

User entry Signed floating-point number

Factory setting 0 kg/s

Additional information *Description*

Corrected value = (factor × value) + offset

Mass flow factor

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

Description Use this function to enter a quantity factor for the mass flow. This multiplication factor is applied over the mass flow range.

User entry Positive floating-point number

Factory setting 1

Additional information *Description*

Corrected value = (factor × value) + offset

Vol. flow offset

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

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

User entry Signed floating-point number

Factory setting 0 m^3/s

Additional information *Description*

Corrected value = (factor × value) + offset

Vol. flow factor

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Vol. flow factor

Description Use this function to enter a quantity factor for the volume flow. This multiplication factor is applied over the volume flow range.

User entry Positive floating-point number

Factory setting 1

Additional information *Description*

Corrected value = (factor × value) + offset

Density offset

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Density offset

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

User entry Signed floating-point number

Factory setting 0 kg/m³

Additional information *Description*

Corrected value = (factor × value) + offset

Density factor

Navigation Expert → Sensor → Sensor adjustm. → Variable adjust → Density factor

Description Use this function to enter a quantity factor for the density. This multiplication factor is applied over the density range.

User entry Positive floating-point number

Factory setting 1

Additional information *Description*

Corrected value = (factor × value) + offset

Temp. offset

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

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

User entry Signed floating-point number

Factory setting 0 K

Additional information *Description*

Corrected value = (factor × value) + offset

Temp. factor

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

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

User entry Positive floating-point number

Factory setting 1

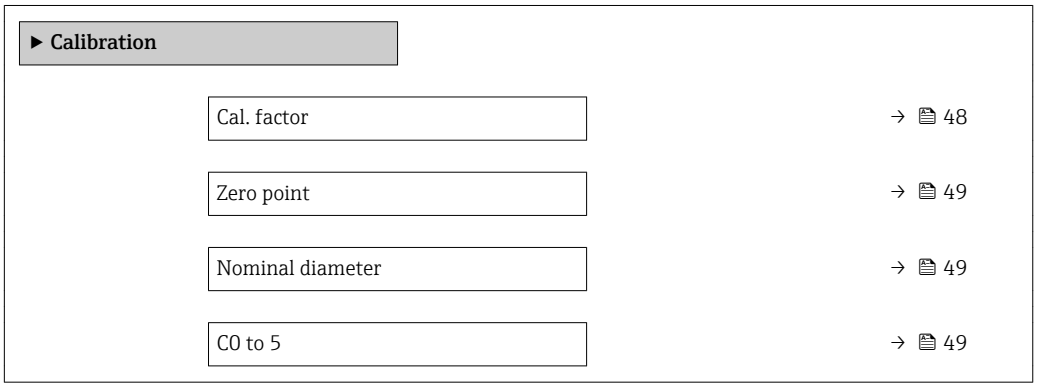
Additional information *Description*

Corrected value = (factor × value) + offset

3.2.5 "Calibration" submenu

- The Cal. factor (→ 48) and the Zero point (→ 49) display the values that were determined during the factory calibration of the mass flow.
- C0 to 5 (→ 49) displays the values that were determined during the factory calibration of the density.
- The volume flow is calculated using the mass flow and the density.

Navigation Expert → Sensor → Calibration



Cal. factor

Navigation Expert → Sensor → Calibration → Cal. factor

Description Displays the current calibration factor for the sensor.

User interface Signed floating-point number

Factory setting Depends on nominal diameter and calibration.

Zero point

Navigation Expert → Sensor → Calibration → Zero point

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

User entry Signed floating-point number

Factory setting Depends on nominal diameter and calibration.

Nominal diameter

Navigation Expert → Sensor → Calibration → Nominal diameter

Description Displays the nominal diameter of the sensor.

User interface DNxx / x"

Factory setting Depends on the size of the sensor

Additional information *Description*

The value is also specified on the sensor nameplate.

C0 to 5

Navigation Expert → Sensor → Calibration → C0 to 5

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

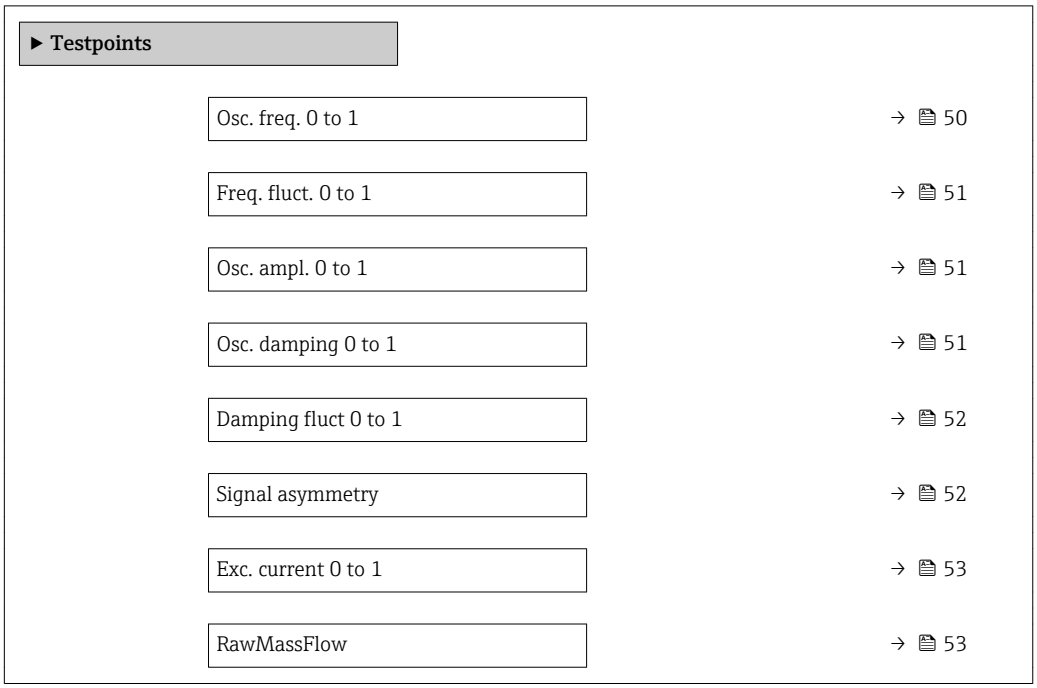
User interface Signed floating-point number

Factory setting 0

3.2.6 "Testpoints" submenu

- The **Testpoints** submenu (→ 49) is used to test the measuring device or the application.
- The parameters can only be accessed via CDI interface or Modbus.

Navigation Expert → Sensor → Testpoints



Osc. freq. 0 to 1

Navigation Expert → Sensor → Testpoints → Osc. freq. 0 to 1

Prerequisite The values for this parameter are defined for the Promass I and Promass Q product versions.

Description Displays the current oscillation frequency.

User interface Positive floating point number

Additional information *Typical values*

The resonance frequency values indicated below are typical values and only serve as a guide.

DN		f_{Air}	f_{Water}
[mm]	[in]	[Hz]	[Hz]
8	$^3/_8$	569	515
15	½	687	594
25	1	825	697

Checking the sensor

1. Fill the measuring tube with water (at ambient temperature and a pressure of 15 psi).
2. Compare the current measured value with the values on the calibration report.
   ↳ A deviation of ±0.5 Hz is not typical and can indicate deposit buildup in the measuring tube, corrosion or abrasion.

Freq. fluct. 0 to 1

Navigation Expert → Sensor → Testpoints → Freq. fluct. 0 to 1

Prerequisite The values for this parameter are defined for the Promass I and Promass Q product versions.

Description Displays the current frequency fluctuation.

User interface Signed floating-point number

Additional information *Typical values*

- Low fluctuation < 0.001: homogeneous medium
- High fluctuation > 0.1: inhomogeneous medium

Osc. ampl. 0 to 1

Navigation Expert → Sensor → Testpoints → Osc. ampl. 0 to 1

Prerequisite The values for this parameter are defined for the Promass I and Promass Q product versions.

Description Displays the relative oscillation amplitude of the sensor in relation to the optimum value.

User interface Signed floating-point number

Additional information *Description*

This value is 100 %under optimum conditions. The value can fall in the case of complex media (two-phase, high viscosity or high gas velocity).

This value can be very low under extreme conditions. If the value is halved, the repeatability rate is twice as bad.

Limit values

5 %

Osc. damping 0 to 1

Navigation Expert → Sensor → Testpoints → Osc. damping 0 to 1

Prerequisite The values for this parameter are defined for the Promass I and Promass Q product versions.

Description Displays the current oscillation damping.

User interface Positive floating-point number

Additional information

Description

Oscillation damping is an indicator of the sensor's current need for excitation current. Oscillation damping is the ratio between the excitation current and the absolute oscillation amplitude.

Example

0.002 A/12.5 µm = 160 A/m

Typical values

- Low oscillation damping < 500 A/m: homogeneous medium
- High oscillation damping > 1 000 A/m: inhomogeneous medium

Damping fluct 0 to 1

Navigation Expert → Sensor → Testpoints → Damping fluct 0 to 1

Prerequisite The values for this parameter are defined for the Promass I and Promass Q product versions.

Description Displays the current fluctuation of tube damping.

User interface Signed floating-point number

Additional information

Typical values

- Low fluctuation < 1: homogeneous medium
- High fluctuation > 10: inhomogeneous medium

Signal asymmetry

Navigation Expert → Sensor → Testpoints → Signal asymmetry

Description Displays the relative difference between the oscillation amplitude measured at the inlet and outlet of the sensor.

User interface Signed floating-point number

Additional information

Description

The measured value is the result of production tolerances of the sensor coils and should remain constant over the life time of a sensor.

Typical value

- ±10 %
- A change > ±10 % can indicate deposit buildup in the measuring tubes, corrosion or abrasion.

Exc. current 0 to 1

Navigation Expert → Sensor → Testpoints → Exc. current 0 to 1

Prerequisite The values for this parameter are defined for the Promass I and Promass Q product versions.

Description Displays the effective excitation current.

User interface Signed floating-point number

Additional information **NOTICE!**

The maximum available excitation current has been reached when the oscillation amplitude shown is less than 100 %.

Typical values

- Low excitation current < 5 mA: homogeneous medium
- High excitation current of 25 mA: inhomogeneous medium

RawMassFlow

Navigation Expert → Sensor → Testpoints → RawMassFlow

Description Displays the unprocessed mass flow (contains all sensor corrections etc.).

User interface Signed floating-point number

Additional information *Description*

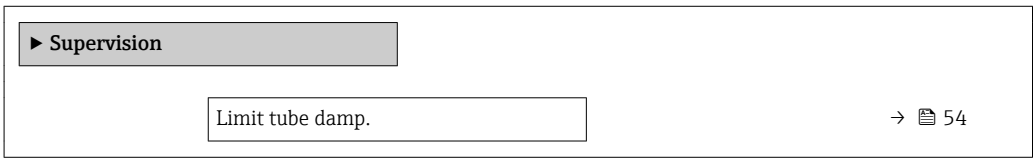
Displays the mass flow value before offset and factor correction, damping, low flow cut off and monitoring of a partially filled pipe. This value can be used to check the current zero point, similar to the zero point adjustment function.

Dependency

The unit is taken from the **Mass flow unit** parameter (→ 25)

3.2.7 "Supervision" submenu

Navigation Expert → Sensor → Supervision



Limit tube damp.

Navigation Expert → Sensor → Supervision → Limit tube damp.

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

User entry Positive floating-point number

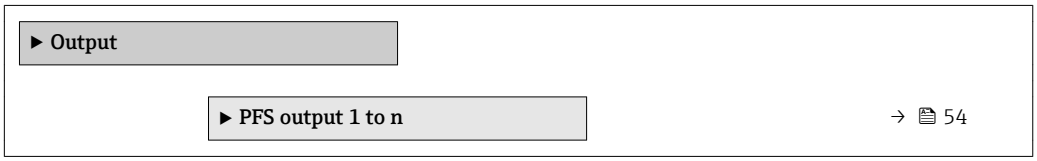
Factory setting Positive floating-point number

Additional information *Limit value*

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

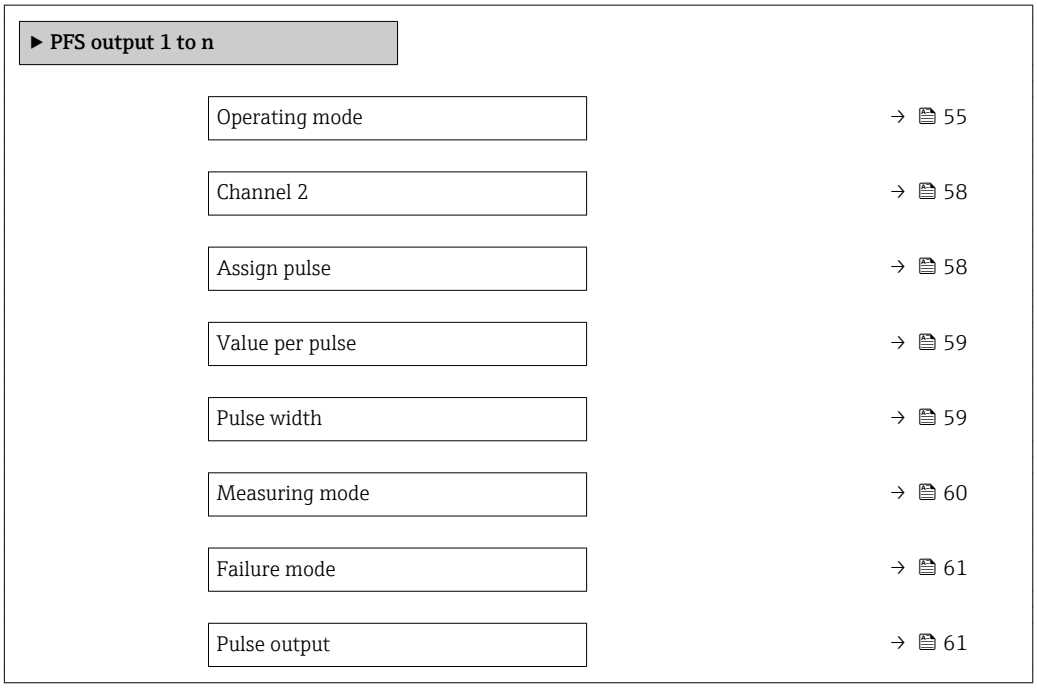
3.3 "Output" submenu

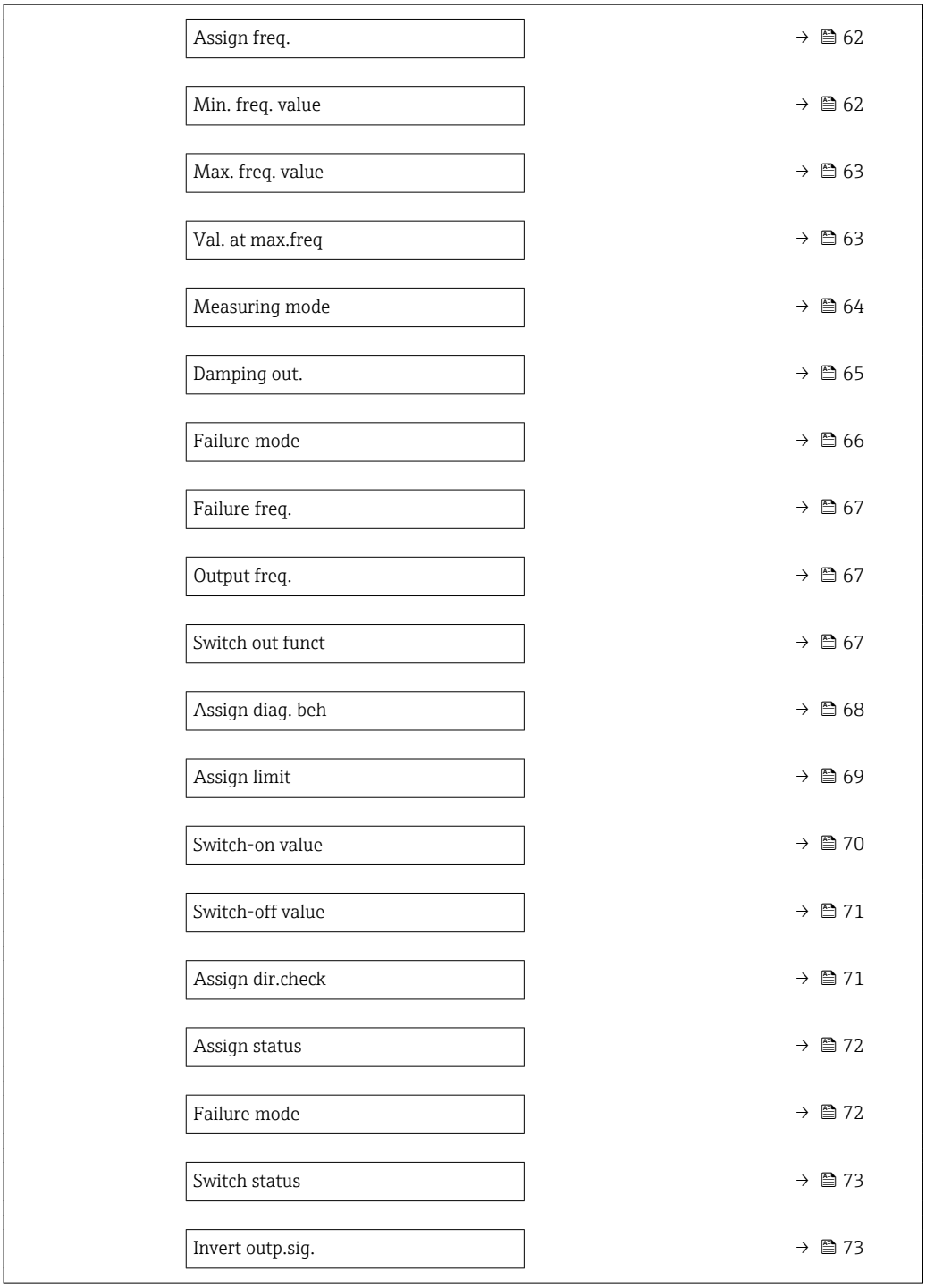
Navigation Expert → Output



3.3.1 "PFS output 1 to n" submenu

Navigation Expert → Output → PFS output 1 to n





Operating mode

Navigation Expert → Output → PFS output 1 to n → Operating mode

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

Selection

- Off
- Pulse
- Automatic pulse
- Frequency
- Switch

Factory setting

- Pulse/freq./switch output 1: **Pulse** option
- Pulse/freq./switch output 2: **Switch** option

Additional information

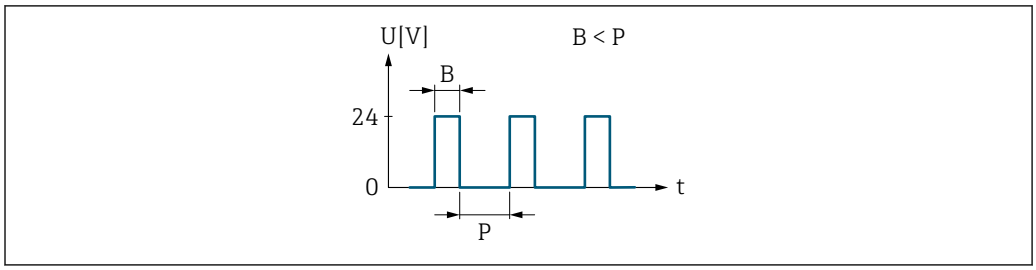
"Off" option

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 with 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



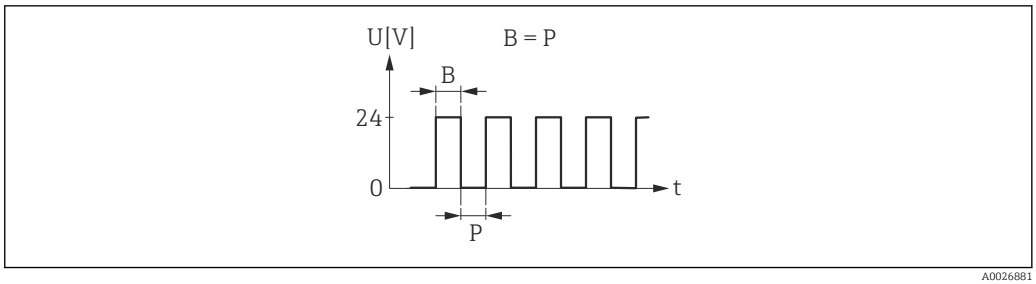
2 *Quantity-proportional pulse (pulse value) with pulse width to be configured*

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 with 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



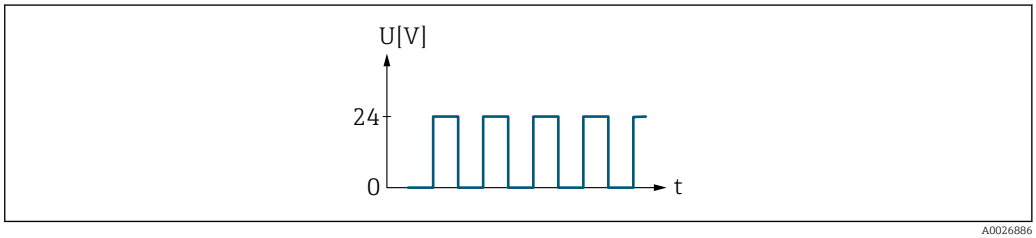
3 *Quantity-proportional pulse (pulse value) with automatic pulse width*

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

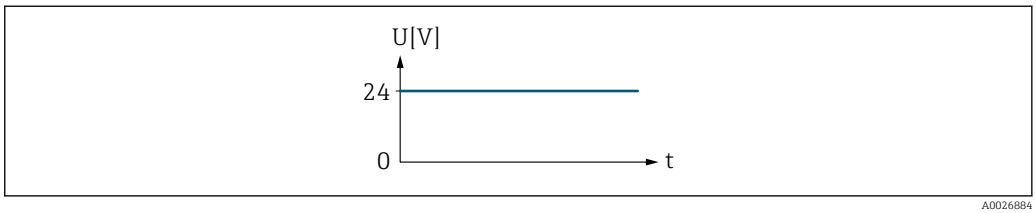


4 *Flow-proportional frequency output*

"Switch" option

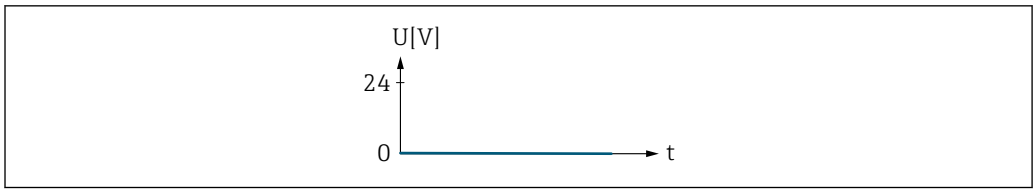
Contact for displaying a condition (e.g. alarm or warning if a limit value is reached)

Example
Alarm response without alarm



5 *No alarm, high level*

Example
Alarm response in case of alarm



6 Alarm, low level

Channel 2

Navigation Expert → Output → PFS output 1 to n → Channel 2

Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 55).

Description Use this function to output a redundant pulse with or without a time delay With this setting, switch output 2 can be used as a redundant output. This is used primarily in metrological applications.

Selection
- Off
- Redundant 0°
- Redundant 90°
- Redundant 180°

Factory setting Off

Additional information *Options*
- Off
  Pulse output 2 is not used.
- Redundant 0°
  Redundant pulses are output without a time delay.
- Redundant 90°
  Redundant pulses are output with a time delay of half a pulse width.
- Redundant 180°
  Redundant pulses are output with a time delay of a full pulse width.

Assign pulse

Navigation Expert → Output → PFS output 1 to n → Assign pulse

Prerequisite One of the following options is selected in the **Operating mode** parameter (→ 55):
- Pulse
- Automatic pulse

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

Selection
- Off
- Mass flow
- Volume flow

Factory setting Off

Value per pulse

Navigation Expert → Output → PFS output 1 to n → Value per pulse

Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 55) and a process variable is selected in the **Assign pulse** parameter (→ 58).

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

User entry Signed floating-point number

Factory setting Depends on country and nominal diameter→ 95

Additional information *User entry*

Weighting of the pulse output with a quantity.

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

Pulse width

Navigation Expert → Output → PFS output 1 to n → Pulse width

Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 55) and a process variable is selected in the **Assign pulse** parameter (→ 58).

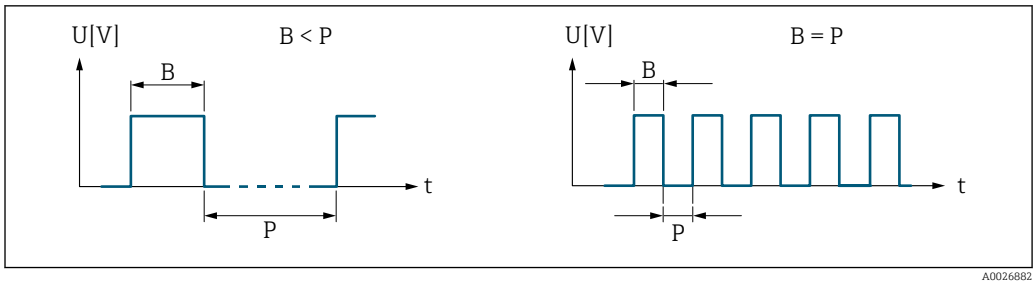
Description Use this function to enter the duration of the output pulse.

User entry 0.05 to 3.75 ms

Factory setting 0.05 ms

Additional information *Description*

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



B Pulse width entered
P Pauses between the individual pulses

Example

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

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

Measuring mode

Navigation Expert → Output → PFS output 1 to n → Measuring mode

Prerequisite

In the **Operating mode** parameter (→ 55), one of the following options is selected:
- Pulse
- Automatic pulse

In the **Assign pulse** parameter (→ 58), one of the following options is selected:
- Mass flow
- Volume flow

Description

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

Selection

- Forward flow
- Forward/Reverse
- Reverse flow

Factory setting

Forward flow

Additional information

Selection

- Forward flow
  Positive flow is output, negative flow is not output.
- Forward/Reverse
  Positive and negative flow are output (absolute value), but a distinction is not made between positive and negative flow.
- Reverse flow
  Negative flow is output, positive flow is not output.

For a detailed description of the options available, see the **Measuring mode** parameter (→ 64)

Failure mode

Navigation Expert → Output → PFS output 1 to n → Failure mode

Prerequisite The **Pulse** option is selected in the **Operating mode** parameter (→ 55) and a process variable is selected in the **Assign pulse** parameter (→ 58).

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

Selection
- Actual value
- No pulses

Factory setting Actual value

Additional information *Description*

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

Selection

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

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

Pulse output

Navigation Expert → Output → PFS output 1 to n → Pulse output 1 to n

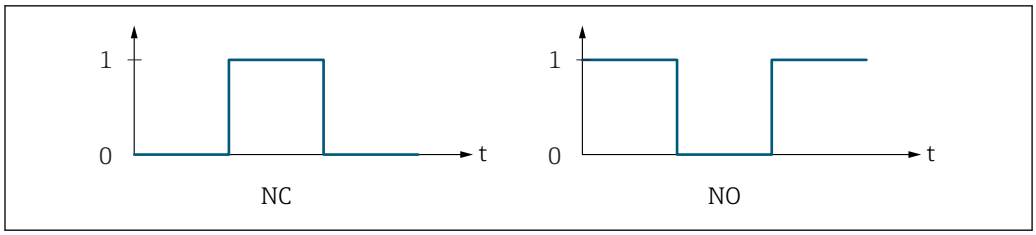
Prerequisite In the **Operating mode** parameter (→ 55), one of the following options is selected:
- Pulse
- Automatic pulse

Description Displays the pulse frequency currently output.

User interface Positive floating-point number

Additional information *Description*

- The pulse output is an open emitter output.
- This is configured at the factory in such a way that the transistor is conductive for the duration of the pulse (NO contact) and is safety-oriented.
- The **Value per pulse** parameter (→ 59) and **Pulse width** parameter (→ 59) (Operating mode (→ 55) Pulse) can be used to define the value (i.e. the measured value amount that corresponds to a pulse) and the duration of the pulse.



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

The output behavior can be reversed via the **Invert outp.sig.** parameter (→ 🖹 73) i.e. the transistor does not conduct for the duration of the pulse.

In addition, the behavior of the output in the event of a device alarm (**Failure mode** parameter (→ 🖹 61)) can be configured.

The duration of the pulses must be defined as a function of the input card used. The pulse(s) must not exceed the maximum input frequency of the counter card.

Assign freq.

Navigation Expert → Output → PFS output 1 to n → Assign freq.

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 🖹 55) parameter.

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

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

Factory setting Off

Min. freq. value

Navigation Expert → Output → PFS output 1 to n → Min. freq. value

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 🖹 55) and a process variable is selected in the **Assign freq.** parameter (→ 🖹 62).

Description Use this function to enter the minimum frequency.

User entry 0.0 to 10 000.0 Hz

Factory setting 0.0 Hz

Additional information The measured value for the minimum frequency is always 0 Kelvin.

Max. freq. value

Navigation Expert → Output → PFS output 1 to n → Max. freq. value

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 55) and a process variable is selected in the **Assign freq.** parameter (→ 62).

Description Use this function to enter the end value frequency.

User entry 0.0 to 10 000.0 Hz

Factory setting 10 000.0 Hz

Val. at max.freq

Navigation Expert → Output → PFS output 1 to n → Val. at max.freq

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 55) and a process variable is selected in the **Assign freq.** parameter (→ 62).

Description Use this function to enter the measured value for the end value frequency.

User entry Signed floating-point number

Factory setting Depends on country and nominal diameter

Additional information

Description

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

Dependency

The entry depends on the process variable selected in the **Assign freq.** parameter (→ 62).

Measuring mode

Navigation Expert → Output → PFS output 1 to n → Measuring mode

Prerequisite In the **Operating mode** parameter (→ 55), the **Frequency** option is selected, and one of the following options is selected in the **Assign freq.** parameter (→ 62):
- Mass flow
- Volume flow
- Density
- Temperature

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

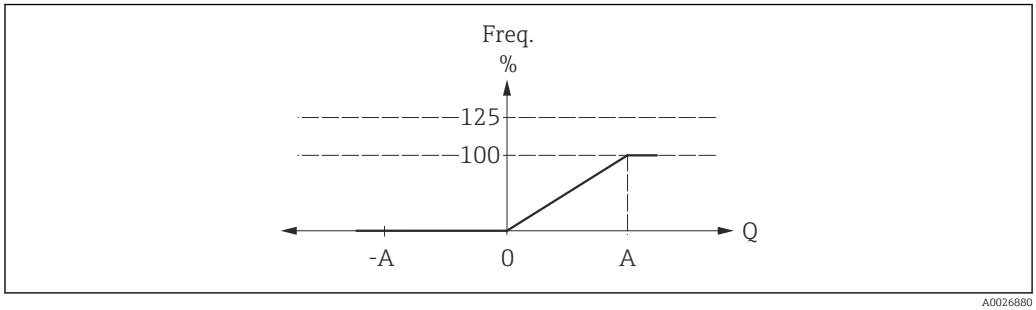
Selection
- Forward flow
- Forward/Reverse
- Reverse flow

Factory setting Forward flow

Additional information *"Forward flow" option*

The frequency output signal is proportional to the measured variable assigned. The measuring range is defined by the value that is assigned to the Val. at max.freq (A). The measured value for the minimum frequency is implicitly 0.

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



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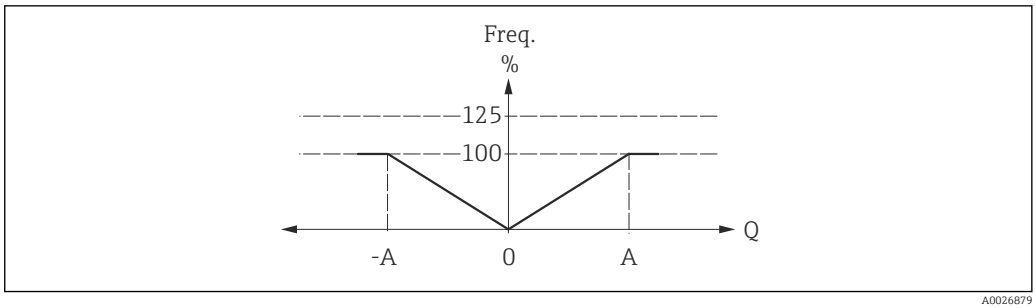
A Val. at max.freq

"Forward/Reverse" option

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

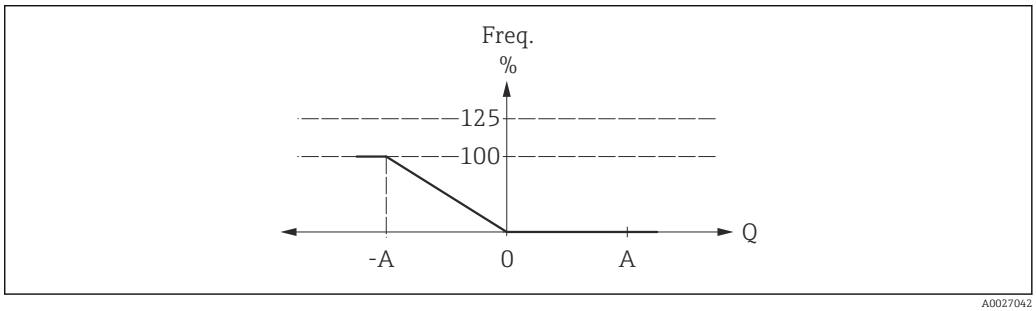
The flow components outside the scaled measuring range are taken into account for signal output as follows:
If the effective flow exceeds the absolute value A, the diagnostic message ⚠**S442 Freq. output 1 to n** is displayed. If the value is exceeded, the frequency remains at the maximum frequency,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



A Val. at max.freq

"Reverse flow" option

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



A Val. at max.freq

Damping out.

Navigation Expert → Output → PFS output 1 to n → Damping out.

Prerequisite In the **Operating mode** parameter (→ 55), the **Frequency** option is selected, and one of the following options is selected in the **Assign freq.** parameter (→ 62):
- Mass flow
- Volume flow
- Density
- Temperature

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

User entry 0 to 999.9 s

Factory setting 0.0 s

Additional information *User entry*

Use this function to enter a time constant (PT1 element [4]) for frequency output damping:
- If a low time constant is entered, the current output reacts particularly quickly to fluctuating measured variables.
- On the other hand, the current output reacts more slowly if a high time constant is entered.

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

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

This damping is not recommended for applications with high-speed filling $t_{fill} < 5$ s.

Failure mode

Navigation Expert → Output → PFS output 1 to n → Failure mode

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 55) and a process variable is selected in the **Assign freq.** parameter (→ 62).

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

Selection
- Actual value
- Defined value
- 0 Hz

Factory setting 0 Hz

Additional information *Selection*

- Actual value
  In the event of a device alarm, the frequency output continues on the basis of the current flow measurement. The device alarm is ignored.
- Defined value
  In the event of a device alarm, the frequency output continues on the basis of a predefined value. The Failure freq. (→ 67) replaces the current measured value, making it possible to bypass the device alarm. The actual measurement is switched off for the duration of the device alarm.
- 0 Hz
  In the event of a device alarm, the frequency output is "switched off".

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

4) proportional transmission behavior with first order delay

Failure freq.

Navigation Expert → Output → PFS output 1 to n → Failure freq.

Prerequisite The **Frequency** option is selected in the **Operating mode** parameter (→ 55) and a process variable is selected in the **Assign freq.** parameter (→ 62).

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

User entry 0.0 to 10 000.0 Hz

Factory setting 0.0 Hz

Output freq.

Navigation Expert → Output → PFS output 1 to n → Output freq. 1 to n

Prerequisite In the **Operating mode** parameter (→ 55), the **Frequency** option is selected.

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

User interface 0.0 to 10 000.0 Hz

Switch out funct

Navigation Expert → Output → PFS output 1 to n → Switch out funct

Prerequisite The **Switch** option is selected in the **Operating mode** parameter (→ 55).

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

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

Factory setting Off

Additional information *Selection*

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

Assign diag. beh

Navigation Expert → Output → PFS output 1 to n → Assign diag. beh

Prerequisite
- In the **Operating mode** parameter (→ 55), the **Switch** option is selected.
- In the **Switch out funct** parameter (→ 67), the **Diag. behavior** option is selected.

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

Selection
- Alarm
- Alarm or warning
- Warning

Factory setting Alarm

Additional information *Description*

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

Selection

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

Assign limit

Navigation Expert → Output → PFS output 1 to n → Assign limit

Prerequisite
- The **Switch** option is selected in the **Operating mode** parameter (→ 55) parameter.
- The **Limit** option is selected in the **Switch out funct** parameter (→ 67) parameter.

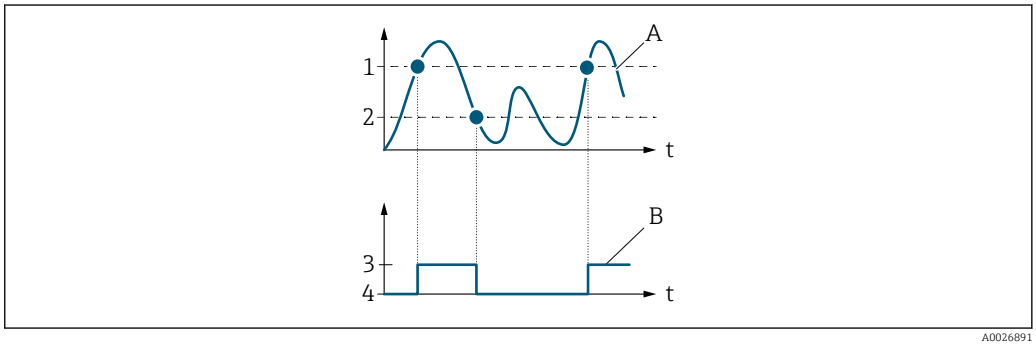
Description Use this function to select a process variable for the limit function.

Selection
- Mass flow
- Volume flow
- Density
- Temperature

Factory setting Mass flow

Additional information *Description*

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



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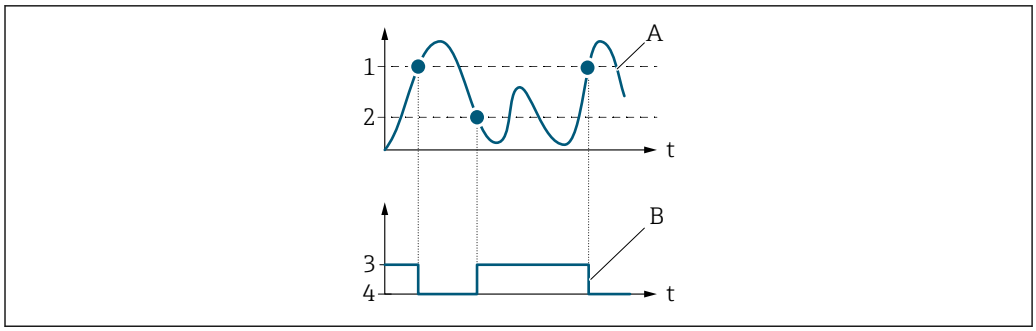
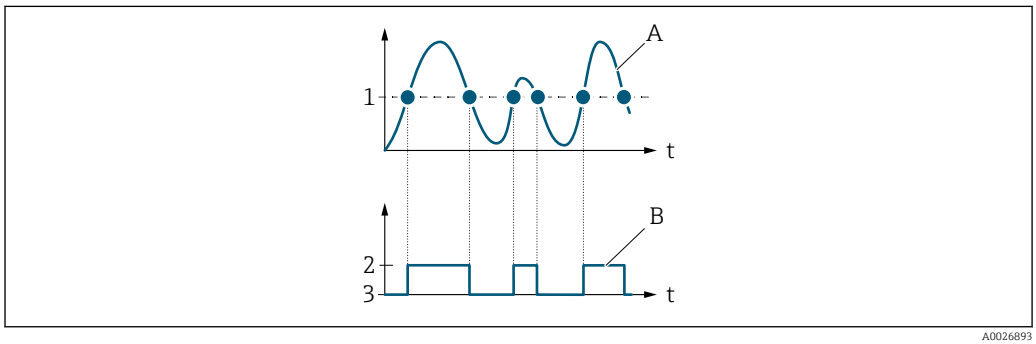
1 Switch-on value
2 Switch-off value
3 Conductive
4 Non-conductive
A Process variable
B Status output

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



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

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



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

Switch-on value

Navigation Expert → Output → PFS output 1 to n → Switch-on value

Prerequisite
- In the **Operating mode** parameter (→ 55), the **Switch** option is selected.
- In the **Switch out funct** parameter (→ 67), the **Limit** option is selected.

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

User entry Signed floating-point number

Factory setting Country-specific:
- 0 g/s
- 0 oz/s

Additional information

Description

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

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

Dependency

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

Switch-off value

Navigation Expert → Output → PFS output 1 to n → Switch-off value

Prerequisite

- In the **Operating mode** parameter (→ 55), the **Switch** option is selected.
- In the **Switch out funct** parameter (→ 67), the **Limit** option is selected.

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

User entry Signed floating-point number

Factory setting

Country-specific:
- 0 g/s
- 0 oz/s

Additional information

Description

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

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

Dependency

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

Assign dir.check

Navigation Expert → Output → PFS output 1 to n → Assign dir.check

Prerequisite

- The **Switch** option is selected in the **Operating mode** parameter (→ 55).
- The **Fl. direct.check** option is selected in the **Switch out funct** parameter (→ 67).

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

Selection

- Off
- Volume flow
- Mass flow

Factory setting Mass flow

Additional information *Description*

If the value of the assigned process variable is ≥ 0, the status output is conductive. Otherwise, the switch output is non-conductive.

Assign status

Navigation Expert → Output → PFS output 1 to n → Assign status

Prerequisite
- The **Switch** option is selected in the **Operating mode** parameter (→ 55).
- The **Status** option is selected in the **Switch out funct** parameter (→ 67).

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

Selection
- Partial pipe det
- Low flow cut off

Factory setting Partial pipe det

Additional information *Options*

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

Failure mode

Navigation Expert → Output → PFS output 1 to n → Failure mode

Description Use this function to select a failsafe mode for the switch output in the event of a device alarm.

Selection
- Actual status
- Open
- Closed

Factory setting Open

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

Switch status

Navigation Expert → Output → PFS output 1 to n → Switch status 1 to n

Prerequisite The **Switch** option is selected in the **Operating mode** parameter (→ 55).

Description Displays the current switch status of the status output.

User interface
- Open
- Closed

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

Invert outp.sig.

Navigation Expert → Output → PFS output 1 to n → Invert outp.sig.

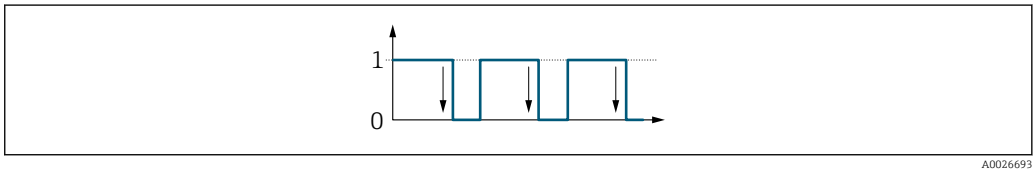
Description Use this function to select whether to invert the output signal.

Selection
- No
- Yes

Factory setting
- Pulse/freq./switch output 1: yes
- Pulse/freq./switch output 2: no

Additional information *Selection*

No option (passive - negative)



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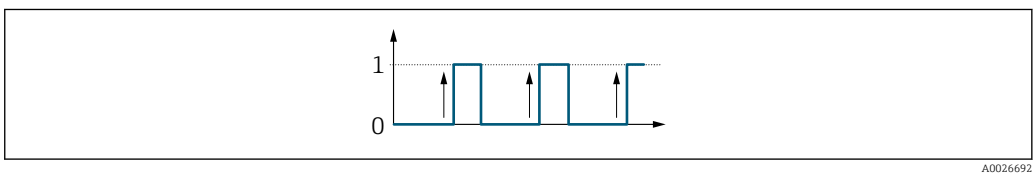
Yes option (passive - positive)



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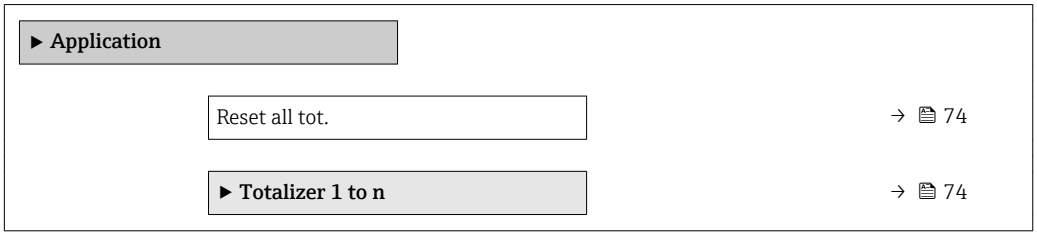
3.4 "Application" submenu

Navigation Expert → Application



Reset all tot.

Navigation Expert → Application → Reset all tot.

Description Use this function to reset all totalizers to the value **0** and restart the totaling process. This deletes all the flow values previously totalized.

Selection
- Cancel
- Reset + totalize

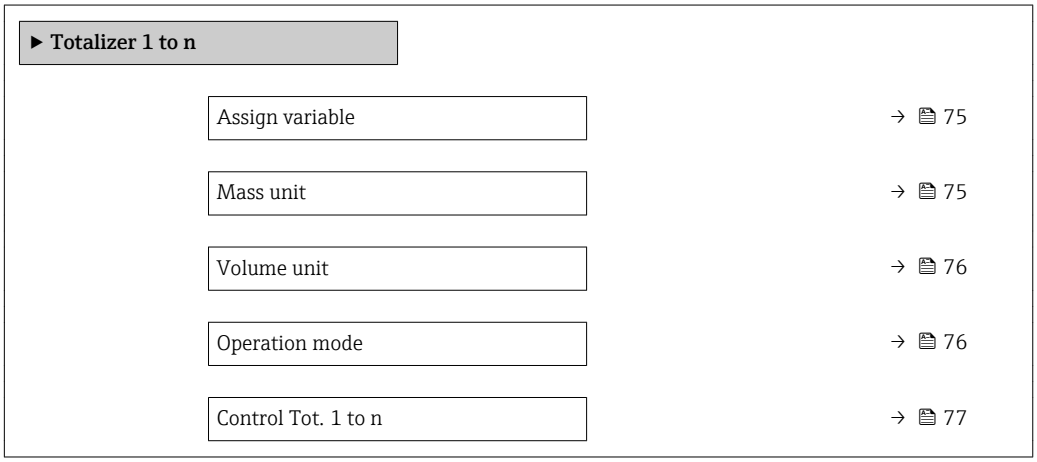
Factory setting Cancel

Additional information *Selection*

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

3.4.1 "Totalizer 1 to n" submenu

Navigation Expert → Application → Totalizer 1 to n



Preset value 1 to n	→ 78
Failure mode	→ 78

Assign variable

Navigation Expert → Application → Totalizer 1 to n → Assign variable

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

Selection
- Off
- Volume flow
- Mass flow

Factory setting Mass flow

Additional information

Description

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

Selection

If the **Off** option is selected, only **Assign variable** parameter (→ 75) is still displayed in the **Totalizer 1 to n** submenu. All other parameters in the submenu are hidden.

Mass unit

Navigation Expert → Application → Totalizer 1 to n → Mass unit

Prerequisite The **Mass flow** option is selected in the **Assign variable** parameter (→ 75) of the **Totalizer 1 to n** submenu.

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

Selection

SI units
- g
- kg
- t

US units
- oz
- lb
- STon

Custom-specific units
User mass

Factory setting Country-specific:
- kg
- lb

Factory setting Country-specific:
- g
- oz

Additional information *Selection*

For an explanation of the abbreviated units: → 97

Volume unit

Navigation Expert → Application → Totalizer 1 to n → Volume unit

Prerequisite The **Volume flow** option is selected in the **Assign variable** parameter (→ 75) of the **Totalizer 1 to n** submenu.

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

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)

Custom-specific units
User vol.

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

Factory setting Country-specific:
- ml
- fl oz (us)

Additional information *Selection*

For an explanation of the abbreviated units: → 97

Operation mode

Navigation Expert → Application → Totalizer 1 to n → Operation mode

Prerequisite A process variable is selected in the **Assign variable** parameter (→ 75) of the **Totalizer 1 to n** submenu.

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

Selection
- Net flow total
- Forward total
- Reverse total

Factory setting
Net flow total

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

Control Tot. 1 to n

Navigation
Expert → Application → Totalizer 1 to n → Control Tot. 1 to n

Prerequisite
A process variable is selected in the **Assign variable** parameter (→ 75) of the **Totalizer 1 to n** submenu.

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

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

Factory setting
Totalize

Additional information
Selection

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

Preset value 1 to n

Navigation Expert → Application → Totalizer 1 to n → Preset value 1 to n

Prerequisite A process variable is selected in the **Assign variable** parameter (→ 75) of the **Totalizer 1 to n** submenu.

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

User entry Signed floating-point number

Factory setting Country-specific:
- 0 kg
- 0 lb

Additional information *User entry*

The unit of the selected process variable is specified for the totalizer depending on the selection made in the **Assign variable** parameter (→ 75):
- **Volume flow** option: **Volume flow unit** parameter (→ 27)
- **Mass flow** option: **Mass flow unit** parameter (→ 25)

Example

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

Failure mode

Navigation Expert → Application → Totalizer 1 to n → Failure mode

Prerequisite A process variable is selected in the **Assign variable** parameter (→ 75) of the **Totalizer 1 to n** submenu.

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

Selection
- Stop
- Actual value
- Last valid value

Factory setting Stop

Additional information

Description

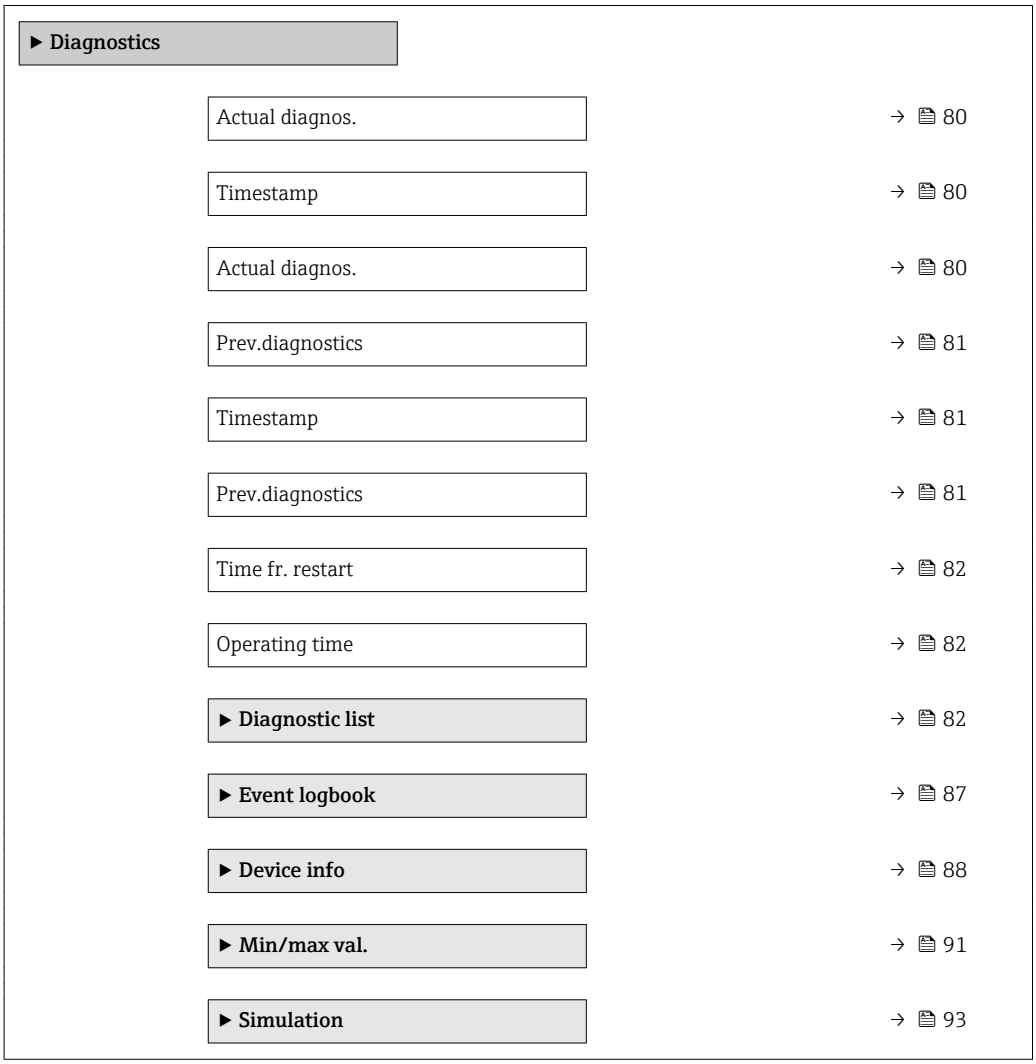
This setting does not affect the failsafe mode of other totalizers and the outputs. This is specified in separate parameters.

Selection

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

3.5 "Diagnostics" submenu

Navigation Expert → Diagnostics



Actual diagnos.

Navigation Expert → Diagnostics → Actual diagnos.

Prerequisite A diagnostic event has occurred.

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

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

Additional information *Display*

Additional pending diagnostic messages can be viewed in the **Diagnostic list** submenu (→ 82).

Example

For the display format:
⊗F271 Main electronic

Timestamp

Navigation Expert → Diagnostics → Timestamp

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

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

Additional information *Display*

The diagnostic message can be viewed via the **Actual diagnos.** parameter (→ 80).

Example

For the display format:
24d12h13m00s

Actual diagnos.

Navigation Expert → Diagnostics → Actual diagnos.

Prerequisite A diagnostic event has occurred.

Description Displays the service ID of the current diagnostic message.

User interface 0 to 65 535

Prev.diagnostics

Navigation Expert → Diagnostics → Prev.diagnostics

Prerequisite Two diagnostic events have already occurred.

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

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

Additional information *Example*

For the display format:
⊗F271 Main electronic

Timestamp

Navigation Expert → Diagnostics → Timestamp

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

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

Additional information *Display*

The diagnostic message can be viewed via the **Prev.diagnostics** parameter (→ 81).

Example

For the display format:
24d12h13m00s

Prev.diagnostics

Navigation Expert → Diagnostics → Prev.diagnostics

Prerequisite Two diagnostic events have already occurred.

Description Displays the service ID of the diagnostic message that occurred before the current diagnostic message.

User interface 0 to 65 535

Time fr. restart

Navigation Expert → Diagnostics → Time fr. restart

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

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

Operating time

Navigation Expert → Diagnostics → Operating time

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

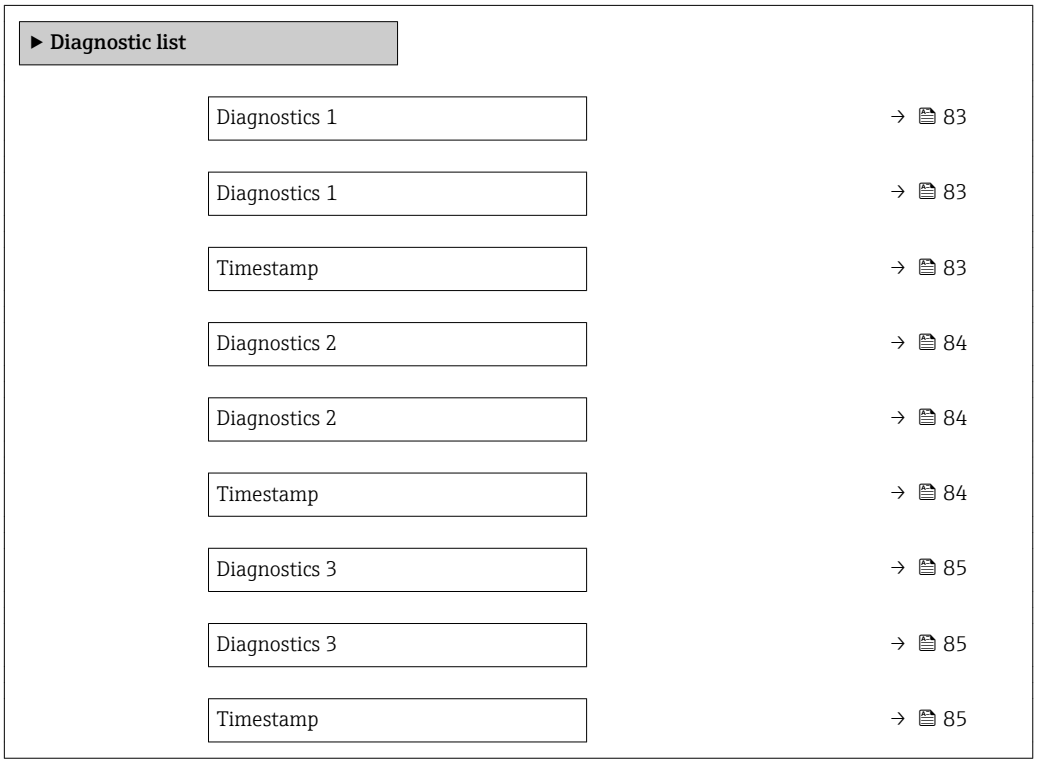
User interface Days (d), hours (h), minutes (m) and seconds (s)

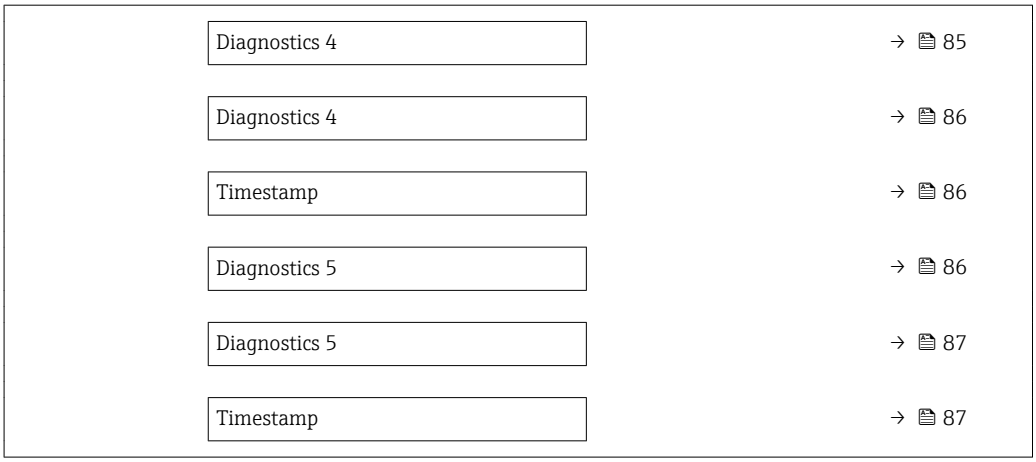
Additional information *User interface*

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

3.5.1 "Diagnostic list" submenu

Navigation Expert → Diagnostics → Diagnostic list





Diagnostics 1

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 1

Description Displays the current diagnostics message with the highest priority.

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

Additional information *Examples*

For the display format:
- ⚠S442 Freq. output
- ⊗F276 I/O module

Diagnostics 1

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 1

Description Displays the service ID of the current diagnostic message with the highest priority.

User interface 0 to 65 535

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

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

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

Additional information *Display*

The diagnostic message can be viewed via the **Diagnostics 1** parameter (→ 83).

Example

For the display format:
24d12h13m00s

Diagnostics 2

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 2

Description Displays the current diagnostics message with the second-highest priority.

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

Additional information *Examples*

For the display format:
- ⚠S442 Freq. output
- ⊗F276 I/O module

Diagnostics 2

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 2

Description Displays the service ID of the current diagnostic message with the second-highest priority.

User interface 0 to 65 535

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

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

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

Additional information *Display*

The diagnostic message can be viewed via the **Diagnostics 2** parameter (→ 84).

Example

For the display format:
24d12h13m00s

Diagnostics 3

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 3

Description Displays the current diagnostics message with the third-highest priority.

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

Additional information *Examples*

For the display format:
- ⚠S442 Freq. output
- ⊗F276 I/O module

Diagnostics 3

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 3

Description Displays the service ID of the current diagnostic message with the third-highest priority.

User interface 0 to 65 535

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

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

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

Additional information *Display*

The diagnostic message can be viewed via the **Diagnostics 3** parameter (→ 85).

Example

For the display format:
24d12h13m00s

Diagnostics 4

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 4

Description Displays the current diagnostics message with the fourth-highest priority.

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

Additional information *Examples*

For the display format:
- ⚠S442 Freq. output
- ⊗F276 I/O module

Diagnostics 4

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 4

Description Displays the service ID of the current diagnostic message with the fourth-highest priority.

User interface 0 to 65 535

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

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

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

Additional information *Display*

The diagnostic message can be viewed via the **Diagnostics 4** parameter (→ 85).

Example

For the display format:
24d12h13m00s

Diagnostics 5

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 5

Description Displays the current diagnostics message with the fifth-highest priority.

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

Additional information *Examples*

For the display format:
- ⚠S442 Freq. output
- ⊗F276 I/O module

Diagnostics 5

Navigation Expert → Diagnostics → Diagnostic list → Diagnostics 5

Description Displays the service ID of the current diagnostic message with the fifth-highest priority.

User interface 0 to 65 535

Timestamp

Navigation Expert → Diagnostics → Diagnostic list → Timestamp

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

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

Additional information *Display*

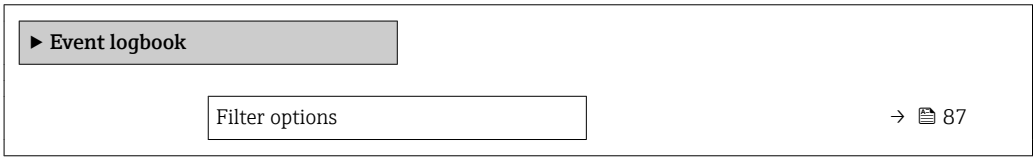
The diagnostic message can be viewed via the **Diagnostics 5** parameter (→ 86).

Example

For the display format:
24d12h13m00s

3.5.2 "Event logbook" submenu

Navigation Expert → Diagnostics → Event logbook



Filter options

Navigation Expert → Diagnostics → Event logbook → Filter options

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

Selection
- All
- Failure (F)
- Funct. check (C)

- Out of spec. (S)
- Mainten. req.(M)
- Information (I)

Factory setting All

Additional information *Description*

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

3.5.3 "Device info" submenu

Navigation Expert → Diagnostics → Device info

Device tag

Navigation Expert → Diagnostics → Device info → Device tag

Description Use this function to enter the unique name for the measuring point so that it can be identified quickly within the plant. The name is displayed in the header.

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

Factory setting Dosimass

Serial number

Navigation Expert → Diagnostics → Device info → Serial number

Description Displays the serial number of the measuring device.

It can also be found on the nameplate.

User interface Max. 11-digit character string comprising letters and numbers.

Additional information *Description*

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

Firmware version

Navigation Expert → Diagnostics → Device info → Firmware version

Description Displays the device firmware version installed.

User interface Character string in the format xx.yy.zz

Additional information *Display*

The Firmware version is also located:
- On the title page of the Operating instructions
- On the transmitter nameplate

Device name

Navigation Expert → Diagnostics → Device info → Device name

Description Displays the name of the measuring device. It can also be found on the nameplate.

User interface Max. 32 characters such as letters or numbers.

Factory setting Dosimass

Order code

Navigation Expert → Diagnostics → Device info → Order code

Description Displays the device order code.

User interface Character string composed of letters, numbers and certain punctuation marks (e.g. /).

Additional information *Description*

It can be found in the "Order code" field on the nameplate.

The order code is generated from the extended order code through a process of reversible transformation. The extended order code indicates the attributes for all the device features in the product structure. The device features are not directly readable from the order code.

Uses of the order code
- To order an identical spare device.
- To identify the device quickly and easily, e.g. when contacting Endress+Hauser.

Ext. order cd. 1

Navigation Expert → Diagnostics → Device info → Ext. order cd. 1

Description Displays the first part of the extended order code.

On account of length restrictions, the extended order code is split into a maximum of 3 parameters.

User interface Character string

Additional information *Description*

The extended order code indicates the version of all the features of the product structure for the measuring device and thus uniquely identifies the measuring device.

It can be found in the "Ext. ord. cd." field on the nameplate.

Ext. order cd. 2

Navigation Expert → Diagnostics → Device info → Ext. order cd. 2

Description Displays the second part of the extended order code.

User interface Character string

Additional information For additional information, see **Ext. order cd. 1** parameter (→ 90)

Ext. order cd. 3

Navigation Expert → Diagnostics → Device info → Ext. order cd. 3

Description Displays the third part of the extended order code.

User interface Character string

Additional information For additional information, see **Ext. order cd. 1** parameter (→ 90)

ENP version

Navigation Expert → Diagnostics → Device info → ENP version

Description Displays the version of the electronic nameplate.

User interface Character string

Factory setting 2.02.00

Additional information *Description*

This electronic nameplate stores a data record for device identification that includes more data than the nameplates attached to the outside of the device.

Config. counter

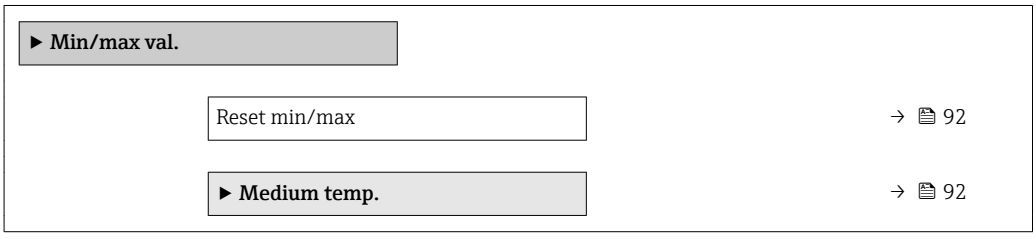
Navigation Expert → Diagnostics → Device info → Config. counter

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

User interface 0 to 65 535

3.5.4 "Min/max val." submenu

Navigation Expert → Diagnostics → Min/max val.



Reset min/max

Navigation Expert → Diagnostics → Min/max val. → Reset min/max

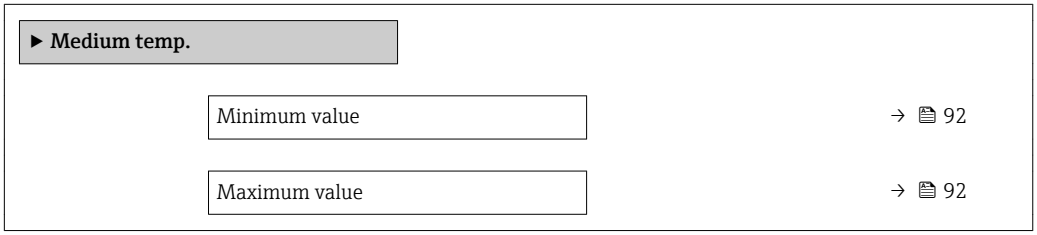
Description Use this function to select measured variables whose minimum, maximum and average measured values are to be reset.

Selection Cancel

Factory setting Cancel

"Medium temp." submenu

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



Maximum value

Navigation Expert → Diagnostics → Min/max val. → Medium temp. → Maximum value

Description Displays the highest previously measured medium temperature value.

User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 30)

Minimum value

Navigation Expert → Diagnostics → Min/max val. → Medium temp. → Minimum value

Description Displays the lowest previously measured medium temperature value.

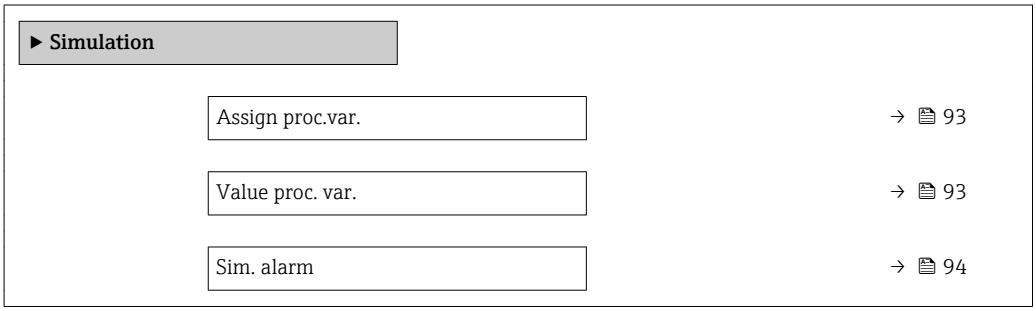
User interface Signed floating-point number

Additional information *Dependency*

The unit is taken from the **Temperature unit** parameter (→ 30)

3.5.5 "Simulation" submenu

Navigation Expert → Diagnostics → Simulation



Assign proc.var.

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

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

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

Factory setting Off

Additional information *Description*

The simulation value of the process variable selected is defined in the **Value proc. var.** parameter (→ 93).

Value proc. var.

Navigation Expert → Diagnostics → Simulation → Value proc. var.

Prerequisite A process variable is selected in the **Assign proc.var.** parameter (→ 93).

Description Use this function to enter a simulation value for the selected process variable. Subsequent measured value processing and the signal output use this simulation value. In this way, users can verify whether the measuring device has been configured correctly.

User entry Depends on the process variable selected

Factory setting 0

Additional information *User entry*

The unit of the displayed measured value is taken from the **System units** submenu (→ 25).

Sim. alarm

Navigation Expert → Diagnostics → Simulation → Sim. alarm

Description Use this function to switch the device alarm on and off.

Selection
- Off
- On

Factory setting Off

4 Country-specific factory settings

4.1 SI units

Not valid for USA and Canada.

4.1.1 System units

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

4.1.2 Pulse value

Nominal diameter [mm]	[g/p]
8	0.02
15	0.1
25	0.2

4.1.3 On value low flow cut off

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

Nominal diameter [mm]	On value low flow cut off for liquid [g/s]
8	2
15	7
25	20

4.2 US units

Only valid for USA and Canada.

4.2.1 System units

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

4.2.2 Pulse value

Nominal diameter [in]	[oz/p]
3/8	0.001
½	0.004
1	0.007

4.2.3 On value low flow cut off

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

Nominal diameter [in]	On-value for liquid [oz/s]
3/8	0.08
½	0.25
1	0.7

5 Explanation of abbreviated units

5.1 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

5.2 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)

5.3 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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