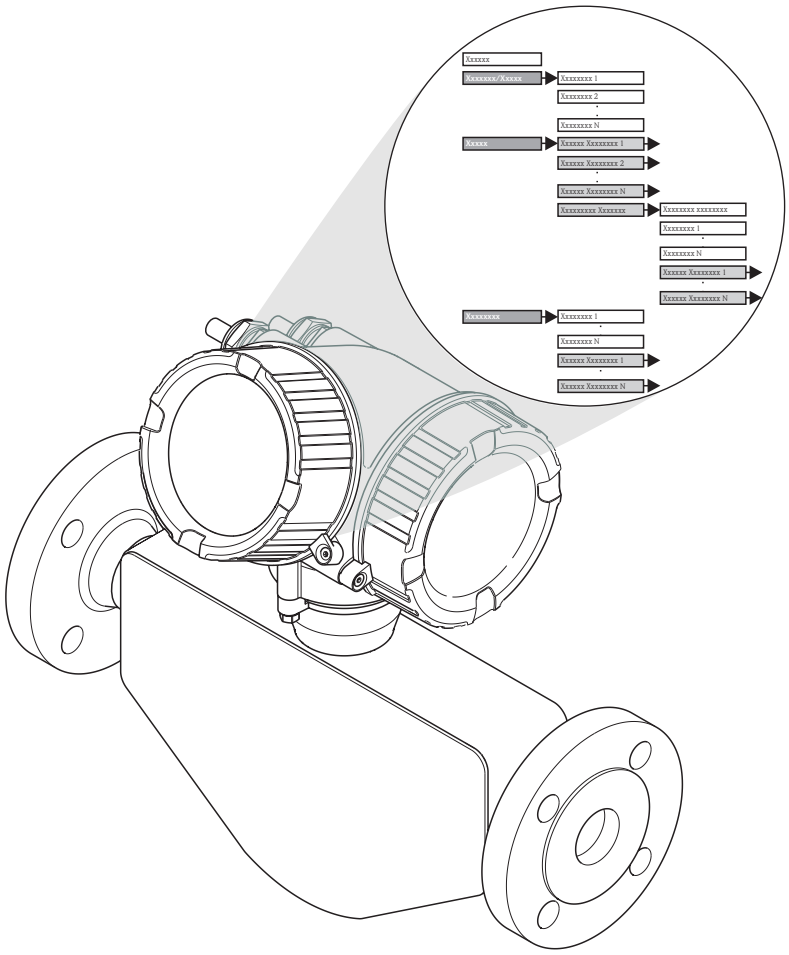
Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Description of Device Parameters

Proline Promass E TB2
HART

Coriolis mass flow measuring system
Version for operators and maintenance technicians



GP01009D/06/EN/06.10
71112122

Valid as of version
01.00.zz (Device software)

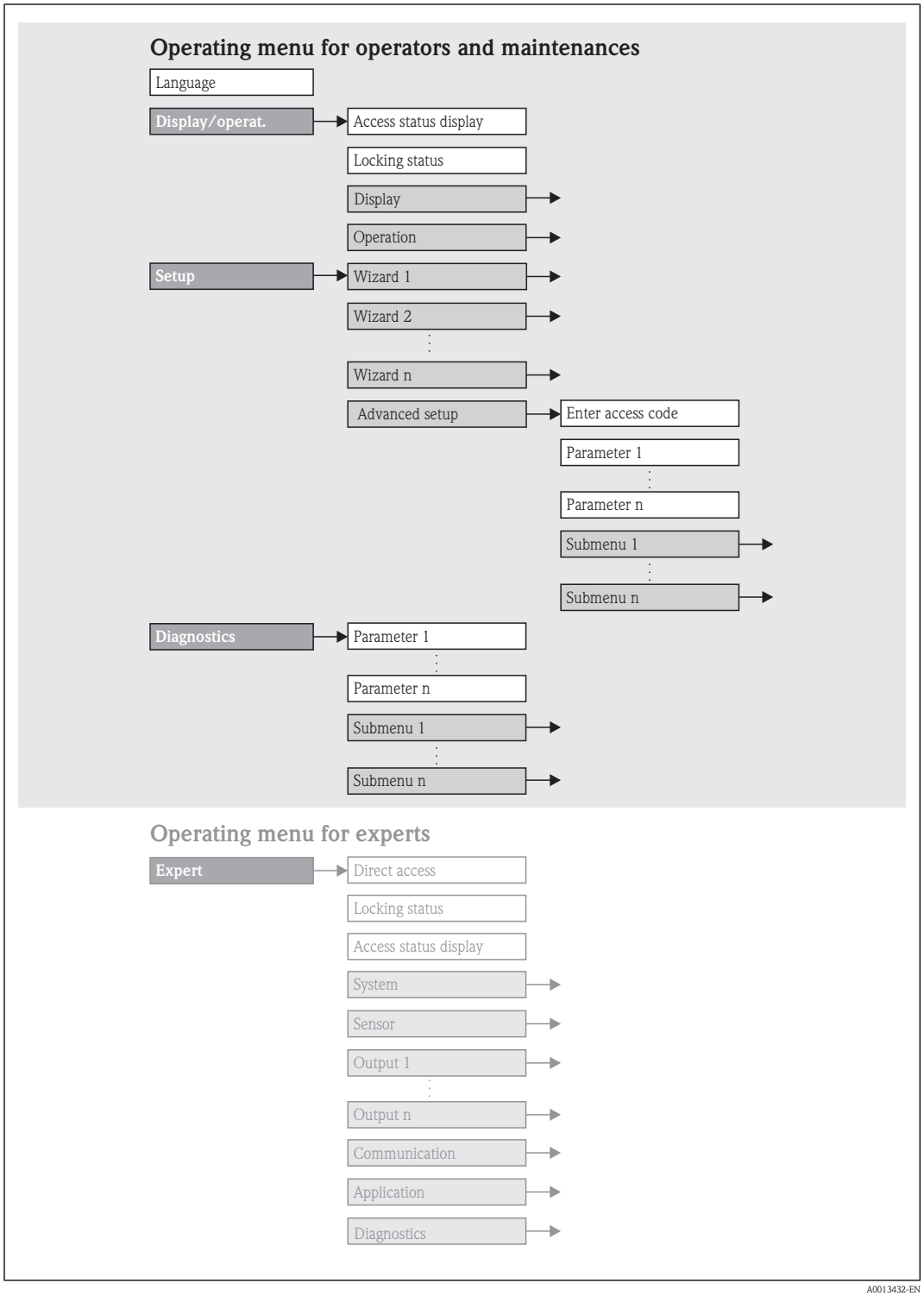
Endress+Hauser
People for Process Automation

1 Important document information

1.1 About this document

1.1.1 Document function

This document explains all the parameters in the 1st part of the operating menu: the menu for operators and maintenance. This menu is highlighted in grey below.



A0013432-EN

This part of the menu contains all the parameters for operation and commissioning. Wizards are provided for these parameters to make navigation easier.

1.1.2 Additional standard documentation on the device

Document type	Purpose and content of the document
Technical Information	**Planning aid for your device** The document contains all the technical data on the device and provides an overview of the accessories and other products that can be ordered for the device.
Brief Operating Instructions	**Guide that takes you quickly to the 1st measured value** The Brief Operating Instructions contain all the essential information from incoming acceptance to initial commissioning.
Operating Instructions	**Your reference document** The Operating Instructions contain all the information that is required in various phases of the life cycle of the device: from product identification, incoming acceptance and storage, to mounting, connection, operation and commissioning through to troubleshooting, maintenance and disposal.
Description of Device Parameters Version for experts	**Reference for your parameters** The document provides a detailed explanation of each individual parameter in the 2nd part of the operating menu: the expert menu. It contains all the device parameters and allows direct access to the parameters by entering a specific code. The description is aimed at those who work with the device over the entire life cycle and perform specific configurations.

1.1.3 Supplementary device-dependent documentation

Document type	Device particularities and document content
Safety Instructions	**Operation in hazardous areas** The document contains all the necessary information for the safe operation of the device in hazardous areas, and explains how the device can be identified as an Ex system from the device nameplate.
Information on the Pressure Equipment Directive	**Operation in accordance with the Pressure Equipment Directive** The document contains all the necessary information for the safe operation of the device when used in accordance with the Pressure Equipment Directive, and explains how the device can be identified as pressure equipment from the device nameplate.
Functional Safety Manual	**Operation in SIL applications** The document contains all the necessary information for the safe operation of the device in SIL applications, such as settings and installation instructions.
Installation Instructions	**Ordered accessory** The Installation Instructions contain all the information needed to install the ordered accessory or spare part.

The document types listed are available:
- On the CD supplied with the device
- In the Download Area of the Endress+Hauser Internet site: www.endress.com → Download

1.1.4 Using this document

Information on the document structure

- The structure of the document is based on the menu structure for operation via the local display.
- The individual parameters, and their descriptions, are listed as they appear in the menu structure when operating the device via the local display. If a parameter is located at a different point in the menu structure when using an operating tool, the navigation path for the operating tool is also provided in the description.
- Specific parameters and their descriptions for operating tools are included at the appropriate points in the menu structure.

Finding a specific parameter description

Existing knowledge	Fastest route
Parameter name	**Keyword index** Alphabetic list of the parameters with a page reference to the parameter description
Name of menu or submenu	**Table of contents** List of the menus and submenus including a page reference to the parameter description
	Overview of the operating menu (→ 🖹 6) Graphic representation of the menu structure with the menu parameters and a page reference to the parameter description

Structure of a parameter description

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

Complete parameter name Write-protected parameter = 🔒

Navigation
- Navigation path to the parameter via the local display
- Navigation path to the parameter via the operating tool

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

Prerequisite
The parameter is only available under these specific conditions

Description
Description of the parameter function

Options
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

1.2 Target group

The document is aimed at trained specialists who are responsible for the device during normal operation or who are responsible for parameter changes for maintenance and troubleshooting.

All specialists must meet the following conditions:
- Have a relevant qualification for their specific function and task
- Be authorized by the plant owner/operator
- Have read and understood the Operating Instructions
- Have fundamental knowledge on the operation of the device and what to do in the event of an error

1.3 Explanation of symbols

1.3.1 Symbols and notation for certain types of information

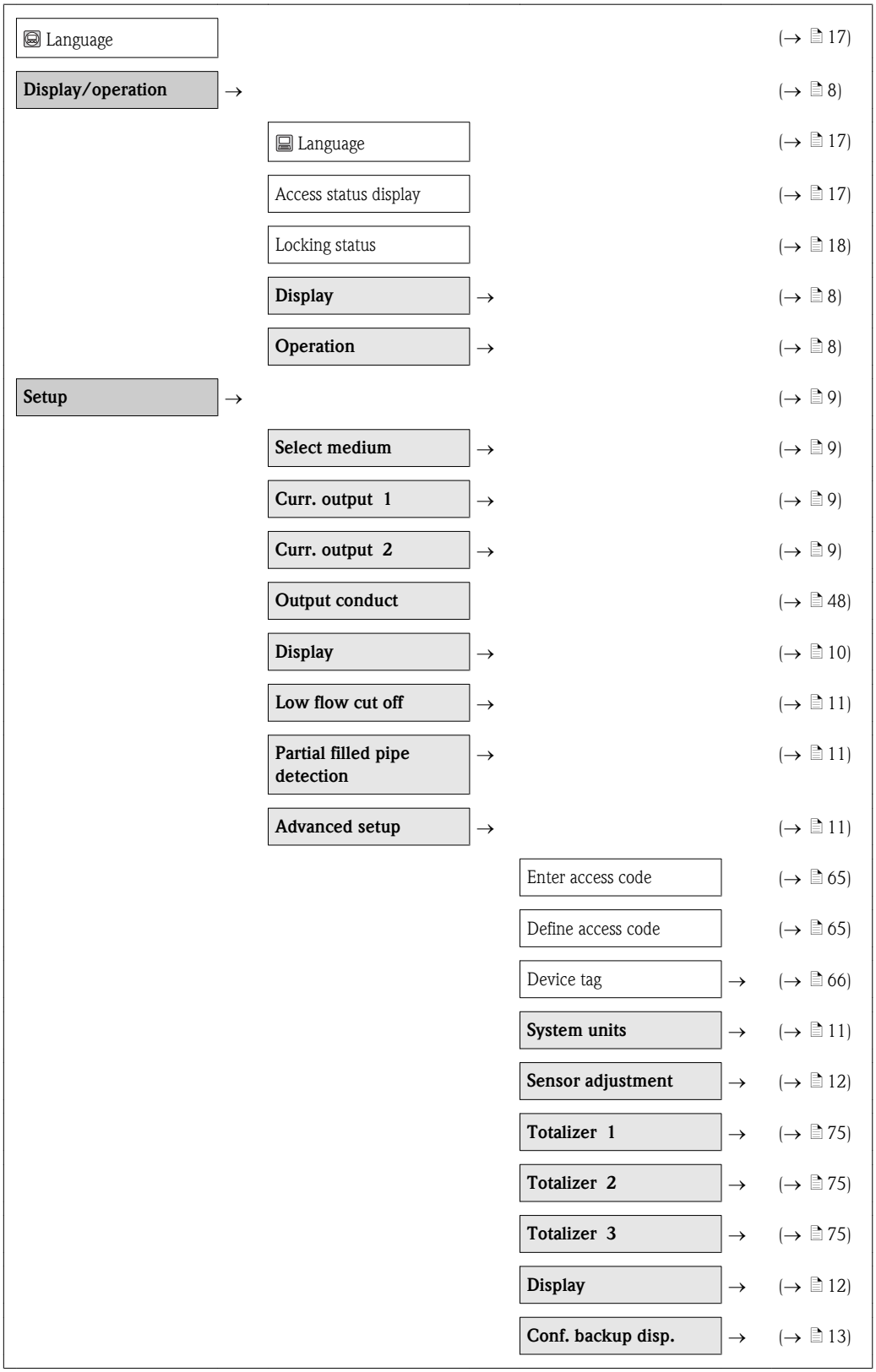
Symbol	Meaning
 A0011193	**Tip** Indicates additional information.
 A0011194	**Reference to documentation** Refers to the corresponding device documentation.
 A0011195	**Reference to page** Refers to the corresponding page number.
 A0011196	**Reference to graphic** Refers to the corresponding graphic number and page number.
 A0013140	**Operation via local display** Indicates navigation to the parameter via the local display.
 A0013143	**Operation via operating tool** Indicates navigation to the parameter via the operating tool.
 A0013144	**Write-protected parameter** Indicates a parameter that can be locked against changes by entering a user-specific code.

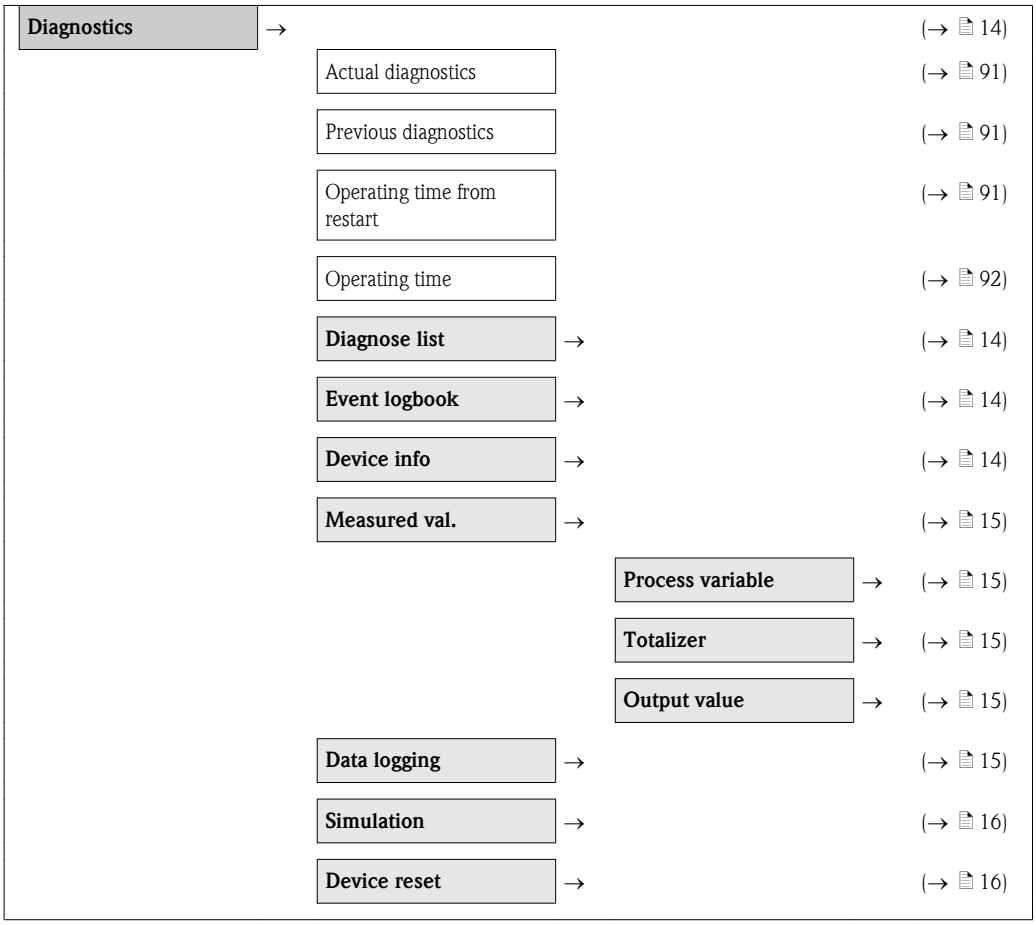
1.3.2 Symbols and notation in graphics

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

2 Overview of the operating menu

The following tables provide an overview of the menu structure and the related parameters for operation by an operator or maintenance technician. The page reference refers to where the parameter description can be found.




Diagnostics → (→ 14)
Actual diagnostics (→ 91)
Previous diagnostics (→ 91)
Operating time from restart (→ 91)
Operating time (→ 92)
Diagnose list → (→ 14)
Event logbook → (→ 14)
Device info → (→ 14)
Measured val. → (→ 15)
Process variable → (→ 15)
Totalizer → (→ 15)
Output value → (→ 15)
Data logging → (→ 15)
Simulation → (→ 16)
Device reset → (→ 16)

2.1 Submenus of the "Display/operation" menu

2.1.1 "Display" submenu

Display	→	(→ 19)
	Format display	(→ 19)
	Contrast display	(→ 20)
	Display interval	(→ 21)

2.1.2 "Operation" submenu

Operation	→	(→ 22)
	Control totalizer 1	(→ 22)
	Preset value 1	(→ 22)
	Control totalizer 2	(→ 22)
	Preset value 2	(→ 22)
	Control totalizer 3	(→ 22)
	Preset value 3	(→ 22)
	Reset all totalizers	(→ 23)

2.2 Submenus of the "Setup" menu

2.2.1 "Select medium" wizard

Select medium →		(→ 24)
	Select medium	(→ 24)
	Select gas type	(→ 25)
	Reference sound velocity	(→ 25)
	Temperature coefficient sound velocity	(→ 26)
	Pressure compensation	(→ 26)
	Pressure value	(→ 26)

2.2.2 "Current output 1-2" wizard

Current output 1-2 →		(→ 28)
	Assign current output 1-2	(→ 30)
	Mass flow unit	(→ 30)
	Volume flow unit	(→ 31)
	Density unit	(→ 32)
	Corrected volume flow unit	(→ 33)
	Corrected volume flow calculation	(→ 33)
	Reference density unit	(→ 34)
	Fixed reference density	(→ 34)
	Linear expansion coefficient	(→ 35)
	Square expansion coefficient	(→ 35)
	Temperature unit	(→ 36)
	Reference temperature	(→ 36)
	Current span	(→ 37)
	4 mA value	(→ 38)
	20 mA value	(→ 40)
	Failure mode	(→ 40)

	Failure current	(→ 41)

2.2.3 "Display" wizard

Display →		(→ 42)
	Format display	(→ 42)
	Value 1 display	(→ 44)
	0% bargraph value 1	(→ 44)
	100% bargraph value 1	(→ 45)
	Value 2 display	(→ 45)
	Value 3 display	(→ 46)
	0% bargraph value 3	(→ 46)
	100% bargraph value 3	(→ 47)
	Value 4 display	(→ 47)

2.2.4 "Output conditioning" wizard

Output conduct →		(→ 48)
	Level of flow fluctuation	(→ 49)
	Measuring mode output 1	(→ 51)
	Measuring mode output 2	(→ 51)
	Display damping	(→ 50)
	Damping output 1	(→ 51)
	Damping output 2	(→ 51)
	Operating mode totalizer 1	(→ 55)
	Operating mode totalizer 2	(→ 55)
	Operating mode totalizer 3	(→ 55)
	Assign process variable	(→ 56)
	On value low flow cut off	(→ 56)
	Off value low flow cut off	(→ 57)
	Pressure shock suppression	(→ 57)

2.2.5 "Low flow cut off" wizard

Low flow cut off	→	(→ 59)
Assign process variable		(→ 59)
On value low flow cut off		(→ 59)
Off value low flow cut off		(→ 60)
Pressure shock suppression		(→ 61)

2.2.6 "Partial filled pipe detection" wizard

Partial filled pipe detection	→	(→ 63)
Assign process variable		(→ 63)
Low value partial filled pipe detection		(→ 63)
High value partial filled pipe detection		(→ 64)
Response time part. filled pipe detect.		(→ 64)

2.2.7 Submenus of the "Advanced setup" menu

"System units" submenu

System units	→	(→ 67)
Mass flow unit		(→ 67)
Mass unit		(→ 67)
Volume flow unit		(→ 68)
Volume unit		(→ 69)
Corrected volume flow unit		(→ 69)
Corrected volume unit		(→ 70)
Density unit		(→ 70)
Reference density unit		(→ 71)
Temperature unit		(→ 72)
Length unit		(→ 72)
Pressure unit		(→ 72)

"Sensor adjustment" submenu

Sensor adjustment →		(→ 74)
	Installation direction	(→ 74)
	Zero point adjustment control	(→ 74)

"Totalizer 1-3" submenu

Totalizer 1-3 →		(→ 75)
	Assign process variable	(→ 75)
	Unit	(→ 75)
	Operating mode totalizer 1-3	(→ 76)
	Failure mode	(→ 77)

"Display" submenu

Display →		(→ 78)
	Format display	(→ 78)
	Value 1 display	(→ 79)
	0% bargraph value 1	(→ 80)
	100% bargraph value 1	(→ 80)
	Decimal places 1	(→ 81)
	Value 2 display	(→ 81)
	Decimal places 2	(→ 82)
	Value 3 display	(→ 82)
	0% bargraph value 3	(→ 83)
	100% bargraph value 3	(→ 83)
	Decimal places 3	(→ 83)
	Value 4 display	(→ 84)
	Decimal places 4	(→ 84)
	Display interval	(→ 85)
	Display damping	(→ 85)
	Header	(→ 86)
	Header text	(→ 86)

	Separator	(→ 87)

"Conf. backup disp." submenu

Conf. backup disp. →		
	Operating time	(→ 88)
	Last backup	(→ 88)
	Configuration management	(→ 88)
	Backup state	(→ 89)
	Comparison result	(→ 90)

2.3 Submenus of the "Diagnostics" menu

2.3.1 "Diagnose list" submenu

Diagnose list	→	(→ 93)
Diagnostics 1		(→ 93)
Diagnostics 2		(→ 93)
Diagnostics 3		(→ 93)
Diagnostics 4		(→ 93)
Diagnostics 5		(→ 93)

2.3.2 "Event logbook" submenu

Event logbook	→	(→ 94)
Filter options		(→ 94)
Events list		(→ 94)

2.3.3 "Device info" submenu

Device info	→	(→ 96)
Device		(→ 96)
Serial number		(→ 96)
Firmware version		(→ 96)
Device name		(→ 96)
Order code		(→ 97)
Extended order code 1		(→ 97)
Extended order code 2		(→ 97)
Extended order code 3		(→ 97)
Device revision		(→ 97)
Device ID		(→ 98)
Device type		(→ 98)
Manufacturer ID		(→ 98)

2.3.4 "Measured value" submenu

"Process variable" submenu

Process variable	→	(→ 99)
	Mass flow	(→ 99)
	Volume flow	(→ 99)
	Corrected volume flow	(→ 99)
	Density	(→ 100)
	Reference density	(→ 100)
	Temperature	(→ 100)

"Totalizer" submenu

Totalizer	→	(→ 101)
	Totalizer value 1	(→ 101)
	Totalizer overflow 1	(→ 101)
	Totalizer value 2	(→ 101)
	Totalizer overflow 2	(→ 101)
	Totalizer value 3	(→ 101)
	Totalizer overflow 3	(→ 101)

"Output value" submenu

Output value	→	(→ 103)
	Output current 1	(→ 103)
	Measured current 1	(→ 103)
	Terminal voltage 1	(→ 103)
	Output current 2	(→ 103)

2.3.5 "Data logging" submenu

Data logging	→	(→ 104)
	Assign channel 1	(→ 104)
	Assign channel 2	(→ 104)
	Assign channel 3	(→ 104)

	Assign channel 4	(→ 104)
	Logging interval	(→ 104)
	Clear logging data	(→ 105)
	Display channel 1	(→ 105)
	Display channel 2	(→ 105)
	Display channel 3	(→ 105)
	Display channel 4	(→ 105)

2.3.6 "Simulation" submenu

Simulation	→	(→ 107)
	Assign simulation process variable	(→ 107)
	Value process variable	(→ 107)
	Simulation current output 1	(→ 108)
	Value current output 1	(→ 108)
	Simulation current output 2	(→ 108)
	Value current output 2	(→ 108)
	Simulation device alarm	(→ 108)

2.3.7 "Device reset" submenu

Device reset	→	(→ 109)
	Device reset	(→ 109)

3 Description of the individual device parameters

The following section lists the parameters as they appear in the menu structure on the local display. Specific parameters for operating tools are included at the appropriate points in the menu structure.

Language

Navigation
Language
Display/operat. → Language

Description
Language setting for the local display

Options
- English
- German
- French
- Spanish
- Italian
- Dutch
- Japanese

Factory setting
English
Alternatively, the ordered language is preset in the device.

3.1 "Display/operation" menu

This menu only appears if the device has an local display.

Access status display

Navigation
Display/operat. → Access status display

Description
Use this function to view the access authorization to parameters via the local display. If a -symbol appears in front of a parameter, the parameter cannot be changed via the local display with the current access authorization.

- The access authorization can be changed via the **Enter access code** parameter (→ 65).
- If additional write protection is active, this restricts the current access authorization even further. The write protection status can be viewed via the **Locking status** parameter (→ 18).

User interface
- Operator
- Maintenance

Factory setting
Maintenance

Additional information
User interface

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

Locking status

Navigation Display/operat.→ Locking status

Description Use this function to view the active write protection. If two or more types of write protection are active, the write protection with the highest priority is shown on the display.

The -symbol appears in front of parameters that cannot be modified since they are write-protected.

User interface

- Hardware locked (priority 1)
  The DIP switch for hardware locking is activated on the main electronics module. This locks write access to the parameters (e.g. via local display or operating tool).
- Temporarily locked (priority 2)
  Write access to the parameters is temporarily locked on account of internal processes in progress in the device (e.g. data upload/download, reset etc.). The parameters can be modified as soon as the processes are complete.
- None (priority 3)
  The access authorization displayed in the **Access status display** parameter applies (→ 17).

Additional information *Hardware locked*

Information on disabling hardware write protection is provided in the "Write protection via the locking DIP switch" section of the Operations Instructions for the device.

3.1.1 "Display" submenu

Format display

Navigation

Display/operat. → Display → Format display

Description

Use this function to select how the measured value is shown on the local display. The display format (size, bar graph etc.) and number of measured values displayed simultaneously (1 to 4) can be configured. This setting only applies to normal operation.

- The **Value 1 display - Value 4 display** parameters are used to specify which measured values are shown on the display and in which order (→ 44) (→ 45) (→ 46) (→ 47).
- If more measured values are specified than the selected display mode permits, the values alternate on the device display. The display time until the next change is configured using the **Display interval** parameter (→ 21).

Options

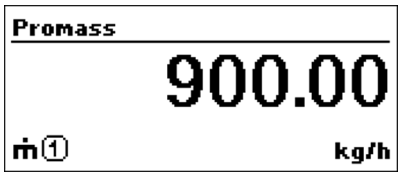
- 1 value, max. size
- 1 bargraph + 1 value
- 2 values
- 1 value large + 2 values
- 4 values

Factory setting

1 value, max. size

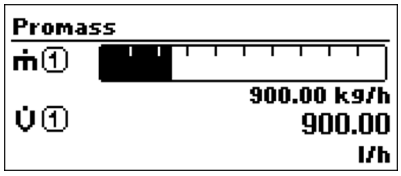
Additional information

1 value, max. size



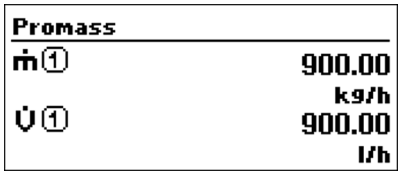
A0013099

1 bargraph + 1 value



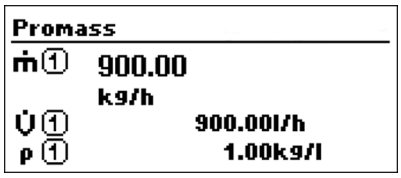
A0013098

2 values



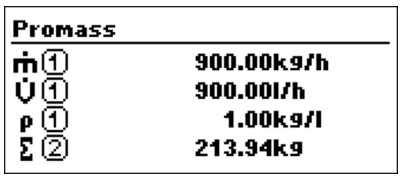
A0013100

1 value large + 2 values



A0013102

4 values



A0013103

Contrast display

Navigation

Display/operat. → Display → Contrast display

Description

Use this function to adapt the display contrast to the ambient conditions (e.g. the lighting or viewing angle).

Set the contrast via push-buttons:
- Brighter: press the ⊖ + Ⓔ buttons simultaneously
- Darker: press the ⊕ + Ⓔ buttons simultaneously

User entry

20 to 80 %

Factory setting 30 %

Display interval

Navigation Display/operat. → Display → Display interval

Description Use this function to set the length of time the measured values are displayed if the values alternate on the display. This type of alternating display only occurs automatically if the number of measured values defined exceeds the number of values the selected display format can display simultaneously.

- The **Value 1 display - Value 4 display** parameters are used to specify which measured values are shown on the display (→ 44) (→ 45) (→ 46) (→ 47).
- The display format of the displayed measured values is specified using the **Format display** parameter (→ 19).

User entry 1 to 10 s

Factory setting 5 s

3.1.2 "Operation" submenu

Control totalizer 1-3

Navigation
Display/operat. → Operation → Control tot. 1
Display/operat. → Operation → Control tot. 2
Display/operat. → Operation → Control tot. 3

Prerequisite
One of the following process variables is selected in the **Assign process variable** parameter of the **Totalizer 1-3** submenu (→ 75):
- Mass flow
- Volume flow
- Corrected volume flow

Description
Use this function to control the totalizer value.

Options
- Totalize
  The totalizer is started or continues totalizing with the current counter reading.
- Reset + hold
  The totaling process is stopped and the totalizer is reset to0.
- Preset + hold
  The totaling process is stopped and the totalizer is set to the defined start value in the **Preset** parameter.
- Reset + totalize
  The totalizer is reset to0 and the totaling process is restarted.
- Preset + totalize
  The totalizer is set to the defined start value in the **Preset** parameter and the totaling process is restarted.

Factory setting
Totalize

Preset value 1-3

Navigation
Display/operat. → Operation → Preset value 1
Display/operat. → Operation → Preset value 2
Display/operat. → Operation → Preset value 3

Prerequisite
One of the following process variables is selected in the **Assign process variable** parameter of the **Totalizer 1-3** submenu (→ 75):
- Mass flow
- Volume flow
- Corrected volume flow

Description
Use this function to specify a start value for totalizer 1. This setting is suitable for repeated batching processes with a fixed batching quantity, for example.

User entry
Max. 15-digit floating-point number with sign

Factory setting

Country-dependent:
- 0 kg
- 0 lb

Additional information

User entry

The unit depends on the process variable that is assigned to the totalizer in the **Assign process variable** parameter of the **Totalizer 1-3** submenu (→ 75).

Reset all totalizers

Navigation

Display/operat. → Operation → Reset all tot.

Description

Resets all the totalizers to 0 and restarts the totaling process. This deletes all the flow values previously totalized.

Options

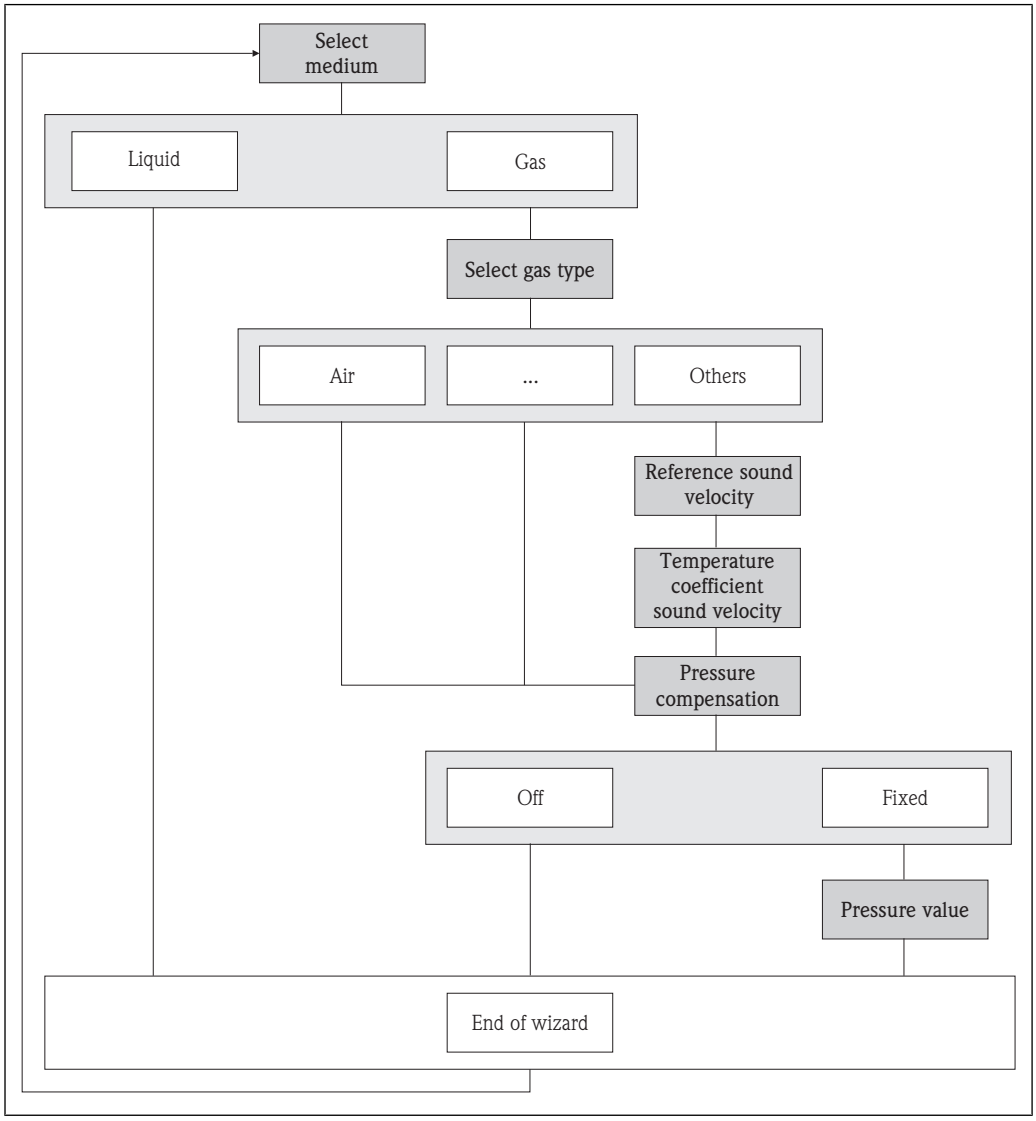
- Cancel
  No action is executed and the user exits the parameter.
- Reset + totalize
  All totalizers are reset to 0 and the totaling process is restarted.

Factory setting

Cancel

3.2 "Setup" menu

3.2.1 "Select medium" wizard



Select medium

Navigation Setup → Select medium → Select medium

Description Use this function to select the type of medium.

Options
- Liquid
- Gas

Factory setting Liquid

Select gas type

Navigation Setup → Select medium → Select gas type

Prerequisite The **Gas** option is selected in the **Select medium** parameter (→ 24).

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

Options
- Air
- Ammonia NH3
- Argon Ar
- Sulfur hexafluoride SF6
- Oxygen O2
- Ozone O3
- Nitrogen oxide NOx
- Nitrogen N2
- Nitrous oxide N2O
- Methane CH4
- Hydrogen H2
- Helium He
- Hydrogen chloride HCl
- Hydrogen sulfide H2S
- Ethylene C2H4
- Carbon dioxide CO2
- Carbon monoxide CO
- Chlorine Cl2
- Butane C4H10
- Propane C3H8
- Propylene C3H6
- Ethane C2H6
- Others

Factory setting Air

Reference sound velocity

Navigation Setup → Select medium → Sound velocity

Prerequisite The **Others** option is selected in the **Select gas type** parameter (→ 25).

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

User entry 0 to 99 999 m/s

Factory setting 0 m/s

Additional information *User entry*
For conversion:1 m/s = 3.281 ft/s

Temperature coefficient sound velocity

Navigation Setup → Select medium → Temp. coeff. SV

Prerequisite The **Others** option is selected in the **Select gas type** parameter (→ 25).

Description Use this function to enter the temperature coefficient of the sound velocity of the desired gas.

User entry 0 to 99 999 (m/s)/K

Factory setting 0 (m/s)/K

Additional information *User entry*
For conversion: T [K] = 0.555 · T [°F]

Pressure compensation

Navigation Setup → Select medium → Pressure compen.

Prerequisite The **Gas** option is selected in the **Select medium** parameter (→ 24).

Description Use this function to switch on automatic pressure correction. This makes it possible to compensate for the effect of a difference in pressure between the calibration pressure and process pressure, which affects the measured error for the mass flow or density.

Options
- Off
  Pressure correction is switched off.
- Fixed
  The process pressure for pressure correction is fixed.

Factory setting Off

Additional information *Fixed*

The process pressure value is taken from the **Pressure value** parameter (→ 26).

Pressure value

Navigation Setup → Select medium → Pressure value

Prerequisite The **Fixed** option is selected in the **Pressure compensation** parameter (→ 26).

Description Use this function to enter a value for the process pressure to be used for pressure correction.

User entry Max. 15-digit, positive floating-point number

Factory setting

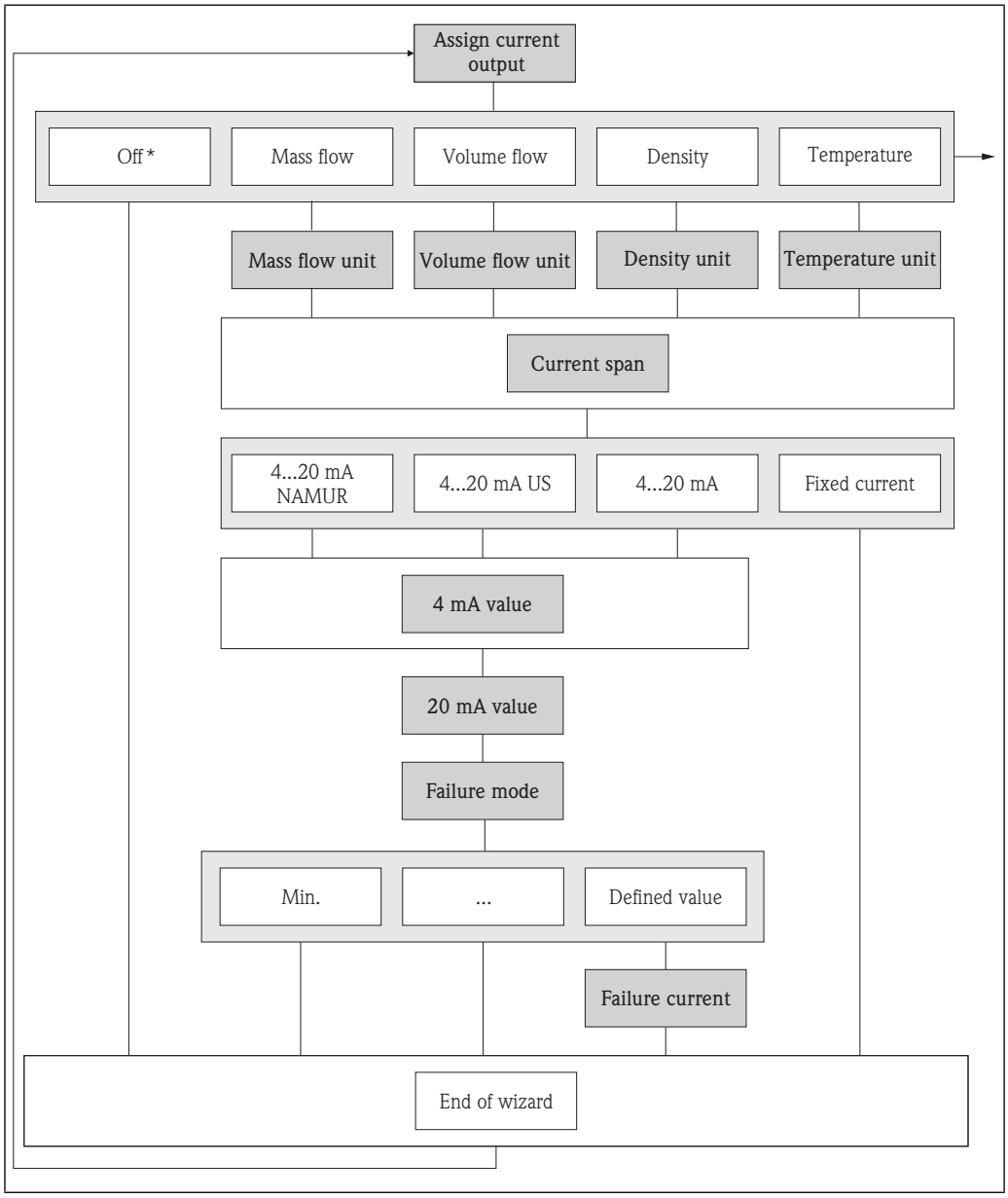
Country-dependent:
- 1.01 bar a
- 14.7 psi a

Additional information

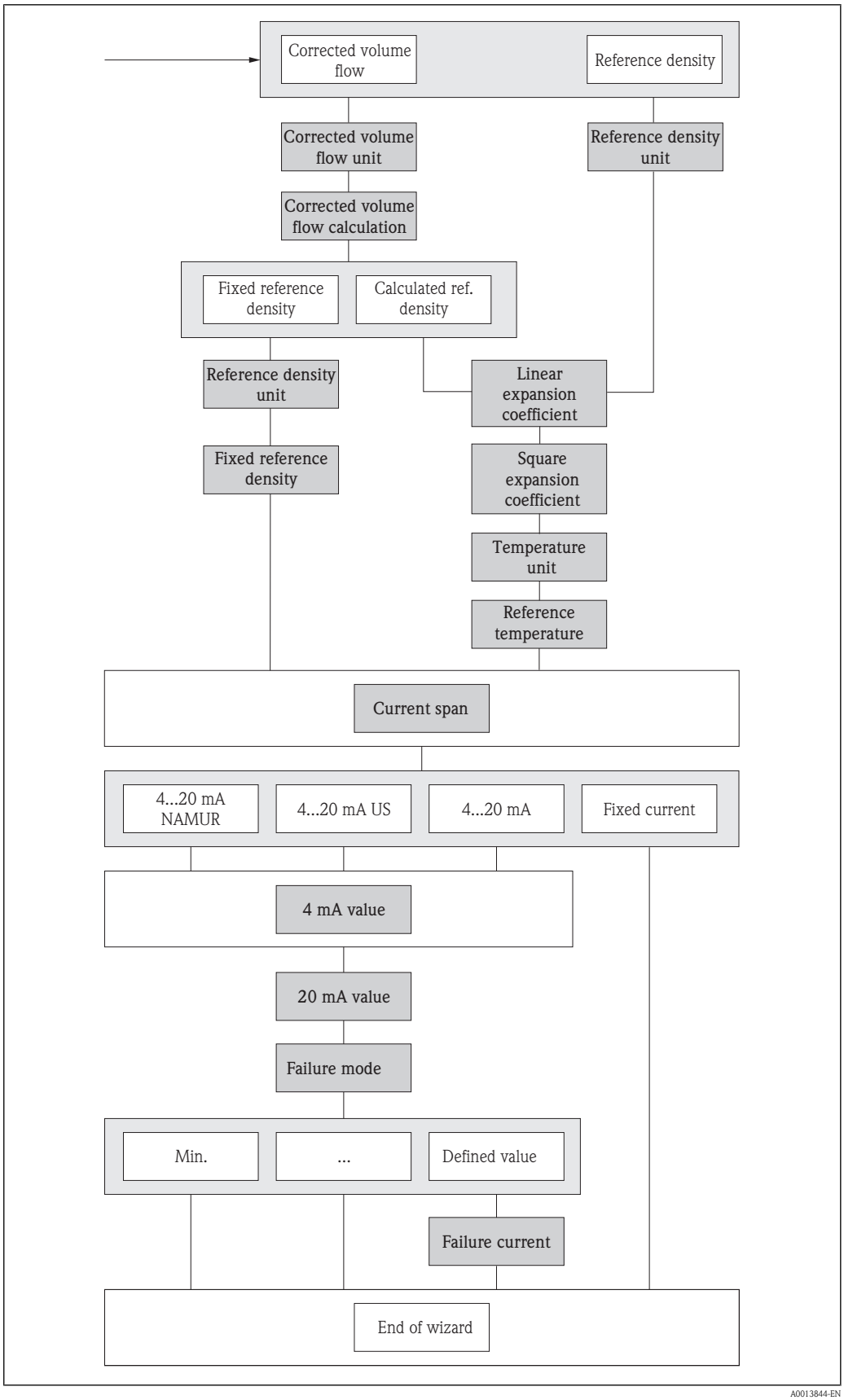
User entry

The unit is taken from the **Pressure unit** parameter (→ 72).

3.2.2 "Current output 1-2" wizard



* *Option only for current output 2*


Corrected volume flow
Reference density
Corrected volume flow unit
Reference density unit
Corrected volume flow calculation
Fixed reference density
Calculated ref. density
Reference density unit
Linear expansion coefficient
Fixed reference density
Square expansion coefficient
Temperature unit
Reference temperature
Current span
4...20 mA NAMUR
4...20 mA US
4...20 mA
Fixed current
4 mA value
20 mA value
Failure mode
Min.
...
Defined value
Failure current
End of wizard
A0013844-EN

Assign current output 1-2

Navigation
Setup → Curr. output 1 → Assign curr.
Setup → Curr. output 2 → Assign curr.

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

Options
- Off (only for current output 2)
- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature

Factory setting
- Current output 1: mass flow
- Current output 2: off

Mass flow unit

Navigation
Setup → Curr. output 1 → Mass flow unit
Setup → Curr. output 2 → Mass flow unit

Prerequisite
The **Mass flow** option is selected in the **Assign current output 1-2** parameter (→ 30).

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

The unit selected applies to the following variables:
- Current outputs (→ 28)
- Low flow cut off (→ 59)
- Simulation process variable (→ 107)

Options

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

Customer-specific units
– User mass/s
– User mass/min
– User mass/h
– User mass/d

Factory setting
Country-dependent:
- kg/h
- lb/min

Additional information

Customer-specific units

The unit for the customer-specific mass is defined in the **Mass unit** parameter(→ 67).

Options

For an explanation of the abbreviated units, please refer to the "Explanation of abbreviated units" section (→ 112)

Volume flow unit

Navigation

Setup → Curr. output 1 → Volume flow unit
Setup → Curr. output 2 → Volume flow unit

Prerequisite

The **Volume flow** option is selected in the **Assign current output 1-2** parameter (→ 30).

Description

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

The unit selected applies to the following variables:
- Current outputs (→ 28)
- Low flow cut off (→ 59)
- Simulation process variable (→ 107)

Options

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

US units
– cm^3/s, cm^3/min, cm^3/h, cm^3/d
– af/s, af/min, af/h, af/d
– cf/s, cf/min, cf/h, cf/d
– fl oz/s (us), fl oz/min (us), fl oz/h (us), fl oz/d (us)
– gal/s (us), gal/min (us), gal/h (us,) gal/d (us)
– Mgal/s (us), Mgal/min (us), Mgal/h (us), Mgal/d (us)
– bbl/s (us;liq.), bbl/min (us;liq.), bbl/h (us;liq.), bbl/d (us;liq.)
– bbl/s (us;beer), bbl/min (us;beer), bbl/h (us;beer), bbl/d (us;beer)
– bbl/s (us;oil), bbl/min (us;oil), bbl/h (us;oil), bbl/d (us;oil)
– bbl/s (us;tank), bbl/min (us;tank), bbl/h (us;tank), bbl/d (us;tank)

Imperial units
– gal/s (imp), gal/min (imp), gal/h (imp), gal/d (imp)
– Mgal/s (imp), Mgal/min (imp), Mgal/h (imp), Mgal/d (imp)
– bbl/s (imp;oil), bbl/min (imp;oil), bbl/h (imp;oil), bbl/d (imp;oil)

Customer-specific units
– User vol./s
– User vol./min
– User vol./h
– User vol./d

Factory setting

Country-dependent:
- l/h
- gal/min (us)

Additional information

Customer-specific units

The unit for the customer-specific volume is specified in the **Volume unit** parameter (→ 69).

Options

For an explanation of the abbreviated units, please refer to the "Explanation of abbreviated units" section (→ 112)

Density unit

Navigation

Setup → Curr. output 1 → Density unit
Setup → Curr. output 2 → Density unit

Prerequisite

The **Density** option is selected in the **Assign current output 1-2** parameter (→ 30).

Description

Use this function to select the unit for the density.

The unit selected applies to the following variables:
- Current outputs (→ 28)
- Low value partial filled pipe detection(→ 63)
- High value partial filled pipe detection(→ 64)
- Simulation process variable (→ 107)
- Density adjustment (in the **Expert** menu)

Options

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

US units
– lb/cf
– 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)

Customer-specific units
User dens.

Factory setting

Country-dependent
- kg/l
- lb/cf

Additional information

Options

- SD = specific density
- SG = specific gravity
  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).

For an explanation of the abbreviated units, please refer to the "Explanation of abbreviated units" section (→ 112)

Corrected volume flow unit

Navigation
Setup → Curr. output 1 → Cor.volflow unit
Setup → Curr. output 2 → Cor.volflow unit

Prerequisite
The **Corrected volume flow** option is selected in the **Assign current output 1-2** parameter (→ 30).

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

The unit selected applies to the following variables:
- Current outputs (→ 28)
- Low flow cut off (→ 59)
- Simulation process variable (→ 107)

Options
SI units
– Nl/s, Nl/min, Nl/h, Nl/d
– Nm^3/s, Nm^3/min, Nm^3/h, Nm^3/d
– Sm^3/s, Sm^3/min, Sm^3/h, Sm^3/d

- **US units**
  – Scf/s, Scf/min, Scf/h, Scf/d
  – Sgal/s (us), Sgal/min (us), Sgal/h (us), Sgal/d (us)
  – Sbbl/s (us;liq.), Sbbl/min (us;liq.), Sbbl/h (us;liq.), Sbbl/d (us;liq.)
- **Imperial units**
  Sgal/s (imp), Sgal/min (imp), Sgal/h (imp), Sgal/d (imp)

Factory setting
Country-dependent:
- Nl/h
- Scf/min

Additional information
Options

For an explanation of the abbreviated units, please refer to the "Explanation of abbreviated units" section (→ 112)

Corrected volume flow calculation

Navigation
Setup → Curr. output 1 → Corr. vol.flow.
Setup → Curr. output 2 → Corr. vol.flow.

Prerequisite
The **Corrected volume flow** option is selected in the **Assign current output 1-2** parameter (→ 30).

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

Options
- Fixed reference density
- Calculated reference density

Factory setting
Calculated reference density

Reference density unit

Navigation

Setup → Curr. output 1 → Reference density unit
Setup → Curr. output 2 → Reference density unit

Prerequisite

- The **Reference density** option is selected in the **Assign current output 1-2** parameter (→ 30).
  or
- The **Fixed reference density** option is selected in the **Corrected volume flow calculation** parameter (→ 33).

Description

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

The unit selected applies to the following variables:
- Current outputs (→ 28)
- Low value partial filled pipe detection(→ 63)
- High value partial filled pipe detection(→ 64)
- Simulation process variable (→ 107)
- Fixed reference density (→ 34)
- Density adjustment (in the **Expert** menu)

Options

SI units
– kg/Nl
– kg/Nm³

US units
– g/Scm³
– kg/Sm³
– lb/scf

Factory setting

Country-dependent:
- kg/Nl
- lb/scf

Additional information

Options

For an explanation of the abbreviated units, please refer to the "Explanation of abbreviated units" section (→ 112)

Fixed reference density

Navigation

Setup → Curr. output 1 → Fixed ref. density
Setup → Curr. output 2 → Fixed ref. density

Prerequisite

The **Fixed reference density** option is selected in the **Corrected volume flow calculation** parameter (→ 33).

Description

Use this function to enter a fixed value for the reference density. The reference density is used to calculate the corrected volume.

User entry

Max. 15-digit, positive floating-point number

Factory setting

Country-dependent:
- 1 kg/Nl
- 62.4 lb/Scf

Additional information

User entry

The unit is taken from the **Reference density unit** parameter (→ 34).

Linear expansion coefficient

Navigation

Setup → Curr. output 1 → Linear exp. coeff.
Setup → Curr. output 2 → Fixed linear exp. coeff.

Prerequisite

- The **Reference density** option is selected in the **Assign current output 1-2** parameter (→ 30).
  or
- The **Calculated reference density** option is selected in the **Corrected volume flow calculation** parameter (→ 33) .

Description

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

User entry

0 to 1 [1/K]

Factory setting

0 [1/K]

Square expansion coefficient

Navigation

Setup → Curr. output 1 → Square exp. coeff
Setup → Curr. output 2 → Square exp. coeff

Prerequisite

- The **Reference density** option is selected in the **Assign current output 1-2** parameter (→ 30).
  or
- The **Calculated reference density** option is selected in the **Corrected volume flow calculation** parameter (→ 33).

Description

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

User entry

0 to 1 [$1/K^2$]

Factory setting

0 [$1/K^2$]

Temperature unit

Navigation
Setup → Curr. output 1 → Temperature unit
Setup → Curr. output 2 → Temperature unit

Prerequisite
- The **Reference density** option is selected in the **Assign current output 1-2** parameter (→ 30).
  or
- The **Temperature** option is selected in the **Assign current output 1-2** parameter (→ 30).
  or
- The **Calculated reference density** option is selected in the **Corrected volume flow calculation** parameter (→ 33).

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

The unit selected applies to the following variables:
- Current outputs (→ 28)
- Reference temperature (→ 36)
- Simulation process variable (→ 107)

Options
- °C (Celsius)
- °F (Fahrenheit)
- K (Kelvin)
- °R (Rankine)

Factory setting
Country-dependent:
- °C (Celsius)
- °F (Fahrenheit)

Reference temperature

Navigation
Setup → Curr. output 1 → Ref. temperature
Setup → Curr. output 2 → Ref. temperature

Prerequisite
- The **Reference density** option is selected in the **Assign current output 1-2** parameter (→ 30).
  or
- The **Calculated reference density** option is selected in the **Corrected volume flow calculation** parameter (→ 33).

Description
Use this function to enter the reference temperature for calculating the reference density.

User entry
Max. 15-digit floating-point number with sign

Factory setting
Country-dependent:
- 20 °C
- 68 °F

Additional information

User entry

The unit is taken from the **Temperature unit** parameter (→ 36).

Reference density calculation

$\rho_N = \rho \cdot (1 + \alpha\,\Delta t + \beta\,\Delta t^2)$; where $\Delta t = t - t_N$

- ρ_N = reference density
- ρ = fluid density currently measured
- t = fluid temperature currently measured
- t_N = reference temperature at which the reference density is calculated (e.g. 20 °C)
- α = linear expansion coefficient of the fluid, unit = [1/K]; K = Kelvin
- β = square expansion coefficient of the fluid, unit = [1/K²]

Current span

Navigation

Setup→ Curr. output 1 → Current span
Setup→ Curr. output 2 → Current span

Description

Use this function to select the current span. The selection specifies the operational range for the process value and the upper and lower level for signal on alarm.

- In the event of an error, the current output adopts the value defined in the **Failure mode** parameter (→ 40).
- If the measured value is outside the measuring range, the device displays the diagnostics message ⚠**S441 Current output 1-2**. The measuring range is defined by the **4 mA value** and **20 mA value** parameters (→ 38) (→ 40).

Options

- 4 to 20 mA NAMUR
- 4 to 20 mA US
- 4 to 20 mA
- Fixed current

Factory setting

Country-dependent:
- 4 to 20 mA NAMUR
- 4 to 20 mA US

Additional information

Fixed current
The current value is set via the **Fixed current** parameter (in the **Expert** menu).

Information on this parameter is provided in the document "Description of Device Parameters, Version for Experts".

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

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

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

If the flow exceeds or drops below the upper or lower signal on alarm level, the device displays the diagnostics message **⚠S441 Current output 1-2**.

4 mA value

Navigation

Setup→ Curr. output 1 → 4 mA value
Setup→ Curr. output 2 → 4 mA value

Prerequisite

One of the following options is selected in the **Current span** parameter (→ 37):

- 4 to 20 mA NAMUR
- 4 to 20 mA US
- 4 to 20 mA

Description

Use this function to specify a value for the 4 mA current. Positive and negative values are permitted depending on the process variable (e.g. mass flow) assigned in the **Assign current output 1-2** parameter (→ 30). In addition, the value can be greater or smaller than the value assigned for the 20 mA current in the **20 mA value** parameter (→ 40).

User entry

Max. 15-digit floating-point number with sign

Factory setting

Country-dependent:
- 0 kg/h
- 0 lb/min

Additional information

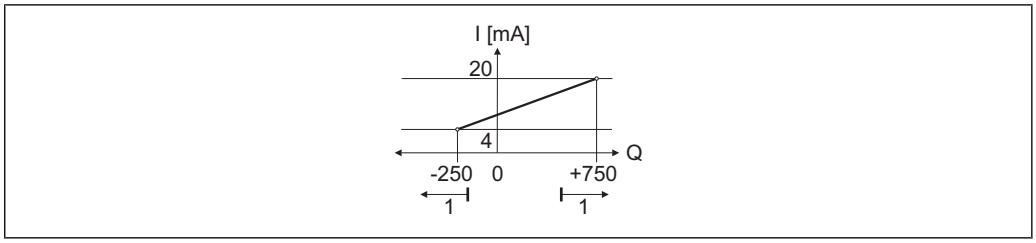
User entry
The unit depends on the process variable selected in the **Assign current output 1-2** parameter (→ 30).

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

- Current span
- Measuring mode
- Failure mode

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

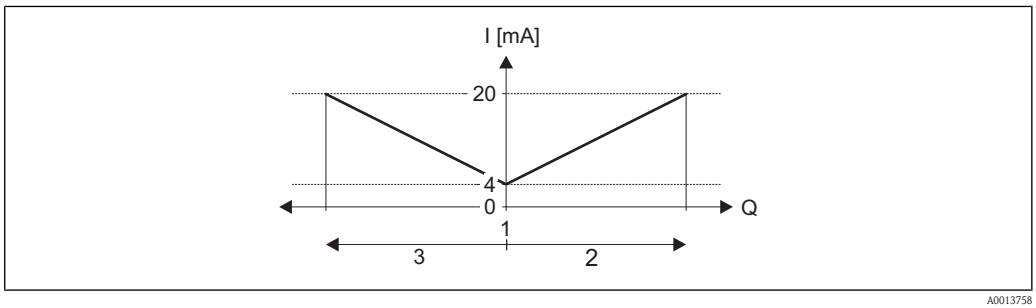
Configuration example A: Measuring mode with **Forward flow** option
- **4 mA value** parameter = not equal to zero flow (e.g. –250 kg/h)
- **20 mA value** parameter = not equal to zero flow (e.g. +750 kg/h)
- Calculated current value = 8 mA at zero flow



Q Flow
I Current
1 Measuring range is exceeded or undershot

The operational range of the measuring device is defined by entering the values for the **4 mA value** and **20 mA value** parameters. If the effective flow exceeds or drops below this operational range, the device displays the diagnostics message **⚠S441 Current output 1-2**.

Configuration example B: Measuring mode with **Forward/reverse flow** option



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

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

Configuration example C: Measuring mode with **Reverse flow compensation** option
If flow is characterized by severe fluctuations (e.g. when using reciprocating pumps), flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 s (→ 📄 51).

20 mA value

Navigation
Setup→ Curr. output 1 → 20 mA value
Setup→ Curr. output 2 → 20 mA value

Prerequisite
One of the following options is selected in the **Current span** parameter (→ 37).

- 4 to 20 mA NAMUR
- 4 to 20 mA US
- 4 to 20 mA

Description
Use this function to specify a value for the 20 mA current. Positive and negative values are permitted depending on the process variable (e.g. mass flow) assigned in the **Assign current output 1-2** parameter (→ 30). In addition, the value can be greater or smaller than the value assigned for the 4 mA current in the **4 mA value** parameter (→ 38).

User entry
Max. 15-digit floating-point number with sign

Factory setting
Depends on country and nominal diameter (→ 110)

Additional information
User entry
The unit depends on the process variable selected in the **Assign current output 1-2** parameter (→ 30).

Example
- Value assigned to4 mA = –250 kg/h
- Value assigned to20 mA = +750 kg/h
- Calculated current value = 8 mA (at zero flow)

If the **Forward/reverse flow** option is selected in the **Measuring mode current output 1-2** parameter, different algebraic signs cannot be entered for the values of the **4 mA value** and **20 mA value** parameters (→ 51). The diagnostics message **⚠S441 Current output 1-2** is displayed.

See the configuration examples for the **4 mA value** parameter (→ 38).

Failure mode

Navigation
Setup→ Curr. output 1 → Failure mode
Setup→ Curr. output 2 → Failure mode

Prerequisite
One of the following options is selected in the **Current span** parameter (→ 37):

- 4 to 20 mA NAMUR
- 4 to 20 mA US
- 4 to 20 mA

Description
Use this function to select the value of the current output in the event of an alarm condition. This setting does not affect the error response mode of other outputs and totalizers. This is specified in separate parameters.

Options

- Min.
  The current output adopts the value of the lower level for signal on alarm.
- Max.
  The current output adopts the value of the upper level for signal on alarm.
- Last valid value
  The current output is based on the last measured value that was valid before the error occurred.
- Actual value
  The current output is based on the actual measured value on the basis of the current flow measurement; the error is ignored.
- Defined value
  The current output value is defined in the **Failure current** parameter (→ 41).

Factory setting

Max.

Additional information

Min. and Max.

The signal on alarm level is specified using the **Current span** parameter(→ 37).

Failure current

Navigation

Setup → Curr. output 1 → Failure current
Setup → Curr. output 2 → Failure current

Prerequisite

The **Defined value** option is selected in the **Failure mode** parameter (→ 40).

Description

Use this function to define the value the current output adopts in an alarm condition.

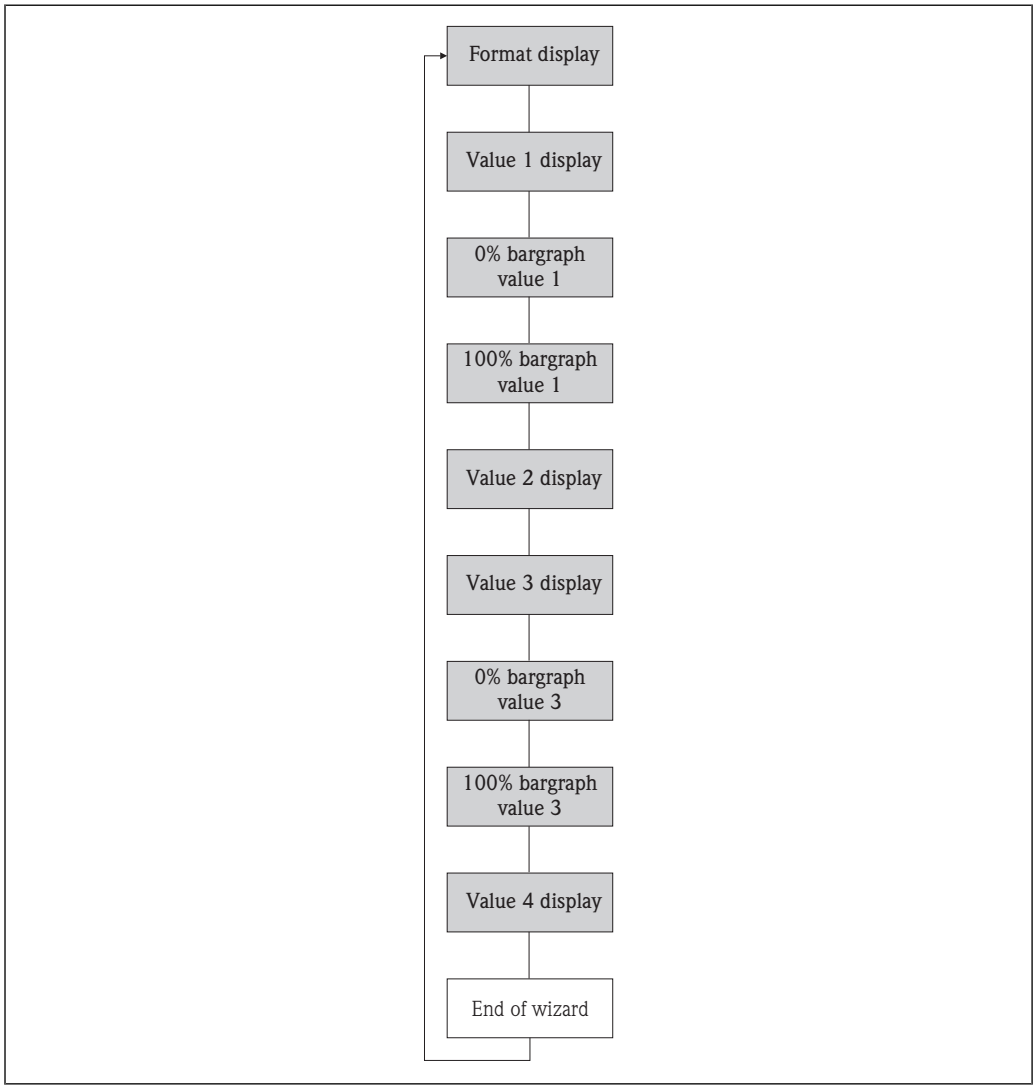
User entry

3.6 to 22.5 mA

Factory setting

22.5 mA

3.2.3 "Display" wizard



Format display

Navigation Display/operat. → Display → Format display

Description Use this function to select how the measured value is shown on the local display. The display format (size, bar graph etc.) and number of measured values displayed simultaneously (1 to 4) can be configured. This setting only applies to normal operation.

- The **Value 1 display - Value 4 display** parameters are used to specify which measured values are shown on the display and in which order (→ 44) (→ 45) (→ 46) (→ 47).
- If more measured values are specified than the display mode selected permits, the values alternate on the device display. The display time until the next change is configured using the **Display interval** parameter (→ 21).

Options

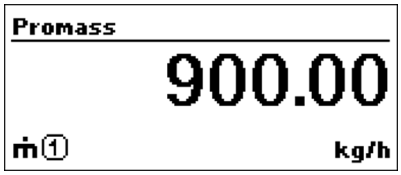
- 1 value, max. size
- 1 bargraph + 1 value
- 2 values
- 1 value large + 2 values
- 4 values

Factory setting

1 value, max. size

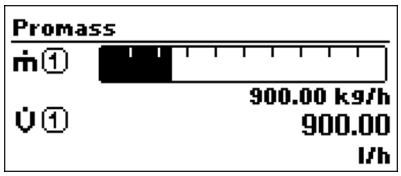
Additional information

1 value, max. size



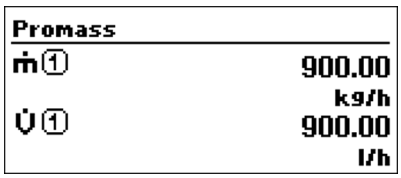
A0013099

1 bargraph + 1 value



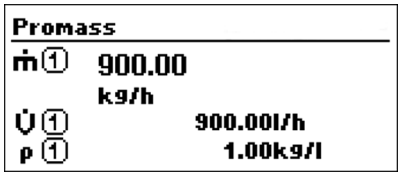
A0013098

2 values



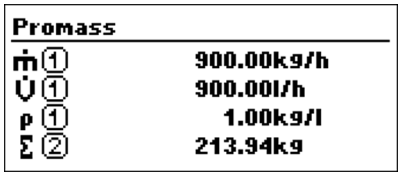
A0013100

1 value large + 2 values



A0013102

4 values



A0013103

Value 1 display

Navigation
Setup → Display → Value 1 display

Description
Use this function to select one of the measured values to be shown on the local display. If several measured values are displayed at once, the measured value selected here will be the first value to be displayed. The value is only displayed during normal operation.

The **Format display** parameter is used to specify how many measured values are displayed simultaneously and how (→ 42).

Options
- None
- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Current output 1
- Current output 2

Factory setting
Mass flow

Additional information
Options

The unit for the value is taken from the **System units** menu (→ 67).

0% bargraph value 1

Navigation
Setup → Display → 0% bargraph 1

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

The **Format display** parameter is used to specify when the measured value is to be displayed as a bar graph (→ 42)

User entry
Max. 15-digit floating-point number with sign

Factory setting
Country-dependent:
- 0 kg/h
- 0 lb/min

Additional information
User entry

The unit for the value is taken from the **System units** menu (→ 67).

100% bargraph value 1

Navigation Setup → Display → 100% bargraph 1

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

The **Format display** parameter is used to specify when the measured value is to be displayed as a bar graph (→ 42)

User entry Max. 15-digit floating-point number with sign

Factory setting Depends on country and nominal diameter (→ 110)

Additional information *User entry*

The unit for the value is taken from the **System units** menu (→ 67).

Value 2 display

Navigation Setup → Display → Value 2 display

Description Use this function to select one of the measured values to be shown on the local display. If several measured values are displayed at once, the measured value selected here will be the second value to be displayed. The value is only displayed during normal operation.

The **Format display** parameter is used to specify how many measured values are displayed simultaneously and how (→ 42).

Options

- None
- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Current output 1
- Current output 2

Factory setting None

Additional information *User entry*

The unit for the value is taken from the **System units** menu (→ 67).

Value 3 display

Navigation Setup → Display → Value 3 display

Description Use this function to select one of the measured values to be shown on the local display. If more than two measured values are displayed at once, the measured value selected here will be the third value to be displayed. The value is only displayed during normal operation.

The **Format display** parameter is used to specify how many measured values are displayed simultaneously and how (→ 42).

Options
- None
- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Current output 1
- Current output 2

Factory setting None

Additional information *User entry*

The unit for the value is taken from the **System units** menu (→ 67).

0% bargraph value 3

Navigation Setup → Display → 0% bargraph 3

Description Use this function to enter the 0% bar graph value to be shown on the display for the measured value 3.

The **Format display** parameter is used to specify when the measured value is to be displayed as a bar graph (→ 42)

User entry Max. 15-digit floating-point number with sign

Factory setting Country-dependent:
- 0 kg/h
- 0 lb/min

Additional information *User entry*

The unit for the value is taken from the **System units** menu (→ 67).

100% bargraph value 3

Navigation Setup → Display → 100% bargraph 3

Description Use this function to enter the 100% bar graph value to be shown on the display for the measured value 3.

The **Format display** parameter is used to specify when the measured value is to be displayed as a bar graph (→ 42)

User entry Max. 15-digit floating-point number with sign

Factory setting Depends on country and nominal diameter (→ 110)

Additional information *User entry*

The unit for the value is taken from the **System units** menu (→ 67).

Value 4 display

Navigation Setup → Display → Value 4 display

Description Use this function to select one of the measured values to be shown on the local display. If four measured values are displayed at once, the measured value selected here will be the fourth value to be displayed. The value is only displayed during normal operation.

The **Format display** parameter is used to specify how many measured values are displayed simultaneously and how (→ 42).

Options

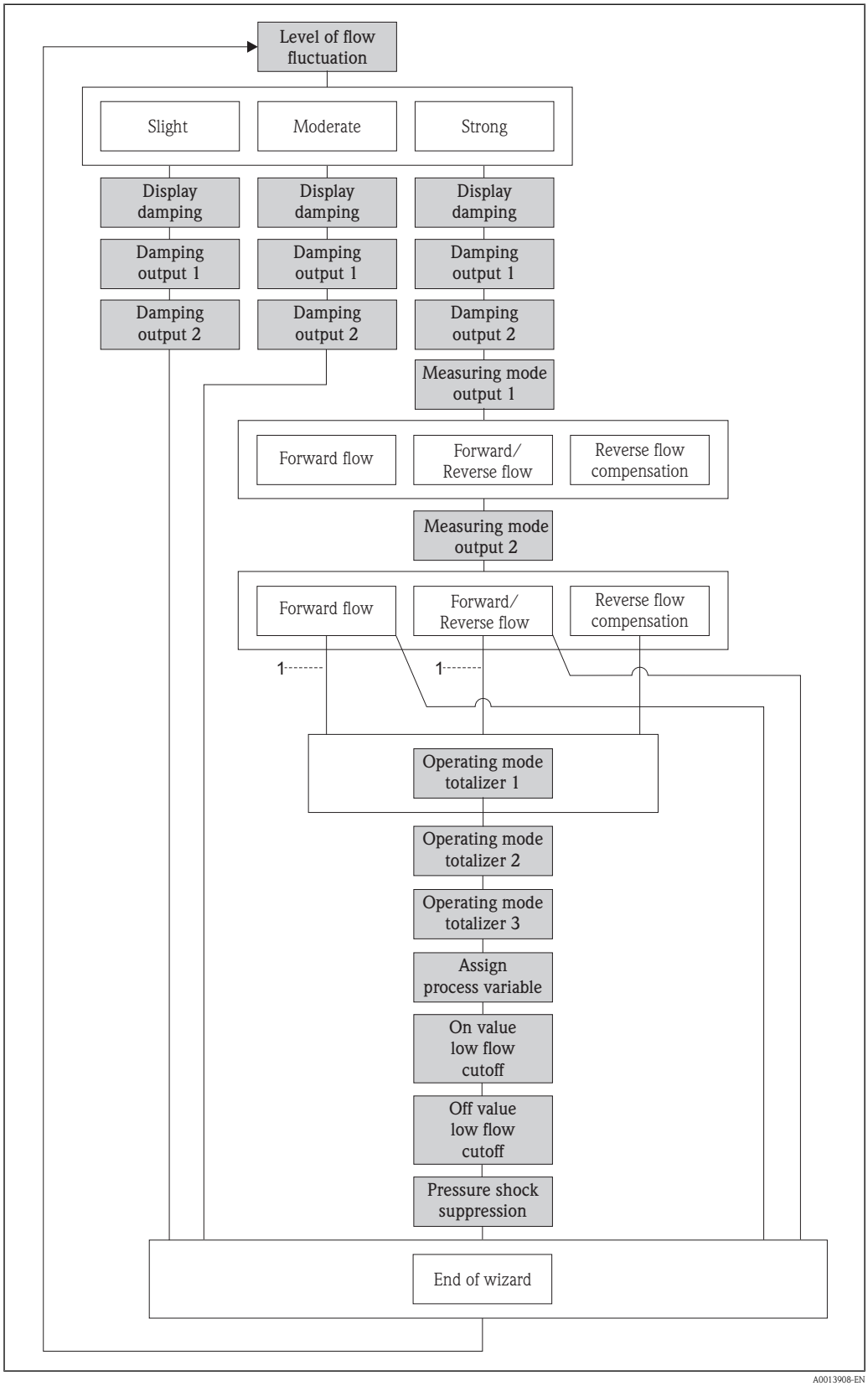
- None
- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Current output 1
- Current output 2

Factory setting None

Additional information *Options*

The unit for the value is taken from the **System units** menu (→ 67).

3.2.4 "Output conditioning" wizard



1 The "Reverse flow compensation" option was selected in the "Measuring mode output 1" parameter

Level of flow fluctuation

Navigation

Setup → Output cond. → Fluctuat. level

Description

This function indicates the extent measured values fluctuate due to changes in the process. On the basis of the option selected here, a recommended value range is displayed when entering the reaction time (damping) of the local display or the outputs. This recommended range only appears when configuring in the **Output cond.** wizard.
The setting does not affect flow damping or density damping.

Recommendation
It is always advisable to work through the **Output conditioning** wizard if there is any uncertainty about the exact flow characteristic.

Options

- Slight
- Moderate
- Strong

Factory setting

Moderate

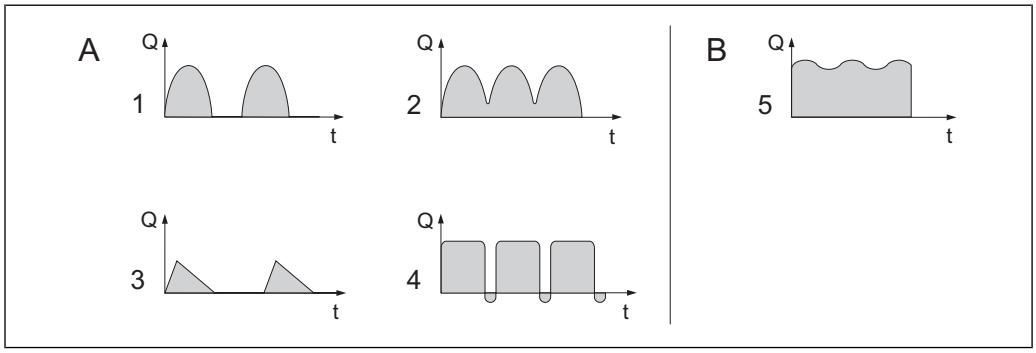
Additional information

Slight
This setting is suitable for stable process conditions with minimum measured value fluctuation.

Moderate
This setting is suitable for situations in which the measured value fluctuations are minor to moderate, e.g. if using geared pumps, tri-cylinder pumps or multicylinder pumps. See example B
(→ 1, 50)

Strong (reverse flow compensation)
This setting is suitable for situations in which the measured values fluctuate to a large extent, e.g. certain types of pump such as reciprocating, peristaltic and cam-type pumps, for example, create a flow characterized by severe periodic fluctuations. Negative flows can occur with pumps of these types on account of the closing volume of the valves or valve leaks. See example A
(→ 1, 50)
The **Strong** menu guides you systematically through the setup procedure for all the device functions that have to be configured for reverse flow compensation. Once the functions have been configured in the Output conditioning "Strong" menu, reverse flow fluctuations of this nature can be compensated over the entire flow range ensuring correct measurement.

Example of flow characteristics for various types of pump



1 Influence of pumps on flow

Q Flow
t Time
A High pulsation flow
B Low pulsation flow
1 1-cylinder cam-type
2 2-cylinder cam-type
3 Magnetic pump
4 Peristaltic pump, flexible connecting cable
5 Multicylinder reciprocating pump

Display damping

Navigation Setup → Output cond. → Display damping

Prerequisite Local display available.

Description Use this function to set the reaction time of the local display to fluctuations in the measured value caused by process conditions. A time constant is entered for this purpose: if a low time constant is entered, the display reacts very quickly to fluctuating measured variables. If a high time constant is entered, the display reaction is damped.

The recommended value range for the time constant is displayed in the lower part of the display. This range is configured using the **Level of flow fluctuation** parameter (→ 49).

User entry 0 to 999 s

Factory setting 0 s

Damping output 1-2

Navigation

Setup→ Output cond. → Damping out 1
Setup→ Output cond. → Damping out 2

Prerequisite

One of the following options is selected in the **Assign current output 1-2** parameter(→ 30):

- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature

Description

Use this function to set the reaction time of the current output signal to fluctuations in the measured value caused by process conditions. A time constant is entered for this purpose: if a low time constant is entered, the current output reacts very quickly to fluctuating measured variables. If a high time constant is entered, the current output reaction is damped.

The recommended value range for the time constant is displayed in the lower part of the display. This range is configured using the **Level of flow fluctuation** parameter (→ 49).

User entry

0 to 999 s

Factory setting

1 s

Measuring mode output 1-2

Navigation

Setup → Output cond. → Mode output 1
Setup → Output cond. → Mode output 2

Prerequisite

- The **Strong** option is selected in the **Level of flow fluctuation** parameter (→ 49).
- One of the following options is selected in the **Assign current output 1-2** parameter (→ 30):
  - Mass flow
  - Volume flow
  - Corrected volume flow
  - Density
  - Reference density
  - Temperature

Description

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

The process variable that is assigned to the current output via the **Assign current output 1-2** parameter is displayed under the parameter(→ 30).

Options

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

Factory setting

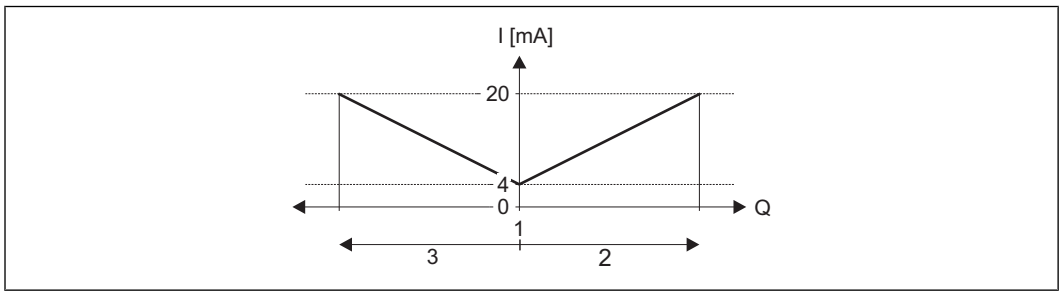
Forward flow

Additional information

Forward flow
The current output signal is proportional to the process variable assigned. The measuring range is defined by the values that are assigned to the 4 mA and 20 mA current value. The flow components outside the scaled measuring range are taken into account for signal output as follows:

Both values are defined as not equal to the zero flow (e.g. 4 mA current value = –5 kg/h, 20 mA current value = 10 kg/h):
If the effective flow exceeds or drops below this measuring range, the device displays the diagnostics message ⚠**S441 Current output 1-2**.

Forward/reverse flow



A0013758

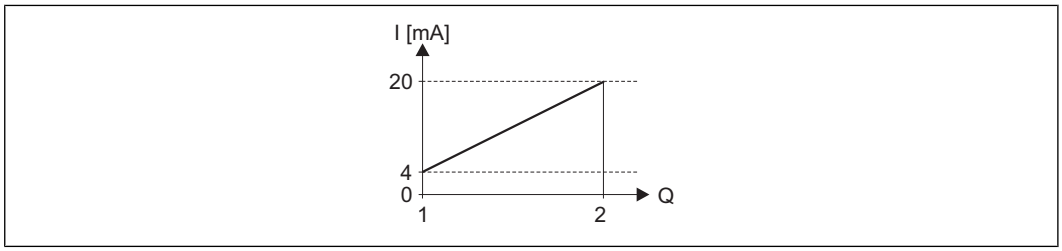
Q Flow
I Current
1 Value assigned to 4 mA current
2 Forward flow
3 Reverse flow

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

Reverse flow compensation
If flow is characterized by severe fluctuations (e.g. when using reciprocating pumps), flow components outside the measuring range are buffered, balanced and output after a maximum delay of 60 s.
If the buffered data cannot be processed within approx. 60 s, the diagnostics message ⚠**S441 Current output 1-2** is displayed. Under certain plant conditions, flow values can aggregate in the buffer, for example in the case of prolonged and unwanted fluid reverse flow. However, this buffer is reset in all relevant programming adjustments which affect the current output.

Examples of how the current output behaves

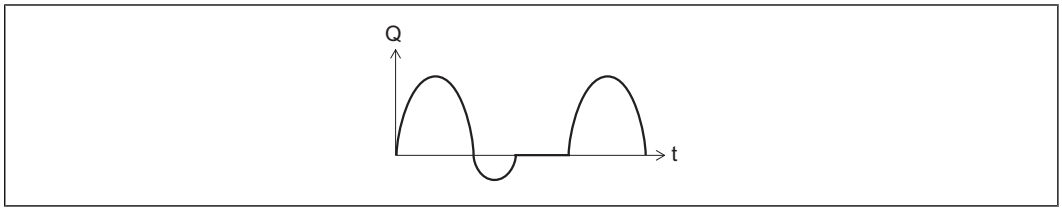
Example 1 Defined measuring range: lower range value and upper range value with the **same** sign



2 Measuring range

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

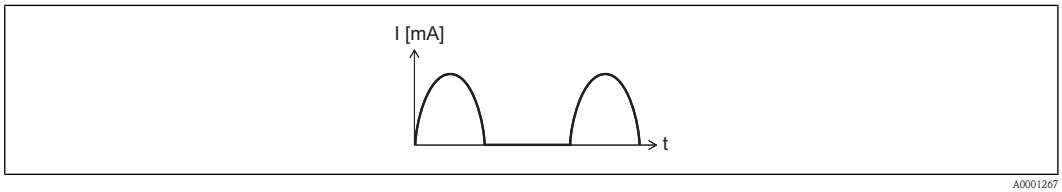
With the following flow response



3 Flow response

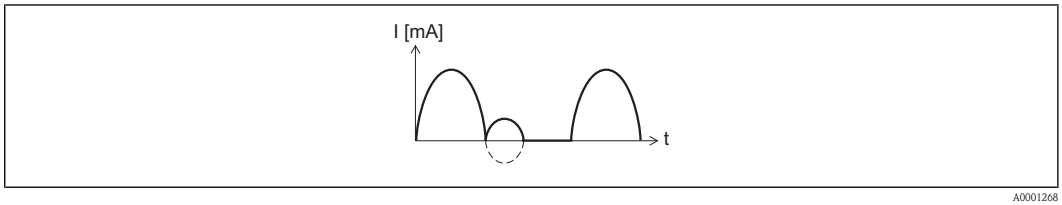
Q Flow
t Time

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



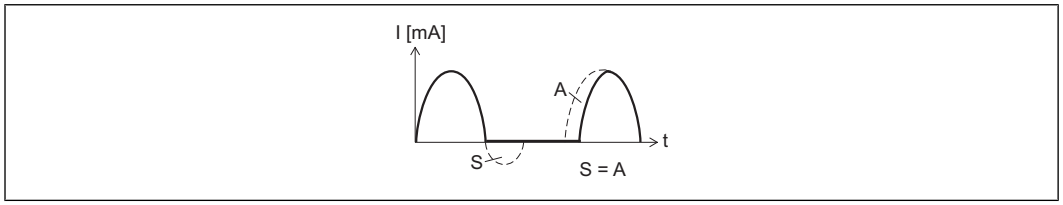
I Current
t Time

With the **Forward/reverse flow** option:
The current output signal is independent of the direction of flow.



I Current
t Time

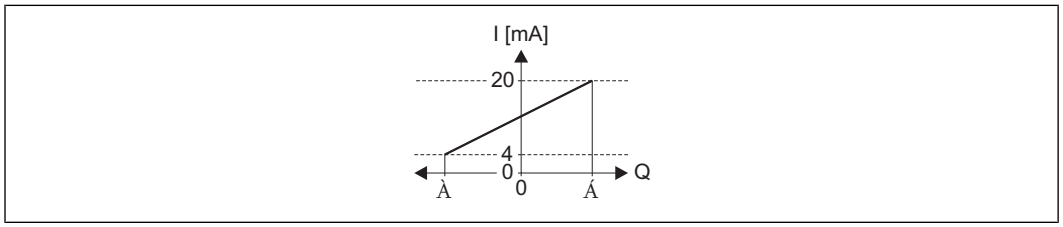
With the **Reverse flow compensation** option:
Flow components outside the span are buffered, balanced and output after a maximum delay of 60 s.



A0001269

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

Example 2 Defined measuring range: lower range value and upper range value with **different** signs

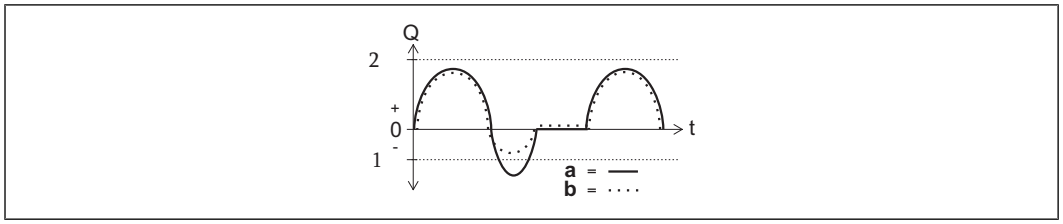


A0001272

4 Measuring range

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

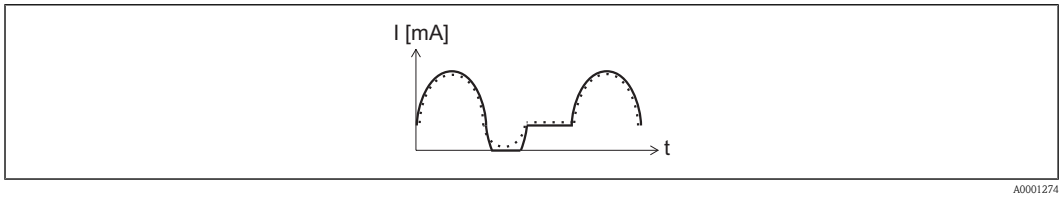
With flow a (—) outside, b (- -) inside the measuring range



A0001273

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

With the **Forward flow** option:
- a (—): The flow components outside the scaled measuring range cannot be taken into account for signal output. The diagnostics message ⚠**S441 Current output 1-2** is displayed.
- b (····): The current output signal is proportional to the process variable assigned.

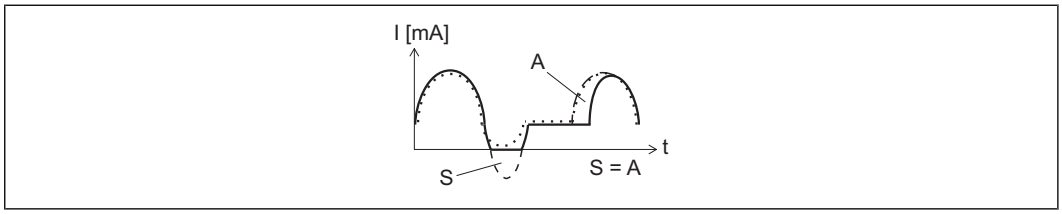


A0001274

I Current
t Time

With the **Forward/reverse flow** option:
This option cannot be selected here since the values for the **4 mA value** and **20 mA value** parameters have different algebraic signs.

With the **Reverse flow compensation** option:
Flow components outside the span are buffered, balanced and output after a maximum delay of 60 s.



A0001275

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

Operation mode totalizer 1-3

Navigation
Setup → Output cond. → Op. mode tot. 1
Setup → Output cond. → Op. mode tot. 2
Setup → Output cond. → Op. mode tot. 3

Prerequisite
- The **Reverse flow compensation** option is selected in the **Measuring mode output 1** parameter (→ 51).
  or
- The **Reverse flow compensation** option is selected in the **Measuring mode output 2** parameter (→ 51).

Description
Use this function to define how the totalizer totalizes the flow.

Options
- Net flow total
  Positive and negative flow values are totalized and balanced against one another. Net flow in the flow direction is registered.
- Forward flow total
  Only the flow in the forward flow direction is totalized.
- Reverse flow total
  Only the flow against the forward flow direction is totalized (= reverse flow total).

Factory setting
Net flow total

Assign process variable

Navigation Setup → Output cond. → Assign variable

Prerequisite
- The **Reverse flow compensation** option is selected in the **Measuring mode output 1** parameter (→ 51).
  or
- The **Reverse flow compensation** option is selected in the **Measuring mode output 2** parameter (→ 51).

Description Use this function to select a process variable for low flow cut off.

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

Factory setting Mass flow

On value low flow cut off

Navigation Setup → Output cond. → On value

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 56):
- Mass flow
- Volume flow
- Corrected volume flow

Description Use this function to enter a switch-on value for low flow cut off. Low flow cut off is active if the value entered is not equal to 0 (→ 57).

User entry Max. 15-digit, positive floating-point number

Factory setting For liquids: depends on country and nominal diameter (→ 110)

Additional information *User entry*

The unit depends on the process variable selected in the **Assign process variable** parameter (→ 56).

Off value low flow cut off

Navigation Setup → Output cond. → Off value

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 56):

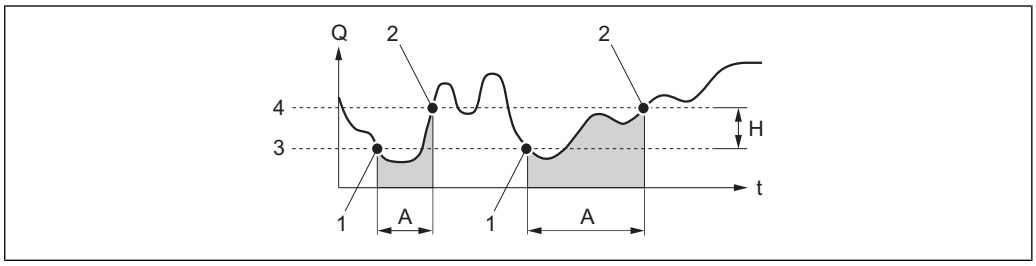
- Mass flow
- Volume flow
- Corrected volume flow

Description Use this function to enter a switch-off value for low flow cut off. The off value is entered as a positive hysteresis from the on value(→ 56).

Options 0 to 100 %

Factory setting 50 %

Additional information *Example*



A0012887

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

Pressure shock suppression

Navigation Setup → Output cond. → Pres. shock sup.

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 56):

- Mass flow
- Volume flow
- Corrected volume flow

Description

Use this function to enter the time interval for signal suppression (= active pressure shock suppression).
The closure of a valve can cause brief but severe movements of the fluid in the piping system, movements which the measuring system registers. The pulses totaled in this way result in a totalizer reading error, particularly in the case of batching processes.

Activation of the shock suppression

- Prerequisite: the flow rate is less than the on value for low flow cut off
- Output values
  - Current output: outputs the current corresponding to zero flow.
  - Flow displayed: 0
  - Totalizer: the totalizers are pegged at the last correct value

Deactivation of the shock suppression

- Prerequisite: the time interval set in this function has elapsed.
- If the flow exceeds the switch-off point of the low flow cut off, the actual flow value is then displayed and output.

User entry

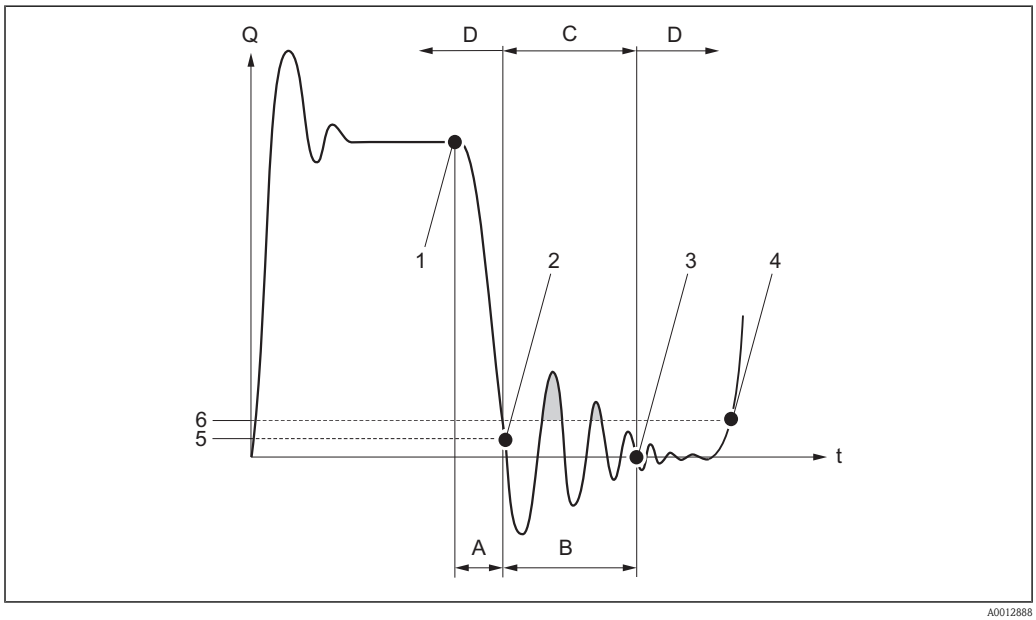
0 to 100 s

Factory setting

0 s

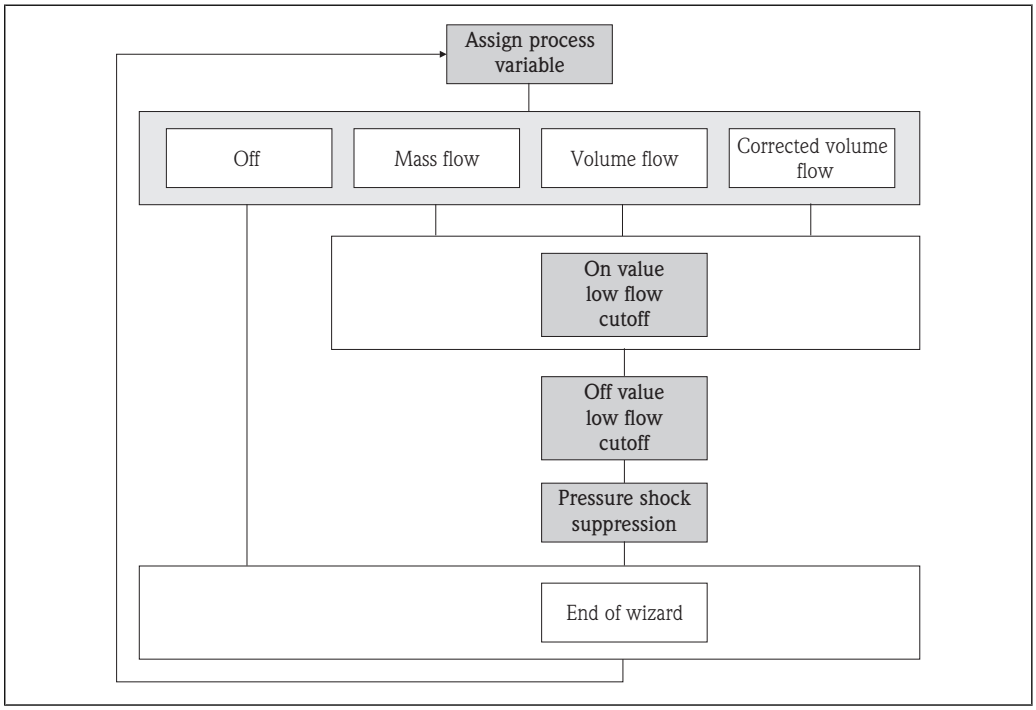
Additional information

Example



Q Flow
t Time
A After run
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

3.2.5 "Low flow cut off" wizard



Assign process variable

Navigation Setup → Low flow cut off → Assign variable

Description Use this function to select a process variable for low flow cut off.

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

Factory setting Mass flow

On value low flow cut off

Navigation Setup → Low flow cut off → On value

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 59):
- Mass flow
- Volume flow
- Corrected volume flow

Description Use this function to enter a switch-on value for low flow cut off. Low flow cut off is active if the value entered is not equal to 0 (→ 57).

User entry Max. 15-digit, positive floating-point number

Factory setting For liquids: depends on country and nominal diameter (→ 110)

Additional information *User entry*

The unit depends on the process variable selected in the **Assign process variable** parameter (→ 59).

Off value low flow cut off

Navigation Setup → Low flow cut off → Off value

Prerequisite One of the following options is selected in the **Assign process variable** parameter (→ 59):

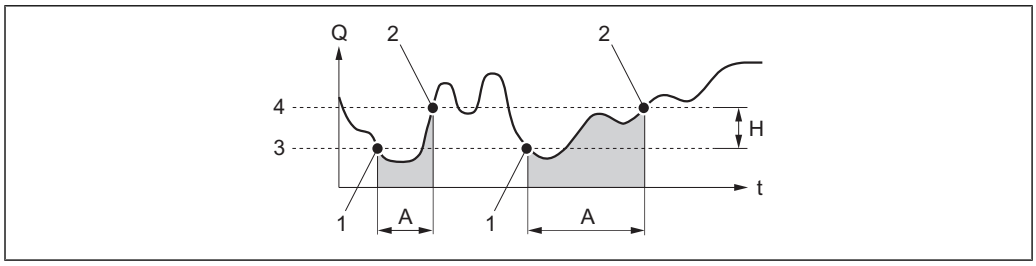
- Mass flow
- Volume flow
- Corrected volume flow

Description Use this function to enter a switch-off value for low flow cut off. The off value is entered as a positive hysteresis from the on value (→ 59).

Options 0 to 100 %

Factory setting 50 %

Additional information *Example*



A0012887

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

Pressure shock suppression

Navigation

Setup → Low flow cut off → Pres. shock sup.

Prerequisite

One of the following options is selected in the **Assign process variable** parameter (→ 59):

- Mass flow
- Volume flow
- Corrected volume flow

Description

Use this function to enter the time interval for signal suppression (= active pressure shock suppression).
The closure of a valve can cause brief but severe movements of the fluid in the piping system, movements which the measuring system registers. The pulses totaled in this way result in a totalizer reading error, particularly in the case of batching processes.

Activation of the shock suppression

- Prerequisite: the flow rate is less than the on value for low flow cut off
- Output values
  - Current output: outputs the current corresponding to zero flow.
  - Flow displayed: 0
  - Totalizer: the totalizers are pegged at the last correct value

Deactivation of the shock suppression

- Prerequisite: the time interval set in this function has elapsed.
- If the flow exceeds the switch-off point of the low flow cut off, the actual flow value is then displayed and output.

User entry

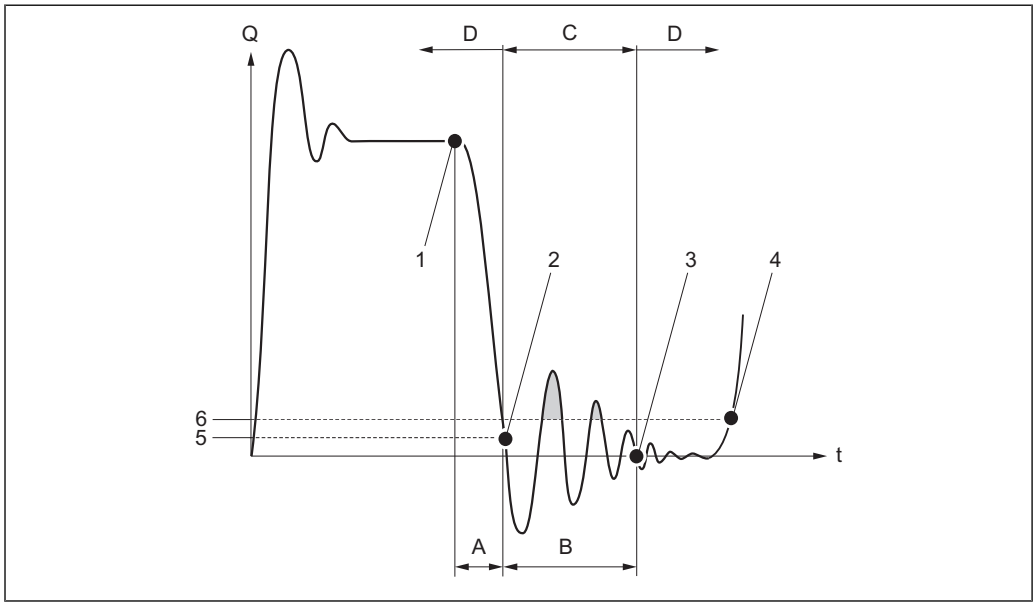
0 to 100 s

Factory setting

0 s

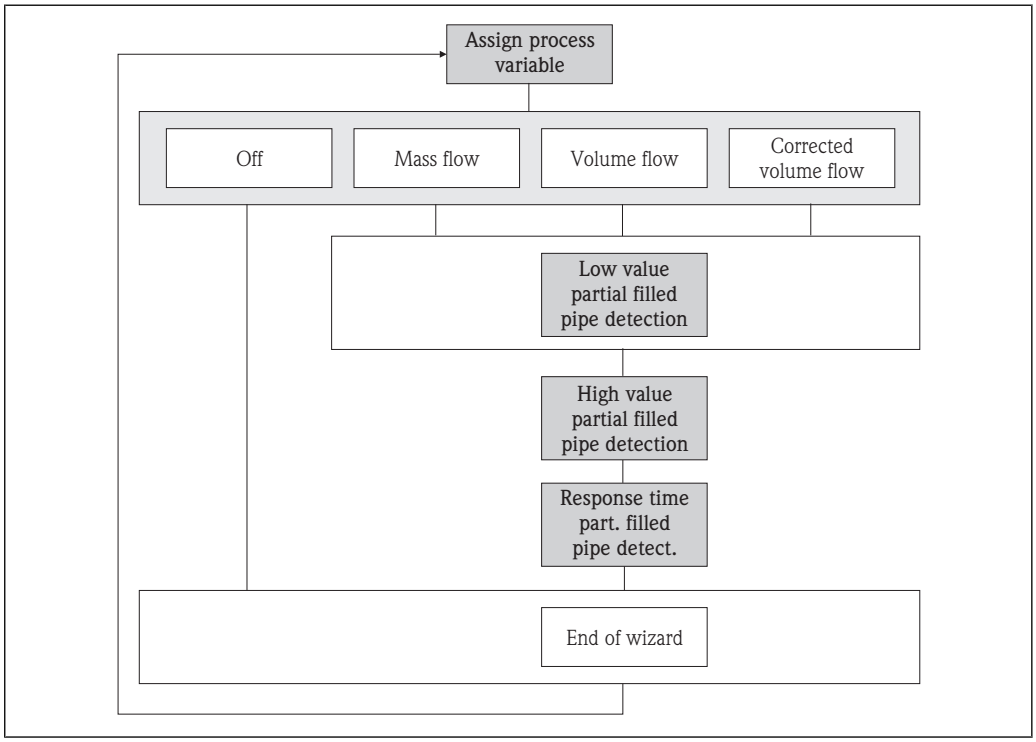
Additional information

Example



Q Flow
t Time
A After run
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

3.2.6 "Partial filled pipe detection" wizard



Assign process variable

Navigation Setup → Partial pipe det.→ Assign variable

Description Use this function to select a process variable to detect empty or partially filled pipes. In the event of gas measurement: Deactivate empty pipe detection on account of the low gas density.

Options
- Off
- Density
- Reference density

Factory setting Density

Low value partial filled pipe detection

Navigation Setup → Partial pipe det. → Low value

Prerequisite The **Density** or **Reference density** option is selected in the **Assign process variable** parameter (→ 63).

Description Use this function to enter a lower limit value to activate detection of an empty or partially filled pipe. If the measured density drops below this value, partial filled pipe detection is activated.

User entry Max. 15-digit, positive floating-point number

Factory setting

Country-dependent:
- 0.2 kg/l
- 12.5 lb/cf

Additional information

User entry
The lower value must be smaller than the higher value which is defined in the **High value partial filled pipe detection** parameter (→ 64).

The unit depends on the process variable selected in the **Assign process variable** parameter (→ 63).

High value partial filled pipe detection

Navigation

Setup → Partial pipe det. → High value

Prerequisite

The **Density** or **Reference density** option is selected in the **Assign process variable** parameter (→ 63).

Description

Use this function to enter an upper limit value to activate detection of an empty or partially filled pipe. If the measured density exceeds this value, partial filled pipe detection is activated.

User entry

Max. 15-digit, positive floating-point number

Factory setting

Country-dependent:
- 6 kg/l
- 374.6 lb/cf

Additional information

User entry
The higher value must be greater than the lower value which is defined in the **Low value partial filled pipe detection** parameter (→ 63).

The unit depends on the process variable selected in the **Assign process variable** parameter (→ 63).

Response time part. filled pipe detect.

Navigation

Setup → Partial pipe det. → Response time

Description

Use this function to enter the time interval until the diagnostics message ⚠**S862 Partly filled pipe detection** is displayed for an empty or partially filled pipe.

User entry

0 to 100 s

Factory setting

1 s

3.2.7 Advanced setup

Enter access code

Navigation Setup → Advanced setup → Ent. access code

Function Use this function to enable write-protected parameters via local operation. For local operation, the user-specific access code defined in the **Define access code** parameter is entered (→ 65). If an incorrect access code is entered, the user obtains the access rights of the "Operator" role.
The write protection affects all parameters marked with the -symbol in the document. On the local display, the -symbol in front of a parameter indicates that the parameter is write-protected. If no key is pressed for 10 minutes in the navigation and editing mode, the device automatically locks the write-protected parameters. If the user goes from the navigation and editing mode back to the measured value display mode, the device automatically locks the write-protected parameters after 60 s.

Please contact your Endress+Hauser Sales Center if you lose your access code

User entry 1 to 9999

Define access code

Navigation Setup → Advanced setup → Def. access code

Description Use this function to restrict write-access to parameters to protect the configuration of the device against unintentional changes via the local display. A user-specific access code is specified for this purpose. For operating tools, on the other hand, write access is controlled via access authorization management in the operating tool.
The write protection affects all parameters marked with the -symbol in the document. On the local display, the -symbol in front of a parameter indicates that the parameter is write-protected.

Once the access code has been defined, write-protected parameters can only be modified if the access code is entered in the **Enter access code** parameter (→ 65).

Changing the access code
- Enter the current access code in the **Define access code** parameter and confirm.
- Define the new access code.

Please contact your Endress+Hauser Sales Center if you lose your access code

User entry 1 to 9999

Factory setting 0

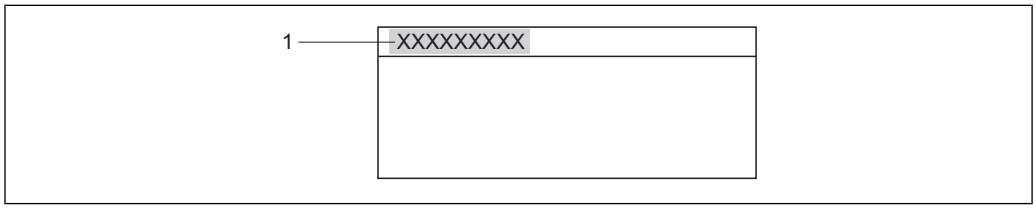
Additional information *User entry*
A message is displayed if the access code is not in the input range.

Factory setting
If the factory setting is not changed or0 is defined as the access code, the parameters are not write-protected and the device configuration can be modified. The user is logged on in the role of *Maintenance*.

Device tag

Navigation Setup → Advanced setup → Device tag

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



1 Header text

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

Factory setting Promass

Additional information *User entry*
The number of characters displayed depends on the characters used.

"Advanced setup" menu: "System units" submenu

Mass flow unit

Navigation

Setup → Advanced setup → System units → Mass flow unit

Description

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

The unit selected applies to the following variables:
- Current outputs (→ 28)
- Low flow cut off (→ 59)
- Simulation process variable (→ 107)

Options

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

Customer-specific units
– User mass/s
– User mass/min
– User mass/h
– User mass/d

Factory setting

Country-dependent:
- kg/h
- lb/min

Additional information

Customer-specific units

The unit for the customer-specific mass is defined in the **Mass unit** parameter (→ 67).

Options

For an explanation of the abbreviated units, please refer to the "Explanation of abbreviated units" section (→ 112)

Mass unit

Navigation

Setup → Advanced setup → System units → Mass unit

Description

Use this function to select the unit for the mass.

Options

SI units
g, kg, t

US units
oz, lb, STon

Customer-specific unit
User mass

Factory setting

Country-dependent:
- kg
- lb

Additional information

Customer-specific unit

The unit is taken from the **Mass flow unit** parameter and displayed in the options listed (→ 67).

Volume flow unit

Navigation

Setup → Advanced setup → System units → Volume flow unit

Description

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

The unit selected applies to the following variables:
- Current outputs (→ 28)
- Low flow cut off (→ 59)
- Simulation process variable (→ 107)

Options

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

US units
– af/s, af/min, af/h, af/d
– cf/s, cf/min, cf/h, cf/d
– fl oz/s (us), fl oz/min (us), fl oz/h (us), fl oz/d (us)
– gal/s (us), gal/min (us), gal/h (us,) gal/d (us)
– Mgal/s (us), Mgal/min (us), Mgal/h (us), Mgal/d (us)
– bbl/s (us;liq.), bbl/min (us;liq.), bbl/h (us;liq.), bbl/d (us;liq.)
– bbl/s (us;beer), bbl/min (us;beer), bbl/h (us;beer), bbl/d (us;beer)
– bbl/s (us;oil), bbl/min (us;oil), bbl/h (us;oil), bbl/d (us;oil)
– bbl/s (us;tank), bbl/min (us;tank), bbl/h (us;tank), bbl/d (us;tank)

Imperial units
– gal/s (imp), gal/min (imp), gal/h (imp), gal/d (imp)
– Mgal/s (imp), Mgal/min (imp), Mgal/h (imp), Mgal/d (imp)
– bbl/s (imp;oil), bbl/min (imp;oil), bbl/h (imp;oil), bbl/d (imp;oil)

Customer-specific units
– User vol./s
– User vol./min
– User vol./h
– User vol./d

Factory setting

Country-dependent:
- l/h
- gal/min (us)

Additional information

Customer-specific units

The unit for the customer-specific volume is specified in the **Volume unit** parameter (→ 69).

Options

For an explanation of the abbreviated units, please refer to the "Explanation of abbreviated units" section (→ 112)

Volume unit

Navigation

Setup → Advanced setup → System units → Volume unit

Description

Use this function to select the unit for the volume.

Options

SI units
cm^3, dm^3, m^3, ml, l

US units
- af, cf
- fl oz (us), gal (us), Mgal (us)
- bbl (us;liq.), bbl (us;beer), bbl (us;oil), bbl (us;tank)

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

Customer-specific unit
User vol.

Factory setting

Country-dependent
- l
- gal (us)

Additional information

Customer-specific unit

The unit entered is taken from the **Volume flow unit** parameter and displayed in the options listed (→ 68).

Corrected volume flow unit

Navigation

Setup → Advanced setup → System units → Cor. vol. flow unit

Description

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

The unit selected applies to the following variables:
- Current outputs (→ 28)
- Low flow cut off (→ 59)
- Simulation process variable (→ 107)

Options

SI units
– Nl/s, Nl/min, Nl/h, Nl/d
– Nm^3/s, Nm^3/min, Nm^3/h, Nm^3/d
– Sm^3/s, Sm^3/min, Sm^3/h, Sm^3/d

US units
– Scf/s, Scf/min, Scf/h, Scf/d
– Sgal/s (us), Sgal/min (us), Sgal/h (us), Sgal/d (us)
– Sbbl/s (us;liq.), Sbbl/min (us;liq.), Sbbl/h (us;liq.), Sbbl/d (us;liq.)

Imperial units
Sgal/s (imp), Sgal/min (imp), Sgal/h (imp), Sgal/d (imp)

Factory setting

Country-dependent:
- Nl/h
- Scf/min

Additional information

Options

For an explanation of the abbreviated units, please refer to the "Explanation of abbreviated units" section (→ 112).

Corrected volume unit

Navigation

Setup → Advanced setup → System units → Corr. vol. unit

Description

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

Options

SI units
Nl, Nm^3

US units
Sl, Sm^3, Scf, Sgal (us), Sbbl (us;liq.)

Imperial units
Sgal (imp)

Factory setting

Country-dependent:
- Nl
- Scf

Density unit

Navigation

Setup → Advanced setup → System units → Density unit

Description

Use this function to select the unit for the density.

The unit selected applies to the following variables:
- Current outputs
- Low value partial filled pipe detection
- High value partial filled pipe detection
- Simulation process variable (→ 107)
- Density adjustment (in the **Expert** menu)

Options

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

US units
– lb/cf
– 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)

Customer-specific units
User dens.

Factory setting

Country-dependent
- kg/l
- lb/cf

Additional information

Options

- SD = specific density
- SG = specific gravity
  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).

For an explanation of the abbreviated units, please refer to the "Explanation of abbreviated units" section (→ 112).

Reference density unit

Navigation

Setup → Advanced setup → System units → Ref. dens. unit

Description

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

The unit selected applies to the following variables:
- Current outputs (→ 32)
- Low value partial filled pipe detection (→ 63)
- High value partial filled pipe detection (→ 64)
- Simulation process variable (→ 107)
- Fixed reference density (→ 34)
- Density adjustment (in the **Expert** menu)

Options

SI units
kg/Nm³, kg/Nl

US units
– g/Scm³
– kg/Sm³
– lb/scf

Factory setting

Country-dependent:
- kg/Nl
- lb/scf

Additional information *Options*

For an explanation of the abbreviated units, please refer to the "Explanation of abbreviated units" section (→ 112).

Temperature unit

Navigation Setup → Advanced setup → System units → Temperature unit

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

The unit selected also applies to the following variables:
- Current outputs (→ 28)
- Reference temperature (→ 36)
- Simulation process variable (→ 107)

Options
- °C (Celsius)
- °F (Fahrenheit)
- K (Kelvin)
- °R (Rankine)

Factory setting Country-dependent:
- °C (Celsius)
- °F (Fahrenheit)

Length unit

Navigation Setup → Advanced setup → System units → Length unit

Description Use this function to select the unit of length for the nominal diameter.

Options

SI units
mm, m

US units
in, ft

Factory setting Country-dependent:
- mm
- in

Pressure unit

Navigation Setup → Advanced setup → System units → Pressure unit

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

The unit selected also applies to the **Pressure value** parameter (→ 26).

Options

SI units
– Pa a, kPa a, Mpa a, bar a
– Pa g, kPa g, Mpa g, bar g

US units
psi a, psi g

Factory setting

Country-dependent:
- bar a
- psi a

"Advanced setup" menu: "Sensor adjustment" submenu

Installation direction

Navigation Setup → Advanced setup → Sensor adjustment → Install. direct.

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

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

Options
- Flow in arrow direction
- Flow against arrow direction

Factory setting Flow in arrow direction

Zero point adjustment control

Navigation Setup → Advanced setup → Sensor adjustm. → Zero point adj. → Zero point adj.

Description This function enables a zero point adjustment to be automatically carried out. The message **Busy** appears below the parameter during the adjustment process. The new zero point value determined by the measuring device is displayed in the **Zero point** parameter.
If the sensor is defective or flow is present, the message **Zero point adjust failure** appears on the display. This event message is also entered in the event log(→ 94).

- The **Zero point** parameter is described in the document "Description of Device Parameters, Expert Version".
- Information on the procedure for performing zero point adjustment is provided in the Operating Instructions for the device.

Options
- Cancel
- Start

Factory setting Cancel

"Advanced setup" menu: "Totalizer 1-3" submenu

Assign process variable

Navigation

Setup → Advanced setup → Totalizer 1 → Assign variable
Setup → Advanced setup → Totalizer 2 → Assign variable
Setup → Advanced setup → Totalizer 3 → Assign variable

Description

Use this function to select a process variable for the totalizer.
If the option selected is changed, the device resets the totalizer to 0.

Options

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

Factory setting

Mass flow

Additional information

Options
If the **Off** option is selected, only the **Assign process variable** parameter is selected in the **Totalizer 1-3** submenu. All other parameters in the submenu are hidden (→ 75).

Unit

Navigation

Setup → Advanced setup → Totalizer 1 → Unit
Setup → Advanced setup → Totalizer 2 → Unit
Setup → Advanced setup → Totalizer 3 → Unit

Prerequisite

One of the following options is selected in the **Assign process variable** parameter (→ 75):

- Mass flow
- Volume flow
- Corrected volume flow

Description

Use this function to select the process variable of the totalizer.

The unit is selected separately for each totalizer. The unit is independent of the option selected in the **System units** menu (→ 67).

Options

Depends on the process variable selected:
- g, kg, t
- oz, lb, STon
- User mass

or

- cm^3, dm^3, m^3, ml, l
- af, cf
- fl oz (us), gal (us), Mgal (us)
- bbl (us;liq.), bbl (us;beer), bbl (us;oil), bbl (us;tank)
- gal (imp), Mgal (imp), bbl (imp;oil)
- User vol.

or

- Nl, Nm^3
- Sl, Sm^3, Scf, Sgal (us), Sbbl (us;liq.)
- Sgal (imp)

Factory setting

Country-dependent:
- kg
- lb

Operating mode totalizer 1-3

Navigation

Setup → Advanced setup → Totalizer 1 → Operation mode
Setup → Advanced setup → Totalizer 2 → Operation mode
Setup → Advanced setup → Totalizer 3 → Operation mode

Prerequisite

One of the following options is selected in the **Assign process variable** parameter (→ 75):
- Mass flow
- Volume flow
- Corrected volume flow

Description

Use this function to define how the totalizer totalizes the flow.

Options

- Net flow total
  Positive and negative flow values are totalized and balanced against one another. Net flow in the flow direction is registered.
- Forward flow total
  Only the flow in the forward flow direction is totalized.
- Reverse flow total
  Only the flow against the forward flow direction is totalized (= reverse flow total).

Factory setting

Net flow total

Failure mode

Navigation

Setup → Advanced setup → Totalizer 1 → Failure mode
Setup → Advanced setup → Totalizer 2 → Failure mode
Setup → Advanced setup → Totalizer 3 → Failure mode

Prerequisite

One of the following options is selected in the **Assign process variable** parameter (→ 75):

- Mass flow
- Volume flow
- Corrected volume flow

Description

Use this function to define how the totalizer behaves in an alarm condition. This setting does not affect the error response mode of other totalizers and the outputs. This is specified in separate parameters.

Options

- Stop
  Totalizing is stopped in an alarm condition.
- Actual value
  The totalizer continues to count based on the actual measured value; the error is ignored.
- Last valid value
  The totalizer continues to count based on the last valid measured value before the error occurred.

Factory setting

Stop

Advanced setup: "Display" submenu

Format display

Navigation

Setup → Advanced setup → Display → Format display

Description

Use this function to select how the measured value is shown on the local display. The display format (size, bar graph etc.) and number of measured values displayed simultaneously (1 to 4) can be configured. This setting only applies to normal operation.

- The **Value 1 display - Value 4 display** parameters are used to specify which measured values are shown on the display and in which order (→ 79) (→ 81) (→ 82) (→ 84).
- If more measured values are specified than the display mode selected permits, the values alternate on the device display. The display time until the next change is configured using the **Display interval** parameter (→ 85).

Options

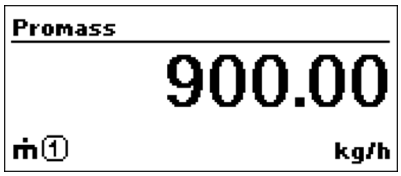
- 1 value, max. size
- 1 bargraph + 1 value
- 2 values
- 1 value large + 2 values
- 4 values

Factory setting

1 value, max. size

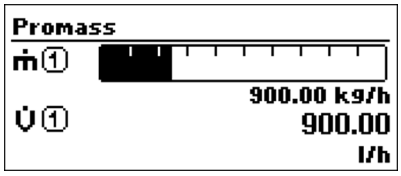
Additional information

1 value, max. size



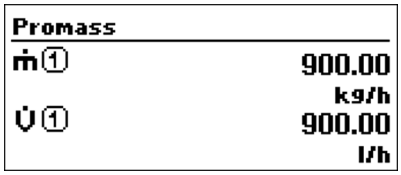
A0013099

1 bargraph + 1 value



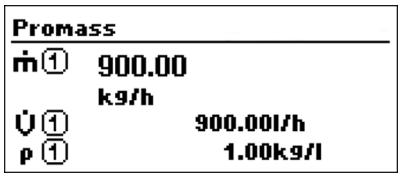
A0013098

2 values



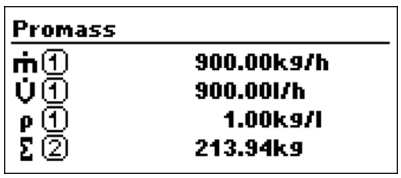
A0013100

1 value large + 2 values



A0013102

4 values



A0013103

Value 1 display

Navigation

Setup → Advanced setup → Display → Value 1 display

Description

Use this function to select one of the measured values to be shown on the local display. If several measured values are displayed at once, the measured value selected here will be the first value to be displayed. The value is only displayed during normal operation.

The **Format display** parameter is used to specify how many measured values are displayed simultaneously and how (→ 78).

Options

- None
- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Current output 1
- Current output 2

Factory setting

Mass flow

Additional information

Options

The unit for the value is taken from the **System units** menu (→ 67).

0% bargraph value 1

Navigation

Setup → Advanced setup → Display → 0% bargraph 1

Description

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

The **Format display** parameter is used to specify when the measured value is to be displayed as a bar graph (→ 78).

User entry

Max. 15-digit floating-point number with sign

Factory setting

Country-dependent:
- 0 kg/h
- 0 lb/min

Additional information

User entry

The unit for the value is taken from the **System units** menu (→ 67).

100% bargraph value 1

Navigation

Setup → Advanced setup → Display → 100% bargraph 1

Description

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

The **Format display** parameter is used to specify when the measured value is to be displayed as a bar graph (→ 78).

User entry

Max. 15-digit floating-point number with sign

Factory setting Depends on country and nominal diameter (→ 110)

Additional information *User entry*

The unit for the value is taken from the **System units** menu (→ 67).

Decimal places 1

Navigation Setup → Advanced setup → Display → Decimal places 1

Prerequisite A measured value is specified in the **Value 1 display** parameter (→ 79).

Description Use this function to specify the number of decimal places for measured value 1. This setting does not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display.

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

Default setting x.xx

Value 2 display

Navigation Setup → Advanced setup → Display → Value 2 display

Description Use this function to select one of the measured values to be shown on the local display. If several measured values are displayed at once, the measured value selected here will be the second value to be displayed. The value is only displayed during normal operation.

The **Format display** parameter is used to specify how many measured values are displayed simultaneously and how (→ 78).

Options
- None
- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Current output 1
- Current output 2

Factory setting None

Additional information *User entry*

The unit for the value is taken from the **System units** menu (→ 67).

Decimal places 2

Navigation Setup → Advanced setup → Display → Decimal places 2

Prerequisite A measured value is specified in the **Value 2 display** parameter (→ 81).

Description Use this function to specify the number of decimal places for measured value 2. This setting does not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display.

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

Factory setting x.xx

Value 3 display

Navigation Setup → Advanced setup → Display → Value 3 display

Description Use this function to select one of the measured values to be shown on the local display. If more than two measured values are displayed at once, the measured value selected here will be the third value to be displayed. The value is only displayed during normal operation.

The **Format display** parameter is used to specify how many measured values are displayed simultaneously and how(→ 78).

Options
- None
- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Current output 1
- Current output 2

Factory setting None

Additional information *User entry*

The unit for the value is taken from the **System units** menu (→ 67).

0% bargraph value 3

Navigation Setup → Advanced setup → Display → 0% bargraph 3

Description Use this function to enter the 0% bar graph value to be shown on the display for the measured value 3.

The **Format display** parameter is used to specify when the measured value is to be displayed as a bar graph (→ 78).

User entry Max. 15-digit floating-point number with sign

Factory setting Country-dependent:
- 0 kg/h
- 0 lb/min

Additional information *User entry*

The unit for the value is taken from the **System units** menu (→ 67).

100% bargraph value 3

Navigation Setup → Advanced setup → Display → 100% bargraph 3

Description Use this function to enter the 100% bar graph value to be shown on the display for the measured value 3.

The **Format display** parameter is used to specify when the measured value is to be displayed as a bar graph (→ 78).

User entry Max. 15-digit floating-point number with sign

Factory setting Depends on country and nominal diameter (→ 110)

Additional information *User entry*

The unit for the value is taken from the **System units** menu (→ 67).

Decimal places 3

Navigation Setup → Advanced setup → Display → Decimal places 3

Prerequisite A measured value is specified in the **Value 3 display** parameter(→ 82).

Description Use this function to specify the number of decimal places for measured value 3. This setting does not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display.

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

Factory setting x.xx

Value 4 display

Navigation Setup → Advanced setup → Display → Value 4 display

Description Use this function to select one of the measured values to be shown on the local display. If four measured values are displayed at once, the measured value selected here will be the fourth value to be displayed. The value is only displayed during normal operation.

The **Format display** parameter is used to specify how many measured values are displayed simultaneously and how (→ 78).

Options
- None
- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature
- Totalizer 1
- Totalizer 2
- Totalizer 3
- Current output 1
- Current output 2

Factory setting None

Additional information *Options*

The unit for the value is taken from the **System units**menu (→ 67).

Decimal places 4

Navigation Setup → Advanced setup → Display → Decimal places 4

Prerequisite A measured value is specified in the **Value 4 display** parameter (→ 84).

Description Use this function to specify the number of decimal places for measured value 4. This setting does not affect the measuring or computational accuracy of the device. The arrow displayed between the measured value and the unit indicates that the device computes with more digits than are shown on the local display.

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

Factory setting x.xx

Display interval

Navigation Setup → Advanced setup → Display → Display interval

Description Use this function to set the length of time the measured values are displayed if the values alternate on the display. This type of alternating display only occurs automatically if the number of measured values defined exceeds the number of values the selected display format can display simultaneously.

- The **Value 1 display**–**Value 4 display** parameters are used to specify what measured values are shown on the display (→ 79) (→ 81) (→ 82) (→ 84).
- The display format of the displayed measured values is specified using the **Format display** parameter (→ 78).

User entry 1 to 10 s

Factory setting 5 s

Display damping

Navigation Setup → Advanced setup → Display → Display damping

Prerequisite Local display available.

Description Use this function to set the reaction time of the local display to fluctuations in the measured value caused by process conditions. A time constant is entered for this purpose: if a low time constant is entered, the display reacts very quickly to fluctuating measured variables. If a high time constant is entered, the display reaction is damped.

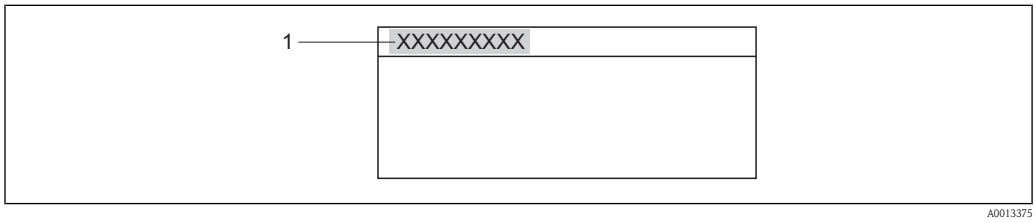
User entry 0 to 999 s

Factory setting 0 s

Header

Navigation Setup → Advanced setup → Display → Header

Description Use this function to select the contents of the header of the local display. The header text only appears during normal operation.



1 Position of the header text on the display

Options
- Device tag
- Free text

Factory setting Device tag

Additional information

Device tag
Is defined in the **Device tag** parameter (→ 66).

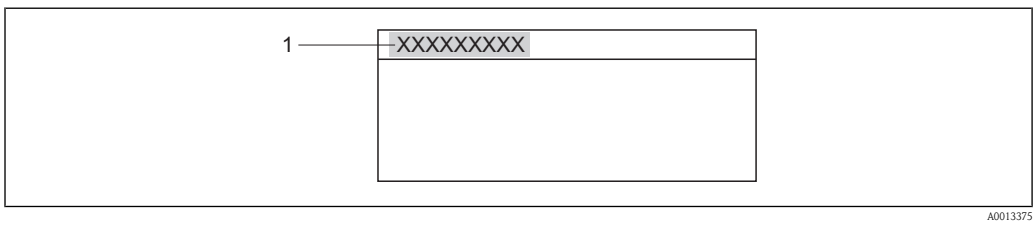
Free text
Is defined in the **Header text** parameter (→ 86).

Header text

Navigation Setup → Advanced setup → Display → Header text

Prerequisite The **Free text** option is selected in the **Header** parameter (→ 86).

Description Use this function to enter a customer-specific text for the header of the local display. The header text only appears during normal operation.



1 Position of the header text on the display

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

Factory setting ------------

Additional information

User entry
The number of characters displayed depends on the characters used.

Separator

Navigation Setup → Advanced setup → Display → Separator

Description Use this function to select the decimal separator.

Options
- . (point)
- , (comma)

Factory setting . (point)

"Advanced setup" menu: "Configuration backup display" submenu

The **Configuration backup display** menu only appears if the device has an local display.

Operating time

Navigation Setup → Advanced setup → Conf.backup disp → Operating time

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

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

Additional information *User interface*
The maximum number of days is 9999, which is equivalent to 27 years.

Last backup

Navigation Setup → Advanced setup → Conf.backup disp → Last backup

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

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

Configuration management

Navigation Setup → Advanced setup → Conf.backup disp → Config. managem.

Description Use this function to select an action to save the data to the display module. While this action is in progress, the configuration cannot be edited via the local display and a message on the processing status appears on the display.

To view the status message in the operating tool, use the **Backup state** parameter (→ 89)

Options

- Cancel
  No action is executed and the user exits the parameter.
- Execute backup
  A backup copy of the current device configuration in the HistoROM is saved to the display module of the device. The backup copy comprises the transmitter data of the device.
- Restore
  The last backup copy of the device configuration is copied from the display module to the HistoROM of the device. The backup copy comprises the transmitter data of the device.
- Duplicate
  The transmitter configuration from another device is duplicated to the device using the display module.
- Compare
  The device configuration saved in the display module is compared to the current device configuration of the HistoROM.
- Clear backup data
  The backup copy of the device configuration is deleted from the display module of the device.

Factory setting

Cancel

Additional information

Compare
The result can be viewed in the **Comparison result** parameter (→ 90).

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

Backup state

Navigation

Setup → Advanced setup → Conf.backup disp → Backup state

Prerequisite

One of the following options is selected in the **Configuration management** parameter (→ 88):

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

Description

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

User interface

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

Factory setting

None

Comparison result

Navigation

Setup → Advanced setup → Conf.backup disp → Compar. result

Description

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

The comparison is started via the **Compare settings** option in the **Configuration management** parameter (→ 88).

User interface

- Settings identical
  The current device configuration of the HistoROM is identical to the backup copy in the display module.
- Settings not identical
  The current device configuration of the HistoROM is not identical to the backup copy in the display module.
- No backup available
  There is no backup copy of the device configuration of the HistoROM in the display module.
- Backup settings corrupt
  The current device configuration of the HistoROM is corrupt or not compatible with the backup copy in the display module.
- Check not done
  The device configuration of the HistoROM has not yet been compared to the backup copy in the display module.

Factory setting

Check not done

Additional information

Settings identical
If the transmitter configuration of another device was copied to the device via the display module using the **Duplicate** option in the **Configuration management** parameter, the current device configuration of the HistoROM is only partially identical to your backup copy in the display module: The settings for the transmitter are not identical.

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

3.3 "Diagnostics" menu

Actual diagnostics

Navigation Diagnostics → Actual diagnos.

Description Use this function to display the current diagnostics message. If two or more messages occur simultaneously, the message with the highest priority is shown on the display.

Information on what is causing the message, and remedy measures, can be viewed via the E-button.

User interface Symbol for event behavior, diagnostics event and event text

Factory setting _ _ _ _ _ _ _ _

Additional information *User interface*

Example for display format:
⚠S441 Current output 1

Previous diagnostics

Navigation Diagnostics → Prev. diagnostics

Description Use this function to display the diagnostics message last displayed before the current message. This condition can still apply.

Information on what is causing the message, and remedy measures, can be viewed via the E-button.

User interface Symbol for event behavior, diagnostics event and event text

Factory setting _ _ _ _ _ _ _ _

Additional information *User interface*

Example for display format:
⚠C411 Upload/download active

Operating time from restart

Navigation 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 Diagnostics → Operating time

Description Use this function to display the total time the device has been in operation up to now.

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.

3.3.1 "Diagnose list" submenu

Up to 5 diagnostics messages currently pending are displayed in this submenu. If more than 5 messages are pending, the messages with the highest priority are shown on the display.

Information on what is causing the message, and remedy measures, can be viewed via the E-button.

Information on diagnostics measures in the device and an overview of all the diagnostics messages is provided in the Operating Instructions for the device

Diagnostics 1-5

Navigation

Diagnostics → Diagnose list → Diagnostics 1
Diagnostics → Diagnose list → Diagnostics 2
Diagnostics → Diagnose list → Diagnostics 3
Diagnostics → Diagnose list → Diagnostics 4
Diagnostics → Diagnose list → Diagnostics 5

Description

Use this function to display the current diagnostics messages with the highest priority to the fifth-highest priority.

User interface

Symbol for event behavior, diagnostics event and event text

Factory setting

_ _ _ _ _ _ _ _

Additional information

User interface

Example 1 for display format:
⚠S441 Current output 1

Example 2 for display format:
F276 I/O module error

3.3.2 "Event logbook" submenu

Filter options

Navigation Diagnostics → Event logbook → Filter options

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

The status signals are categorized according to NAMUR NE 107: F = failure, M = maintenance request, C = function check, S = out of specification

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

Factory setting All

Events list

Navigation Diagnostics → Event logbook → Events list

Description Use this function to display the history of event messages of the category selected in the **Filter options** parameter (→ 94). A maximum of 20 event messages are displayed in chronological order. If the advanced HistoROM function is enabled in the device, the event list can contain up to 100 entries.

The following symbols indicate whether an event has occurred or has ended:
- : Event has occurred
- : Event has ended

Information on what is causing the message, and remedy measures, can be viewed via the E-button.

User interface
- For event messages in category I: information event, event text, "recording event" symbol and time event occurred
- For event messages in category F, M, C, S (status signal): diagnostics event, event text, "recording event" symbol and time event occurred

Factory setting _ _ _ _ _ _ _ _

Additional information

User interface

Example 1 for display format:
I1091 Configuration modified
➔ 24d12h13m00s

Example 2 for display format:
S441 Current output 1
➔ 01d4h12min30s

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

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

3.3.3 "Device info" submenu

Device

Navigation Diagnostics → Device info.→ Device

Description Use this function to view the device designation.

User interface Max. 32-digit character string comprising letters, numbers or special characters (e.g. @, %, /)

Factory setting Promass

Serial number

Navigation Diagnostics → Device info.→ Serial number

Description Use this function to view the serial number of the device. It can also be found on the nameplate of the sensor and transmitter.

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

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

Firmware version

Navigation Diagnostics → Device info→ Firmware version

Description Use this function to view the device firmware version installed.

User interface Max. 6-digit character string in the format xx.yy.zz

Device name

Navigation Diagnostics → Device info → Device name

Description Use this function to view the name of the transmitter. It can also be found on the nameplate of the transmitter.

User interface Promass TB2

Order code

Navigation Diagnostics → Device info → Order code

Description Use this function to view the order code of the device. It can also be found on the nameplate of the sensor and transmitter. The order code is generated from the extended order code, which defines all the device features of the product structure. In contrast, only some of the device features can be read directly 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.

User interface Max. 20-digit character string comprising letters, numbers, punctuation marks or +, -

Extended order code 1-3

Navigation Diagnostics → Device info → Ext. order cd.1
Diagnostics → Device info → Ext. order cd. 2
Diagnostics → Device info → Ext. order cd. 3

Description Use this function to display the first, second or third part of the extended order code. On account of length restrictions, the extended order code is split into a maximum of 3 parameters.
The extended order code indicates the version of all the features of the product structure for the device and thus uniquely identifies the device. It can also be found on the nameplate of the sensor and transmitter.

Uses of the extended order code
- To order an identical spare device.
- To check the ordered device features against the shipping note.

User interface Max. 20-digit character string

Device revision

Navigation Diagnostics → Device info → Device revision

Prerequisite Device with HART protocol

Description Use this function to view the device revision with which the device is registered with the HART Communication Foundation. It is needed to assign the appropriate device description file (DD) to the device.

User interface 2-digit hexadecimal number

Device ID

Navigation Diagnostics → Device info→ Device ID

Prerequisite Device with HART protocol

Description Use this function to view the device ID for identifying the device in a HART network.

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

User interface 6-digit hexadecimal number

Device type

Navigation Diagnostics → Device info → Device type

Prerequisite Device with HART protocol

Description Use this function to view the device type with which the device is registered with the HART Communication Foundation. The device type is specified by the manufacturer. It is needed to assign the appropriate device description file (DD) to the device.

User interface 2-digit hexadecimal number

Factory setting 0x54 (for Promass E TB2)

Manufacturer ID

Navigation Diagnostics → Device info→ Manufacturer ID

Prerequisite Device with HART protocol

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

User interface 2-digit hexadecimal number

Factory setting 0x11 (for Endress+Hauser)

3.3.4 "Measured value" submenu

"Measured value" submenu: "Process variables" submenu

Mass flow

Navigation Diagnostics → Measured val. → Process variab. → Mass flow

Description Use this function to view the mass flow currently measured.

User interface Max. 15-digit floating-point number with sign

Additional information *User interface*

The unit for the value is taken from the **System units** menu (→ 67).

Volume flow

Navigation Diagnostics → Measured val. → Process variab. → Volume flow

Description Use this function to view the volume flow currently calculated. It is calculated from the measured mass flow and the measured density.

User interface Max. 15-digit floating-point number with sign

Additional information *User interface*

The unit for the value is taken from the **System units** menu (→ 67).

Corrected volume flow

Navigation Diagnostics → Measured val. → Process variab. → Correct. vol. flow

Description Use this function to view the corrected volume flow currently calculated. It is is derived from the measured mass flow and the reference density of the fluid (density at reference temperature, measured or fixed entry).

User interface Max. 15-digit floating-point number with sign

Additional information *User interface*

The unit for the value is taken from the **System units** menu (→ 67).

Density

Navigation Diagnostics → Measured val. → Process variab. → Density

Description Use this function to view the currently measured density or its specific gravity.

User interface Max. 15-digit floating-point number with sign

Additional information *User interface*

The unit for the value is taken from the **System units** menu (→ 67).

Reference density

Navigation Diagnostics → Measured val. → Process variab. → Ref. density

Description Use this function to view the density of the fluid at reference temperature. The reference density displayed is calculated using the measured density.

User interface Max. 15-digit floating-point number with sign

Additional information *User interface*

The unit for the value is taken from the **System units** menu (→ 67).

Temperature

Navigation Diagnostics → Measured val.→ Process variab. → Temperature

Description Use this function to view the temperature currently measured.

User interface Max. 15-digit floating-point number with sign

Additional information *User interface*

The unit for the value is taken from the **System units** menu (→ 67).

"Measured value" submenu: "Totalizer" submenu

Totalizer value 1-3

Navigation

Diagnostics → Measured val.→ Totalizer → Totalizer val. 1
Diagnostics → Measured val.→ Totalizer → Totalizer val. 2
Diagnostics → Measured val.→ Totalizer → Totalizer val. 3

Prerequisite

One of the following options is selected in the **Assign process variable** parameter of the **Totalizer 1-3** submenu (→ 75):

- Mass flow
- Volume flow
- Corrected volume flow

Description

Use this function to check the current totalizer reading.
Since only a maximum of 7 digits can be displayed, if the display range is exceeded the current totalizer reading is the sum of the totalizer value and the overflow value from the **Totalizer overflow 1-3** parameter (→ 101).

In the event of an error, the totalizer adopts the mode defined in the **Failure mode** parameter (→ 77).

User interface

–9 999 999 to +9 999 999

Additional information

User interface
The value of the process variable totalized since measuring began can be positive or negative. This depends on the settings in the **Operating mode totalizer 1-3** and **Installation direction** parameters(→ 76) (→ 74).

Depending on the process variable selected, the corresponding value unit is taken from the **System units** menu (→ 67) .

Example
Calculation of the current totalizer reading when the value exceeds the 7-digit display range:
– Value in the**Totalizer value 1** parameter: 196 845.7 kg
– Value in the **Totalizer overflow 1**: 1 10^7 parameter (1 overflow) = 10 000 000 [kg]
– Current totalizer reading: 10 196 845.7 kg

Totalizer overflow 1 to 3

Navigation

Diagnostics → Measured val.→ Totalizer → Tot. overflow 1
Diagnostics → Measured val.→ Totalizer → Tot. overflow 2
Diagnostics → Measured val.→ Totalizer → Tot. overflow 3

Prerequisite

One of the following options is selected in the **Assign process variable** parameter of the **Totalizer 1-3** submenu (→ 75):

- Mass flow
- Volume flow
- Corrected volume flow

Description

Use this function to view the current totalizer overflow. If the current reading has more than 7 digits, which is the maximum value range that can be displayed, the value above this range is given as an overflow.
The current totalizer reading is thus the sum of the overflow value and the totalizer value from the **Totalizer value 1-3** parameter (→ 101).

User interface

Integer

Additional information

User interface

Depending on the process variable selected, the corresponding value unit is taken from the **System units** menu (→ 67) .

Example
Calculation of the current totalizer reading when the value exceeds the 7-digit display range:
– Value in the **Totalizer value 1** parameter: 196 845.7 kg
– Value in the **Totalizer overflow 1** parameter: 2 10^7 (2 overflows) = 20 000 000 [kg]
– Current totalizer reading: 20 196 845.7 kg

"Measured value" submenu: "Output value" submenu

Output current 1-2

Navigation
Diagnostics → Measured val. → Output value→ Output curr. 1
Diagnostics → Measured val. → Output value→ Output curr. 2

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

User interface
3.59 to 22.5 mA

Additional information
The **Current output 1-2** wizard is used to configure the current output (→ 28).

Measured current 1

Navigation
Diagnostics → Measured val.→ Output value → Measur. curr. 1

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

User interface
3.59 to 22.5 mA

Terminal voltage 1

Navigation
Diagnostics → Measured val.→ Output value → Terminal volt. 1

Description
Use this function to view the actual terminal voltage that is present at the current output.

User interface
12 to 36 V

3.3.5 "Data logging" submenu

The menu is only displayed if the extended function of the HistoROM is enabled in the device.

Assign channel 1-4

Navigation

Diagnostics → Data logging → Assign chan. 1
Diagnostics → Data logging → Assign chan. 2
Diagnostics → Data logging → Assign chan. 3
Diagnostics → Data logging → Assign chan. 4

Description

Use this function to assign a process variable to the data logging channel.

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

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

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

Options

- Off
- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature

Factory setting

Off

Logging interval

Navigation

Diagnostics → Data logging → Logging interval

Description

Definition of the logging interval t_{log} for data logging. This defines the interval between the individual data points in the data log, and thus the maximum loggable process time T_{log}:

- If 1 logging channel is used: $T_{log} = 1000 \cdot t_{log}$
- If 2 logging channels are used: $T_{log} = 500 \cdot t_{log}$
- If 3 logging channels are used: $T_{log} = 333 \cdot t_{log}$
- If 4 logging channels are used: $T_{log} = 250 \cdot t_{log}$

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

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

User entry

1.0 to 3600.0 s

Factory setting 10.0 s

Additional information *Example*
If 1 logging channel is used:

- $T_{log} = 1000 \cdot 1\ s = 1\,000\ s \cong 15\ min$
- $T_{log} = 1000 \cdot 10\ s = 10\,000\ s \cong 3\ h$
- $T_{log} = 1000 \cdot 80\ s = 80\,000\ s \cong 1\ d$
- $T_{log} = 1000 \cdot 3\,600\ s = 3\,600\,000\ s \cong 41\ d$

Clear logging data

Navigation Diagnostics → Data logging → Clear logging data

Description Use this function to clear the entire logging data.

Options
- Cancel
  The data are not cleared. All the data are retained.
- Clear data
  The logging data are cleared. The logging process starts from scratch.

Factory setting Cancel

Display channel 1 - Display channel 4

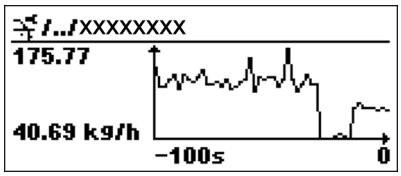
Navigation
Diagnostics → Data logging→ Display channel 1
Diagnostics → Data logging → Display channel 2
Diagnostics → Data logging → Display channel 3
Diagnostics → Data logging → Display channel 4

Prerequisite One of the following options is selected in the **Assign channel 1 - Assign channel 4** parameter:

- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature

Description

Use this function to view the measured value trend for the logging channel in the form of a chart.



A0013859

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

The process variable whose measured value curve is displayed is specified in the **Assign channel 1 - Assign channel 4** parameter (→ 104).

3.3.6 "Simulation" submenu

Assign simulation process variable

Navigation Diagnostics → Simulation → Assign proc. var.

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

The simulation value of the selected process variable is defined in the **Value process variable** parameter (→ 107).

Options
- Off
- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature

Factory setting Off

Value process variable

Navigation Diagnostics → Simulation → Value proc. var.

Prerequisite One of the following options is selected in the **Assign simulation process variable** parameter (→ 107):
- Mass flow
- Volume flow
- Corrected volume flow
- Density
- Reference density
- Temperature

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

Additional information *User entry*

The unit for the value is taken from the **System units** menu (→ 67).

Simulation current output 1-2

Navigation
Diagnostics → Simulation → Sim.curr.out. 1
Diagnostics → Simulation → Sim.curr.out. 2

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

The simulation value is defined in the **Value current output 1-2** parameter (→ 108).

Options
- On
  Current simulation is active.
- Off
  Current simulation is switched off. The device is in normal measuring mode or another process variable is being simulated.

Factory setting
Off

Value current output 1-2

Navigation
Diagnostics → Simulation → Value curr.out. 1
Diagnostics → Simulation → Value curr.out. 2

Prerequisite
The **On** option is selected in the **Simulation current output 1-2** parameter (→ 108) .

Description
Use this function to enter a current value for the simulation. In this way, users can verify the correct adjustment of the current output and the correct function of downstream components.

Input range
3.6 to 22.5 mA

Factory setting
Current value currently measured

Simulation device alarm

Navigation
Diagnostics → Simulation → Sim. alarm

Description
Use this function to switch the device alarm on and off. In this way, users can verify the correct adjustment of the current output and the correct function of downstream switching units.
The display alternates between the measured value and a diagnostics message of the *"function check" category (C)* while simulation is in progress:

Options
- On
- Off

Factory setting
Off

3.3.7 "Device reset" submenu

Device reset

Navigation Diagnostics → Device reset → Device reset

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

Options
- Cancel
  No action is executed and the user exits the parameter.
- To factory defaults
  Every parameter is reset to the factory setting.
- To delivery settings
  Every parameter for which a customer-specific default setting was ordered is reset to this customer-specific value. All other parameters are reset to the factory setting.
- 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 is not modified.

Factory setting Cancel

Additional information *To delivery settings*

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

4 Country-specific factory settings

4.1 SI units (not for USA and Canada)

On-value, low flow cut off (depends on type of fluid)

Nominal diameter [mm]	On-value for liquid
8	8 kg/h
15	26 kg/h
25	72 kg/h
40	180 kg/h
50	300 kg/h

Output current range

Current output 1	4 to 20 mA NAMUR
Current output 2	4 to 20 mA NAMUR

Full scale value current output 1 (20 mA value), 100% bar graph value 1, 100% bar graph value 3

Nominal diameter [mm]	Full scale value current output 1
8	400 kg/h
15	1 300 kg/h
25	3 600 kg/h
40	9 000 kg/h
50	15 000 kg/h

System units

Mass	kg
Mass flow	kg/h
Volume	l
Volume flow	l/h
Corrected volume	Nl
Corrected volume flow	Nl/h
Density	kg/l
Reference density	kg/Nl
Temperature	°C
Length	mm
Pressure	bar a

4.2 US units (only for USA and Canada)

On-value, low flow cut off (depends on type of fluid)

Nominal diameter [in]	On-value for liquid
3/8	0.3 lb/min
1/2	1 lb/min
1	2.6 lb/min
1 1/2	6.6 lb/min
2	11 lb/min

Output current range

Current output 1	4 to 20 mA US
Current output 2	4 to 20 mA US

Full scale value current output 1 (20 mA value), 100% bar graph value 1, 100% bar graph value 3

Nominal diameter [in]	Full scale value current output 1
3/8	15 lb/min
1/2	50 lb/min
1	130 lb/min
1 1/2	330 lb/min
2	550 lb/min

System units

Mass	lb
Mass flow	lb/min
Volume	gal (us)
Volume flow	gal/min (us)
Corrected volume	Scf
Corrected volume flow	Scf/min
Density	lb/cf
Reference density	lb/scf
Temperature	°F
Length	in
Pressure	psi a

5 Explanation of abbreviated units

5.1 SI units

Process variab.	Units	Explanation
Time	s, min, h, d	Second, minutes, hour, day
Mass	g, kg, t	Gram, kilogram, metric ton
Length	mm, m	Millimeter, meter
Volume	cm^3, dm^3, m^3, ml, l	Cubic centimeter, cubic decimeter, cubic meter, milliliter, liter
Corrected volume	Nl, Nm^3	Normal liter, normal cubic meter
Temperature	°C , °F, K, °R	Celsius, Fahrenheit, Kelvin, Rankine
Pressure	Pa a, kPa a, Mpa a, bar a	Pascal, kilopascal, megapascal, bar/absolute
	Pa g, kPa g, Mpa g, bar g	Pascal, kilopascal, megapascal, bar/ relative (gauge)
Mass flow	g/s, g/min, g/h, g/d	Gram/time unit
	kg/s, kg/min, kg/h, kg/d	Kilogram/time unit
	t/s, t/min, t/h, t/d	Metric ton/time unit
Volume flow	cm^3/s , cm^3/min, cm^3/h, cm^3/d	Cubic centimeter/time unit
	dm^3/s, dm^3/min, dm^3/h, dm^3/d	Cubic decimeter/time unit
	m^3/s, m^3/min, m^3/h, m^3/d	Cubic meter/time unit
	ml/s, ml/min, ml/h, ml/d	Milliliter/time unit
	l/s, l/min, l/h, l/d	Liter/time unit
Corrected volume flow	Nl/s, Nl/min, Nl/h, Nl/d	Normal liter/time unit
	Nm^3/s, Nm^3/min, Nm^3/h, Nm^3/d	Normal cubic meter/time unit
	Sm^3/s, Sm^3/min, Sm^3/h, Sm^3/d	Standard cubic meter (standard)/time unit
Density	g/cm^3, g/m^3	Gram/volume unit
	kg/dm^3, kg/l, kg/m^3	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 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).
Reference density	kg/Nm^3, kg/Nl	Kilogram/normal volume unit

5.2 US units

Process variab.	Units	Explanation
Time	s, min, h, d	Second, minutes, hour, day
Mass	oz, lb, STon	Ounce, pound, standard ton
Length	in, ft	Inch, feet
Volume	af, cf	Acre foot, cubic foot
	fl oz (us), gal (us), Mgal (us)	Fluid ounce, gallon, million gallon

Process variab.	Units	Explanation
	bbl (us;liq.), bbl (us;beer), bbl (us;oil), bbl (us;tank)	Barrel (normal liquids), barrel (beer), barrel (petrochemicals), barrel (filling tanks)
Corrected volume	Sl, Scm^3, Sm^3, Scf, Sgal (us), Sbbl (us;liq.)	Standard liter, standard cubic centimeter, standard cubic meter, standard gallon, standard barrel
Temperature	°C , °F, K, °R	Celsius, Fahrenheit, Kelvin, Rankine
Pressure	psi a	Psi absolute
	psi g	Psi gauge
Mass flow	oz/s, oz/min, oz/h, oz/d	Ounce/time unit
	lb/s, lb/min, lb/h, lb/d	Pound/time unit
	STon/s, STon/min, STon/h, STon/d	Standard ton/time unit
Volume flow	af/s, af/min, af/h, af/d	Acre foot/time unit
	cf/s, cf/min, cf/h, cf/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
	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
	bl/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
Corrected volume flow	Scf/s, Scf/min, Scf/h, Scf/d	Standard cubic foot/time unit
	Sgal/s (us), Sgal/min (us), Sgal/h (us), Sgal/d (us)	Standard gallon/time unit
	Sbbl/s (us;liq.), Sbbl/min (us;liq.), Sbbl/h (us;liq.), Sbbl/d (us;liq.)	Barrel/time unit (normal liquids)
Density	lb/cf, 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
Reference density	g/Scm^3, kg/Sm^3, lb/Scf	Weight unit/standard volume unit

5.3 Imperial units

Process variab.	Units	Explanation
Time	s, min, h, d	Second, minutes, hour, day
Volume	gal (imp), Mgal (imp), bbl (imp;oil)	Gallon, mega gallon, barrel (petrochemicals), barrel (beer)
Corrected volume	Sgal (imp)	Standard gallon
Temperature	°C , °F, K, °R	Celsius, Fahrenheit, Kelvin, Rankine
Volume flow	gal/s (imp), gal/min (imp), gal/h (imp), gal/d (imp)	Gallon/time unit
	Mgal/s (imp), Mgal/min (imp), Mgal/h (imp), Mgal/d (imp)	Mega gallon/time unit

Process variab.	Units	Explanation
	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
Corrected volume flow	Sgal/s (imp), Sgal/min (imp), Sgal/h (imp), Sgal/d (imp)	Standard gallon/time unit
Density	lb/gal (imp), lb/bbl (imp;beer), lb/bbl (imp;oil)	Pound/volume unit

Index

Symbols

A

B

C

D

E

V

W

Z

www.endress.com/worldwide

Endress+Hauser

People for Process Automation

GP01009D/06/EN/06.10
71112122