

Special Documentation

Promag 400

HART

Custody transfer
Meter for drinking water



Table of contents

1	About this document	4
1.1	Document function	4
1.2	Using this document	4
1.3	Symbols used	4
1.4	Documentation	5
2	Basic safety instructions	5
2.1	Requirements for the personnel	5
3	Product description	5
4	Product identification	6
5	Operation and commissioning	9
5.1	Operating conditions for "standard" version	9
5.2	Operating conditions for "0 x DN inlet/ outlet runs" version	12
5.3	As-delivered state	15
5.4	Custody transfer	15
5.5	Reading parameters relevant for custody transfer	24
5.6	Custody transfer logbook	26
5.7	Procedure for market surveillance	27
5.8	Repeated calibration due to legal metrology controls	28
5.9	Sealing	28
6	List of the parameters that can be configured in custody transfer mode	31
6.1	Configurable parameters	32
6.2	Deviating parameter configuration	42

1 About this document

1.1 Document function

This manual is Special Documentation that describes the use of the device in custody transfer measurement.

NOTICE

When installing:

- ▶ Follow the Operating Instructions for the device.

1.2 Using this document

1.2.1 Information on the document structure










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
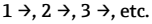

- The arrangement of the parameters, along with a short description, according to the **Operation** menu, **Setup** menu, **Diagnostics** menu: Operating Instructions
- Operating concept: Operating Instructions

1.3 Symbols used

1.3.1 Symbols for certain types of information

Symbol	Meaning
	Tip Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
	Notice or individual step to be observed
	Series of steps
	Result of a step

1.3.2 Symbols in graphics

Symbol	Meaning
	Item numbers
	Series of steps of individual, consecutive images
	Series of steps within an image

Symbol	Meaning
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections

1.4 Documentation

This manual is Special Documentation. It is not a substitute for the Operating Instructions supplied with the device.

For detailed information, refer to the Operating Instructions and other documentation on the CD-ROM provided or visit "www.endress.com/deviceviewer".

The Special Documentation is an integral part of the following Operating Instructions:

Measuring device	Documentation code
Promag W 400	BA01063D

2 Basic safety instructions

2.1 Requirements for the personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:

- ▶ Trained, qualified specialists must have a relevant qualification for this specific function and task.
- ▶ Are authorized by the plant owner/operator.
- ▶ Are familiar with federal/national regulations.
- ▶ Before starting work, read and understand the instructions in the manual and supplementary documentation as well as the certificates (depending on the application).
- ▶ Follow instructions and comply with basic conditions.

The operating personnel must fulfill the following requirements:

- ▶ Are instructed and authorized according to the requirements of the task by the facility's owner-operator.
- ▶ Follow the instructions in this manual.

3 Product description

The measuring device is optionally tested in accordance with OIML R49 (www.oiml.org) and has an EU type-examination certificate according to Measuring Instruments Directive 2014/32/EU (MID) for service subject to legal metrological control ("custody transfer") for cold water (Annex III).

The device is used with a legally controlled totalizer on the local display and optionally with a legally controlled pulse output.

Measuring devices subject to legal metrological control totalize in both directions, i.e. all the outputs consider flow components in the positive (forward) and negative (reverse) flow direction.

Generally a measuring device subject to legal metrological control is secured against tampering by seals on the transmitter or sensor. Usually, these seals may be broken only by an authorized representative of the responsible authority for legal metrology controls.


After putting the device into circulation or after sealing the device, operation via the local display is only possible to a limited extent.

Europe

Since the European Measuring Instruments Directive 2004/22/EC came into effect on November 1 2006 and was replaced by 2014/32/EU on April 20 2016, meters with the relevant marking can be placed on the market across the borders of all EU member states that have ratified the requirements of Annex III (MI-001) of the European Measuring Instruments Directive and incorporated them into national law.

The associated Declaration of Conformity for the measuring device, as per the European Measuring Instruments Directive 2014/32/EC, was made in accordance with Modules B +D:

Module B: Type examination according to OIML R49:2013 Module D: Declaration of type conformity based on quality assurance of the production process.

 With the entry into force of the revised European Measuring Instruments Directive 2014/32/EU on April 20 2016, all certificates issued under Directive 2004/22/EC will remain valid until their regular expiry date. As a result of this transitional system, various certificates and documents pertaining to the same device can make reference to different versions of the European Measuring Instruments Directive. This does not compromise the conformity of the measuring device in any way.

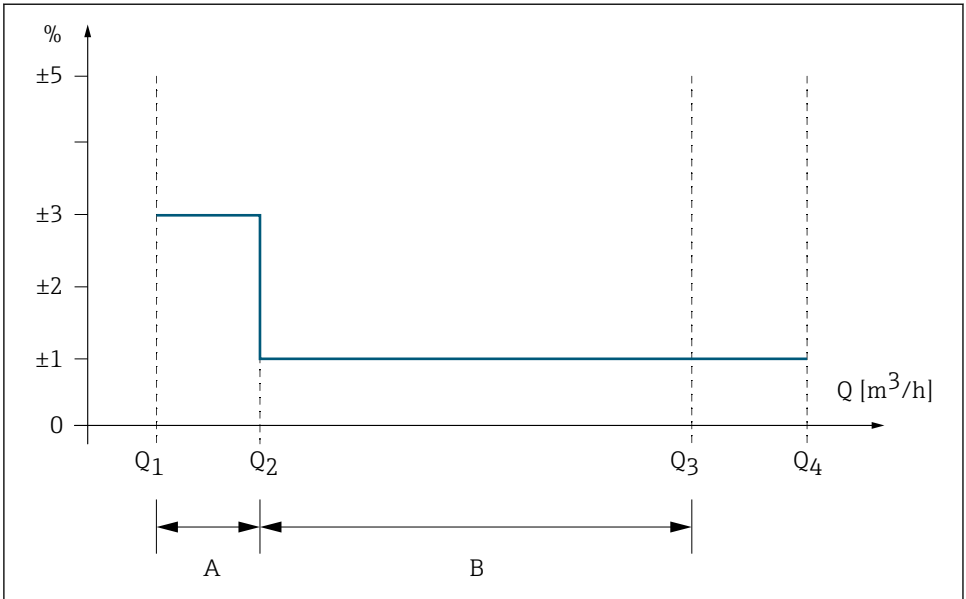
Outside Europe

Detailed ordering information for national approvals based on OIML R49 is available from your local Endress+Hauser sales center.

4 Product identification

Measuring devices for use subject to legal metrology controls are supplied with the relevant marking.

Accuracy class 1

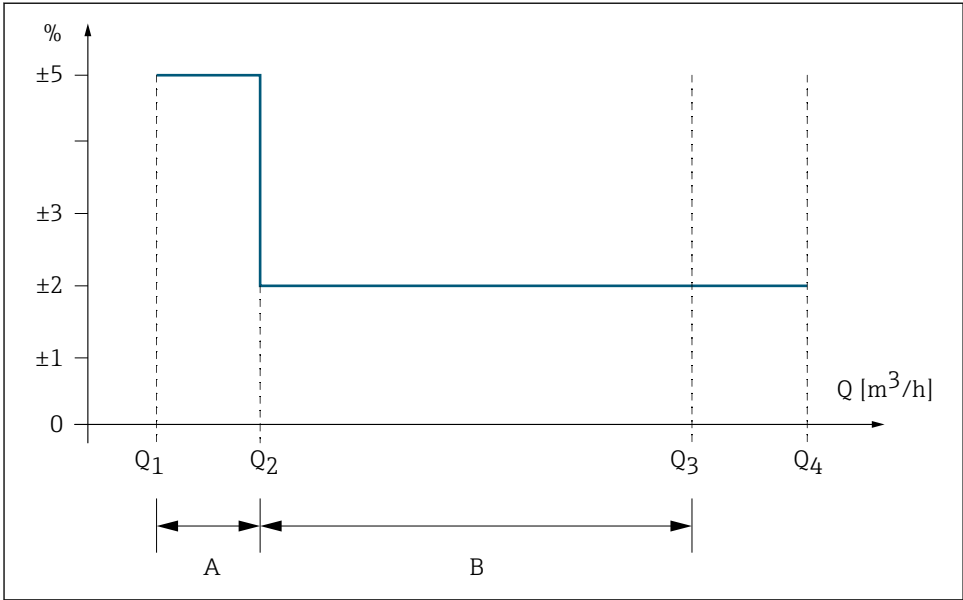


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1 Flow ranges and maximum permissible errors for cold water

- A Lower zone
Maximum permissible error: $\pm 3\%$
- B Upper zone
Maximum permissible error: $\pm 1\%$

Accuracy class 2

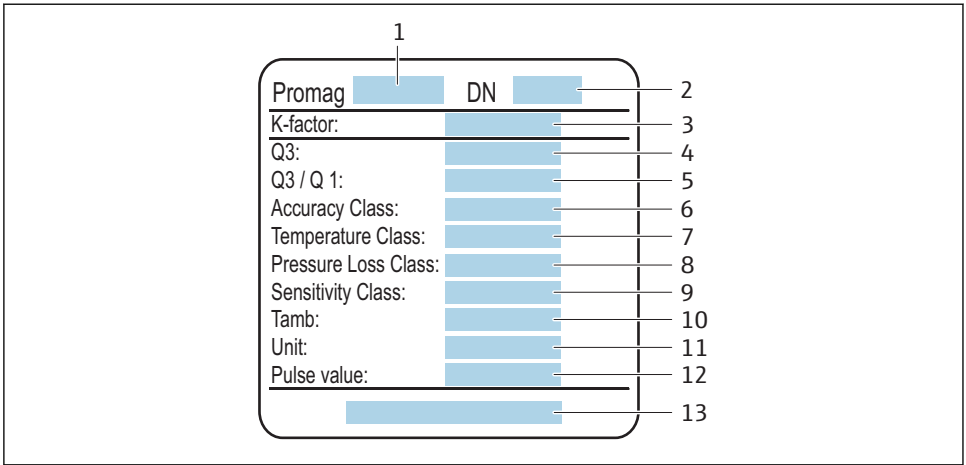


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2 Flow ranges and maximum permissible errors for cold water

- A Lower zone
Maximum permissible error: $\pm 5\%$
- B Upper zone
Maximum permissible error: $\pm 2\%$

Cold water Medium temperature range +0.1 to +50 °C (+32.2 to +122 °F)	
Minimum flowrate Q_1	The lowest flowrate at which the meter provides indications that satisfy the requirements concerning the maximum permissible errors (MPEs).
Transitional flowrate Q_2	The flowrate value occurring between the permanent flowrate Q_3 and the minimum flowrate Q_1 , at which the flowrate range is divided into two zones (the upper zone and lower zone). Each zone has a characteristic MPE.
Permanent flowrate Q_3	The highest flowrate at which the meter operates in a satisfactory manner under normal conditions of use.
Overload flowrate Q_4	The highest flowrate at which the meter operates in a satisfactory manner for a short period of time without deteriorating.



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3 Sensor nameplate, subject to mandatory verification

- 1 Name of sensor
- 2 Nominal diameter of sensor
- 3 K-factor
- 4 Flowrate Q_3
- 5 Flowrate Q_3 / Q_1
- 6 Accuracy class
- 7 Temperature class
- 8 Pressure loss class
- 9 Sensitivity class
- 10 Ambient temperature
- 11 Unit
- 12 Pulse value (output option J)
- 13 Number of certificate

5 Operation and commissioning

Two versions of the custody-transfer Promag W 400 are available.


Version	Sensor
Standard	Continuous measuring tube
0 x DN inlet/outlet runs	Constricted measuring tube

5.1 Operating conditions for "standard" version

The measuring device should be sized in such a way that, under normal operating conditions as per the specifications of OIML R49, it operates in the range from Q_1 to Q_4 .

The measuring device is designed for:

Accuracy class	2
Temperature class	T50
Pressure loss class	Δp 10
Environmental class	B / O / M
Electromagnetic class	E2
Orientation	Horizontal, vertical
Inlet run from flange	5 × DN corresponds to sensitivity class U5
Outlet run from flange	2 × DN corresponds to class D3
Flow direction	Bidirectional
Test equipment	Measurement transducer, calculator, indicating device
Test equipment	Type P

 An uninterruptible power supply must be guaranteed for the operation of the device.

5.1.1 Flow characteristic values

The following flow characteristic values correspond to the specifications of OIML R49.

DN		Q ₁	Q ₂	Q ₃	Q ₄	Q ₃ / Q ₁	Low flow cutoff with 50 % hysteresis ¹⁾
[mm]	[in]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]
25	1	0.10	0.16	16.00	20.00	160	0.016
32	1 ¼	0.16	0.25	25.00	31.25	160	0.025
40	1 ½	0.25	0.40	40.00	50.00	160	0.040
50	2	0.39	0.63	63.00	78.75	160	0.063
65	2 ½	0.50	0.80	100.00	125.00	200	0.080
80	3	0.80	1.28	160.00	200.00	200	0.128
100	4	1.25	2.00	250.00	312.50	200	0.200
125	5	1.60	2.56	400.00	500.00	250	0.256
150	6	2.52	4.03	630.00	787.50	250	0.403
200	8	4.00	6.40	1000.00	1250.00	250	0.640
250	10	6.40	10.24	1600.00	2000.00	250	1.024
300	12	10.00	16.00	2500.00	3125.00	250	1.600

DN		Q ₁	Q ₂	Q ₃	Q ₄	Q ₃ / Q ₁	Low flow cutoff with 50 % hysteresis ¹⁾
[mm]	[in]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]
350	14	10.00	16.00	2 500.00	3 125.00	250	1.600
375	15	16.00	25.60	4 000.00	5 000.00	250	2.560
400	16	16.00	25.60	4 000.00	5 000.00	250	2.560
450	18	16.00	25.60	4 000.00	5 000.00	250	2.560
500	20	25.20	40.32	6 300.00	7 875.00	250	4.032
600	24	39.38	63.00	6 300.00	7 875.00	160	6.300
700	28	50.40	80.64	6 300.00	7 875.00	125	8.064
750	30	63.00	100.80	6 300.00	7 875.00	100	10.080
800	32	63.00	100.80	6 300.00	7 875.00	100	10.080

1) Values cannot be edited when the custody transfer mode is activated.

5.1.2 Flow characteristic values of certified pulse output

DN		Pulse value	Pulse width
[mm]	[in]	[dm ³]	[ms]
25	1	0.50	45
32	1 ¼	1.00	50
40	1 ½	1.00	35
50	2	2.50	50
65	2 ½	2.50	35
80	3	5.00	45
100	4	5.00	25
125	5	10.00	35
150	6	10.00	20
200	8	25.00	35
250	10	25.00	20
300	12	50.00	25
350	14	50.00	25
375	15	100.00	35
400	16	100.00	35

DN		Pulse value	Pulse width
[mm]	[in]	[dm ³]	[ms]
450	18	100.00	35
500	20	150.00	30
600	24	250.00	50
700	28	250.00	50
750	30	250.00	50
800	32	250.00	50



- The configuration of the certified pulse output is defined by the standard.
- The factory setting for the certified pulse output is such that the minimum measured value resolution specified in the standard is maintained for the "flow characteristic values" in the table and the pulse output does not go to overflow at Q4.
- A pulse modulation of 50/50 (high low level) is presumed.
- If the certified pulse output is configured differently, in terms of the approval this can limit the operable flow range (Q3/Q1).

5.2 Operating conditions for "0 x DN inlet/outlet runs" version



Only applies for the order code for "Design", option C


The measuring device should be sized in such a way that, under normal operating conditions as per the specifications of OIML R49, it operates in the range from Q_1 to Q_4 .

The measuring device is designed for:

Accuracy class ¹⁾	1 or 2
Temperature class	T50
Pressure loss class	Δp 40
Environmental class	B / O / M
Electromagnetic class	E2
Orientation	Horizontal, vertical
Inlet run from flange	0 × DN corresponds to class U0
Outlet run from flange	0 × DN corresponds to class D0
Flow direction	Bidirectional

Test equipment	Measurement transducer, calculator, indicating device
Test equipment	Type P

1) Only accuracy class 2 exists as a legal basis for measuring devices according to European approval MI-001.

 An uninterruptible power supply must be guaranteed for the operation of the device.

5.2.1 Flow characteristic values

The following flow characteristic values correspond to the specifications of OIML R49.

Accuracy class 1

DN		Q ₁	Q ₂	Q ₃	Q ₄	Q ₃ / Q ₁	Low flow cutoff with 50 % hysteresis ¹⁾
[mm]	[in]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]
50	2	0.13	0.20	40.00	50.00	315	0.02
65	2 ½	0.20	0.32	63.00	78.80	315	0.03
80	3	0.32	0.51	100.00	125.00	315	0.05
100	4	0.51	0.81	160.00	200.00	315	0.08
125	5	0.79	1.27	250.00	312.50	315	0.13
150	6	1.27	2.03	400.00	500.00	315	0.20
200	8	2.00	3.20	630.00	787.50	315	0.32
250	10	3.17	5.08	1000.00	1250.00	315	0.51
300	12	5.08	8.13	1600.00	2000.00	315	0.81

1) Values cannot be edited when the custody transfer mode is activated.

Accuracy class 2

DN		Q ₁	Q ₂	Q ₃	Q ₄	Q ₃ / Q ₁	Low flow cutoff with 50 % hysteresis ¹⁾
[mm]	[in]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]
50	2	0.06	0.10	40.00	50.00	630	0.01
65	2 ½	0.10	0.16	63.00	78.80	630	0.02
80	3	0.16	0.25	100.00	125.00	630	0.03
100	4	0.25	0.41	160.00	200.00	630	0.04

DN		Q1	Q ₂	Q ₃	Q ₄	Q ₃ / Q ₁	Low flow cutoff with 50 % hysteresis ¹⁾
[mm]	[in]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]
125	5	0.40	0.63	250.00	312.50	630	0.06
150	6	0.63	1.02	400.00	500.00	630	0.10
200	8	1.00	1.60	630.00	787.50	630	0.16
250	10	1.59	2.54	1000.00	1250.00	630	0.25
300	12	2.54	4.06	1600.00	2000.00	630	0.41

1) Values cannot be edited when the custody transfer mode is activated.

5.2.2 Flow characteristic values of certified pulse output



The pulse value is the same for both accuracy classes.

DN		Pulse value	Pulse width
[mm]	[in]	[dm ³]	[ms]
50	2	0.50	15
65	2 ½	0.50	10
80	3	1.00	15
100	4	1.00	10
125	5	2.50	15
150	6	2.50	10
200	8	5.00	10
250	10	10.00	15
300	12	15.00	10



- The configuration of the certified pulse output is defined by the standard.
- The factory setting for the certified pulse output is such that the minimum measured value resolution specified in the standard is maintained for the "flow characteristic values" in the table and the pulse output does not go to overflow at Q₄.
- A pulse modulation of 50/50 (high low level) is presumed.
- If the certified pulse output is configured differently, in terms of the approval this can limit the operable flow range (Q₃/Q₁).

5.3 As-delivered state



Europe

Measuring devices according to the type-examination certificate as per Measuring Instruments Directive 2014/32/EU, Annex III (MI-001) are supplied in an electronically and mechanically locked state with custody transfer mode enabled. Changes to the measuring device's custody transfer-related configuration may only be made by specially qualified Endress+Hauser service technicians or by authorized representatives of the local authority responsible for legal metrology controls.



Additional information for as-delivered state in Europe

Devices with output options H and I are supplied with custody transfer locking of "defined parameters". Devices with output option J - certified pulse output are supplied with custody transfer locking of "all parameters".

Custody transfer parameters	Default value
Custody transfer counter	1
Timestamp last custody transfer	Activation at the factory
Counter custody transfer changes	0



Outside Europe

Measuring devices according to the Declaration of Conformity as per OIML R49 are not supplied in an electronically locked state. The customer is expected to place the measuring device on the market with the involvement of the competent national authority for legal metrology controls and correctly implement the locally applicable requirements as regards the locking and sealing of the measuring device. The authorized representative of the national authority for legal metrology controls is responsible for any information required in this regard.

Custody transfer parameters	Default value
Custody transfer counter	0
Timestamp last custody transfer	0
Counter custody transfer changes	0

5.4 Custody transfer



National rules or regulations must be observed when performing custody transfer.



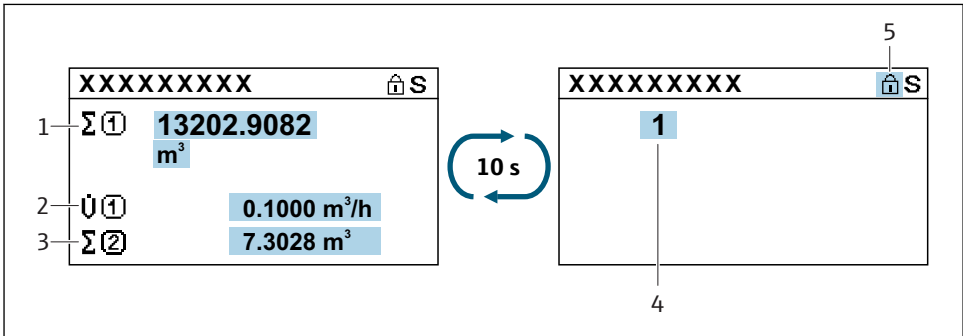
An **authorized user login** is available: EH000 with password 177801. This **authorized user login** is the non-personalized factory login and enables the activation and deactivation of the custody transfer mode. Settings made using this login must be documented and personalized by the system operator. In addition, the responsible calibration authority must be informed of these changes.

5.4.1 Outputs relevant for custody transfer

For output versions H and I, the local display of totalizer 1 is the output that is relevant for custody transfer. For output version J, the local display or the certified pulse output can be selected as the output that is relevant for custody transfer.

Local display

The values that are displayed on the local display are predefined in Custody transfer mode. Any configuration settings made beforehand for the local display are overwritten. The local display shows one value in large format and two additional values. The local display alternates every ten seconds between values 1 to 3 and value 4. A padlock symbol is displayed in the top right-hand corner in the custody transfer mode.



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- 1 Display for value 1
- 2 Display for value 2
- 3 Display for value 3
- 4 Display for custody transfer counter
- 5 Padlock symbol (Custody transfer active)

Value	Description
1	Totalizer with unit m ³ . Displays up to nine integer values (before the decimal). Higher values are displayed in scientific notation.
2	Current volume flow with unit m ³ /h.
3	User configurable.
4	Custody transfer counter.

Certified pulse output

For measuring devices with output version J, the certified pulse output can be used as the output that is relevant for custody transfer.

5.4.2 Authorized user login



To change the measuring device to the Custody transfer mode, the non-personalized, **authorized user login** (factory login) can be used. However, the use of a personalized, **authorized user login** with associated **password** is recommended. This is available only to national market surveillance and authorized persons from the relevant centers. This **authorized user login** is comparable to a personalized sealing pliers and is used to uniquely identify the person / authority who has locked or unlocked the measuring device for custody transfer measurement.



To create an **authorized user login** with **password**, please contact your E+H sales center.

To create the **Authorized user login** parameter with **password**, the following data are required.

Required data	Example
Applicant type	<ul style="list-style-type: none"> ▪ System operator ▪ Market surveillance ▪ Approval center ▪ Endress+Hauser employee
First name	John
Surname	Smith
Company	ABC Company
Department	ABC Department
Address	Any Street 1
Country	Anywhere
City/Town	Anytown
ZIP code	123456
Telephone	123456
E-mail address	John.Smith@sample.com

- The **Authorized user login** parameter consists of five characters comprising two letters and three digits.
- For each **Authorized user login** parameter comprising five characters, a **password** is generated.
- When changes are made, the **Authorized user login** parameter is saved in the Custody transfer logbook.

5.4.3 Parameter description - deactivating Custody transfer



An **authorized user login** is available: EH000 with password 177801. This **authorized user login** is the non-personalized factory login and enables the activation and deactivation of the custody transfer mode. Settings made using this login must be documented and personalized by the system operator. In addition, the responsible calibration authority must be informed of these changes.

Navigation

"Setup" menu → Advanced setup → Custody transfer deactivation

► Custody transfer deactivation	
Authorized user login	→ 18
Password	→ 18
Login state	→ 19
Year	→ 19
Month	→ 19
Day	→ 19
AM/PM	→ 19
Hour	→ 19
Minute	→ 19
Clear custody transfer logbook	→ 19
Entry 30 of custody transfer logbook	→ 19
Toggle DIP switch	→ 19

Parameter overview with brief description

Parameter	Description	User entry / User interface / Selection	Factory setting
Authorized user login	Enter a specified authorized user login.	Authorized user login	EH000
Password	Enter a specified password.	0 to 999 999	177 801

Parameter	Description	User entry / User interface / Selection	Factory setting
Login state	Display login status.	<ul style="list-style-type: none"> ■ Logged in ■ Logged out 	Logged out
Year	Enter the year.	9 to 99	10
Month	Enter the month.	<ul style="list-style-type: none"> ■ January ■ February ■ March ■ April ■ May ■ June ■ July ■ August ■ September ■ October ■ November ■ December 	January
Day	Enter the day.	1 to 31 d	1 d
AM/PM	Select AM/PM.	<ul style="list-style-type: none"> ■ AM ■ PM 	AM
Hour	Enter the hour.	0 to 23 h	12 h
Minute	Enter the minutes.	0 to 59 min	0 min
Clear custody transfer logbook	Delete custody transfer logbook selection.	<ul style="list-style-type: none"> ■ Cancel ■ Clear data 	Cancel
Entry 30 of custody transfer logbook	Display the recorded logbook entries.	0...30	0
Toggle DIP switch	Display the DIP switch status.	<ul style="list-style-type: none"> ■ Off ■ On 	Off

5.4.4 Disabling Custody transfer mode

A list of all the defined parameters and custody transfer parameters is provided in the Annex .



If the **authorized user login** and **password** are entered via the display module, perform the following steps in the order indicated. If the **authorized user login** and **password** are entered via the Web server, the device must first be opened and connected to the service interface.



The procedure does not have a time limit.




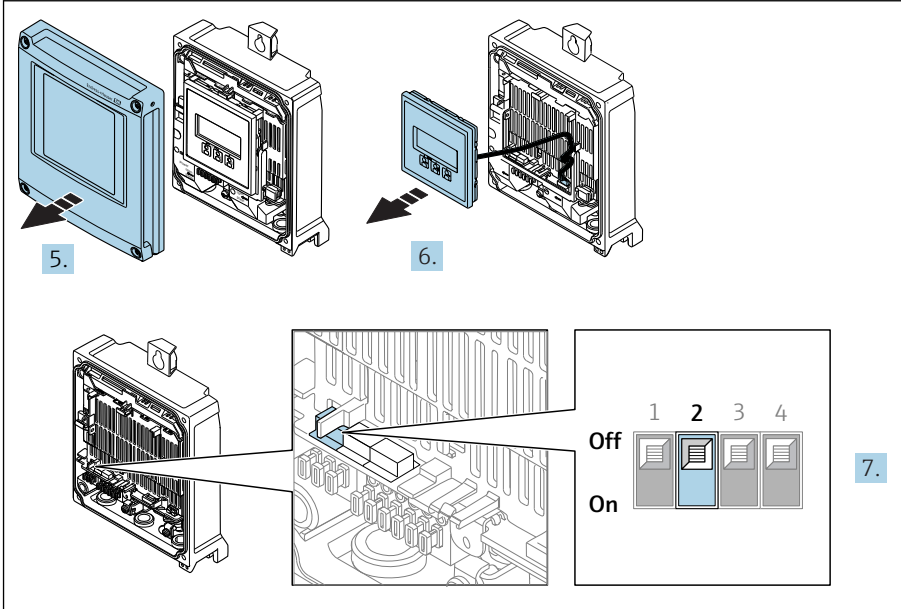
The measuring device can only be unlocked by means of the **Authorized user login** parameter with the correct **password** and **DIP switch**. If only the **DIP switch** is set to the **On** position, the measuring device will not switch to Custody transfer mode. A warning message is generated, which can be cleared only by resetting the **DIP switch** .



Use a suitable tool - preferably one with a non-metal tip - to switch the DIP switch.

Opening the measuring device and disabling custody transfer mode


1. Break the optional sealing.
2. Enter the **Authorized user login** parameter and **Password** parameter in the menu →  21.
3. Enter the time and date information.
4. Disconnect the power supply to the device.
- 5.



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Unscrew the cover of the transmitter.

6. Remove the display module.
7. Set **DIP switch 2** to the **Off** position.
8. Reverse the procedure to close the measuring device.
9. Reestablish the power supply.

 If the measuring device was correctly unlocked using the **Authorized user login** parameter, **password** and **DIP switch 2**, the padlock symbol disappears from the display and the internal Custody transfer counter is incremented. In addition, an entry with Timestamp (operating hours) is generated in the logbook. An entry is also recorded in the event logbook. When the device is in an unlocked state, all parameters can be edited.

5.4.5 Parameter description - activating Custody transfer





An **authorized user login** is available: EH000 with password 177801. This **authorized user login** is the non-personalized factory login and enables the activation and deactivation of the custody transfer mode. Settings made using this login must be documented and personalized by the system operator. In addition, the responsible calibration authority must be informed of these changes.

Navigation

"Setup" menu → Advanced setup → Custody transfer activation







► Custody transfer activation	
Authorized user login	→ 22
Password	→ 22
Login state	→ 19
Display test	→ 22
Year	→ 22
Month	→ 22
Day	→ 22
AM/PM	→ 22
Hour	→ 22
Minute	→ 22
Clear custody transfer logbook	→ 22
Entry 30 of custody transfer logbook	→ 22

Checksum	→  22
Toggle DIP switch	→  22



Parameter overview with brief description

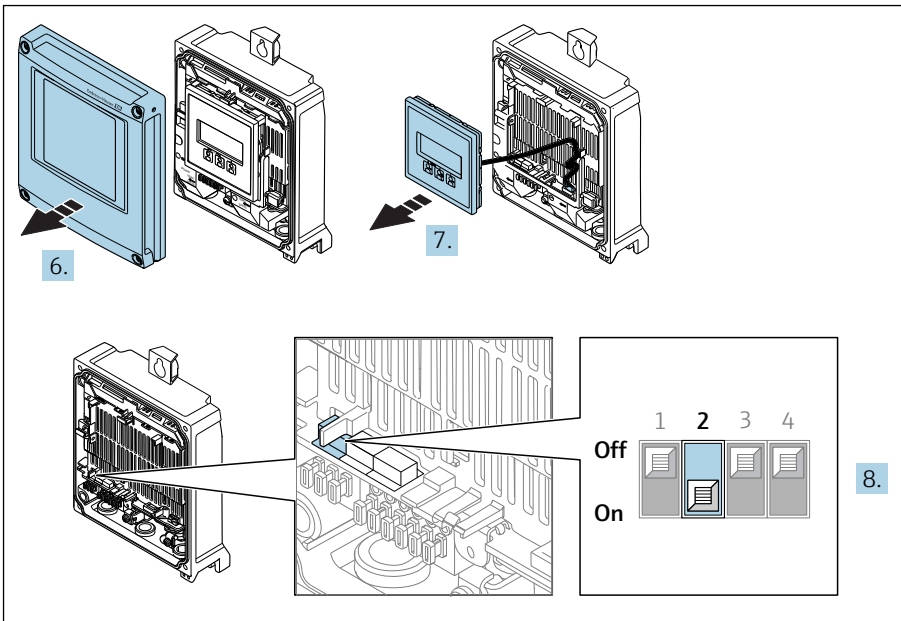
Parameter	Description	User entry / Selection / User interface	Factory setting
Authorized user login	Enter a specified authorized user login.	Authorized user login	EH000
Password	Enter a specified password.	0 to 999 999	177 801
Display test	Start or cancel display test.	<ul style="list-style-type: none"> ■ Cancel ■ Start 	Cancel
Year	Enter the year.	9 to 99	10
Month	Enter the month.	<ul style="list-style-type: none"> ■ January ■ February ■ March ■ April ■ May ■ June ■ July ■ August ■ September ■ October ■ November ■ December 	January
Day	Enter the day.	1 to 31 d	1 d
AM/PM	Select AM/PM.	<ul style="list-style-type: none"> ■ AM ■ PM 	AM
Hour	Enter the hour.	0 to 23 h	12 h
Minute	Enter the minutes.	0 to 59 min	0 min
Clear custody transfer logbook	Delete custody transfer logbook selection.	<ul style="list-style-type: none"> ■ Cancel ■ Clear data 	Cancel
Entry 30 of custody transfer logbook	Display the recorded logbook entries.	0...30	0
Checksum	Shows the checksum of the entire firmware.	Positive integer	-
Toggle DIP switch	Display the DIP switch status.	<ul style="list-style-type: none"> ■ Off ■ On 	Off

5.4.6 Setting up Custody transfer mode

-  If the **authorized user login** and **password** are entered via the display module, perform the following steps in the order indicated. If the **authorized user login** and **password** are entered via the Web server, the device must first be opened and connected to the service interface.
-  The procedure does not have a time limit.
-  The measuring device can be locked only by means of the **Authorized user login** parameter with associated password and **DIP switch 2**. If only **DIP switch 2** is set to the **ON** position, the measuring device will not switch to the custody transfer mode. A warning message is generated, which can be cleared only by resetting **DIP switch 2**.
-  Defined parameters and custody transfer parameters cannot be edited in the locked state. A list of all the non-editable parameters is provided in Section 6 .
-  Before you enable the custody transfer mode, choose whether all the parameters or defined parameters should be locked.
-  Use a suitable tool - preferably one with a non-metal tip - to switch the DIP switch.

Opening the measuring device and setting up the custody transfer mode

1. Select the parameters to be locked with the **Custody transfer locking** parameter →  24.
2. Enter the **Authorized user login** parameter and **Password** parameter in the menu →  21.
3. Enter the time and date information.
4. As an option, the custody transfer logbook can be cleared.
5. Disconnect the power supply to the device.



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Unscrew the cover of the transmitter.

7. Remove the display module.
8. Set **DIP switch 2** to the **On** position.
9. Follow the reverse sequence to close the measuring device, and seal if desired.
10. Reestablish the power supply.
11. A padlock symbol (🔒) appears in the header of the display.

i If the measuring device was locked correctly using the **Authorized user login** parameter, **Password** parameter and **DIP switch 2**, the padlock symbol appears on the display and the internal Custody transfer counter is incremented. In addition, an entry with Timestamp (operating hours) is generated in the Custody transfer logbook. An entry is also recorded in the event logbook.

5.5 Reading parameters relevant for custody transfer

i In custody transfer mode, the following parameters can be viewed via the display or the service interface (Web server).

Navigation

"Operation" menu → Custody transfer

▶ Custody transfer	
Custody transfer mode	→ 25
Firmware version	→ 25
Checksum	→ 25
Custody transfer counter	→ 25
Custody transfer locking	→ 25
Timestamp last custody transfer	→ 25
Display test	→ 25

Parameter overview with brief description

Parameter	Description	User interface / Selection	Factory setting
Custody transfer mode	Shows if the custody transfer mode is in progress.	<ul style="list-style-type: none"> ■ Off ■ On 	Off
Firmware version	Shows the device firmware version installed.	Character string in the format xx.yy.zz	–
Checksum	Shows the checksum of the entire firmware.	Positive integer	–
Custody transfer counter	Indicates how often custody transfer mode has been enabled so far.	0 to 65 535	–
Custody transfer locking	Select if all or a part of the parameters are write-protected in the custody transfer mode.	<ul style="list-style-type: none"> ■ Defined parameters ■ All parameters 	Defined parameters
Timestamp last custody transfer	Indicates the time when the custody transfer mode was last enabled.	Days (d), hours (h), minutes (m) and seconds (s)	–
Display test	Start or cancel display test.	<ul style="list-style-type: none"> ■ Cancel ■ Start 	Cancel

5.5.1 Display test

The character test string is used to test the display. When the display test is selected, the display test sequence starts and the test string is displayed with an inverted background. Once the text display is confirmed, the test string is displayed again with a non-inverted background and the display test is finished.

5.6 Custody transfer logbook

The Custody transfer logbook can be viewed on the display via FieldCare or the Web server.

- The last entry is displayed first.
- A maximum of 30 entries can be saved in the Custody transfer logbook. If these are all in use, no further entries will be saved and a warning message will appear.
- If parameters relating to Custody transfer mode are changed while custody transfer mode is disabled, this is recorded in the Custody transfer logbook. In addition, an exact description of the changed parameter is saved in the event logbook.

Navigation

"Diagnostics" menu → Custody transfer logbook

► Custody transfer logbook	
Logbook entry	→ 27
Entry 30 of custody transfer logbook	→ 27
Event number	→ 27
Event logbook	→ 27
Timestamp	→ 27
Authorized user login	→ 27
Totalizer value	→ 27
Totalizer overflow	→ 27
Date/time	→ 27

Parameter overview with brief description

Parameter	Description	User entry / User interface	Factory setting
Logbook entry	Select a logbook entry.	1 to 30	1
Entry 30 of custody transfer logbook	Display the recorded logbook entries.	0..30	0
Event number	Display the event number.	Positive integer	1
Event logbook	Display the event.	–	0
Timestamp	Display the timestamp.	Date of timestamp.	0
Authorized user login	Display the specified authorized user login.	Authorized user login	EH000
Totalizer value	Display the totalizer value.	Signed floating-point number	0
Totalizer overflow	Display the totalizer overflow.	Signed floating-point number	0
Date/time	Display the date/time.	Date/time	0

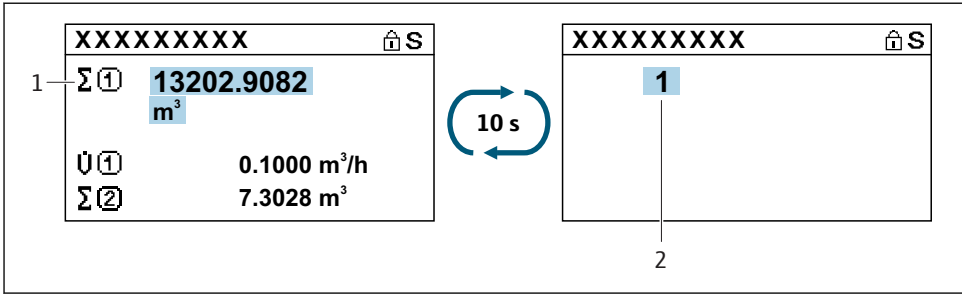
5.6.1 Deleting the Custody transfer logbook

The Custody transfer logbook can be deleted only if you have previously logged in using an **Authorized user login** parameter and **password**.

1. In the **Custody transfer activation** wizard or **Custody transfer deactivation** wizard, log in with an **Authorized user login** parameter and **password**.
2. The **Clear custody transfer logbook** parameter is now available in the **Custody transfer activation** wizard and in the **Custody transfer deactivation** wizard .
 - ↳ If the Custody transfer logbook is deleted, this is stored as the first new entry in the custody transfer logbook.

5.7 Procedure for market surveillance

The recommended procedure for market surveillance is the comparison between the status of the custody transfer counter shown under display value 4 on the display and the last documented status of the custody transfer counter. The display alternates every ten seconds between the custody transfer counter status and the totalizer.



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- 1 Display for totalizer.
- 2 Display for custody transfer counter status.

If the custody transfer counter status on the display and the last documented custody transfer counter status are identical, the device has not been tampered with.

However, if the two custody transfer counter statuses are not identical, the following procedure is recommended:

Retrieve the following parameters in the Custody transfer logbook:

1. **Authorized user login** parameter: Check the last authorized user login where a change was made to parameters relevant for custody transfer.
2. **Event logbook** parameter: Verify changes.
3. **Totalizer value** parameter: Check the value of the totalizer at the time of the change.
4. **Timestamp** parameter: Check the operating time at which the change was made.
5. In the Event logbook, search for the entry with the applicable Timestamp in the Event logbook and verify which changes were carried out.

In this way, market surveillance can verify what was changed by whom at a particular time.

5.8 Repeated calibration due to legal metrology controls

The system operator is obliged to perform a recalibration in accordance with the relevant applicable national regulations.

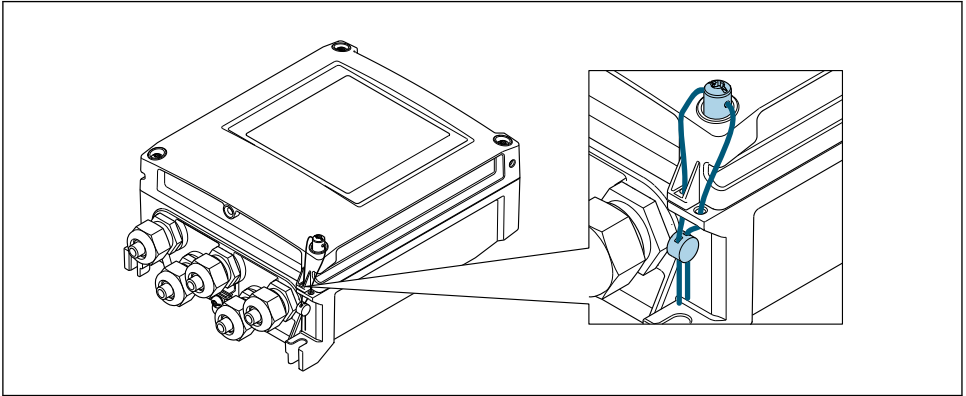
5.9 Sealing



It is possible to seal the measuring device. The system operator or the competent calibration authority is responsible for applying the optional seal. The seal can be applied to the housing using a seal screw and the relevant bracket.

5.9.1 Sealing the transmitter

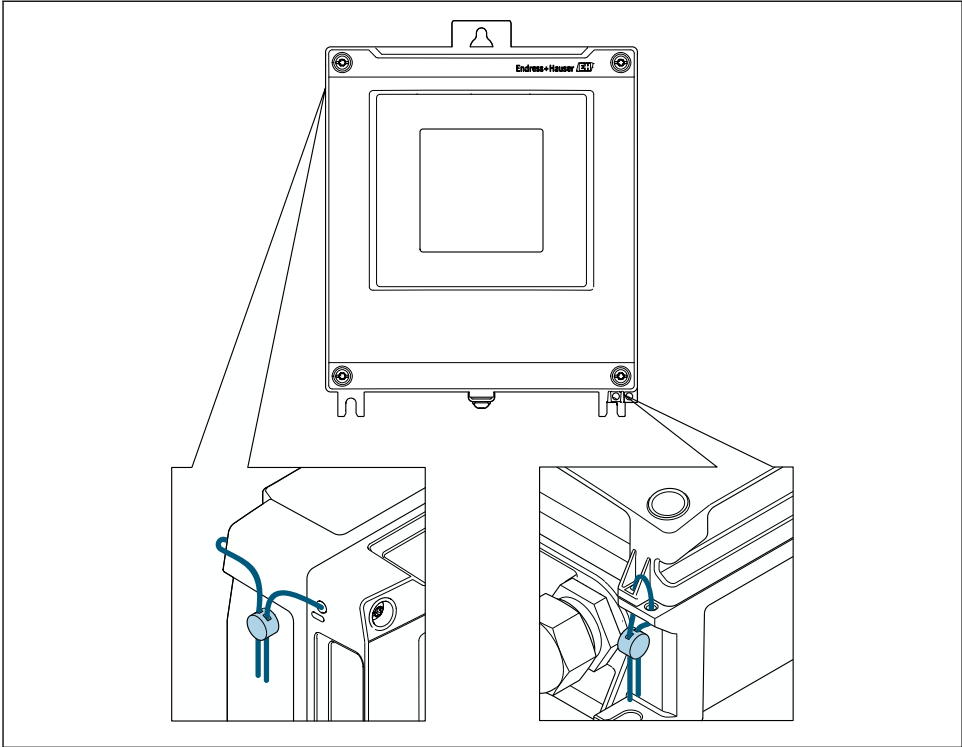
Aluminum transmitter



A0025237

1. Pull the wire through the bore in the housing and through the screw head. In doing so, ensure that the wire is taut and there is no leeway for the screw to loosen.
2. Seal the wire ends.

Polycarbonate transmitter

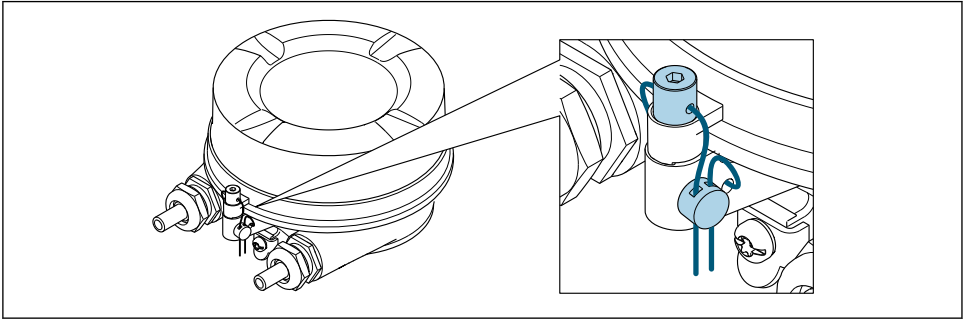


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1. Remove the display guard before sealing.
2. Pull the wire through the holes in the housing.
3. Seal the wire ends.
4. Fit the display guard back on after sealing.

5.9.2 Sealing the connection housing

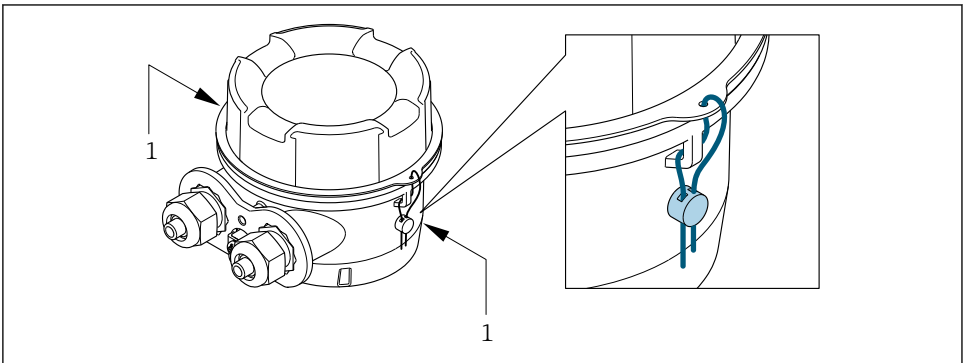
Connection housing remote version



A0025239

1. Pull the wire through the bore in the housing and through the screw head. In doing so, ensure that the wire is taut and there is no leeway for the screw to loosen.
2. Seal the wire ends.

Connection housing remote version, IP68



A0025238

1. Feed the wire through the bore hole in the cover and connection housing. In doing so, ensure that the wire is taut.
2. Seal the wire ends.

6 List of the parameters that can be configured in custody transfer mode

Parameters that are relevant for custody transfer must be write-protected in the custody transfer mode. Three options are available for this purpose:

- Hardware write protection
- Custody transfer locking of all parameters
- Custody transfer locking of defined parameters

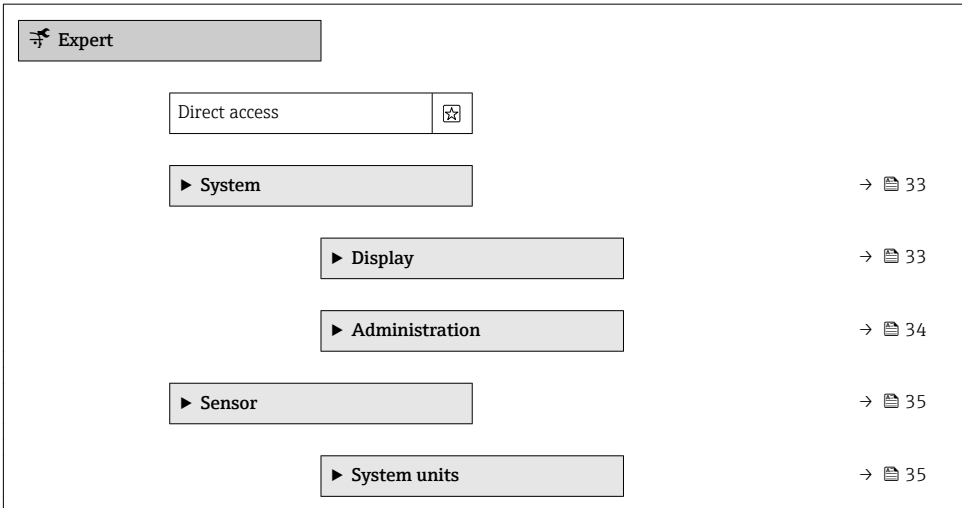
6.1 Configurable parameters

Description

- Hardware write protection sets write-protection for every parameter. See the section on "Write protection via write protection switch" in the Operating Instructions.
- **Custody transfer locking of all parameters** is the **custody transfer lock** set at the factory for measuring devices with output **J**. The settings of the certified pulse output are locked in the **Custody transfer locking of all parameters** mode.
- **Custody transfer locking of defined parameters** is the **custody transfer lock** set at the factory for measuring devices with output **H** and **I**.
- The following list contains all the parameters that can be edited in the **Custody transfer locking of all parameters** and **defined parameters** mode. These parameters are not marked.
- The parameters that are marked can also be edited in the **Custody transfer locking of defined parameters** mode.
- Generally speaking, all the parameters that are not listed cannot be edited in the custody transfer mode.

Navigation

"Expert" menu



▶ Process parameters	→ 35
▶ Calibration	→ 35
▶ Output	→ 35
▶ Current output 1	→ 35
▶ Pulse/frequency/switch output 1 to n	→ 36
▶ Communication	→ 37
▶ HART output	→ 37
▶ Web server	→ 38
▶ WLAN settings	→ 39
▶ Diagnostics	→ 40
▶ Event logbook	→ 40
▶ Data logging	→ 40
▶ Heartbeat Technology	→ 41

6.1.1 "System" submenu

"Display" submenu

Navigation

"Expert" menu → System → Display

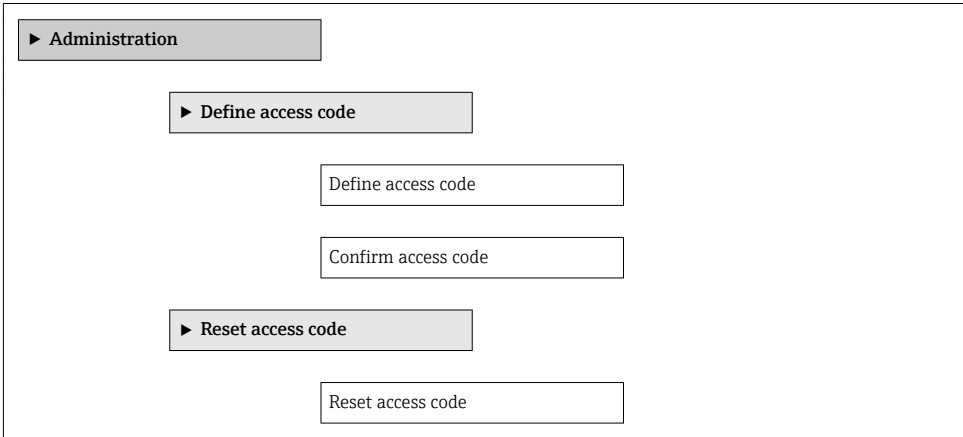
▶ Display	
Display language	✳

Value 3 display	
0% bargraph value 3	
100% bargraph value 3	
Decimal places 3	
Header	
Header text	
Separator	
Contrast display	
Backlight	

"Administration" submenu

Navigation

"Expert" menu → System → Administration





6.1.2 "Sensor" submenu

"System units" submenu

Navigation


"Expert" menu → Sensor → System units

▶ System units	
Conductivity unit	
Date/time format	

"Process parameters" submenu

Navigation

"Expert" menu → Sensor → Process parameters

▶ Process parameters	
Conductivity measurement	

"Calibration" submenu

Navigation

"Expert" menu → Sensor → Calibration


▶ Calibration	
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6.1.3 "Output" submenu

"Current output 1" submenu
















Navigation

"Expert" menu → Output → Current output 1

▶ Current output 1	
Fixed current	

"Pulse/frequency/switch output 1 to n" submenu**Navigation**

"Expert" menu → Output → Pulse/frequency/switch output 1 to n













► Pulse/frequency/switch output 1 to n	
Assign pulse output 1 to n	
Pulse scaling	
Pulse width	
Measuring mode	
Failure mode	
Assign frequency output	
Minimum frequency value	
Maximum frequency value	
Measuring value at minimum frequency	
Measuring value at maximum frequency	
Measuring mode	
Damping output 1 to n	
Failure mode	
Failure frequency	
Assign flow direction check	














6.1.4 "Communication" submenu

"HART output" submenu

Navigation

"Expert" menu → Communication → HART output


▶ HART output	
▶ Configuration	
HART short tag	
Device tag	
HART address	
No. of preambles	
Fieldbus writing access	
▶ Burst configuration	
▶ Burst configuration 1 to n	
Burst mode 1 to n	
Burst command 1 to n	
Burst variable 0	
Burst variable 1	
Burst variable 2	
Burst variable 3	
Burst variable 4	







Burst variable 5	
Burst variable 6	
Burst variable 7	
Burst trigger mode	
Burst trigger level	
Min. update period	
Max. update period	
► Information	
Device type	
Manufacturer ID	
HART descriptor	
HART message	
Hardware revision	
HART date code	

"Web server" submenu

Navigation

"Expert" menu → Communication → Web server










► Web server	
Web server language	






DHCP client	
IP address	
Subnet mask	
Default gateway	
Web server functionality	
Login page	

"WLAN settings" wizard

Navigation

"Expert" menu → Communication → WLAN settings

▶ WLAN settings	
WLAN	
WLAN mode	
SSID name	
Network security	
User name	
WLAN password	
WLAN IP address	
WLAN subnet mask	
WLAN passphrase	


Assign SSID name	
SSID name	
2.4 GHz WLAN channel	
Select antenna	
WLAN IP address	

6.1.5 "Diagnostics" submenu

"Event logbook" submenu

Navigation






"Expert" menu → Diagnostics → Event logbook



► Event logbook	
Filter options	

"Data logging" submenu

Navigation

"Expert" menu → Diagnostics → Data logging

► Data logging	
Assign channel 1	
Assign channel 2	
Assign channel 3	
Assign channel 4	
Logging interval	

Clear logging data	
Data logging	
Logging delay	
Data logging control	

"Heartbeat Technology" submenu

Navigation

"Expert" menu → Diagnostics → Heartbeat Technology

▶ Heartbeat Technology
▶ Heartbeat base settings
Plant operator
Location
Partially filled pipe
▶ Performing verification
Year
Month
Day
Hour
AM/PM
Minute

External device information

Start verification

Measured values

6.2 Deviating parameter configuration

 The configuration of the following parameters deviates from the factory settings and corresponds to the specifications of OIML R49.

Parameters	Factory setting	Configuration
Format display	1 value, max.	1 value, max. + 2 values ¹⁾
Value 1 display	Mass flow	Totalizer 1 ¹⁾
Decimal places 1	x.xx	Depends on the nominal diameter of the device ¹⁾
Value 2 display	None	Volume flow ¹⁾
Value 4 display	None	Custody transfer counter ¹⁾
Display interval	5 s	10 s ¹⁾
Volume flow unit	l/h or gal/min	m ³ /h
Volume unit	m ³ or gal	dm ³
Totalizer 1 (Assign process variable)	Volume flow	Volume flow
Totalizer 1 (Operating mode)	Net flow total	Net flow total
Unit totalizer 1 to n	l or gal	m ³
Totalizer 1 (Failure mode)	Stop	Stop
Totalizer 2 (Assign process variable)	Volume flow	Volume flow
Totalizer 2 (Operating mode)	Net flow total	Forward flow
Totalizer 2 to n (Unit totalizer 1)	l or gal	m ³
Totalizer 2 (Failure mode)	Stop	Stop
Totalizer 3 (Assign process variable)	Volume flow	Volume flow
Totalizer 3 (Operating mode)	Net flow total	Reverse flow
Totalizer 3 to n (Unit totalizer 1)	l or gal	m ³
Totalizer 3 (Failure mode)	Stop	Stop
Flow damping	4	7
Low flow cut off	Volume flow	Volume flow

Parameters	Factory setting	Configuration
On-time low flow cut off	Depends on nominal diameter	See the "Configurable parameters" section → 32
Empty pipe detection	Off	On
PFS output 1 (Operating mode) ²⁾	Pulse	Pulse
PFS output 1 (Assign pulse 1) ²⁾	Off	Volume flow
PFS output 1 (Value per pulse) ²⁾	Depends on nominal diameter	See the "Configurable parameters" section → 32
PFS output 1 (Pulse width) ²⁾	100	See the "Configurable parameters" section → 32
PFS output 1 (Measuring mode) ²⁾	Forward flow	Forward flow
PFS output 1 to n (Failure mode) ²⁾	No pulses	No pulses
PFS output 2 (Operating mode) ²⁾	Pulse	Switch
PFS output 2 (Switch off function) ²⁾	Off	Flow direction monitoring
PFS output 2 (Assign flow direction check) ²⁾	Volume flow	Volume flow

- 1) These parameters are set automatically when custody transfer mode is activated, and reset when custody transfer mode is deactivated.
- 2) Only available with order code for "Output;input", option J.

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