

Special Documentation

Proline Promag 800

Custody transfer
Meter for drinking water
Modbus RS485



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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

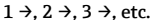
- 
- Detailed information on the "Parameters with a short description" is provided in the Operating Instructions
 - Detailed information on the "Operating philosophy" is provided in the Operating Instructions

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



For an overview of the scope of the associated Technical Documentation, refer to the following:

- *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

This manual is Special Documentation. It does not replace the Operating Instructions supplied with the device.

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

Measuring device	Documentation code
Promag W 800 Modbus RS485	BA02043D
Promag W 800 Modbus RS485	GP01153D

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 device consists of a transmitter and a sensor.

Proline Promag 800

Compact version – transmitter and sensor form a mechanical unit.

Proline Promag 800 - Advanced

Two device versions are available:

- Compact version – transmitter and sensor form a mechanical unit.
- Remote version - transmitter and sensor are mounted in separate locations.

Two sensor versions are available for each transmitter.

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

The measuring device is tested in accordance with OIML R 49:2013 (www.oiml.org) as an option 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 meets the requirements in accordance with OIML R 49:2013.

Sensor version – Standard

DN [mm]	Indicating Resolution (Maximum values) [m³]	Indicating Range (Minimum values) [m³]
25	0.0001	99 999
32, 40, 50	0.001	99 999
65, 80	0.001	999 999
100, 125, 150	0.01	999 999
200, 250	0.01	9 999 999
300, 350, 375, 400, 450, 500, 600, 700, 750, 800, 900	0.1	9 999 999

Sensor version - 0x DN inlet/outlet runs (accuracy class 1 & accuracy class 2)

DN [mm]	Indicating Resolution (Maximum values) [m³]	Indicating range (Minimum values) [m³]
50	0.0001	99 999
65	0.001	99 999
80, 100, 125, 150	0.001	999 999

DN [mm]	Indicating Resolution (Maximum values) [m ³]	Indicating range (Minimum values) [m ³]
200	0.01	999999
250, 300	0.01	9999999

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. These seals may only be opened by a representative of the competent authority for legal metrology controls.

The measuring device cannot generally be operated without tools. All information relevant for custody transfer is shown on the display when custody transfer mode is enabled. The Smart Blue app is one tool that can be used to operate the measuring device. Parameters that are relevant for custody transfer are write-protected when custody transfer mode is enabled.



Europe

Since the European Measuring Instruments Directive 2004/22/EC came into effect on November 1, 2006 and the revised 2014/32/EU version 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 R 49:2013. 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.



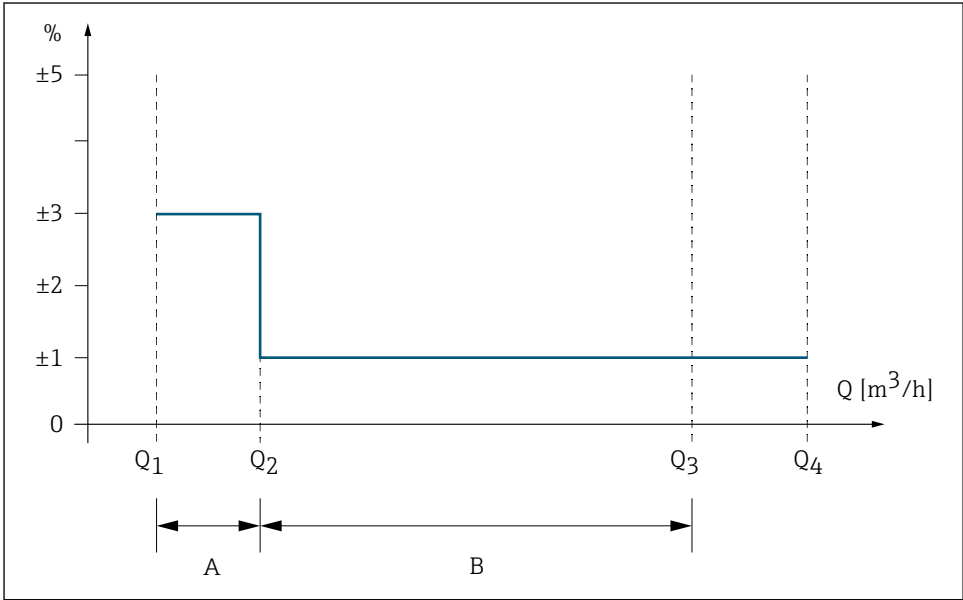
Outside Europe

Detailed ordering information for national approvals based on OIML R 49:2013 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

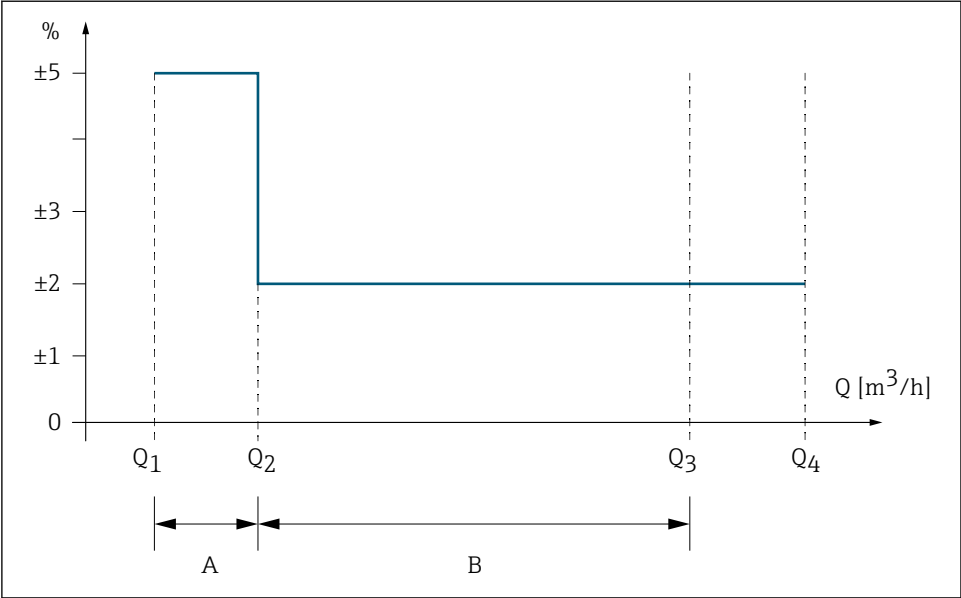


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1 Flow ranges and maximum permissible errors for cold water

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

Accuracy class 2

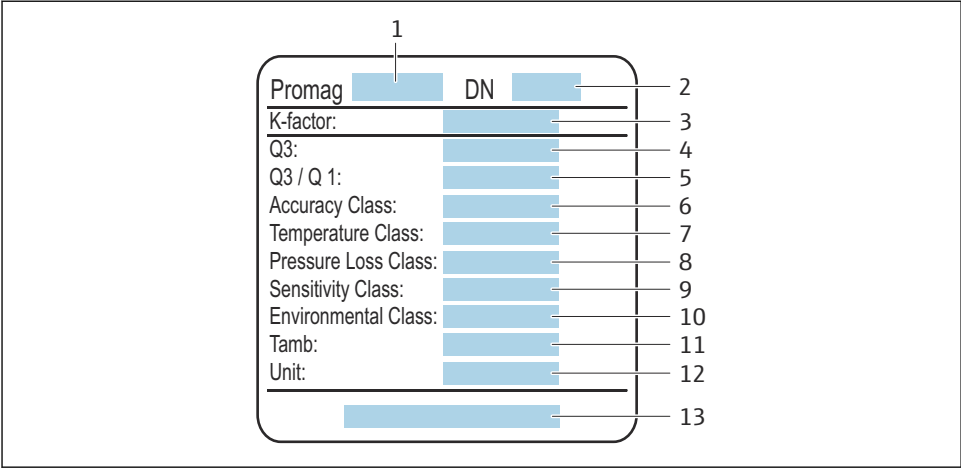


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2 Flow ranges and maximum permissible errors for cold water

- A Lower zone
Maximum permissible error: ±5 %
- B Upper zone
Maximum permissible error: ±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 the sensor*
- 2 *Nominal diameter of the sensor*
- 3 *Calibration factor/zero point*
- 4 *Flowrate Q_3*
- 5 *Flowrate Q_3 / Q_1*
- 6 *Accuracy class*
- 7 *Temperature class*
- 8 *Pressure loss class*
- 9 *Sensitivity class*
- 10 *Environmental class*
- 11 *Ambient temperature*
- 12 *Unit*
- 13 *Number of certificate*

5 Operation and commissioning

5.1 Operating conditions for sensor standard version

 The operating conditions listed are valid for all transmitters. →  6

The measuring device should be sized in such a way that, under normal operating conditions as per the specifications of OIML R 49:2013, 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	$5 \times DN$ corresponds to sensitivity class U5
Outlet run from flange	$2 \times DN$ corresponds to sensitivity class D3
Flow direction	Bidirectional
Test equipment	Measurement transducer, calculator, indicating device
Test equipment	Type P



Please note the following for operation:

- An uninterrupted power supply must be guaranteed if the device is not powered by a battery.
- Use shielded signal cables.
- Observe the installation conditions in the Technical Information, particularly the potential equalization.

5.1.1 Flow characteristic values

The following flow characteristic values correspond to the specifications in OIML R 49:2013.

DN		Q ₁	Q ₂	Q ₃	Q ₄	Q ₃ / Q ₁	Low flow cutoff with 100 % hysteresis ¹⁾
[mm]	[in]	[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	0.032
32	1 ¼	0.16	0.25	25.00	31.25	160	0.050
40	1 ½	0.25	0.40	40.00	50.00	160	0.080
50	2	0.39	0.63	63.00	78.75	160	0.126
65	2 ½	0.63	1.00	100.00	125.00	160	0.200
80	3	1.00	1.60	160.00	200.00	160	0.320
100	4	1.56	2.50	250.00	312.50	160	0.500
125	5	2.50	4.00	400.00	500.00	160	0.800
150	6	3.94	6.30	630.00	787.50	160	1.260
200	8	6.25	10.00	1000.00	1250.00	160	2.000
250	10	10.00	16.00	1600.00	2000.00	160	3.200
300	12	15.63	25.00	2500.00	3125.00	160	5.000

DN		Q1	Q ₂	Q ₃	Q ₄	Q ₃ / Q ₁	Low flow cutoff with 100 % hysteresis ¹⁾
[mm]	[in]	[m³/h]	[m³/h]	[m³/h]	[m³/h]		[m³/h]
350	14	15.63	25.00	2 500.00	3 125.00	160	5.000
375	15	25.00	40.00	4 000.00	5 000.00	160	8.000
400	16	25.00	40.00	4 000.00	5 000.00	160	8.000
450	18	25.00	40.00	4 000.00	5 000.00	160	8.000
500	20	32.00	51.20	4 000.00	5 000.00	125	10.240
600	24	50.00	80.00	4 000.00	5 000.00	80	16.000
700	28	63.49	101.59	4 000.00	5 000.00	63	20.317
750	30	80.00	128.00	4 000.00	5 000.00	50	25.600
800	32	80.00	128.00	4 000.00	5 000.00	50	25.600
900	36	100.00	160.00	4 000.00	5 000.00	40	32.000

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

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

 The operating conditions listed are valid for all transmitters. →  6

 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 R 49:2013, it operates in the range from Q₁ to Q₄.

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 sensitivity class U0
Outlet run from flange	0 × DN corresponds to sensitivity 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.



Please note the following for operation:

- An uninterrupted power supply must be guaranteed if the device is not powered by a battery.
- Use shielded signal cables.
- Observe the installation conditions in the Technical Information, particularly the potential equalization.

5.2.1 Flow characteristic values

The following flow characteristic values correspond to the specifications in OIML R 49:2013.

Accuracy class 1

DN		Q ₁	Q ₂	Q ₃	Q ₄	Q ₃ / Q ₁	Low flow cutoff with 100 % hysteresis ¹⁾
[mm]	[in]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]		[m ³ /h]
50	2	0.20	0.32	40.00	50.00	200	0.064
65	2 ½	0.32	0.50	63.00	78.75	200	0.101
80	3	0.50	0.80	100.00	125.00	200	0.160
100	4	0.80	1.28	160.00	200.00	200	0.256
125	5	1.25	2.00	250.00	312.50	200	0.400
150	6	2.00	3.20	400.00	500.00	200	0.640
200	8	3.15	5.04	630.00	787.50	200	1.008
250	10	5.00	8.00	1000.00	1250.00	200	1.600
300	12	8.00	12.80	1600.00	2000.00	200	2.560

- 1) Values cannot be edited when custody transfer mode is enabled.

Accuracy class 2

DN		Q ₁	Q ₂	Q ₃	Q ₄	Q ₃ / Q ₁	Low flow cutoff with 100 % hysteresis ¹⁾
[mm]	[in]	[m ³ /h]	[m ³ /h]	[m ³ /h]	[m ³ /h]		[m ³ /h]
50	2	0.10	0.16	40.00	50.00	400	0.032
65	2 ½	0.16	0.25	63.00	78.75	400	0.050
80	3	0.25	0.40	100.00	125.00	400	0.080
100	4	0.40	0.64	160.00	200.00	400	0.128
125	5	0.63	1.00	250.00	312.50	400	0.200
150	6	1.00	1.60	400.00	500.00	400	0.320
200	8	1.58	2.52	630.00	787.50	400	0.504
250	10	2.50	4.00	1000.00	1250.00	400	0.800
300	12	4.00	6.40	1600.00	2000.00	400	1.280

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

5.3 As-delivered state



Europe

Devices in accordance with a type-examination certificate as per Measuring Instruments Directive 2014/32/EU, Annex III (MI-001), are supplied 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.

All devices are supplied with CT locking: **Defined parameters**.

Custody transfer parameters	Default value
Custody transfer counter	1
Timestamp last custody transfer	Factory/workshop activation
Counter custody transfer changes	0



Outside Europe

Measuring devices according to the Declaration of Conformity as per OIML R 49:2013 are unlocked or delivered with custody transfer mode disabled. The customer is expected to place the measuring device on the market with the involvement of the competent national calibration authority 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.

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.

5.4.1 Outputs relevant for custody transfer

Local display

In order to meet legal requirements, the local display is configured for custody transfer ex works. The recommended configuration of the parameters is described in Section 6.2 → 43.

The local display alternates between values that are relevant for custody transfer and values that are not relevant for custody transfer showing the values in sequence in 10-second intervals.

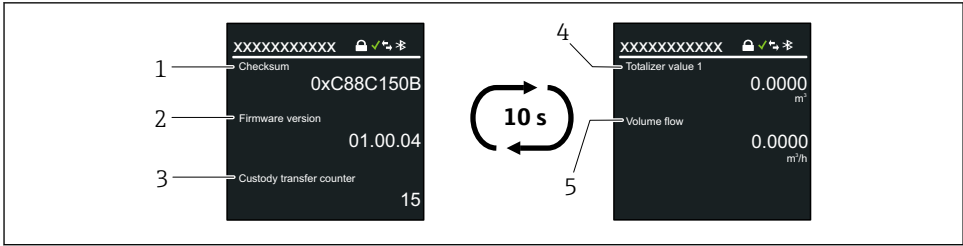
Available operational displays:

- Operational display 1
- Operational display 2
- Operational display 3 (optional)
- Color-inverted display of the last operational display shown

The checksum, device firmware version and custody transfer counter are shown on operational display 1. This operational display is only shown when custody transfer mode is enabled.

Custody transfer-related totalizer 1 and the current volume flow are shown on operational display 2. Totalizer 1 is automatically displayed when custody transfer mode is enabled. The

current volume flow is configured as display value 1 and blocked when custody transfer mode is enabled. Display value 2 is optionally shown if it has been configured.



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4 Operational display 1 and operational display 2

- 1 Checksum
- 2 Firmware version
- 3 Custody transfer counter
- 4 Totalizer
- 5 Current volume flow

Operational display 3 is shown optionally if display values 3 and 4 have been configured. The last operational display shown is then displayed in the inverted color scheme for 2 seconds and acts as a display test.

Navigation

"Local display" menu → Custody transfer

► Custody transfer

Checksum

Firmware version

Custody transfer counter

Totalizer value 1

Unit totalizer 1

→ 17

→ 17

→ 17

→ 17

→ 17

Parameter overview with brief description

Parameter	Description	User interface / Selection	Factory setting
Checksum	Shows the firmware's checksum.	Positive integer	–
Firmware version	Shows the device firmware version installed.	Character string comprising numbers, letters and special characters	–
Custody transfer counter	Indicates how often custody transfer mode has been enabled so far.	0 to 65 535	–
Totalizer value	Displays the value of the totalizer.	Character string comprising numbers, letters and special characters	–
Process variable unit	Select the unit for the process variable of the totalizer.	Unit choose list	m ³

5.4.2 Determining parameters locked in Custody transfer

Select the preferred write protection option for custody transfer mode.

 Promag W 800 is supplied from the factory with CT locking: **Defined parameters**.

Navigation

"Application" menu → Custody transfer → Custody transfer locking

► Custody transfer

Custody transfer locking

→  17

Parameter overview with brief description

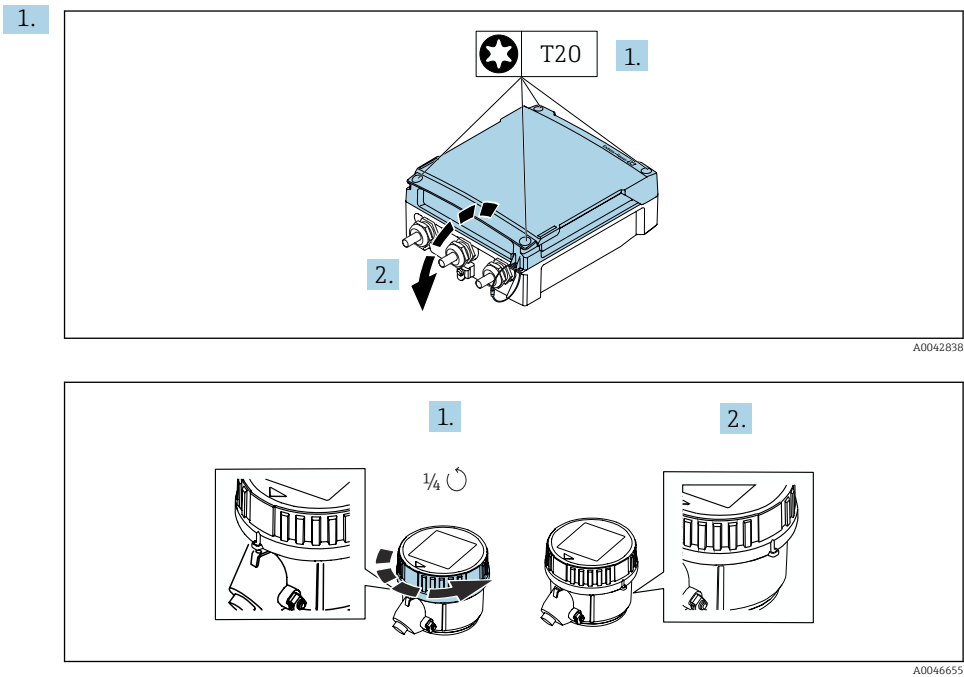
Parameter	Description	Selection
Custody transfer locking	Indicate whether all parameters or only parameters relevant to custody transfer should be write-protected.	▪ Defined parameters ▪ All parameters

5.4.3 Disabling Custody transfer mode

A list of all the defined and custody transfer parameters is provided in the Appendix →  31.

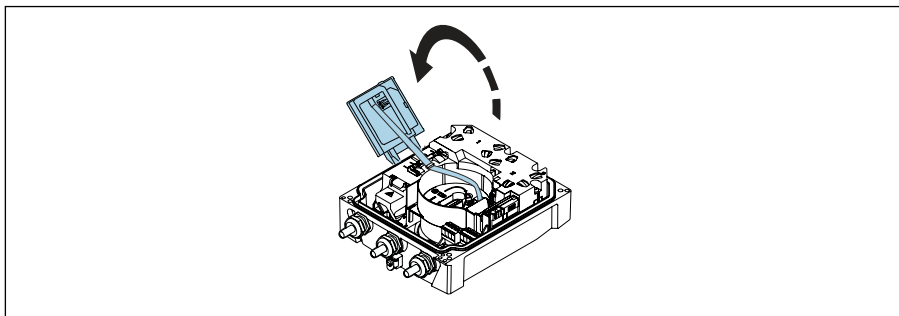
 Use a suitable tool - preferably one with a non-metal tip - to switch the DIP switch.

Open the measuring device and disable custody transfer mode

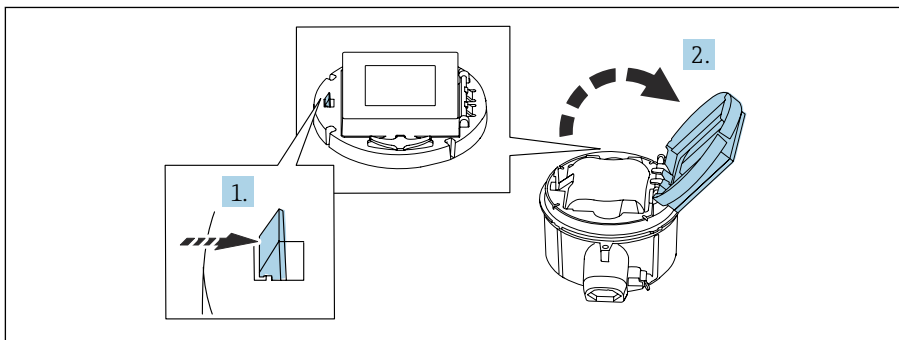


Unscrew the cover of the transmitter.

2.



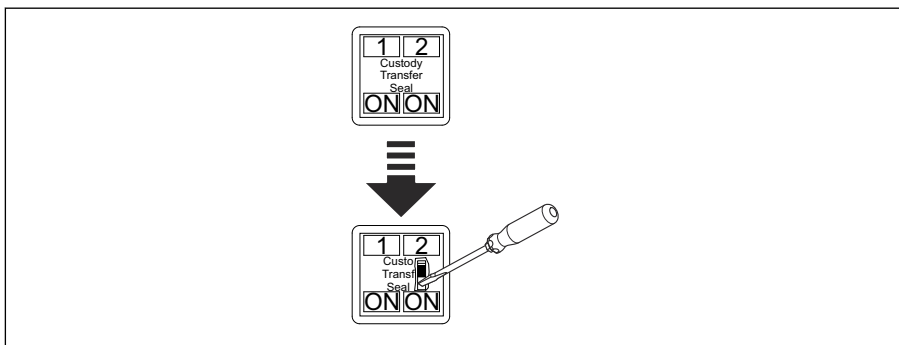
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Open the display module.

3.



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Break open the adhesive seal on the back of the display module above the **DIP switch** and set **DIP switch 2 (Custody transfer)** to the **OFF** position.

4. Close the measuring device in reverse order.

 The note for **DIP switch 2 (Custody transfer)** is located on the connection label in the connection compartment cover.

 If the measuring device was correctly unlocked with **DIP switch 2 (Custody transfer)**, the locking symbol on the display disappears and the internal Custody transfer counter is incremented. An entry is created in the event logbook with the Timestamp. When the device is in an unlocked state, all parameters can be edited. Changes to custody transfer-related parameters create an entry in the event logbook.

5.4.4 Setting up Custody transfer mode

 The device can only be locked with **DIP switch 2 (Custody Transfer)**.

 The parameters are write-protected in custody transfer mode. The parameters that are relevant for custody transfer (**Defined parameters**) or additional parameters defined by Endress+Hauser (**All parameters**) are selected via the custody transfer locking parameter. A list of all the editable parameters is provided in Section 6. →  31

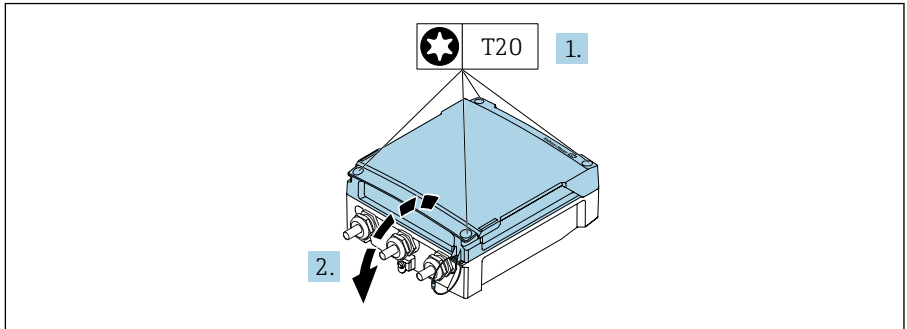
 Before you enable the custody transfer mode, choose whether **All parameters** or **Defined parameters** should be locked.

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

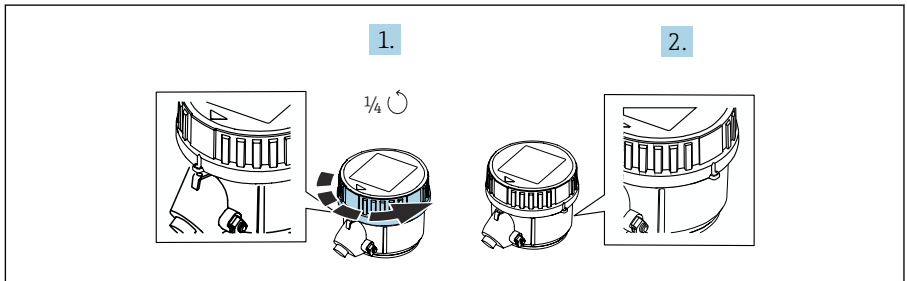
Open the measuring device and set up custody transfer mode

1. Select the parameters to be locked with the **Custody transfer locking** parameter →  23.

2.



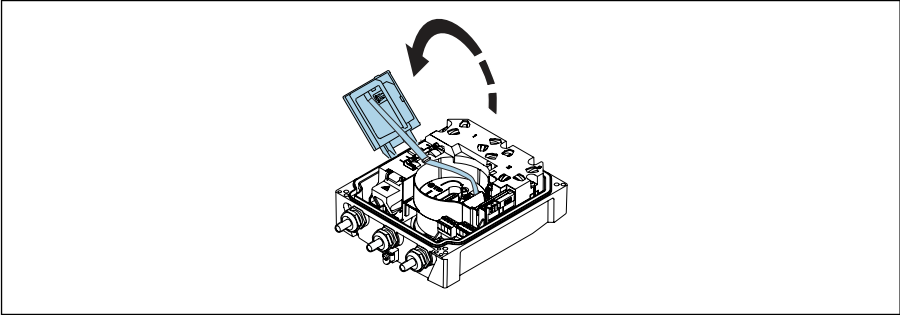
A0042838



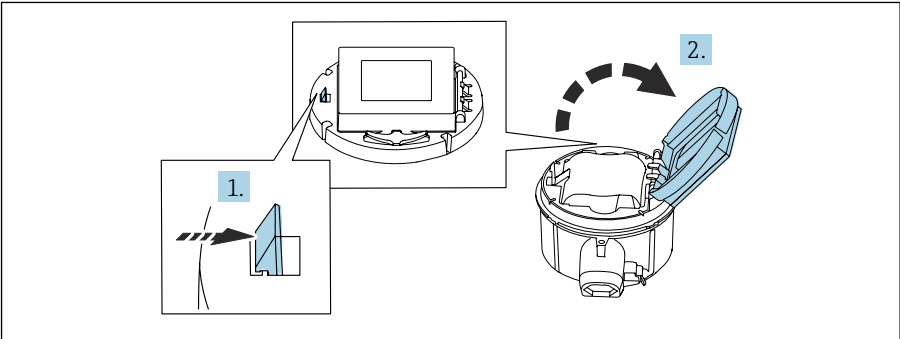
A0046655

Unscrew the cover of the transmitter.

3.



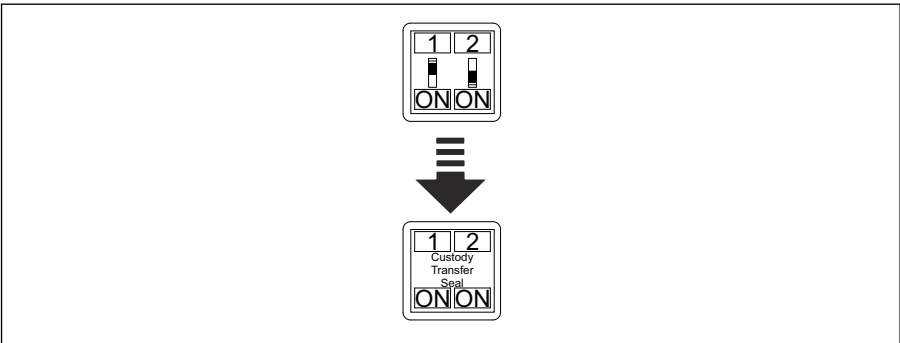
A0043731



A0046658

Open the display module.

4.



A0053887

Set **DIP switch 2 (Custody transfer)** on the back of the display module to the **ON** position and seal the **DIP switch** with an adhesive label.

5. Close the measuring device in reverse order.



If the measuring device was correctly locked with **DIP switch 2 (Custody transfer)**, the locking symbol appears on the display and the internal Custody transfer counter is incremented. An entry is also created in the event logbook with the Timestamp.

5.5 Custody transfer submenu



In custody transfer mode, the following parameters can be viewed via the SmartBlue app. These can also be read via MODBUS RS485 Register.

Navigation

"Application" menu → Custody transfer

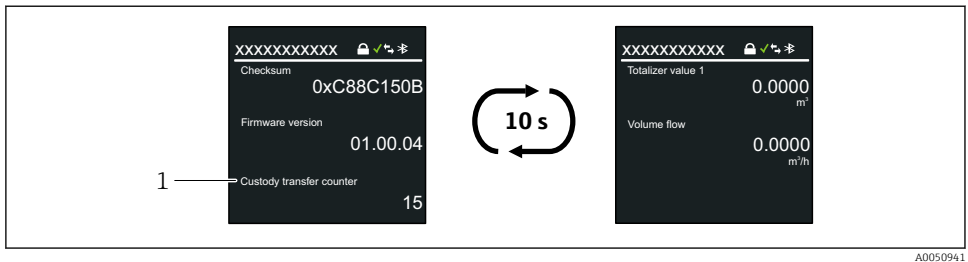
► Custody transfer		
Custody transfer mode	→	24
Totalizer 1 value	→	24
Checksum	→	24
Firmware version	→	24
Custody transfer counter	→	24
Custody transfer locking	→	24
Timestamp last custody transfer	→	24
DIP switch status	→	24
Configuration changed	→	24
Counter custody transfer changes	→	24

Parameter overview with brief description

Parameter	Description	User interface / Selection	Factory setting
Custody transfer mode	Shows if the device is in custody transfer mode.	■ Off ■ On	–
Totalizer value	Displays the value of the totalizer.	Character string comprising numbers, letters and special characters	–
Checksum	Shows the firmware's checksum.	Positive integer	–
Firmware version	Shows the device firmware version installed.	Character string comprising numbers, letters and special characters	–
Custody transfer locking	Indicate whether all parameters or only parameters relevant to custody transfer should be write-protected.	■ Defined parameters ■ All parameters	–
Custody transfer counter	Indicates how often custody transfer mode has been enabled so far.	0 to 65 535	–
Timestamp last custody transfer	Shows the timestamp when custody transfer mode was last activated.	Character string comprising numbers, letters and special characters	–
DIP switch status	Shows the current status of the DIP switch for custody transfer.	■ Off ■ On	–
Configuration changed	Shows whether the hardware was replaced in custody transfer mode.	0 to 1	–
Counter custody transfer changes	Shows the number of times a parameter relevant to custody transfer has been changed.	0 to 65 535	–

5.6 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 3 on operating screen 1 and the last documented status of the custody transfer counter. The display alternates between operating screen 1 and operating screen 2 (and optionally operating screen 3) every 10 seconds.



5 Operating screen 1 and operating screen 2

1 Custody transfer counter

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:

Check the entries in the "Diagnostics" menu → "Event logbook" submenu:

1. Check the sealing of the housing.
2. Search the event logbook for the entries "Custody transfer inactive" (I1518) and then for entries "Custody transfer parameter changed" (I1651).

This enables market surveillance to check what exact time custody transfer mode was disabled and whether a custody transfer parameter was changed.

5.7 Repeated calibration due to legal metrology controls

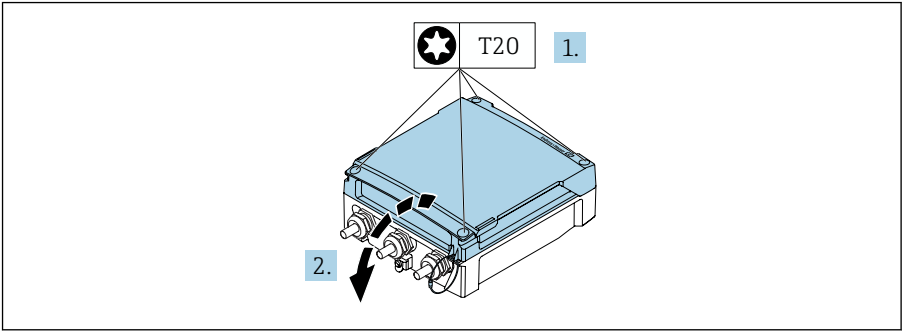
The system operator is obliged to perform a recalibration in accordance with the relevant applicable national regulations.

5.8 Sealing

-  The DIP switch of the measuring device must be sealed with an adhesive seal to prevent access to DIP switch 2 (Custody Transfer) to enable/disable custody transfer mode. The housing of the measuring device can optionally be sealed. The optional seal can be applied using a sealing screw and the relevant holder on the housing. The system operator or the competent calibration authority is responsible for applying the optional seal.

5.8.1 DIP switch

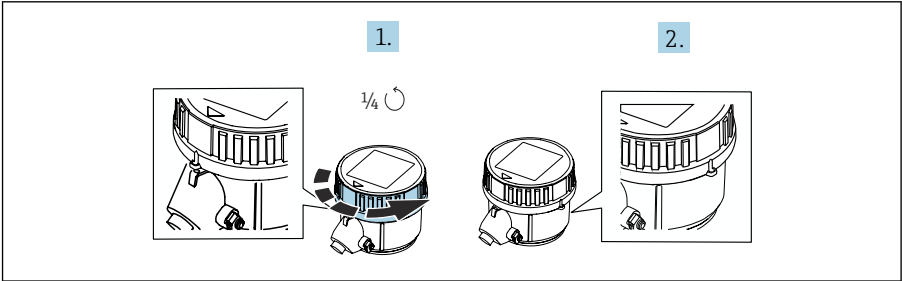
1.



A0042838

1.

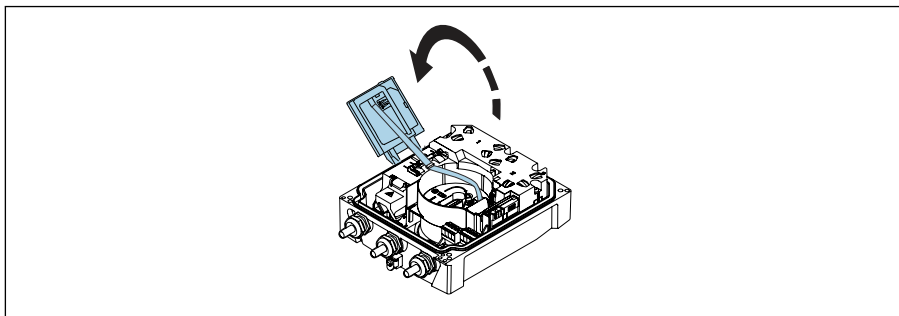
2.



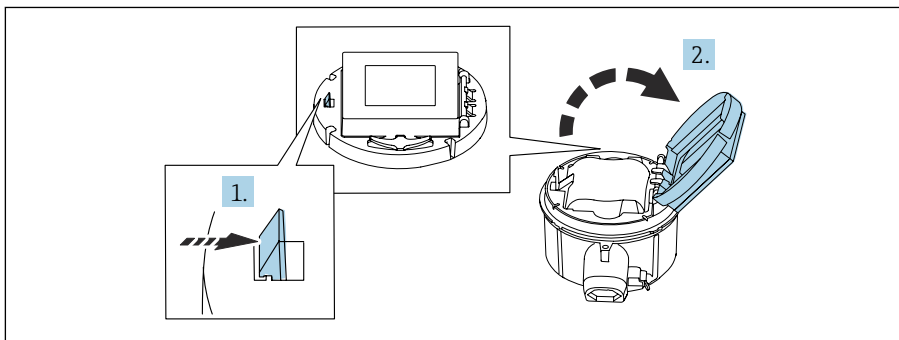
A0046655

Before sealing, unscrew the cover of the transmitter.

2.



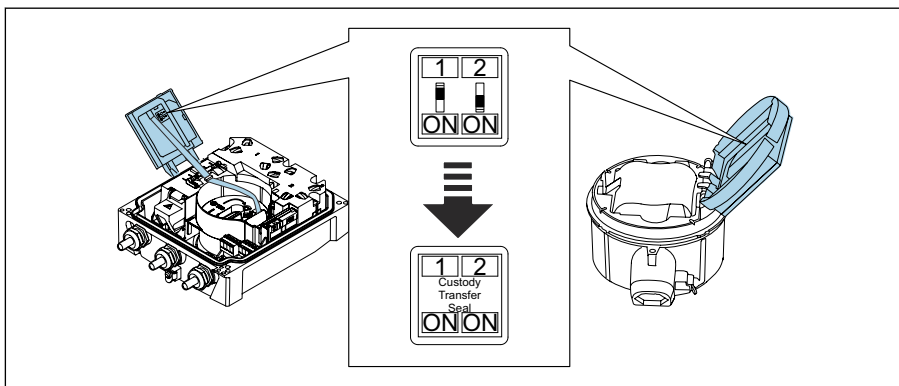
A0043731



A0046658

Open the display module.

3.

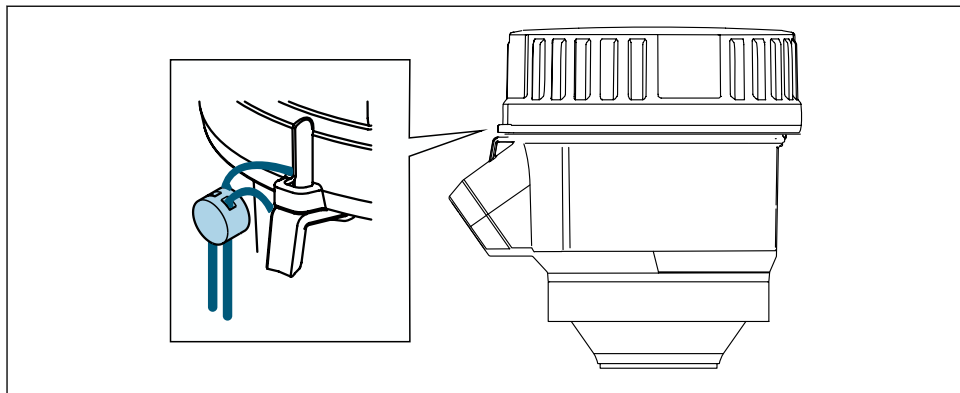


A0053885

Seal DIP switch 2 (**Custody transfer**) with an adhesive seal.

4. Close the measuring device in reverse order.

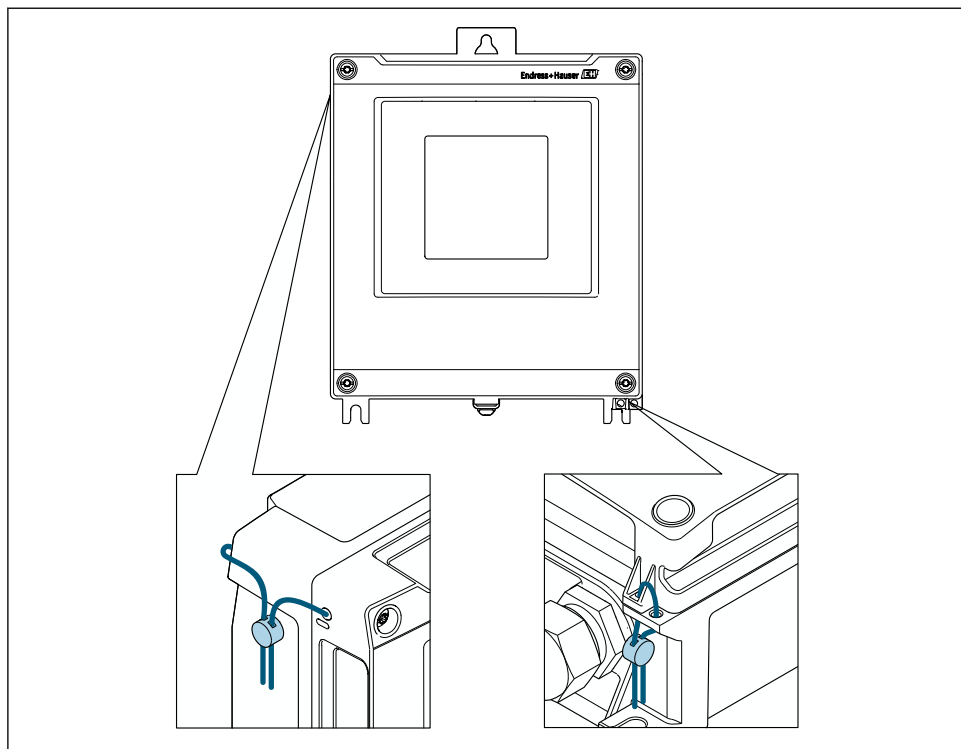
5.8.2 Promag 800 transmitter - Compact version



A0051099

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.

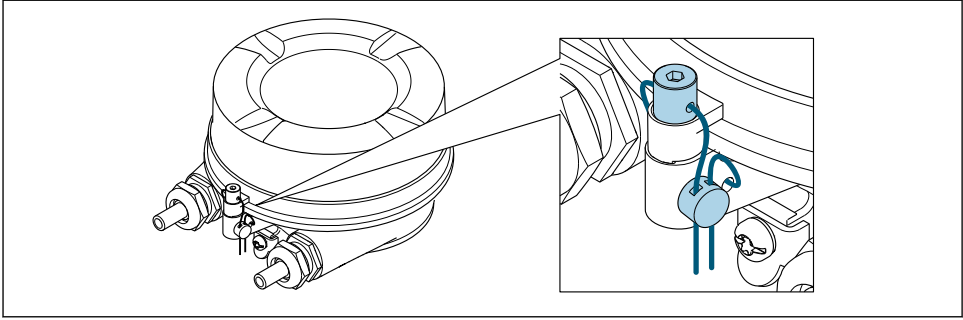
5.8.3 Promag 800 Advanced transmitter - Compact and remote version



A0041369

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.

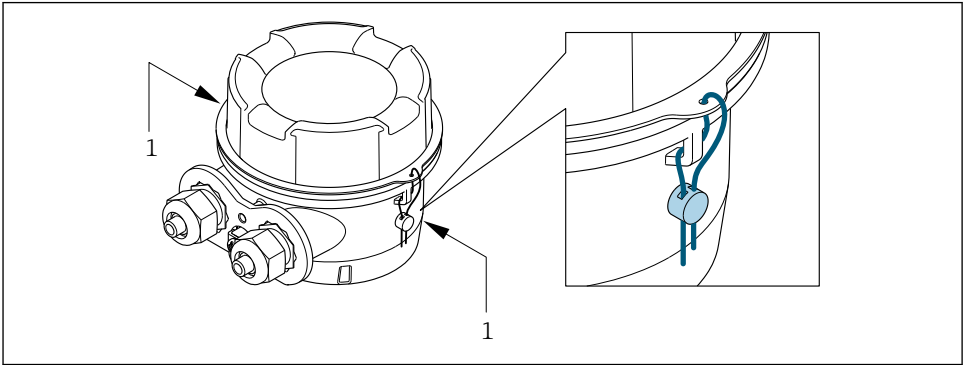
5.8.4 Promag 800 Advanced connection housing - Remote version IP66/67



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.

5.8.5 Promag 800 Advanced 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.

5.9 Battery replacement

The power supply via battery packs and the procedure for battery replacement are described in the relevant Operating Instructions → 5.

For measuring devices in the custody transfer mode, the **System** menu in the SmartBlue app must be used with a dedicated code to access the relevant device parameters for changing the battery.

 The transmitter housing must be opened to change a battery pack. The optional seal must be broken for this purpose →  25.

 In the case of battery-powered measuring devices that are in custody transfer mode, the following diagnostic message is output if the expected battery life drops below 180 days:
960 Battery life below 180 days

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:

Write protection	Description
Hardware write protection	Sets every parameter to write-protected.
CT locking: All parameters	Locks the parameters that are relevant for custody transfer (CT) and also parameters that are predefined by Endress+Hauser and are not relevant for custody transfer.
CT locking: Defined parameters	Only locks parameters that are relevant for custody transfer.

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.
- The **CT locking: Defined parameters** is the custody transfer locking configured at the factory for all measuring devices.
- The parameters that are not marked can be edited in **CT locking: All parameters** and **Defined parameters**.
- The parameters that are marked  can also be edited in Custody transfer locking: **Defined parameters**.
- Generally speaking, all the parameters that are not listed cannot be edited in the custody transfer mode.

 A description of the device parameters is provided in the associated Technical Documentation →  5

Navigation
Operating tool

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► Guidance	→ 33
► Commissioning	→ 33
► Update certificates	→ 34
► Import / Export	→ 34
► Diagnostics	→ 35
► Simulation	→ 35
► Heartbeat Technology	→ 35
► Application	→ 36
► System units	→ 36
► Sensor	→ 36
► Pulse/switch output 1 to n	→ 37
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► User management	→ 39

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► Power management	→  43
► Display	→  43

6.1.1 "Guidance" menu

"Commissioning" wizard

Navigation

"Operating tool" menu → Guidance → Commissioning

► Commissioning

Temperature unit

Pressure unit

Operating mode



Assign pulse output 1 to n



Pulse width



Value per pulse



Switch-on value



Switch-off value



Value 2 display

Value 3 display

Value 4 display

Time format

Time zone

Set date/time

"Update certificates" wizard

Navigation

"Operating tool" menu → Guidance → Update certificates

► Update certificates

Country code

State or province

Organization unit

Locality

Organization

"Import / Export" submenu

Navigation

"Operating tool" menu → Guidance → Import / Export

► Import / Export

Select result dataset

6.1.2 "Diagnostics" menu

"Simulation" submenu

Navigation

"Operating tool" menu → Diagnostics → Simulation

▶ Simulation

Pulse output simulation 1 to n

Pulse value 1 to n

"Heartbeat Technology" submenu

Navigation

"Operating tool" menu → Diagnostics → Heartbeat Technology

▶ Heartbeat Technology

▶ Performing verification

Plant operator

Location

External device information

Measured values

▶ Verification results

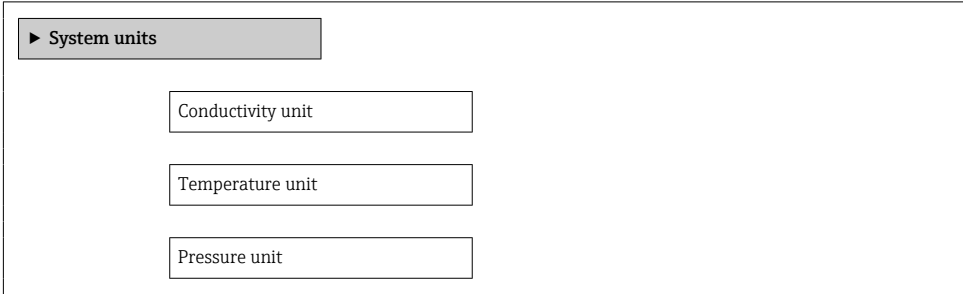
Select result dataset

6.1.3 "Application" menu

"System units" submenu

Navigation

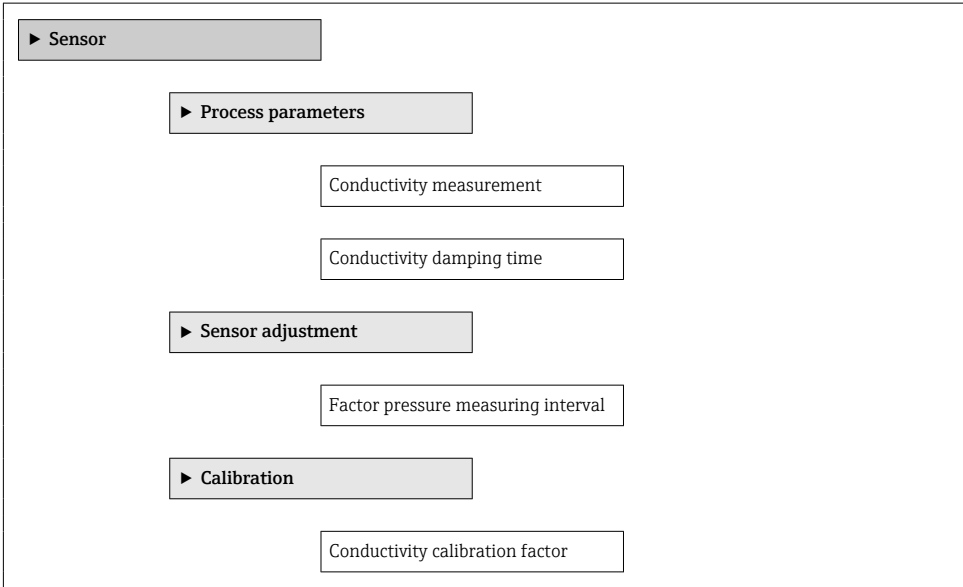
"Operating tool" menu → Application → System units



"Sensor" submenu

Navigation

"Operating tool" menu → Application → Sensor



"Pulse/switch output 1 to n" submenu

Navigation

"Operating tool" menu → Application → Pulse/switch output 1 to n

► Pulse/switch output 1 to n

Operating mode

Assign pulse output 1 to n

Measuring mode

Value per pulse

Pulse width

Failure mode

Switch-on value

Switch-off value

Assign flow direction check

"Communication" submenu

Navigation

"Operating tool" menu → Application → Communication

► Communication

► Modbus configuration

Bus address

Baudrate

Parity

Byte order

Telegram delay

Failure mode

Fieldbus writing access

► Modbus data map

Scan list register 0 to 15

"Data logging" submenu

Navigation

"Operating tool" menu → Application → Data logging

► Data logging

Log interval

Reference time log interval

"Measured value supervision" submenu

Navigation

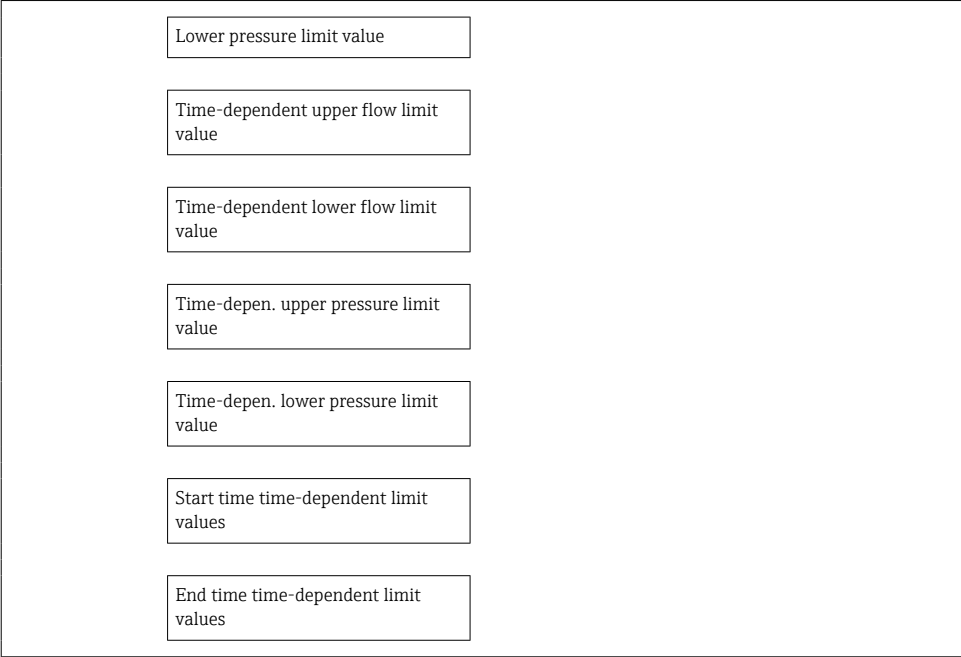
"Operating tool" menu → Application → Measured value supervision

► Measured value supervision

Upper flow limit value

Lower flow limit value

Upper pressure limit value

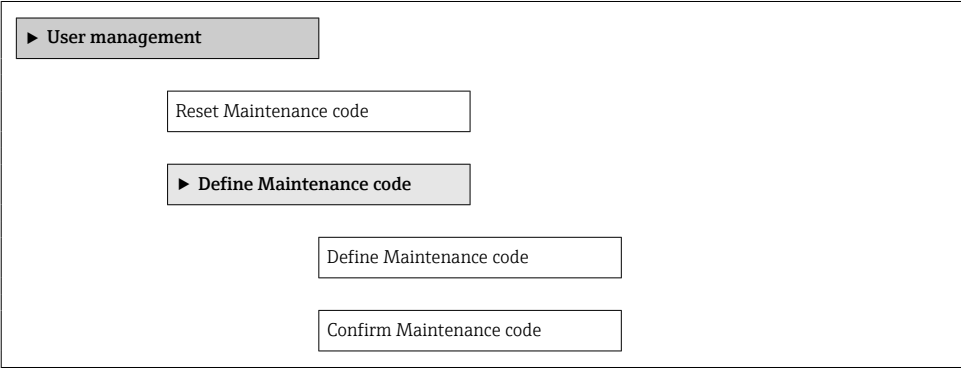


6.1.4 "System" menu

"User management" submenu

Navigation

"Operating tool" menu → System → User management



"Connectivity" submenu

Navigation

"Operating tool" menu → System → Connectivity

▶ Connectivity

▶ Bluetooth configuration

Bluetooth

▶ Cellular radio network

▶ Access data

APN name

APN user name

APN password

Preferred network type

▶ DNS configuration

Port primary NTP server

URL primary NTP server

Port secondary NTP server

URL secondary NTP server

DNS server IP

▶ Cloud

► MQTT configuration

MQTT broker port

MQTT broker URL

MQTT user name

MQTT password

► Data transfer options

Data transfer

Connection interval battery mode

Days of the week

Reference time connection interval

Connection interval battery mode

Days of the week

Reference time connection interval

► Config. certificate signing request

Country code

State or province

Locality

Organization
Organization unit

"Date/time" submenu

Navigation

"Operating tool" menu → System → Date/time

► Date/time
Set date/time
Time format
Time zone

"Geolocation" submenu

Navigation

"Operating tool" menu → System → Geolocation

► Geolocation
Location description
Longitude
Latitude
Altitude
Location method

"Power management" submenu

Navigation

"Operating tool" menu → System → Power management

► Power management

Confirm battery replacement

Low battery diagnostic message

Capacity battery 1

Capacity battery 2

"Display" submenu

Navigation

"Operating tool" menu → System → Display

► Display

Value 2 display

Value 3 display

Value 4 display

Brightness

Backlight

Contrast display

6.2 Deviating parameter configuration



The configuration of the following parameters deviates from the factory settings and corresponds to the specifications of OIML R 49:2013.

Parameter	Factory setting	Parameter configuration
Measuring interval mode	Intelligent adaptation	Fixed value
Measuring interval	none	7
Format display	Maximum of 4 display values	Maximum of 3 display values per operational display
Operational display 1: Display value 1	none	Checksum ¹⁾
Operational display 1: Display value 2	none	Firmware ¹⁾
Operational display 1: Display value 3	none	Custody transfer counter ¹⁾
Operational display 2: Display value 1	Volume flow	Custody transfer-related totalizer ¹⁾
Operational display 2: Display value 2	none	Volume flow
Decimal places 1	x.xx	Depends on the nominal diameter of the device ¹⁾
Display interval	none	10 s ¹⁾
Volume flow unit	l/h or gal/min	m ³ /h
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)	Forward flow total	Forward flow total
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)	Reverse flow total	Reverse flow total
Totalizer 3 to n (Unit totalizer 1)	l or gal	m ³
Totalizer 3 (Failure mode)	Stop	Stop
Low flow cut off	Volume flow	Volume flow
On-time low flow cut off	Depends on nominal diameter	See the "Operation and commissioning" section
Empty pipe detection	Off	On

- 1) These parameters are set automatically when custody transfer mode is activated and reset when custody transfer mode is deactivated.

7Modbus RS485 Register information

7.1Notes

7.1.1Structure of the register information

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

Navigation: navigation path to the parameter					
Parameter	Register	Data type	Access type	User interface/ Selection/ User entry	→ 
Name of parameter	Indicated in decimal numerical format	- Float length = 4 byte - Integer length = 2 byte - String length, depending on parameter	Possible type of access to parameter: - Read access via function codes 03, 04 or 23 - Write access via function codes 06, 16 or 23	Options List of the individual options for the parameter - Option 1 - Option 2 - Option 3 ⁽⁺⁾  ⁽⁺⁾ = Factory setting depends on country, order options or device settings User entry Specific value or input range for the parameter	Page number information and cross-reference to the standard parameter description

NOTICE

If non-volatile device parameters are modified via the MODBUS RS485 function codes 06, 16 or 23, the change is saved in the EEPROM of the measuring device.

The number of writes to the EEPROM is technically restricted to a maximum of 1 million.

- ▶ Make sure to comply with this limit since, if it is exceeded, data loss and measuring device failure will result.
- ▶ Avoid constantly writing non-volatile device parameters via the MODBUS RS485.

7.1.2Address model

The Modbus RS485 register addresses of the measuring device are implemented in accordance with the "Modbus Applications Protocol Specification V1.1".

In addition, systems are used that work with the register address model "Modicon Modbus Protocol Reference Guide (PI-MBUS-300 Rev. J)".

Depending on the function code used, a number is added at the start of the register address with this specification:

- "3" → "Read" access
- "4" → "Write" access

Function code	Access type	Register in accordance with "Modbus Applications Protocol Specification"	Register in accordance with "Modicon Modbus Protocol Reference Guide"
03 04 23	Read	XXXX Example: mass flow = 2007	3XXXX Example: mass flow = 32007
06 16 23	Write	XXXX Example: reset totalizer = 6401	4XXXX Example: reset totalizer = 46401

7.2 Overview of the operating menu

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

Navigation

Operating tool → Application

► Custody transfer		
Custody transfer mode	→	 47
Totalizer 1 value	→	 47
Checksum	→	 47
Firmware version	→	 47
Custody transfer counter	→	 47
Custody transfer locking	→	 47
Timestamp last custody transfer	→	 47
DIP switch status	→	 47

Configuration changed	→  47
Counter custody transfer changes	→  47

7.3 Register information

Navigation: Custody transfer					
Parameter	Register	Data type	Access	Selection / User entry / User interface	→ 
Custody transfer mode	3094	Integer	Read	0 = Off 1 = On	24
Totalizer 1 value	30230 to 30235	String	Read	Character string comprising numbers, letters and special characters	17
Checksum	6117	Integer	Read	Positive integer	17
Firmware version	7277 to 7280	String	Read	Character string comprising numbers, letters and special characters	17
Custody transfer counter	2849	Integer	Read	0 to 65 535	17
Custody transfer locking	5926	Integer	Read / Write	0 = All parameters 1 = Defined parameters	17
Timestamp last custody transfer	29737 to 29747	String	Read	Character string comprising numbers, letters and special characters	24
DIP switch status	5778	Integer	Read	0 = Off 1 = On	24
Configuration changed	3264	Integer	Read	0 to 1	24
Counter custody transfer changes	3007	Integer	Read	0 to 65 535	24



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www.addresses.endress.com
