Technical Information **Proline Promass O 100**

Coriolis flowmeter



The robust high-pressure measuring instrument with an ultra-compact transmitter

Application

- Measuring principle operates independently of physical fluid properties such as viscosity or density
- For premium accuracy at highest process pressures, fully suitable for offshore conditions

Device properties

- Measuring tube in 25Cr Duplex, 1.4410 (UNS S32750)
- Process pressure up to PN 250 (Class 1500)
- Nominal diameter: DN 80 to 250 (3 to 10")
- Robust, ultra-compact transmitter housing
- Highest degree of protection: IP69K
- Local display available

Your benefits

- Maximum safety highest resistance to stress corrosion cracking
- Fewer process measuring points multivariable measurement (flow, density, temperature)
- Space-saving installation no in-/outlet run needs
- Space-saving transmitter full functionality on smallest footprint
- Time-saving local operation without additional software and hardware – integrated web server
- Integrated verification Heartbeat Technology



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About this document

Symbols Electrical symbols

Symbol	Meaning
	Direct current
~	Alternating current
$\overline{}$	Direct current and alternating current
<u></u>	Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	Protective earth (PE) Ground terminals that must be connected to ground prior to establishing any other connections.
	The ground terminals are located on the interior and exterior of the device: Interior ground terminal: protective earth is connected to the mains supply. Exterior ground terminal: device is connected to the plant grounding system.

$Symbols \ for \ certain \ types \ of \ information$

Symbol	Meaning
✓	Permitted Procedures, processes or actions that are permitted.
	Preferred Procedures, processes or actions that are preferred.
X	Forbidden Procedures, processes or actions that are forbidden.
i	Tip Indicates additional information.
<u> </u>	Reference to documentation
	Reference to page
	Reference to graphic
	Visual inspection

Symbols in graphics

Symbol	Meaning
1, 2, 3,	Item numbers
1., 2., 3.,	Series of steps
A, B, C,	Views
A-A, B-B, C-C,	Sections
EX	Hazardous area
×	Safe area (non-hazardous area)
≋➡	Flow direction

Function and system design

Measuring principle

The measuring principle is based on the controlled generation of Coriolis forces. These forces are always present in a system when both translational and rotational movements are superimposed.

 $F_c = 2 \cdot \Delta m (v \cdot \omega)$

 F_c = Coriolis force

 $\Delta m = moving mass$

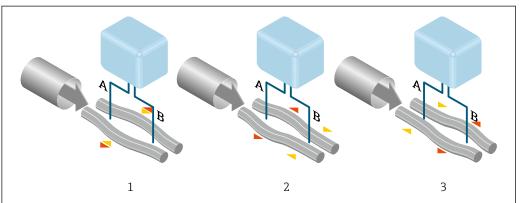
 $\omega = rotational velocity$

v = radial velocity in rotating or oscillating system

The amplitude of the Coriolis force depends on the moving mass Δm , its velocity v in the system and thus on the mass flow. Instead of a constant rotational velocity ω , the sensor uses oscillation.

In the sensor, two parallel measuring tubes containing flowing medium oscillate in antiphase, acting like a vibrating fork. The Coriolis forces produced at the measuring tubes cause a phase shift in the tube oscillations (see illustration):

- At zero flow (when the medium is at a standstill) the two tubes oscillate in phase (1).
- Mass flow causes deceleration of the oscillation at the inlet of the tubes (2) and acceleration at the outlet (3).



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The phase shift (A-B) increases with increasing mass flow. Electrodynamic sensors register the tube oscillations at the inlet and outlet. System balance is ensured by the antiphase oscillation of the two measuring tubes. The measuring principle operates independently of temperature, pressure, viscosity, conductivity and flow profile.

Density measurement

The measuring tube is continuously excited at its resonance frequency. A change in the mass and thus the density of the oscillating system (comprising measuring tube and medium) results in a corresponding, automatic adjustment in the oscillation frequency. The resonance frequency is thus a function of the medium density. The microprocessor utilizes this relationship to obtain a density signal.

Volume measurement

Together with the measured mass flow, this is used to calculate the volume flow.

Temperature measurement

The temperature of the measuring tube is determined in order to calculate the compensation factor due to temperature effects. This signal corresponds to the process temperature and is also available as an output signal.

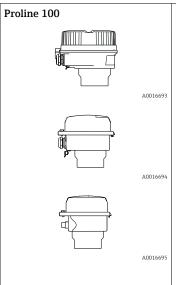
Measuring system

The device consists of a transmitter and a sensor. If a device with Modbus RS485 intrinsically safe is ordered, the Safety Barrier Promass 100 is part of the scope of supply and must be implemented to operate the device.

The device is available as a compact version:

The transmitter and sensor form a mechanical unit.

Transmitter



Device versions and materials:

- Compact, aluminum, coated:
 Aluminum, AlSi10Mq, coated
- Compact, stainless: Stainless steel 1.4404 (316L)

 Ultra-compact, stainless: Stainless steel 1.4404 (316L)

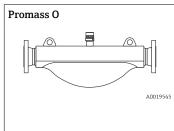
Configuration:

- Via operating tools (e.g. FieldCare, DeviceCare)
- Also for device version with local display (LCD):
 Via web browser
- Also for device version with 4-20 mA HART, pulse/frequency/switch output:

Via web browser

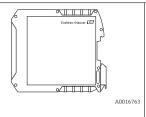
- Also for device version with EtherNet/IP output:
 - Via web browser
 - Via Add-on Profile Level 3 for automation system from Rockwell Automation
 - Via Electronic Data Sheet (EDS)
- Also for device version with PROFINET output:
 - Via web browser
 - Via device master file (GSD)

Sensor



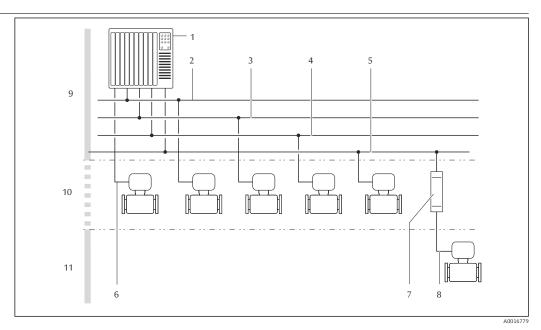
- Bent dual-tube system
- For use at high pressures
- Simultaneous measurement of flow, volume flow, density and temperature (multivariable)
- Suitable for offshore applications
- Nominal diameters: DN 80 to 250 (3 to 10")
- Materials:
 - Sensor: stainless steel, 1.4404 (316L)
 - Measuring tubes:
 - Stainless steel, 1.4410/UNS S32750 25Cr Duplex (Super Duplex)
 - Process connections:
 - Stainless steel, 1.4410/F53 25Cr Duplex (Super Duplex)

Safety Barrier Promass 100



- Dual-channel safety barrier for installation in non-hazardous locations or zone 2/div. 2:
 - Channel 1: DC 24 V power supply
 - Channel 2: Modbus RS485
- In addition to current, voltage and power limitation, it offers galvanic isolation of circuits for explosion protection.
- Easy top-hat rail mounting (DIN 35 mm) for installation in control cabinets

Equipment architecture



 $\blacksquare 1$ Possibilities for integrating measuring instruments into a system

- 1 Automation system (e.g. PLC)
- 2 EtherNet/IP
- 3 PROFIBUS DP
- 4 PROFINET
- 5 Modbus RS485
- 6 4-20 mA HART, pulse/frequency/switch output
- 7 Safety Barrier Promass 100
- 8 Modbus RS485, intrinsically safe
- 9 Non-hazardous area
- 10 Non-hazardous area and Zone 2/Div. 2
- 11 Hazardous area and Zone 1/Div. 1

Reliability

IT security

The manufacturer warranty is valid only if the product is installed and used as described in the Operating Instructions. The product is equipped with security mechanisms to protect it against any inadvertent changes to the settings.

IT security measures, which provide additional protection for the product and associated data transfer, must be implemented by the operators themselves in line with their security standards.

Input

Measured variable

Direct measured variables

- Mass flow
- Density
- Temperature

Calculated measured variables

- Volume flow
- Corrected volume flow
- Reference density

Measuring range

Measuring range for liquids

DN		Measuring range full scal	e values $\dot{m}_{\min(F)}$ to $\dot{m}_{\max(F)}$
[mm]	[in]	[kg/h]	[lb/min]
80	3	0 to 180 000	0 to 6615
100	4	0 to 350 000	0 to 12 860
150	6	0 to 800 000	0 to 29 400

Measuring range for gases

The full scale value depends on the density and the speed of sound of the gas used. The full scale value can be calculated with the following formulas:

$$\dot{m}_{\text{max}(G)} = (\rho_G \cdot (c_G/m) \cdot d_i^2 \cdot (\pi/4) \cdot 3600 \cdot n)$$

m _{max(G)}	Maximum full scale value for gas [kg/h]
ρ_{G}	Gas density in [kg/m³] at operating conditions
c_G	Speed of sound (gas) [m/s]
d _i	Measuring tube internal diameter [m]
π	Pi
n = 2	Number of measuring tubes
m = 2	For all gases other than pure H2 and He gas
m = 3	For pure H2 and He gas



Recommended measuring range



Flow limit → 🖺 48

Operable flow range

Over 1000:1.

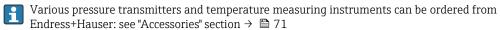
Flow rates above the preset full scale value do not override the electronics unit, with the result that the totalizer values are registered correctly.

Input signal

External measured values

To increase the measurement accuracy of certain measured variables or to calculate the corrected volume flow for gases, the automation system can continuously write different measured values to the measuring instrument:

- Operating pressure to increase measurement accuracy (Endress+Hauser recommends the use of a pressure measuring instrument for absolute pressure, e.g. Cerabar M or Cerabar S)
- Medium temperature to increase measurement accuracy (e.g. iTEMP)
- Reference density for calculating the corrected volume flow for gases



It is recommended to read in external measured values to calculate the following measured variables:

- Mass flow
- Corrected volume flow

HART protocol

The measured values are written from the automation system to the measuring device via the HART protocol. The pressure transmitter must support the following protocol-specific functions:

- HART protocol
- Burst mode

Digital communication

The measured values can be written by the automation system via:

- PROFIBUS DP
- Modbus RS485
- EtherNet/IP
- PROFINET

Output

Output signal

HART current output

Current output	4-20 mA HART (active)
Maximum output values	DC 24 V (no flow)22.5 mA
Load	0 to 700 Ω
Resolution	0.38 μΑ
Damping	Configurable: 0.07 to 999 s
Assignable measured variables	 Mass flow Volume flow Corrected volume flow Density Reference density Temperature The range of options increases if the measuring device has one or more application packages.

Pulse/frequency/switch output

Function	Can be set to pulse, frequency or switch output
Version	Passive, open collector
Maximum input values	■ DC 30 V ■ 25 mA
Voltage drop	For 25 mA: ≤ DC 2 V
Pulse output	

Pulse width	Configurable: 0.05 to 2 000 ms
Maximum pulse rate	10 000 Impulse/s
Pulse value	Adjustable
Assignable measured variables	 Mass flow Volume flow Corrected volume flow
Frequency output	
Output frequency	Configurable: 0 to 10 000 Hz
Damping	Configurable: 0 to 999 s
Pulse/pause ratio	1:1
Assignable measured variables	 Mass flow Volume flow Corrected volume flow Density Reference density Temperature The range of options increases if the measuring device has one or more application packages.
Switch output	
Switching behavior	Binary, conductive or non-conductive
Switching delay	Configurable: 0 to 100 s
Number of switching cycles	Unlimited
Assignable functions	 Off On Diagnostic behavior Limit value Mass flow Volume flow Corrected volume flow Density Reference density Temperature Totalizer 1-3 Flow direction monitoring Status Partially filled pipe detection Low flow cut off The range of options increases if the measuring device has one or more application packages.

PROFIBUS DP

Signal encoding	NRZ code
Data transfer	9.6 kBaud12 MBaud
Terminating resistor	Integrated, can be activated via DIP switches

Modbus RS485

Physical interface	In accordance with EIA/TIA-485-A standard
Terminating resistor	 For device version used in non-hazardous areas or Zone 2/Div. 2: integrated and can be activated via DIP switches on the transmitter electronics module For device version used in intrinsically safe areas: integrated and can be activated via DIP switches on the Safety Barrier Promass 100

EtherNet/IP

Standards In accord	ance with IEEE 802.3
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PROFINET

[Standards	In accordance with IEEE 802.3
- 1		

Signal on alarm

Depending on the interface, failure information is displayed as follows:

Current output

Current output 4-20 mA		
Failure mode	Configurable: 4 to 20 mA in accordance with NAMUR recommendation NE 43 4 to 20 mA in accordance with US Min. value: 3.59 mA Max. value: 22.5 mA Definable value between: 3.59 to 22.5 mA Actual value Last valid value	

Pulse/frequency/switch output

Pulse output			
Failure mode	Configurable: Actual value No pulses		
Frequency output			
Failure mode	Configurable: Actual value O Hz Definable value between: 0 to 12 500 Hz		
Switch output			
Failure mode	Configurable: Current status Open Closed		

PROFIBUS DP

Status and alarm	Diagnostics in accordance with PROFIBUS PA Profile 3.02
messages	

Modbus RS485

Failure mode	Choose from:	
	■ NaN value instead of current value	
	■ Last valid value	

EtherNet/IP

Device diagnostics	Device condition can be read out in Input Assembly
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PROFINET

Local display

Plain text display	With information on cause and remedial measures	
Backlight	Red backlighting indicates a device error.	



Status signal as per NAMUR recommendation NE 107

Interface/protocol

- Via digital communication:
 - HART protocol
 - PROFIBUS DP
 - Modbus RS485
 - EtherNet/IP
 - PROFINET
- Via service interface

Service interface CDI-RJ45

■ Plain text display

With information on cause and remedial actions



Additional information on remote operation $\rightarrow \triangleq 60$

Web browser

Plain text display	With information on cause and remedial measures
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LEDs

Status information	Status indicated by various LEDs	
	The following information is displayed depending on the device version: Supply voltage active Data transmission active Device alarm/error has occurred Network available 1) Connection established 1) PROFINET blinking feature 2)	

- 1) Only available for PROFINET, Ethernet/IP
- 2) Only available for PROFINET,

Ex connection data

These values only apply for the following device version:

Order code for "Output", option M "Modbus RS485", for use in intrinsically safe areas

Safety Barrier Promass 100

Safety-related values

Terminal numbers			
Supply voltage		Signal transmission	
2 (L-)	1 (L+)	26 (B)	27 (A)
U _{nom} = DC 24 V U _{max} = AC 260 V		$U_{nom} = DC 5 V$ $U_{max} = AC 260 V$	

Intrinsically safe values

Terminal numbers			
Supply voltage		Signal transmission	
20 (L-)	20 (L-) 10 (L+)		72 (A)
$\begin{array}{c} U_o = 16.24 \ V \\ I_o = 623 \ mA \\ P_o = 2.45 \ W \\ \text{For IIC}^{ 1)} : L_o = 92.8 \ \mu\text{H}, \ C_o = 0.433 \ \mu\text{F}, \ L_o/R_o = 14.6 \ \mu\text{H}/\Omega \\ \text{For IIC} : L_o = 92.8 \ \mu\text{H}, \ C_o = 0.433 \ \mu\text{F}, \ L_o/R_o = 14.6 \ \mu\text{H}/\Omega \\ \text{For IIB}^{ 1)} : L_o = 372 \ \mu\text{H}, \ C_o = 2.57 \ \mu\text{F}, \ L_o/R_o = 58.3 \ \mu\text{H}/\Omega \\ \end{array}$			
For an overview and for information on the interdependencies between the gas group - sensor - nominal diameter, see the "Safety Instructions" (XA) document for the measuring device			

The gas group depends on the sensor and nominal diameter

Transmitter

Intrinsically safe values

Order code for	Terminal numbers			
"Approval"	Supply voltage		Signal transmission	
	20 (L-)	10 (L+)	62 (B)	72 (A)
 Option BM: ATEX II2G + IECEx Z1 Ex ia, II2D Ex tb Option BO: ATEX II1/2G + IECEx Z0/Z1 Ex ia, II2D Option BQ: ATEX II1/2G + IECEx Z0/Z1 Ex ia Option BU: ATEX II2G + IECEx Z1 Ex ia Option C2: CSA C/US IS Cl. I, II, III Div. 1 Option 85: ATEX II2G + IECEx Z1 Ex ia + CSA C/US IS Cl. I, II, III Div. 1 		$I_{i} = 62$ $P_{i} = 2$ $L_{i} = 0$	6.24 V 23 mA .45 W 0 µH 6 nF	

For an overview and for information on the interdependencies between the gas group - sensor - nominal diameter, see the "Safety Instructions" (XA) document for the measuring device

Low flow cut off

The switch points for low flow cut off are user-selectable.

Protocol-specific data

HART

Manufacturer ID	0x11
Device type ID	0x4A
HART protocol revision	7
Device description files (DTM, DD)	Information and files under: www.endress.com
HART load	Min. 250 Ω

Dynamic variables	Read out the dynamic variables: HART command 3 The measured variables can be freely assigned to the dynamic variables.
	Measured variables for PV (primary dynamic variable) Mass flow Volume flow Corrected volume flow Density Reference density Temperature Measured variables for SV, TV, QV (secondary, tertiary and quaternary dynamic variable) Mass flow Volume flow Corrected volume flow Density Reference density
	 Temperature Totalizer 1 Totalizer 2 Totalizer 3 The range of options increases if the measuring device has one or more
	application packages. Heartbeat Technology application package Additional measured variables are available with the Heartbeat Technology application package: Carrier pipe temperature Oscillation amplitude 0
Device variables	Read out the device variables: HART command 9 The device variables are permanently assigned.
	A maximum of 8 device variables can be transmitted: • 0 = mass flow • 1 = volume flow • 2 = corrected volume flow • 3 = density • 4 = reference density • 5 = temperature • 6 = totalizer 1 • 7 = totalizer 2 • 8 = totalizer 3 • 13 = target mass flow • 14 = carrier mass flow
	■ 15 = concentration

PROFIBUS DP

Manufacturer ID	0x11
Ident number	0x1561
Profile version	3.02
Device description files (GSD, DTM, DD)	Information and files available at: ■ https://www.endress.com/download On the device product page: PRODUCTS → Product Finder → Links ■ https://www.profibus.com

Output values	Analog input 1 to 8	
(from measuring instrument to	9 -	
automation system)	 Volume flow 	
,	Corrected volume flow	
	Target mass flow	
	Carrier mass flow	
	Density	
	Reference density	
	• Concentration	
	• Temperature	
	Carrier pipe temperature Floatronics temperature	
	Electronics temperatureOscillation frequency	
	Oscillation irrequency Oscillation amplitude	
	Frequency fluctuation	
	Oscillation damping	
	Tube damping fluctuation	
	Signal asymmetry	
	Exciter current	
	Digital input 1 to 2	
	Partially filled pipe detection	
	Low flow cut off	
	Totalizer 1 to 3	
	Mass flow	
	Volume flow	
	Corrected volume flow	
	- Gorrected volume now	
Input values	Analog output 1 to 3 (fixed assignment)	
(from automation system to	• Pressure	
measuring instrument)	■ Temperature	
	Reference density	
	Digital output 1 to 3 (fixed assignment)	
	Digital output 1: switch positive zero return on/off Digital output 2: perform zero adjustment	
	Digital output 2: perform zero adjustmentDigital output 3: switch switch output on/off	
	Totalizer 1 to 3	
	Totalize Reset and hold	
	Preset and hold	
	Stop	
	Operating mode configuration:	
	■ Net flow total	
	Forward flow total	
	 Reverse flow total 	
Supported functions	■ Identification & maintenance	
Dapported Infections	Straightforward device identification on the part of the control system and	
	nameplate	
	PROFIBUS upload/download	
	Reading and writing parameters is up to ten times faster with PROFIBUS	
	upload/download.	
	Condensed status	
	Straightforward and self-explanatory diagnostic information by	
	categorizing diagnostic messages that occur	
Configuration of the device	■ DIP switches on the I/O electronics module	
address	 Via operating tools (e.g. FieldCare) 	
	1 (

Modbus RS485

Protocol	Modbus Applications Protocol Specification V1.1
Device type	Slave
Slave address range	1 to 247
Broadcast address range	0

Function codes	 03: Read holding register 04: Read input register 06: Write single registers 08: Diagnostics 16: Write multiple registers 23: Read/write multiple registers
Broadcast messages	Supported by the following function codes: 06: Write single registers 16: Write multiple registers 23: Read/write multiple registers
Supported baud rate	 1200 BAUD 2400 BAUD 4800 BAUD 9600 BAUD 19200 BAUD 38400 BAUD 57600 BAUD 115200 BAUD
Data transfer mode	ASCII RTU
Data access	Each device parameter can be accessed via Modbus RS485. For Modbus register information, see "Description of device parameters" documentation → 🖹 71

EtherNet/IP

Protocol	- The CID Networks Library Volume 1, Common Industrial Protect	
Protocol	 The CIP Networks Library Volume 1: Common Industrial Protocol The CIP Networks Library Volume 2: Ethernet/IP Adaptation of CIP 	
Communication type	■ 10Base-T ■ 100Base-TX	
Device profile	Generic device (product type: 0x2B)	
Manufacturer ID	0x49E	
Device type ID	0x104A	
Baud rates	Automatic $^{10}\!\!/_{100}$ Mbit with half-duplex and full-duplex detection	
Polarity	Auto-polarity for automatic correction of crossed TxD and RxD pairs	
Supported CIP connections	Max. 3 connections	
Explicit connections	Max. 6 connections	
I/O connections	Max. 6 connections (scanner)	
Configuration options for measuring instrument	 DIP switches on the electronics module for IP addressing Manufacturer-specific software (FieldCare) Add-on Profile Level 3 for Rockwell Automation control systems Web browser Electronic Data Sheet (EDS) integrated in the measuring instrument 	
Configuration of the EtherNet interface	 Speed: 10 MBit, 100 MBit, auto (factory setting) Duplex: half-duplex, full-duplex, auto (factory setting) 	
Configuration of the device address	 DIP switches on the electronics module for IP addressing (last octet) DHCP Manufacturer-specific software (FieldCare) Add-on Profile Level 3 for Rockwell Automation control systems Web browser Ethernet/IP tools, e.g. RSLinx (Rockwell Automation) 	
Device Level Ring (DLR)	No	

Fix input			
RPI	5 ms to 10 s (factory setting: 2	20 ms)	
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	$O \rightarrow T$ configuration:	0x66	64
	$T \rightarrow O$ configuration:	0x64	44
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	$O \rightarrow T$ configuration:	0x66	64
	$T \rightarrow O$ configuration:	0x64	44
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	$O \rightarrow T$ configuration:	0xC7	-
	$T \rightarrow O$ configuration:	0x64	44
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	$O \rightarrow T$ configuration:	0xC7	-
	$T \rightarrow O$ configuration:	0x64	44
	 Corrected volume flow Density Reference density Temperature Totalizer 1 Totalizer 2 Totalizer 3 		
Configurable Input			
RPI	5 ms to 10 s (factory setting: 2	<u> </u>	G. (1)
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0x66	64
	$T \rightarrow O$ configuration:	0x65	88
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	$O \rightarrow T$ configuration:	0x66	64
	$T \rightarrow O$ configuration:	0x65	88
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0xC7	-
	$T \rightarrow O$ configuration:	0x65	88
Input only Multicast	-	Instance	Size [byte]
	Instance configuration:	0x69	-
	$O \rightarrow T$ configuration:	0xC7	-
	$T \rightarrow O$ configuration:	0x65	88

Configurable Input Assembly	 Current device diagnostics Mass flow Volume flow Corrected volume flow Density Reference density Temperature Totalizer 1 Totalizer 2 Totalizer 3 The range of options increases if the measuring device has one or more application packages.
Fix output	
Output Assembly	 Activation of reset totalizers 1-3 Activation of pressure compensation Activation of reference density compensation Activation of temperature compensation Reset totalizers 1-3 External pressure value Pressure unit External reference density Reference density unit External temperature Temperature unit
Configuration	
Configuration Assembly	Only the most common configurations are listed below. Software write protection Mass flow unit Mass unit Volume flow unit Volume flow unit Corrected volume flow unit Corrected volume unit Density unit Reference density unit Temperature unit Pressure unit Length Totalizer 1-3: Assignment Unit Mode of operation Failure mode Alarm delay

PROFINET

Protocol	"Application layer protocol for decentral device periphery and distributed automation", version 2.3
Conformity class	В
Communication type	100 Mbps
Device profile	Application interface identifier 0xF600 Generic device
Manufacturer ID	0x11
Device type ID	0x844A
Device description files (GSD, DTM)	Information and files available at: ■ https://www.endress.com/download On the device product page: PRODUCTS → Product Finder → Links ■ https://www.profibus.com
Baud rates	Automatic 100 Mbit/s with full-duplex detection

Periods	From 8 ms
Polarity	Auto-polarity for automatic correction of crossed TxD and RxD pairs
Supported connections	 1 x AR (Application Relation) 1 x Input CR (Communication Relation) 1 x Output CR (Communication Relation) 1 x Alarm CR (Communication Relation)
Configuration options for measuring instrument	 DIP switches on the electronics module, for device name assignment (last part) Manufacturer-specific software (FieldCare, DeviceCare) Web browser Device master file (GSD), can be read out via the integrated web server of the measuring instrument
Configuration of the device name	 DIP switches on the electronics module, for device name assignment (last part) DCP protocol
Output values (from measuring instrument to automation system)	Analog Input module (slot 1 to 14) Mass flow Volume flow Corrected volume flow Target mass flow Carrier mass flow Density Reference density Concentration Temperature Carrier pipe temperature Electronics temperature Oscillation frequency Oscillation amplitude Frequency fluctuation Oscillation damping Tube damping fluctuation Signal asymmetry Exciter current
	Discrete Input module (slot 1 to 14) Empty pipe detection Low flow cut off Diagnostics Input module (slot 1 to 14) Last diagnostics Current diagnostics Totalizer 1 to 3 (slot 15 to 17) Mass flow Volume flow Corrected volume flow Heartbeat Verification module (fixed assignment) Verification status (slot 23)
	The range of options increases if the measuring device has one or more application packages.

Input values (from automation system to measuring instrument)	Analog Output module (fixed assignment) External pressure (slot 18) External temperature (slot 19) External reference density (slot 20) Discrete Output module (fixed assignment) Activate/deactivate positive zero return (slot 21) Perform zero adjustment (slot 22)
	Totalizer 1 to 3 (slot 15 to 17) Totalize Reset and hold Preset and hold Stop Operating mode configuration: Net flow total Forward flow total Reverse flow total
	Heartbeat Verification module (fixed assignment) Start verification (slot 23) The range of options increases if the measuring device has one or more application packages.
Supported functions	 Identification & maintenance Simple device identification via: Control system Nameplate Measured value status The process variables are communicated with a measured value status Blinking feature via the local display for simple device identification and assignment

Administration of software options

Input/output value	Process variable	Category	Slot	
Output value	Mass flow	Process variable	114	
	Volume flow			
	Corrected volume flow			
	Density			
	Reference density			
	Temperature			
	Electronics temperature			
	Oscillation frequency			
	Frequency fluctuation			
	Oscillation damping			
	Oscillation frequency			
	Signal asymmetry			
	Exciter current			
	Empty pipe detection			
	Low flow cut off			
	Current device diagnostics			
	Previous device diagnostics			
Output value	Target mass flow	Concentration 1)	114	
	Carrier mass flow			
	Concentration			
Output value	Carrier pipe temperature	Heartbeat Technology ²⁾	114	

Input/output value	Process variable	Category	Slot
	Oscillation damping 1		
	Oscillation frequency 1		
	Oscillation amplitude 0		
	Oscillation amplitude 1		
	Frequency fluctuation 1		
	Tube damping fluctuation 1		
	Exciter current 1		
Input value	External density	Process monitoring	18
	External temperature		19
	External reference density		20
	Flow override		21
	Zero adjustment		22
	Verification status	Heartbeat Verification 2)	23

- Only available with the "Concentration" application package. Only available with the Heartbeat Technology application package. 1) 2)

Startup configuration

Startup configuration (NSU)

If startup configuration is enabled, the configuration of the most important device parameters is taken from the automation system and used.

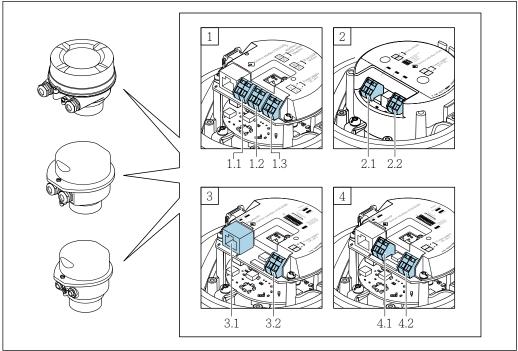
The following configuration is taken from the automation system:

- Management
 - Software revision
 - Write protection
- System units
 - Mass flow
 - Mass
 - Volume flow
 - Volume
 - Corrected volume flow
 - Corrected volume
 - Density
 - Reference density
 - Temperature
 - Pressure
- Concentration application package
 - Coefficients A0 to A4
 - Coefficients B1 to B3
- Sensor adjustment
- Process parameters
 - Damping (flow, density, temperature)
 - Flow override
- Low flow cut off
 - Assign process variable
 - Switch-on/switch-off point
 - Pressure shock suppression
- Empty pipe detection
 - Assign process variable
 - Limit values
 - Response time
 - Max. damping
- Corrected volume flow calculation
 - External reference density
 - Fixed reference density
 - Reference temperature
 - Linear expansion coefficient
 - Square expansion coefficient
- Measuring mode
 - Medium
 - Gas type
 - Reference sound velocity
 - Temperature coefficient sound velocity
- External compensation
 - Pressure compensation
 - Pressure value
- External pressure
- Diagnostic settings
- Diagnostic behavior for diverse diagnostic information

Power supply

Terminal assignment

Overview: housing version and connection versions



A001677

- A Housing version: compact, aluminum coated
- B Housing version: compact, stainless
- C Housing version: ultra-compact, stainless
- Connection version: 4-20 mA HART, pulse/frequency/switch output
- 1.1 Signal transmission: pulse/frequency/switch output
- 1.2 Signal transmission: 4-20 mA HART
- 1.3 Supply voltage
- 2 Connection version: Modbus RS485
- 2.1 Signal transmission
- 2.2 Supply voltage
- 3 Connection version: EtherNet/IP and PROFINET
- 3.1 Signal transmission
- 3.2 Supply voltage
- 4 Connection version: PROFIBUS DP
- 4.1 Signal transmission
- 4.2 Supply voltage

Transmitter

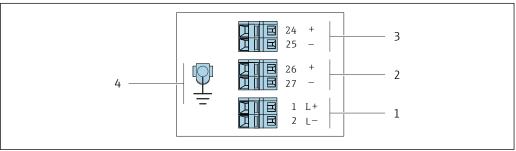
Connection version 4-20 mA HART with pulse/frequency/switch output $^{\circ}$ Order code for "Output", option $^{\circ}$ B

Depending on the housing	na version the tr	ansmitters can be	ordered with	terminals or device plugs.
Depending on the nousing	iq version, the tr	ansimillers can be	Olucicu With	terminais or device prays.

Order code for	Connection me	thods available	Possible options for order code
"Housing"	Outputs	Power supply	"Electrical connection"
Options A, B	Terminals	Terminals	 Option A: coupling M20x1 Option B: thread M20x1 Option C: thread G ½" Option D: thread NPT ½"
Options A, B	Device plug → 🖺 31	Terminals	■ Option L: plug M12x1 + thread NPT ½" ■ Option N: plug M12x1 + coupling M20 ■ Option P: plug M12x1 + thread G ½" ■ Option U: plug M12x1 + thread M20
Options A, B, C	Device plug → 🖺 31	Device plug → 🖺 31	Option Q : 2 x plug M12x1

Order code for "Housing":

- Option A: compact, coated aluminum
- Option B: compact, stainlessOption C: ultra-compact, stainless



- **₽** 2 Terminal assignment 4-20 mA HART with pulse/frequency/switch output
- 1 Power supply: DC 24 V
- 2
- Output 1: 4-20 mA HART (active)
 Output 2: pulse/frequency/switch output (passive) 3
- 4 ${\it Connection for cable shield (IO signals) if present and/or protective ground from the supply voltage if present.}$ Not for option C "Ultra-compact, hygienic, stainless".

	Terminal number					
Order code for "Output"	Power	supply	Outp	out 1	Outp	out 2
2	2 (L-)	1 (L+)	27 (-)	26 (+)	25 (-)	24 (+)
Option B	DC 24 V		4-20 mA HART (active)		Pulse/frequency/switch output (passive)	

Order code for "Output":

Option **B**: 4-20 mA HART with pulse/frequency/switch output

PROFIBUS DP connection version

For use in the non-hazardous area and Zone 2/Div. 2

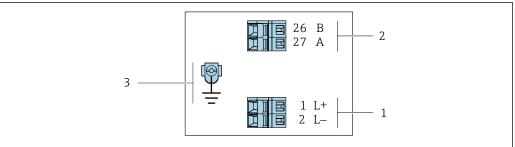
Order code for "Output", option L

Depending on the housing version, the transmitters can be ordered with terminals or device plugs.

Order code for	Connection methods available		Possible options for order code
"Housing"	Output	Power supply	"Electrical connection"
Options A, B	Terminals	Terminals	 Option A: coupling M20x1 Option B: thread M20x1 Option C: thread G ½" Option D: thread NPT ½"
Options A, B	Device plug → 🖺 31	Terminals	■ Option L: plug M12x1 + thread NPT ½" ■ Option N: plug M12x1 + coupling M20 ■ Option P: plug M12x1 + thread G ½" ■ Option U: plug M12x1 + thread M20
Options A, B, C	Device plug → 🖺 31	Device plug → 🖺 31	Option Q : 2 x plug M12x1

Order code for "Housing":

- $\, \bullet \,$ Option A: compact, coated aluminum
- Option **B**: compact, stainless
- Option **C**: ultra-compact, stainless



- ₩ 3 PROFIBUS DP terminal assignment
- 1 Power supply: DC 24 V
- PROFIBUS DP
- 3 ${\it Connection for cable shield (IO signals) if present and/or protective ground from the supply voltage if present.}$ Not for option C "Ultra-compact, hygienic, stainless".

		Terminal number			
Order code for	Power supply		Output		
"Output"	2 (L-)	1 (L+)	26 (RxD/TxD-P)	27 (RxD/TxD- N)	
Option L	DC 24 V		В	A	

Order code for "Output":

Option L: PROFIBUS DP, for use in non-hazardous areas and Zone 2/Div. 2

Modbus RS485 connection version

i

For use in the non-hazardous area and Zone 2/Div. 2

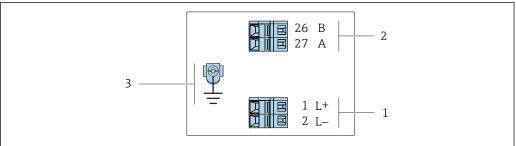
Order code for "Output", option ${\bf M}$

Depending on the housing version, the transmitters can be ordered with terminals or device plugs.

Onder sode for	Order code for Connection methods available		Descible entions for order sode
"Housing"	Output	Power supply	Possible options for order code "Electrical connection"
Options A, B	Terminals	Terminals	 Option A: coupling M20x1 Option B: thread M20x1 Option C: thread G ½" Option D: thread NPT ½"
Options A, B	Device plug → 🖺 31	Terminals	■ Option L: plug M12x1 + thread NPT ½" ■ Option N: plug M12x1 + coupling M20 ■ Option P: plug M12x1 + thread G ½" ■ Option U: plug M12x1 + thread M20
Options A, B, C	Device plug → 🖺 31	Device plug → 🖺 31	Option Q : 2 x plug M12x1

Order code for "Housing":

- $\, \blacksquare \,$ Option A: compact, coated aluminum
- Option **B**: compact, stainless
- Option **C**: ultra-compact, stainless



A001952

- Modbus RS485 terminal assignment, connection version for use in non-hazardous areas and Zone 2/Div.
- 1 Power supply: DC 24 V
- 2 Modbus RS485
- 3 Connection for cable shield (IO signals) if present and/or protective ground from the supply voltage if present. Not for option C "Ultra-compact, hygienic, stainless".

	Terminal number				
Order code for "Output"	Power supply		Power supply Output		put
	1 (L+)	2 (L-)	26 (B)	27 (A)	
Option M	DC 24 V		Modbus	RS485	

Order code for "Output":

Option M: Modbus RS485, for use in non-hazardous areas and Zone 2/Div. 2

Modbus RS485 connection version

For use in the intrinsically safe area. Connection via Safety Barrier Promass 100.

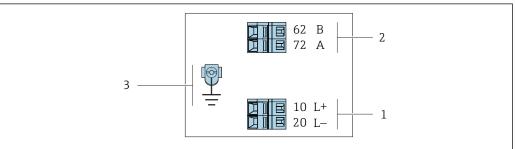
Order code for "Output", option ${\bf M}$

Depending on the housing version, the transmitters can be ordered with terminals or device plugs.

Order code for	Connection me	thods available	Descible entions for order sode
"Housing"	Output	Power supply	Possible options for order code "Electrical connection"
Options A, B	Terminals	Terminals	 Option A: coupling M20x1 Option B: thread M20x1 Option C: thread G ½" Option D: thread NPT ½"
A, B, C	Device plug → 🖺 31		Option I: plug M12x1

Order code for "Housing":

- Option A: compact, coated aluminum
- Option **B**: compact, stainless
- Option C: ultra-compact, stainless



A0030219

- Modbus RS485 terminal assignment, connection version for use in intrinsically safe areas (connection via Safety Barrier Promass 100)
- 1 Intrinsically safe power supply
- 2 Modbus RS485
- 3 Connection for cable shield (IO signals) if present and/or protective ground from the supply voltage if present. Not for option C "Ultra-compact, hygienic, stainless".

Order code for "Output"	10 (L+)	20 (L-)	62 (B)	72 (A)
Option M	Intrinsically safe supply voltage		Modbus RS485,	intrinsically safe

Order code for "Output":

Option M: Modbus RS485, for use in the intrinsically safe area (connection via Safety Barrier Promass 100)

EtherNet/IP connection version

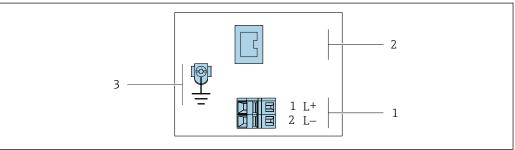
Order code for "Output", option ${\bf N}$

Depending on the housing version, the transmitters can be ordered with terminals or device plugs.

Order code for	Connection me	thods available	Possible options for order code
"Housing"	Output	Power supply	"Electrical connection"
Options A, B	Device plug → 🗎 32	Terminals	 Option L: plug M12x1 + thread NPT ½" Option N: plug M12x1 + coupling M20 Option P: plug M12x1 + thread G ½" Option U: plug M12x1 + thread M20
Options A, B, C	Device plug → 🖺 32	Device plug → 🖺 32	Option Q : 2 x plug M12x1

Order code for "Housing":

- Option **A**: compact, coated aluminum
- Option B: compact, stainless
 Option C: ultra-compact, stainless



₽ 6 EtherNet/IP terminal assignment

- Power supply: DC 24 V 1
- 2 EtherNet/IP
- Connection for cable shield (IO signals) if present and/or protective ground from the supply voltage if present. 3 Not for option C "Ultra-compact, hygienic, stainless".

	Terminal number			
Order code for "Output"	Power supply		Output	
o alpac	2 (L-)	1 (L+)	Device plug M12x1	
Option N	DC 24 V		EtherNet/IP	
Order code for "Output": Option N : EtherNet/IP				

PROFINET connection version

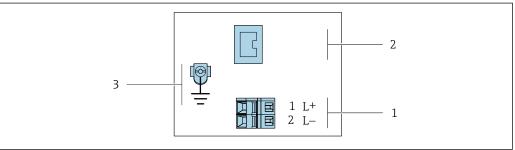
Order code for "Output", option ${\bf R}$

Depending on the housing version, the transmitters can be ordered with terminals or device plugs.

Oudan as da fan	Connection methods available		Descible autions for order and
Order code for "Housing"	Output	Power supply	Possible options for order code "Electrical connection"
Options A, B	Device plug → 🖺 30	Terminals	 Option L: plug M12x1 + thread NPT ½" Option N: plug M12x1 + coupling M20 Option P: plug M12x1 + thread G ½" Option U: plug M12x1 + thread M20
Options A, B, C	Device plug → 🖺 30	Device plug → 🖺 30	Option Q : 2 x plug M12x1

Order code for "Housing":

- Option **A**: compact, coated aluminum
- Option B: compact, stainless
- Option **C**: ultra-compact, stainless



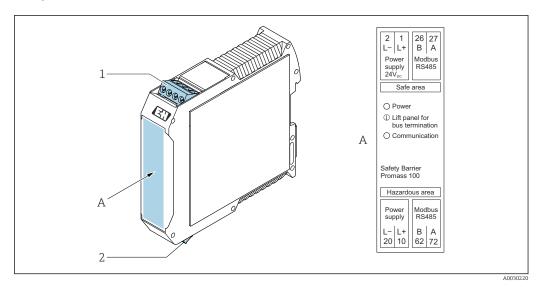
A0017054

\blacksquare 7 PROFINET terminal assignment

- 1 Power supply: DC 24 V
- 2 PROFINET
- 3 Connection for cable shield (IO signals) if present and/or protective ground from the supply voltage if present. Not for option C "Ultra-compact, hygienic, stainless".

	Terminal number			
Order code for "Output"	Power supply		Output	
Julput	2 (L-)	1 (L+)	Device plug M12x1	
Option R	DC 24 V		PROFINET	
Order code for "Output":				

Safety Barrier Promass 100



- 8 Safety Barrier Promass 100 with terminals
- 1 Non-hazardous area: Zone 2; Class I, Division 2
- 2 Intrinsically safe area

Pin assignment, device plug

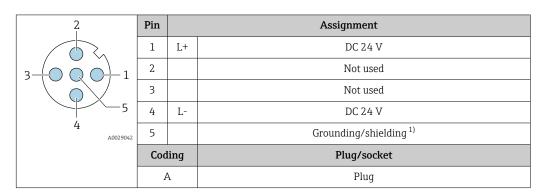
Order codes for the M12x1 plugs, see the "Order code for **electrical connection**" column:

- PROFIBUS DP→ 🖺 25
- Modbus RS485 → 🖺 26
- EtherNet/IP → 🗎 28
- PROFINET → 🗎 29

Supply voltage

Intrinsically safe for all connection versions except MODBUS RS485, intrinsically safe (device side), male connection (plug)



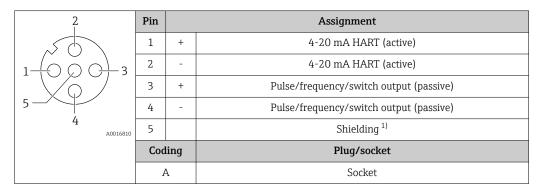


- Connection for protective ground and/or shielding from the supply voltage if present. Not for option C
 "Ultra-compact, hygienic, stainless". Note: There is a metallic connection between the union nut of the M12
 cable and the transmitter housing.
- The following is recommended as a socket:
 - Binder, series 763, part no. 79 3440 35 05
 - Alternatively: Phoenix part no. 1682951 SAC-5P-5.0-PUR/M12FS SH
 - \bullet With the order code for "Output", option **B**: 4-20 mA HART, pulse/frequency/switch output
 - With the order code for "Output", option **N**: EtherNet/IP
 - When using the device in a hazardous location: Use a suitably certified socket.

30

4-20 mA HART with pulse/frequency/switch output

Device plug for signal transmission (device side), female connection

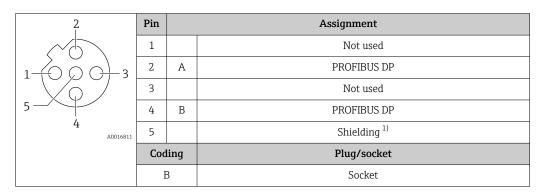


- Connection for cable shield (IO signals) if present. Not for option C "Ultra-compact, hygienic, stainless".
 Note: There is a metallic connection between the union nut of the M12 cable and the transmitter housing.
- Recommended plug: Binder, series 763, part no. 79 3439 12 05
 When using the device in a hazardous location, use a suitably certified plug.

PROFIBUS DP

For use in the non-hazardous area and Zone 2/Div. 2.

Device plug for signal transmission (device side)



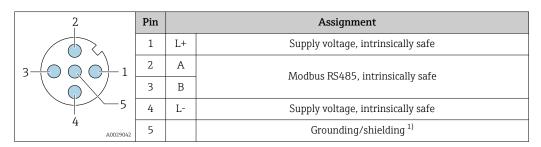
- 1) Connection for cable shield (IO signals) if present. Not for option C "Ultra-compact, hygienic, stainless".

 Note: There is a metallic connection between the union nut of the M12 cable and the transmitter housing.
- Recommended plug: Binder, series 763, part no. 79 4449 20 05

 When using the device in a hazardous location, use a suitably certified plug.

MODBUS RS485

Device plug for signal transmission with supply voltage (device side), MODBUS RS485 (intrinsically safe)

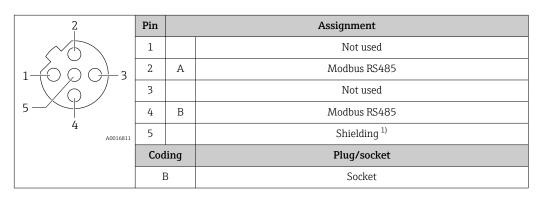


Coding	Plug/socket
А	Plug

- Connection for protective ground and/or shielding from the supply voltage if present. Not for option C 1) "Ultra-compact, hygienic, stainless". Note: There is a metallic connection between the union nut of the M12 cable and the transmitter housing.
- Recommended socket: Binder, series 763, part no. 79 3439 12 05 • When using the device in a hazardous location: Use a suitably certified socket.

Device plug for signal transmission (device side), MODBUS RS485 (not intrinsically safe)

For use in the non-hazardous area and Zone 2/Div. 2.



- 1) Connection for cable shield (IO signals) if present. Not for option C "Ultra-compact, hygienic, stainless". Note: There is a metallic connection between the union nut of the M12 cable and the transmitter housing.
- Recommended plug: Binder, series 763, part no. 79 4449 20 05 • When using the device in a hazardous location, use a suitably certified plug.

EtherNet/IP

Device plug for signal transmission (device side)

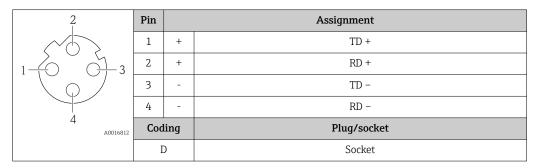
2	Pin		Assignment
	1	+	Tx
1 3	2	+	Rx
	3	-	Tx
	4	-	Rx
4 A0016812	Cod	ling	Plug/socket
	Ι)	Socket

- There is a metallic connection between the union nut of the M12 cable and the transmitter housing.

 Recommended plug:
 - Binder, series 763, part no. 99 3729 810 04
 - Phoenix, part no. 1543223 SACC-M12MSD-4Q
 - When using the device in a hazardous location, use a suitably certified plug.

PROFINET

Device plug for signal transmission (device side)





- There is a metallic connection between the union nut of the M12 cable and the transmitter housing.
 Recommended plug:
- - Binder, series 763, part no. 99 3729 810 04
 - Phoenix, part no. 1543223 SACC-M12MSD-4Q
 - When using the device in a hazardous location, use a suitably certified plug.

Supply voltage

The power unit must be tested to ensure it meets safety requirements (e.g. PELV, SELV).

Transmitter

For device version with communication type:

- HART, PROFIBUS DP, EtherNet/IP: DC 20 to 30 V
- Modbus RS485, device version:
 - For use in the non-hazardous area and Zone 2/Div. 2: DC 20 to 30 V
 - For use in the intrinsically safe area: power supply via Safety Barrier Promass 100

Promass 100 safety barrier

DC 20 to 30 V

Power consumption

Transmitter

Order code for "Output"	Maximum Power consumption
Option B : 4-20 mA HART with pulse/frequency/switch output	3.5 W
Option L: PROFIBUS DP	3.5 W
Option M Modbus RS485, for use in non-hazardous areas and Zone 2/ Div. 2	3.5 W
Option M : Modbus RS485, for use in intrinsically safe areas	2.45 W
Option N: EtherNet/IP	3.5 W
Option R: PROFINET	3.5 W

Safety Barrier Promass 100

Order code for "Output"	Maximum Power consumption
Option M : Modbus RS485, for use in intrinsically safe areas	4.8 W

Current consumption

Transmitter

Order code for "Output"	Maximum current consumption	Maximum switch-on current	
Option B : 4-20mA HART, pul./freq./switch output	145 mA	18 A (< 0.125 ms)	
Option L : PROFIBUS DP	145 mA	18 A (< 0.125 ms)	

Order code for "Output"	Maximum current consumption	Maximum switch-on current
Option M Modbus RS485, for use in non-hazardous areas and Zone 2/Div. 2	90 mA	10 A (< 0.8 ms)
Option M : Modbus RS485, for use in intrinsically safe areas	145 mA	16 A (< 0.4 ms)
Option N : EtherNet/IP	145 mA	18 A (< 0.125 ms)
Option R : PROFINET	145 mA	18 A (< 0.125 ms)

Safety Barrier Promass 100

Order code for "Output"	Maximum current consumption	Maximum switch-on current
Option M : Modbus RS485, for use in intrinsically safe areas	230 mA	10 A (< 0.8 ms)

Device fuse

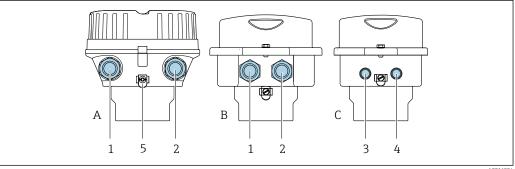
Fine-wire fuse (slow-blow) T2A

Power supply failure

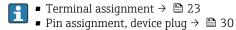
- Totalizers stop at the last value measured.
- Depending on the device version, the configuration is retained in the device memory or in the plug-in memory (HistoROM DAT).
- Error messages (incl. total operated hours) are stored.

Electrical connection

Transmitter connection



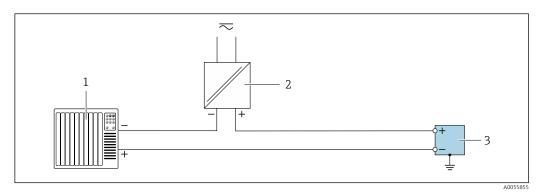
- Α Housing version: compact, coated, aluminum
- В Housing version: compact, stainless
- Housing version: ultra-compact, stainless С
- Cable entry or device plug for signal transmission
- Cable entry or device plug for supply voltage 2
- 3 Device plug for signal transmission
- Device plug for supply voltage
- Ground terminal. Cable lugs, pipe clips or ground disks are recommended for optimization of the grounding/ shielding.



In the case of device versions with a connector, the transmitter housing does not need to be opened to connect the signal cable or power supply cable.

Connection examples

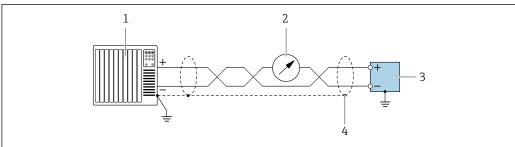
Pulse output/frequency output/switch output



■ 9 Connection example for pulse output/frequency output/switch output (passive)

- 1 Automation system with pulse input/frequency input/switch input (e.g. PLC)
- 2 Power supply
- 3 Transmitter with pulse output/frequency output/switch output (passive)

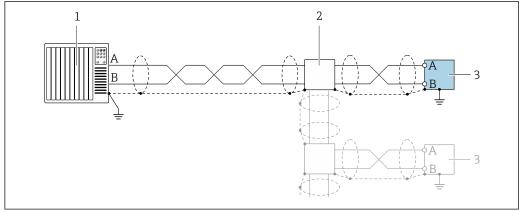
Current output 4 to 20 mA HART



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- \blacksquare 10 Connection example for 4 to 20 mA current output with HART (active)
- 1 Automation system with 4 to 20 mA current input with HART (e.g. PLC)
- 2 Optional display unit: Note maximum load
- *3* Transmitter with 4 to 20 mA current output with HART (active)
- 4 Ground cable shield at one end. For installations in compliance with NAMUR NE 89, grounding of the cable shield on both sides is required.

Modbus RS485



■ 11 Connection example for Modbus RS485

- 1 Automation system with Modbus master (e.g. PLC)
- 2 Optional distribution box
- 3 Transmitter with Modbus RS485

Endress+Hauser 35

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PROFIBUS DP



See https://www.profibus.com "PROFIBUS Installation Guidelines".

PROFINET



See https://www.profibus.com "PROFINET Planning guideline".

EtherNet/IP



See https://www.odva.org"EtherNet/IP Media Planning & Installation Manual".

Potential equalization

Requirements

For potential equalization:

- Pay attention to in-house grounding concepts
- Take account of operating conditions like the pipe material and grounding
- Connect the medium, sensor and transmitter to the same electric potential
- Use a ground cable with a minimum cross-section of 6 mm² (10 AWG) and a cable lug for potential equalization connections

Terminals

Transmitter

Spring terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)

Promass 100 safety barrier

Plug-in screw terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)

Cable entries

- Cable gland: M20 \times 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)
- Thread for cable entry:
 - M20
 - G 1/2"
 - NPT ½"

Cable specification

Permitted temperature range

- The installation guidelines that apply in the country of installation must be observed.
- The cables must be suitable for the minimum and maximum temperatures to be expected.

Power supply cable (incl. conductor for the inner ground terminal)

Standard installation cable is sufficient.

Signal cable

4 to 20 mA current output (without HART)

Standard installation cable is sufficient.

Pulse/frequency/switch output

Standard installation cable is sufficient.

Current output 4 to 20 mA HART

Shielded twisted-pair cable.



See https://www.fieldcommgroup.org "HART PROTOCOL SPECIFICATIONS".

Modbus RS485

Shielded twisted-pair cable.



See https://modbus.org "MODBUS over Serial Line Specification and Implementation Guide".

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PROFIBUS DP

Shielded twisted-pair cable. Cable type A is recommended.



See https://www.profibus.com "PROFIBUS Installation Guidelines".

PROFINET

Only PROFINET cables.



See https://www.profibus.com "PROFINET Planning guideline".

EtherNet/IP

Twisted-pair Ethernet CAT 5 or better.



See https://www.odva.org"EtherNet/IP Media Planning & Installation Manual".

Connecting cable between Safety Barrier Promass 100 and measuring device

Cable type	Shielded twisted-pair cable with 2x2 wires. When grounding the cable shield, observe the grounding concept of the plant.
Maximum cable resistance	2.5Ω , one side



Comply with the maximum cable resistance specifications to ensure the operational reliability of the measuring device.

The maximum cable length for individual wire cross-sections is specified in the table below. Observe the maximum capacitance and inductance per unit length of the cable and connection values for hazardous areas.

Wire cros	ss-section	Maximum o	cable length
[mm ²]	[AWG]	[m]	[ft]
0.5	20	70	230
0.75	18	100	328
1.0	17	100	328
1.5	16	200	656
2.5	14	300	984

Performance characteristics

Reference operating conditions

- Error limits based on ISO 11631
- Water
 - +15 to +45 °C (+59 to +113 °F)
 - 2 to 6 bar (29 to 87 psi)
- Data as indicated in the calibration protocol
- Accuracy based on accredited calibration rigs according to ISO 17025



To obtain measured errors, use the *Applicator* sizing tool $\rightarrow \Box 70$

Maximum measurement error

o.r. = of reading; $1 \text{ g/cm}^3 = 1 \text{ kg/l}$; T = medium temperature

Base accuracy



Design fundamentals $\rightarrow \triangleq 40$

Mass flow and volume flow (liquids)

- ±0.05 % o.r. (optional for mass flow: PremiumCal; order code for "Calibration flow", option D)
- ±0.10 % o.r. (standard)

Mass flow (gases)

±0.35 % o.r.

Density (liquids)

Under reference conditions	Standard density calibration	Wide-range Density specification ^{1) 2)}	Extended density calibration ^{3) 4)}
[g/cm³]	[g/cm³]	[g/cm³]	[g/cm³]
±0.0005	±0.0005	±0.001	±0.0005

- 1) Valid range for special density calibration: 0 to 2 g/cm 3 , +5 to +80 $^{\circ}$ C (+41 to +176 $^{\circ}$ F)
- 2) order code for "Application package", option EE "Special density" (for nominal diameters \leq 100 DN)
- 3) Valid range for extended density calibration: 0 to 2 g/cm³, +20 to +60 °C (+68 to +140 °F)
- 4) order code for "Application package", option E1 "Extended density" "

Temperature

 $\pm 0.5 \,^{\circ}\text{C} \pm 0.005 \cdot \text{T} \,^{\circ}\text{C} \, (\pm 0.9 \,^{\circ}\text{F} \pm 0.003 \cdot (\text{T} - 32) \,^{\circ}\text{F})$

Zero point stability

DN		Zero point stability	
[mm]	[in]	[kg/h]	[lb/min]
80	3	9	0.330
100	4	14	0.514
150	6	32	1.17
250	10	88	3.23

Flow values

Flow values as turndown parameters depending on nominal diameter.

SI units

DN	1:1	1:10	1:20	1:50	1:100	1:500
[mm]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]
80	180 000	18000	9 000	3 600	1800	360
100	350000	35 000	17500	7 000	3 500	700
150	800 000	80000	40 000	16 000	8 000	1600

US units

DN	1:1	1:10	1:20	1:50	1:100	1:500
[inch]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]
3	6615	661.5	330.8	132.3	66.15	13.23
4	12 860	1286	643.0	257.2	128.6	25.72
6	29 400	2940	1470	588	294	58.80

Accuracy of outputs



The output accuracy must be factored into the measurement error if analog outputs are used; but can be ignored for fieldbus outputs (e.g. Modbus RS485, EtherNet/IP).

The outputs have the following base accuracy specifications:

Current output

	Accuracy	Max. ±5 μA
--	----------	------------

Pulse/frequency output

o.r. = of reading

Accuracy	Max. ±50 ppm o.r. (over the entire ambient temperature range)
----------	---------------------------------------------------------------

Repeatability

o.r. = of reading; $1 \text{ g/cm}^3 = 1 \text{ kg/l}$; T = medium temperature

Base repeatability



Mass flow and volume flow (liquids)

 ± 0.025 % o.r. (PremiumCal, for mass flow)

±0.05 % o.r.

Mass flow (gases)

±0.25 % o.r.

Density (liquids)

 $\pm 0.00025 \text{ g/cm}^3$

Temperature

 $\pm 0.25 \,^{\circ}\text{C} \pm 0.0025 \cdot \text{T} \,^{\circ}\text{C} \, (\pm 0.45 \,^{\circ}\text{F} \pm 0.0015 \cdot (\text{T}-32) \,^{\circ}\text{F})$

Response time

The response time depends on the configuration (damping).

Influence of ambient temperature

Current output

o.r. = of reading

Temperature coefficient	Max. ±0.005 % o.r./°C
-------------------------	-----------------------

Pulse/frequency output

Temperature coefficient	No additional effect. Included in accuracy.
-------------------------	---------------------------------------------

Influence of medium temperature

Mass flow

o.f.s. = of full scale value

If there is a difference between the temperature during zero adjustment and the process temperature, the additional measurement error of the sensors is typically ± 0.0002 %o.f.s./°C (± 0.0001 % o.f.s./°F).

The influence is reduced when the zero adjustment is performed at process temperature.

Density

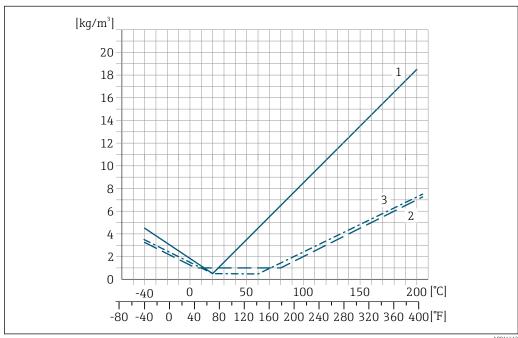
If there is a difference between the density calibration temperature and the process temperature, the measurement error of the sensors is typically ± 0.00010 g/cm³/°C (± 0.000005 g/cm³/°F). Field density adjustment is possible.

Wide-range density specification (special density calibration)

If the process temperature is outside the valid range ($\Rightarrow \triangleq 37$) the measurement error is $\pm 0.00005 \text{ g/cm}^3 \text{ /°C } (\pm 0.000025 \text{ g/cm}^3 \text{ /°F})$

Extended density specification

If the process temperature is outside the valid range ($\Rightarrow \triangleq 37$) the measurement error is $\pm 0.00005 \text{ g/cm}^3 \text{ /°C } (\pm 0.000025 \text{ g/cm}^3 \text{ /°F})$



A0016612

- Field density adjustment, for example at +20 $^{\circ}$ C (+68 $^{\circ}$ F)
- Special density calibration
- Extended density calibration

Temperature

 $\pm 0.005 \cdot \text{T} \, ^{\circ}\text{C} \, (\pm 0.005 \cdot (\text{T} - 32) \, ^{\circ}\text{F})$

Influence of medium pressure

The following shows how the process pressure (gauge pressure) affects the accuracy of the mass flow.

o.r. = of reading



It is possible to compensate for the effect by:

- Reading in the current pressure measured value via the current input or a digital input.
- Specifying a fixed value for the pressure in the device parameters.



Operating Instructions \rightarrow \blacksquare 71.

DN		[% o.r./bar]	[% o.r./psi]
[mm]	[in]		
80	3	-0.0056	-0.0004
100	4	-0.0037	-0.0002
150	6	-0.002	-0.0001
250	10	-0.0067	-0.0005

Design fundamentals

o.r. = of reading, o.f.s. = of full scale value

BaseAccu = base accuracy in % o.r., BaseRepeat = base repeatability in % o.r.

MeasValue = measured value; ZeroPoint = zero point stability

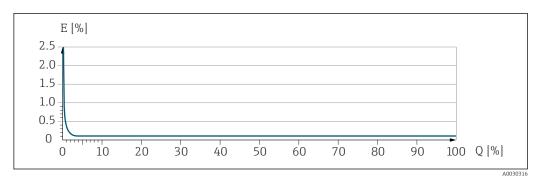
Calculation of the maximum measured error as a function of the flow rate

Flow rate	Maximum measured error in % o.r.
$\geq \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$	± BaseAccu
A0023	
$<\frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$	$\pm \frac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$
A002	33 A0021334

Calculation of the maximum repeatability as a function of the flow rate

Flow rate	Maximum repeatability in % o.r.
$\geq \frac{\frac{1}{2} \cdot ZeroPoint}{BaseRepeat} \cdot 100$	± BaseRepeat
A002	
< ½ · ZeroPoint BaseRepeat · 100	± ½ · ZeroPoint MeasValue · 100
A002	336 A0021337

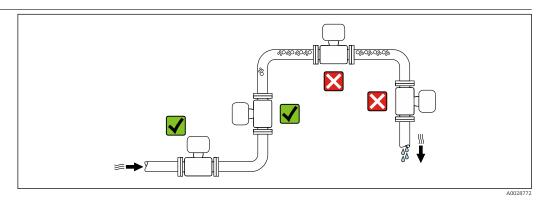
Example of maximum measurement error



- E Maximum measurement error in % o.r. (example)
- Q Flow rate in % of maximum full scale value

Installation

Mounting location

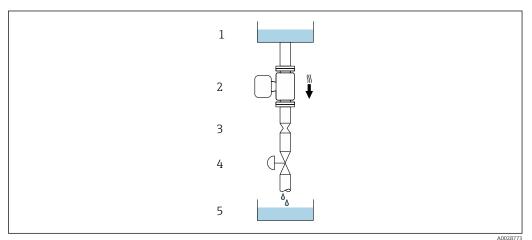


To avoid measurement errors caused by gas bubble formation in the measuring tube, avoid the following installation locations in the pipe:

- Highest point of a pipeline
- Directly upstream of a free pipe outlet in a down pipe

Installation in down pipes

However, the following installation suggestion allows for installation in an open vertical pipeline. Pipe restrictions or the use of an orifice with a smaller cross-section than the nominal diameter prevent the sensor running empty while measurement is in progress.



- \blacksquare 12 Installation in a down pipe (e.g. for batching applications)
- 1 Supply tank
- 2 Sensor
- 3 Orifice plate, pipe restriction
- 4 Valve
- 5 Filling container

DN/	NPS	Ø orifice plate, pipe restriction		
[mm]	[in]	[mm]	[in]	
80	3	50	1.97	
100	4	65	2.60	
150	6	90	3.54	

Orientation

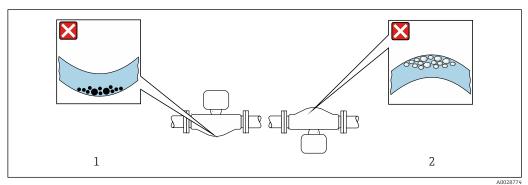
The direction of the arrow on the sensor nameplate helps you to install the sensor according to the flow direction (direction of medium flow through the piping).

	Recommendation		
A	Vertical orientation	A0015591	√ √ 1)
В	Horizontal orientation, transmitter at top	A0015589	✓ ✓ ²⁾ Exception: → • 13, • 43

	Orientatio	Recommendation	
С	Horizontal orientation, transmitter at bottom	A0015590	✓ ✓ ³⁾ Exception: → 🖸 13, 🖺 43
D	Horizontal orientation, transmitter at side	A0015592	×

- 1) This orientation is recommended to ensure self-draining.
- 2) Applications with low process temperatures may reduce the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.
- 3) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.

If a sensor is installed horizontally with a curved measuring tube, match the position of the sensor to the medium properties.



■ 13 Orientation of sensor with curved measuring tube

- Avoid this orientation for media with entrained solids: Risk of solids accumulating
- 2 Avoid this orientation for outgassing media: Risk of gas accumulating

Inlet and outlet runs

Special installation instructions

Drainability

When installed vertically, the measuring tubes can be drained completely and protected against buildup.

Hygienic compatibility

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When installing in hygienic applications, please refer to the information in the "Certificates and approvals/hygienic compatibility" section

Rupture disk

Process-related information: $\rightarrow \triangleq 48$.

WARNING

Danger from medium escaping!

Medium escaping under pressure can cause injury or material damage.

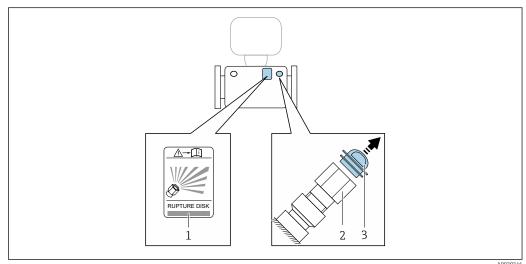
- ▶ Take precautions to prevent danger to persons and damage if the rupture disk is actuated.
- ▶ Observe the information on the rupture disk sticker.
- Make sure that the function and operation of the rupture disk is not impeded through the installation of the device.
- ▶ Do not use a heating jacket.
- ▶ Do not remove or damage the rupture disk.

The position of the rupture disk is indicated by a sticker affixed beside it.

The transportation guard must be removed.

The existing connecting nozzles are not intended for the purpose of rinsing or pressure monitoring, but instead serve as the mounting location for the rupture disk.

In the event of a failure of the rupture disk, a drain device can be screwed onto the internal thread of the rupture disk in order to drain off any escaping medium.



- 1 Rupture disk label
- Rupture disk with 1/2" NPT internal thread and 1" width across flats 2
- 3 Transport protection

For information on the dimensions, see the "Mechanical construction" section (accessories).

Zero point verification and zero adjustment

All measuring instruments are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions $\rightarrow \stackrel{\triangle}{=} 37$. Therefore, a zero adjustment in the field is generally not required.

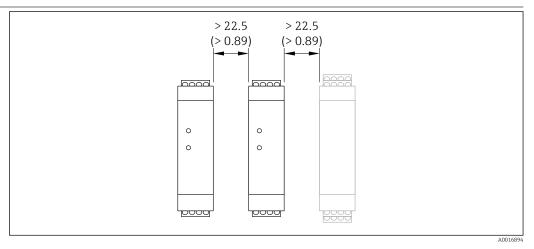
Experience shows that zero adjustment is advisable only in special cases:

- To achieve maximum measurement accuracy even with low flow rates.
- Under extreme process or operating conditions (e.g. very high process temperatures or very highviscosity media).
- For gas applications with low pressure.

For information on checking the zero point and performing a zero adjustment, see the Operating Instructions for the device.

To achieve the highest possible measurement accuracy at low flow rates, the installation must protect the sensor from mechanical stress during operation.

Installing the Safety Barrier Promass 100



Minimum distance between additional Safety Barrier Promass 100 or other modules. Engineering unit ■ 14 mm (in)

Environment

Ambient temperature range

Measuring instrument	 -40 to +60 °C (-40 to +140 °F) Order code for "Test, certificate", option JM: -50 to +60 °C (-58 to +140 °F)
Safety Barrier Promass 100	−40 to +60 °C (−40 to +140 °F)

► If operating outdoors:

Avoid direct sunlight, particularly in warm climatic regions.

Storage temperature

-40 to +80 °C (-40 to +176 °F), preferably at +20 °C (+68 °F) (standard version) -50 to +80 °C (-58 to +176 °F) (Order code for "*Test, certificate*", option JM)

Climate class

DIN EN 60068-2-38 (test Z/AD)

Degree of protection

Transmitter and sensor

- Standard: IP66/67, Type 4X enclosure, suitable for pollution degree 4
- With the order code for "Sensor options", option CM: IP69 can also be ordered
- When the housing is open: IP20, Type 1 enclosure, suitable for pollution degree 2
- Display module: IP20, Type 1 enclosure, suitable for pollution degree 2

Safety Barrier Promass 100

IP20

Vibration resistance and shock resistance

Sinusoidal vibration similar to IEC 60068-2-6

- 2 to 8.4 Hz, 7.5 mm peak
- 8.4 to 2000 Hz, 2 g peak

Broadband random vibration similar to IEC 60068-2-64

- 10 to 200 Hz, 0.01 q²/Hz
- 200 to 2000 Hz, 0.003 g²/Hz
- Total: 2.70 g rms

Half-sine shocks similar to IEC 60068-2-27

6 ms 50 g

Rough handling shocks similar to IEC 60068-2-31

Electromagnetic compatibility (EMC)

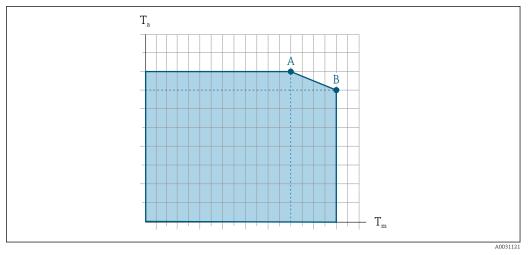
- As per IEC/EN 61326
- As per NAMUR Recommendation 21 (NE 21), NAMUR Recommendation 21 (NE 21) is fulfilled when the device is installed in accordance with NAMUR Recommendation 98 (NE 98).
- As per IEC/EN 61000-6-2 and IEC/EN 61000-6-4
- Complies with emission limits for industry as per EN 55011 (class A)
- Device version with PROFIBUS DP: Complies with emission limits for industry as per EN 50170 Volume 2, IEC 61784
- The following applies for PROFIBUS DP: If baud rates > 1.5 MBaud, an EMC cable entry must be used and the cable shield must continue as far as the terminal wherever possible.
- Details are provided in the Declaration of Conformity.
- This unit is not intended for use in residential environments and cannot guarantee adequate protection of the radio reception in such environments.

Process

Medium temperature range

-40 to +205 °C (-40 to +401 °F)

Dependency of ambient temperature on medium temperature



Exemplary representation, values in the table below.

T_a Ambient temperature

T_m Medium temperature

A Maximum permitted medium temperature T_m at $T_{a max}$ = 60 °C (140 °F); higher medium temperatures T_m require a reduction in the ambient temperature T_a

B Maximum permitted ambient temperature T_a for the maximum specified medium temperature T_m of the sensor

Values for devices that are used in the hazardous area: Separate Ex documentation (XA) for the device .

Not insulated				Insulated			
A B				A B			
Ta			Ta	T _m	Ta	T _m	
60 °C (140 °F)	170 °C (338 °F)	50 °C (122 °F)	205 °C (401 °F)	60 °C (140 °F)	110 °C (230 °F)	50 ℃ (122 °F)	205 °C (401 °F)

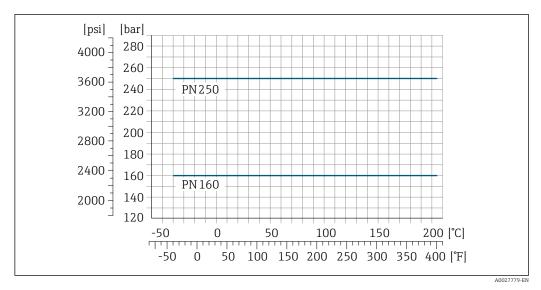
Medium density

0 to 5 000 kg/m 3 (0 to 312 lb/cf)

Pressure-temperature ratings

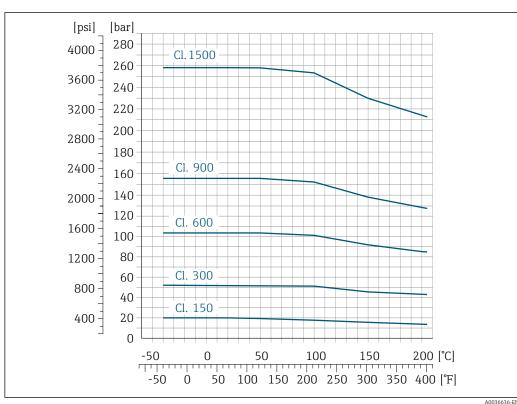
The following pressure/temperature diagrams apply to all pressure-bearing parts of the device and not just the process connection. The diagrams show the maximum permissible medium pressure depending on the specific medium temperature.

Flange connection similar to EN 1092-1 (DIN 2501)



■ 16 With flange material stainless steel, 1.4410/F53 25Cr Duplex (Super Duplex)

Flange connection similar to ASME B16.5



■ 17 With flange material stainless steel, 1.4410/F53 25Cr Duplex (Super Duplex)

Sensor housing

The sensor housing is filled with dry nitrogen gas and protects the electronics and mechanics inside.

If a measuring tube fails (e.g. due to process characteristics like corrosive or abrasive fluids), the fluid will initially be contained by the sensor housing.

In the event of a tube failure, the pressure level inside the sensor housing will rise according to the operating process pressure. If the user judges that the sensor housing burst pressure does not provide an adequate safety margin, the device can be fitted with a rupture disk. This prevents excessively high pressure from forming inside the sensor housing. Therefore, the use of a rupture

disk is strongly recommended in applications involving high gas pressures, and particularly in applications in which the process pressure is greater than 2/3 of the sensor housing burst pressure.

If the sensor is to be purged with gas (gas detection), it should be equipped with purge connections.

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Do not open the purge connections unless the containment can be filled immediately with a dry, inert gas. Use only low pressure to purge.

Maximum pressure:

- DN 80 to 150 (3 to 6"): 5 bar (72.5 psi)
- DN 250 (10"): 3 bar (43.5 psi)

Burst pressure of the sensor housing

The following sensor housing burst pressures are only valid for standard devices and/or devices equipped with closed purge connections (not opened/as delivered).

If a device fitted with purge connections (order code for "Sensor option", option CH "Purge connection") is connected to the purge system, the maximum pressure is determined by the purge system itself or by the device, depending on which component has the lower pressure classification.

If the device is fitted with a rupture disk (order code for "Sensor option", option CA "Rupture disk"), the rupture disk trigger pressure is decisive .

The sensor housing burst pressure refers to a typical internal pressure which is reached prior to mechanical failure of the sensor housing and which was determined during type testing. The corresponding type test declaration can be ordered with the device (order code for "Additional approval", option LN "Sensor housing burst pressure, type test").

D	N	Sensor housing burst pressure				
[mm]	[in]	[bar]	[psi]			
80	3	120	1740			
100	4	95	1370			
150	6	75	1080			
250	10	50	720			

For information on the dimensions: see the "Mechanical construction" section

Rupture disk

To increase the level of safety, a device version with a rupture disk with a trigger pressure of 10 to 15 bar (145 to 217.5 psi) can be used (order code for "Sensor option", option CA "rupture disk").

Internal cleaning

- CIP cleaning
- SIP cleaning

Options

- Oil- and grease-free version for wetted parts, without declaration Order code for "Service", option HA ¹⁾
- Oil- and grease-free version for wetted parts as per IEC/TR 60877-2.0 and BOC 50000810-4, with declaration

Order code for "Service", option HB 1)

Flow limit

Select the nominal diameter by optimizing between the required flow range and permissible pressure loss.



¹⁾ Cleaning only refers to the measuring instrument. Any accessories that have been supplied are not cleaned.

- The minimum recommended full scale value is approx. 1/20 of the maximum full scale value
- For the most common applications, 20 to 50 % of the maximum full scale value can be considered ideal
- A low full scale value must be selected for abrasive media (such as liquids with entrained solids): flow velocity < 1 m/s (< 3 ft/s).
- For gas measurement the following rules apply:
 - The flow velocity in the measuring tubes should not exceed half the speed of sound (0.5 Mach)
 - The maximum mass flow depends on the density of the gas: formula
- To calculate the flow limit, use the *Applicator* sizing tool $\rightarrow \triangle 70$

Pressure loss



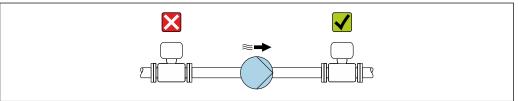
To calculate the pressure loss, use the *Applicator* sizing tool $\rightarrow \triangleq 70$

Static pressure

It is important that cavitation does not occur, or that gases entrained in the liquids do not outgas. This is prevented by means of a sufficiently high static pressure.

For this reason, the following mounting locations are recommended:

- At the lowest point in a vertical pipe
- Downstream from pumps (no danger of vacuum)



A0028777

Thermal insulation

In the case of some fluids, it is important to keep the heat radiated from the sensor to the transmitter to a low level. A wide range of materials can be used for the required insulation.

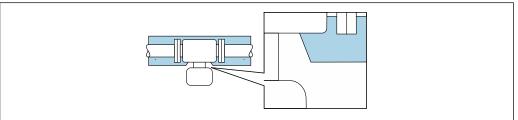
The following device versions are recommended for applications with thermal insulation: Version with extended neck:

Order code for "Measuring tube material", option FA with an extended neck length of 105 mm (4.13 in).

NOTICE

Electronics overheating on account of thermal insulation!

- ▶ Recommended orientation: horizontal orientation, transmitter housing pointing downwards.
- Do not insulate the transmitter housing .
- Maximum permissible temperature at the lower end of the transmitter housing: 80 °C (176 °F)
- ► Thermal insulation with exposed extension neck: We recommend that you do not insulate the extension neck in order to ensure optimum dissipation of heat.



A003439

 $\blacksquare 18$ Thermal insulation with exposed extension neck

Heating

Some media require suitable measures to avoid loss of heat at the sensor.

Heating options

- Electrical heating, e.g. with electric band heaters ²⁾
- Via pipes carrying hot water or steam
- Via heating jackets

NOTICE

Danger of overheating when heating

- ▶ Ensure that the temperature at the lower end of the transmitter housing does not exceed $80\,^{\circ}\text{C}$ (176 $^{\circ}\text{F}$).
- ► Ensure that sufficient convection takes place at the transmitter neck.
- ► Ensure that a sufficiently large area of the transmitter neck remains exposed. The uncovered part serves as a radiator and protects the electronics from overheating and excessive cooling.
- ▶ When using in potentially explosive atmospheres, observe the information in the device-specific Ex documentation. For detailed information on the temperature tables, see the separate document entitled "Safety Instructions" (XA) for the device.
- ► Consider the behavior of the process diagnostics "830 Ambient temperature too high" and "832 Electronics temperature too high" if overheating cannot be avoided by a suitable system design.

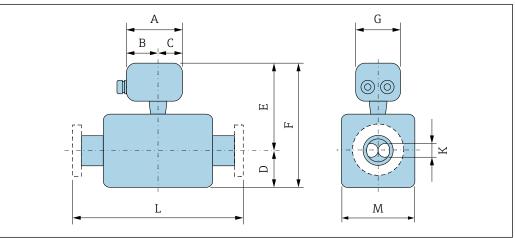
Vibrations

The high oscillation frequency of the measuring tubes ensures that the correct operation of the measuring system is not influenced by plant vibrations.

Mechanical construction

Dimensions in SI units

Compact version



A0033787

Order code for "Housing", option A "Compact, aluminum, coated"

DN	A 1)	B 1)	С	D	E ²⁾	F ²⁾	G	К	L	M
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
80	148	94	54	200	292	492	136	38.5	3)	117
100	148	94	54	254	308	562	136	49.0	3)	138
150	148	94	54	378	328	706	136	66.1	3)	205

- 1) Depending on the cable gland used: values up to +30 mm
- 2) If using a display, order code for "Display; Operation", option B: values +28 mm $\,$
- Depends on the particular process connection $\rightarrow \triangleq 52$

Order code for "Housing", option B "Compact, hygienic, stainless"

DN	A 1)	B 1)	С	D	E ²⁾	F ²⁾	G	K	L	M
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
80	137	78	59	200	288	488	134	38.5	3)	117
100	137	78	59	254	304	548	134	49.0	3)	138
150	137	78	59	378	324	702	134	66.1	3)	205

- 1) Depending on the cable gland used: values up to $\pm 30 \text{ mm}$
- 2) If using a display, order code for "Display; Operation", option B: values +28 mm
- Depends on the particular process connection $\rightarrow \stackrel{\frown}{\blacksquare} 52$

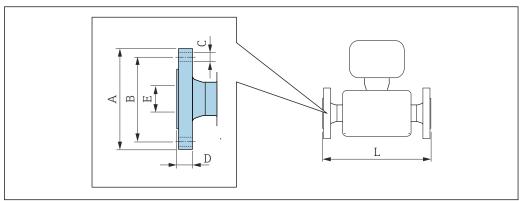
Order code for "Housing", option C "Ultra-compact hygienic, stainless"

DN	A 1)	B 1)	С	D	E 2)	F 2)	G	K	L	M
[mm]										
80	124	68	56	200	287	487	112	38.5	³⁾ Depen ds	117
100	124	68	56	254	303	547	112	49.0		138
150	124	68	56	378	323	701	112	66.1		205

- 1) Depending on the cable gland used: values up to +30 mm
- 2) If using a display, order code for "Display; Operation", option B: values +14 mm $\,$
- 3) Depends on the particular process connection $\rightarrow \stackrel{\triangle}{=} 52$

Flange connections

Fixed flange EN 1092-1, ASME B16.5, JIS B2220



A002317

Length tolerance for dimension L in mm:

■ DN \leq 100: +1.5/-2.0

■ DN ≥ 150: ±3.5

Flange according to EN 1092-1 Form B2 (DIN 2501): PN160 Stainless steel, 1.4410/F53 25Cr Duplex (Super Duplex) Order code for "Process connection", option DAD D Ε L [mm] [mm] [mm] [mm] [mm] [mm] [mm] 80 230 180 $8 \times \emptyset 26$ 36 80.9 916 100 265 210 8 × Ø30 40 104.3 1208 150 355 290 50 155.7 1476 12 × Ø33

Flange with groove according to EN 1092-1 Form D (DIN 2512N): PN160 Stainless steel, 1.4410/F53 25Cr Duplex (Super Duplex) Order code for "Process connection", option DCD DN С D Ε L Α [mm] [mm] [mm] [mm] [mm] [mm] [mm] 80 230 180 8 × Ø26 80.9 916 36 100 265 210 8 × Ø30 40 104.3 1208 150 355 290 12 × Ø33 50 155.7 1476

Stainless stee	Flange according to EN 1092-1 Form B2 (DIN 2501): PN250 Stainless steel, 1.4410/F53 25Cr Duplex (Super Duplex) Order code for "Process connection", option DBD										
DN A B C D E L [mm] [mm] [mm] [mm] [mm]											
80	255	200	8 × Ø30	46	77.7	948					
100	100 300 235 8 × Ø33 54 100.3 1248										
150	390	320	12 × Ø36	68	148.3	1540					

Flange with groove according to EN 1092-1 Form D (DIN 2512N): PN250 Stainless steel, 1.4410/F53 25Cr Duplex (Super Duplex)

Order code for "Process connection", option **DDD**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
80	255	200	8 × Ø30	46	77.7	948
100	300	235	8 × Ø33	54	100.3	1248
150	390	320	12 × Ø36	68	148.3	1540

Flange according to ASME B16.5: Class 900 Schedule 40
Stainless steel, 1.4410/F53 25Cr Duplex (Super Duplex)

Order code for "Process connection", option ADD

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
80	240	190.5	8 × Ø25.4	45.1	78.0	962
100	290	235	8 × Ø31.8	51.4	102.4	1251
150	380	317.5	12 × Ø31.8	62.6	154.1	1513

Flange according to ASME B16.5: Class 1500 Schedule 80 Stainless steel, 1.4410/F53 25Cr Duplex (Super Duplex)

Order code for "Process connection", option AFD

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
80	265	203.2	8 × Ø31.8	54.8	73.7	993
100	310	241.3	8 × Ø35.1	60.8	97.3	1270
150	395	317.5	12 × Ø38.1	89.6	146.3	1577

RTJ flange according to ASME B16.5: Class 900 Schedule 40 Stainless steel, 1.4410/F53 25Cr Duplex (Super Duplex)

Order code for "Process connection", option AED

oraci coac joi	1 / 0 0 0 0 0 0 / 1 / 10	ction, option 2				
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
80	240	190.5	8 × Ø25.4	46.0	78.0	963
100	290	235	8 × Ø31.8	52.3	102.4	1252
150	380	317.5	12 × Ø31.8	63.5	154.1	1515

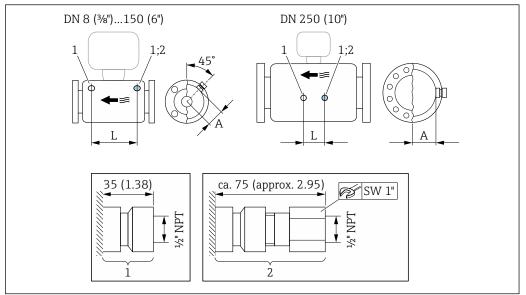
RTJ flange according to ASME B16.5: Class 1500 Schedule 80 Stainless steel, 1.4410/F53 25Cr Duplex (Super Duplex)

Order code for "Process connection", option AGD

Oraci coae joi	order code for Process connection, option Adv										
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]					
80	265	203.2	8 × Ø31.8	55.7	73.7	995					
100	310	241.3	8 × Ø35.1	61.7	97.3	1272					
150	395	317.5	12 × Ø38.1	92.1	146.3	1582					

Accessories

Purge connections/rupture disk



A002891

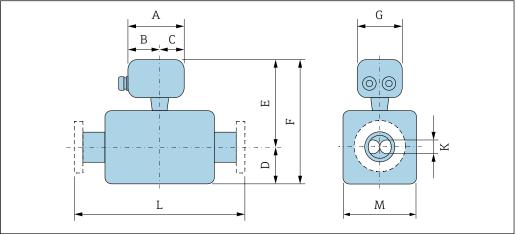
■ 19

- Connection nipple for purge connections: order code for "Sensor options", option CH "Purge connection"
- 2 Connection nipple with rupture disk: order code for "Sensor option", option CA "Rupture disk"

DN	A	L		
[mm]	[mm]	[mm]		
80	101	560		
100	120	684		
150	141	880		
250	182	380		

Dimensions in US units

Compact version



A003378

Order code for "Housing", option A "Compact, aluminum, coated"

DN	A 1)	B 1)	С	D	E 2)	F ²⁾	G	K	L	М
[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
3	5.83	3.7	2.13	7.87	11.5	19.37	5.35	1.52	3)	4.61
4	5.83	3.7	2.13	10	12.13	22.13	5.35	1.93		5.43
6	5.83	3.7	2.13	14.88	12.91	27.8	5.35	2.6		8.07

- 1) Depending on the cable gland used: values up to +30 in
- 2) If using a display, order code for "Display; Operation", option B: values +28 in
- 3) Depends on the particular process connection $\rightarrow \triangleq 56$

Order code for "Housing", option B "Compact, hygienic, stainless"

DN	A 1)	B 1)	С	D	E ²⁾	F ²⁾	G	К	L	М
[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
3	5.39	3.07	2.32	7.87	11.34	19.21	5.28	1.52	3)	4.61
4	5.39	3.07	2.32	10	11.97	21.57	5.28	1.93	3)	5.43
6	5.39	3.07	2.32	14.88	12.76	27.64	5.28	2.6	3)	8.07

- 1) Depending on the cable gland used: values up to +30 in
- 2) If using a display, order code for "Display; Operation", option B: values +28 in
- 3) Depends on the particular process connection $\rightarrow \triangleq 56$

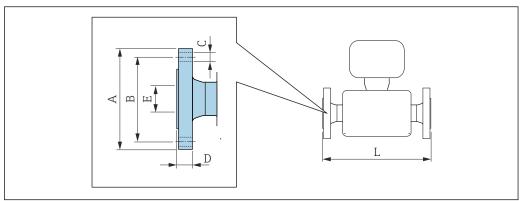
Order code for "Housing", option C "Ultra-compact hygienic, stainless"

DN	A 1)	B 1)	С	D	E 2)	F 2)	G	K	L	М
[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	
3	4.88	2.68	2.2	7.87	11.3	19.17	4.41	1.52	³⁾ Depen ds	4.61
4	4.88	2.68	2.2	10	11.93	21.54	4.41	1.93		5.43
6	4.88	2.68	2.2	14.88	12.72	27.6	4.41	2.6		8.07

- 1) Depending on the cable gland used: values up to +30 in
- 2) If using a display, order code for "Display; Operation", option B: values +14 in

Flange connections

Fixed flange ASME B16.5



Length tolerance for dimension L in inches: • DN \leq 4": +0.06/-0.08
• DN \geq 6": \pm 0.14

Stainless st	Flange similar to ASME B16.5: Class 900 Schedule 40 Stainless steel, 1.4410/F53 25Cr Duplex (Super Duplex) Order code for "Process connection", option ADD										
DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	L [in]					
3	9.45	7.5	8 × Ø1.0	1.78	3.07	37.87					
4	11.42	9.25	8 × Ø1.25	2.02	4.03	49.25					
6	14.96	12.5	12 × Ø1.25	2.46	6.07	59.57					

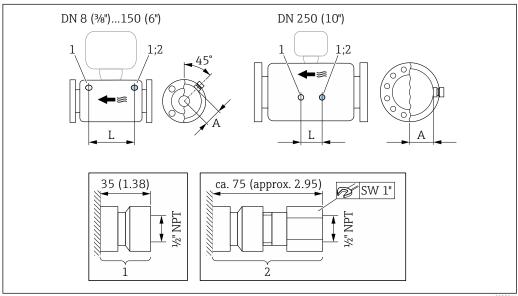
Stainless st	Flange similar to ASME B16.5: Class 1500 Schedule 80 Stainless steel, 1.4410/F53 25Cr Duplex (Super Duplex) Order code for "Process connection", option AFD										
DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	L [in]					
3	10.43	8	8 × Ø1.0	2.16	2.9	39.09					
4	12.20	9.5	8 × Ø1.38	2.39	3.83	50					
6	15.55	12.5	12 × Ø1.50	3.53	5.76	62.09					

Stainless st	RTJ flange similar to ASME B16.5: Class 900 Schedule 40 Stainless steel, 1.4410/F53 25Cr Duplex (Super Duplex) Order code for "Process connection", option AED										
DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	L [in]					
3	9.45	7.5	8 × Ø1.0	1.81	3.07	37.91					
4	11.42	9.25	8 × Ø1.25	2.06	4.03	49.29					
6	14.96	12.5	12 × Ø1.25	2.5	6.07	59.65					

RTJ flange similar to ASME B16.5: Class 1500 Schedule 80 Stainless steel, 1.4410/F53 25Cr Duplex (Super Duplex) Order code for "Process connection", option AGD						
DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	L [in]
3	10.43	8	8 × Ø1.0	2.19	2.9	39.17
4	12.2	9.5	8 × Ø1.38	2.43	3.83	50.08
6	15.55	12.5	12 × Ø1.50	3.63	5.76	62.28

Accessories

Purge connections/rupture disk



- A0028914
- 1 Connection nipple for purge connections: order code for "Sensor options", option CH "Purge connection"
- 2 Connection nipple with rupture disk: order code for "Sensor option", option CA "Rupture disk"

DN	A	L
[in]	[in]	[in]
3	3.98	22.05
4	4.72	26.93
6	5.55	34.65
10	7.17	14.96

Weight

All values (weight exclusive of packaging material) refer to devices with ASME B16.5 Class 900 flanges. Weight specifications including transmitter: order code for "Housing", option A "Compact, aluminum coated".

Weight in SI units

DN [mm]	Weight [kg]
80	75
100	141
150	246
250	572

Weight in US units

DN [in]	Weight [lbs]
3	165
4	311
6	542
10	1261

Safety Barrier Promass 100

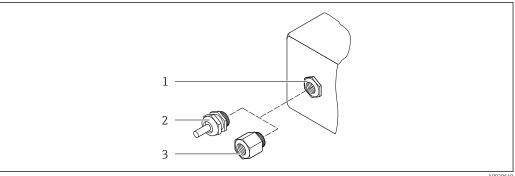
49 g (1.73 ounce)

Materials

Transmitter housing

- Order code for "Housing", option A "Compact, aluminum coated": Aluminum, AlSi10Mg, coated
- Order code for "Housing", option **B** "Compact, stainless": Stainless steel 1.4404 (316L)
- Order code for "Housing", option **C** "Ultra-compact, stainless": Stainless steel 1.4404 (316L)
- Window material for optional local display (→ 🖺 60):
 - For order code for "Housing", option A: glass
 - For order code for "Housing", option **B** and **C**: plastic

Cable entries/cable glands



\blacksquare 20 Possible cable entries/cable glands

- Internal thread M20 \times 1.5
- 2 Cable gland M20 \times 1.5
- Adapter for cable entry with internal thread G $\frac{1}{2}$ " or NPT $\frac{1}{2}$ "

Order code for "Housing", option A "Compact, aluminum, coated"

The various cable entries are suitable for hazardous and non-hazardous areas.

Cable entry/cable gland	Material
Cable gland M20 × 1.5	
Adapter for cable entry with female thread G 1/2"	Nickel-plated brass
Adapter for cable entry with female thread NPT 1/2"	

Order code for "Housing", option B "Compact, stainless"

The various cable entries are suitable for hazardous and non-hazardous areas.

Cable entry/cable gland	Material
Cable gland M20 × 1.5	Stainless steel, 1.4404 (316L)
Adapter for cable entry with female thread G ½"	
Adapter for cable entry with female thread NPT 1/2"	

Device plug

Electrical connection	Material
Plug M12x1	 Socket: Stainless steel, 1.4404 (316L) Contact housing: Polyamide Contacts: Gold-plated brass

Sensor housing

- Acid and alkali-resistant outer surface
- Stainless steel, 1.4404 (316L)

Measuring tubes

Stainless steel, 1.4410/UNS S32750 25Cr Duplex (Super Duplex)

Process connections

Stainless steel, 1.4410/F53 25Cr Duplex (Super Duplex)



Accessories

Safety Barrier Promass 100

Housing: Polyamide

Process connections

Fixed flange connections:

- EN 1092-1 (DIN 2512N) flange
- ASME B16.5 flange
- JIS B2220 flange



Process connection materials

Surface roughness

All data relate to parts in contact with medium.

The following surface roughness categories can be ordered: Not polished

Operability

Operating concept

Operator-oriented menu structure for user-specific tasks

- Commissioning
- Operation
- Diagnostics
- Expert level

Fast and safe commissioning

- Individual menus for applications
- Menu guidance with brief descriptions of the individual parameter functions

Reliable operation

- Operation in the following languages:
 - Via "FieldCare", "DeviceCare" operating tool:
 English, German, French, Spanish, Italian, Chinese, Japanese
 - Via integrated web browser (only available for device versions with HART, PROFIBUS DP, PROFINET and EtherNet/IP):
 - English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Bahasa (Indonesian), Vietnamese, Czech, Swedish, Korean
- Uniform operating philosophy applied to operating tools and web browser
- If replacing the electronic module, transfer the device configuration via the plug-in memory (HistoROM DAT) which contains the process and measuring instrument data and the event logbook. No need to reconfigure.

For devices with Modbus RS485, the data recovery function is implemented without the plug-in memory (HistoROM DAT).

Efficient diagnostic behavior increases measurement reliability

- Remedial action can be called up via the operating tools and web browser
- Diverse simulation options
- Status indicated by several light emitting diodes (LEDs) on the electronic module in the housing compartment

Local display



A local display is only available for device versions with the following communication protocols: HART, PROFIBUS-DP, PROFINET, EtherNet/IP

The local display is only available with the following device order code: Order code for "Display; operation", option **B**: 4-line; illuminated, via communication

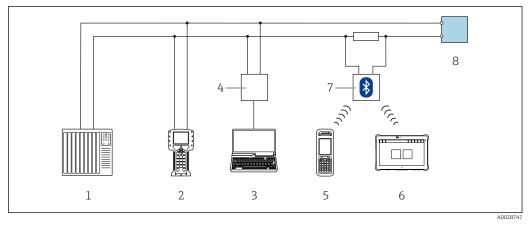
Display element

- 4-line liquid crystal display with 16 characters per line.
- White background lighting; switches to red in event of device errors.
- Format for displaying measured variables and status variables can be individually configured.
- Permitted ambient temperature for the display: -20 to +60 °C (-4 to +140 °F). The readability of the display may be impaired at temperatures outside the temperature range.

Remote operation

Via HART protocol

This communication interface is available in device versions with a HART output.

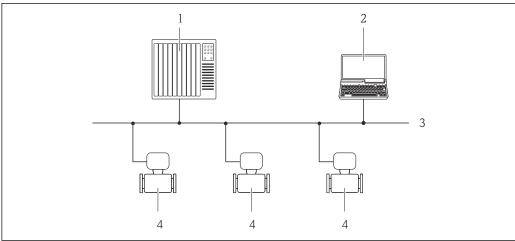


■ 21 Options for remote operation via HART protocol

- 1 Automation system (e.g. PLC)
- 2 Field Communicator 475
- 3 Computer with operating tool (e.g. FieldCare, AMS Device Manager, SIMATIC PDM)
- 4 Commubox FXA195 (USB)
- 5 Field Xpert SFX350 or SFX370
- 6 Field Xpert SMT70
- 7 VIATOR Bluetooth modem with connecting cable
- 8 Transmitter

Via PROFIBUS DP network

This communication interface is available in device versions with PROFIBUS DP.



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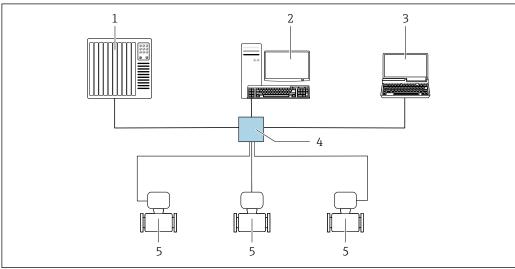
■ 22 Options for remote operation via PROFIBUS DP network

- 1 Automation system
- 2 Computer with PROFIBUS network card
- *3 PROFIBUS DP network*
- 4 Measuring instrument

Via EtherNet/IP network

This communication interface is available in device versions with EtherNet/IP.

Star topology



A003207

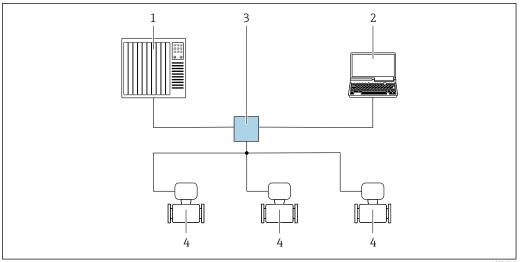
■ 23 Options for remote operation via Ethernet/IP network: star topology

- 1 Automation system, z.B. "RSLogix" (Rockwell Automation)
- Workstation for measuring instrument operation: with Custom Add-On Profile for "RSLogix 5000" (Rockwell Automation) or with Electronic Data Sheet (EDS)
- 3 Computer with web browser for accessing the integrated web server or computer with operating tool (e.g. FieldCare, DeviceCare) with COM DTM "CDI Communication TCP/IP"
- 4 Standard Ethernet switch, e.g. Scalance X204 (Siemens)
- 5 Measuring instrument

Via PROFINET network

This communication interface is available in device versions with PROFINET.

Star topology



A00265

■ 24 Options for remote operation via PROFINET network: star topology

- 1 Automation system, e.g. Simatic S7 (Siemens)
- 2 Computer with web browser for accessing integrated web server or computer with operating tool (e.g. FieldCare, DeviceCare, SIMATIC PDM) with COM DTM "CDI Communication TCP/IP"
- 3 Standard Ethernet switch, e.g. Scalance X204 (Siemens)
- 4 Measuring instrument

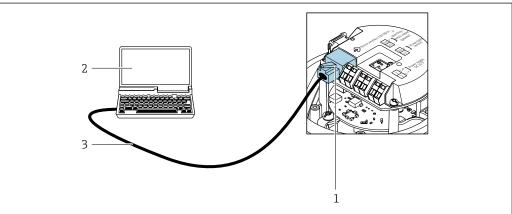
Service interface

Via service interface (CDI-RJ45)

This communication interface is present in the following device version:

- Order code for "Output", option **B**: 4-20 mA HART, pulse/frequency/switch output
- Order code for "Output", option **L**: PROFIBUS DP
- Order code for "Output", option **N**: Ethernet/IP
- Order code for "Output", option R: PROFINET

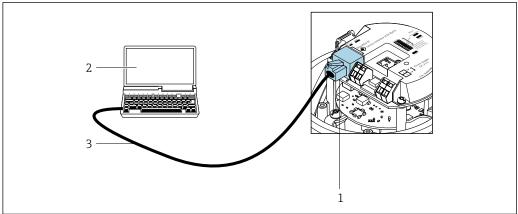
HART



A0016926

- 25 Connection for the order code for "Output", option B: 4-20 mA HART, pulse/frequency/switch output
- 1 Service interface (CDI-RJ45) of the measuring instrument with access to the integrated web server
- 2 Computer with web browser for accessing the integrated web server or with FieldCare operating tool with COM DTM "CDI Communication TCP/IP"
- 3 Standard Ethernet connecting cable with RJ45 plug

PROFIBUS DP

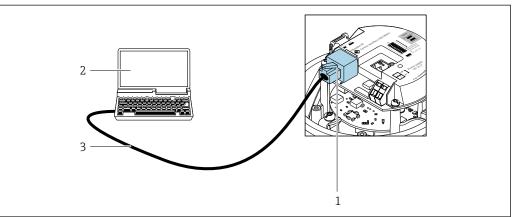


A0021270

■ 26 Connection for order code for "Output", option L: PROFIBUS DP

- 1 Service interface (CDI-RJ45) of the measuring instrument with access to the integrated web server
- 2 Computer with web browser for accessing the integrated web server or with FieldCare operating tool with COM DTM "CDI Communication TCP/IP"
- 3 Standard Ethernet connecting cable with RJ45 plug

EtherNet/IP

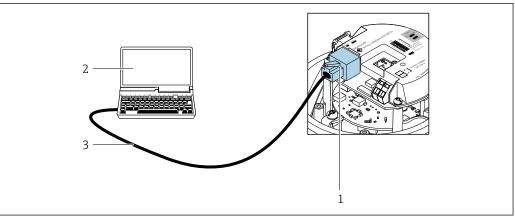


A0016940

■ 27 Connection for order code for "Output", option N: EtherNet/IP

- Service interface (CDI-RJ45) and EtherNet/IP interface of the measuring instrument with access to the integrated web server
- 2 Computer with web browser for accessing the integrated web server or with FieldCare operating tool with COM DTM "CDI Communication TCP/IP"
- 3 Standard Ethernet connecting cable with RJ45 plug

PROFINET

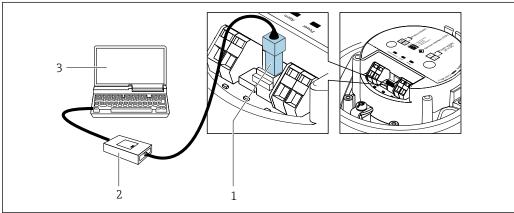


- Connection for order code for "Output", option R: PROFINET ₹ 28
- Service interface (CDI-RJ45) and PROFINET interface of the measuring instrument with access to the integrated web server
- Computer with web browser for accessing the integrated web server or with FieldCare operating tool with COM DTM "CDI Communication TCP/IP"
- Standard Ethernet connecting cable with RJ45 plug

Via service interface (CDI)

This communication interface is present in the following device version: Order code for "Output", option M: Modbus RS485

Modbus RS485



- Service interface (CDI) of the measuring instrument
- 2 Commubox FXA291
- Computer with FieldCare operating tool with COM DTM "CDI Communication FXA291"

Certificates and approvals

Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

- 1. Select the product using the filters and search field.
- 2. Open the product page.
- 3. Select **Downloads**.

CE mark

The device meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied.

Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

UKCA marking

The device meets the legal requirements of the applicable UK regulations (Statutory Instruments). These are listed in the UKCA Declaration of Conformity along with the designated standards. By selecting the order option for UKCA marking, Endress+Hauser confirms a successful evaluation and testing of the device by affixing the UKCA mark.

Contact address Endress+Hauser UK:

Endress+Hauser Ltd.

Floats Road

Manchester M23 9NF United Kingdom www.uk.endress.com

RCM marking

The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".

Ex approval

The measuring device is certified for use in hazardous areas and the relevant safety instructions are provided in the separate "Safety Instructions" (XA) document. Reference is made to this document on the nameplate.



The separate Ex documentation (XA) containing all the relevant explosion protection data is available from your Endress+Hauser sales center.

HART certification

HART interface

The measuring device is certified and registered by the FieldComm Group. The measuring system meets all the requirements of the following specifications:

- Certified according to HART 7
- The device can also be operated with certified devices of other manufacturers (interoperability)

Certification PROFIBUS

PROFIBUS interface

The measuring device is certified and registered by the PNO (PROFIBUS Nutzerorganisation e.V./ PROFIBUS User Organization). The measuring system meets all the requirements of the following specifications:

- Certified according to PA Profile 3.02
- The device can also be operated with certified devices of other manufacturers (interoperability)

Certification PROFINET

PROFINET interface

The measuring instrument is certified and registered by the PROFIBUS Nutzerorganisation e.V. (PNO). The measuring system meets all the requirements of the following specifications:

- Certified according to:
 - Test specification for PROFINET devices
 - PROFINET Netload Class 2 100 Mbit/s
- The device can also be operated with certified devices of other manufacturers (interoperability).
- The device supports PROFINET S2 system redundancy.

EtherNet/IP certification

The measuring device is certified and registered by the ODVA (Open Device Vendor Association). The measuring system meets all the requirements of the following specifications:

- Certified in accordance with the ODVA Conformance Test
- EtherNet/IP Performance Test
- EtherNet/IP PlugFest compliance
- The device can also be operated with certified devices of other manufacturers (interoperability)

Modbus RS485 certification

The measuring instrument meets all the requirements of the MODBUS RS485 conformity test and has the "MODBUS RS485 Conformance Test Policy, Version 2.0". The measuring instrument has successfully passed all the test procedures carried out.

Pressure Equipment Directive

The measuring instruments can be ordered with or without PED or PESR. If a device with PED or PESR is required, this must be ordered explicitly. A UK order option must be selected for PESR under the order code for "Approvals".

- With the marking
 - a) PED/G1/x (x = category) or
 - b) PESR/G1/x (x = category)
 - on the sensor nameplate, Endress+Hauser confirms compliance with the "Essential Safety Requirements"
 - a) specified in Annex I of the Pressure Equipment Directive 2014/68/EU or
 - b) Schedule 2 of Statutory Instruments 2016 No. 1105.
- Devices bearing this marking (PED or PESR) are suitable for the following types of medium:
 - Media in Group 1 and 2 with a vapor pressure greater than, or smaller and equal to 0.5 bar (7.3 psi)
 - Unstable gases
- Devices not bearing this marking (without PED or PESR) are designed and manufactured according
 to sound engineering practice. They meet the requirements of
 - a) Art. 4, Section 3 of the Pressure Equipment Directive 2014/68/EU or
 - b) Part 1, Section 8 of Statutory Instruments 2016 No. 1105.

The scope of application is indicated

- a) in diagrams 6 to 9 in Annex II of the Pressure Equipment Directive 2014/68/EU or
- b) in Schedule 3, Section 2 of Statutory Instruments 2016 No. 1105.

Additional certification

Marine approval

Currently valid certificates are available:

- In the Downloads area of the Endress+Hauser website: www.endress.com → Downloads
- Specify the following details:
 - Product root, e.g. 8E1B
 - Search: Approval & Certificates → Marine

CRN approval

Some device versions have CRN approval. A CRN-approved process connection with a CSA approval must be ordered for a CRN-approved device.

Tests and certificates

- ISO 23277 ZG2x (PT) + ISO 10675-1 ZG1 (RT) measuring tube (PT) + process connection (RT) welded seam. test report
- Penetrant+Radiographic testing ASME B31.3 NFS (RT) measuring tube (PT) + process connection (RT) welded seam, test report
- Penetrant+Radiographic testing ASME VIII Div.1(RT) measuring tube (PT) + process connection (RT) welded seam, test report
- Visual+Penetrant+Radiographic testing NORSOK M-601 (RT) measuring tube (VT+PT) + process connection. (VT + RT) welded seam, test report
- ISO 23277 ZG2x (PT) + ISO 10675-1 ZG1 (DR) measuring tube (PT) + process connection (DR) welded seam, test report
- Penetrant+Radiographic testing ASME B31.3 NFS (DR) measuring tube (PT) + process connection (DR) welded seam, test report
- Penetrant+Radiographic testing ASME VIII Div.1 (DR) measuring tube (PT) + process connection (DR) welded seam, test report
- Visual+Penetrant+Radiographic testing NORSOK M-601 (DR) measuring tube (VT+PT) + process conn. (VT+DR) welded seam, test report
- ullet EN10204-3.1 material certificate, wetted parts
- Pressure test, internal process, test report (order code for "Test, certificate", option JB)
- Material identification check (PMI), internal procedure, wetted parts, test report (option JK)

Testing of welded connections

Option	Test standard				Component	
	ISO 23277 AL2x (PT) ISO 10675-1 AL1 (RT, DR)	ASME B31.3 NFS	ASME VIII Div.1 Appx. 4+8	NORSOK M-601	Measuring tube	Test procedure
KF	Х				PT	RT
KK		х			PT	RT
KP			х		PT	RT
KR				х	VT, PT	VT, RT

Option	Test standard				Component	
	ISO 23277 AL2x (PT) ISO 10675-1 AL1 (RT, DR)	ASME B31.3 NFS	ASME VIII Div.1 Appx. 4+8	NORSOK M-601	Measuring tube	Test procedure
K1	Х				PT	DR
K2		х			PT	DR
КЗ			Х		PT	DR
K4				х	VT, PT	VT, DR

PT = penetrant testing, RT = radiographic testing, VT = visual testing, DR = digital radiography All options with test report

External standards and guidelines

■ EN 60529

Degrees of protection provided by enclosure (IP code)

■ IEC/EN 60068-2-6

Environmental influences: Test procedure - Test Fc: vibrate (sinusoidal).

■ IEC/EN 60068-2-31

Environmental influences: Test procedure - Test Ec: shocks due to rough handling, primarily for devices.

■ EN 61010-1

Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements

■ GB 30439.5

Safety requirements for industrial automation products - Part 5: Flowmeter safety requirements

■ EN 61326-1/-2-3

EMC requirements for electrical equipment for measurement, control and laboratory use

■ NAMUR NE 21

Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment

■ NAMUR NE 32

Data retention in the event of a power failure in field and control instruments with microprocessors

■ NAMUR NE 43

Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.

■ NAMUR NE 53

Software of field devices and signal-processing devices with digital electronics

NAMUR NE 80

The application of the pressure equipment directive to process control devices

■ NAMUR NE 105

Specifications for integrating fieldbus devices in engineering tools for field devices

■ NAMUR NE 107

Self-monitoring and diagnostics of field devices

■ NAMUR NE 131

Requirements for field devices for standard applications

■ NAMUR NE 132

Coriolis mass meter

NACE MR0103

Materials resistant to sulfide stress cracking in corrosive petroleum refining environments.

■ NACE MR0175/ISO 15156-1

Materials for use in H2S-containing Environments in Oil and Gas Production.

■ ETSI EN 300 328

Guidelines for 2.4 GHz radio components.

■ EN 301489

Electromagnetic compatibility and radio spectrum matters (ERM).

Ordering information

Detailed ordering information is available from your nearest sales organization www.addresses.endress.com or in the Product Configurator at www.endress.com:

1. Select the product using the filters and search field.

- 2. Open the product page.
- 3. Select **Configuration**.

Product Configurator - the tool for individual product configuration

- Up-to-the-minute configuration data
- Depending on the device: direct input of information specific to the measuring point, such as the measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

Application packages

Many different application packages are available to enhance the functionality of the device. Such packages might be needed to address safety aspects or specific application requirements.

The application packages can be ordered with the device or subsequently from Endress+Hauser. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.



Detailed information on the application packages:

Special Documentation $\rightarrow \boxed{2}$ 72

Heartbeat Technology

Order code for "Application package", option EB "Heartbeat Verification + Monitoring"

Heartbeat Verification

Meets the requirement for traceable verification in accordance with DIN ISO 9001:2015 Clause 7.6 a) "Control of monitoring and measuring equipment".

- Functional testing in the installed state without interrupting the process.
- Traceable verification results on request, including a report.
- Simple testing process via local operation or other operating interfaces.
- Clear measuring point assessment (pass/fail) with high total test coverage within the framework
 of manufacturer specifications.
- Extension of calibration intervals according to operator's risk evaluation.

Heartbeat Monitoring

Continuously supplies data, which are characteristic of the measuring principle, to an external condition monitoring system for the purpose of preventive maintenance or process analysis. These data enable the operator to:

- Draw conclusions using these data and other information about the impact the process influences (e.g. corrosion, abrasion, deposit buildup etc.) have on measuring performance over time.
- Schedule servicing in time.
- Monitor the process or product quality, e.g. gas pockets.



Detailed information on Heartbeat Technology:

Special Documentation \rightarrow $\stackrel{\triangle}{=}$ 72

Concentration measurement

Order code for "Application package", option ED "Concentration"

Calculation and outputting of fluid concentrations.

The measured density is converted to the concentration of a substance of a binary mixture using the "Concentration" application package:

Concentration calculation from user-defined tables.

The measured values are output via the digital and analog outputs of the measuring instrument.



For detailed information, see the Special Documentation for the device.

Special density

Order code for "Application package", option EE "Special density"

Many applications use density as a key measured value for monitoring quality or controlling processes. The device measures the density of the fluid as standard and makes this value available to the control system.

The "Special Density" application package offers high-precision density measurement over a wide density and temperature range particularly for applications subject to varying process conditions.

The following information can be found in the calibration certificate supplied:

- Density performance in air
- Density performance in liquids with different density
- Density performance in water with different temperatures



For detailed information, see the Operating Instructions for the device.

Extended density

Order code for "Application package", option E1 "Extended density"

For volume-based applications, the device can calculate and output a volume flow rate by dividing the mass flow rate by the measured density.

This application package is the standard calibration for custody transfer applications according to national and international standards (e.g. OIML, MID). It is recommended for volume-based fiscal dosing applications over a wide temperature range.

The calibration certificate supplied describes the density performance in air and water at various temperatures in detail.



For detailed information, see the Operating Instructions for the device.

Accessories

Various accessories, which can be ordered with the device or subsequently from Endress+Hauser, are available for the device. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

Device-specific accessories

For the sensor

Accessories	Description
Heating jacket	Is used to stabilize the temperature of the fluids in the sensor. Water, water vapor and other non-corrosive liquids are permitted for use as fluids.
	If using oil as a heating medium, please consult with Endress+Hauser.
	Special Documentation SD02159D

Communication-specific accessories

Accessories	Description
Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB interface. Technical Information TI00404F
Commubox FXA291	Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop. Technical Information TI00405C
HART loop converter HMX50	Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values. Technical Information TI00429F Operating Instructions BA00371F
Wireless HART adapter SWA70	Is used for the wireless connection of field devices. The WirelessHART adapter can be easily integrated into field devices and existing infrastructures, offers data protection and transmission safety and can be operated in parallel with other wireless networks with minimum cabling complexity. Operating Instructions BA00061S

Fieldgate FXA42	Transmission of the measured values of connected 4 to 20 mA analog measuring instruments, as well as digital measuring instruments Technical Information TI01297S Operating Instructions BA01778S Product page: www.endress.com/fxa42
Field Xpert SMT50	The Field Xpert SMT50 tablet PC for device configuration enables mobile plant asset management in non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress. This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle.
	 Technical Information TI01555S Operating Instructions BA02053S Product page: www.endress.com/smt50
Field Xpert SMT70	The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in hazardous and non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress. This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle.
	 Technical Information TI01342S Operating Instructions BA01709S Product page: www.endress.com/smt70
Field Xpert SMT77	The Field Xpert SMT77 tablet PC for device configuration enables mobile plant asset management in areas categorized as Ex Zone 1. Technical Information TI01418S Operating Instructions BA01923S Product page: www.endress.com/smt77

Service-specific accessories

Accessory	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring instruments: Choice of measuring instruments for industrial requirements Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and measurement accuracy. Graphic display of the calculation results Determining the partial order code. Administration, documentation and access to all project-related data and parameters over the entire life cycle of a project.
	Applicator is available: Via the Internet: https://portal.endress.com/webapp/applicator
Netilion	lloT ecosystem: Unlock knowledge With the Netilion IIoT ecosystem, Endress+Hauser allows you to optimize your plant performance, digitize workflows, share knowledge, and enhance collaboration. Based on decades of experience in process automation, Endress+Hauser offers the process industry an IloT ecosystem that enables you to gain useful insights from data. These insights can be used to optimize processes, leading to increased plant availability, efficiency, and reliability - ultimately resulting in a more profitable plant. www.netilion.endress.com
FieldCare	FDT-based plant asset management tool from Endress+Hauser. It can configure all intelligent field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition. Operating Instructions BA00027S and BA00059S
DeviceCare	Tool to connect and configure Endress+Hauser field devices. • Technical Information: TI01134S • Innovation brochure: IN01047S

System components	Accessories	Description
	Memograph M graphic data manager	The Memograph M graphic data manager provides information on all the relevant measured variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick. Technical Information TI00133R Operating Instructions BA00247R
	iTEMP	The temperature transmitters can be used in all applications and are suitable for the measurement of gases, steam and liquids. They can be used to read in the

medium temperature.

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

"Fields of Activity" document FA00006T

• *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

Standard documentation



Supplementary information on the semi-standard options is available in the relevant Special Documentation in the TSP database.

Brief Operating Instructions

Brief Operating Instructions for the sensor

Measuring instrument	Documentation code
Proline Promass O	KA01285D

Brief Operating Instructions for the transmitter

	Documentation code				
Measuring instrument	HART	PROFIBUS DP	Modbus RS485	EtherNet/IP	PROFINET
Proline Promass 100	KA01334D	KA01333D	KA01335D	KA01332D	KA01336D

Operating Instructions

	Documentation code				
Measuring device	HART	PROFIBUS DP	Modbus RS485	EtherNet/IP	PROFINET
Promass O 100	BA01191D	BA01252D	BA01180D	BA01185D	BA01430D

Description of Device Parameters

Measuring	Documentation code					
instrument	HART	PROFIBUS DP	Modbus RS485	EtherNet/IP	PROFINET	
Promass 100	GP01033D	GP01034D	GP01035D	GP01036D	GP01037D	

Supplementary devicedependent documentation

Safety Instructions

Content	Documentation code
ATEX/IECEx Ex i	XA00159D
ATEX/IECEx Ex nA	XA01029D
cCSAus IS	XA00160D
INMETRO Ex i	XA01219D
INMETRO Ex nA	XA01220D
NEPSI Ex i	XA01249D
NEPSI Ex nA	XA01262D

Special Documentation

Contents	Documentation code
Information on the Pressure Equipment Directive	SD01614D
Concentration measurement Ethernet/IP, HART, Modbus RS485, PROFIBUS DP	SD01152D
Concentration measurement PROFINET	SD01503D
Heartbeat Technology EtherNet/IP, HART, Modbus RS485, PROFIBUS DP	SD01153D
Heartbeat Technology PROFINET	SD01493D
Web server HART	SD01820D
Web server PROFIBUS DP	SD01821D
Web server EtherNet/IP	SD01822D
Web server PROFINET	SD01823D

Installation Instructions

Contents	Note
	The corresponding documentation code is listed with the relevant accessory. $\rightarrow \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $

Registered trademarks

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PROFIBUS®

Registered trademark of the PROFIBUS Nutzerorganisation e.V. (PROFIBUS User Organization), Karlsruhe, Germany

Modbus[©]

Registered trademark of SCHNEIDER AUTOMATION, INC.

Ethernet/IP™

Trademark of ODVA, Inc.

PROFINET®

Registered trademark of the PROFIBUS Nutzerorganisation e.V. (PROFIBUS User Organization), Karlsruhe, Germany

TRI-CLAMP®

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