

Technical Information

Proline Promag W 400

Electromagnetic flowmeter



The flowmeter with integrated web server & sensor with EN ISO 12944 corrosion protection

Application

- The measuring principle is practically independent of pressure, density, temperature and viscosity
- The specialist for very demanding applications in the water and wastewater industry

Device properties

- International drinking water approvals
- Degree of protection IP68 (Type 6P enclosure)
- Approved for custody transfer to MI-001/OIML R49
- Transmitter housing made of durable polycarbonate or aluminum
- Same housing concept for compact/remote version
- Integrated data logger for measured values monitoring

Your benefits

- For direct underground installation or permanent underwater use
- Safe, reliable long-term operation – robust and completely welded sensor
- Energy-saving flow measurement – no pressure loss due to cross-section constriction
- Maintenance-free – no moving parts
- Safe operation – no need to open device thanks to touch control display, backlighting
- Time-saving local operation without additional software and hardware – integrated web server
- Integrated verification – Heartbeat Technology™

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Document information

Symbols used

Electrical symbols

Symbol	Meaning	Symbol	Meaning
	Direct current		Alternating current
	Direct current and alternating current		Ground connection A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
	Protective ground connection A terminal which must be connected to ground prior to establishing any other connections.		Equipotential connection A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice.

Symbols for certain types of information

Symbol	Meaning
	Permitted Procedures, processes or actions that are permitted.
	Preferred Procedures, processes or actions that are preferred.
	Forbidden Procedures, processes or actions that are forbidden.
	Tip Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic
	Visual inspection

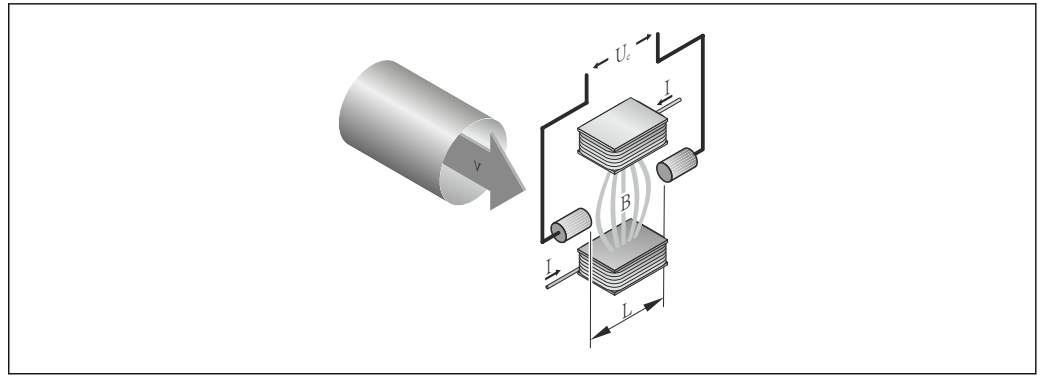
Symbols in graphics

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

Function and system design

Measuring principle

Following *Faraday's law of magnetic induction*, a voltage is induced in a conductor moving through a magnetic field.



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U_e Induced voltage
 B Magnetic induction (magnetic field)
 L Electrode spacing
 I Current
 v Flow velocity

In the electromagnetic measuring principle, the flowing medium is the moving conductor. The voltage induced (U_e) is proportional to the flow velocity (v) and is supplied to the amplifier by means of two measuring electrodes. The flow volume (Q) is calculated via the pipe cross-section (A). The DC magnetic field is created through a switched direct current of alternating polarity.

Formulae for calculation

- Induced voltage $U_e = B \cdot L \cdot v$
- Volume flow $Q = A \cdot v$

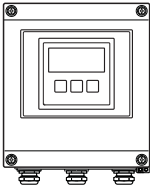
Measuring system

The device consists of a transmitter and a sensor.

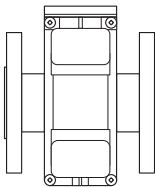
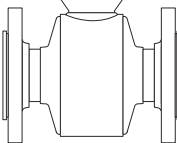
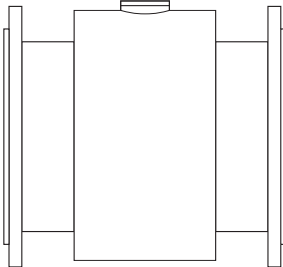
Two device versions are available:

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

Transmitter

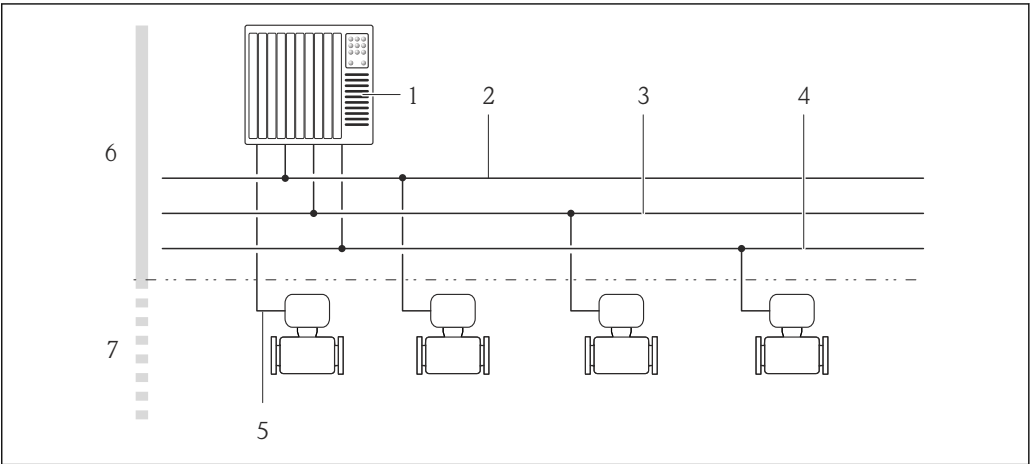
Promag 400  A0017117	Device versions and materials ■ Compact version: compact housing - Polycarbonate plastic - Aluminum, AlSi10Mg, coated ■ Remote version: wall-mount housing - Polycarbonate plastic - Aluminum, AlSi10Mg, coated Configuration: ■ External operation via four-line, illuminated local display with touch control and guided menus ("Make-it-run" wizards) for applications ■ Via operating tools (e.g. FieldCare) ■ Via Web browser (e.g. Microsoft Internet Explorer) ■ Also for device version with EtherNet/IP output: - Via Add-on Profile Level 3 for automation system from Rockwell Automation - Via Electronic Data Sheet (EDS) ■ Also for device version with PROFIBUS DP output: - Via PDM driver for Siemens automation system
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Sensor

Promag W <i>Fixed flange: DN 25 to 300 (1 to 12")</i>  A0017040	■ Nominal diameter range: DN 25 to 2000 (1 to 78") ■ Materials: - Sensor housing: aluminum, AlSi10Mg, coated; carbon steel with protective varnish - Sensor connection housing (standard): aluminum, AlSi10Mg, coated - Sensor connection housing (option): polycarbonate - Measuring tubes ¹⁾: - DN 25 to 300 (1 to 12"): stainless steel, 1.4301/1.4306/304/304L - DN 350 to 2000 (14 to 78"): stainless steel, 1.4301/304 - Liner: hard rubber, polyurethane - Electrodes: stainless steel, 1.4435 (316L); Alloy C22, 2.4602 (UNS N06022); tantalum - Process connections: - Stainless steel, 1.4404/1.4571/F316L - Carbon steel, A105/A181/A350LF2/A515(70)/FE410WB/S235JRG2/S235J+N/S275JR/P235GH/P250GH/P265GH - Seals: as per DIN EN 1514-1 - Ground disks: stainless steel, 1.4435 (316L); Alloy C22, 2.4602 (UNS N06022); tantalum
<i>Fixed flange: DN 25 to 300 (1 to 12")</i>  A0022673	
<i>Fixed flange: DN 350 to 2000 (14 to 78")</i>  A0017041	

1) For carbon steel flange material with Al/Zn protective coating (DN 25 to 300 (1 to 12")), protective varnish (IP68) (DN 50 to 300 (2 to 12")) or protective varnish ≥ DN 350 (14")

Equipment architecture



1 Possibilities for integrating measuring devices into a system

- 1 Control system (e.g. PLC)
- 2 EtherNet/IP
- 3 PROFIBUS DP
- 4 Modbus RS485
- 5 4-20 mA HART, pulse/frequency/switch output
- 6 Non-hazardous area
- 7 Non-hazardous area and Zone 2/Div. 2

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Safety

IT security

We only provide a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.

IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

Input

Measured variable

Direct measured variables

- Volume flow (proportional to induced voltage)
- Electrical conductivity

 In custody transfer: only volume flow

Calculated measured variables

Mass flow

Measuring range

Typically $v = 0.01$ to 10 m/s (0.03 to 33 ft/s) with the specified accuracy

Electrical conductivity: 5 to $10\,000$ $\mu\text{S}/\text{cm}$

Flow characteristic values in SI units

Nominal diameter		Recommended flow Min./max. full scale value (v ~ 0.3/10 m/s)	Factory settings		
			Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[mm]	[in]	[m³/h]	[m³/h]	[m³]	[m³/h]
25	1	9 to 300 dm³/min	75 dm³/min	0.5 dm³	1 dm³/min
32	–	15 to 500 dm³/min	125 dm³/min	1 dm³	2 dm³/min

Nominal diameter		Recommended flow	Factory settings		
			Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[mm]	[in]	[m³/h]	[m³/h]	[m³]	[m³/h]
40	1 ½	25 to 700 dm³/min	200 dm³/min	1.5 dm³	3 dm³/min
50	2	35 to 1 100 dm³/min	300 dm³/min	2.5 dm³	5 dm³/min
65	–	60 to 2 000 dm³/min	500 dm³/min	5 dm³	8 dm³/min
80	3	90 to 3 000 dm³/min	750 dm³/min	5 dm³	12 dm³/min
100	4	145 to 4 700 dm³/min	1 200 dm³/min	10 dm³	20 dm³/min
125	–	220 to 7 500 dm³/min	1 850 dm³/min	15 dm³	30 dm³/min
150	6	20 to 600	150	0.025	2.5
200	8	35 to 1 100	300	0.05	5
250	10	55 to 1 700	500	0.05	7.5
300	12	80 to 2 400	750	0.1	10
350	14	110 to 3 300	1 000	0.1	15
375	15	140 to 4 200	1 200	0.15	20
400	16	140 to 4 200	1 200	0.15	20
450	18	180 to 5 400	1 500	0.25	25
500	20	220 to 6 600	2 000	0.25	30
600	24	310 to 9 600	2 500	0.3	40
700	28	420 to 13 500	3 500	0.5	50
750	30	480 to 15 000	4 000	0.5	60
800	32	550 to 18 000	4 500	0.75	75
900	36	690 to 22 500	6 000	0.75	100
1 000	40	850 to 28 000	7 000	1	125
–	42	950 to 30 000	8 000	1	125
1 200	48	1 250 to 40 000	10 000	1.5	150
–	54	1 550 to 50 000	13 000	1.5	200
1 400	–	1 700 to 55 000	14 000	2	225
–	60	1 950 to 60 000	16 000	2	250
1 600	–	2 200 to 70 000	18 000	2.5	300
–	66	2 500 to 80 000	20 500	2.5	325
1 800	72	2 800 to 90 000	23 000	3	350
–	78	3 300 to 100 000	28 500	3.5	450
2 000	–	3 400 to 110 000	28 500	3.5	450

Flow characteristic values in US units

Nominal diameter		Recommended flow Min./max. full scale value (v ~ 0.3/10 m/s)	Factory settings		
			Full scale value current output (v ~ 2.5 m/s)	Pulse value (~ 2 pulse/s)	Low flow cut off (v ~ 0.04 m/s)
[in]	[mm]	[gal/min]	[gal/min]	[gal]	[gal/min]
1	25	2.5 to 80	18	0.2	0.25
–	32	4 to 130	30	0.2	0.5
1 ½	40	7 to 190	50	0.5	0.75
2	50	10 to 300	75	0.5	1.25
–	65	16 to 500	130	1	2
3	80	24 to 800	200	2	2.5
4	100	40 to 1250	300	2	4
–	125	60 to 1950	450	5	7
6	150	90 to 2 650	600	5	12
8	200	155 to 4 850	1 200	10	15
10	250	250 to 7 500	1 500	15	30
12	300	350 to 10 600	2 400	25	45
14	350	500 to 15 000	3 600	30	60
15	375	600 to 19 000	4 800	50	60
16	400	600 to 19 000	4 800	50	60
18	450	800 to 24 000	6 000	50	90
20	500	1 000 to 30 000	7 500	75	120
24	600	1 400 to 44 000	10 500	100	180
28	700	1 900 to 60 000	13 500	125	210
30	750	2 150 to 67 000	16 500	150	270
32	800	2 450 to 80 000	19 500	200	300
36	900	3 100 to 100 000	24 000	225	360
40	1 000	3 800 to 125 000	30 000	250	480
42	–	4 200 to 135 000	33 000	250	600
48	1 200	5 500 to 175 000	42 000	400	600
54	–	9 to 300 Mgal/d	75 Mgal/d	0.0005 Mgal/d	1.3 Mgal/d
–	1 400	10 to 340 Mgal/d	85 Mgal/d	0.0005 Mgal/d	1.3 Mgal/d
60	–	12 to 380 Mgal/d	95 Mgal/d	0.0005 Mgal/d	1.3 Mgal/d
–	1 600	13 to 450 Mgal/d	110 Mgal/d	0.0008 Mgal/d	1.7 Mgal/d
66	–	14 to 500 Mgal/d	120 Mgal/d	0.0008 Mgal/d	2.2 Mgal/d
72	1 800	16 to 570 Mgal/d	140 Mgal/d	0.0008 Mgal/d	2.6 Mgal/d
78	–	18 to 650 Mgal/d	175 Mgal/d	0.0010 Mgal/d	3.0 Mgal/d
–	2 000	20 to 700 Mgal/d	175 Mgal/d	0.0010 Mgal/d	2.9 Mgal/d



To calculate the measuring range, use the *Applicator* sizing tool → 109

Recommended measuring range

"Flow limit" section →  43



For custody transfer, the applicable approval determines the permitted measuring range and the pulse value.

Operable flow range

Over 1000 : 1



For custody transfer, the operable flow range is 100 : 1 to 250 : 1, depending on the nominal diameter. Further details are specified by the applicable approval.

Input signal**External measured values**

Various pressure transmitters and temperature measuring devices can be ordered from Endress +Hauser: see "Accessories" section →  109

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

Fieldbuses

The measured values can be written from the automation system to the measuring via:

- PROFIBUS DP
- Modbus RS485
- EtherNet/IP

Status input

Maximum input values	■ DC 30 V ■ 6 mA
Response time	Adjustable: 5 to 200 ms
Input signal level	■ Low signal: DC -3 to +5 V ■ High signal: DC 12 to 30 V
Assignable functions	■ Off ■ Reset totalizers 1-3 separately ■ Reset all totalizers ■ Flow override

Output

Output signal**Current output**

Current output	Can be set as: ■ 4-20 mA NAMUR ■ 4-20 mA US ■ 4-20 mA HART ■ 0-20 mA
Maximum output values	■ DC 24 V (no flow) ■ 22.5 mA
Load	0 to 700 Ω
Resolution	0.5 µA

Damping	Adjustable: 0.07 to 999 s
Assignable measured variables	■ Volume flow ■ Mass flow ■ Flow velocity ■ Conductivity ■ Electronic temperature

Pulse/frequency/switch output

Function	■ With the order code for "Output; Input", option H: output 2 can be set as a pulse or frequency output ■ With the order code for "Output; Input", option I: output 2 and 3 can be set as a pulse, frequency or switch output ■ With the order code for "Output; Input", option J: output 2 firmly assigned as certified pulse output
Version	Passive, open collector
Maximum input values	■ DC 30 V ■ 250 mA
Voltage drop	For 25 mA: ≤ DC 2 V
Pulse output	
Pulse width	Adjustable: 0.05 to 2 000 ms
Maximum pulse rate	10 000 Impulse/s
Pulse value	Adjustable
Assignable measured variables	■ Volume flow ■ Mass flow
Frequency output	
Output frequency	Adjustable: 0 to 12 500 Hz
Damping	Adjustable: 0 to 999 s
Pulse/pause ratio	1:1
Assignable measured variables	■ Volume flow ■ Mass flow ■ Conductivity ■ Flow velocity ■ Electronic temperature
Switch output	
Switching behavior	Binary, conductive or non-conductive
Switching delay	Adjustable: 0 to 100 s
Number of switching cycles	Unlimited
Assignable functions	■ Off ■ On ■ Diagnostic behavior ■ Limit value: – Off – Volume flow – Mass flow – Conductivity – Flow velocity – Totalizer 1-3 – Electronic temperature ■ Flow direction monitoring ■ Status – Empty pipe detection – Low flow cut off

PROFIBUS DP

Signal encoding	NRZ code
Data transfer	9.6 kBaud...12 MBaud

Modbus RS485

Physical interface	In accordance with EIA/TIA-485-A standard
Terminating resistor	Integrated, can be activated via DIP switch on the transmitter electronics module

EtherNet/IP

Standards	In accordance with IEEE 802.3
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Signal on alarm

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

Current output*4-20 mA*

Failure mode	Selectable (as per NAMUR recommendation NE 43): ■ Minimum value: 3.6 mA ■ Maximum value: 22 mA ■ Defined value: 3.59 to 22.5 mA ■ Actual value ■ Last valid value
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0-20 mA

Failure mode	Choose from: ■ Maximum alarm: 22 mA ■ Defined value: 0 to 22.5 mA
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HART

Device diagnostics	Device condition can be read out via HART Command 48
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Pulse/frequency/switch output*Pulse output*

Failure mode	Choose from: ■ Actual value ■ No pulses
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Frequency output

Failure mode	Choose from: ■ Actual value ■ 0 Hz ■ Defined value: 0 to 12 500 Hz
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Switch output

Failure mode	Choose from: ■ Current status ■ Open ■ Closed
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PROFIBUS DP

Status and alarm messages	Diagnostics in accordance with PROFIBUS PA Profile 3.02
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Modbus RS485

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

Device diagnostics	Device condition can be read out in Input Assembly
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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

Operating tool

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

Plain text display	With information on cause and remedial measures
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Additional information on remote operation → 101

Web browser

Plain text display	With information on cause and remedial measures
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Light emitting diodes (LED)

Status information	Status indicated by various light emitting diodes The following information is displayed depending on the device version: ■ Supply voltage active ■ Data transmission active ■ Device alarm/error has occurred ■ EtherNet/IP network available ■ EtherNet/IP connection established
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Low flow cut off

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

Galvanic isolation

The following connections are galvanically isolated from each other:

- Inputs
- Outputs
- Power supply

Protocol-specific data

HART

Manufacturer ID	0x11
Device type ID	0x67
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) ▪ Off ▪ Volume flow ▪ Mass flow ▪ Conductivity ▪ Flow velocity ▪ Electronic temperature Measured variables for SV, TV, QV (secondary, tertiary and quaternary dynamic variable) ▪ Volume flow ▪ Mass flow ▪ Conductivity ▪ Flow velocity ▪ Electronic temperature ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3
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 = volume flow ▪ 1 = mass flow ▪ 2 = conductivity ▪ 3 = flow velocity ▪ 4 = electronic temperature ▪ 5 = totalizer 1 ▪ 6 = totalizer 2 ▪ 7 = totalizer 3

PROFIBUS DP

Manufacturer ID	0x11
Ident number	0x1562
Profile version	3.02
Device description files (GSD, DTM, DD)	Information and files under: ▪ www.endress.com ▪ www.profibus.org
Output values (from measuring device to automation system)	Analog input 1 to 4 ▪ Mass flow ▪ Volume flow ▪ Flow velocity ▪ Conductivity ▪ Electronic temperature Digital input 1 to 2 ▪ Empty pipe detection ▪ Low flow cut off ▪ Verification status Totalizer 1 to 3 ▪ Mass flow ▪ Volume flow

Input values (from automation system to measuring device)	Analog output 1 (fixed assignment) External density Digital output 1 to 2 (fixed assignment) ■ Digital output 1: switch positive zero return on/off ■ Digital output 2: start verification 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 Simplest 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 Simplest and self-explanatory diagnostic information by categorizing diagnostic messages that occur
Configuration of the device address	■ DIP switches on the I/O electronics module ■ Via operating tools (e.g. FieldCare)

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	■ 1 200 BAUD ■ 2 400 BAUD ■ 4 800 BAUD ■ 9 600 BAUD ■ 19 200 BAUD ■ 38 400 BAUD ■ 57 600 BAUD ■ 115 200 BAUD
Data transfer mode	■ ASCII ■ RTU
Data access	Each device parameter can be accessed via Modbus RS485.  For Modbus register information

EtherNet/IP

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	0x1067		
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 device	■ 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 device		
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: 20 ms)		
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0x66	56
	T → O configuration:	0x64	32
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0x66	56
	T → O configuration:	0x64	32
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0xC7	-
	T → O configuration:	0x64	32
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0xC7	-
	T → O configuration:	0x64	32

Input Assembly	▪ Current device diagnostics ▪ Volume flow ▪ Mass flow ▪ Conductivity ▪ Totalizer 1 ▪ Totalizer 2 ▪ Totalizer 3		
Configurable Input			
RPI	5 ms to 10 s (factory setting: 20 ms)		
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0x66	56
	T → O configuration:	0x65	88
Exclusive Owner Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0x66	56
	T → O configuration:	0x65	88
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x68	398
	O → T configuration:	0xC7	-
	T → O configuration:	0x65	88
Input only Multicast		Instance	Size [byte]
	Instance configuration:	0x69	-
	O → T configuration:	0xC7	-
	T → O configuration:	0x65	88
Configurable Input Assembly	▪ Volume flow ▪ Mass flow ▪ Electronic temperature ▪ Conductivity ▪ Totalizer 1 to 3 ▪ Flow velocity ▪ Volume flow unit ▪ Mass flow unit ▪ Temperature unit ▪ Conductivity unit ▪ Unit totalizer 1-3 ▪ Flow velocity unit ▪ Verification result ▪ Verification status		
	 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 reference density compensation ▪ Reset totalizers 1-3 ▪ External density ▪ Density unit ▪ Activation verification ▪ Start verification		

Configuration	
Configuration Assembly	Only the most common configurations are listed below. ■ Software write protection ■ Mass flow unit ■ Mass unit ■ Volume flow unit ■ Volume unit ■ Density unit ■ Conductivity ■ Temperature unit ■ Totalizer 1-3: - Assignment - Unit - Operating mode - Failure mode ■ Alarm delay

Power supply

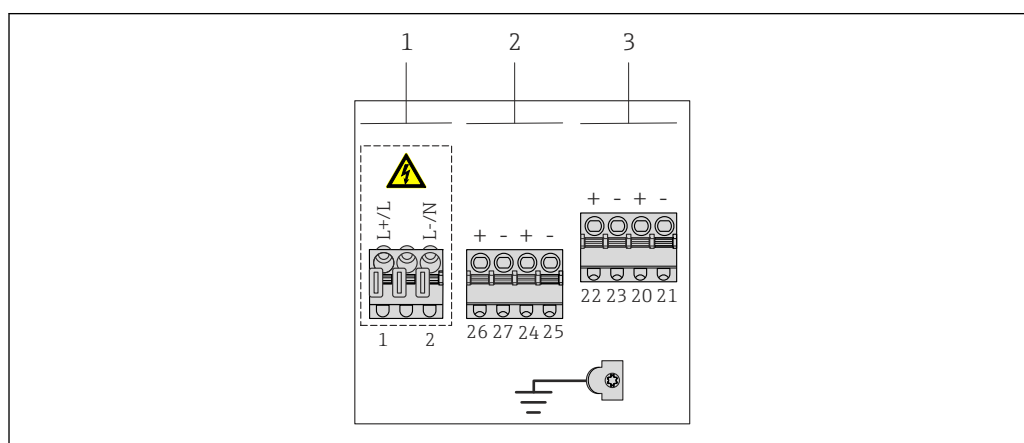
Terminal assignment

Transmitter

0-20 mA/4-20 mA HART connection version with additional outputs and inputs

The sensor can be ordered with terminals.

Connection methods available		Possible options for order code "Electrical connection"
Outputs	Power supply	
Terminals	Terminals	■ Option A: coupling M20x1 ■ Option B: thread M20x1 ■ Option C: thread G ½" ■ Option D: thread NPT ½"



A0020424

- 1 Supply voltage
2 Output 1 (26/27) and output 2 (24/25)
3 Output 3 (22/23) and input 1 (20/21)

Supply voltage

Order code for "Power supply"	Terminal numbers	
	1 (L+/L)	2 (L-/N)
Option L (wide range power unit)	AC100 to 240 V	
	AC/DC24 V	

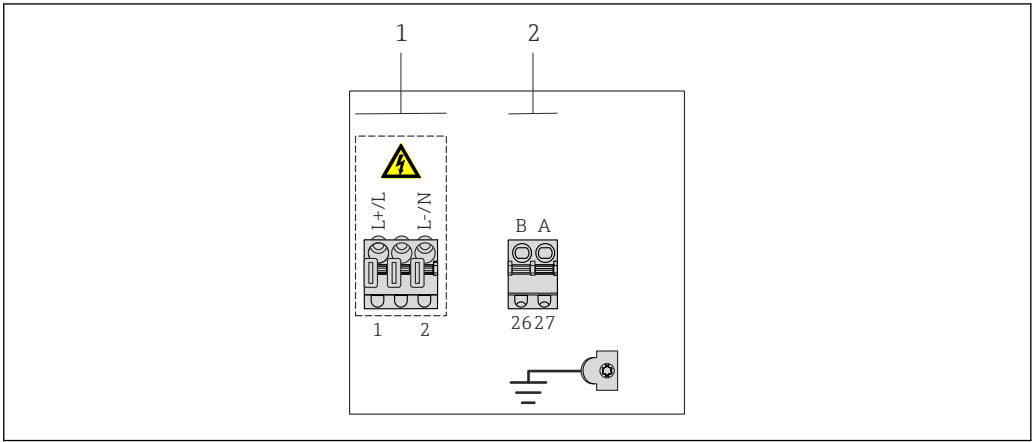
Signal transmission 0-20 mA/4-20 mA HART with additional outputs and inputs

Order code for "Output" and "Input"	Terminal numbers							
	Output 1		Output 2		Output 3		Input	
	26 (+)	27 (-)	24 (+)	25 (-)	22 (+)	23 (-)	20 (+)	21 (-)
Option H	4-20 mA HART (active) 0-20 mA (active)		Pulse/frequency output (passive)		Switch output (passive)		-	
Option I	4-20 mA HART (active) 0-20 mA (active)		Pulse/frequency/switch output (passive)		Pulse/frequency/switch output (passive)		Status input	
Option J	4-20 mA HART (active) 0-20 mA (active)		Permanently assigned Pulse output adjusted (passive)		Pulse/frequency/switch output (passive)		Status input	

PROFIBUS DP connection version

The sensor can be ordered with terminals.

Connection methods available		Possible options for order code "Electrical connection"
Outputs	Power supply	
Terminals	Terminals	- Option A: coupling M20x1 - Option B: thread M20x1 - Option C: thread G ½" - Option D: thread NPT ½"



- 1 Supply voltage (wide range power unit)
2 PROFIBUS DP

Supply voltage

Order code for "Power supply"	Terminal numbers	
	1 (L+/L)	2 (L-/N)
Option L (wide range power unit)	AC100 to 240 V	
	AC/DC24 V	

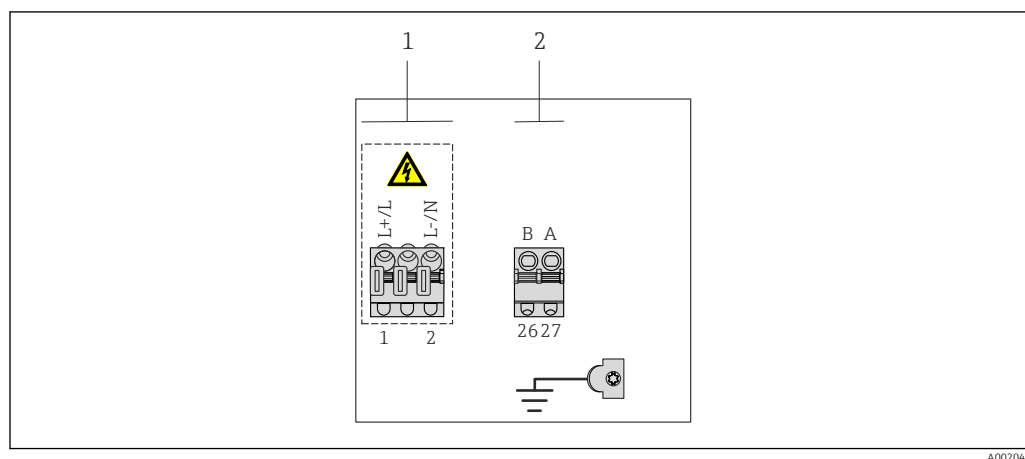
PROFIBUS DP signal transmission

Order code for "Output" and "Input"	Terminal numbers	
	26 (RxD/TxD-P)	27 (RxD/TxD-N)
Option L	B	A
Order code for "Output": Option L: PROFIBUS DP, for use in non-hazardous areas and Zone 2/div. 2		

Modbus RS485 connection version

The sensor can be ordered with terminals.

Connection methods available		Possible options for order code "Electrical connection"
Outputs	Power supply	
Terminals	Terminals	- Option A: coupling M20x1 - Option B: thread M20x1 - Option C: thread G ½" - Option D: thread NPT ½"



A0020427

- 1 Supply voltage (wide range power unit)
2 Modbus RS485

Supply voltage

Order code for "Power supply"	Terminal numbers	
	1 (L+/L)	2 (L-/N)
Option L (wide range power unit)	AC100 to 240 V	
	AC/DC24 V	

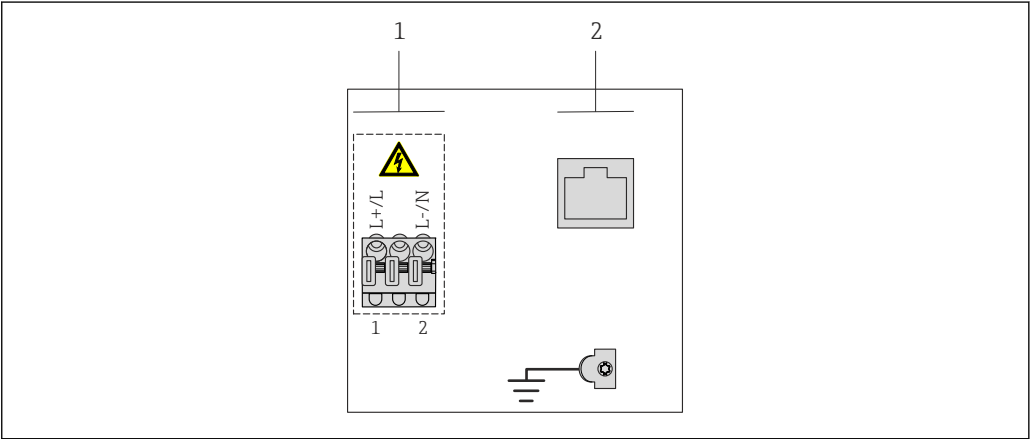
Signal transmission Modbus RS485

Order code for "Output" and "Input"	Terminal numbers	
	26 (+)	27 (-)
Option M	B	A

EtherNet/IP connection version

The sensor can be ordered with terminals or a device plug.

Connection methods available		Possible options for order code "Electrical connection"
Outputs	Power supply	
Terminals	Terminals	■ Option A: coupling M20x1 ■ Option B: thread M20x1 ■ Option C: thread G ½" ■ Option D: thread NPT ½"
Device plug	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



A0020428

- 1 Supply voltage (wide range power unit)
- 2 EtherNet/IP

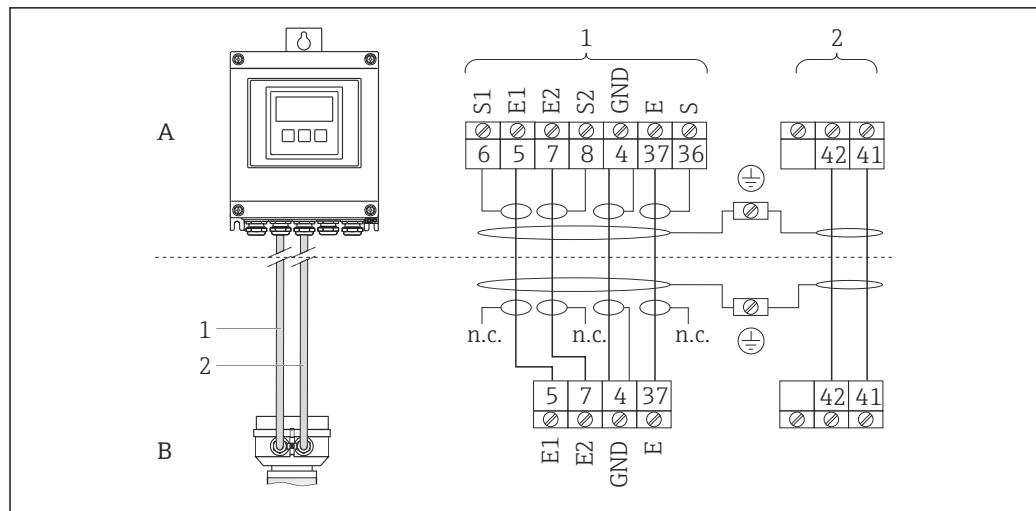
Supply voltage

Order code for "Power supply"	Terminal numbers	
	1 (L+/L)	2 (L-/N)
Option L (wide range power unit)	AC100 to 240 V	
	AC/DC24 V	

EtherNet/IP signal transmission

Order code for "Output"	Connection via
Option N	EtherNet/IP connector

Remote version



A0020534

 2 Remote version terminal assignment

A Transmitter wall-mount housing

B Sensor connection housing

1 Electrode cable

2 Coil current cable

n.c. Not connected, insulated cable shields

Terminal No. and cable colors: 6/5 = brown; 7/8 = white; 4 = green; 36/37 = yellow

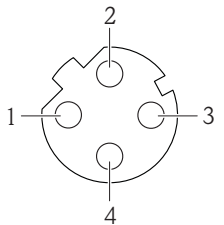
Pin assignment, device plug



Order codes for the M12x1 connectors, see the "Order code for electrical connection" column: EtherNet/IP

EtherNet/IP

Device plug for signal transmission (device side)

	Pin	Assignment		Coding	Plug/socket
	1	+	Tx	D	Socket
	2	+	Rx		
	3	-	Tx		
	4	-	Rx		

A0016812



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

Transmitter

Order code for "Power supply"	Terminal voltage	Frequency range
Option L	AC100 to 240 V	50/ 60 Hz, ± 4 Hz
	AC/DC24 V	50/ 60 Hz, ± 4 Hz

Power consumption

Order code for "Output"	Maximum power consumption
Option H: 4-20mA HART, pulse/frequency/switch output, switch output	30 VA/8 W
Option I: 4-20mA HART, 2 x pulse/frequency/switch output, status input	30 VA/8 W

Order code for "Output"	Maximum power consumption
Option J : 4-20mA HART, certified pulse output, pulse/frequency/switch output, status input	30 VA/8 W
Option L : PROFIBUS DP	30 VA/8 W
Option M : Modbus RS485	30 VA/8 W
Option N : EtherNet/IP	30 VA/8 W

Current consumption

Transmitter

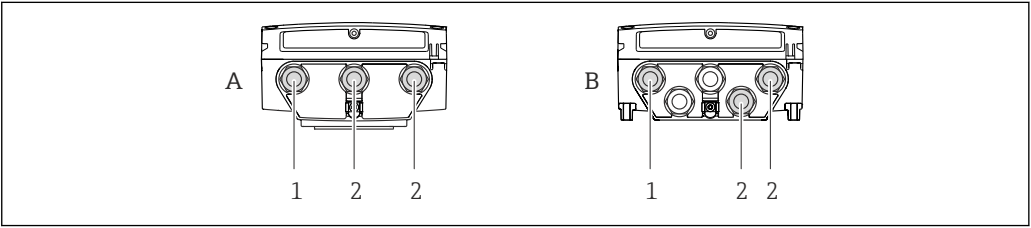
Order code for "Power supply"	Maximum Current consumption	Maximum switch-on current
Option L : AC 100 to 240 V	145 mA	25 A (< 5 ms)
Option L : AC/DC 24 V	350 mA	27 A (< 5 ms)

Power supply failure

- Totalizers stop at the last value measured.
- Configuration is retained in the plug-in memory (HistoROM DAT).
- Error messages (incl. total operated hours) are stored.

Electrical connection

Connecting the transmitter



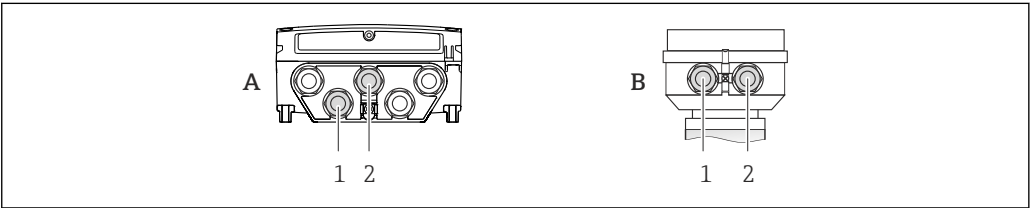
A0017113

3 Supply voltage and signal transmission connection

- A Compact version
- B Remote version wall-mount housing
- 1 Cable entry for supply voltage
- 2 Cable entry for signal transmission

Remote version connection

Connecting cable



A0017267

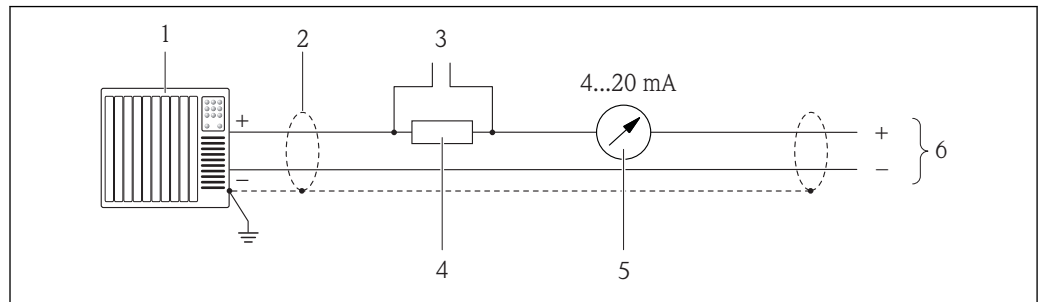
4 Connecting cable connection: electrode and coil current cable

- A Transmitter wall-mount housing
- B Sensor connection housing
- 1 Electrode cable
- 2 Coil current cable

- Fix the cable run or route it in an armored conduit. Cable movements can influence the measuring signal especially in the case of low fluid conductivities.
- Route the cable well clear of electrical machines and switching elements.
- Ensure potential equalization between sensor and transmitter .

Connection examples

Current output 4-20 mA HART

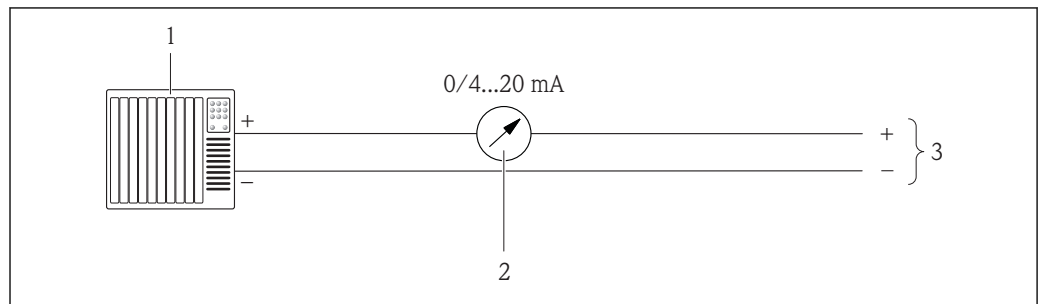


A0016800

5 Connection example for 4-20 mA HART current output (active)

- 1 Automation system with current input (e.g. PLC)
- 2 Cable shield, observe cable specifications → 29
- 3 Connection for HART operating devices
- 4 Resistor for HART communication ($\geq 250 \Omega$): observe maximum load
- 5 Analog display unit: observe maximum load
- 6 Transmitter

Current output 4-20 mA

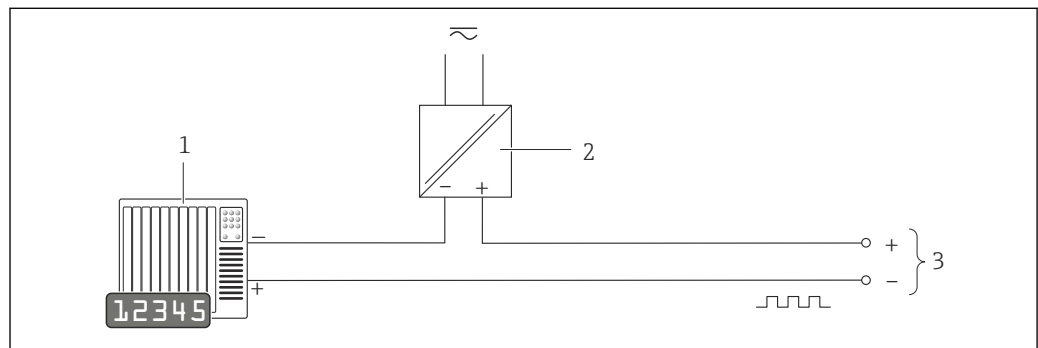


A0017162

6 Connection example for 0-20 mA current output (active) and 4-20 mA current output (active)

- 1 Automation system with current input (e.g. PLC)
- 2 Analog display unit: observe maximum load
- 3 Transmitter

Pulse/frequency output

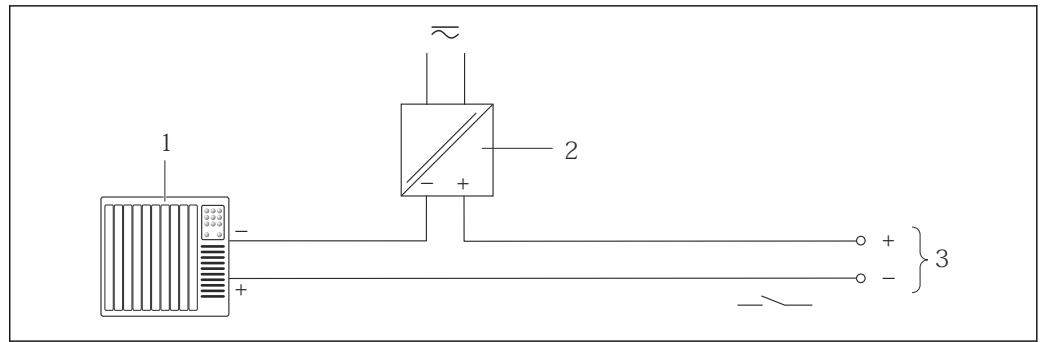


A0016801

7 Connection example for pulse/frequency output (passive)

- 1 Automation system with pulse/frequency input (e.g. PLC)
- 2 Power supply
- 3 Transmitter: observe input values

Switch output

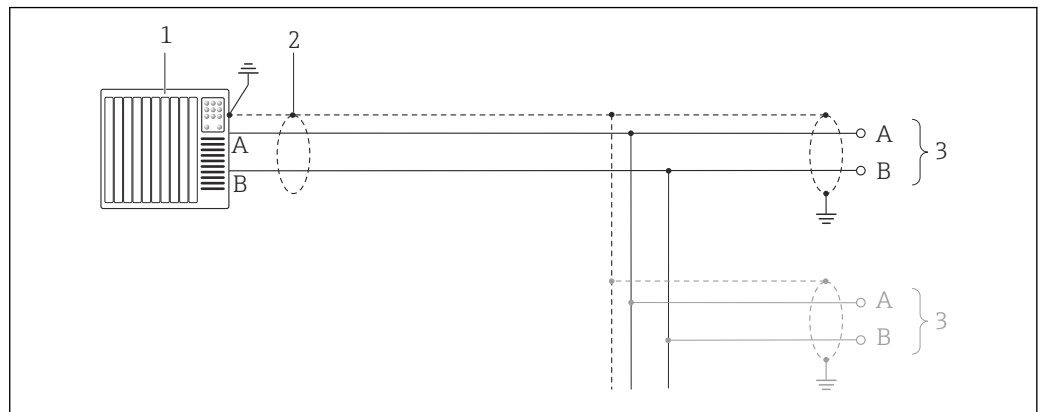


A0016802

8 Connection example for switch output (passive)

- 1 Automation system with switch input (e.g. PLC)
- 2 Power supply
- 3 Transmitter: observe input values

PROFIBUS DP



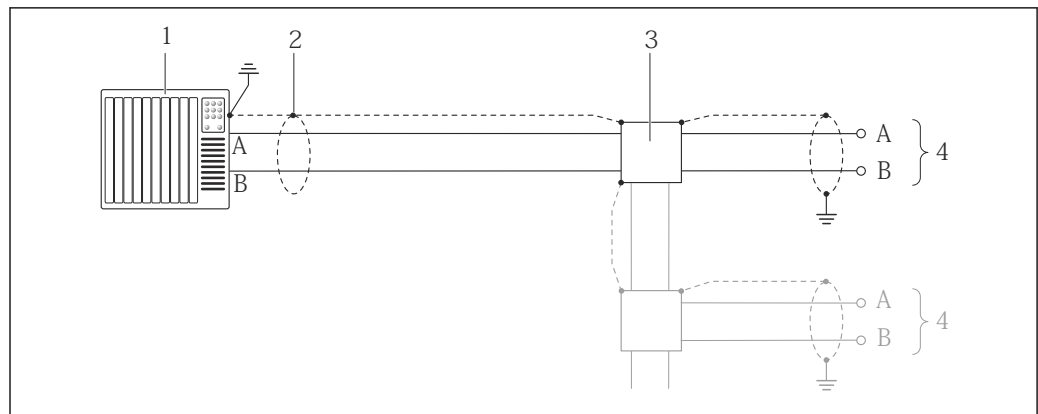
A0021429

9 Connection example for PROFIBUS DP, non-hazardous area and Zone 2/Div. 2

- 1 Control system (e.g. PLC)
- 2 Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications → 29
- 3 Transmitter

i 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.

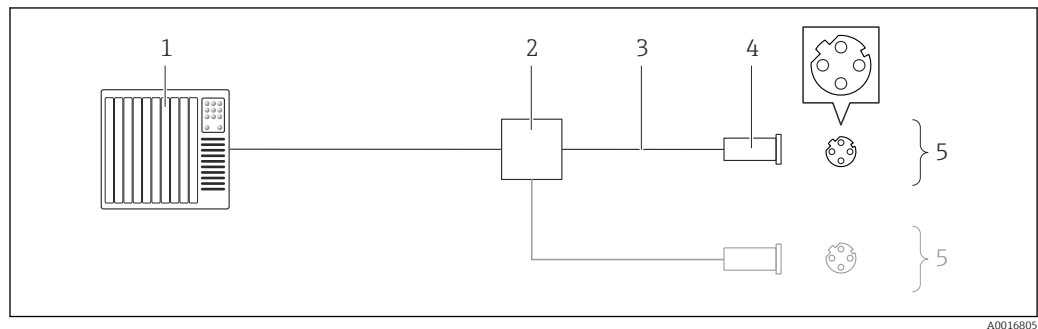
Modbus RS485



10 Connection example for Modbus RS485, non-hazardous area and Zone 2/Div. 2

- 1 Control system (e.g. PLC)
- 2 Cable shield: the cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications → 29
- 3 Distribution box
- 4 Transmitter

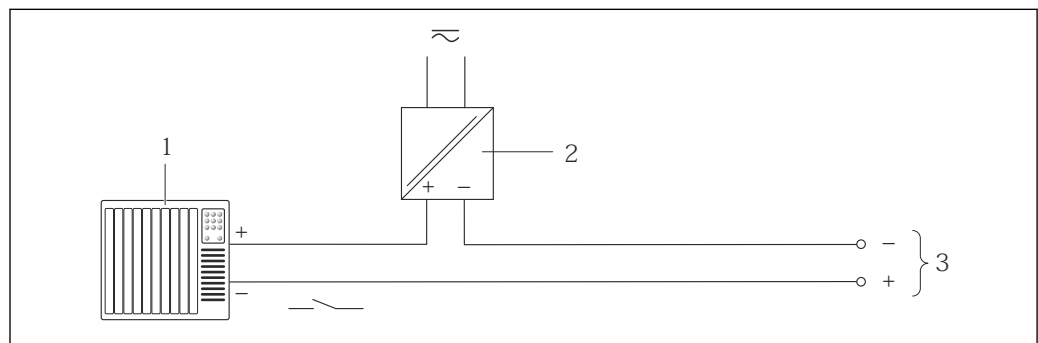
EtherNet/IP



11 Connection example for EtherNet/IP

- 1 Control system (e.g. PLC)
- 2 Ethernet switch
- 3 Observe cable specifications → 30
- 4 Device plug
- 5 Transmitter

Status input



12 Connection example for status input

- 1 Automation system with status output (e.g. PLC)
- 2 Power supply
- 3 Transmitter: observe input values

Potential equalization

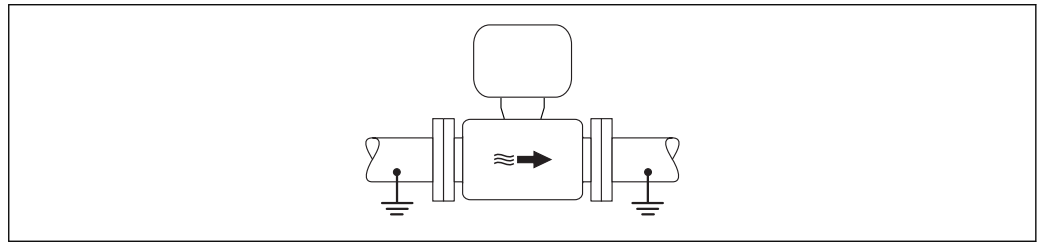
Requirements

Please consider the following to ensure correct measurement:

- Same electrical potential for the fluid and sensor
- Remote version: same electrical potential for the sensor and transmitter
- Company-internal grounding concepts
- Pipe material and grounding

Connection examples for standard situations

Metal, grounded pipe



A0016315

13 Potential equalization via measuring tube

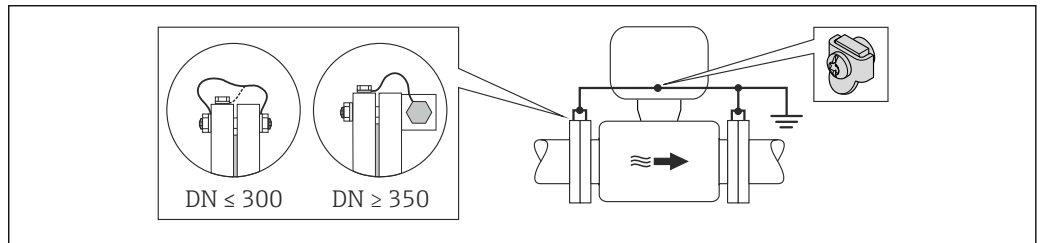
Connection example in special situations

Unlined and ungrounded metal pipe

This connection method also applies in situations where:

- The customary potential equalization is not used
- Equalizing currents are present

Ground cable	Copper wire, at least 6 mm^2 (0.0093 in^2)
---------------------	--



A0016317

14 Potential equalization via ground terminal and pipe flanges

Note the following when installing:

- Connect both sensor flanges to the pipe flange via a ground cable and ground them.
- Connect the connection housing of the transmitter or sensor to ground potential by means of the ground terminal provided for the purpose. To mount the ground cable:
 - If $\text{DN} \leq 300$ (12"): Mount the ground cable directly on the conductive flange coating of the sensor with the flange screws.
 - If $\text{DN} \geq 350$ (14"): Mount the ground cable directly on the metal transport bracket.

i For remote device versions, the ground terminal in the example always refers to the sensor and **not** to the transmitter.

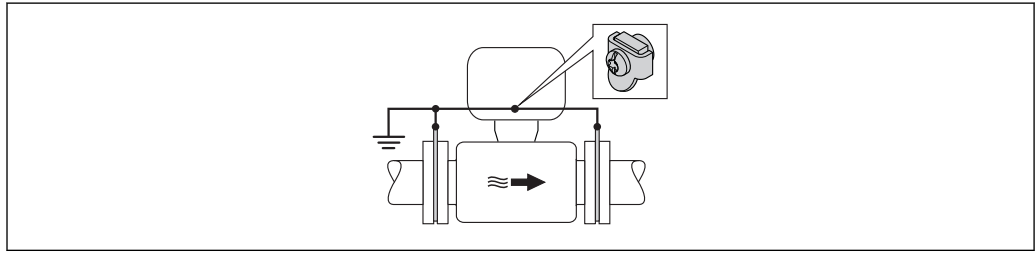
i The necessary ground cable can be ordered from Endress+Hauser .

Plastic pipe or pipe with insulating liner

This connection method also applies in situations where:

- The customary potential equalization is not used
- Equalizing currents are present

Ground cable	Copper wire, at least 6 mm^2 (0.0093 in^2)
---------------------	--



A0016318

15 Potential equalization via ground terminal and ground disks

Note the following when installing:

The ground disks must be connected to the ground terminal via the ground cable and be connected to ground potential.

i For remote device versions, the ground terminal in the example always refers to the sensor and **not** to the transmitter.

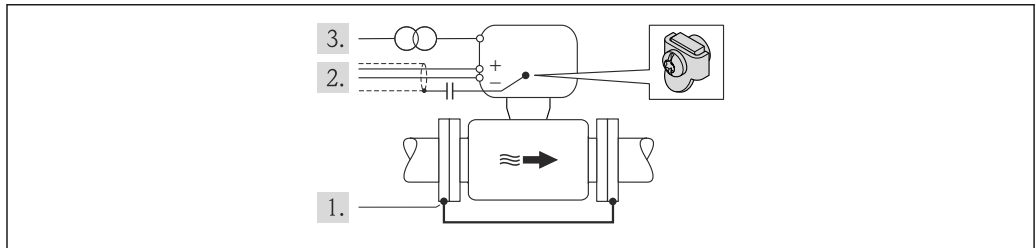
i The ground cable and ground disks can be ordered from Endress+Hauser → 108.

Pipe with a cathodic protection unit

This connection method is only used if the following two conditions are met:

- Metal pipe without liner or pipe with electrically conductive liner
- Cathodic protection is integrated in the personal protection equipment

Ground cable	Copper wire, at least 6 mm^2 (0.0093 in^2)
---------------------	--



A0016319

Prerequisite: The sensor is installed in the pipe in a way that provides electrical insulation.

1. Connect the two flanges of the pipe to one another via a ground cable.
2. Guide the shield of the signal lines through a capacitor.
3. Connect the measuring device to the power supply such that it is floating in relation to the protective ground (isolation transformer).

i For remote device versions, the ground terminal in the example always refers to the sensor and **not** to the transmitter.

i The necessary ground cable can be ordered from Endress+Hauser .

Terminals

Transmitter

- Supply voltage cable: plug-in spring terminals for wire cross-sections 0.5 to 2.5 mm^2 (20 to 14 AWG)
- Signal cable: plug-in spring terminals for wire cross-sections 0.5 to 2.5 mm^2 (20 to 14 AWG)
- Electrode cable: spring terminals for wire cross-sections 0.5 to 2.5 mm^2 (20 to 14 AWG)
- Coil current cable: spring terminals for wire cross-sections 0.5 to 2.5 mm^2 (20 to 14 AWG)

Sensor connection housing

Spring terminals for wire cross-sections 0.5 to 2.5 mm^2 (20 to 14 AWG)

Cable entries**Cable entry thread**

- M20 x 1.5
- Via adapter:
 - NPT ½"
 - G ½"

Cable gland

- For standard cable: M20 × 1.5 with cable Ø6 to 12 mm (0.24 to 0.47 in)
- For reinforced cable: M20 × 1.5 with cable Ø9.5 to 16 mm (0.37 to 0.63 in)



If metal cable entries are used, use a grounding plate.

Cable specification**Permitted temperature range**

- -40 °C (-40 °F) to +80 °C (+176 °F)
- Minimum requirement: cable temperature range ≥ ambient temperature +20 K

Power supply cable

Standard installation cable is sufficient.

Signal cable*Current output*

- For 0-20 mA and 4-20 mA: standard installation cable is sufficient.
- For 4-20 mA HART: Shielded cable recommended. Observe grounding concept of the plant.

Pulse/frequency/switch output

Standard installation cable is sufficient.

Status input

Standard installation cable is sufficient.

PROFIBUS DP

The IEC 61158 standard specifies two types of cable (A and B) for the bus line which can be used for every transmission rate. Cable type A is recommended.

Cable type	A
Characteristic impedance	135 to 165 Ω at a measuring frequency of 3 to 20 MHz
Cable capacitance	<30 pF/m
Wire cross-section	>0.34 mm ² (22 AWG)
Cable type	Twisted pairs
Loop resistance	≤110 Ω/km
Signal damping	Max. 9 dB over the entire length of the cable cross-section
Shielding	Copper braided shielding or braided shielding with foil shield. When grounding the cable shield, observe the grounding concept of the plant.

Modbus RS485

The EIA/TIA-485 standard specifies two types of cable (A and B) for the bus line which can be used for every transmission rate. Cable type A is recommended.

Cable type	A
Characteristic impedance	135 to 165 Ω at a measuring frequency of 3 to 20 MHz
Cable capacitance	<30 pF/m
Wire cross-section	>0.34 mm ² (22 AWG)
Cable type	Twisted pairs

Loop resistance	≤110 Ω/km
Signal damping	Max. 9 dB over the entire length of the cable cross-section
Shielding	Copper braided shielding or braided shielding with foil shield. When grounding the cable shield, observe the grounding concept of the plant.

EtherNet/IP

The standard ANSI/TIA/EIA-568-B.2 Annex specifies CAT 5 as the minimum category for a cable used for EtherNet/IP. CAT 5e and CAT 6 are recommended.



For more information on planning and installing EtherNet/IP networks, please refer to the "Media Planning and Installation Manual. EtherNet/IP" of ODVA Organization.

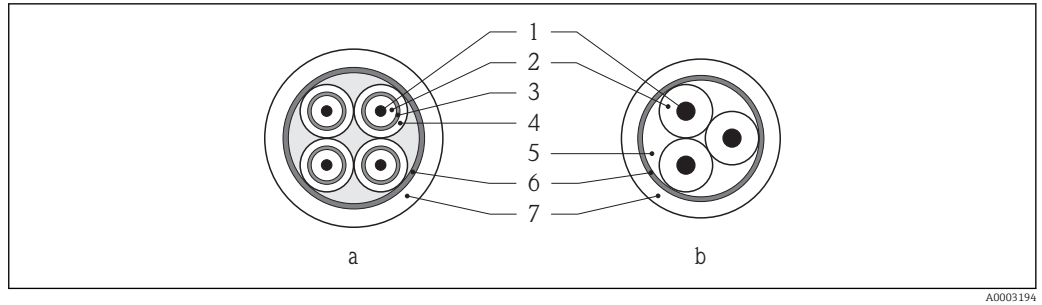
Connecting cable for remote version

Electrode cable

Standard cable	3 ×0.38 mm ² (20 AWG) with common, braided copper shield (ϕ ~7 mm (0.28 in)) and individual shielded cores
Cable for empty pipe detection (EPD)	4 ×0.38 mm ² (20 AWG) with common, braided copper shield (ϕ ~7 mm (0.28 in)) and individual shielded cores
Conductor resistance	≤50 Ω/km (0.015 Ω/ft)
Capacitance: core/shield	≤420 pF/m (128 pF/ft)
Operating temperature	–20 to +80 °C (–68 to +176 °F)

Coil current cable

Standard cable	2 ×0.75 mm ² (18 AWG) with common, braided copper shield (ϕ ~ 7 mm (0.28")) and individually shielded cores
Conductor resistance	≤37 Ω/km (0.011 Ω/ft)
Capacitance: core/core, shield grounded	≤120 pF/m (37 pF/ft)
Operating temperature	–20 to +80 °C (–68 to +176 °F)
Test voltage for cable insulation	≤ AC 1433 V r.m.s. 50/60 Hz or ≥ DC 2026 V



16 Cable cross-section

- a* Electrode cable
b Coil current cable
 1 Core
 2 Core insulation
 3 Core shield
 4 Core jacket
 5 Core reinforcement
 6 Cable shield
 7 Outer jacket



A connecting cable can be ordered from Endress+Hauser for IP68:

- Pre-terminated cables that are already connected to the sensor.
- Pre-terminated cables, where the cables are connected by the customer onsite (incl. tools for sealing the connection compartment)

Reinforced connecting cables

Reinforced connecting cables with an additional, reinforcing metal braid should be used for:

- When laying the cable directly in the ground
- Where there is a risk of damage from rodents
- If using the device below IP68 degree of protection



Reinforced connecting cables with an additional, reinforcing metal braid can be ordered from Endress+Hauser .

Operation in zones of severe electrical interference

The measuring system meets the general safety requirements → 106 and EMC specifications → 40.

Grounding is by means of the ground terminal provided for the purpose inside the connection housing. The stripped and twisted lengths of cable shield to the ground terminal must be as short as possible.

Performance characteristics

Reference operating conditions

In accordance with DIN EN 29104

- Medium temperature: $+28 \pm 2 \text{ }^{\circ}\text{C}$ ($+82 \pm 4 \text{ }^{\circ}\text{F}$)
- Ambient temperature: $+22 \pm 2 \text{ }^{\circ}\text{C}$ ($+72 \pm 4 \text{ }^{\circ}\text{F}$)
- Warm-up period: 30 min

Installation

- Inlet run $> 10 \times \text{DN}$
- Outlet run $> 5 \times \text{DN}$
- Sensor and transmitter grounded.
- The sensor is centered in the pipe.



No special requirements must be observed at the inlet and outlet runs to keep within the in-service maximum permissible errors for custody transfer.



To calculate the measuring range, use the *Applicator* sizing tool → 109

Maximum measured error**Error limits under reference operating conditions**

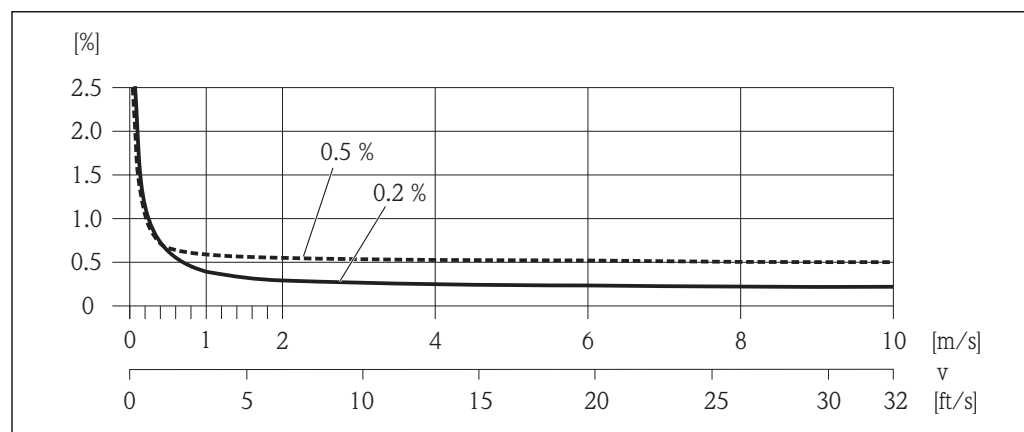
o.r. = of reading

Volume flow

- $\pm 0.5\%$ o.r. ± 1 mm/s (0.04 in/s)
- Optional: $\pm 0.2\%$ o.r. ± 2 mm/s (0.08 in/s)

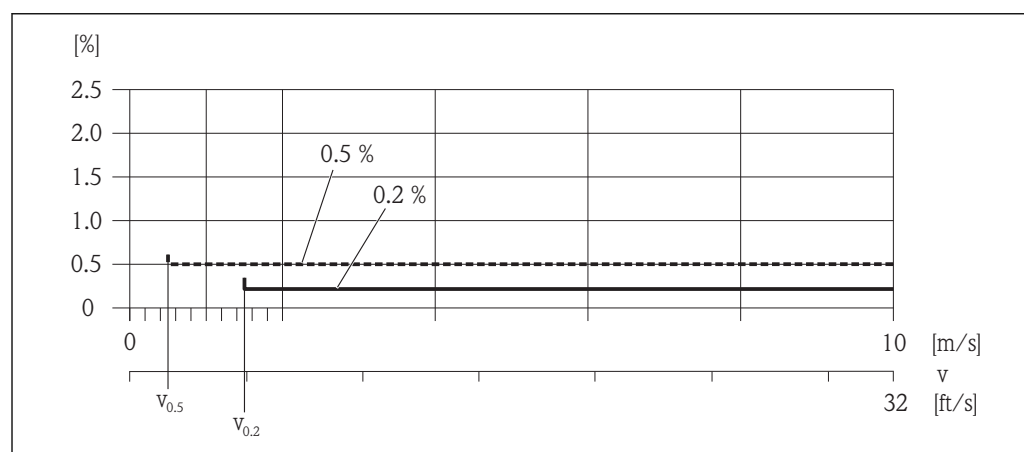


Fluctuations in the supply voltage do not have any effect within the specified range.



A0005531

17 Maximum measured error in % o.r.



A0017051

18 Flat Spec in % o.r.

Flat Spec flow values 0.5 %

Nominal diameter		$v_{0.5}$	
[mm]	[in]	[m/s]	[ft/s]
25 to 600	1 to 24	0.5	1.64

Flat Spec flow values 0.2 %

Nominal diameter		$v_{0.2}$	
[mm]	[in]	[m/s]	[ft/s]
25 to 600	1 to 24	1.5	4.92

Electrical conductivity

Max. measured error not specified.

Accuracy of outputs

o.r. = of reading

The outputs have the following base accuracy specifications.

Current output

Accuracy	Max. $\pm 5 \mu\text{A}$
----------	--------------------------

Pulse/frequency output

Accuracy	Max. $\pm 50 \text{ ppm o.r.}$ (across the complete ambient temperature range)
----------	--

Repeatability

o.r. = of reading

Volume flow

max. $\pm 0.1 \%$ o.r. $\pm 0.5 \text{ mm/s}$ (0.02 in/s)

Electrical conductivity

Max. $\pm 5 \%$ o.r.

Influence of ambient temperature

o.r. = of reading

Current output

Temperature coefficient	Max. $\pm 0.005\% \text{ o.r./}^\circ\text{C}$
-------------------------	--

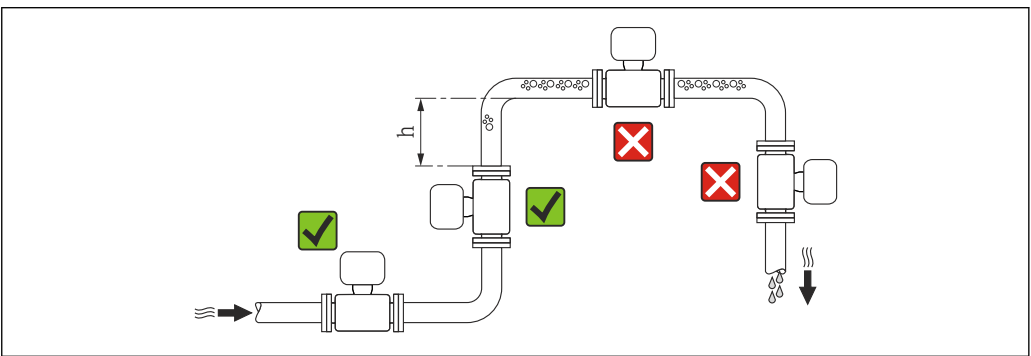
Pulse/frequency output

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

Installation

No special measures such as supports are necessary. External forces are absorbed by the construction of the device.

Mounting location



A0023343

Preferably install the sensor in an ascending pipe, and ensure a sufficient distance to the next pipe elbow: $h \geq 2 \times \text{DN}$

To prevent measuring errors arising from accumulation of gas bubbles in the measuring tube, avoid the following mounting locations in the pipe:

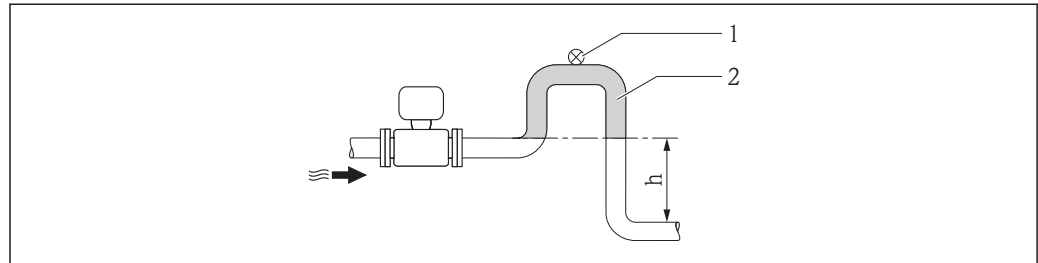
- Highest point of a pipeline.
- Directly upstream of a free pipe outlet in a down pipe.

Installation in down pipes

Install a siphon with a vent valve downstream of the sensor in down pipes whose length $h \geq 5 \text{ m}$ (16.4 ft). This precaution is to avoid low pressure and the consequent risk of damage to the measuring tube. This measure also prevents the system losing prime.



For information on the liner's resistance to partial vacuum



A0017064

19 Installation in a down pipe

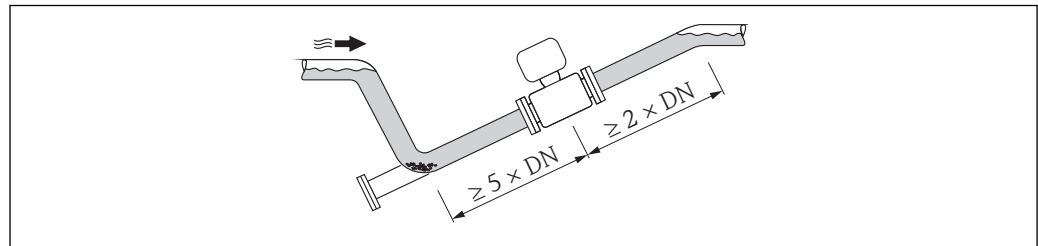
1 Vent valve

2 Pipe siphon

h Length of down pipe

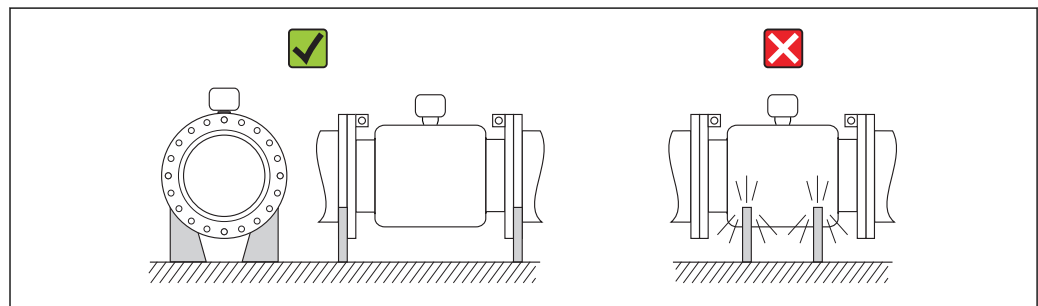
Installation in partially filled pipes

A partially filled pipe with a gradient necessitates a drain-type configuration. The empty pipe detection (EPD) function offers additional protection by detecting empty or partially filled pipes.



A0017063

For heavy sensors DN ≥ 350 (14")



A0016276

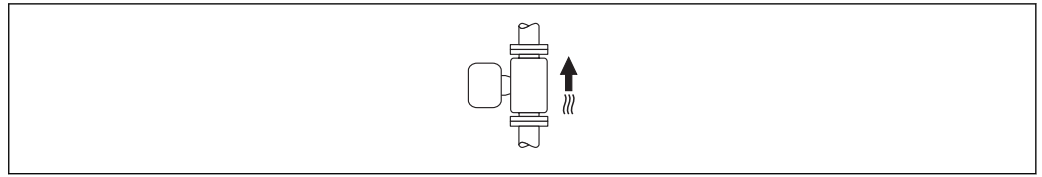
Orientation

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).

An optimum orientation position helps avoid gas and air accumulations and deposits in the measuring tube.

The measuring device also offers the empty pipe detection function to detect partially filled measuring pipes in the event of outgassing fluids or variable process pressures.

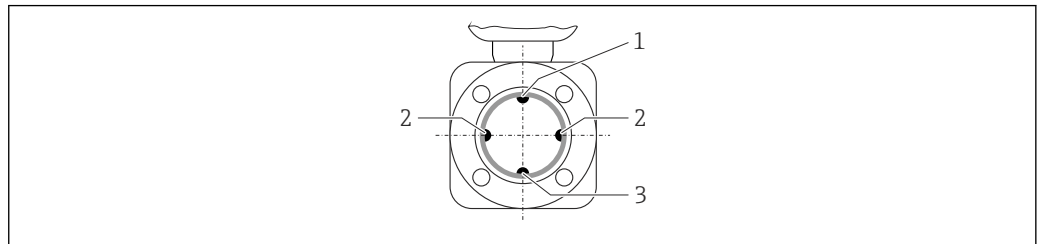
Vertical



A0015591

Optimum for self-emptying pipe systems and for use in conjunction with empty pipe detection.

Horizontal



A0016260

- 1 EPD electrode for empty pipe detection
- 2 Measuring electrodes for signal detection
- 3 Reference electrode for potential equalization

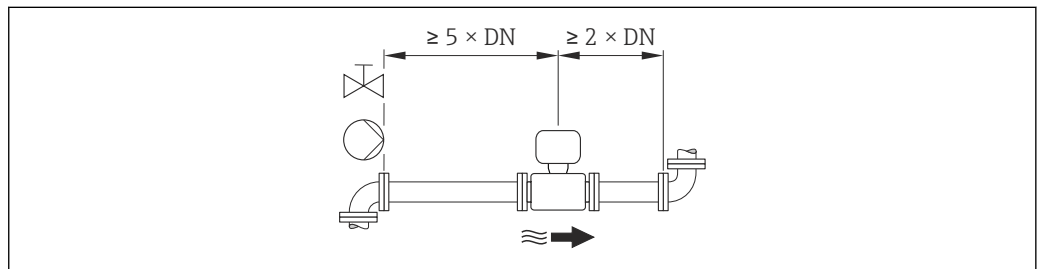


- The measuring electrode plane must be horizontal. This prevents brief insulation of the two measuring electrodes by entrained air bubbles.
- Empty pipe detection only works if the transmitter housing is pointing upwards as otherwise there is no guarantee that the empty pipe detection function will actually respond to a partially filled or empty measuring tube.

Inlet and outlet runs

If possible, install the sensor upstream from fittings such as valves, T-pieces or elbows.

Observe the following inlet and outlet runs to comply with accuracy specifications:



A0016275



To keep within the in-service maximum permissible errors for custody transfer no additional requirements apply with regard to the graphic illustrated above.

Adapters

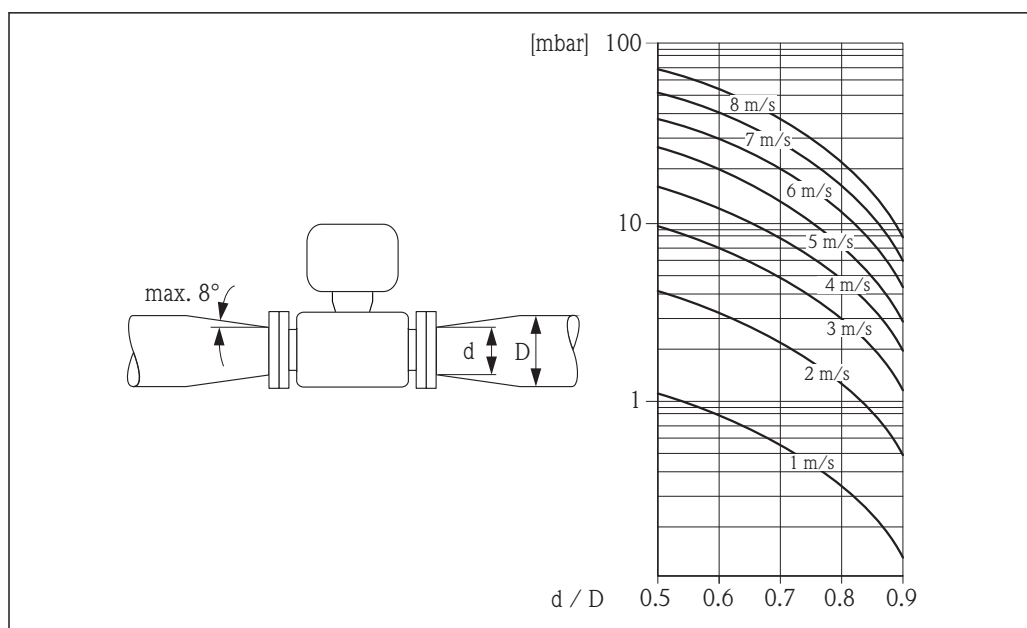
Suitable adapters to DIN EN 545 (double-flange reducers) can be used to install the sensor in larger-diameter pipes. The resultant increase in the rate of flow improves measuring accuracy with very slow-moving fluids.

The nomogram shown here can be used to calculate the pressure loss caused by reducers and expanders:

- Calculate the ratio of the diameters d/D .
- From the nomogram read off the pressure loss as a function of flow velocity (downstream from the reduction) and the d/D ratio.



The nomogram only applies to liquids with a viscosity similar to that of water.

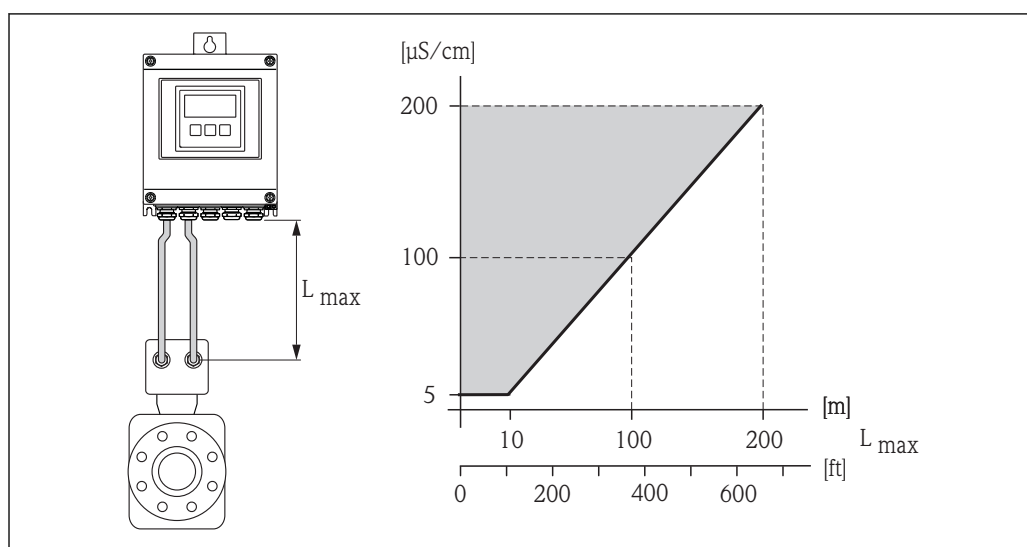


A0016359

Length of connecting cable

To ensure correct measuring results when using the remote version, observe the maximum permitted cable length $L_{\max}$. This length is determined by the conductivity of the fluid.

If measuring liquids in general: 5 $\mu\text{S}/\text{cm}$



A0016539

20 Permitted length of connecting cable for remote version

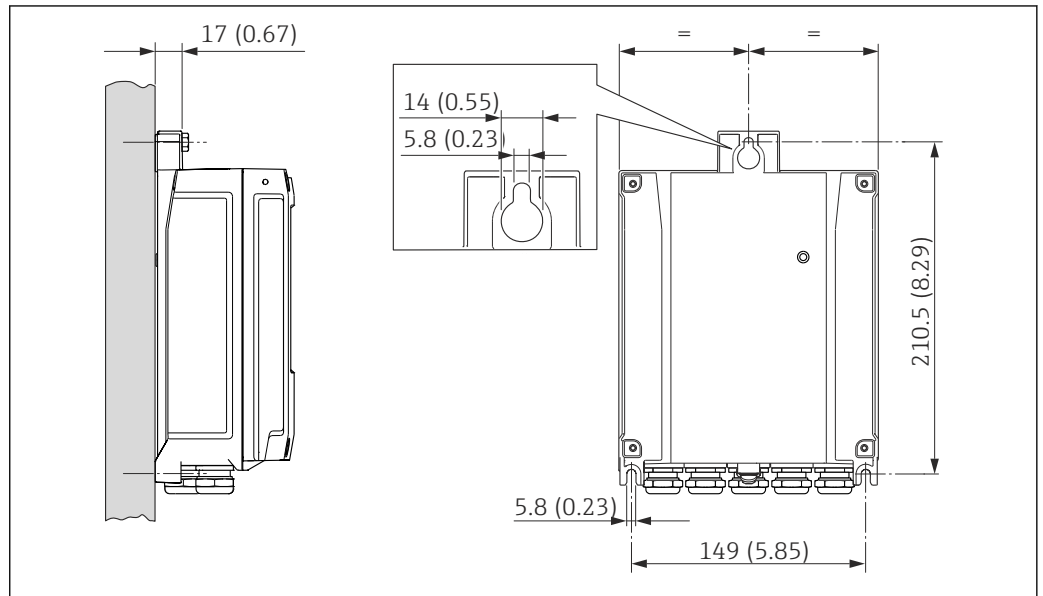
Area shaded gray = permitted range

$L_{\max}$ = length of connecting cable in [m] ([ft])

[$\mu\text{S}/\text{cm}$] = fluid conductivity

Installing the wall-mount housing

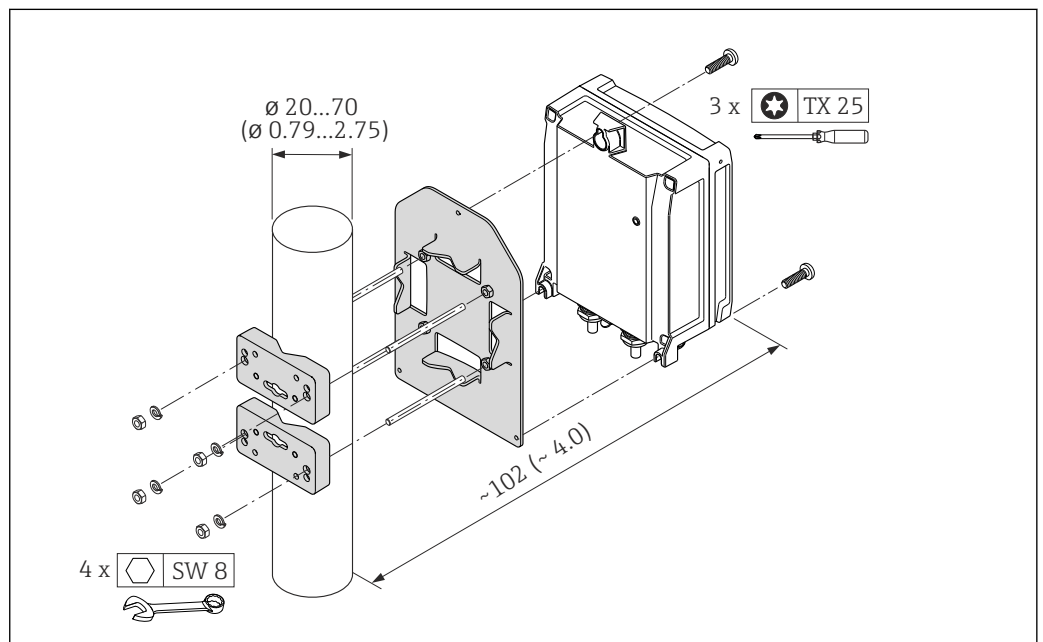
Wall mounting



A0020523

21 Engineering unit mm (in)

Post mounting



A0020705

22 Engineering unit mm (in)

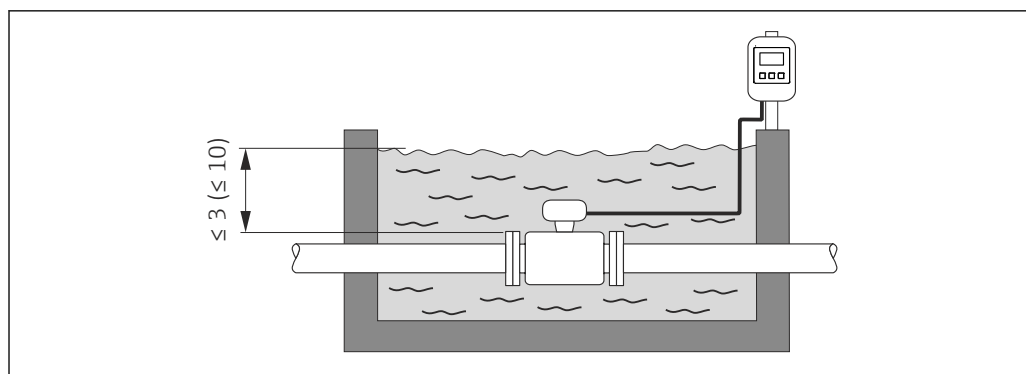
Special mounting instructions

Display protection

To ensure that the optional display protection can be easily opened, maintain the following minimum head clearance: 350 mm (13.8 in)

Permanent immersion in water

A fully welded remote version with IP68 protection is optionally available for permanent immersion in water ≤ 3 m (10 ft) or in exceptional cases for use for up to 48 hours at ≤ 10 m (30 ft). The measuring device meets the requirements of corrosion categories C5-M and Im1/Im2/Im3. The fully welded design along with the connection compartment sealing system ensure that moisture cannot enter the measuring device.



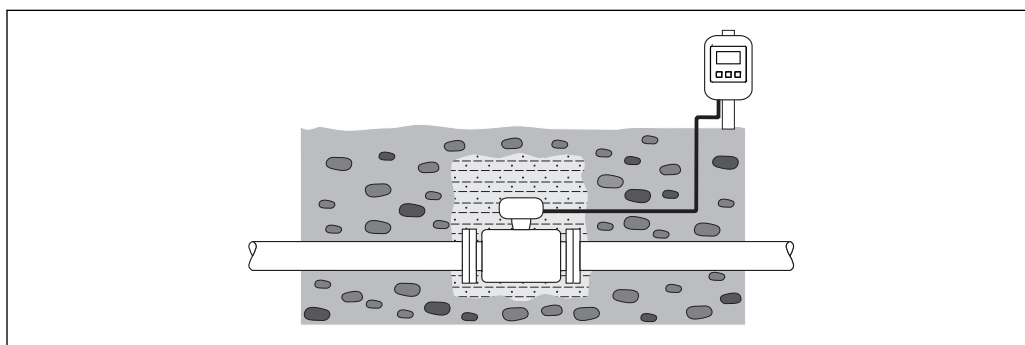
A0017296

23 Engineering unit in m(ft)

 Replacement of cable gland on connection housing →  29

Buried applications

A remote version with IP68 protection is optionally available for buried applications. The measuring device satisfies the certified corrosion protection Im1/Im2/Im3 in accordance with EN ISO 12944. It can be used directly underground without the need for additional protective measures. The device is mounted in accordance with the usual regional installation regulations (e.g. EN DIN 1610).



A0017298

Environment

Ambient temperature range

Transmitter	–40 to +60 °C (–40 to +140 °F)
Local display	–20 to +60 °C (–4 to +140 °F), the readability of the display may be impaired at temperatures outside the temperature range.
Sensor	■ Process connection material, carbon steel: –10 to +60 °C (+14 to +140 °F) ■ Process connection material, stainless steel: –40 to +60 °C (–40 to +140 °F) Mount the transmitter separately from the sensor if both the ambient and fluid temperatures are high.
Liner	Do not exceed or fall below the permitted temperature range of the liner .

If operating outdoors:

- Install the measuring device in a shady location.
- Avoid direct sunlight, particularly in warm climatic regions.
- Avoid direct exposure to weather conditions.

- If the compact version of the device is insulated at low temperatures, the insulation must also include the device neck.
- Protect the display against impact.
- Protect the display from abrasion by sand in desert areas.



A display protector can be ordered from Endress+Hauser: "Accessories" section → 108

Storage temperature

The storage temperature corresponds to the operating temperature range of the measuring transmitter and the appropriate measuring sensors.

- Protect the measuring device against direct sunlight during storage in order to avoid unacceptably high surface temperatures.
- Select a storage location where moisture cannot collect in the measuring device as fungus or bacteria infestation can damage the liner.
- If protection caps or protective covers are mounted these should never be removed before installing the measuring device.

Atmosphere

If a plastic transmitter housing is permanently exposed to certain steam and air mixtures, this can damage the housing.



If you are unsure, please contact your Endress+Hauser Sales Center for clarification.

Degree of protection

Transmitter

- As standard: IP66/67, type 4X enclosure
- When housing is open: IP20, type 1 enclosure

Sensor

- As standard: IP66/67, type 4X enclosure
- Optionally available for remote version:
 - IP66/67, type 4X enclosure; fully welded, with protective varnish EN ISO 12944 C5-M. Suitable for use in corrosive atmospheres.
 - IP68, type 6P enclosure; fully welded, with protective varnish as per EN ISO 12944 C5-M. Suitable for permanent immersion in water ≤3 m (10 ft) or 48 hours at depths ≤10 m (30 ft).
 - IP68, type 6P enclosure; fully welded, with protective varnish as per EN ISO 12944 Im1/Im2/Im3. Suitable for permanent immersion in saline water ≤3 m (10 ft) or 48 hours at depths ≤10 m (30 ft) or in buried applications.

Shock resistance

Compact version

6 ms 30 g, according to IEC 60068-2-27

Remote version

- Transmitter: 6 ms 30 g, according to IEC 60068-2-27
- Sensor: 6 ms 50 g, according to IEC 60068-2-27

Vibration resistance

Compact version

- Vibration sinusoidal, 1 g peak, according to IEC 60068-2-6
- Vibration broad-band random, 1.54 g rms, according to IEC 60068-2-64

Remote version

- Transmitter
 - Vibration sinusoidal, 1 g peak, according to IEC 60068-2-6
 - Vibration broad-band random, 1.54 g rms, according to IEC 60068-2-64
- Sensor:
 - Vibration sinusoidal, 2 g peak, according to IEC 60068-2-6
 - Vibration broad-band random, 2.70 g rms, according to IEC 60068-2-64

Mechanical load

- Protect the transmitter housing against mechanical effects, such as shock or impact; the use of the remote version is sometimes preferable.
- Never use the transmitter housing as a ladder or climbing aid.

Electromagnetic compatibility (EMC)

- As per IEC/EN 61326 and NAMUR Recommendation 21 (NE 21)
- 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

i 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.

i For details refer to the Declaration of Conformity.

Process**Medium temperature range**

- 0 to +80 °C (+32 to +176 °F) for hard rubber, DN 50 to 2000 (2 to 78")
- -20 to +50 °C (-4 to +122 °F) for polyurethane, DN 25 to 1200 (1 to 48")

i In custody transfer mode, the permitted fluid temperature is 0 to +50 °C (+32 to +122 °F).

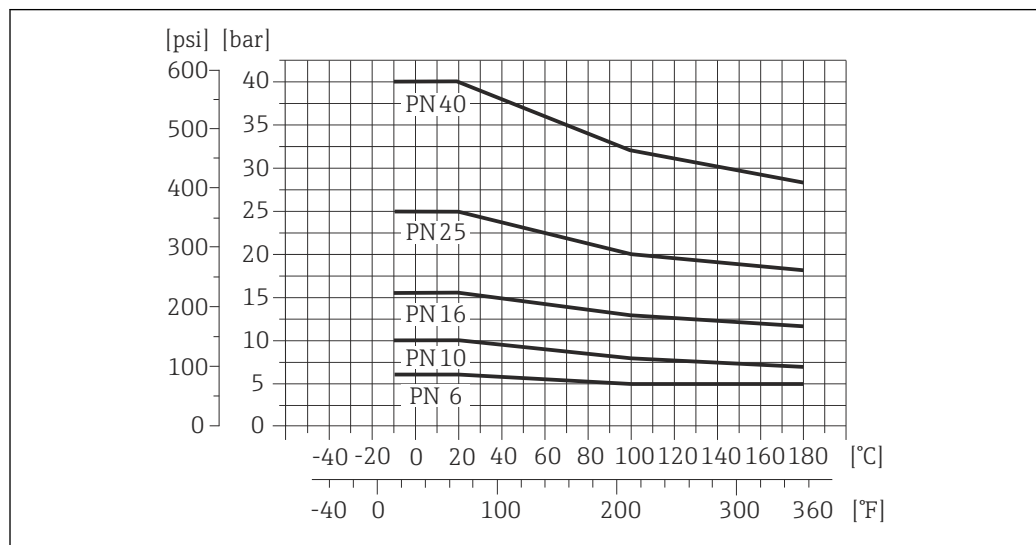
Conductivity

≥ 5 µS/cm for liquids in general

i Note that in the case of the remote version, the requisite minimum conductivity also depends on the cable length → 36.

Pressure-temperature ratings

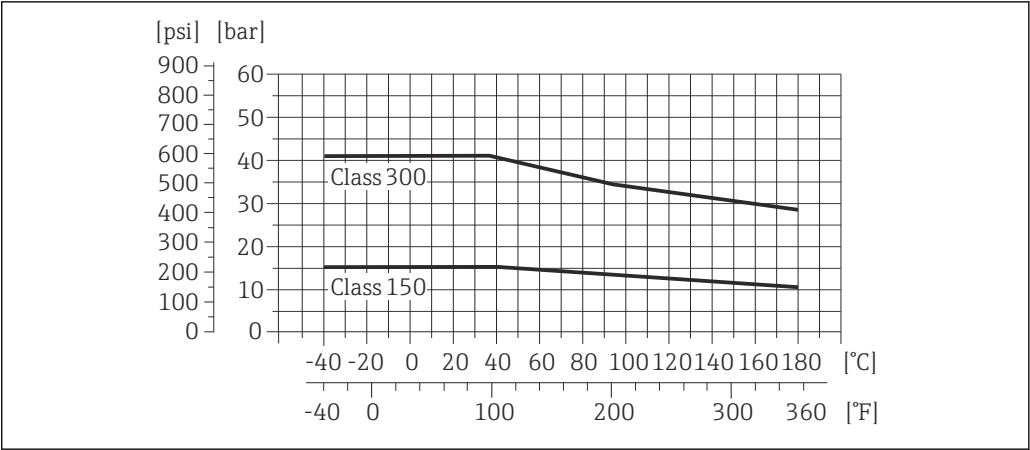
The following pressure-temperature ratings refer to the entire device and not just the process connection.

Process connection: fixed flange according to EN 1092-1 (DIN 2501)

A0021188-EN

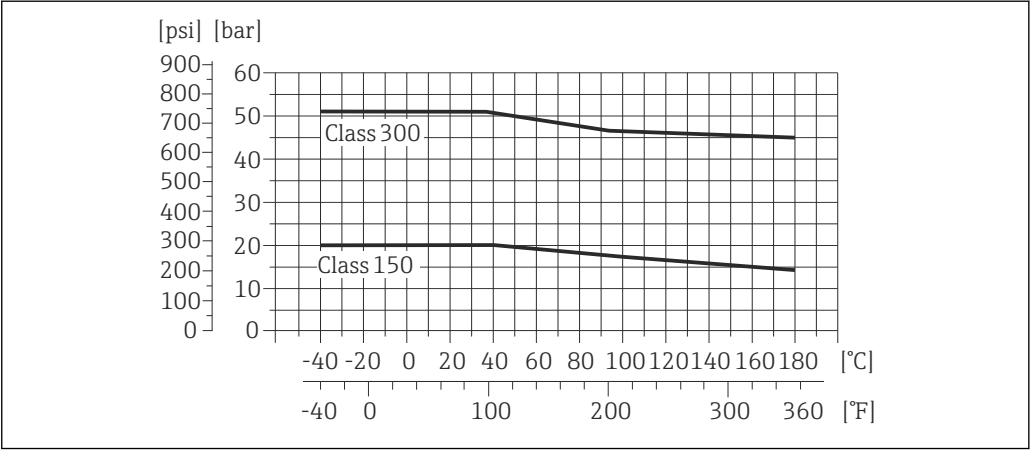
24 Process connection material: stainless steel, 1.4404/1.4571/F316L; carbon steel, A105/FE410WB/P250GH/S235JRG2/S235JR+N

Process connection: fixed flange according to ASME B16.5



A0021185-EN

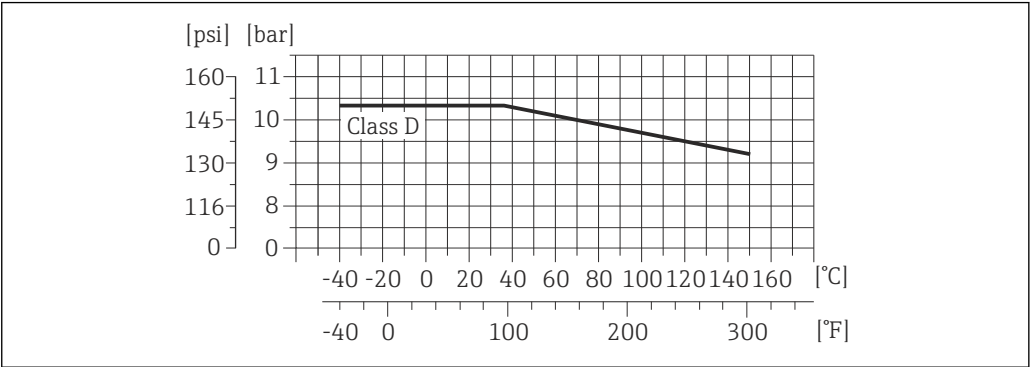
25 Process connection material: stainless steel, F316L similar to 1.4404



A0021182-EN

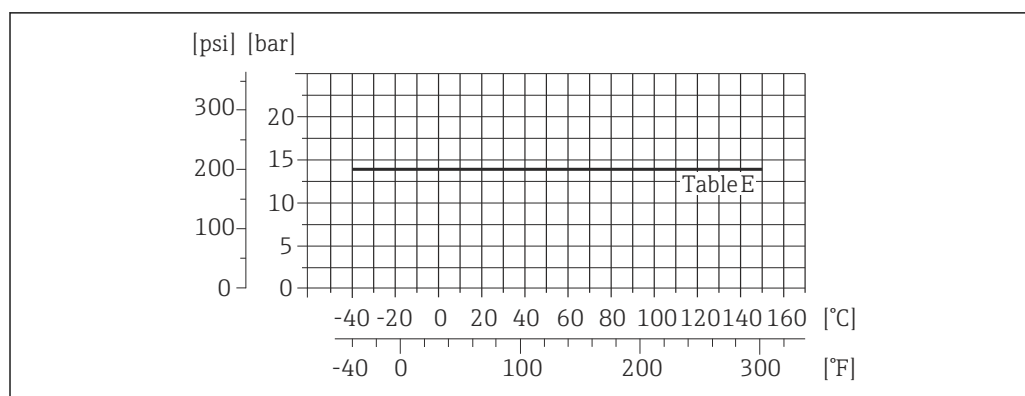
26 Process connection material: carbon steel, A105/A515(70)

Process connection: fixed flange according to AWWA C207



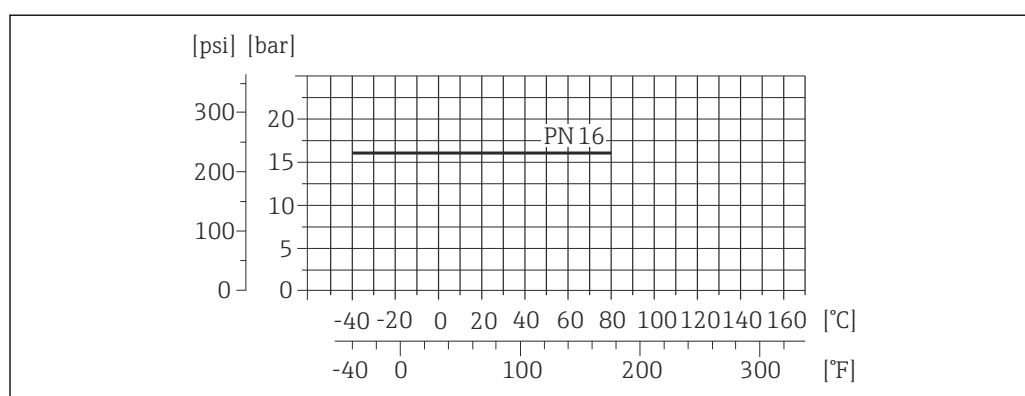
A0021409-EN

27 Process connection material: carbon steel, A105/A181/P265GH/S275JR

Process connection: fixed flange according to AS 2129

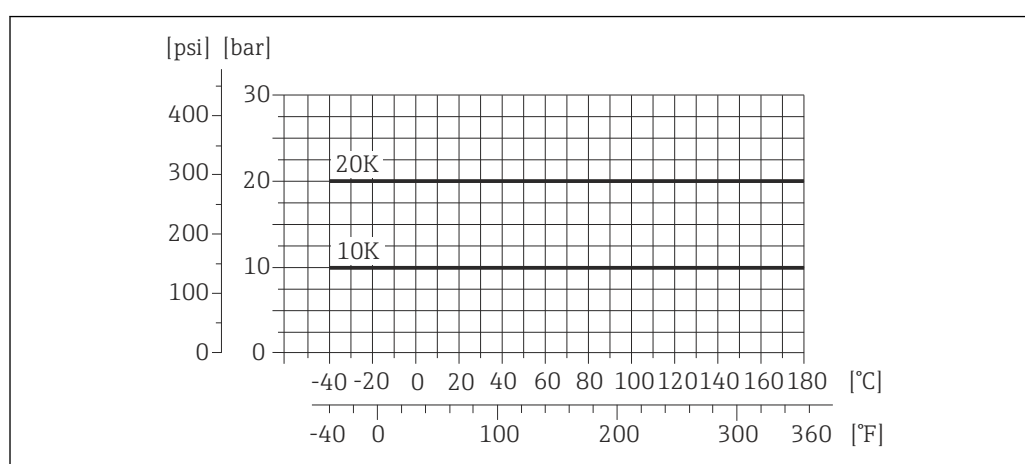
A0021189-EN

28 Process connection material: carbon steel, A105/FE410WB/P235GH/P265GH/S235JRG2

Process connection: fixed flange according to AS 4087

A0023077-EN

29 Process connection material: carbon steel, A105/P265GH/S275JR

Process connection: fixed flange according to JIS B2220

A0021183-EN

30 Process connection material: stainless steel, F316L similar to 1.4404; carbon steel, A105/A350LF2

Pressure tightness

Liner: hard rubber

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for fluid temperatures:		
[mm]	[in]	+25 °C (+77 °F)	+50 °C (+122 °F)	+80 °C (+176 °F)
50...2000	2...78	0 (0)	0 (0)	0 (0)

Liner: polyurethane

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for fluid temperatures:	
[mm]	[in]	+25 °C (+77 °F)	+50 °C (+122 °F)
25...1200	1...48	0 (0)	0 (0)

Flow limit

The diameter of the pipe and the flow rate determine the nominal diameter of the sensor. The optimum velocity of flow is between 2 to 3 m/s (6.56 to 9.84 ft/s). Also match the velocity of flow (v) to the physical properties of the fluid:

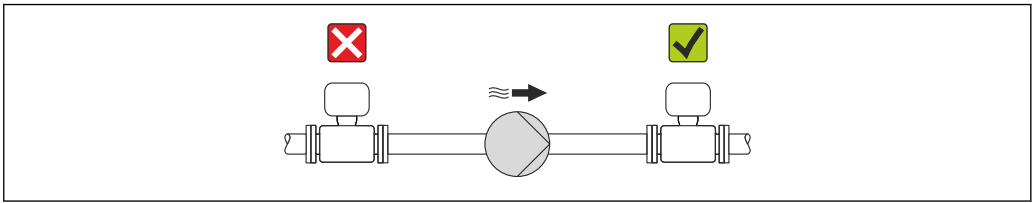
- $v < 2 \text{ m/s}$ (6.56 ft/s): for abrasive fluids (e.g. potter's clay, lime milk, ore slurry)
- $v > 2 \text{ m/s}$ (6.56 ft/s): for fluids producing buildup (e.g. wastewater sludges)

-  A necessary increase in the flow velocity can be achieved by reducing the sensor nominal diameter.
-  For an overview of the measuring range full scale values, see the "Measuring range" section →  7
-  For custody transfer, the applicable approval determines the permitted measuring range.

Pressure loss

- No pressure loss occurs if the sensor is installed in a pipe with the same nominal diameter.
- Pressure losses for configurations incorporating adapters according to DIN EN 545 →  35

System pressure



A0015594

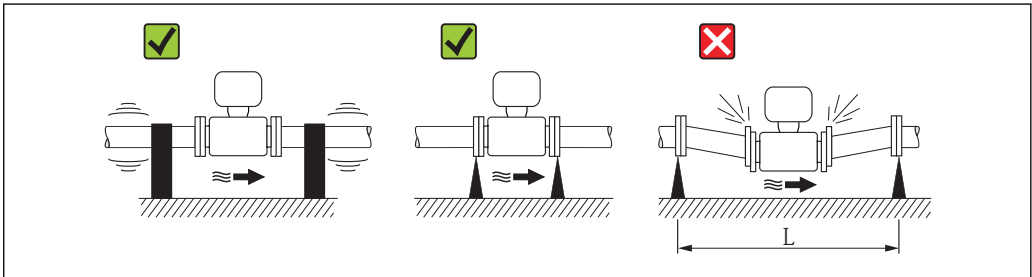
Never install the sensor on the pump suction side in order to avoid the risk of low pressure, and thus damage to the liner.

-  Furthermore, install pulse dampers if reciprocating, diaphragm or peristaltic pumps are used.
- 
 - For information on the liner's resistance to partial vacuum →  42
 - For information on the shock resistance of the measuring system →  39
 - For information on the vibration resistance of the measuring system →  39

Vibrations

In the event of very strong vibrations, the pipe and sensor must be supported and fixed. It is also advisable to mount the sensor and transmitter separately.

- 
 - For information on the shock resistance of the measuring system →  39
 - For information on the vibration resistance of the measuring system →  39



A0016266

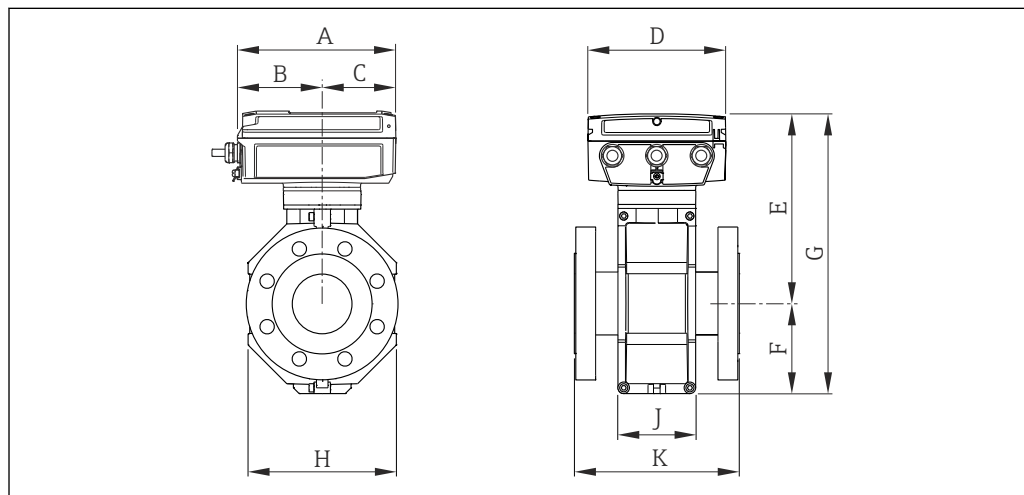
 31 Measures to avoid device vibrations ($L > 10 \text{ m}$ (33 ft))

Mechanical construction

Dimensions in SI units

Compact version

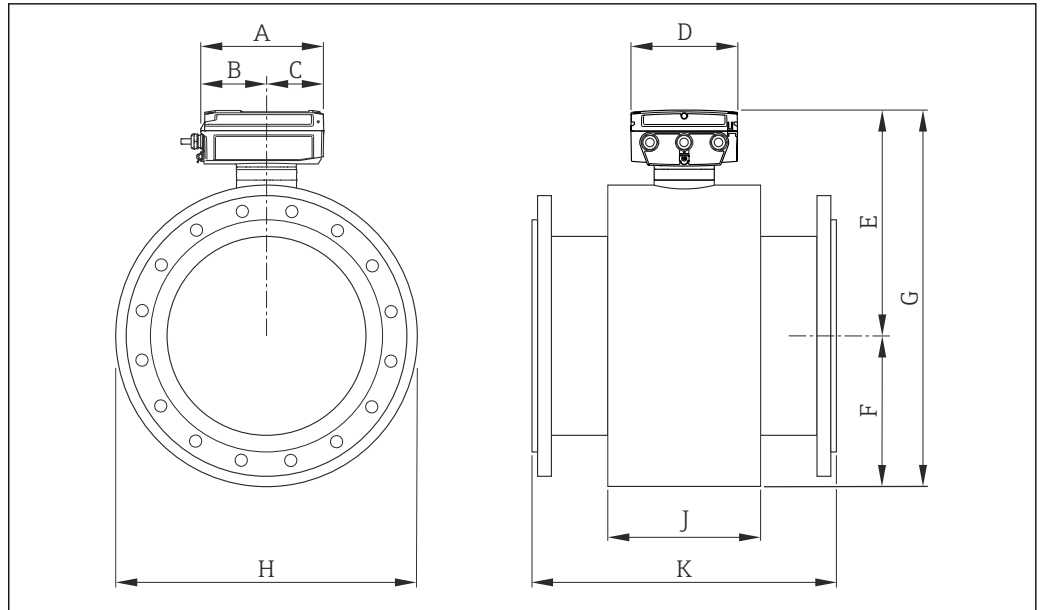
Order code for "Housing", option M "Compact, polycarbonate" or option A "Compact, aluminum, coated"



A0020352

DN ¹⁾	A	B	C	D	E	F	G	H	J	K ²⁾
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	193	103	90	167	222	84	306	120	94	200
32	193	103	90	167	222	84	306	120	94	200
40	193	103	90	167	222	84	306	120	94	200
50	193	103	90	167	222	84	306	120	94	200
65	193	103	90	167	247	109	356	180	94	200
80	193	103	90	167	247	109	356	180	94	200
100	193	103	90	167	247	109	356	180	94	250
125	193	103	90	167	287	150	437	260	140	250
150	193	103	90	167	287	150	437	260	140	300
200	193	103	90	167	312	180	492	324	156	350
250	193	103	90	167	337	205	542	400	166	450
300	193	103	90	167	362	230	592	460	166	500

- 1) EN (DIN), AS, JIS; For flanges according to AS, only nominal diameters DN 80, 100 and 150 to 300 are available.
- 2) The length is independent of the selected pressure rating. Length in accordance with DVGW/ISO.

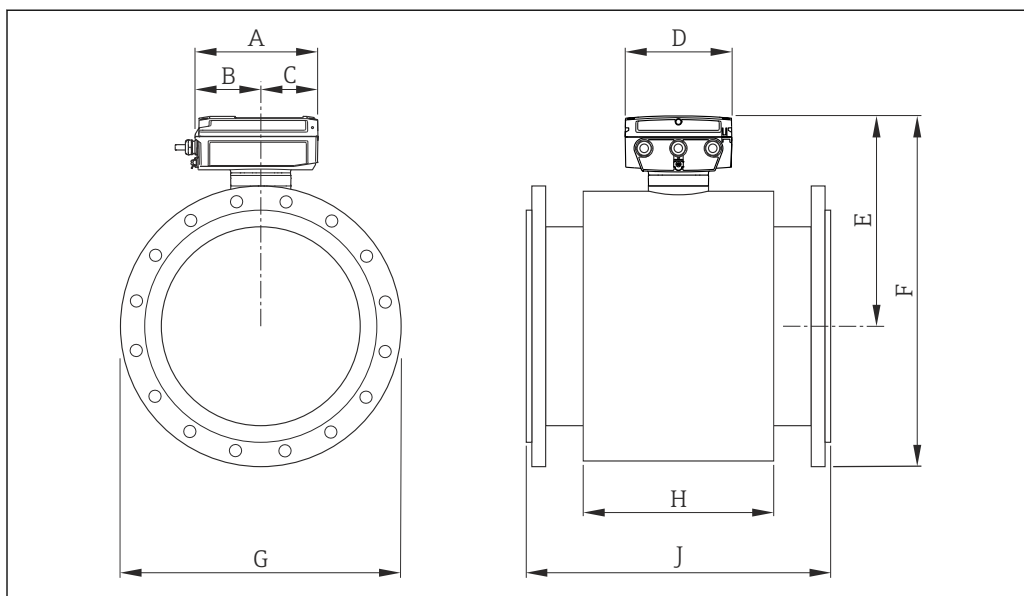


A0017154

DN ¹⁾	A	B	C	D	E	F	G	H	J	K ²⁾
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
350	193	103	90	167	432	282	714	564	276	550
375	193	103	90	167	458	308	766	616	276	600
400	193	103	90	167	458	308	766	616	276	600
450	193	103	90	167	483	333	816	666	292	650
500	193	103	90	167	508	359	867	717	292	650
600	193	103	90	167	560	410	970	821	402	780
700	193	103	90	167	662	512	1174	1024	589	910
750	193	103	90	167	662	512	1174	1024	626	975
800	193	103	90	167	683	534	1217	1067	647	1040
900	193	103	90	167	760	610	1370	1220	785	1170
1000	193	103	90	167	836	686	1522	1372	862	1300
1050	193	103	90	167	862	712	1574	1424	912	1365
1200	193	103	90	167	961	811	1772	1622	992	1560
1350	193	103	90	167	1062	912	1974	1824	1252	1755
1400	193	103	90	167	1137	987	2124	1974	1252	1820
1500	193	103	90	167	1161	1011	2172	2022	1392	1950
1600	193	103	90	167	1206	1056	2262	2112	1482	2080
1650	193	103	90	167	1243	1093	2336	2186	1482	2145
1800	193	103	90	167	1338	1188	2526	2376	1632	2340
2000	193	103	90	167	1388	1238	2626	2476	1732	2600

- 1) EN (DIN), AS; For flanges according to AS, only nominal diameters DN 350, 400, 500 and 600 are available.
- 2) The length is independent of the selected pressure rating. Length in accordance with DVGW/ISO.

Order code for "Housing", option M "Compact, polycarbonate" or option A "Compact, aluminum, coated";
order code for "Design", option A "Insertion length short"

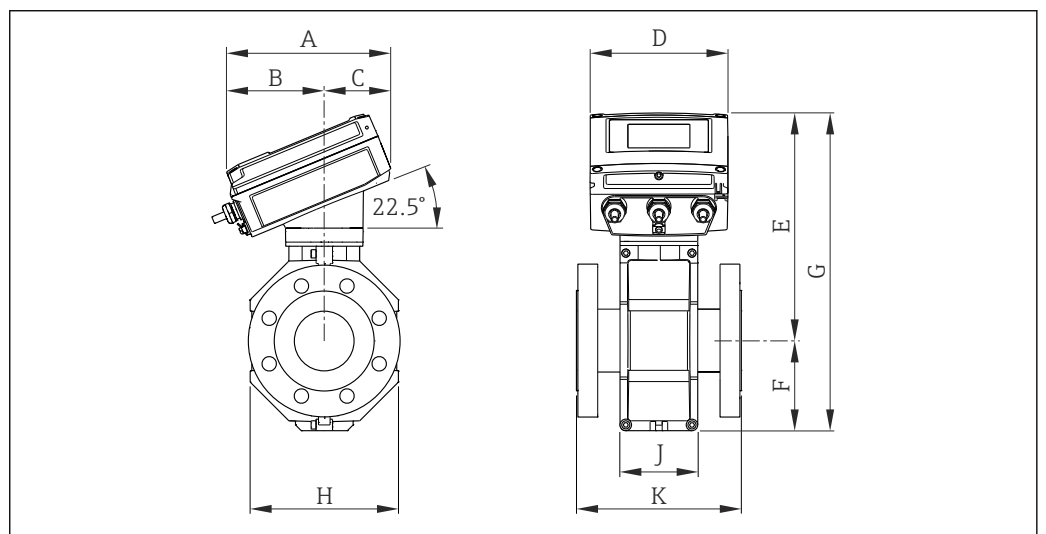


A0017153

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	H [mm]	J [mm]
350	193	103	90	167	386	290	550
375	193	103	90	167	412	290	600
400	193	103	90	167	412	290	600
450	193	103	90	167	440	290	600
500	193	103	90	167	465	290	600
600	193	103	90	167	506	290	600
700	193	103	90	167	571	424	700
750	193	103	90	167	608	454	750
800	193	103	90	167	627	500	800
900	193	103	90	167	677	580	900
1000	193	103	90	167	727	660	1000
1050	193	103	90	167	763	755	1050
1200	193	103	90	167	841	828	1200
1350	193	103	90	167	953	1008	1350
1400	193	103	90	167	953	1008	1400
1500	193	103	90	167	1053	1147	1500
1600	193	103	90	167	1053	1147	1600
1650	193	103	90	167	1104	1284	1650
1800	193	103	90	167	1161	1379	1800
2000	193	103	90	167	1272	1569	2000

DN [mm]	Dimension F					Dimension G				
	EN (DIN)			ASME	AS	EN (DIN)			ASME	AS
	PN 6 [mm]	PN 10 [mm]	PN 16 [mm]	AWWA [mm]	[mm]	PN 6 [mm]	PN 10 [mm]	PN 16 [mm]	AWWA [mm]	[mm]
350	631	638	702	653	648	490	505	520	533	525
375	–	–	–	–	687	–	–	–	–	550
400	682	694	760	710	702	540	565	580	597	580
450	737	747	823	757	760	595	615	640	635	640
500	787	800	926	814	817	645	670	715	699	705
600	883	896	1026	912	918	755	780	840	813	825
700	1001	1018	1145	1034	1026	860	895	910	927	910
750	–	–	–	1100	1106	–	–	–	984	995
800	1115	1135	1240	1157	1157	975	1015	1025	1060	1060
900	1215	1235	1240	1261	1265	1075	1115	1125	1168	1175
1000	1315	1342	1355	1372	1355	1175	1230	1225	1289	1255
1050	–	–	–	1436	–	–	–	–	1346	–
1200	1544	1569	1584	1597	1586	1405	1455	1255	1511	1490
1350	–	–	–	1795	–	–	–	–	1683	–
1400	1768	1791	1796	–	–	1630	1675	1685	–	–
1500	–	–	–	1980	–	–	–	–	1854	–
1600	1968	2011	2019	–	–	1830	1915	1930	–	–
1650	–	–	–	2120	–	–	–	–	2032	–
1800	2183	2218	2226	2259	–	2045	2115	2130	2197	–
2000	2404	2434	2444	2453	–	2265	2325	2345	2362	–

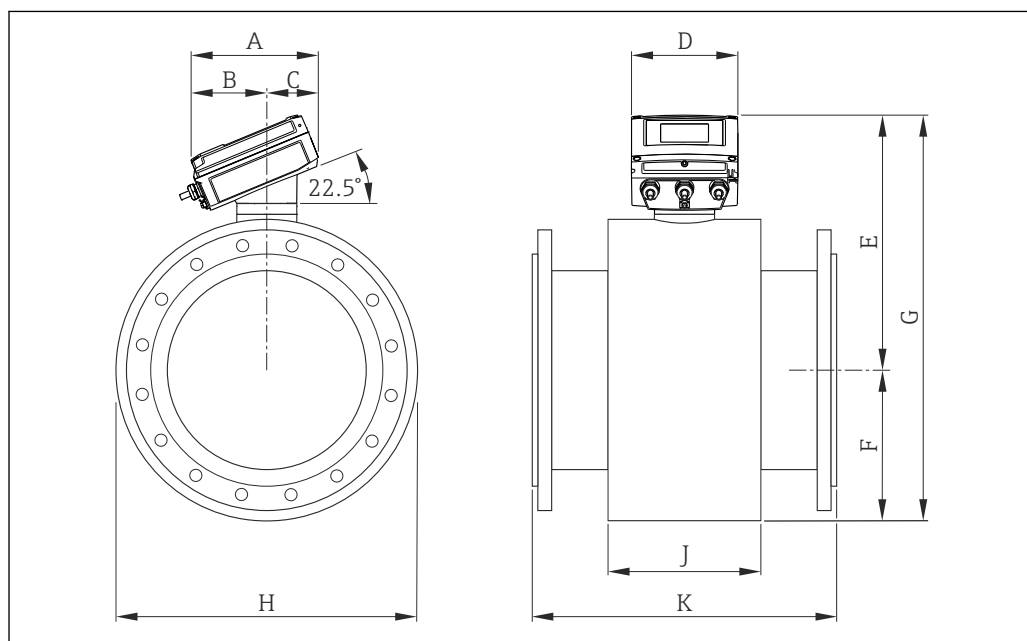
Order code for "Housing", option Q "Compact, polycarbonate, inclined" or option R "Compact, aluminum, coated, inclined"



A0020353

DN ¹⁾	A	B	C	D	E	F	G	H	J	K ²⁾
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	199	119	80	167	267	84	351	120	94	200
32	199	119	80	167	267	84	351	120	94	200
40	199	119	80	167	267	84	351	120	94	200
50	199	119	80	167	267	84	351	120	94	200
65	199	119	80	167	292	109	401	180	94	200
80	199	119	80	167	292	109	401	180	94	200
100	199	119	80	167	292	109	401	180	94	250
125	199	119	80	167	332	150	482	260	140	250
150	199	119	80	167	332	150	482	260	140	300
200	199	119	80	167	357	180	537	324	156	350
250	199	119	80	167	382	205	587	400	166	450
300	199	119	80	167	407	230	637	460	166	500

- 1) EN (DIN), AS, JIS; For flanges according to AS, only nominal diameters DN 80, 100 and 150 to 300 are available.
- 2) The length is independent of the selected pressure rating. Length in accordance with DVGW/ISO.



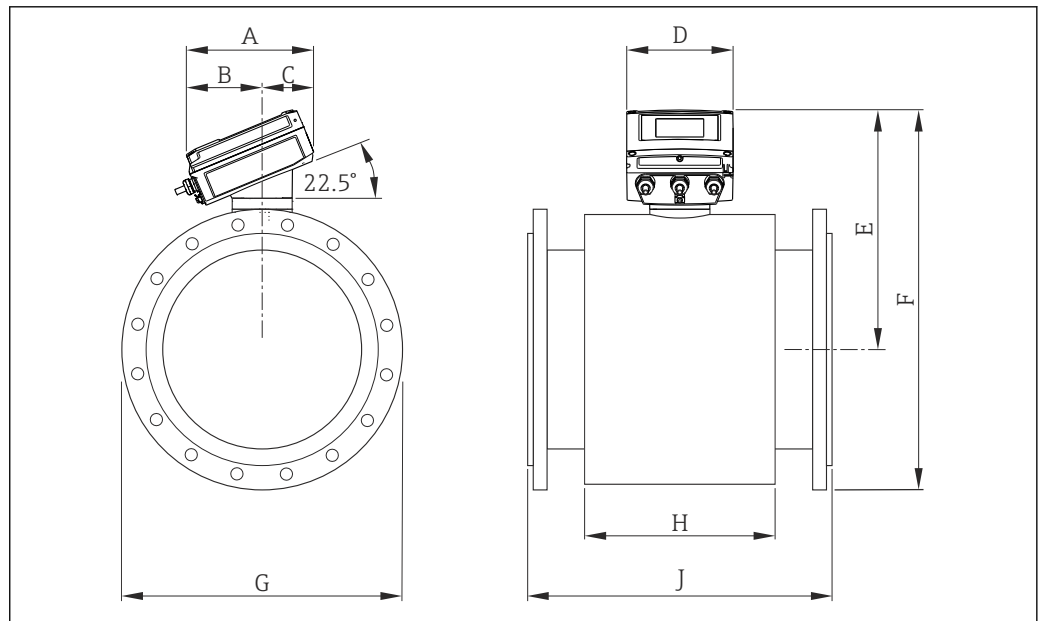
A0020396

DN ¹⁾	A	B	C	D	E	F	G	H	J	K ²⁾
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
350	199	119	80	167	477	282	759	564	276	550
375	199	119	80	167	503	308	811	616	276	600
400	199	119	80	167	503	308	811	616	276	600
450	199	119	80	167	528	333	861	666	292	650
500	199	119	80	167	553	359	912	717	292	650
600	199	119	80	167	605	410	1015	821	402	780
700	199	119	80	167	707	512	1219	1024	589	910
750	199	119	80	167	707	512	1219	1024	626	975

DN ¹⁾	A	B	C	D	E	F	G	H	J	K ²⁾
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
800	199	119	80	167	728	534	1262	1067	647	1040
900	199	119	80	167	805	610	1415	1220	785	1170
1000	199	119	80	167	881	686	1567	1372	862	1300
1050	199	119	80	167	907	712	1619	1424	912	1365
1200	199	119	80	167	1006	811	1817	1622	992	1560
1350	199	119	80	167	1107	912	2019	1824	1252	1755
1400	199	119	80	167	1182	987	2169	1974	1252	1820
1500	199	119	80	167	1206	1011	2217	2022	1392	1950
1600	199	119	80	167	1251	1056	2307	2112	1482	2080
1650	199	119	80	167	1288	1093	2381	2186	1482	2145
1800	199	119	80	167	1383	1188	2571	2376	1632	2340
2000	199	119	80	167	1433	1238	2671	2476	1732	2600

- 1) EN (DIN), AS; For flanges according to AS, only nominal diameters DN 350, 400, 500 and 600 are available.
- 2) The length is independent of the selected pressure rating. Length in accordance with DVGW/ISO.

Order code for "Housing", option Q "Compact, polycarbonate, inclined" or option R "Compact, aluminum, coated, inclined"; order code for "Design", option A "Insertion length short"



A0020393

DN	A	B	C	D	E	H	J
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
350	199	119	80	167	431	290	550
375	199	119	80	167	457	290	600
400	199	119	80	167	457	290	600
450	199	119	80	167	485	290	600
500	199	119	80	167	510	290	600
600	199	119	80	167	551	290	600

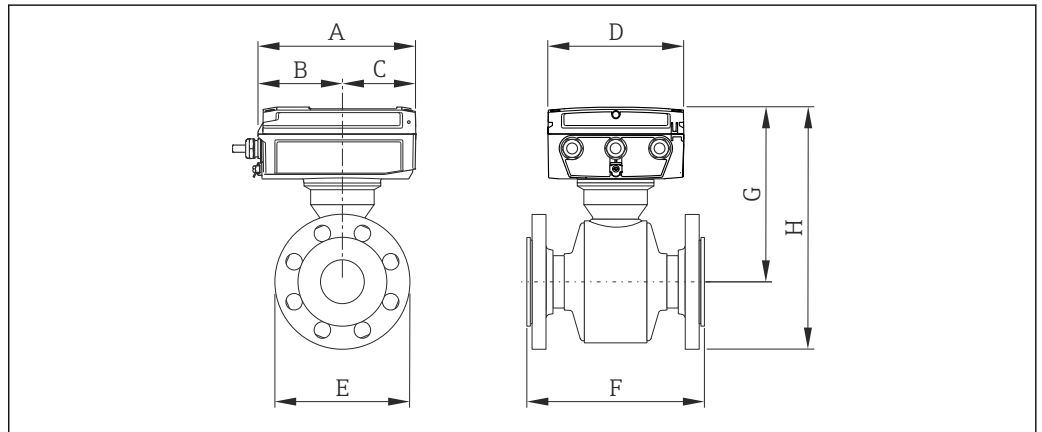
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	H [mm]	J [mm]
700	199	119	80	167	616	424	700
750	199	119	80	167	653	454	750
800	199	119	80	167	672	500	800
900	199	119	80	167	722	580	900
1000	199	119	80	167	772	660	1000
1050	199	119	80	167	808	755	1050
1200	199	119	80	167	886	828	1200
1350	199	119	80	167	998	1008	1350
1400	199	119	80	167	953	1008	1400
1500	199	119	80	167	1098	1147	1500
1600	199	119	80	167	1098	1147	1600
1650	199	119	80	167	1149	1284	1650
1800	199	119	80	167	1206	1379	1800
2000	199	119	80	167	1317	1569	2000

DN [mm]	Dimension F					Dimension G				
	EN (DIN)			ASME	AS	EN (DIN)			ASME	AS
	PN 6 [mm]	PN 10 [mm]	PN 16 [mm]	AWWA [mm]	[mm]	PN 6 [mm]	PN 10 [mm]	PN 16 [mm]	AWWA [mm]	[mm]
350	676	683	618	698	693	490	505	520	533	525
375	–	–	–	–	732	–	–	–	–	550
400	727	739	672	755	747	540	565	580	597	580
450	782	792	732	802	805	595	615	640	635	640
500	832	845	795	859	862	645	670	715	699	705
600	928	941	898	957	963	755	780	840	813	825
700	1046	1063	1008	1079	1071	860	895	910	927	910
750	–	–	–	1145	1151	–	–	–	984	995
800	1160	1180	1112	1202	1202	975	1015	1025	1060	1060
900	1260	1280	1212	1306	1310	1075	1115	1125	1168	1175
1000	1360	1387	1327	1417	1400	1175	1230	1225	1289	1255
1050	–	–	–	1481	–	–	–	–	1346	–
1200	1589	1614	1556	1642	1631	1405	1455	1255	1511	1490
1350	–	–	–	1840	–	–	–	–	1683	–
1400	1813	1836	1768	–	–	1630	1675	1685	–	–
1500	–	–	–	2025	–	–	–	–	1854	–
1600	2013	2056	1991	–	–	1830	1915	1930	–	–
1650	–	–	–	2165	–	–	–	–	2032	–
1800	2228	2263	2198	2304	–	2045	2115	2130	2197	–
2000	2449	2479	2416	2498	–	2265	2325	2345	2362	–

Order code for "Sensor option", option CA in combination with order code for "Calibration flow", options A/B/D/E/F/G/H/K/M/N



- Order code for "Calibration flow", options A/B/D/E/F/G/H/K/M/N available for order in conjunction with order code for "Housing", option M "Compact, polycarbonate"
- Order code for "Calibration flow", options H/K also available for order in conjunction with order code for "Housing", option A "Compact, aluminum, coated"



A0021328

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	F [mm]	G [mm]
25	193	103	90	167	200	188
32	193	103	90	167	200	188
40	193	103	90	167	200	188
50	193	103	90	167	200	188
65	193	103	90	167	200	200
80	193	103	90	167	200	205
100	193	103	90	167	250	218
125	193	103	90	167	250	231
150	193	103	90	167	300	252
200	193	103	90	167	350	278
250	193	103	90	167	450	311
300	193	103	90	167	500	336

Dimension E										
DN [mm]	EN (DIN)				ASME		AS		JIS	
	PN 10 [mm]	PN 16 [mm]	PN 25 [mm]	PN 40 [mm]	Class 150 [mm]	Class 300 [mm]	Table E [mm]	PN 16 [mm]	10K [mm]	20K [mm]
25	–	–	–	140	140	140	140	–	140	140
32	–	–	–	140	–	–	–	–	140	140
40	–	–	–	150	140	155	–	–	140	140
50	–	–	–	165	153	165	150	150	155	155
65	–	185	–	185	–	–	–	–	175	175
80	–	200	–	200	191	210	185	185	185	200
100	–	220	–	325	229	254	215	215	210	225

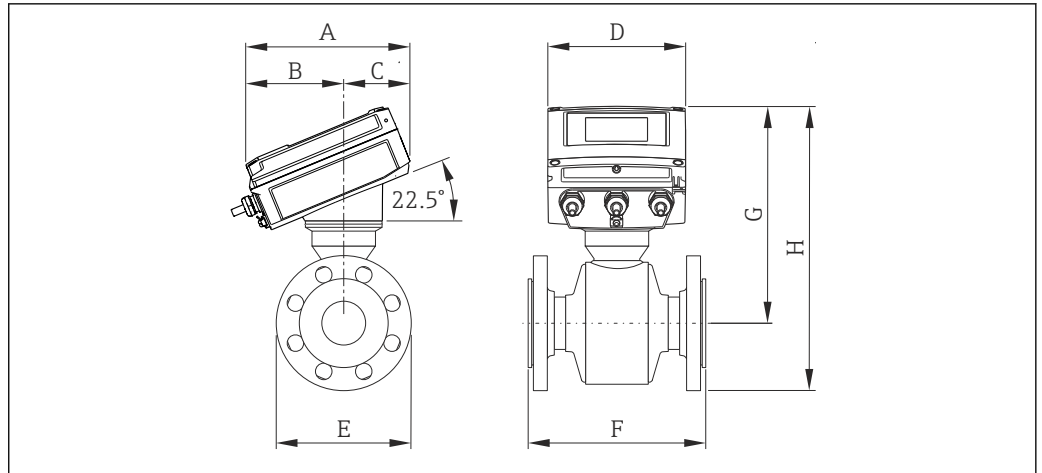
Dimension E										
DN	EN (DIN)				ASME		AS		JIS	
	PN 10	PN 16	PN 25	PN 40	Class 150	Class 300	Table E	PN 16	10K	20K
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
125	–	250	–	270	–	–	–	–	250	270
150	–	285	–	300	280	318	280	280	280	305
200	340	340	360	–	343	–	335	335	330	350
250	395	405	425	–	407	–	405	405	400	430
300	445	460	485	–	483	–	455	455	445	480

Dimension H										
DN	EN (DIN)				ASME		AS		JIS	
	PN 10	PN 16	PN 25	PN 40	Class 150	Class 300	Table E	PN 16	10K	20K
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	–	–	–	258	258	258	258	–	258	258
32	–	–	–	258	–	–	–	–	258	258
40	–	–	–	262	258	265	–	–	258	258
50	–	–	–	270	263	270	262	262	265	265
65	–	293	–	293	–	–	–	–	288	288
80	–	305	–	305	300	309	298	298	298	305
100	–	328	–	380	331	344	325	325	323	330
125	–	355	–	365	–	–	–	–	355	365
150	–	394	–	402	391	410	393	393	393	404
200	448	448	458	–	448	–	445	445	443	452
250	508	513	523	–	514	–	513	513	511	526
300	558	566	578	–	578	–	563	563	558	576

Order code for "Sensor option", option CA in combination with order code for "Calibration flow", options A/B/D/E/F/G/H/K/M/N



- Order code for "Calibration flow", options A/B/D/E/F/G/H/K/M/N available for order in conjunction with order code for "Housing", option Q "Compact, polycarbonate, inclined"
- Order code for "Calibration flow", options H/K also available for order in conjunction with order code for "Housing", option R "Compact, aluminum, coated, inclined"



A0021329

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	F [mm]	G [mm]
25	199	119	80	167	200	232
32	199	119	80	167	200	232
40	199	119	80	167	200	232
50	199	119	80	167	200	232
65	199	119	80	167	200	244
80	199	119	80	167	200	249
100	199	119	80	167	250	262
125	199	119	80	167	250	275
150	199	119	80	167	300	296
200	199	119	80	167	350	322
250	199	119	80	167	450	355
300	199	119	80	167	500	380

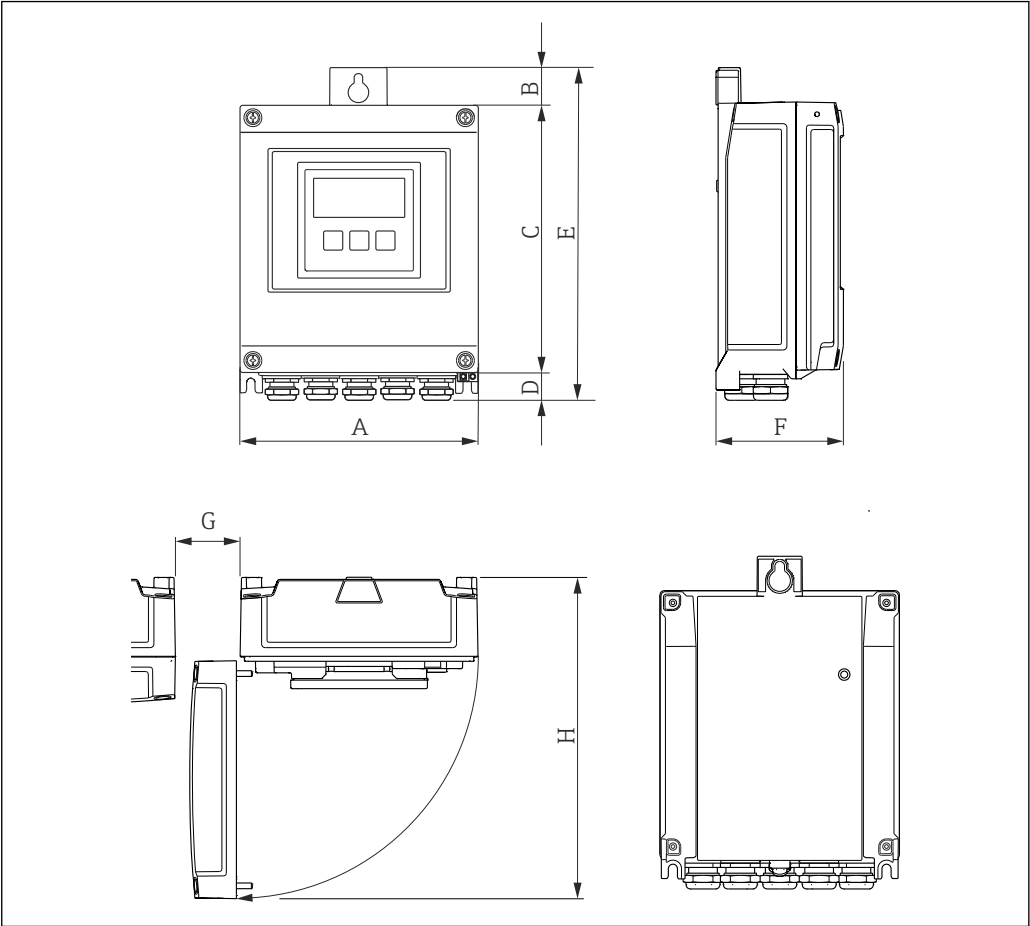
Dimension E										
DN [mm]	EN (DIN)				ASME		AS		JIS	
	PN 10 [mm]	PN 16 [mm]	PN 25 [mm]	PN 40 [mm]	Class 150 [mm]	Class 300 [mm]	Table E [mm]	PN 16 [mm]	10K [mm]	20K [mm]
25	-	-	-	140	140	140	140	-	140	140
32	-	-	-	140	-	-	-	-	140	140
40	-	-	-	150	140	155	-	-	140	140
50	-	-	-	165	153	165	150	150	155	155
65	-	185	-	185	-	-	-	-	175	175
80	-	200	-	200	191	210	185	185	185	200
100	-	220	-	325	229	254	215	215	210	225
125	-	250	-	270	-	-	-	-	250	270
150	-	285	-	300	280	318	280	280	280	305
200	340	340	360	-	343	-	335	335	330	350

Dimension E										
DN	EN (DIN)				ASME		AS		JIS	
	PN 10	PN 16	PN 25	PN 40	Class 150	Class 300	Table E	PN 16	10K	20K
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
250	395	405	425	–	407	–	405	405	400	430
300	445	460	485	–	483	–	455	455	445	480

Dimension H										
DN	EN (DIN)				ASME		AS		JIS	
	PN 10	PN 16	PN 25	PN 40	Class 150	Class 300	Table E	PN 16	10K	20K
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	–	–	–	302	302	302	302	–	302	302
32	–	–	–	302	–	–	–	–	302	302
40	–	–	–	307	302	310	–	–	302	302
50	–	–	–	315	309	315	307	307	310	310
65	–	337	–	337	–	–	–	–	332	332
80	–	349	–	349	345	354	342	342	342	349
100	–	372	–	425	377	389	370	370	367	375
125	–	400	–	410	–	–	–	–	400	410
150	–	439	–	446	436	455	436	436	436	449
200	492	492	502	–	494	–	490	490	487	497
250	553	558	568	–	559	–	558	558	555	570
300	603	610	623	–	622	–	608	608	603	620

Transmitter remote version

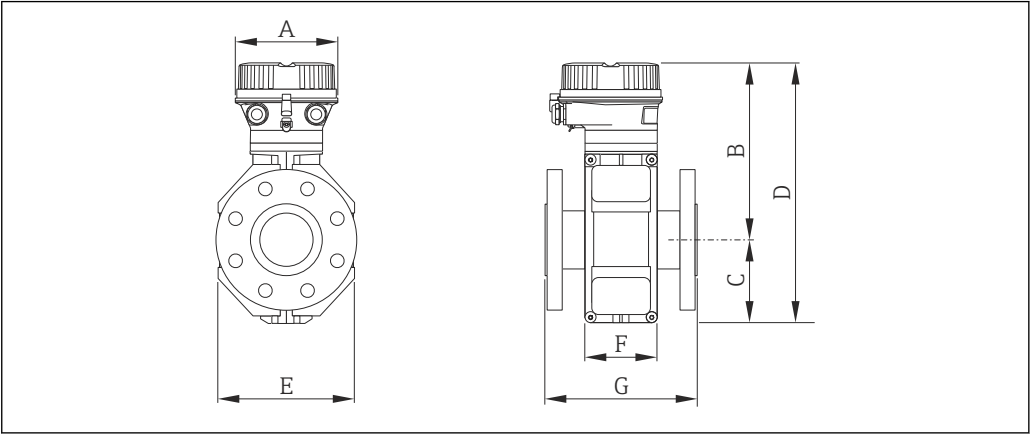
Order code for "Housing", option N "Remote, polycarbonate" or option P "Remote, aluminum coated"



A0020522

A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	H [mm]
167	24	187	21	232	80	50	240

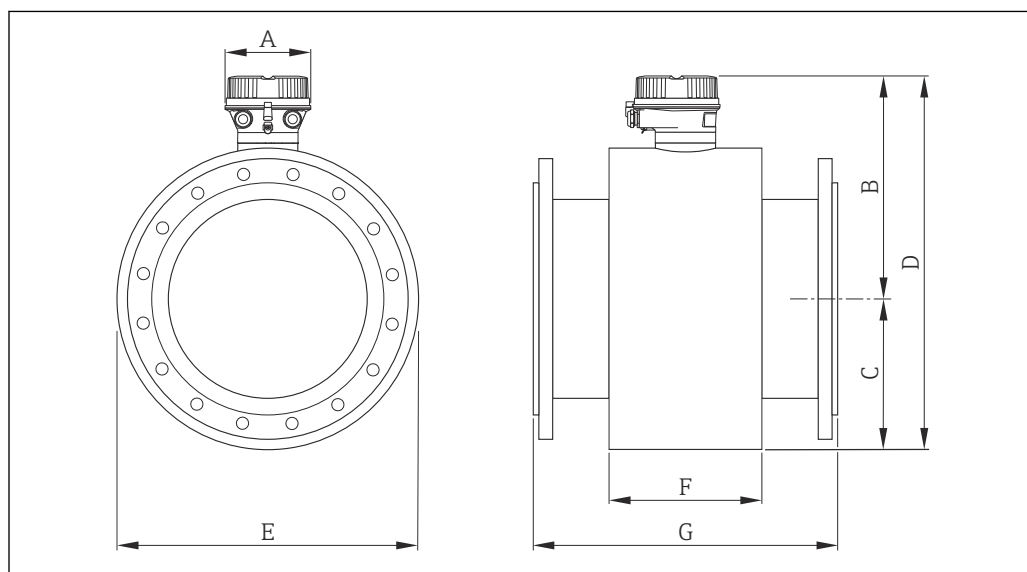
Sensor remote version



A0017282

DN ¹⁾ [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G ²⁾ [mm]
25	136	207	84	291	120	94	200
32	136	207	84	291	120	94	200
40	136	207	84	291	120	94	200
50	136	207	84	291	120	94	200
65	136	232	109	341	180	94	200
80	136	232	109	341	180	94	200
100	136	232	109	341	180	94	250
125	136	272	150	422	260	140	250
150	136	272	150	422	260	140	300
200	136	297	180	477	324	156	350
250	136	322	205	527	400	156	450
300	136	347	230	577	460	166	500

- 1) EN (DIN), AS, JIS; For flanges according to AS, only nominal diameters DN 80, 100 and 150 to 300 are available.
- 2) The length is independent of the selected pressure rating. Length in accordance with DVGW/ISO.



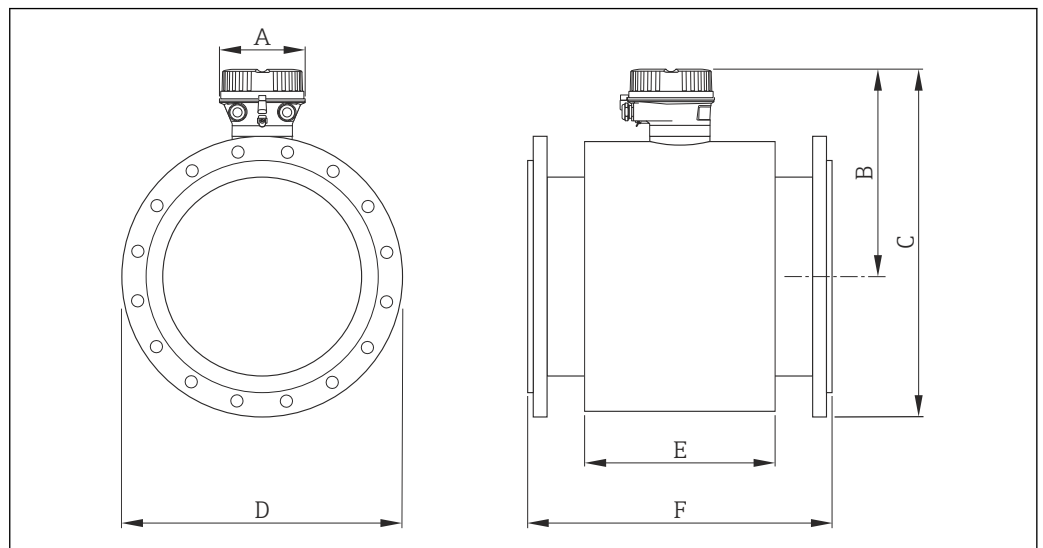
A0017283

DN ¹⁾ [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G ²⁾ [mm]
350	136	407	282	689	564	276	550
375	136	433	308	741	616	276	600
400	136	433	308	741	616	276	600
450	136	458	333	791	666	292	650
500	136	483	359	842	717	292	650
600	136	535	411	946	821	402	780
700	136	637	512	1149	1024	589	910
750	136	637	512	1149	1024	626	975
800	136	658	534	1192	1067	647	1040

DN ¹⁾ [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G ²⁾ [mm]
900	136	735	610	1345	1220	785	1170
1000	136	811	686	1497	1372	862	1300
1050	136	837	712	1549	1424	912	1365
1200	136	936	811	1747	1622	992	1560
1350	136	1037	912	1949	1824	1252	1755
1400	136	1112	987	2099	1974	1252	1820
1500	136	1136	1011	2147	2022	1392	1950
1600	136	1181	1056	2237	2112	1482	2080
1650	136	1218	1093	2311	2186	1482	2145
1800	136	1313	1188	2501	2376	1632	2340
2000	136	1363	1238	2601	2476	1732	2600

- 1) EN (DIN), AS; For flanges according to AS, only nominal diameters DN 350, 400, 500 and 600 are available.
2) The length is independent of the selected pressure rating. Length in accordance with DVGW/ISO.

Order code for "Design", option A "Insertion length short"



A0017284

DN [mm]	A [mm]	B [mm]	E [mm]	F [mm]
350	136	358	290	550
375	136	384	290	600
400	136	384	290	600
450	136	412	290	600
500	136	437	290	600
600	136	478	290	600
700	136	543	424	700
750	136	579	454	750
800	136	599	500	800
900	136	649	580	900

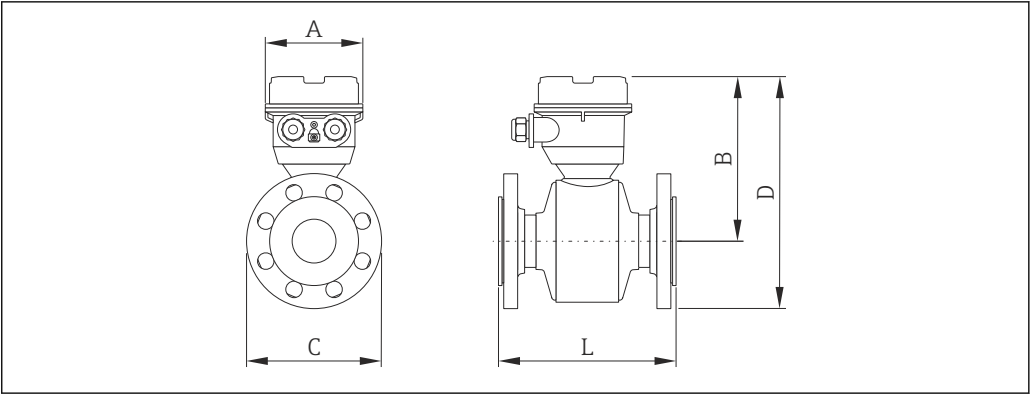
DN [mm]	A [mm]	B [mm]	E [mm]	F [mm]
1000	136	699	660	1000
1050	136	735	755	1050
1200	136	813	828	1200
1350	136	925	1008	1350
1400	136	925	1008	1400
1500	136	1025	1147	1500
1600	136	1025	1147	1600
1650	136	1076	1284	1650
1800	136	1133	1379	1800
2000	136	1244	1569	2000

DN [mm]	Dimension C					Dimension D				
	EN (DIN)			ASME	AS	EN (DIN)			ASME	AS
	PN 6 [mm]	PN 10 [mm]	PN 16 [mm]	AWWA [mm]	[mm]	PN 6 [mm]	PN 10 [mm]	PN 16 [mm]	AWWA [mm]	[mm]
350	603	610	616	625	620	490	505	520	533	525
375	–	–	–	–	659	–	–	–	–	550
400	654	666	672	682	674	540	565	580	597	580
450	709	719	729	729	732	595	615	640	635	640
500	759	772	791	786	789	645	670	715	699	705
600	855	868	903	884	890	755	780	840	813	825
700	973	990	1009	1006	998	860	895	910	927	910
750	–	–	–	1072	1078	–	–	–	984	995
800	1087	1107	1123	1129	1129	975	1015	1025	1060	1060
900	1187	1207	1223	1233	1237	1075	1115	1125	1168	1175
1000	1287	1314	1338	1344	1327	1175	1230	1225	1289	1255
1050	–	–	–	1408	–	–	–	–	1346	–
1200	1516	1541	1567	1569	1558	1405	1455	1255	1511	1490
1350	–	–	–	1767	–	–	–	–	1683	–
1400	1740	1763	1779	–	–	1630	1675	1685	–	–
1500	–	–	–	1952	–	–	–	–	1854	–
1600	1940	1983	2002	–	–	1830	1915	1930	–	–
1650	–	–	–	2092	–	–	–	–	2032	–
1800	2155	2190	2209	2231	–	2045	2115	2130	2197	–
2000	2376	2406	2427	2425	–	2265	2325	2345	2362	–

Order code for "Sensor option", option CA...CE "Corrosion protection"

Option	Description
CA	IP66/67, Type 4X, fully welded; corrosion protection EN ISO 12944 C5-M
CB	IP68, Type 6P, fact-potted; corrosion protection EN ISO 12944 C5-M/Im1/Im2/Im3
CC	IP68, Type 6P, cust-potted; corrosion protection EN ISO 12944 C5-M/Im1/Im2/Im3

Option	Description
CD	Buried IP68, Type 6P, fact-potted; corrosion protection EN ISO 12944 Im2/Im3
CE	Buried IP68, Type 6P, cust-potted; corrosion protection EN ISO 12944 Im2/Im3



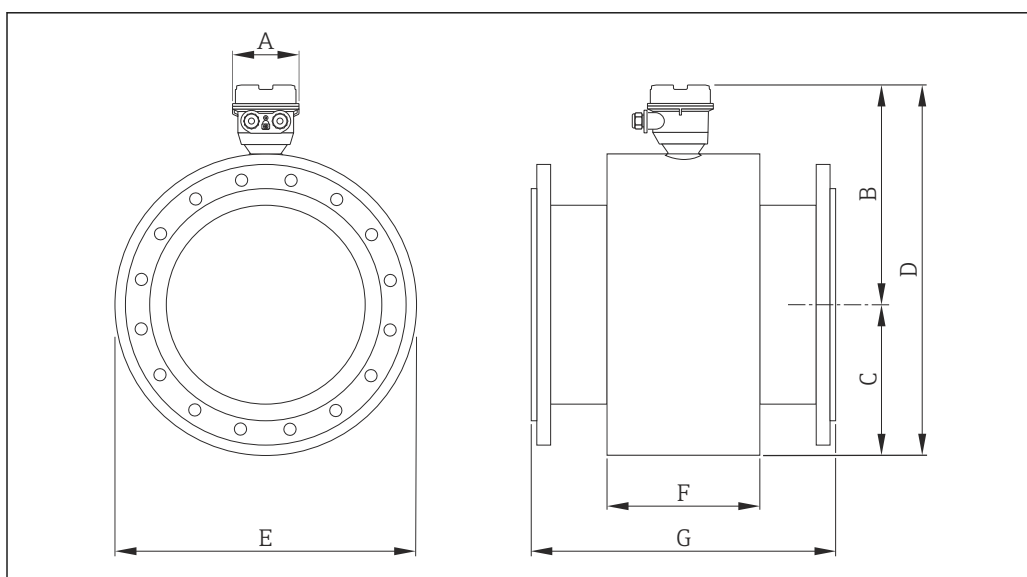
A0020399

DN [mm]	A [mm]	B [mm]	L [mm]
25	112	189	200
32	112	189	200
40	112	189	200
50	112	189	200
65	112	202	200
80	112	207	200
100	112	219	250
125	112	232	250
150	112	254	300
200	112	279	350
250	112	313	450
300	112	338	500

Dimension C										
DN [mm]	EN (DIN)				ASME		AS		JIS	
	PN 10 [mm]	PN 16 [mm]	PN 25 [mm]	PN 40 [mm]	Class 150 [mm]	Class 300 [mm]	Table E [mm]	PN 16 [mm]	10K [mm]	20K [mm]
25	–	–	–	140	110	140	140	–	140	140
32	–	–	–	140	–	–	–	–	140	140
40	–	–	–	150	125	155	–	–	140	140
50	–	–	–	165	150	165	150	150	155	155
65	–	185	–	185	–	–	–	–	175	175
80	–	200	–	200	190	209.6	185	185	185	200
100	–	220	–	325	230	254	215	215	210	225
125	–	250	–	270	–	–	–	–	250	270
150	–	285	–	300	280	317.5	280	280	280	305

Dimension C										
DN	EN (DIN)				ASME		AS		JIS	
	PN 10	PN 16	PN 25	PN 40	Class 150	Class 300	Table E	PN 16	10K	20K
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
200	340	340	360	–	345	–	335	335	330	350
250	395	405	425	–	405	–	405	405	400	430
300	445	460	485	–	485	–	455	455	445	480

Dimension D										
DN	EN (DIN)				ASME		AS		JIS	
	PN 10	PN 16	PN 25	PN 40	Class 150	Class 300	Table E	PN 16	10K	20K
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	–	–	–	260	260	260	260	–	260	260
32	–	–	–	260	–	–	–	–	260	260
40	–	–	–	264	260	267	–	–	260	260
50	–	–	–	272	265	272	264	264	267	267
65	–	295	–	295	–	–	–	–	290	290
80	–	307	–	307	302	311	300	300	300	307
100	–	330	–	382	333	346	327	327	325	332
125	–	357	–	367	–	–	–	–	357	367
150	–	396	–	404	393	412	395	395	395	406
200	450	450	460	–	450	–	447	447	445	454
250	510	515	525	–	516	–	515	515	513	528
300	560	568	580	–	580	–	565	565	560	578



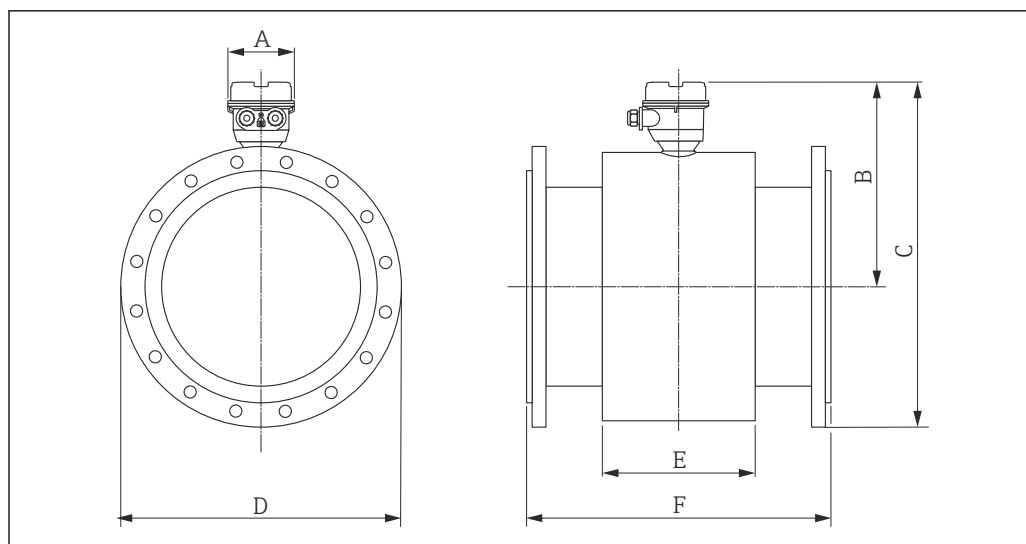
A0020435

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G ¹⁾ [mm]
350	112	395	282	677	564	276	550
375	112	421	308	729	616	276	600
400	112	421	308	729	616	276	600
450	112	446	333	779	666	292	650
500	112	472	359	830	717	292	650
600	112	524	411	934	821	402	780
700	112	625	512	1137	1024	589	910
750	112	625	512	1137	1024	626	975
800	112	647	534	1180	1067	647	1040
900	112	723	610	1333	1220	785	1170
1000	112	799	686	1485	1372	862	1300
1050	112	825	712	1537	1424	912	1365
1200	112	924	811	1735	1622	992	1560
1350	112	1025	912	1937	1824	1252	1755
1400	112	1100	987	2087	1974	1252	1820
1500	112	1124	1011	2135	2022	1392	1950
1600	112	1169	1056	2225	2112	1482	2080
1650	112	1206	1093	2299	2186	1482	2145
1800	112	1301	1188	2489	2376	1632	2340
2000	112	1351	1238	2589	2476	1732	2600

1) The length is independent of the selected pressure rating. Length in accordance with DVGW/ISO.

Order code for "Design", option A "Insertion length short" and order code for "Sensor option", option CA...CE "Corrosion protection"

Option	Description
CA	IP66/67, Type 4X, fully welded; corrosion protection EN ISO 12944 C5-M
CB	IP68, Type 6P, fact-potted; corrosion protection EN ISO 12944 C5-M/Im1/Im2/Im3
CC	IP68, Type 6P, cust-potted; corrosion protection EN ISO 12944 C5-M/Im1/Im2/Im3
CD	Buried IP68, Type 6P, fact-potted; corrosion protection EN ISO 12944 Im2/Im3
CE	Buried IP68, Type 6P, cust-potted; corrosion protection EN ISO 12944 Im2/Im3



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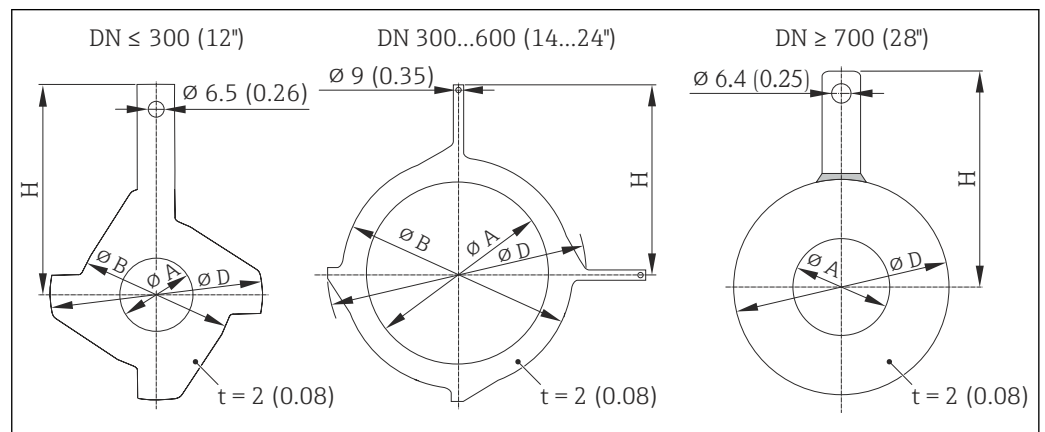
DN [mm]	A [mm]	B [mm]	E [mm]	F [mm]
350	112	350	290	550
375	112	376	290	600
400	112	376	290	600
450	112	403	290	600
500	112	428	290	600
600	112	478	290	600
700	112	549	424	700
750	112	586	454	750
800	112	605	500	800
900	112	655	580	900
1000	112	705	660	1000
1050	112	741	755	1050
1200	112	819	828	1200
1350	112	931	1008	1350
1400	112	931	1008	1400
1500	112	1031	1147	1500
1600	112	1031	1147	1600
1650	112	1082	1284	1650
1800	112	1139	1379	1800
2000	112	1250	1569	2000

DN [mm]	Dimension C					Dimension D				
	EN (DIN)			ASME	AS	EN (DIN)			ASME	AS
	PN 6 [mm]	PN 10 [mm]	PN 16 [mm]	AWWA [mm]	[mm]	PN 6 [mm]	PN 10 [mm]	PN 16 [mm]	AWWA [mm]	[mm]
350	595	603	610	–	613	490	505	520	–	525
375	–	–	–	–	651	–	–	–	–	550

DN [mm]	Dimension C					Dimension D				
	EN (DIN)			ASME	AS	EN (DIN)			ASME	AS
	PN 6 [mm]	PN 10 [mm]	PN 16 [mm]	AWWA [mm]	[mm]	PN 6 [mm]	PN 10 [mm]	PN 16 [mm]	AWWA [mm]	[mm]
400	646	659	666	–	666	540	565	580	–	580
450	701	711	723	–	723	595	615	640	–	640
500	751	763	786	–	781	645	670	715	–	705
600	856	868	898	–	891	755	780	840	–	825
700	979	996	1004	1012	1004	860	895	910	927	910
750	–	–	–	1078	1084	–	–	–	984	995
800	1093	1113	1118	1135	1135	975	1015	1025	1060	1060
900	1193	1213	1218	1239	1243	1075	1115	1125	1168	1175
1000	1293	1320	1333	1350	1333	1175	1230	1225	1289	1255
1050	–	–	–	1414	–	–	–	–	1346	–
1200	1522	1547	1562	1575	1564	1405	1455	1255	1511	1490
1350	–	–	–	1773	–	–	–	–	1683	–
1400	1746	1769	1774	–	–	1630	1675	1685	–	–
1500	–	–	–	1958	–	–	–	–	1854	–
1600	1946	1989	1997	–	–	1830	1915	1930	–	–
1650	–	–	–	2098	–	–	–	–	2032	–
1800	2161	2196	2204	2237	–	2045	2115	2130	2197	–
2000	2382	2412	2422	2431	–	2265	2325	2345	2362	–

Accessories

Ground disks for flange connections



32 Engineering unit mm (in)

DN [mm]	Pressure rating	A [mm]	B [mm]	D [mm]	H [mm]
25	1)	26	62	77.5	87.5
32	1)	35	80	87.5	94.5
40	1)	41	82	101	103

DN [mm]	Pressure rating	A [mm]	B [mm]	D [mm]	H [mm]
50	¹⁾	52	101	115.5	108
65	¹⁾	68	121	131.5	118
80	¹⁾	80	131	154.5	135
100	¹⁾	104	156	186.5	153
125	¹⁾	130	187	206.5	160
150	¹⁾	158	217	256	184
200	¹⁾	206	267	288	205
250	¹⁾	260	328	359	240
300	¹⁾	312	375	413	273
350	DIN, PN 6	343	433	479	365
350	DIN, PN 10	343	400	479	365
350	ASME, Class 150	343	400	479	365
400	DIN, PN 6	393	470	542	395
400	DIN, PN 10	393	469	542	395
400	ASME, Class 150	393	469	542	395
450	DIN, PN 6	439	525	583	417
450	DIN, PN 10	439	535	583	417
450	ASME, Class 150	439	535	583	417
500	DIN, PN 6	493	575	650	460
500	DIN, PN 10	493	588	650	460
500	ASME, Class 150	493	588	650	460
600	DIN, PN 6	593	676	766	522
600	DIN, PN 10	593	688	766	522
600	ASME, Class 150	593	688	766	522
700	DIN, PN 6	697	–	786	460
700	DIN, PN 10	693	–	813	480
700	AS, PN 16	687	–	807	490
700	AWWA, Class D	693	–	832	494
750	AWWA, Class D	743	–	833	523
800	DIN, PN 6	799	–	893	520
800	DIN, PN 10	795	–	920	540
800	AS, PN 16	789	–	914	550
800	AWWA, Class D	795	–	940	561
900	DIN, PN 6	897	–	993	570
900	DIN, PN 10	893	–	1020	590
900	AS, PN 16	886	–	1014	595
900	AWWA, Class D	893	–	1048	615
1000	DIN, PN 6	999	–	1093	620
1000	DIN, PN 10	995	–	1127	650

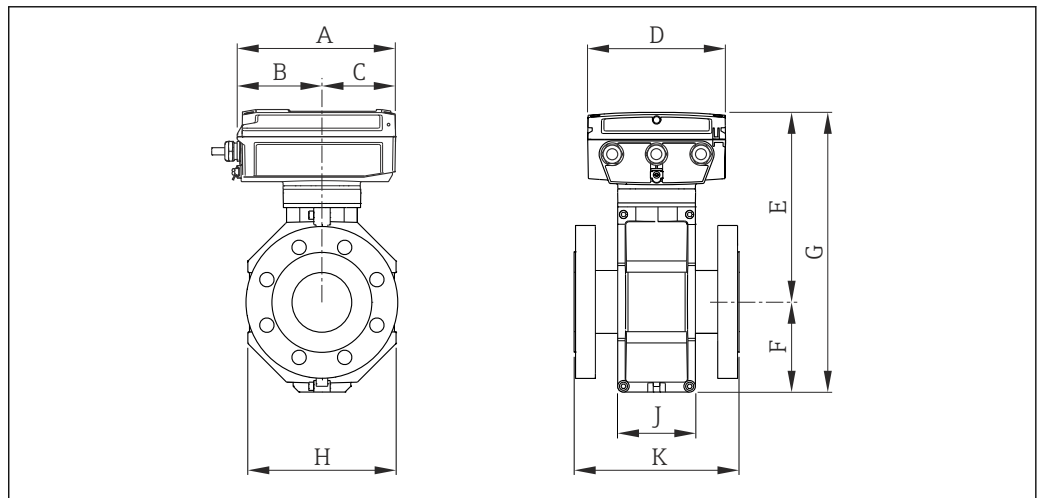
DN [mm]	Pressure rating	A [mm]	B [mm]	D [mm]	H [mm]
1000	AS, PN 16	988	–	1131	660
1000	AWWA, Class D	995	–	1163	675
1050	AWWA, Class D	1044	–	1220	704
1200	DIN, PN 6	1203	–	1310	733

- 1) Ground disks can be used for all the flange standards/pressure ratings which can be supplied in the standard version.

Dimensions in US units

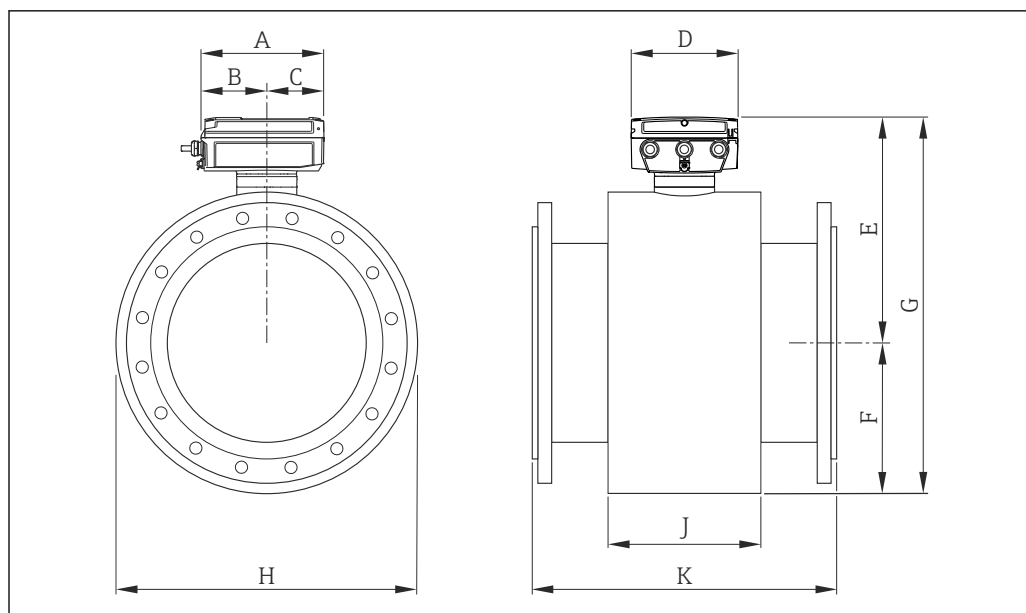
Compact version

Order code for "Housing", option M "Compact, polycarbonate" or option A "Compact, aluminum, coated"



DN ¹⁾ [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G [in]	H [in]	J [in]	K ²⁾ [in]
1	7.60	4.06	3.54	6.57	8.74	3.31	12.1	4.72	3.70	7.87
1 ½	7.60	4.06	3.54	6.57	8.74	3.31	12.1	4.72	3.70	7.87
2	7.60	4.06	3.54	6.57	8.74	3.31	12.1	4.72	3.70	7.87
3	7.60	4.06	3.54	6.57	9.72	4.29	14.0	7.09	3.70	7.87
4	7.60	4.06	3.54	6.57	9.72	4.29	14.0	7.09	3.70	9.84
6	7.60	4.06	3.54	6.57	11.3	5.91	17.2	10.2	5.51	11.8
8	7.60	4.06	3.54	6.57	12.3	7.09	19.4	12.8	6.14	13.8
10	7.60	4.06	3.54	6.57	13.3	8.07	21.4	15.8	6.14	17.7
12	7.60	4.06	3.54	6.57	14.3	9.06	23.4	18.1	6.54	19.7

- 1) ASME
2) The length is independent of the selected pressure rating. Length in accordance with DVGW/ISO.

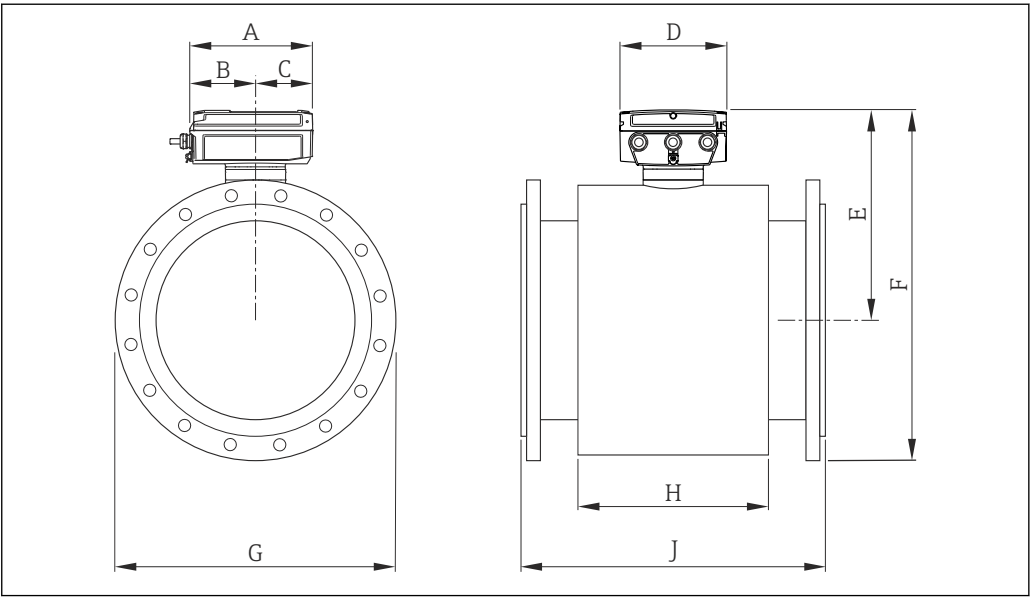


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DN ¹⁾ [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G [in]	H [in]	J [in]	K ²⁾ [in]
14	7.60	4.06	3.54	6.57	17.0	11.1	28.1	22.2	10.9	21.7
15	7.60	4.06	3.54	6.57	18.0	12.1	30.1	24.2	10.9	23.6
16	7.60	4.06	3.54	6.57	18.0	12.1	30.1	24.2	10.9	23.6
18	7.60	4.06	3.54	6.57	19.0	13.1	32.1	26.2	11.5	25.6
20	7.60	4.06	3.54	6.57	20.0	14.1	34.1	28.2	11.5	25.6
24	7.60	4.06	3.54	6.57	22.1	16.2	38.3	32.3	15.8	30.7
28	7.60	4.06	3.54	6.57	26.1	20.1	46.2	40.3	23.2	35.8
30	7.60	4.06	3.54	6.57	26.1	20.1	46.2	40.3	24.6	38.4
32	7.60	4.06	3.54	6.57	26.9	21.0	47.9	42.0	25.5	40.9
36	7.60	4.06	3.54	6.57	29.9	24.0	53.9	48.0	30.9	46.0
40	7.60	4.06	3.54	6.57	32.9	27.0	59.9	54.0	33.9	51.2
42	7.60	4.06	3.54	6.57	33.9	28.0	61.9	56.0	35.9	53.7
48	7.60	4.06	3.54	6.57	37.8	31.9	69.7	63.8	39.0	61.4
54	7.60	4.06	3.54	6.57	41.8	35.9	77.7	71.8	42.3	69.1
60	7.60	4.06	3.54	6.57	45.7	39.8	85.5	79.6	54.8	76.8
66	7.60	4.06	3.54	6.57	48.9	43.0	91.9	86.0	58.4	84.4
72	7.60	4.06	3.54	6.57	52.7	46.8	99.5	93.5	64.2	92.1
78	7.60	4.06	3.54	6.57	54.7	48.7	103.4	97.5	68.2	102.3

- 1) ASME, AWWA; flanges ≤ 24 in only available according to ASME, flanges ≥ 28 in only available according to AWWA.
- 2) The length is independent of the selected pressure rating. Length in accordance with DVGW/ISO.

Order code for "Housing", option M "Compact, polycarbonate" or option A "Compact, aluminum, coated";
order code for "Design", option A "Insertion length short"

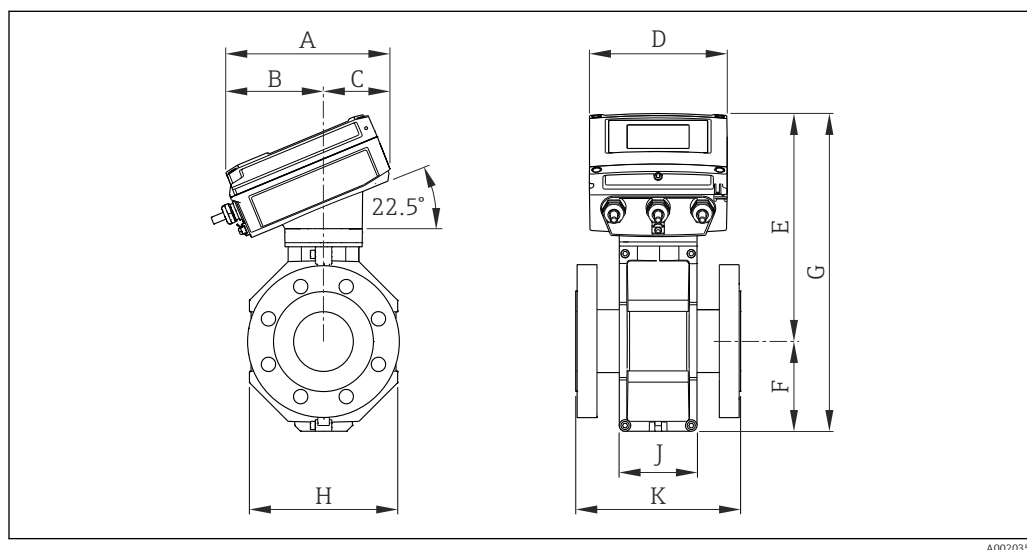


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DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	H [in]	J [in]
14	7.60	4.06	3.54	6.57	15.2	11.4	21.6
15	7.60	4.06	3.54	6.57	16.2	11.4	23.6
16	7.60	4.06	3.54	6.57	16.2	11.4	23.6
18	7.60	4.06	3.54	6.57	17.3	11.4	23.6
20	7.60	4.06	3.54	6.57	18.3	11.4	23.6
24	7.60	4.06	3.54	6.57	19.9	11.4	23.6
28	7.60	4.06	3.54	6.57	22.5	16.7	27.6
30	7.60	4.06	3.54	6.57	23.9	17.9	29.5
32	7.60	4.06	3.54	6.57	24.7	19.7	31.5
36	7.60	4.06	3.54	6.57	26.6	22.8	35.4
40	7.60	4.06	3.54	6.57	28.6	26.0	39.4
42	7.60	4.06	3.54	6.57	30.0	29.7	41.3
48	7.60	4.06	3.54	6.57	33.1	32.6	47.2
54	7.60	4.06	3.54	6.57	37.5	39.7	53.1
60	7.60	4.06	3.54	6.57	41.4	45.2	59.0
66	7.60	4.06	3.54	6.57	43.4	50.6	64.9
72	7.60	4.06	3.54	6.57	45.7	54.3	70.8
78	7.60	4.06	3.54	6.57	50.1	61.8	78.7

DN [in]	Dimension F					Dimension G				
	EN (DIN)			ASME	AS	EN (DIN)			ASME	AS
	PN 6 [in]	PN 10 [in]	PN 16 [in]	AWWA [in]	[in]	PN 6 [in]	PN 10 [in]	PN 16 [in]	AWWA [in]	[in]
14	24.8	25.1	27.6	25.7	25.5	19.3	19.9	20.5	21.0	20.7
15	–	–	–	–	27	–	–	–	–	21.7
16	26.8	27.3	30.0	27.0	27.6	21.3	22.2	22.8	23.5	22.8
18	29.0	29.4	32.4	29.8	29.9	23.4	24.2	25.2	25.0	25.2
20	31.0	31.5	36.5	32.0	32.1	25.4	26.4	28.1	27.5	27.8
24	34.7	35.3	40.4	35.9	36.1	29.7	30.7	33.1	32.0	32.5
28	39.4	40.1	45.1	40.7	40.4	33.9	35.2	35.8	36.5	35.8
30	–	–	–	43.3	43.5	–	–	–	38.7	39.2
32	43.9	44.7	48.8	45.5	45.5	38.4	40.0	40.4	41.7	41.7
36	47.8	48.6	48.8	49.6	49.8	42.3	43.9	44.3	46.0	46.3
40	51.7	52.8	53.4	54.0	53.3	46.3	48.4	48.2	50.7	49.4
42	–	–	–	56.5	–	–	–	–	53.0	–
48	60.8	61.7	62.4	62.9	62.4	55.3	57.3	49.4	59.5	58.7
54	–	–	–	70.6	–	–	–	–	66.3	–
60	–	–	–	77.9	–	–	–	–	73.0	–
66	–	–	–	83.4	–	–	–	–	80.0	–
72	85.9	87.3	87.6	88.9	–	80.5	83.3	83.9	86.5	–
78	94.6	95.8	96.2	96.6	–	89.2	91.5	92.3	93.0	–

Order code for "Housing", option Q "Compact, polycarbonate, inclined" or option R "Compact, aluminum, coated, inclined"



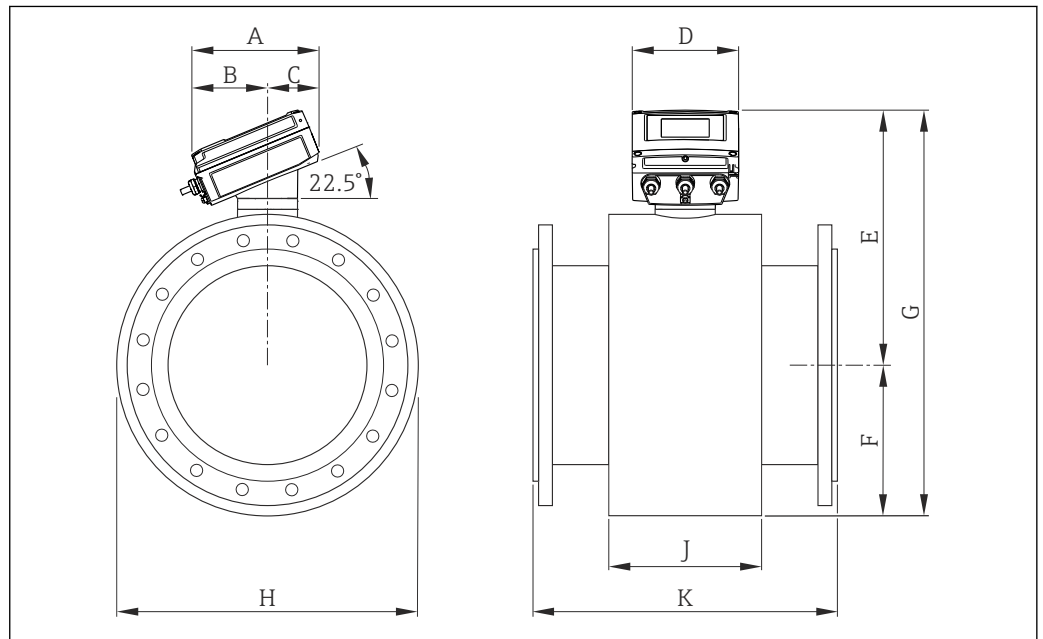
A0020353

DN ¹⁾ [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G [in]	H [in]	J [in]	K ²⁾ [in]
1	7.83	4.69	3.15	6.57	10.5	3.31	13.8	4.72	3.70	7.87
1 ½	7.83	4.69	3.15	6.57	10.5	3.31	13.8	4.72	3.70	7.87
2	7.83	4.69	3.15	6.57	10.5	3.31	13.8	4.72	3.70	7.87

DN ¹⁾	A	B	C	D	E	F	G	H	J	K ²⁾
[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
3	7.83	4.69	3.15	6.57	11.5	4.29	15.8	7.09	3.70	7.87
4	7.83	4.69	3.15	6.57	11.5	4.29	15.8	7.09	3.70	9.84
6	7.83	4.69	3.15	6.57	13.1	5.91	19.0	10.2	5.51	11.8
8	7.83	4.69	3.15	6.57	14.0	7.09	21.1	12.8	6.14	13.8
10	7.83	4.69	3.15	6.57	15.0	8.07	23.1	15.8	6.14	17.7
12	7.83	4.69	3.15	6.57	16.0	9.06	25.1	18.1	6.54	19.7

1) ASME

2) The length is independent of the selected pressure rating. Length in accordance with DVGW/ISO.

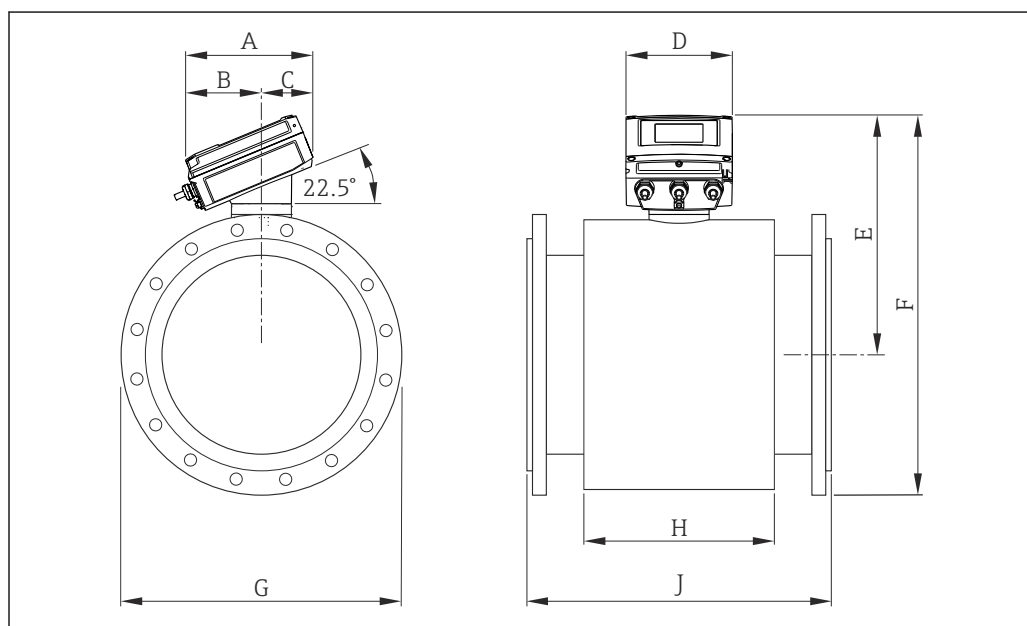


DN ¹⁾	A	B	C	D	E	F	G	H	J	K ²⁾
[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
14	7.83	4.69	3.15	6.57	18.8	11.1	29.9	22.2	10.9	21.7
15	7.83	4.69	3.15	6.57	19.8	12.1	31.9	24.2	10.9	23.6
16	7.83	4.69	3.15	6.57	19.8	12.1	31.9	24.2	10.9	23.6
18	7.83	4.69	3.15	6.57	20.8	13.1	33.9	26.2	11.5	25.6
20	7.83	4.69	3.15	6.57	21.8	14.1	35.9	28.2	11.5	25.6
24	7.83	4.69	3.15	6.57	23.8	16.2	40.0	32.3	15.8	30.7
28	7.83	4.69	3.15	6.57	27.8	20.2	48.0	40.3	23.2	35.8
30	7.83	4.69	3.15	6.57	27.8	20.2	48.0	40.3	24.6	38.4
32	7.83	4.69	3.15	6.57	28.7	21.0	49.7	42.0	25.5	40.9
36	7.83	4.69	3.15	6.57	32.7	24.0	55.7	48.0	30.9	46.0
40	7.83	4.69	3.15	6.57	34.7	27.0	61.7	54.0	33.9	51.2
42	7.83	4.69	3.15	6.57	35.7	28.0	63.7	56.0	35.9	53.7
48	7.83	4.69	3.15	6.57	39.6	31.9	71.5	63.8	39.0	61.4
54	7.83	4.69	3.15	6.57	43.6	35.9	79.5	71.8	42.3	69.1

DN ¹⁾	A	B	C	D	E	F	G	H	J	K ²⁾
[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
60	7.83	4.69	3.15	6.57	47.5	39.8	87.3	79.6	54.8	76.8
66	7.83	4.69	3.15	6.57	50.7	43.0	93.7	86.0	58.4	84.4
72	7.83	4.69	3.15	6.57	54.4	46.8	101.2	93.5	64.2	92.1
78	7.83	4.69	3.15	6.57	56.4	48.8	105.2	97.5	68.2	102.3

- 1) ASME, AWWA; flanges ≤ 24 in only available according to ASME, flanges ≥ 28 in only available according to AWWA.
2) The length is independent of the selected pressure rating. Length in accordance with DVGW/ISO.

Order code for "Housing", option Q "Compact, polycarbonate, inclined" or option R "Compact, aluminum, coated, inclined"; order code for "Design", option A "Insertion length short"



A0020393

DN	A	B	C	D	E	H	J
[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
14	7.83	4.69	3.15	6.57	17.0	11.4	21.6
15	7.83	4.69	3.15	6.57	18.0	11.4	23.6
16	7.83	4.69	3.15	6.57	18.0	11.4	23.6
18	7.83	4.69	3.15	6.57	19.1	11.4	23.6
20	7.83	4.69	3.15	6.57	20.1	11.4	23.6
24	7.83	4.69	3.15	6.57	21.7	11.4	23.6
28	7.83	4.69	3.15	6.57	24.3	16.7	27.6
30	7.83	4.69	3.15	6.57	25.7	17.9	29.5
32	7.83	4.69	3.15	6.57	26.5	19.7	31.5
36	7.83	4.69	3.15	6.57	28.4	22.8	35.4
40	7.83	4.69	3.15	6.57	30.4	26.0	39.4
42	7.83	4.69	3.15	6.57	31.8	29.7	41.3
48	7.83	4.69	3.15	6.57	34.9	32.6	47.2
54	7.83	4.69	3.15	6.57	39.3	39.7	53.1

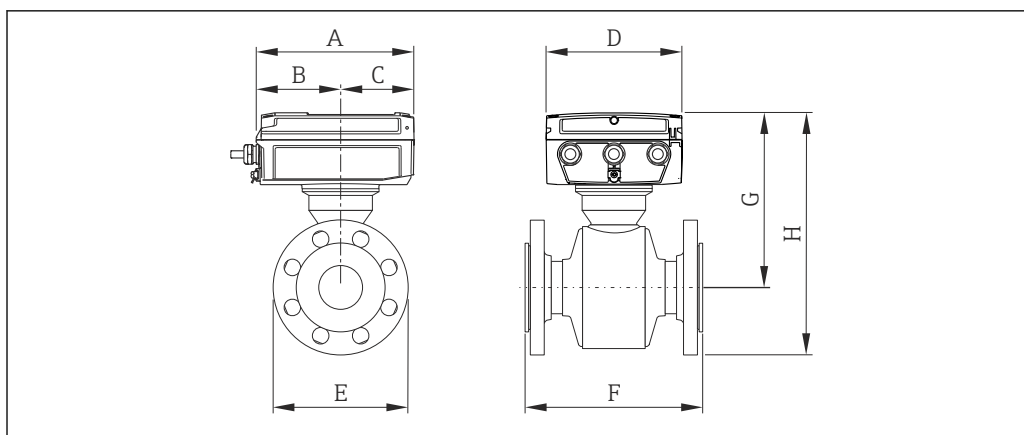
DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	H [in]	J [in]
60	7.83	4.69	3.15	6.57	43.2	45.2	59.0
66	7.83	4.69	3.15	6.57	45.2	50.6	64.9
72	7.83	4.69	3.15	6.57	47.5	54.3	70.8
78	7.83	4.69	3.15	6.57	51.9	61.8	78.7

DN [in]	Dimension F					Dimension G				
	EN (DIN)			ASME	AS	EN (DIN)			ASME	AS
	PN 6 [in]	PN 10 [in]	PN 16 [in]	AWWA [in]	[in]	PN 6 [in]	PN 10 [in]	PN 16 [in]	AWWA [in]	[in]
14	26.6	26.9	24.3	27.5	27.3	19.3	19.9	20.5	21.0	20.7
15	–	–	–	–	28.8	–	–	–	–	21.7
16	28.6	29.1	26.5	28.8	29.4	21.3	22.2	22.8	23.5	22.8
18	30.8	31.2	28.8	31.6	31.7	23.4	24.2	25.2	25.0	25.2
20	32.8	33.3	31.3	33.8	33.9	25.4	26.4	28.1	27.5	27.8
24	36.5	37.1	35.4	37.7	37.9	29.7	30.7	33.1	32.0	32.5
28	41.2	41.9	39.7	42.5	42.2	33.9	35.2	35.8	36.5	35.8
30	–	–	–	45.1	45.3	–	–	–	38.7	39.2
32	45.7	46.5	43.8	47.3	47.3	38.4	40.0	40.4	41.7	41.7
36	49.6	50.4	47.7	51.4	49.8	42.3	43.9	44.3	46.0	46.3
40	53.5	54.6	52.2	55.8	55.1	46.3	48.4	48.2	50.7	49.4
42	–	–	–	58.3	–	–	–	–	53.0	–
48	62.6	63.5	61.3	64.7	64.2	55.3	57.3	49.4	59.5	58.7
54	–	–	–	72.4	–	–	–	–	66.3	–
60	–	–	–	79.7	–	–	–	–	73.0	–
66	–	–	–	85.2	–	–	–	–	80.0	–
72	87.7	89.1	86.5	90.7	–	80.5	83.3	83.9	86.5	–
78	96.4	97.6	95.1	98.4	–	89.2	91.5	92.3	93.0	–

Order code for "Sensor option", option CA in combination with order code for "Calibration flow", options A/B/D/E/F/G/H/K/M/N



- Order code for "Calibration flow", options A/B/D/E/F/G/H/K/M/N available for order in conjunction with order code for "Housing", option M "Compact, polycarbonate"
- Order code for "Calibration flow", options H/K also available for order in conjunction with order code for "Housing", option A "Compact, aluminum, coated"



A0021328

DN [in]	A [in]	B [in]	C [in]	D [in]	F [in]	G [in]
1	7.60	4.06	3.54	6.57	7.87	7.40
2	7.60	4.06	3.54	6.57	7.87	7.40
3	7.60	4.06	3.54	6.57	7.87	8.07
4	7.60	4.06	3.54	6.57	9.84	8.58
6	7.60	4.06	3.54	6.57	11.8	9.92
8	7.60	4.06	3.54	6.57	13.8	10.9
10	7.60	4.06	3.54	6.57	17.7	12.2
12	7.60	4.06	3.54	6.57	19.7	13.2

Dimension E										
DN [in]	EN (DIN)				ASME		AS		JIS	
	PN 10 [in]	PN 16 [in]	PN 25 [in]	PN 40 [in]	Class 150 [in]	Class 300 [in]	Table E [in]	PN 16 [in]	10K [in]	20K [in]
1	–	–	–	5.51	5.51	5.51	5.51	–	5.51	5.51
2	–	–	–	6.50	6.02	6.50	5.91	5.91	6.10	6.10
3	–	7.87	–	7.87	7.52	8.27	7.28	7.28	7.28	7.87
4	–	8.66	–	12.8	9.02	10.0	8.46	8.46	8.27	8.86
6	–	11.2	–	11.8	11.0	12.5	11.0	11.0	11.0	12.0
8	13.4	13.4	14.2	–	13.5	–	13.2	13.2	13.0	13.8
10	15.6	15.9	16.7	–	16.0	–	15.9	15.9	15.8	16.9
12	17.5	18.1	19.1	–	19.0	–	17.9	17.9	17.5	18.9

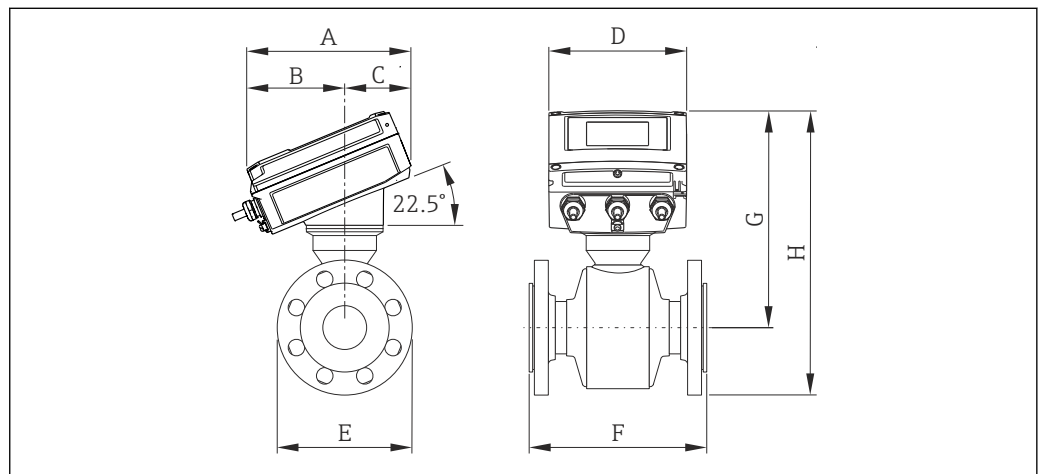
Dimension H										
DN [in]	EN (DIN)				ASME		AS		JIS	
	PN 10 [in]	PN 16 [in]	PN 25 [in]	PN 40 [in]	Class 150 [in]	Class 300 [in]	Table E [in]	PN 16 [in]	10K [in]	20K [in]
1	–	–	–	10.2	10.2	10.2	10.2	–	10.2	10.2
2	–	–	–	10.6	10.4	10.6	10.3	10.3	10.4	10.4

Dimension H										
DN	EN (DIN)				ASME		AS		JIS	
	PN 10	PN 16	PN 25	PN 40	Class 150	Class 300	Table E	PN 16	10K	20K
[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
3	–	12	–	12	11.8	12.2	11.7	11.7	11.7	12
4	–	12.9	–	15	13	13.5	12.8	12.8	12.7	13
6	–	15.5	–	15.8	15.4	16.1	15.5	15.5	15.5	15.9
8	17.6	17.6	18	–	17.6	–	17.5	17.5	17.4	17.8
10	20	20.2	20.6	–	20.2	–	20.2	20.2	20.1	20.7
12	22	22.3	22.8	–	22.8	–	22.2	22.2	22	22.7

Order code for "Sensor option", option CA in combination with order code for "Calibration flow", options A/B/D/E/F/G/H/K/M/N



- Order code for "Calibration flow", options A/B/D/E/F/G/H/K/M/N available for order in conjunction with order code for "Housing", option Q "Compact, polycarbonate, inclined"
- Order code for "Calibration flow", options H/K also available for order in conjunction with order code for "Housing", option R "Compact, aluminum, coated, inclined"



A0021329

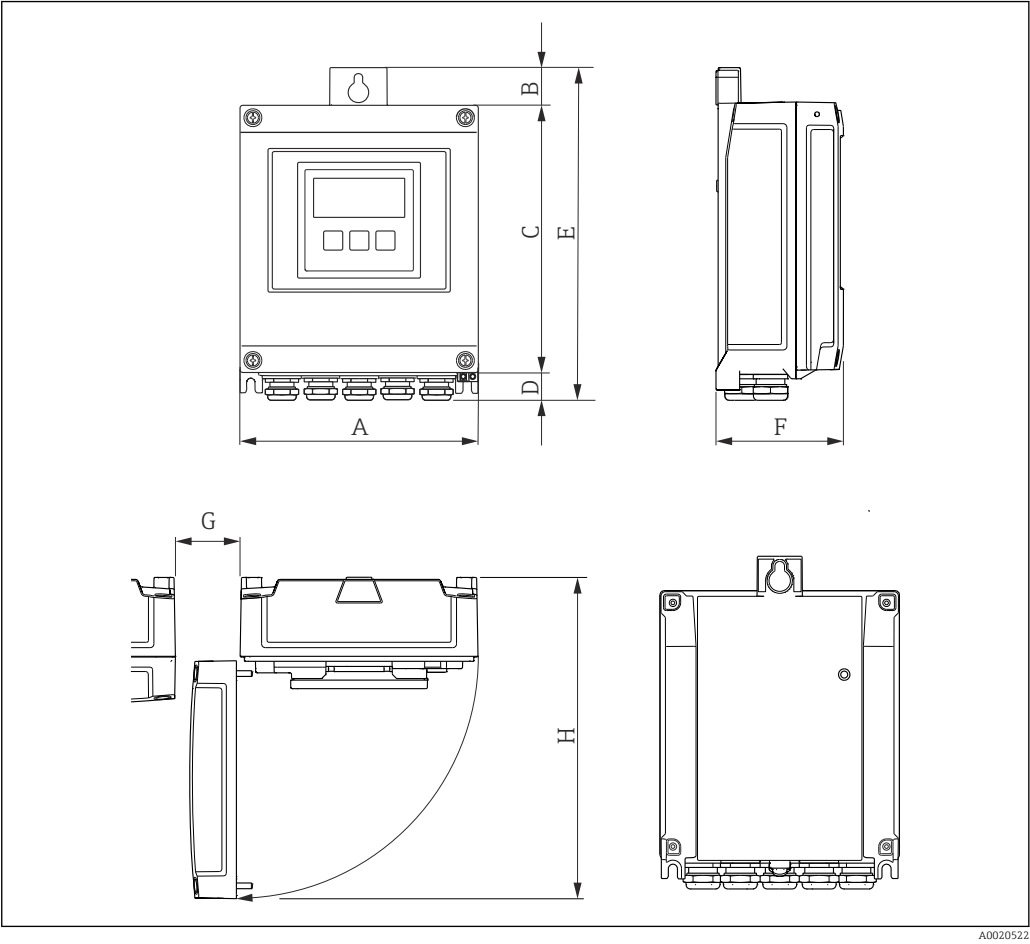
DN	A	B	C	D	F	G
[in]	[in]	[in]	[in]	[in]	[in]	[in]
1	7.83	4.69	3.15	6.57	7.87	9.13
2	7.83	4.69	3.15	6.57	7.87	9.13
3	7.83	4.69	3.15	6.57	7.87	9.80
4	7.83	4.69	3.15	6.57	9.84	10.3
6	7.83	4.69	3.15	6.57	11.8	11.7
8	7.83	4.69	3.15	6.57	13.8	12.7
10	7.83	4.69	3.15	6.57	17.7	14.0
12	7.83	4.69	3.15	6.57	19.7	15.0

Dimension E										
DN	EN (DIN)				ASME		AS		JIS	
	PN 10	PN 16	PN 25	PN 40	Class 150	Class 300	Table E	PN 16	10K	20K
	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
1	–	–	–	5.51	5.51	5.51	5.51	–	5.51	5.51
2	–	–	–	6.50	6.02	6.50	5.91	5.91	6.10	6.10
3	–	7.87	–	7.87	7.52	8.27	7.28	7.28	7.28	7.87
4	–	8.66	–	12.8	9.02	10.0	8.46	8.46	8.27	8.86
6	–	11.2	–	11.8	11.0	12.5	11.0	11.0	11.0	12.0
8	13.4	13.4	14.2	–	13.5	–	13.2	13.2	13.0	13.8
10	15.6	15.9	16.7	–	16.0	–	15.9	15.9	15.7	16.9
12	17.5	18.1	19.1	–	19.0	–	17.9	17.9	17.5	18.9

Dimension H										
DN	EN (DIN)				ASME		AS		JIS	
	PN 10	PN 16	PN 25	PN 40	Class 150	Class 300	Table E	PN 16	10K	20K
	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
1	–	–	–	11.9	11.9	11.9	11.9	–	11.9	11.9
2	–	–	–	12.4	12.2	12.4	12.1	12.1	12.2	12.2
3	–	13.7	–	13.7	13.6	13.9	13.5	13.5	13.5	13.7
4	–	14.6	–	16.7	14.8	15.3	14.6	14.6	14.4	14.8
6	–	17.3	–	17.6	17.2	17.9	17.2	17.2	17.2	17.7
8	19.4	19.4	19.8	–	19.4	–	19.3	19.3	19.2	19.6
10	21.8	22.0	22.4	–	22.0	–	22.0	22.0	21.9	22.4
12	23.7	24.0	24.5	–	24.5	–	23.9	23.9	23.7	24.4

Transmitter remote version

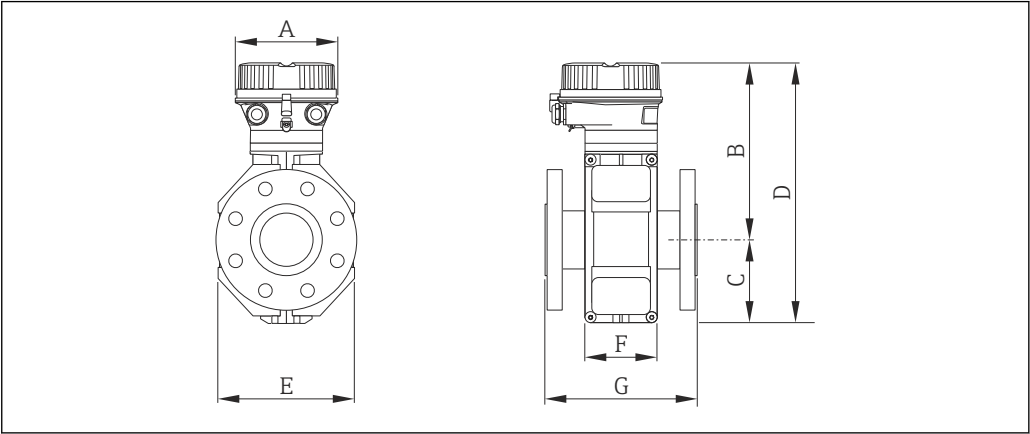
Order code for "Housing", option N "Remote, polycarbonate" or option P "Remote, aluminum coated"



A0020522

A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G [in]	H [in]
6.57	0.94	7.36	0.83	9.13	3.15	1.97	9.5

Sensor remote version

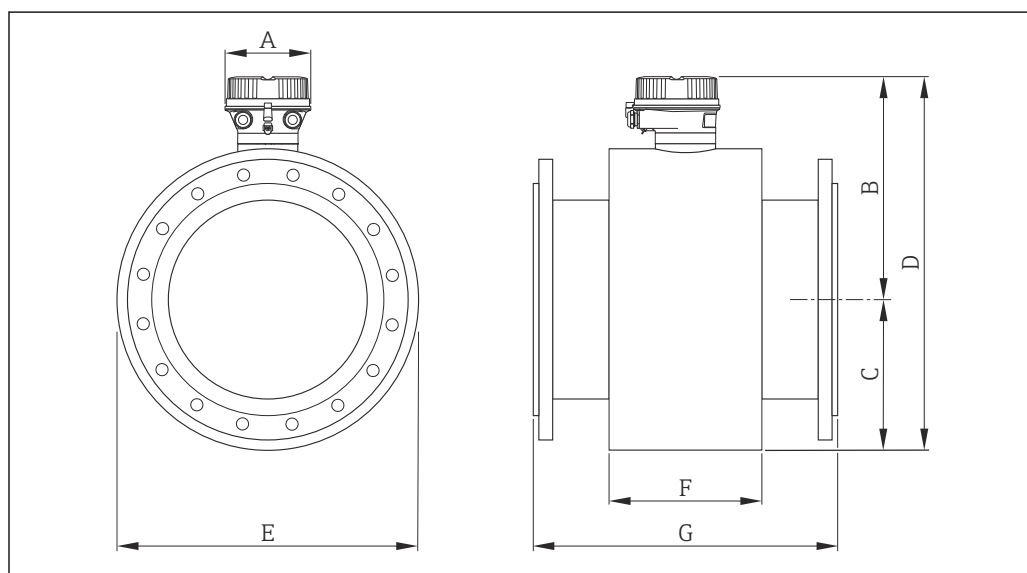


A0017282

DN ¹⁾ [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G ²⁾ [in]
1	5.35	8.15	3.31	11.5	4.72	3.70	7.87
1 ½	5.35	8.15	3.31	11.5	4.72	3.70	7.87
2	5.35	8.15	3.31	11.5	4.72	3.70	7.87
3	5.35	9.13	4.29	13.4	7.09	3.70	7.87
4	5.35	9.13	4.29	13.4	7.09	3.70	9.84
6	5.35	10.7	5.91	16.6	10.2	5.51	11.8
8	5.35	11.7	7.09	18.8	12.8	6.14	13.8
10	5.35	12.7	8.07	20.8	15.8	6.14	17.7
12	5.35	13.7	9.06	22.8	18.1	6.54	19.7

1) ASME

2) The length is independent of the selected pressure rating. Length in accordance with DVGW/ISO.



A0017283

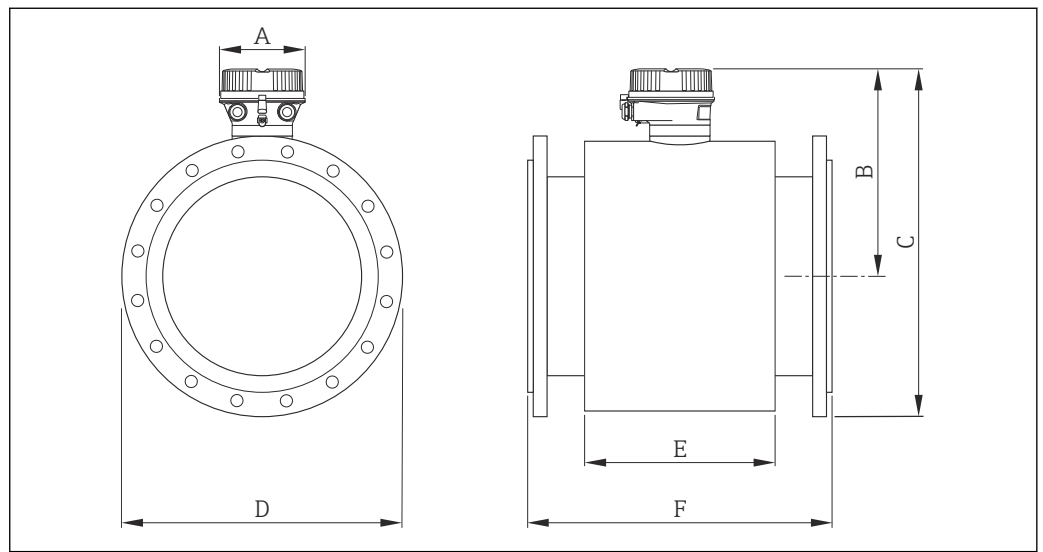
DN ¹⁾ [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G ²⁾ [in]
14	5.35	16.0	11.1	29.3	22.2	10.9	21.7
15	5.35	17.0	12.1	31.3	24.2	10.9	23.6
16	5.35	17.0	12.1	31.3	24.2	10.9	23.6
18	5.35	18.0	13.1	33.3	26.2	11.5	25.6
20	5.35	19.0	14.1	35.3	28.2	11.5	25.6
24	5.35	21.1	16.2	39.4	32.3	15.8	30.7
28	5.35	25.1	20.1	45.2	40.3	23.2	35.8
30	5.35	25.1	20.1	45.2	40.3	24.6	38.4
32	5.35	25.9	21.0	46.9	42.0	25.5	40.9
36	5.35	28.9	24.0	52.9	48.0	30.9	46.0
40	5.35	31.9	27.0	58.9	54.0	33.9	51.2
42	5.35	32.9	28.0	60.9	56.0	35.9	53.7
48	5.35	36.8	31.9	68.7	63.8	39.0	61.4

DN ¹⁾ [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G ²⁾ [in]
54	5.35	40.8	35.9	76.7	71.8	42.3	69.1
60	5.35	44.7	39.8	84.5	79.6	54.8	76.8
66	5.35	47.9	43.0	91.0	86.0	58.4	84.4
72	5.35	51.7	46.8	98.4	93.5	64.2	92.1
78	5.35	53.6	48.7	102.4	97.5	68.2	102.3

1) ASME, AWWA; flanges ≤ 24 in only available according to ASME, flanges ≥ 28 in only available according to AWWA.

2) The length is independent of the selected pressure rating. Length in accordance with DVGW/ISO.

Order code for "Design", option A "Insertion length short"



A0017284

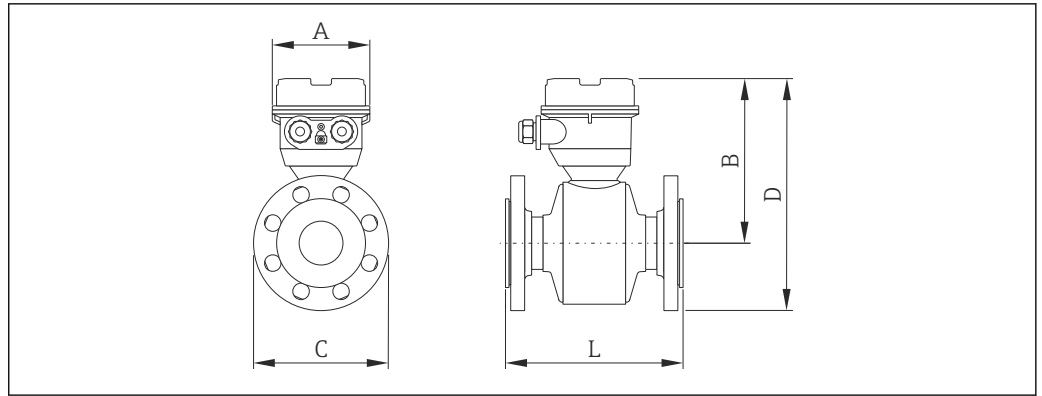
DN [in]	A [in]	B [in]	E [in]	F [in]
14	5.35	14.1	11.4	21.6
15	5.35	15.1	11.4	23.6
16	5.35	15.1	11.4	23.6
18	5.35	16.2	11.4	23.6
20	5.35	17.2	11.4	23.6
24	5.35	18.8	11.4	23.6
28	5.35	21.6	16.7	27.6
30	5.35	23.0	17.9	29.5
32	5.35	23.6	19.7	31.5
36	5.35	25.6	22.8	35.4
40	5.35	27.5	26.0	39.4
42	5.35	28.9	29.7	41.3
48	5.35	32.0	32.6	47.2
54	5.35	36.4	39.6	53.1
60	5.35	40.4	45.2	59.0
66	5.35	42.4	50.6	64.9

DN [in]	A [in]	B [in]	E [in]	F [in]
72	5.35	44.6	54.2	70.8
78	5.35	49.0	61.8	78.7

DN [in]	Dimension C					Dimension D				
	EN (DIN)			ASME	AS	EN (DIN)			ASME	AS
	PN 6 [in]	PN 10 [in]	PN 16 [in]	AWWA [in]	[in]	PN 6 [in]	PN 10 [in]	PN 16 [in]	AWWA [in]	[in]
14	23.7	24.0	24.3	24.6	24.4	19.3	19.9	20.5	21.0	20.7
15	–	–	–	–	25.9	–	–	–	–	21.7
16	25.8	26.2	26.5	26.9	26.5	21.3	22.2	22.8	23.5	22.8
18	27.9	28.3	28.7	28.7	28.8	23.4	24.2	25.2	25.0	25.2
20	29.9	30.4	31.1	30.9	31.1	25.4	26.4	28.1	27.5	27.8
24	33.7	34.2	35.6	34.8	35.0	29.7	30.7	33.1	32.0	32.5
28	38.5	39.2	39.7	39.8	39.5	33.9	35.2	35.8	36.5	35.8
30	–	–	–	42.4	42.4	–	–	–	38.7	39.2
32	43.0	43.8	44.2	44.6	44.6	38.4	40.0	40.4	41.7	41.7
36	46.9	47.7	48.2	48.7	48.9	42.3	43.9	44.3	46.0	46.3
40	50.8	51.9	52.7	53.1	52.4	46.3	48.4	48.2	50.7	49.4
42	–	–	–	55.6	–	–	–	–	53.0	–
48	59.9	60.8	61.7	62.0	61.5	55.3	57.3	49.4	59.5	58.7
54	–	–	–	69.6	–	–	–	–	66.3	–
60	–	–	–	76.9	–	–	–	–	73.0	–
66	–	–	–	82.4	–	–	–	–	80.0	–
72	84.9	86.3	87.0	87.9	–	80.5	83.3	83.9	86.5	–
78	93.6	94.7	95.6	95.5	–	89.2	91.5	92.3	93.0	–

Order code for "Sensor option", option CA...CE "Corrosion protection"

Option	Description
CA	IP66/67, Type 4X, fully welded; corrosion protection EN ISO 12944 C5-M
CB	IP68, Type 6P, fact-potted; corrosion protection EN ISO 12944 C5-M/Im1/Im2/Im3
CC	IP68, Type 6P, cust-potted; corrosion protection EN ISO 12944 C5-M/Im1/Im2/Im3
CD	Buried IP68, Type 6P, fact-potted; corrosion protection EN ISO 12944 Im2/Im3
CE	Buried IP68, Type 6P, cust-potted; corrosion protection EN ISO 12944 Im2/Im3



A0020399

DN [in]	A [in]	B [in]	E [in]
1	4.41	7.44	7.87
2	4.41	7.44	7.87
3	4.41	8.15	7.87
4	4.41	8.62	9.84
6	4.41	10.0	11.8
8	4.41	11.0	13.8
10	4.41	12.3	17.7
12	4.41	13.3	19.7

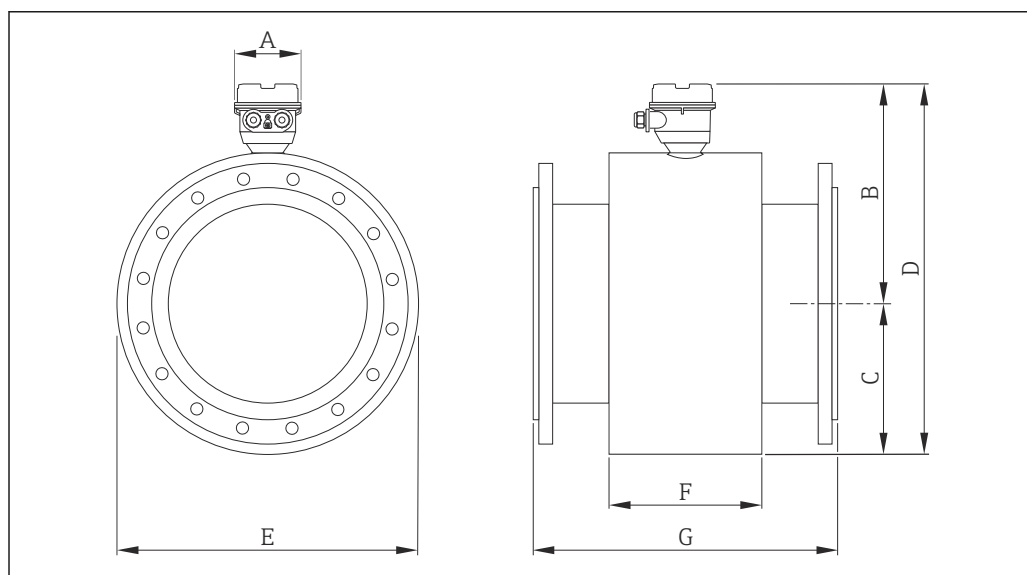
Dimension C

DN [in]	EN (DIN)				ASME		AS		JIS	
	PN 10 [in]	PN 16 [in]	PN 25 [in]	PN 40 [in]	Class 150 [in]	Class 300 [in]	Table E [in]	PN 16 [in]	10K [in]	20K [in]
1	–	–	–	5.51	4.33	5.51	5.51	–	5.51	5.51
2	–	–	–	6.50	5.91	6.50	5.91	5.91	6.10	6.10
3	–	7.87	–	7.87	7.48	8.25	7.28	7.28	7.28	7.87
4	–	8.66	–	12.8	9.06	10.0	8.46	8.46	8.27	8.86
6	–	11.2	–	11.8	11.0	12.5	11.0	11.0	11.0	12.0
8	13.4	13.4	14.2	–	13.6	–	13.2	13.2	13.0	13.8
10	15.6	15.9	16.7	–	16.0	–	15.9	15.9	15.8	16.9
12	17.5	18.1	19.1	–	19.1	–	17.9	17.9	17.5	18.9

Dimension D

DN [in]	EN (DIN)				ASME		AS		JIS	
	PN 10 [in]	PN 16 [in]	PN 25 [in]	PN 40 [in]	Class 150 [in]	Class 300 [in]	Table E [in]	PN 16 [in]	10K [in]	20K [in]
1	–	–	–	10.2	10.2	10.2	10.2	–	10.2	10.2
2	–	–	–	10.7	10.4	10.7	10.4	10.4	10.5	10.5
3	–	12.1	–	12.1	11.9	12.2	11.8	11.8	11.8	12.1

Dimension D										
DN	EN (DIN)				ASME		AS		JIS	
	PN 10	PN 16	PN 25	PN 40	Class 150	Class 300	Table E	PN 16	10K	20K
	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
4	–	13.0	–	15.0	13.1	13.6	12.9	12.9	12.8	13.1
6	–	15.6	–	15.9	15.5	16.2	15.6	15.6	15.6	16.0
8	17.7	17.7	18.1	–	17.7	–	17.6	17.6	17.5	17.9
10	20.1	20.3	20.7	–	20.3	–	20.3	20.3	20.2	20.8
12	22.0	22.4	22.8	–	22.8	–	22.2	22.2	22.0	22.8



A0020435

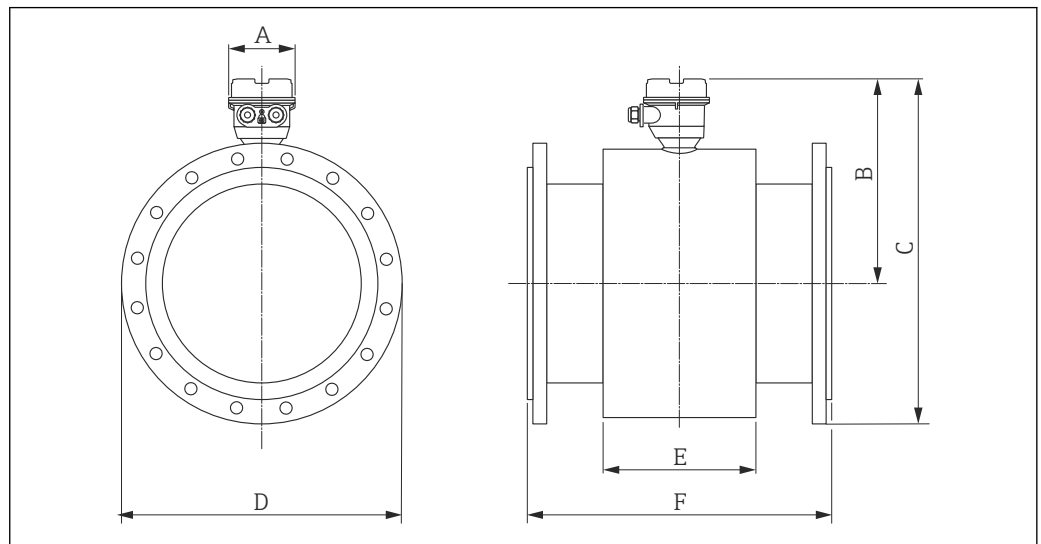
DN	A	B	C	D	E	F	G ¹⁾
[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
14	4.41	15.6	11.1	26.7	22.2	10.9	21.7
15	4.41	16.6	12.1	28.7	24.2	10.9	23.6
16	4.41	16.6	12.1	28.7	24.2	10.9	23.6
18	4.41	17.6	13.1	30.7	26.2	11.5	25.6
20	4.41	18.6	14.1	32.7	28.2	11.5	25.6
24	4.41	20.6	16.2	36.8	32.3	15.8	30.7
28	4.41	24.6	20.2	44.8	40.3	23.2	35.8
30	4.41	24.6	20.2	44.8	40.3	24.6	38.4
32	4.41	25.5	21.0	46.5	42.0	25.5	40.9
36	4.41	28.5	24.0	52.5	48.0	30.9	46.0
40	4.41	31.5	27.0	58.5	54.0	33.9	51.2
42	4.41	32.5	28.0	60.5	56.0	35.9	53.7
48	4.41	36.4	31.9	68.3	63.8	39.0	61.4
54	4.41	40.4	35.9	76.3	71.8	42.3	69.1
60	4.41	44.3	39.8	84.1	79.6	54.8	76.8
66	4.41	47.5	43.0	90.5	86.0	58.4	84.4

DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G ¹⁾ [in]
72	4.41	51.2	46.8	98.0	93.5	64.2	92.1
78	4.41	53.2	48.7	101.9	97.5	68.2	102.3

1) The length is independent of the selected pressure rating. Length in accordance with DVGW/ISO.

Order code for "Design", option A "Insertion length short" and order code for "Sensor option", option CA...CE "Corrosion protection"

Option	Description
CA	IP66/67, Type 4X, fully welded; corrosion protection EN ISO 12944 C5-M
CB	IP68, Type 6P, fact-potted; corrosion protection EN ISO 12944 C5-M/Im1/Im2/Im3
CC	IP68, Type 6P, cust-potted; corrosion protection EN ISO 12944 C5-M/Im1/Im2/Im3
CD	Buried IP68, Type 6P, fact-potted; corrosion protection EN ISO 12944 Im2/Im3
CE	Buried IP68, Type 6P, cust-potted; corrosion protection EN ISO 12944 Im2/Im3



A0018158

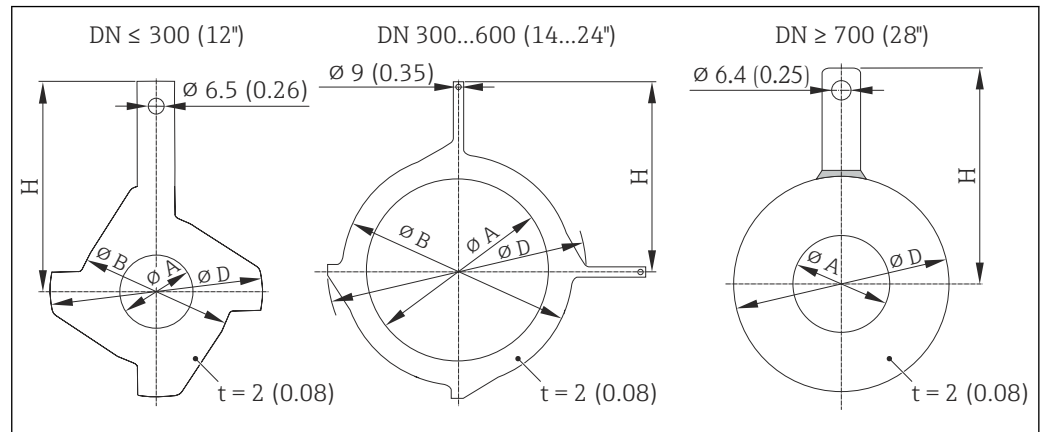
DN [in]	A [in]	B [in]	E [in]	F [in]
14	4.41	13.8	11.4	21.7
15	4.41	14.8	11.4	23.6
16	4.41	14.8	11.4	23.6
18	4.41	15.9	11.4	23.6
20	4.41	16.9	11.4	23.6
24	4.41	18.8	11.4	23.6
28	4.41	21.6	16.7	27.6
30	4.41	23.1	17.9	29.5
32	4.41	23.8	19.7	31.5
36	4.41	25.8	22.8	35.4
40	4.41	27.8	26.0	39.4
42	4.41	29.2	29.7	41.3

DN [in]	A [in]	B [in]	E [in]	F [in]
48	4.41	32.2	32.6	47.2
54	4.41	36.7	39.7	53.2
60	4.41	40.6	45.2	59.1
66	4.41	42.6	50.6	65.0
72	4.41	44.8	54.3	70.9
78	4.41	49.2	61.8	78.7

DN [in]	Dimension C					Dimension D				
	EN (DIN)			ASME	AS	EN (DIN)			ASME	AS
	PN 6 [in]	PN 10 [in]	PN 16 [in]	AWWA [in]	[in]	PN 6 [in]	PN 10 [in]	PN 16 [in]	AWWA [in]	[in]
14	23.4	23.7	24.0	–	24.1	19.3	19.9	20.5	–	20.7
15	–	–	–	–	25.6	–	–	–	–	21.7
16	25.4	25.9	26.2	–	26.2	21.3	22.2	22.8	–	22.8
18	27.6	28.0	28.5	–	28.5	23.4	24.2	25.2	–	25.2
20	29.6	30.0	30.9	–	30.7	25.4	26.4	28.1	–	27.8
24	33.7	34.2	35.4	–	35.1	29.7	30.7	33.1	–	32.5
28	38.5	39.2	39.5	39.8	39.5	33.9	35.2	35.8	36.5	35.8
30	–	–	–	42.4	42.7	–	–	–	38.7	39.2
32	43.0	43.8	44.0	44.7	44.7	38.4	40.0	40.4	41.7	41.7
36	47.0	47.8	48.0	48.8	48.9	42.3	43.9	44.3	46.0	46.3
40	50.9	52.0	52.5	53.1	52.5	46.3	48.4	48.2	50.7	49.4
42	–	–	–	55.7	–	–	–	–	53.0	–
48	59.9	60.9	61.5	62.0	61.6	55.3	57.3	49.4	59.5	58.7
54	–	–	–	69.8	–	–	–	–	66.3	–
60	–	–	–	77.1	–	–	–	–	73.0	–
66	–	–	–	82.6	–	–	–	–	80.0	–
72	85.1	86.5	86.8	88.1	–	80.5	83.3	83.9	86.5	–
78	93.8	95.0	95.4	95.7	–	89.2	91.5	92.3	93.0	–

Accessories

Ground disks for flange connections



A0015442

33 Engineering unit mm (in)

DN [in]	Pressure rating	A [in]	B [in]	D [in]	H [in]
1	¹⁾	1.02	2.44	3.05	3.44
1 ¼	¹⁾	1.38	3.15	3.44	3.72
1 ½	¹⁾	1.61	3.23	3.98	4.06
2	¹⁾	2.05	3.98	4.55	4.25
2 ½	¹⁾	2.68	4.76	5.18	4.65
3	¹⁾	3.15	5.16	6.08	5.31
4	¹⁾	4.09	6.14	7.34	6.02
5	¹⁾	5.12	7.36	8.13	6.30
6	¹⁾	6.22	8.54	10.1	7.24
8	¹⁾	8.11	10.5	11.3	8.07
10	¹⁾	10.2	12.9	14.1	9.45
12	¹⁾	12.3	14.8	16.3	10.8
14	DIN, PN 6	13.5	16.5	18.9	14.4
14	DIN, PN 10	13.5	15.8	18.9	14.4
14	ASME, Class 150	13.5	15.8	18.9	14.4
16	DIN, PN 6	15.5	18.5	21.3	15.6
16	DIN, PN 10	15.5	18.5	21.3	15.6
16	ASME, Class 150	15.5	18.5	21.3	15.6
18	DIN, PN 6	17.3	20.7	23.0	16.4
18	DIN, PN 10	17.3	21.1	23.0	16.4
18	ASME, Class 150	17.3	21.1	23.0	16.4
20	DIN, PN 6	19.4	23.3	25.6	18.1
20	DIN, PN 10	19.4	23.2	25.6	18.1
20	ASME, Class 150	19.4	23.2	25.6	18.1

DN [in]	Pressure rating	A [in]	B [in]	D [in]	H [in]
24	DIN, PN 6	23.4	27.3	30.2	20.6
24	DIN, PN 10	23.4	27.1	30.2	20.6
24	ASME, Class 150	23.4	27.1	30.2	20.6
28	DIN, PN 6	27.4	–	30.9	18.1
28	DIN, PN 10	27.3	–	32.0	18.9
28	AS, PN 16	27.1	–	31.8	19.3
28	AWWA, Class D	27.3	–	32.8	19.5
30	AWWA, Class D	29.3	–	32.8	20.6
32	DIN, PN 6	31.5	–	35.2	20.5
32	DIN, PN 10	31.3	–	36.2	21.3
32	AS, PN 16	31.1	–	36.0	21.7
32	AWWA, Class D	31.3	–	37.0	22.1
36	DIN, PN 6	35.3	–	39.1	22.4
36	DIN, PN 10	35.2	–	40.2	23.2
36	AS, PN 16	34.9	–	39.9	23.4
36	AWWA, Class D	35.2	–	41.3	24.2
40	DIN, PN 6	39.3	–	43.0	24.4
40	DIN, PN 10	39.2	–	44.4	25.6
40	AS, PN 16	38.9	–	44.5	26.0
40	AWWA, Class D	39.2	–	45.8	26.6
42	AWWA, Class D	41.1	–	48.0	27.7
48	DIN, PN 6	47.4	–	51.6	28.9

- 1) Ground disks can be used for all the flange standards/pressure ratings which can be supplied in the standard version.

Weight

Compact version

Weight data:

- Including the transmitter
 - Order code for "Housing", option M, Q: 1.3 kg (2.9 lb)
 - Order code for "Housing", option A, R: 2.0 kg (4.4 lb)
- Excluding packaging material

Weight in SI units

Standard version

EN 1092-1 (DIN 2501)			
DN [mm]	Pressure rating	Weight [kg]	
		Order code for "Housing", option M, Q Polycarbonate plastic	Order code for "Housing", option A, R Aluminum, AlSi10Mg, coated
25	PN 40	5	5.7
32	PN 40	6	6.7
40	PN 40	8	8.7
50	PN 40	9	9.7
65	PN 16	10	10.7

EN 1092-1 (DIN 2501)			
DN [mm]	Pressure rating	Weight [kg]	
		Order code for "Housing", option M, Q Polycarbonate plastic	Order code for "Housing", option A, R Aluminum, AlSi10Mg, coated
80	PN 16	12	12.7
100	PN 16	14	14.7
125	PN 16	20	20.7
150	PN 16	24	24.7
200	PN 10	43	43.7
250	PN 10	63	63.7
300	PN 10	68	68.7
350	PN 6	105	105.7
375	PN 6	120	120.7
400	PN 6	120	120.7
450	PN 6	161	161.7
500	PN 6	156	156.7
600	PN 6	208	208.7
700	PN 6	304	304.7
800	PN 6	357	357.7
900	PN 6	485	485.7
1000	PN 6	589	589.7
1200	PN 6	850	850.7
1400	PN 6	1 300	1 300.7
1600	PN 6	1 700	1 700.7
1800	PN 6	2 200	2 200.7
2000	PN 6	2 800	2 800.7

AS 4087, PN 16		
DN [mm]	Weight [kg]	
	Order code for "Housing", option M, Q Polycarbonate plastic	Order code for "Housing", option A, R Aluminum, AlSi10Mg, coated
80	12	12.7
100	14	14.7
150	24	24.7

JIS B2220, 10K		
DN [mm]	Weight [kg]	
	Order code for "Housing", option M, Q Polycarbonate plastic	Order code for "Housing", option A, R Aluminum, AlSi10Mg, coated
25	5	5.7
32	5	5.7
40	6	6.7
50	7	7.7
65	9	9.7

JIS B2220, 10K		
DN [mm]	Weight [kg]	
	Order code for "Housing", option M, Q Polycarbonate plastic	Order code for "Housing", option A, R Aluminum, AlSi10Mg, coated
80	11	11.7
100	13	13.7
125	19	19.7
150	23	23.7
200	40	40.7
250	68	68.7
300	70	70.7

Order code for "Design", option A

Option A "Insertion length short; ISO/DVGW to DN400, DN450-2000 1:1"

EN 1092-1 (DIN 2501)			
DN [mm]	Order code for "Housing", option M, Q Polycarbonate plastic ¹⁾		
	Weight [kg]		
	PN 6	PN 10	PN 16
450	100	113	139
500	115	133	179
600	156	163	224
700	191	241	288
800	241	316	350
900	309	394	441
1000	360	469	563
1200	530	718	840
1400	785	1 115	1 201
1600	1059	1 625	1 842
1800	1419	2 108	2 354
2000	1878	2 631	2 926

1) Values for aluminum transmitter, AlSi10Mg, coated: + 0.7 kg

AS 2129, Table E		
DN [mm]	Weight [kg]	
	Order code for "Housing", option M, Q Polycarbonate plastic	Order code for "Housing", option A, R Aluminum, AlSi10Mg, coated
450	144	144.7
500	183	183.7
600	261	261.7
700	347	347.7
750	434	434.7
800	494	494.7
900	691	691.7

AS 2129, Table E		
DN [mm]	Weight [kg]	
	Order code for "Housing", option M, Q Polycarbonate plastic	Order code for "Housing", option A, R Aluminum, AlSi10Mg, coated
1000	762	762.7
1200	1238	1238.7

AS 4087, PN 16		
DN [mm]	Weight [kg]	
	Order code for "Housing", option M, Q Polycarbonate plastic	Order code for "Housing", option A, R Aluminum, AlSi10Mg, coated
450	134	134.7
500	183	183.7
600	261	261.7
700	368	368.7
750	446	446.7
800	504	504.7
900	703	703.7
1000	760	760.7
1200	1220	1220.7

Order code for "Calibration flow", options H and K, or options H/K or order code for "Sensor option", option CA

Option	Description
H	MID Type Examination Cert MI-001
K	OIML R49 Class 2
CA	IP66/67, Type 4X, fully welded; corrosion protection EN ISO 12944 C5-M

EN 1092-1 (DIN 2501)			
DN [mm]	Pressure rating	Weight [kg]	
		Order code for "Housing", option M, Q Polycarbonate plastic	Order code for "Housing", option A, R Aluminum, AlSi10Mg, coated
25	PN 40	9	9.7
32	PN 40	10	10.7
40	PN 40	11	11.7
50	PN 40	12	12.7
65	PN 16	13	13.7
80	PN 16	15	15.7
100	PN 16	17	17.7
125	PN 16	22	22.7
150	PN 16	27	27.7
200	PN 10	38	38.7
250	PN 10	51	51.7
300	PN 10	60	60.7

AS 2129, PN 16		
DN [mm]	Weight [kg]	
	Order code for "Housing", option M, Q Polycarbonate plastic	Order code for "Housing", option A, R Aluminum, AlSi10Mg, coated
80	15	15.7
100	17	17.7
125	22	22.7
150	27	27.7

JIS B2220, 10K		
DN [mm]	Weight [kg]	
	Order code for "Housing", option M, Q Polycarbonate plastic	Order code for "Housing", option A, R Aluminum, AlSi10Mg, coated
25	9	9.7
32	10	10.7
40	10	10.7
50	11	11.7
65	12	12.7
80	13	13.7
100	15	15.7
125	20	20.7
150	25	25.7
200	34	34.7
250	50	50.7
300	57	57.7

Weight in US units

Standard version

ASME B16.5, Class 150		
DN [in]	Weight [lbs]	
	Order code for "Housing", option M, Q Polycarbonate plastic	Order code for "Housing", option A, R Aluminum, AlSi10Mg, coated
1	11	12.5
1½	18	19.5
2	20	21.5
3	26	27.5
4	31	32.5
6	53	54.5
8	95	96.5
10	161	162.5
12	238	239.5
14	386	387.5
16	452	453.5
18	562	563.5

ASME B16.5, Class 150		
DN [in]	Weight [lbs]	
	Order code for "Housing", option M, Q Polycarbonate plastic	Order code for "Housing", option A, R Aluminum, AlSi10Mg, coated
20	628	629.5
24	893	894.5

AWWA C207, Class D		
DN [in]	Weight [lbs]	
	Order code for "Housing", option M, Q Polycarbonate plastic	Order code for "Housing", option A, R Aluminum, AlSi10Mg, coated
28	882	883.5
30	1014	1015.5
32	1213	1214.5
36	1764	1765.5
40	1985	1986.5
42	2426	2427.5
48	3087	3088.5
54	4851	4852.5
60	5954	5955.5
66	8159	8160.5
72	9041	9042.5
78	10143	10144.5

Order code for "Design", option A

Option A "Insertion length short; ISO/DVGW to DN400, DN450-2000 1:1"

ASME B16.5, Class 150		
DN [in]	Weight [lbs]	
	Order code for "Housing", option M, Q Polycarbonate plastic	Order code for "Housing", option A, R Aluminum, AlSi10Mg, coated
18	423	424.5
20	505	506.5
24	668	667.5

AWWA C207, Class D		
DN [in]	Weight [lbs]	
	Order code for "Housing", option M, Q Polycarbonate plastic	Order code for "Housing", option A, R Aluminum, AlSi10Mg, coated
28	589	590.5
30	703	704.5
32	847	848.5
36	1039	1040.5
40	1297	1298.5
42	1480	1481.5

AWWA C207, Class D		
DN [in]	Weight [lbs]	
	Order code for "Housing", option M, Q Polycarbonate plastic	Order code for "Housing", option A, R Aluminum, AlSi10Mg, coated
48	1 989	1 990.5
54	2 809	2 810.5
60	3 517	3 518.5
66	4 701	4 702.5
72	5 665	5 666.5
78	6 866	6 867.5

Order code for "Sensor option", option CA

Option CA "IP66/67, Type 4X, fully welded; corrosion protection EN ISO 12944 C5-M

ASME B16.5, Class 150		
DN [in]	Weight [lbs]	
1	17.6	
1½	19.8	
2	24.3	
3	33.1	
4	41.9	
6	61.7	
8	97.0	
10	134.5	
12	189.6	

Transmitter remote version

Wall-mount housing

Depends on the material of the wall-mount housing:

- Polycarbonate plastic: 1.3 kg (2.9 lb)
- Aluminum, AlSi10Mg, coated: 2.0 kg (4.4 lb)

Sensor remote version

Weight data:

- Including sensor connection housing
- Excluding the connecting cable
- Excluding packaging material

Weight in SI units

Standard version

EN 1092-1 (DIN 2501)		
DN [mm]	Pressure rating	Weight [kg]
25	PN 40	5
32	PN 40	6
40	PN 40	7

EN 1092-1 (DIN 2501)		
DN [mm]	Pressure rating	Weight [kg]
50	PN 40	9
65	PN 16	10
80	PN 16	12
100	PN 16	14
125	PN 16	20
150	PN 16	24
200	PN 10	43
250	PN 10	63
300	PN 10	68
350	PN 6	103
375	PN 6	118
400	PN 6	118
450	PN 6	159
500	PN 6	154
600	PN 6	206
700	PN 6	302
800	PN 6	355
900	PN 6	483
1000	PN 6	587
1200	PN 6	848
1400	PN 6	1298
1600	PN 6	1698
1800	PN 6	2198
2000	PN 6	2798

AS 4087, PN 16		
DN [mm]	Weight [kg]	
80	12	
100	14	
125	20	
150	24	

JIS B2220, 10K		
DN [mm]	Weight [kg]	
25	5	
32	5	
40	6	
50	7	
65	9	

JIS B2220, 10K	
DN [mm]	Weight [kg]
80	11
100	13
125	19
150	23
200	40
250	67
300	70

Order code for "Design", option A

Option A "Insertion length short; ISO/DVGW to DN400, DN450-2000 1:1"

EN 1092-1 (DIN 2501)			
DN [mm]	Weight [kg]		
	PN 6	PN 10	PN 16
450	98	111	139
500	113	131	179
600	154	161	224
700	190	240	288
800	240	315	350
900	308	393	441
1000	359	468	563
1200	529	717	840
1400	784	1 114	1 200
1600	1058	1 624	1 841
1800	1418	2 107	2 353
2000	1877	2 630	2 925

AS 2129, Table E	
DN [mm]	Weight [kg]
450	142
500	181
600	259
700	346
750	433
800	493
900	690
1000	761
1200	1 237

AS 4087, PN 16	
DN [mm]	Weight [kg]
450	132
500	181
600	259
700	367
750	445
800	503
900	702
1 000	759
1 200	1 219

Order code for "Calibration flow", options H and K or order code for "Sensor option", option CA

Option	Description
H	MID Type Examination Cert MI-001
K	OIML R49 Class 2
CA	IP66/67, Type 4X, fully welded; corrosion protection EN ISO 12944 C5-M

EN 1092-1 (DIN 2501)		
DN [mm]	Pressure rating	[kg]
25	PN 40	6.5
32	PN 40	8
40	PN 40	8.5
50	PN 40	10
65	PN 16	11
80	PN 16	13
100	PN 16	15
125	PN 16	20
150	PN 16	25
200	PN 10	36
250	PN 10	49
300	PN 10	58

AS 4087, PN 16	
DN [mm]	[kg]
80	13
100	15
150	25

JIS B2220, 10K	
DN [mm]	Weight [kg]
25	6.5
32	7.5
40	7.5
50	9
65	10
80	11
100	13
125	18
150	23
200	32
250	48
300	55

Weight in US units

Standard version

ASME B16.5, Class 150	
DN [in]	Weight [lbs]
1	11
1½	15
2	20
3	26
4	31
6	53
8	95
10	161
12	238
14	381
16	448
18	558
20	624
24	889

AWWA C207, Class D	
DN [in]	Weight [lbs]
28	878
30	1010
32	1208
36	1760
40	1980

AWWA C207, Class D	
DN [in]	Weight [lbs]
42	2 421
48	3 083
54	4 847
60	5 949
66	8 154
72	9 036
78	10 139

Order code for "Design", option A

Option A "Insertion length short; ISO/DVGW to DN400, DN450-2000 1:1"

ASME B16.5, Class 150	
DN [in]	Weight [lbs]
18	420
20	501
24	664

AWWA C207, Class D	
DN [in]	Weight [lbs]
28	587
30	701
32	845
36	1 036
40	1 294
42	1 477
48	1 987
54	1 273
60	3 515
66	4 699
72	5 662
78	6 864

Order code for "Sensor option", option CA

Option CA "IP66/67, Type 4X, fully welded; corrosion protection EN ISO 12944 C5-M"

ASME B16.5, Class 150	
DN [in]	Weight [lbs]
1	13
1½	15.5
2	20

ASME B16.5, Class 150	
DN [in]	Weight [lbs]
3	29
4	37
6	57
8	93
10	130
12	185

Measuring tube specification

Nominal diameter		Pressure rating				Measuring tube internal diameter			
		EN (DIN)	ASME AWWA	AS 2129 AS 4087	JIS	Hard rubber		Polyurethane	
[mm]	[in]					[mm]	[in]	[mm]	[in]
25	1	PN 40	Class 150	–	20K	–	–	24	0.94
32	–	PN 40	–	–	20K	–	–	32	1.26
40	1 ½	PN 40	Class 150	–	20K	–	–	38	1.50
50	2	PN 40	Class 150	Table E, PN 16	10K	50	1.97	50	1.97
65	–	PN 16	–	–	10K	66	2.60	66	2.60
80	3	PN 16	Class 150	Table E, PN 16	10K	79	3.11	79	3.11
100	4	PN 16	Class 150	Table E, PN 16	10K	102	4.02	102	4.02
125	–	PN 16	–	–	10K	127	5.00	127	5.00
150	6	PN 16	Class 150	Table E, PN 16	10K	156	6.14	156	6.14
200	8	PN 10	Class 150	Table E, PN 16	10K	204	8.03	204	8.03
250	10	PN 10	Class 150	Table E, PN 16	10K	258	10.2	258	10.2
300	12	PN 10	Class 150	Table E, PN 16	10K	309	12.2	309	12.2
350	14	PN 6	Class 150	Table E, PN 16	–	342	13.5	342	13.5
375	15	–	–	PN 16	–	392	15.4	–	–
400	16	PN 6	Class 150	Table E, PN 16	–	392	15.4	392	15.4
450	18	PN 6	Class 150	–	–	437	17.2	437	17.2
500	20	PN 6	Class 150	Table E, PN 16	–	492	19.4	492	19.4
600	24	PN 6	Class 150	Table E, PN 16	–	594	23.4	594	23.4
700	28	PN 6	Class D	Table E, PN 16	–	692	27.2	692	27.2
750	30	–	Class D	Table E, PN 16	–	742	29.2	742	29.2
800	32	PN 6	Class D	Table E, PN 16	–	794	31.3	794	31.3
900	36	PN 6	Class D	Table E, PN 16	–	891	35.1	891	35.1
1000	40	PN 6	Class D	Table E, PN 16	–	994	39.1	994	39.1
–	42	–	Class D	–	–	1043	41.1	1043	41.1
1200	48	PN 6	Class D	Table E, PN 16	–	1197	47.1	1197	47.1
–	54	–	Class D	–	–	1339	52.7	–	–
1400	–	PN 6	–	–	–	1402	55.2	–	–
–	60	–	Class D	–	–	1492	58.7	–	–
1600	–	PN 6	–	–	–	1600	63.0	–	–
–	66	–	Class D	–	–	1638	64.5	–	–

Nominal diameter		Pressure rating				Measuring tube internal diameter			
		EN (DIN)	ASME AWWA	AS 2129 AS 4087	JIS	Hard rubber		Polyurethane	
[mm]	[in]					[mm]	[in]	[mm]	[in]
1 800	72	PN 6	Class D	–	–	1 786	70.3	–	–
2 000	78	PN 6	Class D	–	–	1 989	78.3	–	–

Materials

Transmitter housing

Compact version, standard

- Order code for "Housing", option **A** "Compact, aluminum coated":
Aluminum, AlSi10Mg, coated
- Order code for "Housing", option **M**: polycarbonate plastic
- Window material:
 - For order code for "Housing", option **A**: glass
 - For order code for "Housing", option **M**: plastic

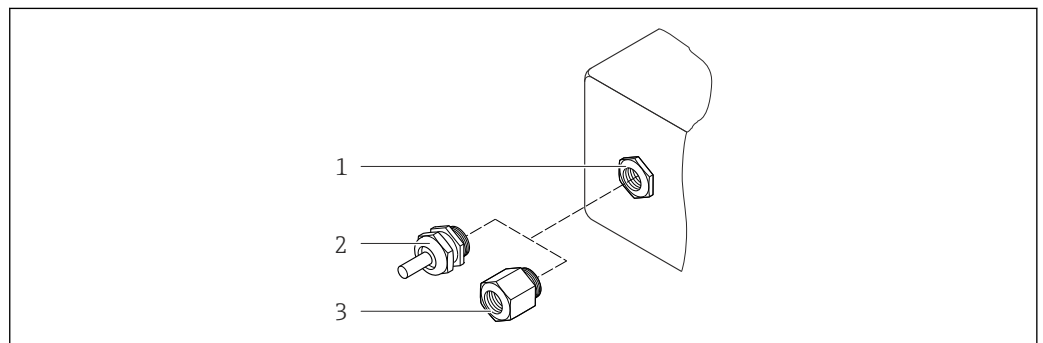
Compact version, inclined

- Order code for "Housing", option **R** "Compact, aluminum coated":
Aluminum, AlSi10Mg, coated
- Order code for "Housing", option **Q**: polycarbonate plastic
- Window material:
 - For order code for "Housing", option **R**: glass
 - For order code for "Housing", option **Q**: plastic

Remote version (wall-mount housing)

- Order code for "Housing", option **P** "Compact, aluminum coated":
Aluminum, AlSi10Mg, coated
- Order code for "Housing", option **N**: polycarbonate plastic
- Window material:
 - For order code for "Housing", option **P**: glass
 - For order code for "Housing", option **N**: plastic

Cable entries/cable glands



34 Possible cable entries/cable glands

- 1 Cable entry in transmitter housing, wall-mount housing or connection housing with internal thread M20 x 1.5
- 2 Cable gland M20 x 1.5
- 3 Adapter for cable entry with internal thread G 1/2" or NPT 1/2"

Compact and remote versions and sensor connection housing

Cable entry/cable gland	Material
Cable gland M20 × 1.5	Plastic
Remote version: cable gland M20 × 1.5 Option of reinforced connecting cable	■ Sensor connection housing: Nickel-plated brass ■ Transmitter wall-mount housing: Plastic
Adapter for cable entry with internal thread G ½" or NPT ½"	Nickel-plated brass

Device plug

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

Connecting cable for remote version

Electrode and coil current cable

- Standard cable: PVC cable with copper shield
- Reinforced cable: PVC cable with copper shield and additional steel wire braided jacket

Sensor housing

- DN 25 to 300 (1 to 12"):
 - Aluminum, AlSi10Mg, coated
 - Carbon steel with Al/Zn protective coating
- DN 50 to 300 (2 to 12"): Carbon steel with protective varnish (IP68)
- DN 350 to 2000 (14 to 78"): Carbon steel with protective varnish

Sensor connection housing

- Standard: aluminum, AlSi10Mg, coated (IP66/67)
- Option:
 - Polycarbonate for IP68 with DN 50 to 300 (2 to 12")
 - Polycarbonate for order code "Sensor option", option CA...CE "Corrosion protection" with DN 350 to 2000 (14 to 78")

Measuring tubes

- DN 25 to 300 (1 to 12")¹⁾: stainless steel, 1.4301/1.4306/304/304L
- DN 350 to 1200 (14 to 48")¹⁾: stainless steel, 1.4301/304
- DN 1350 to 2000 (54 to 78")¹⁾: stainless steel, 1.4301 similar to 304

Liner

- DN 25 to 1200 (1 to 48"): polyurethane
- DN 50 to 2000 (2 to 78"): hard rubber

Electrodes

- Stainless steel, 1.4435 (316L)
- Alloy C22, 2.4602 (UNS N06022)
- Tantalum

1) For carbon steel flange material with Al/Zn protective coating (DN 25 to 300 (1 to 12")), protective varnish (IP68) (DN 50 to 300 (2 to 12")) or protective varnish ≥ DN 350 (14")

Process connections

EN 1092-1 (DIN 2501)

- DN 25 to 1200 ¹⁾:
 - Stainless steel, 1.4404/1.4571/F316L
 - Carbon steel, A105/FE410WB/P250GH/S235JRG2/S235JR+N
- DN 1350 to 2000 ¹⁾:
 - Stainless steel, 1.4404/1.4571
 - Carbon steel, P250GH/S235JRG2
- DN 450 to 2000 ²⁾:
 - Carbon steel, A105/S235JRG2

EN 1092-1 (DIN 2501), PN6:

DN 350 to 1000 ¹⁾:
Carbon steel, A105/FE410WB/S235JRG2

ASME B16.5

- DN 25 to 1200 (1 to 48"):
 - Stainless steel, F316L similar to 1.4404
- DN 25 to 300 (1 to 12") ²⁾:
 - Carbon steel, A105 similar to 1.0432
- DN 350 to 1200 (14 to 48") ²⁾:
 - Carbon steel, A105/A515 Grade 70

AWWA C207

- DN 48":
 - Carbon steel, A105/A181/P265GH/S275JR
- DN 54 to 72":
 - Carbon steel, P265GH similar to 1.0425
- DN 48 to 78" ²⁾:
 - Carbon steel, A105/A181/P265GH/S275JR

AS 2129

- DN 50 to 1200:
 - Carbon steel, A105/S235JRG2
- DN 350 to 1200 ²⁾:
 - Carbon steel, A105/FE410WB/P235GH/P265GH/S235JRG2

AS 4087

- DN 50 to 1200:
 - Carbon steel, A105/S275JR
- DN 350 to 1200 ²⁾:
 - Carbon steel, A105/P265GH/S275JR

JIS B2220

- Stainless steel, F316L similar to 1.4404
- Carbon steel, A105/A350LF2 ¹⁾

Seals

In accordance with DIN EN 1514-1

Accessories

Display protection

Stainless steel, 1.4301 (304L)

2) Order Code for "Design", Option A "Insertion length short"

Ground disks

- Stainless steel, 1.4435 (316L)
- Alloy C22, 2.4602 (UNS N06022)
- Tantalum

Fitted electrodes

Measurement, reference and empty pipe detection electrodes available as standard with:

- 1.4435 (316L)
- Alloy C22, 2.4602 (UNS N06022)
- Tantalum

Optionally available with DN 350 to 2000 (14 to 78"):

Exchangeable measuring electrodes made from 1.4435 (316L)

Process connections

- EN 1092-1 (DIN 2501)³⁾
 - DN ≤ 300: fixed flange (PN 10/16/25/40) = form A
 - DN ≥ 350: fixed flange (PN 6/10/16/25) = flat face
 - DN 450 to 2000⁴⁾: fixed flange (PN 6/10/16) = flat face
- ASME B16.5
 - DN 25 to 600 (1 to 24"): fixed flange (Class 150)
 - DN 350 to 2000 (14 to 78")⁴⁾: fixed flange (Class 150)
 - DN 25 to 150 (1 to 6"): fixed flange (Class 300)
- AWWA C207
 - DN 48 to 72": fixed flange (Class D)
 - DN 48 to 78"⁴⁾: fixed flange (Class D)
- AS 2129
 - DN 50 to 1200: fixed flange (Table E)
 - DN 350 to 1200⁴⁾: fixed flange (Table E)
- AS 4087
 - DN 50 to 1200): fixed flange (PN 16)
 - DN 350 to 1200⁴⁾: fixed flange (PN 16)
- JIS B2220
 - DN 50 to 300: fixed flange (10K)
 - DN 25 to 300: fixed flange (20K)



For information on the materials of the process connections → 99

Surface roughness

Electrodes with 1.4435 (316L); Alloy C22, 2.4602 (UNS N06022); tantalum:

≤ 0.3 to 0.5 μm (11.8 to 19.7 μin)

(All data relate to parts in contact with fluid)

Operability

Operating concept**Operator-oriented menu structure for user-specific tasks**

- Commissioning
- Operation
- Diagnostics
- Expert level

Quick and safe commissioning

- Guided menus ("Make-it-run" wizards) for applications
- Menu guidance with brief explanations of the individual parameter functions

3) Dimensions as per DIN 2501, DN 65 (2 ½") PN 16 and DN 600 (24") PN 16 only as per EN 1092-1

4) Order code for "Design", option A "Insertion length short"

Reliable operation

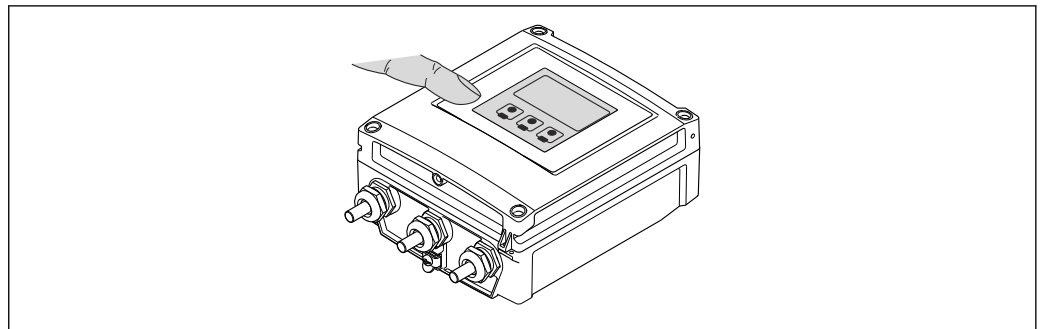
- Operation in the following languages:
 - Via local display: English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Bahasa (Indonesian), Vietnamese, Czech
 - Via "FieldCare" operating tool: English, German, French, Spanish, Italian, Chinese, Japanese
 - Via integrated Web browser (only available for device versions with HART, PROFIBUS DP and EtherNet/IP): English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Bahasa (Indonesian), Vietnamese, Czech
- Uniform operating philosophy applied to device, 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 device data and the event logbook. No need to reconfigure.

Efficient diagnostics increase measurement availability

- Troubleshooting measures can be called up via the device, operating tools and Web browser
- Diverse simulation options, logbook for events that occur and optional line recorder functions



In custody transfer mode, operation is only possible to a limited extent once the device has been put into circulation or has been lead-sealed.

Local operation**Via display module**

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Display elements

- 4-line display
- 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 $+50$ °C (-4 to $+122$ °F)
The readability of the display may be impaired at temperatures outside the temperature range.

Operating elements

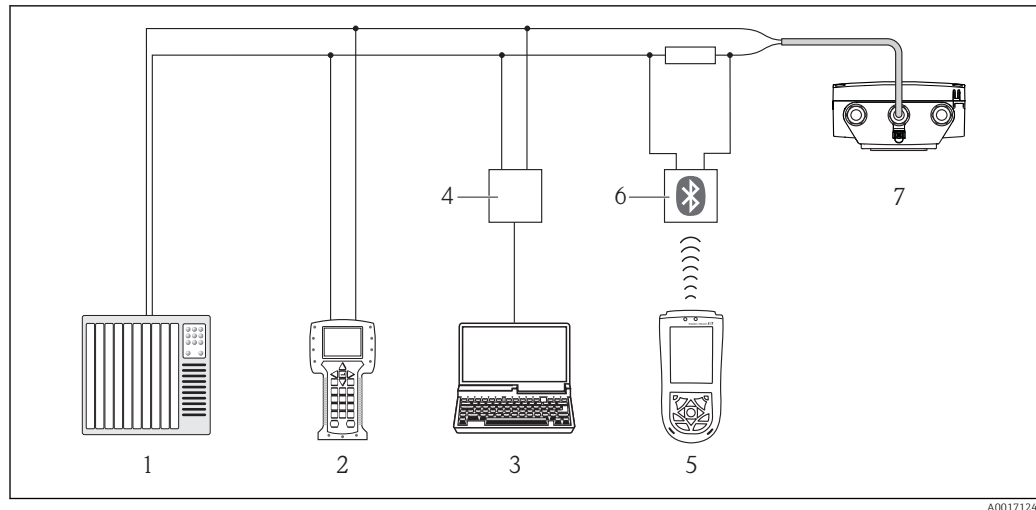
External operation via touch control; 3 optical keys: ☐, ☐, ☐

Additional functionality

- Data backup function
The device configuration can be saved in the display module.
- Data comparison function
The device configuration saved in the display module can be compared to the current device configuration.
- Data transfer function
The transmitter configuration can be transmitted to another device using the display module.

Remote operation**Via HART protocol**

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



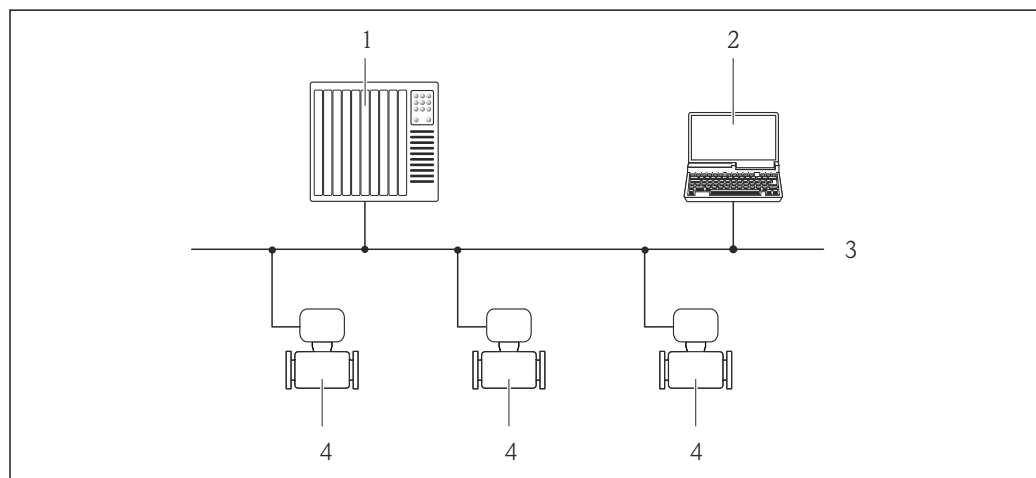
A0017124

35 Options for remote operation via HART protocol

- 1 Control 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 VIATOR Bluetooth modem with connecting cable
- 7 Transmitter

Via PROFIBUS DP network

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



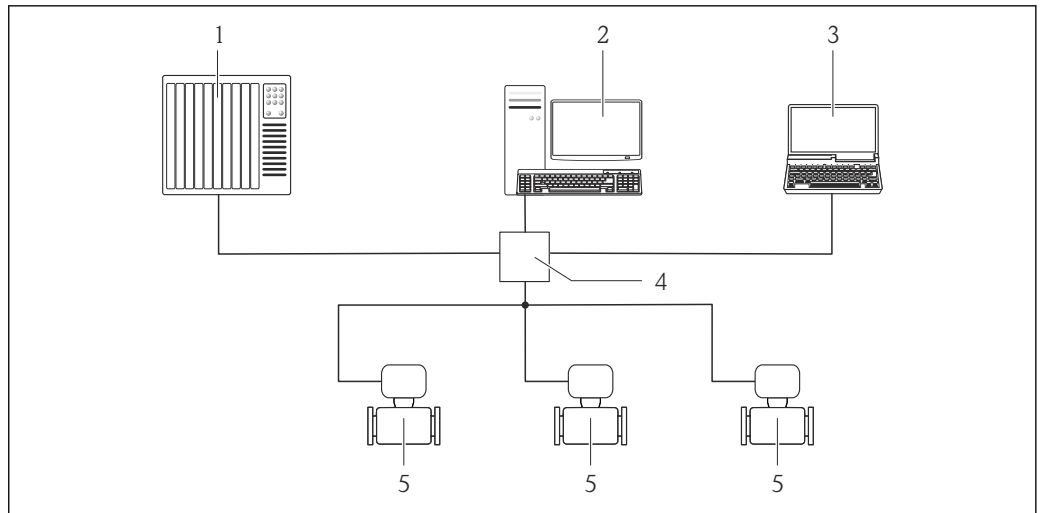
A0020903

36 Options for remote operation via PROFIBUS DP network

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

Via Ethernet-based fieldbus

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



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37 Options for remote operation via Ethernet-based fieldbus

- 1 Control system, e.g. "RSLogix" (Rockwell Automation)
- 2 Workstation for measuring device operation: with Add-on Profile Level 3 for "RSLogix 5000" (Rockwell Automation) or with Electronic Data Sheet (EDS)
- 3 Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or with "FieldCare" operating tool with COM DTM "CDI Communication TCP/IP"
- 4 Ethernet switch
- 5 Measuring device

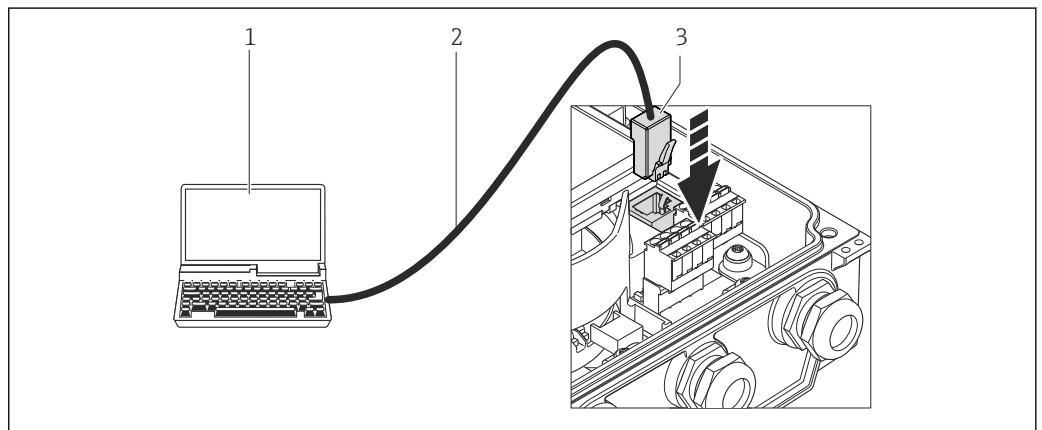
Service interface

Via service interface (CDI-RJ45)

This communication interface is present in the following device version:

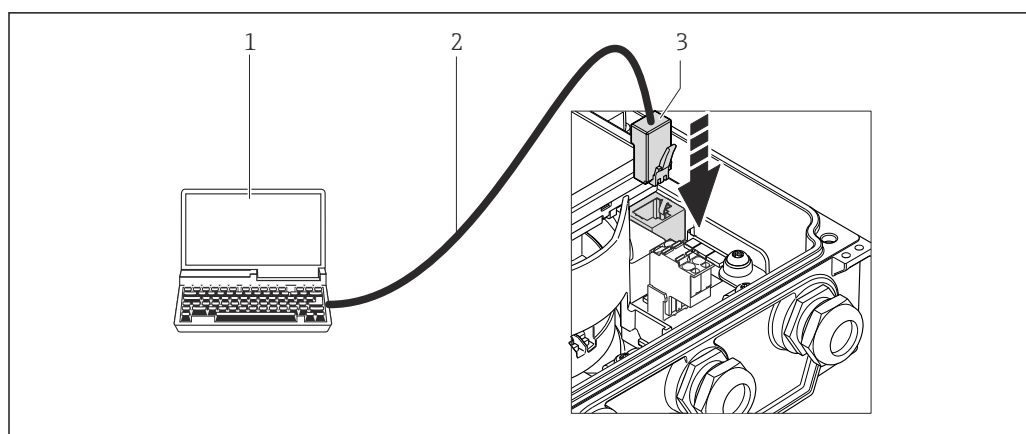
- Order code for "Output", option **H**: 4-20/0-20 mA HART, pulse/frequency/switch output
- Order code for "Output", option **I**: 4-20/0-20 mA HART, pulse/frequency/switch output, status input
- Order code for "Output", option **L**: PROFIBUS DP
- Order code for "Output", option **N**: EtherNet/IP
- Order code for "Output", option **M**: Modbus RS485

HART



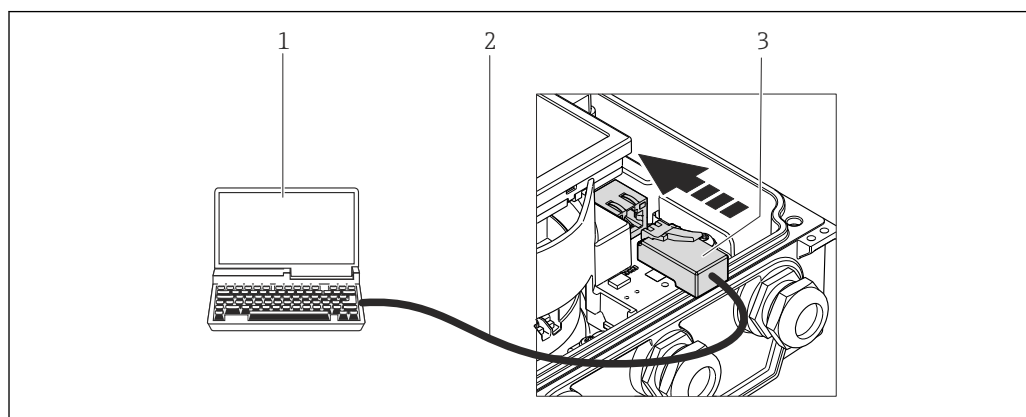
A0020481

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

PROFIBUS DP

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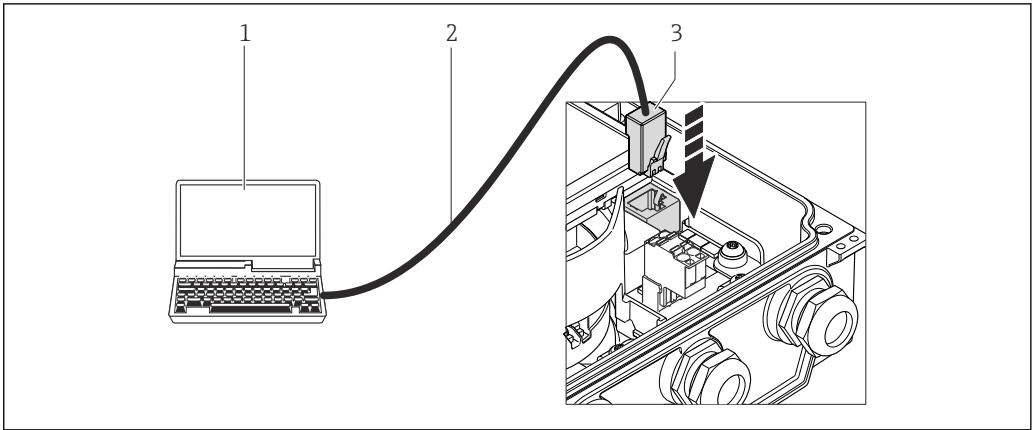
- 1 Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or with "FieldCare" operating tool with COM DTM "CDI Communication TCP/IP"
- 2 Standard Ethernet connecting cable with RJ45 plug
- 3 Service interface (CDI -RJ45) of the measuring device with access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

EtherNet/IP

A0023113

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

Modbus RS485



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

Certificates and approvals

CE mark	The measuring system is in conformity with the statutory requirements of the applicable EC Directives. These are listed in the corresponding EC Declaration of Conformity along with the standards applied. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.
C-Tick symbol	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. ATEX, IECEx Currently, the following versions for use in hazardous areas are available:
Drinking water approval	■ ACS ■ KTW/W270 ■ NSF 61 ■ WRAS BS 6920
Certification PROFIBUS	PROFIBUS interface The measuring device is certified and registered by the PROFIBUS User Organization (PNO). The measuring system meets all the requirements of the following specifications: ■ Certified in accordance with PROFIBUS PA Profile 3.02 ■ The device can also be operated with certified devices of other manufacturers (interoperability)
Modbus RS485 certification	The measuring device meets all the requirements of the MODBUS/TCP conformity test and has the "MODBUS/TCP Conformance Test Policy, Version 2.0". The measuring device has successfully passed all the test procedures carried out and is certified by the "MODBUS/TCP Conformance Test Laboratory" of the University of Michigan.

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)
Measuring instrument approval	Promag W 400 is (optionally) approved as a cold water meter (MI-001) for volume measurement in service subject to legal metrological control in accordance with the European Measuring Instruments Directive 2004/22/EC (MID). Promag W 400 is qualified to OIML R49 and has an OIML Certificate of Conformity (optional).
Other standards and guidelines	■ EN 60529 Degrees of protection provided by enclosures (IP code) ■ EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use ■ IEC/EN 61326 Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements). ■ ANSI/ISA-61010-1 (82.02.01): 2004 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1 General Requirements ■ CAN/CSA-C22.2 No. 61010-1-04 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1 General Requirements ■ 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 105 Specifications for integrating fieldbus devices in engineering tools for field devices ■ NAMUR NE 107 Self-monitoring and diagnosis of field devices ■ NAMUR NE 131 Requirements for field devices for standard applications

Ordering information

Detailed ordering information is available from the following sources:

- In the Product Configurator on the Endress+Hauser web site: www.endress.com → Choose your country → Products → Select measuring technology, software or components → Select product (picklists: measurement method, product family etc.) → Device support (right-hand column): Configure the selected product → The Product Configurator for the selected product is opened.
- From your Endress+Hauser Sales Center: www.addresses.endress.com



Product Configurator - the tool for individual product configuration

- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as 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

Product generation index

Release date	Product root	Modification
01.06.2012	8S1B	Original
01.01.2015	8S1C	DN 08 to 50 measuring tube material 1.4435/316L DN 40 to 50 reduction in length DN 40 to 50 reduction in weight



Additional information is available from your sales center or at:

www.service.endress.com → Downloads

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.

Cleaning

Package	Description
Electrode cleaning circuit (ECC)	The electrode cleaning circuit (ECC) function has been developed to have a solution for applications where magnetite (Fe_3O_4) deposits frequently occur (e.g. hot water). Since magnetite is highly conductive this build up leads to measuring errors and ultimately to the loss of signal. The application package is designed to AVOID build up of highly conductive matter and thin layers (typical of magnetite).

Diagnostics functions

Package	Description
HistoROM extended function	Comprises extended functions concerning the event log and the activation of the measured value memory. Event log: Memory volume is extended from 20 message entries (basic version) to up to 100 entries. Data logging (line recorder): - Memory capacity for up to 1000 measured values is activated. 250 measured values can be output via each of the 4 memory channels. The recording interval can be defined and configured by the user. - Data logging is visualized via the local display or FieldCare.

Heartbeat Technology

Package	Description
Heartbeat Verification +Monitoring	Heartbeat Monitoring: Continuously supplies monitoring data, which are characteristic of the measuring principle, for an external condition monitoring system. This makes it possible to: - Draw conclusions - using these data and other information - about the impact the measuring application has on the measuring performance over time. - Schedule servicing in time. - Monitor the product quality, e.g. gas pockets. Heartbeat Verification: Makes it possible to check the device functionality on demand when the device is installed, without having to interrupt the process. - Access via onsite operation or other operating interfaces, such as FieldCare for instance. - End-to-end, traceable documentation of the verification results, including report. - Makes it possible to extend calibration intervals in accordance with operator's risk assessment.

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 transmitter

Accessories	Description
Display protection	Is used to protect the display against impact or scoring from sand in desert areas.  For details, see Special Documentation SD00333F
Connecting cable for remote version	Coil current and electrode cables, various lengths, reinforced cables available on request.
Ground cable	Set, consisting of two ground cables for potential equalization.
Post mounting kit	Post mounting kit for transmitter.
Compact → remote conversion kit	For converting a compact device version to a remote device version.
Promag 50/53 → Promag 400 conversion kit	For converting a Promag with transmitter 50/53 to a Promag 400.

For the sensor

Accessories	Description
Ground disks	Are used to ground the fluid in lined measuring tubes to ensure proper measurement.  For details, see Installation Instructions EA00070D

Communication-specific accessories

Accessories	Description
Commubox FXA195 HART	For intrinsically safe HART communication with FieldCare via the USB interface.  For details, see "Technical Information" TI00404F
HART Loop Converter HMX50	Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values.  For details, see "Technical Information" TI00429F and 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.  For details, see Operating Instructions BA00061S
Fieldgate FXA320	Gateway for the remote monitoring of connected 4-20 mA measuring devices via a Web browser.  For details, see "Technical Information" TI00025S and Operating Instructions BA00053S
Fieldgate FXA520	Gateway for the remote diagnostics and remote configuration of connected HART measuring devices via a Web browser.  For details, see "Technical Information" TI00025S and Operating Instructions BA00051S

Field Xpert SFX350	Field Xpert SFX350 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the non-Ex area .  For details, see Operating Instructions BA01202S
Field Xpert SFX370	Field Xpert SFX370 is a mobile computer for commissioning and maintenance. It enables efficient device configuration and diagnostics for HART and FOUNDATION Fieldbus devices in the non-Ex area and the Ex area .  For details, see Operating Instructions BA01202S

Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: ■ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, accuracy or process connections. ■ Graphic illustration of the calculation results Administration, documentation and access to all project-related data and parameters throughout the entire life cycle of a project. Applicator is available: ■ Via the Internet: https://wapps.endress.com/applicator ■ On CD-ROM for local PC installation.
W@M	Life cycle management for your plant W@M supports you with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle. The application already contains the data of your Endress+Hauser device. Endress+Hauser also takes care of maintaining and updating the data records. W@M is available: ■ Via the Internet: www.endress.com/lifecyclemanagement ■ On CD-ROM for local PC installation.
FieldCare	FDT-based plant asset management tool from Endress+Hauser. It can configure all smart 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.  For details, see Operating Instructions BA00027S and BA00059S
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.  For details, see "Technical Information" TI00405C

System components

Accessories	Description
Memograph M graphic display recorder	The Memograph M graphic display recorder provides information on all 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.  For details, see "Technical Information" TI00133R and Operating Instructions BA00247R

Documentation



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

- The CD-ROM provided for the device (depending on the device version, the CD-ROM might not be part of the delivery!)
- The *W@M Device Viewer* : Enter the serial number from the nameplate (www.endress.com/deviceviewer)
- The *Endress+Hauser Operations App*: Enter the serial number from the nameplate or scan the 2-D matrix code (QR code) on the nameplate.

Standard documentation

Brief Operating Instructions

Measuring device	Documentation code
Promag W 400	KA01114D

Operating Instructions

Measuring device	Documentation code			
	HART	PROFIBUS DP	Modbus RS485	EtherNet/IP
Promag W 400	BA01063D	BA01234D	BA01231D	BA01214D

Supplementary device-dependent documentation

Special documentation

Contents	Documentation code
Modbus RS485 Register Information	SD01379D
Heartbeat Technology	SD01183D
Information on Custody Transfer Measurement	SD01230D

Installation Instructions

Contents	Documentation code
Installation Instructions for spare part sets	Specified for each individual accessory

Registered trademarks

HART®

Registered trademark of the HART Communication Foundation, Austin, USA

PROFIBUS®

Registered trademark of the PROFIBUS User Organization, Karlsruhe, Germany

Modbus®

Registered trademark of SCHNEIDER AUTOMATION, INC.

EtherNet/IP™

Trademark of ODVA, Inc.

Microsoft®

Registered trademark of the Microsoft Corporation, Redmond, Washington, USA

Applicator®, FieldCare®, Field Xpert™, HistoROM®, Heartbeat Technology™

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www.addresses.endress.com
