

Technical Information

Proline Promass Q 300

Coriolis flowmeter



Innovative specialist for challenging applications with a compact, easily accessible transmitter

Application

- Measuring principle operates independently of physical fluid properties such as viscosity or density
- Highest measurement performance for custody transfer, density and under tough process conditions

Device properties

- Mass/volume flow: measurement error $\pm 0.05\%$
- Density: measurement error $\pm 0.1 \text{ kg/m}^3$
- High turndown due to low pressure loss/zero point
- Compact dual-compartment housing with up to 3 I/Os
- Backlit display with touch control and WLAN access
- Remote display available

Your benefits

- Secured measuring quality – unmatched accuracy of mass flow, volume flow and density
- Optimized performance for liquids with entrained gas – MFT (Multi-Frequency Technology)
- Fewer process measuring points – multivariable measurement (flow, density, temperature)
- Space-saving installation – no in-/outlet run needs
- Full access to process and diagnostic information – numerous, freely combinable I/Os and Ethernet
- Reduced complexity and variety – freely configurable I/O functionality
- Integrated verification – Heartbeat Technology

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

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About this document

Symbols









Electrical symbols

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.
	Potential equalization connection (PE: protective earth) Ground terminals that must be connected to ground prior to establishing any other connections. The ground terminals are located on the interior and exterior of the device: <ul style="list-style-type: none"> ▪ Interior ground terminal: potential equalization is connected to the supply network. ▪ Exterior ground terminal: device is connected to the plant grounding system.

Communication-specific symbols




Symbol	Meaning
	Wireless Local Area Network (WLAN) Communication via a wireless, local network.

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
1, 2, 3, ...	Item numbers
1 , 2 , 3 , ...	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections

Symbol	Meaning
	Hazardous area
	Safe area (non-hazardous area)
	Flow direction

Function and system design

Measuring principle

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

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

F_c = Coriolis force

Δm = moving mass

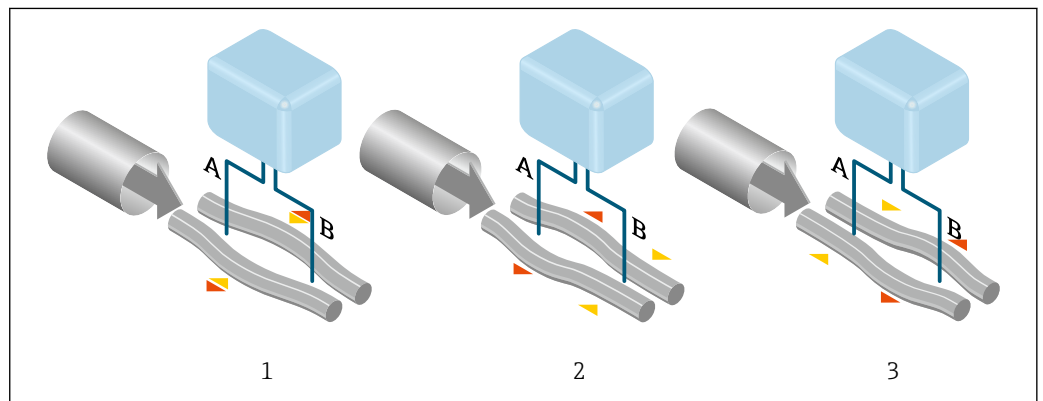
ω = rotational velocity

v = radial velocity in rotating or oscillating system

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

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

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



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

Density measurement

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

Volume measurement

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

Temperature measurement

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

Multi-frequency technology (MFT)

Highly accurate measurement of two-phase flow (gaseous medium with suspended bubbles or micro bubbles) using active compensation. Here, the two measuring tubes are excited simultaneously at different resonance frequencies. By analyzing the resonance characteristics of both oscillations in relation to the medium, measuring errors can be actively compensated.

Gas Fraction Handler (GFH)

The Gas Fraction Handler is a Promass software function that improves measurement stability and repeatability. The function continuously checks for the presence of disturbances in single-phase flow, i.e. gas bubbles in liquids or droplets in gas. In the presence of the second phase, flow and density become increasingly unstable. The Gas Fraction Handler function improves measurement stability with respect to the severity of the disturbances, without any effect under single-phase flow conditions.

 The Gas Fraction Handler is only available in device versions with HART, Modbus RS485, PROFINET and PROFINET with Ethernet-APL.

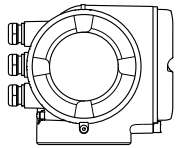
 For detailed information on the Gas Fraction Handler, see the Special Documentation for "Gas Fraction Handler" →  113

Measuring system

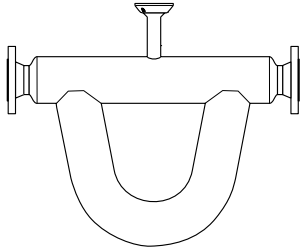
The device consists of a transmitter and a sensor.

The device is available as a compact version:
The transmitter and sensor form a mechanical unit.

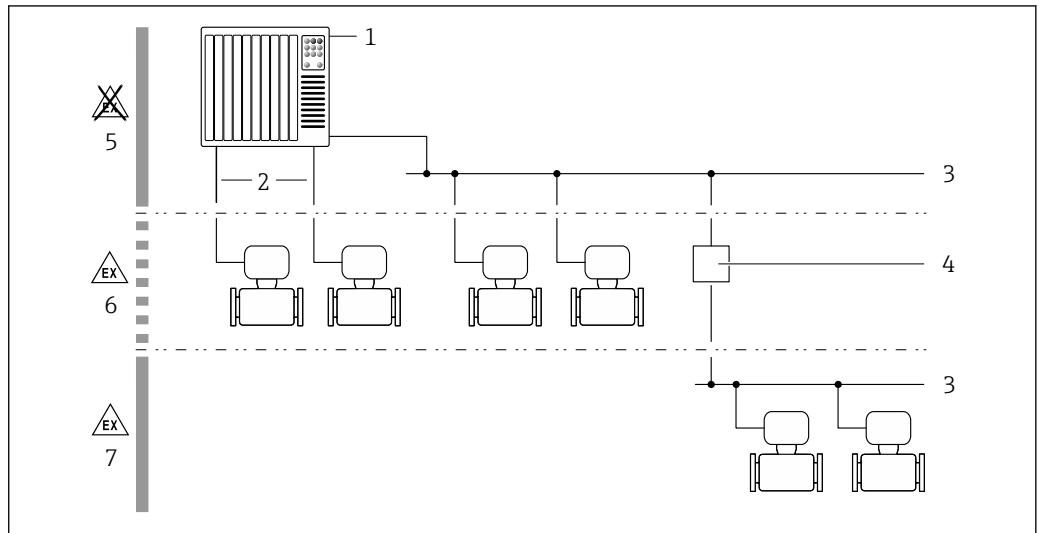
Transmitter

<p>Proline 300</p>  <p>A0026708</p>	<p>Device versions and materials:</p> <ul style="list-style-type: none"> ▪ Transmitter housing <ul style="list-style-type: none"> ▪ Aluminum, coated: aluminum, AlSi10Mg, coated ▪ Stainless, hygienic: stainless steel, 1.4404 ▪ Cast, stainless: cast, stainless steel, 1.4409 (CF3M) similar to 316L ▪ Material of window in transmitter housing: <ul style="list-style-type: none"> ▪ Aluminum, coated: glass ▪ Stainless, hygienic: polycarbonate ▪ Cast, stainless: glass <p>Configuration:</p> <ul style="list-style-type: none"> ▪ External operation via 4-line, illuminated graphic local display (LCD) with touch control and guided menus ("Make-it-run" wizards) for application-specific commissioning. ▪ Via service interface or WLAN interface: <ul style="list-style-type: none"> ▪ Operating tools (e.g. FieldCare, DeviceCare) ▪ Web server (access via Web browser, e.g. Microsoft Internet Explorer, Microsoft Edge)
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Sensor

<p>Promass Q</p>  <p>A0030075</p>	<ul style="list-style-type: none"> ▪ Nominal diameter range: DN 25 to 250 (1 to 10 ") <ul style="list-style-type: none"> ▪ Bent dual-tube system: DN 25 to 100 (1 to 4 ") ▪ Four-tube system: DN 150 to 250 (6 to 10 ") ▪ Excellent performance across a wide range of applications ▪ Simultaneous measurement of flow, volume flow, density and temperature (multivariable) ▪ Immune to process influences ▪ Materials: <ul style="list-style-type: none"> ▪ Sensor: stainless steel, 1.4404 (316L) ▪ Measuring tubes: stainless steel, 1.4404 (316/316L) ▪ Process connections: stainless steel, 1.4404 (316/316L)
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Equipment architecture



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1 Possibilities for integrating measuring devices into a system

- 1 Control system (e.g. PLC)
- 2 Connecting cable (0/4 to 20 mA HART etc.)
- 3 Fieldbus
- 4 Coupler
- 5 Non-hazardous area
- 6 Hazardous area: Zone 2; Class I, Division 2
- 7 Hazardous area: Zone 1; Class I, Division 1

Reliability

IT security

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

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

Device-specific IT security

The device offers a range of specific functions to support protective measures on the operator's side. These functions can be configured by the user and guarantee greater in-operation safety if used correctly. The following list provides an overview of the most important functions:

Function/interface	Factory setting	Recommendation
Write protection via hardware write protection switch → 8	Not enabled	On an individual basis following risk assessment
Access code (also applies to web server login or FieldCare connection) → 8	Not enabled (0000)	Assign a customized access code during commissioning
WLAN (order option in display module)	Enabled	On an individual basis following risk assessment
WLAN security mode	Enabled (WPA2-PSK)	Do not change
WLAN passphrase (Password) → 8	Serial number	Assign an individual WLAN passphrase during commissioning
WLAN mode	Access point	On an individual basis following risk assessment
Web server → 8	Enabled	On an individual basis following risk assessment
Service interface CDI-RJ45 → 9	-	On an individual basis following risk assessment

Protecting access via hardware write protection

Write access to the parameters of the device via the local display, web browser or operating tool (e.g. FieldCare, DeviceCare) can be disabled via a write protection switch (DIP switch on the main electronics module). When hardware write protection is enabled, only read access to the parameters is possible.

Hardware write protection is disabled when the device is delivered.

Protecting access via a password

Different passwords are available to protect write access to the device parameters or access to the device via the WLAN interface.

- **User-specific access code**
Protect write access to the device parameters via the local display, web browser or operating tool (e.g. FieldCare, DeviceCare). Access authorization is clearly regulated through the use of a user-specific access code.
- **WLAN passphrase**
The network key protects a connection between an operating unit (e.g. notebook or tablet) and the device via the WLAN interface which can be ordered as an option.
- **Infrastructure mode**
When the device is operated in infrastructure mode, the WLAN passphrase corresponds to the WLAN passphrase configured on the operator side.

User-specific access code

Write access to the device parameters via the local display, web browser or operating tool (e.g. FieldCare, DeviceCare) can be protected by the modifiable, user-specific access code.

WLAN passphrase: Operation as WLAN access point

A connection between an operating unit (e.g. notebook or tablet) and the device via the WLAN interface, which can be ordered as an optional extra, is protected by the network key. The WLAN authentication of the network key complies with the IEEE 802.11 standard.

When the device is delivered, the network key is pre-defined depending on the device. It can be changed via the **WLAN settings** submenu in the **WLAN passphrase** parameter.

Infrastructure mode

A connection between the device and WLAN access point is protected by means of an SSID and passphrase on the system side. Please contact the relevant system administrator for access.

General notes on the use of passwords

- The access code and network key supplied with the device should be changed during commissioning for safety reasons.
- Follow the general rules for generating a secure password when defining and managing the access code and network key.
- The user is responsible for the management and careful handling of the access code and network key.


Access via web server

The device can be operated and configured via a web browser with the integrated web server. The connection is established via the service interface (CDI-RJ45) or the WLAN interface. For device versions with the EtherNet/IP and PROFINET communication protocols, the connection can also be established via the terminal connection for signal transmission with EtherNet/IP, PROFINET (RJ45 plug) or PROFINET with Ethernet-APL (two-wire).



The web server is enabled when the device is delivered. The web server can be disabled via the **Web server functionality** parameter if necessary (e.g., after commissioning).

The device and status information can be hidden on the login page. This prevents unauthorized access to the information.



Detailed information on the device parameters:
"Description of device parameters" document →  112.

Access via OPC-UA

 The "OPC UA Server" application package is available in the device version with the HART communication protocol →  109.

The device can communicate with OPC UA clients using the "OPC UA Server" application package.

The OPC UA server integrated in the device can be accessed via the WLAN access point using the WLAN interface - which can be ordered as an optional extra - or the service interface (CDI-RJ45) via Ethernet network. Access rights and authorization as per separate configuration.


The following Security Modes are supported as per the OPC UA Specification (IEC 62541):



- None
- Basic128Rsa15 – signed
- Basic128Rsa15 – signed and encrypted

Access via service interface (CDI-RJ45)

The device can be connected to a network via the service interface (CDI-RJ45). Device-specific functions guarantee the secure operation of the device in a network.

The use of relevant industrial standards and guidelines that have been defined by national and international safety committees, such as IEC/ISA62443 or the IEEE, is recommended. This includes organizational security measures such as the assignment of access authorization as well as technical measures such as network segmentation.

 Transmitters with an Ex de approval may not be connected via the service interface (CDI-RJ45)!
Order code for "Approval transmitter + sensor", options (Ex de): BA, BB, C1, C2, GA, GB, MA, MB, NA, NB BB, C2, GB, MB, NB

 The device can be integrated into a ring topology. The device is integrated via the terminal connection for signal transmission (output 1) and the connection to the service interface (CDI-RJ45) →  97.

Input

Measured variable

Direct measured variables

- Mass flow
- Density
- Temperature

Calculated measured variables

- Volume flow
- Corrected volume flow
- Reference density

Measuring range

Measuring range for liquids

DN Measuring instrument		DN Compatible pipe diameter		Measuring range full scale values $\dot{m}_{\min(F)}$ to $\dot{m}_{\max(F)}$	
[mm]	[in]	[mm]	[in]	[kg/h]	[lb/min]
25	1	25/40	1/1½	0 to 20 000	0 to 735
50	2	50/80	2/3	0 to 80 000	0 to 2 940
80	3	80/100	3/4	0 to 200 000	0 to 7 350
100	4	100/150	4/6	0 to 550 000	0 to 20 210
150	6	150/200	6/8	0 to 850 000	0 to 31 240
200	8	200/250	8/10	0 to 1 500 000	0 to 55 130
250	10	250/300	10/12	0 to 2 400 000	0 to 88 200

Measuring range for gases

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

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

$\dot{m}_{\max(G)}$	Maximum full scale value for gas [kg/h]
ρ_G	Gas density in [kg/m ³] at operating conditions
c_G	Sound velocity (gas) [m/s]
d_i	Measuring tube internal diameter [m]
π	Pi
$n = 2$	Number of measuring tubes for DN 25 to 100 (1 to 4 ")
$n = 4$	Number of measuring tubes for DN 150 to 250 (6 to 10 ")
$m = 2$	For all gases except pure H ₂ and He gas
$m = 3$	For pure H ₂ and He gas



To calculate the measuring range, use the *Applicator* sizing tool → 111

Recommended measuring range



Flow limit → 63

Operable flow range

Over 1000 : 1.

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

Input signal

Output and input variants

→ 12

External measured values

Various pressure and temperature measuring devices can be ordered from Endress+Hauser: see "Accessories" section → 111

It is recommended to read in external measured values to calculate the 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

Current input

The measured values are written from the automation system to the measuring device via the current input → 11.

Digital communication

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

- FOUNDATION Fieldbus
- PROFIBUS DP
- PROFIBUS PA
- Modbus RS485
- Modbus TCP over Ethernet-APL
- Ethernet/IP
- PROFINET
- PROFINET over Ethernet-APL

Current input 0/4 to 20 mA

Current input	0/4 to 20 mA (active/passive)
Current span	<ul style="list-style-type: none"> ▪ 4 to 20 mA (active) ▪ 0/4 to 20 mA (passive)
Resolution	1 µA
Voltage drop	Typically: 0.6 to 2 V for 3.6 to 22 mA (passive)
Maximum input voltage	≤ 30 V (passive)
Open-circuit voltage	≤ 28.8 V (active)
Possible input variables	<ul style="list-style-type: none"> ▪ Pressure ▪ Temperature ▪ Density

Status input

Maximum input values	<ul style="list-style-type: none"> ▪ DC -3 to 30 V ▪ If status input is active (ON): R_i >3 kΩ
Response time	Configurable: 5 to 200 ms
Input signal level	<ul style="list-style-type: none"> ▪ Low signal: DC -3 to +5 V ▪ High signal: DC 12 to 30 V
Assignable functions	<ul style="list-style-type: none"> ▪ Off ▪ Reset the individual totalizers separately ▪ Reset all totalizers ▪ Flow override

Output

Output and input variants

Depending on the option selected for output/input 1, different options are available for the other outputs and inputs. Only one option can be selected for each output/input 1 to 3. The following tables must be read vertically (↓).

Example: If the option BA "4–20 mA HART" was selected for output/input 1, one of the options A, B, D, E, F, H, I or J is available for output 2 and one of the options A, B, D, E, F, H, I or J is available for output 3.

Output/input 1 and options for output/input 2



 Options for output/input 3 →  13

Order code for "Output; input 1" (020) →	Possible options												
Current output 4 to 20 mA HART	BA												
Current output 4 to 20 mA HART Ex i passive	↓	CA											
Current output 4 to 20 mA HART Ex i active		↓	CC										
FOUNDATION Fieldbus			↓	SA									
FOUNDATION Fieldbus Ex i				↓	TA								
PROFIBUS DP					↓	LA							
PROFIBUS PA						↓	GA						
PROFIBUS PA Ex i							↓	HA					
Modbus RS485								↓	MA				
EtherNet/IP 2-port switch integrated									↓	NA			
PROFINET 2-port switch integrated										↓	RA		
PROFINET over Ethernet-APL											↓	RB	
PROFINET over Ethernet-APL Ex i												↓	RC
Order code for "Output; input 2" (021) →	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Not used	A	A	A	A	A	A	A	A	A	A	A	A	A
Current output 4 to 20 mA	B			B		B	B		B	B	B	B	
Current output 4 to 20 mA Ex i passive		C	C		C			C					C
User-configurable input/output ¹⁾	D			D		D	D		D	D	D	D	
Pulse/frequency/switch output	E			E		E	E		E	E	E	E	
Double pulse output ²⁾	F								F				
Pulse/frequency/switch output Ex i passive		G	G		G			G					G
Relay output	H			H		H	H		H	H	H	H	
Current input 0/4 to 20 mA	I			I		I	I		I	I	I	I	
Status input	J			J		J	J		J	J	J	J	

1) A specific input or output can be assigned →  20 to a user-configurable input/output.

2) If double pulse output (F) is selected for output/input 2 (021), only the double pulse output (F) option is available for selection for output/input 3 (022).

Output/input 1 and options for output/input 3


 Options for output/input 2 →  12

Order code for "Output; input 1" (020) →	Possible options												
Current output 4 to 20 mA HART	BA												
Current output 4 to 20 mA HART Ex i passive	↓	CA											
Current output 4 to 20 mA HART Ex i active		↓	CC										
FOUNDATION Fieldbus			↓	SA									
FOUNDATION Fieldbus Ex i				↓	TA								
PROFIBUS DP					↓	LA							
PROFIBUS PA						↓	GA						
PROFIBUS PA Ex i							↓	HA					
Modbus RS485								↓	MA				
EtherNet/IP 2-port switch integrated									↓	NA			
PROFINET 2-port switch integrated										↓	RA		
PROFINET over Ethernet-APL/SPE, 10 Mbit/s, 2-wire											↓	RB	
PROFINET over Ethernet-APL Ex i, 10 Mbit/s, 2-wire												↓	RC
Order code for "Output; input 3" (022) →	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
Not used	A	A	A	A	A	A	A	A	A	A	A	A	A
Current output 4 to 20 mA	B						B			B	B	B	B
Current output 4 to 20 mA Ex i passive		C	C										
User-configurable input/output	D						D			D	D	D	D
Pulse/frequency/switch output	E						E			E	E	E	E
Double pulse output (slave) ¹⁾	F									F			
Pulse/frequency/switch output Ex i passive		G	G										
Relay output	H						H			H	H	H	H
Current input 0/4 to 20 mA	I						I			I	I	I	I
Status input	J						J			J	J	J	J

1) If double pulse output (F) is selected for output/input 2 (021), only the double pulse output (F) option is available for output/input 3 (022).


Output signal

Current output 4 to 20 mA HART

Order code	"Output; input 1" (20): Option BA: current output 4 to 20 mA HART
Signal mode	Can be set to: <ul style="list-style-type: none"> ■ Active ■ Passive
Current range	Can be set to: <ul style="list-style-type: none"> ■ 4 to 20 mA NAMUR ■ 4 to 20 mA US ■ 4 to 20 mA ■ 0 to 20 mA (only if the signal mode is active) ■ Fixed current
Open-circuit voltage	DC 28.8 V (active)
Maximum input voltage	DC 30 V (passive)
Load	250 to 700 Ω
Resolution	0.38 μ A
Damping	Configurable: 0 to 999.9 s
Assignable measured variables	<ul style="list-style-type: none"> ■ Mass flow ■ Volume flow ■ Corrected volume flow ■ Density ■ Reference density ■ Temperature ■ Electronics temperature ■ Oscillation frequency 0 ■ Oscillation damping 0 ■ Signal asymmetry ■ Exciter current 0 <p> The range of options increases if the measuring device has one or more application packages.</p>

Current output 4 to 20 mA HART Ex i

Order code	"Output; input 1" (20) choose from: <ul style="list-style-type: none"> ■ Option CA: current output 4 to 20 mA HART Ex i passive ■ Option CC: current output 4 to 20 mA HART Ex i active
Signal mode	Depends on the selected order version.
Current range	Can be set to: <ul style="list-style-type: none"> ■ 4 to 20 mA NAMUR ■ 4 to 20 mA US ■ 4 to 20 mA ■ 0 to 20 mA (only if the signal mode is active) ■ Fixed current
Open-circuit voltage	DC 21.8 V (active)
Maximum input voltage	DC 30 V (passive)
Load	<ul style="list-style-type: none"> ■ 250 to 400 Ω (active) ■ 250 to 700 Ω (passive)
Resolution	0.38 μ A

Damping	Configurable: 0 to 999.9 s
Assignable measured variables	<ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature ▪ Electronics temperature ▪ Oscillation frequency 0 ▪ Oscillation damping 0 ▪ Signal asymmetry ▪ Exciter current 0 <p> The range of options increases if the measuring device has one or more application packages.</p>

FOUNDATION Fieldbus

FOUNDATION Fieldbus	H1, IEC 61158-2, galvanically isolated
Data transfer	31.25 kbit/s
Current consumption	10 mA
Permitted supply voltage	9 to 32 V
Bus connection	With integrated reverse polarity protection

PROFIBUS DP

Signal encoding	NRZ code
Data transfer	9.6 kBaud...12 MBaud
Terminating resistor	Integrated, can be activated via DIP switches

PROFIBUS PA

PROFIBUS PA	In accordance with EN 50170 Volume 2, IEC 61158-2 (MBP), galvanically isolated
Data transmission	31.25 kbit/s
Current consumption	10 mA
Permitted supply voltage	9 to 32 V
Bus connection	With integrated reverse polarity protection

Modbus RS485

Physical interface	RS485 in accordance with EIA/TIA-485 standard
Terminating resistor	Integrated, can be activated via DIP switches

EtherNet/IP

Standards	In accordance with IEEE 802.3
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PROFINET

Standards	In accordance with IEEE 802.3
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PROFINET with Ethernet-APL

Device use	<p>Device connection to an APL field switch The device may only be operated according to the following APL port classifications:</p> <ul style="list-style-type: none"> ▪ If used in hazardous areas: SLAA or SLAC ¹⁾ ▪ If used in non-hazardous areas: SLAX <p>Connection values of APL field switch (corresponds to APL port classification SPCC or SPAA, for instance):</p> <ul style="list-style-type: none"> ▪ Maximum input voltage: 15 V_{DC} ▪ Minimum output values: 0.54 W <p>Device connection to an SPE switch</p> <ul style="list-style-type: none"> ▪ In non-hazardous areas, the device can be used with an appropriate SPE switch: The device can be connected to an SPE switch with a maximum voltage of 30 V_{DC} and a minimum output power of 1.85 W connected. ▪ The SPE switch must support the 10BASE-T1L standard and PoDL power classes 10, 11 or 12 and have a function to disable power class detection.
PROFINET	According to IEC 61158 and IEC 61784
Ethernet-APL	According to IEEE 802.3cg, APL port profile specification v1.0, galvanically isolated
Data transmission	10 Mbit/s
Current consumption	<p>Transmitter</p> <ul style="list-style-type: none"> ▪ Max. 400 mA (24 V) ▪ Max. 200 mA (110 V, 50/60 Hz; 230 V, 50/60 Hz)
Permitted supply voltage	9 to 30 V
Network connection	With integrated reverse polarity protection


1) For more information on using the device in the hazardous area, see the Ex-specific Safety Instructions

Current output 4 to 20 mA


Order code	"Output; input 2" (21), "Output; input 3" (022): Option B: current output 4 to 20 mA
Signal mode	Can be set to: <ul style="list-style-type: none"> ▪ Active ▪ Passive
Current range	Can be set to: <ul style="list-style-type: none"> ▪ 4 to 20 mA NAMUR ▪ 4 to 20 mA US ▪ 4 to 20 mA ▪ 0 to 20 mA (only if the signal mode is active) ▪ Fixed current
Maximum output values	22.5 mA
Open-circuit voltage	DC 28.8 V (active)
Maximum input voltage	DC 30 V (passive)
Load	0 to 700 Ω
Resolution	0.38 μA



Damping	Configurable: 0 to 999.9 s
Assignable measured variables	<ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature ▪ Electronics temperature ▪ Oscillation frequency 0 ▪ Oscillation damping 0 ▪ Signal asymmetry ▪ Exciter current 0 <p> The range of options increases if the measuring device has one or more application packages.</p>


Current output 4 to 20 mA Ex i passive

Order code	"Output; input 2" (21), "Output; input 3" (022): Option C: current output 4 to 20 mA Ex i passive
Signal mode	Passive
Current range	Can be set to: <ul style="list-style-type: none"> ▪ 4 to 20 mA NAMUR ▪ 4 to 20 mA US ▪ 4 to 20 mA ▪ Fixed current
Maximum output values	22.5 mA
Maximum input voltage	DC 30 V
Load	0 to 700 Ω
Resolution	0.38 μA
Damping	Configurable: 0 to 999 s
Assignable measured variables	<ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature ▪ Electronics temperature ▪ Oscillation frequency 0 ▪ Oscillation damping 0 ▪ Signal asymmetry ▪ Exciter current 0 <p> The range of options increases if the measuring device has one or more application packages.</p>


Pulse/frequency/switch output

Function	Can be configured as pulse, frequency or switch output
Version	Open collector Can be set to: <ul style="list-style-type: none"> ▪ Active ▪ Passive ▪ Passive NAMUR <p> Ex-i, passive</p>
Maximum input values	DC 30 V, 250 mA (passive)
Open-circuit voltage	DC 28.8 V (active)
Voltage drop	For 22.5 mA: ≤ DC 2 V

Pulse output	
Maximum input values	DC 30 V, 250 mA (passive)
Maximum output current	22.5 mA (active)
Open-circuit voltage	DC 28.8 V (active)
Pulse width	Configurable: 0.05 to 2 000 ms
Maximum pulse rate	10 000 Impulse/s
Pulse value	Configurable
Assignable measured variables	<ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow  The range of options increases if the measuring device has one or more application packages.
Frequency output	
Maximum input values	DC 30 V, 250 mA (passive)
Maximum output current	22.5 mA (active)
Open-circuit voltage	DC 28.8 V (active)
Output frequency	Configurable: end value frequency 2 to 10 000 Hz ($f_{\max} = 12\,500$ Hz)
Damping	Configurable: 0 to 999.9 s
Pulse/pause ratio	1:1
Assignable measured variables	<ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature ▪ Electronics temperature ▪ Oscillation frequency 0 ▪ Oscillation damping 0 ▪ Signal asymmetry ▪ Exciter current 0  The range of options increases if the measuring device has one or more application packages.
Switch output	
Maximum input values	DC 30 V, 250 mA (passive)
Open-circuit voltage	DC 28.8 V (active)
Switching behavior	Binary, conductive or non-conductive
Switching delay	Configurable: 0 to 100 s


Number of switching cycles	Unlimited
Assignable functions	<ul style="list-style-type: none"> ▪ Disable ▪ On ▪ Diagnostic behavior ▪ Limit <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature ▪ Totalizer 1-3 ▪ Flow direction monitoring ▪ Status <ul style="list-style-type: none"> ▪ Partially filled pipe detection ▪ Low flow cut off <p> The range of options increases if the measuring device has one or more application packages.</p>

Double pulse output

Function	Double pulse
Version	Open collector Can be set to: <ul style="list-style-type: none"> ▪ Active ▪ Passive ▪ Passive NAMUR
Maximum input values	DC 30 V, 250 mA (passive)
Open-circuit voltage	DC 28.8 V (active)
Voltage drop	For 22.5 mA: ≤ DC 2 V
Output frequency	Configurable: 0 to 1000 Hz
Damping	Configurable: 0 to 999 s
Pulse/pause ratio	1:1
Assignable measured variables	<ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature <p> The range of options increases if the measuring device has one or more application packages.</p>

Relay output

Function	Switch output
Version	Relay output, galvanically isolated
Switching behavior	Can be set to: <ul style="list-style-type: none"> ▪ NO (normally open), factory setting ▪ NC (normally closed)

Maximum switching capacity (passive)	<ul style="list-style-type: none"> ▪ DC 30 V, 0.1 A ▪ AC 30 V, 0.5 A
Assignable functions	<ul style="list-style-type: none"> ▪ Disable ▪ On ▪ Diagnostic behavior ▪ Limit <ul style="list-style-type: none"> ▪ Mass flow ▪ Volume flow ▪ Corrected volume flow ▪ Density ▪ Reference density ▪ Temperature ▪ Totalizer 1-3 ▪ Flow direction monitoring ▪ Status <ul style="list-style-type: none"> ▪ Partially filled pipe detection ▪ Low flow cut off <p> The range of options increases if the measuring device has one or more application packages.</p>

User-configurable input/output

One specific input or output is assigned to a user-configurable input/output (configurable I/O) during device commissioning.

The following inputs and outputs are available for assignment:

- Choice of current output: 4 to 20 mA (active), 0/4 to 20 mA (passive)
- Pulse/frequency/switch output
- Choice of current input: 4 to 20 mA (active), 0/4 to 20 mA (passive)
- Status input

The technical values correspond to those of the inputs and outputs described in this section.

Signal on alarm

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

HART current output

Device diagnostics	Device condition can be read out via HART Command 48
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PROFIBUS PA

Status and alarm messages	Diagnostics in accordance with PROFIBUS PA Profile 3.02
Failure current FDE (Fault Disconnection Electronic)	0 mA

PROFIBUS DP

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

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

Device diagnostics	According to "Application Layer protocol for decentralized periphery", Version 2.3
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PROFINET with Ethernet-APL

Device diagnostics	Diagnostics according to PROFINET PA Profile 4
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FOUNDATION Fieldbus

Status and alarm messages	Diagnostics in accordance with FF-891
Failure current FDE (Fault Disconnection Electronic)	0 mA

Modbus RS485

Failure mode	Choose from: <ul style="list-style-type: none"> ▪ NaN value instead of current value ▪ Last valid value
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Modbus TCP-APL

Failure mode	Choose from: <ul style="list-style-type: none"> ▪ NaN value instead of current value ▪ Last valid value
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Current output 0/4 to 20 mA

4 to 20 mA

Failure mode	Choose from: <ul style="list-style-type: none"> ▪ 4 to 20 mA in accordance with NAMUR recommendation NE 43 ▪ 4 to 20 mA in accordance with US ▪ Min. value: 3.59 mA ▪ Max. value: 22.5 mA ▪ Definable value between: 3.59 to 22.5 mA ▪ Actual value ▪ Last valid value
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0 to 20 mA

Failure mode	Choose from: <ul style="list-style-type: none"> ▪ Maximum alarm: 22 mA ▪ Definable value between: 0 to 20.5 mA
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Pulse/frequency/switch output

Pulse output	
Fault mode	Choose from: <ul style="list-style-type: none"> ▪ Actual value ▪ No pulses
Frequency output	
Fault mode	Choose from: <ul style="list-style-type: none"> ▪ Actual value ▪ 0 Hz ▪ Definable value between: 2 to 12 500 Hz

Switch output	
Fault mode	Choose from: <ul style="list-style-type: none"> ▪ Current status ▪ Open ▪ Closed

Relay output

Failure mode	Choose from: <ul style="list-style-type: none"> ▪ Current status ▪ Open ▪ Closed
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Local display

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

 Status signal as per NAMUR recommendation NE 107

Interface/protocol

- Via digital communication:
 - HART protocol
 - FOUNDATION Fieldbus
 - PROFIBUS PA
 - PROFIBUS DP
 - Modbus RS485
 - Modbus TCP with Ethernet-APL
 - EtherNet/IP
 - PROFINET
 - PROFINET with Ethernet-APL
- Via service interface
 - CDI-RJ45 service interface
 - WLAN interface

Plain text display	With information on cause and remedial measures
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 Additional information on remote operation →  91

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: <ul style="list-style-type: none"> ▪ Supply voltage active ▪ Data transmission active ▪ Device alarm/error has occurred ▪ EtherNet/IP network available ▪ EtherNet/IP connection established ▪ PROFINET network available ▪ PROFINET connection established ▪ PROFINET blinking feature
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Load

Output signal → 14

Ex connection data

Safety-related values

Order code "Output; input 1"	Output type	Safety-related values "Output; input 1"	
		26 (+)	27 (-)
Option BA	Current output 4 to 20 mA HART	$U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$	
Option GA	PROFIBUS PA	$U_N = 32 V_{DC}$ $U_M = 250 V_{AC}$	
Option LA	PROFIBUS DP	$U_N = 32 V_{DC}$ $U_M = 250 V_{AC}$	
Option MA	Modbus RS485	$U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$	
Option MB	Modbus TCP with Ethernet-APL	APL port profile SLAX SPE PoDL classes 10, 11, 12 $U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$	
Option SA	FOUNDATION Fieldbus	$U_N = 32 V_{DC}$ $U_M = 250 V_{AC}$	
Option NA	EtherNet/IP	$U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$	
Option RA	PROFINET	$U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$	
Option RB	PROFINET with Ethernet- APL	APL port profile SLAX SPE PoDL classes 10, 11, 12 $U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$	

Order code "Output; input 2"; "Output; input 3"	Output type	Safety-related values			
		Output; input 2		Output; input 3	
		24 (+)	25 (-)	22 (+)	23 (-)
Option B	Current output 4 to 20 mA	$U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$			
Option D	User-configurable input/ output	$U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$			
Option E	Pulse/frequency/switch output	$U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$			
Option F	Double pulse output	$U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$			
Option H	Relay output	$U_N = 30 V_{DC}$ $I_N = 100 mA_{DC}/500 mA_{AC}$ $U_M = 250 V_{AC}$			
Option I	Current input 4 to 20 mA	$U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$			
Option J	Status input	$U_N = 30 V_{DC}$ $U_M = 250 V_{AC}$			

Intrinsically safe values

Order code "Output; input 1"	Output type	Intrinsically safe values "Output; input 1"	
		26 (+)	27 (-)
Option CA	Current output 4 to 20 mA HART Ex i passive	$U_i = 30\text{ V}$ $I_i = 100\text{ mA}$ $P_i = 1.25\text{ W}$ $L_i = 0\text{ }\mu\text{H}$ $C_i = 6\text{ nF}$	
Option CC	Current output 4 to 20 mA HART Ex i active	Ex ia ¹⁾ $U_0 = 21.8\text{ V}$ $I_0 = 90\text{ mA}$ $P_0 = 491\text{ mW}$ $L_0 = 4.1\text{ mH (IIC)}/15\text{ mH (IIB)}$ $C_0 = 160\text{ nF (IIC)}/1\text{ }160\text{ nF (IIB)}$ $U_i = 30\text{ V}$ $I_i = 10\text{ mA}$ $P_i = 0.3\text{ W}$ $L_i = 5\text{ }\mu\text{H}$ $C_i = 6\text{ nF}$	Ex ic ²⁾ $U_0 = 21.8\text{ V}$ $I_0 = 90\text{ mA}$ $P_0 = 491\text{ mW}$ $L_0 = 9\text{ mH (IIC)}/39\text{ mH (IIB)}$ $C_0 = 600\text{ nF (IIC)}/4\text{ }000\text{ nF (IIB)}$
Option HA	PROFIBUS PA Ex i (FISCO Field Device)	Ex ia ¹⁾ $U_i = 30\text{ V}$ $I_i = 570\text{ mA}$ $P_i = 8.5\text{ W}$ $L_i = 10\text{ }\mu\text{H}$ $C_i = 5\text{ nF}$	Ex ic ²⁾ $U_i = 32\text{ V}$ $I_i = 570\text{ mA}$ $P_i = 8.5\text{ W}$ $L_i = 10\text{ }\mu\text{H}$ $C_i = 5\text{ nF}$
Option TA	FOUNDATION Fieldbus Ex i	Ex ia ¹⁾ $U_i = 30\text{ V}$ $I_i = 570\text{ mA}$ $P_i = 8.5\text{ W}$ $L_i = 10\text{ }\mu\text{H}$ $C_i = 5\text{ nF}$	Ex ic ²⁾ $U_i = 32\text{ V}$ $I_i = 570\text{ mA}$ $P_i = 8.5\text{ W}$ $L_i = 10\text{ }\mu\text{H}$ $C_i = 5\text{ nF}$
Option RC	PROFINET with Ethernet- APL Ex i	Ex ia ¹⁾ 2-WISE power load APL port profile SLAA	Ex ic ²⁾ 2-WISE power load APL port profile SLAC

1) Only available for Proline 500 transmitter Zone 1; Class I, Division 1.

2) Only available for transmitter Zone 2; Class I, Division 2.

Order code for "Output; input 2"; "Output; input 3"	Output type	Intrinsically safe values or NIFW values			
		Output; input 2		Output; input 3	
		24 (+)	25 (-)	22 (+)	23 (-)
Option C	Current output 4 to 20 mA Ex i passive	$U_i = 30\text{ V}$ $I_i = 100\text{ mA}$ $P_i = 1.25\text{ W}$ $L_i = 0$ $C_i = 0$			
Option G	Pulse/frequency/switch output Ex i passive	$U_i = 30\text{ V}$ $I_i = 100\text{ mA}$ $P_i = 1.25\text{ W}$ $L_i = 0$ $C_i = 0$			

Low flow cut off


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

Galvanic isolation

- The outputs are galvanically isolated:
- from the power supply
 - from one another
 - from the potential equalization (PE) terminal


Protocol-specific data

HART




Manufacturer ID	0x11
Device type ID	0x3B
HART protocol revision	7
Device description files (DTM, DD)	Information and files under: www.endress.com
HART load	Min. 250 Ω
System integration	Information on system integration: Operating Instructions →  112. <ul style="list-style-type: none"> ▪ Measured variables via HART protocol ▪ Burst Mode functionality

FOUNDATION Fieldbus

Manufacturer ID	0x452B48 (hex)
Ident number	0x103B (hex)
Device revision	1
DD revision	Information and files under: <ul style="list-style-type: none"> ▪ www.endress.com ▪ www.fieldcommgroup.org
CFF revision	
Interoperability Test Kit (ITK)	Version 6.2.0
ITK Test Campaign Number	Information: <ul style="list-style-type: none"> ▪ www.endress.com ▪ www.fieldcommgroup.org
Link Master capability (LAS)	Yes
Choice of "Link Master" and "Basic Device"	Yes Factory setting: Basic Device
Node address	Factory setting: 247 (0xF7)
Supported functions	The following methods are supported: <ul style="list-style-type: none"> ▪ Restart ▪ ENP Restart ▪ Diagnostic ▪ Set to OOS ▪ Set to AUTO ▪ Read trend data ▪ Read event logbook
Virtual Communication Relationships (VCRs)	
Number of VCRs	44
Number of link objects in VFD	50
Permanent entries	1
Client VCRs	0
Server VCRs	10
Source VCRs	43
Sink VCRs	0
Subscriber VCRs	43
Publisher VCRs	43




Device Link Capabilities	
Slot time	4
Min. delay between PDU	8
Max. response delay	16
System integration	Information regarding system integration: Operating Instructions →  112. <ul style="list-style-type: none"> ▪ Cyclic data transmission ▪ Description of the modules ▪ Execution times ▪ Methods

PROFIBUS DP

Manufacturer ID	0x11
Ident number	0x156F
Profile version	3.02
Device description files (GSD, DTM, DD)	Information and files under: <ul style="list-style-type: none"> ▪ https://www.endress.com/download On the device product page: PRODUCTS → Product Finder → Links ▪ https://www.profibus.com
Supported functions	<ul style="list-style-type: none"> ▪ 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	<ul style="list-style-type: none"> ▪ DIP switches on the I/O electronics module ▪ Via operating tools (e.g. FieldCare)
Compatibility with earlier model	<p>If the device is replaced, the measuring device Promass 300 supports the compatibility of the cyclic data with previous models. It is not necessary to adjust the engineering parameters of the PROFIBUS network with the Promass 300 GSD file.</p> <p>Previous model: Promass 83 PROFIBUS DP</p> <ul style="list-style-type: none"> ▪ ID No.: 1529 (hex) ▪ Extended GSD file: EH3x1529.gsd ▪ Standard GSD file: EH3_1529.gsd <p> Description of the function scope of compatibility: Operating Instructions →  112.</p>
System integration	Information regarding system integration: Operating Instructions →  112. <ul style="list-style-type: none"> ▪ Cyclic data transmission ▪ Block model ▪ Description of the modules





PROFIBUS PA

Manufacturer ID	0x11
Ident number	0x156D
Profile version	3.02
Device description files (GSD, DTM, DD)	Information and files under: <ul style="list-style-type: none"> ▪ https://www.endress.com/download On the device product page: PRODUCTS → Product Finder → Links ▪ https://www.profibus.com


Supported functions	<ul style="list-style-type: none"> ▪ 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	<ul style="list-style-type: none"> ▪ DIP switches on the I/O electronics module ▪ Local display ▪ Via operating tools (e.g. FieldCare)
Compatibility with earlier model	<p>If the device is replaced, the measuring device Promass 300 supports the compatibility of the cyclic data with previous models. It is not necessary to adjust the engineering parameters of the PROFIBUS network with the Promass 300 GSD file.</p> <p>Earlier models:</p> <ul style="list-style-type: none"> ▪ Promass 80 PROFIBUS PA <ul style="list-style-type: none"> ▪ ID No.: 1528 (hex) ▪ Extended GSD file: EH3x1528.gsd ▪ Standard GSD file: EH3_1528.gsd ▪ Promass 83 PROFIBUS PA <ul style="list-style-type: none"> ▪ ID No.: 152A (hex) ▪ Extended GSD file: EH3x152A.gsd ▪ Standard GSD file: EH3_152A.gsd <p> Description of the function scope of compatibility: Operating Instructions →  112.</p>
System integration	<p>Information regarding system integration: Operating Instructions →  112.</p> <ul style="list-style-type: none"> ▪ Cyclic data transmission ▪ Block model ▪ Description of the modules

Modbus RS485

Protocol	Modbus Applications Protocol Specification V1.1
Response times	<ul style="list-style-type: none"> ▪ Direct data access: typically 25 to 50 ms ▪ Auto-scan buffer (data range): typically 3 to 5 ms
Device type	Slave
Slave address range	1 to 247
Broadcast address range	0
Function codes	<ul style="list-style-type: none"> ▪ 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	<p>Supported by the following function codes:</p> <ul style="list-style-type: none"> ▪ 06: Write single registers ▪ 16: Write multiple registers ▪ 23: Read/write multiple registers
Supported baud rate	<ul style="list-style-type: none"> ▪ 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 transmission mode	<ul style="list-style-type: none"> ▪ ASCII ▪ RTU


Data access	Each device parameter can be accessed via Modbus RS485.  For Modbus register information
Compatibility with earlier model	If the device is replaced, the measuring device Promass 300 supports the compatibility of the Modbus registers for the process variables and the diagnostic information with the previous model Promass 83. It is not necessary to change the engineering parameters in the automation system.  Description of the function scope of compatibility: Operating Instructions →  112.
System integration	Information regarding system integration: Operating Instructions →  112. <ul style="list-style-type: none"> ▪ Modbus RS485 information ▪ Function codes ▪ Register information ▪ Response time ▪ Modbus data map

EtherNet/IP

Protocol	<ul style="list-style-type: none"> ▪ The CIP Networks Library Volume 1: Common Industrial Protocol ▪ The CIP Networks Library Volume 2: EtherNet/IP Adaptation of CIP
Communication type	<ul style="list-style-type: none"> ▪ 10Base-T ▪ 100Base-TX
Device profile	Generic device (product type: 0x2B)
Manufacturer ID	0x000049E
Device type ID	0x103B
Baud rates	Automatic ¹⁹ / 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	<ul style="list-style-type: none"> ▪ 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	<ul style="list-style-type: none"> ▪ Speed: 10 MBit, 100 MBit, auto (factory setting) ▪ Duplex: half-duplex, full-duplex, auto (factory setting)
Configuration of the device address	<ul style="list-style-type: none"> ▪ 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)	Yes
System integration	Information regarding system integration: Operating Instructions →  112. <ul style="list-style-type: none"> ▪ Cyclic data transmission ▪ Block model ▪ Input and output groups


PROFINET

Protocol	Application layer protocol for decentral device periphery and distributed automation, Version 2.3
Communication type	100 MBit/s

Conformance Class	Conformance Class B
Netload Class	Netload Class 2 0 Mbps
Baud rates	Automatic 100 Mbit/s with full-duplex detection
Cycle times	From 8 ms
Polarity	Auto-polarity for automatic correction of crossed TxD and RxD pairs
Media Redundancy Protocol (MRP)	Yes
System redundancy support	System redundancy S2 (2 AR with 1 NAP)
Device profile	Application interface identifier 0xF600 Generic device
Manufacturer ID	0x11
Device type ID	0x843B
Device description files (GSD, DTM, DD)	Information and files under: <ul style="list-style-type: none"> ▪ www.endress.com ▪ On the product page for the device: Documents/Software → Device drivers ▪ www.profibus.com
Supported connections	<ul style="list-style-type: none"> ▪ 2 x AR (IO Controller AR) ▪ 1 x AR (IO-Supervisor Device AR connection allowed) ▪ 1 x Input CR (Communication Relation) ▪ 1 x Output CR (Communication Relation) ▪ 1 x Alarm CR (Communication Relation)
Configuration options for measuring device	<ul style="list-style-type: none"> ▪ DIP switches on the electronics module, for device name assignment (last part) ▪ Asset management software (FieldCare, DeviceCare, Field Xpert) ▪ Integrated Web server via Web browser and IP address ▪ Device master file (GSD), can be read out via the integrated Web server of the measuring device. ▪ Onsite operation
Configuration of the device name	<ul style="list-style-type: none"> ▪ DIP switches on the electronics module, for device name assignment (last part) ▪ DCP protocol ▪ Asset management software (FieldCare, DeviceCare, Field Xpert) ▪ Integrated Web server
Supported functions	<ul style="list-style-type: none"> ▪ Identification & Maintenance, simple device identifier via: <ul style="list-style-type: none"> ▪ Control system ▪ Nameplate ▪ Measured value status The process variables are communicated with a measured value status ▪ Blinking feature via the local display for simple device identification and assignment ▪ Device operation via asset management software (e.g. FieldCare, DeviceCare, SIMATIC PDM)
System integration	Information regarding system integration: Operating Instructions →  112. <ul style="list-style-type: none"> ▪ Cyclic data transmission ▪ Overview and description of the modules ▪ Status coding ▪ Startup configuration ▪ Factory setting

PROFINET with Ethernet-APL

Protocol	Application layer protocol for decentral device periphery and distributed automation, Version 2.43
Communication type	Ethernet Advanced Physical Layer 10BASE-T1L
Conformance Class	Conformance Class B (PA)
Netload Class	PROFINET Netload Robustness Class 2 10 Mbit/s

Baud rates	10 Mbit/s Full-duplex
Cycle times	64 ms
Polarity	Automatic correction of crossed "APL signal +" and "APL signal -" signal lines
Media Redundancy Protocol (MRP)	Not possible (point-to-point connection to APL field switch)
System redundancy support	System redundancy S2 (2 AR with 1 NAP)
Device profile	PROFINET PA profile 4 (Application interface identifier API: 0x9700)
Manufacturer ID	17
Device type ID	0xA43B
Device description files (GSD, DTM, FDI)	Information and files available at: <ul style="list-style-type: none"> ▪ www.endress.com → Downloads section ▪ www.profibus.com
Supported connections	<ul style="list-style-type: none"> ▪ 2x AR (IO Controller AR) ▪ 2x AR (IO Supervisor Device AR connection allowed)
Configuration options for measuring device	<ul style="list-style-type: none"> ▪ DIP switches on the electronics module, for device name assignment (last part) ▪ Asset management software (FieldCare, DeviceCare, Field Xpert) ▪ Integrated Web server via Web browser and IP address ▪ Device master file (GSD), can be read out via the integrated Web server of the measuring device. ▪ Onsite operation
Configuration of the device name	<ul style="list-style-type: none"> ▪ DIP switches on the electronics module, for device name assignment (last part) ▪ DCP protocol ▪ Asset management software (FieldCare, DeviceCare, Field Xpert) ▪ Integrated Web server
Supported functions	<ul style="list-style-type: none"> ▪ Identification & Maintenance, simple device identifier via: <ul style="list-style-type: none"> ▪ Control system ▪ Nameplate ▪ Measured value status The process variables are communicated with a measured value status ▪ Blinking feature via the local display for simple device identification and assignment ▪ Device operation via asset management software (e.g. FieldCare, DeviceCare, SIMATIC PDM with FDI package)
System integration	Information regarding system integration: Operating Instructions →  112. <ul style="list-style-type: none"> ▪ Cyclic data transmission ▪ Overview and description of the modules ▪ Status coding ▪ Factory setting

Power supply

Terminal assignment

Transmitter: supply voltage, input/outputs

HART

Supply voltage		Input/output 1		Input/output 2		Input/output 3	
1 (+)	2 (-)	26 (+)	27 (-)	24 (+)	25 (-)	22 (+)	23 (-)
The terminal assignment depends on the specific device version ordered → 12.							

FOUNDATION Fieldbus

Supply voltage		Input/output 1		Input/output 2		Input/output 3	
1 (+)	2 (-)	26 (A)	27 (B)	24 (+)	25 (-)	22 (+)	23 (-)
The terminal assignment depends on the specific device version ordered → 12.							

PROFIBUS DP

Supply voltage		Input/output 1		Input/output 2		Input/output 3	
1 (+)	2 (-)	26 (B)	27 (A)	24 (+)	25 (-)	22 (+)	23 (-)
The terminal assignment depends on the specific device version ordered → 12.							

PROFIBUS PA

Supply voltage		Input/output 1		Input/output 2		Input/output 3	
1 (+)	2 (-)	26 (B)	27 (A)	24 (+)	25 (-)	22 (+)	23 (-)
The terminal assignment depends on the specific device version ordered → 12.							

Modbus RS485

Supply voltage		Input/output 1		Input/output 2		Input/output 3	
1 (+)	2 (-)	26 (B)	27 (A)	24 (+)	25 (-)	22 (+)	23 (-)
The terminal assignment depends on the specific device version ordered → 12.							

Modbus TCP with Ethernet-APL

Supply voltage		Input/output 1		Input/output 2		Input/output 3	
1 (+)	2 (-)	26 (+)	27 (-)	24 (+)	25 (-)	22 (+)	23 (-)
The terminal assignment depends on the specific device version ordered → 12.							

PROFINET

Supply voltage		Input/output 1		Input/output 2		Input/output 3	
1 (+)	2 (-)	PROFINET (RJ45 connector)		24 (+)	25 (-)	22 (+)	23 (-)
The terminal assignment depends on the specific device version ordered → 12.							

PROFINET with Ethernet-APL

Supply voltage		Input/output 1		Input/output 2		Input/output 3	
1 (+)	2 (-)	26 (+)	27 (-)	24 (+)	25 (-)	22 (+)	23 (-)
The terminal assignment depends on the specific device version ordered → 12.							

EtherNet/IP

Supply voltage		Input/output 1	Input/output 2		Input/output 3	
1 (+)	2 (-)	EtherNet/IP (RJ45 connector)	24 (+)	25 (-)	22 (+)	23 (-)
The terminal assignment depends on the specific device version ordered → 12.						



Terminal assignment of the remote display and operating module → 35.

Available device plugs



Device plugs may not be used in hazardous areas!

Device plugs for fieldbus systems:

Order code for "Input; output 1"

- Option **SA** "FOUNDATION Fieldbus" → 32
- Option **GA** "PROFIBUS PA" → 32
- Option **NA** "EtherNet/IP" → 32
- Option **RA** "PROFINET" → 33
- Option **RB** "PROFINET with Ethernet-APL" → 33

Device plug for connecting to the service interface:

Order code for "Accessory mounted"

Option **NB**, RJ45 M12 adapter (service interface) → 46

Order code for "Input; output 1", option SA "FOUNDATION Fieldbus"

Order code for "Electrical connection"	Cable entry/connection → 34	
	2	3
M, 3, 4, 5	7/8" connector	-

Order code for "Input; output 1", option GA "PROFIBUS PA"

Order code for "Electrical connection"	Cable entry/connection → 34	
	2	3
L, N, P, U	Connector M12 × 1	-

Order code for "Input; output 1", option NA "EtherNet/IP"

Order code for "Electrical connection"	Cable entry/connection → 34	
	2	3
L, N, P, U	Connector M12 × 1	-
R ^{1) 2)} , S ^{1) 2)} , T ^{1) 2)} , V ^{1) 2)}	Connector M12 × 1	Connector M12 × 1

- 1) Cannot be combined with an external WLAN antenna (order code for "Enclosed accessories", option P8) of an RJ45 M12 adapter for the service interface (order code for "Accessories mounted", option NB) or of the remote display and operating module DKX001
- 2) Suitable for integrating the device in a ring topology.

Order code for "Input; output 1", option RA "PROFINET"

Order code for "Electrical connection"	Cable entry/connection → 34	
	2	3
L, N, P, U	Connector M12 × 1	-
R ^{1) 2)} , S ^{1) 2)} , T ^{1) 2)} , V ^{1) 2)}	Connector M12 × 1	Connector M12 × 1

- 1) Cannot be combined with an external WLAN antenna (order code for "Enclosed accessories", option P8) of an RJ45 M12 adapter for the service interface (order code for "Accessories mounted", option NB) or of the remote display and operating module DKX001.
- 2) Suitable for integrating the device in a ring topology.

Order code for "Input; output 1", option RB "PROFINET with Ethernet-APL"

Order code "Electrical connection"	Cable entry/connection → 34	
	2	3
L, N, P, U	M12 plug × 1	-

Order code for "Accessory mounted", option NB "Adapter RJ45 M12 (service interface)"

Order code "Accessory mounted"	Cable entry/coupling → 34	
	Cable entry 2	Cable entry 3
NB	Plug M12 × 1	-

Supply voltage

Order code "Power supply"	Terminal voltage		Frequency range
	DC	AC	
Option D	DC 24 V	±20%	-
Option E	AC 100 to 240 V	-15...+10%	50/60 Hz
Option I	DC 24 V	±20%	-
	AC 100 to 240 V	-15...+10%	50/60 Hz

Power consumption

Transmitter

Max. 10 W (active power)

switch-on current	Max. 36 A (<5 ms) as per NAMUR Recommendation NE 21
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Current consumption

Transmitter

- Max. 400 mA (24 V)
- Max. 200 mA (110 V, 50/60 Hz; 230 V, 50/60 Hz)

Power supply failure

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



Overcurrent protection element

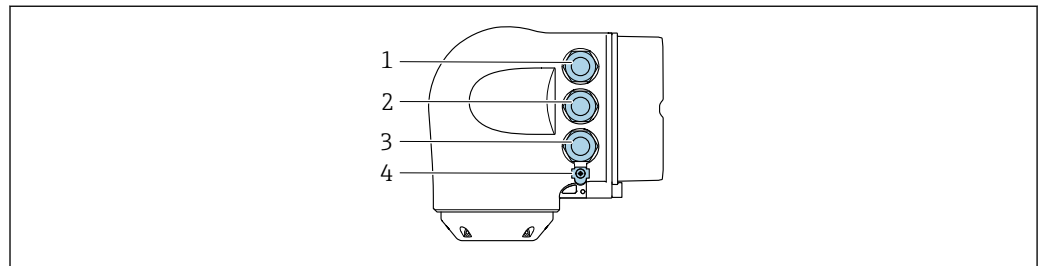
The device must be operated with a dedicated circuit breaker, as it does not have an ON/OFF switch of its own.

- The circuit breaker must be easy to reach and labeled accordingly.
- Permitted nominal current of the circuit breaker: 2 A up to maximum 10 A.

Electrical connection

Transmitter connection

- i** ■ Terminal assignment →  31
- Device plugs available →  32




A0026781

- 1 Terminal connection for supply voltage
- 2 Terminal connection for signal transmission, input/output
- 3 Terminal connection for signal transmission, input/output or terminal for network connection via service interface (CDI-RJ45); Optional: terminal connection for external WLAN antenna or connection for remote display and operating module DKX001
- 4 Terminal connection for potential equalization (PE)

- i** An adapter for the RJ45 to the M12 plug is optionally available:
Order code for "Accessories", option **NB**: "Adapter RJ45 M12 (service interface)"

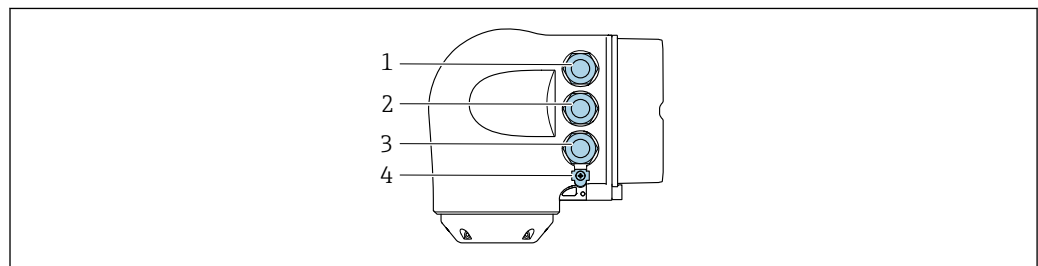
The adapter connects the service interface (CDI-RJ45) to an M12 plug mounted in the cable entry. The connection to the service interface can therefore be established via an M12 plug without opening the device.

- i** Network connection via service interface (CDI-RJ45) →  97

Connecting in a ring topology

Device versions with EtherNet/IP and PROFINET communication protocols can be integrated into a ring topology. The device is integrated via the terminal connection for signal transmission (output 1) and the connection to the service interface (CDI-RJ45).

- i** Integrate the transmitter into a ring topology:
 - EtherNet/IP
 - PROFINET



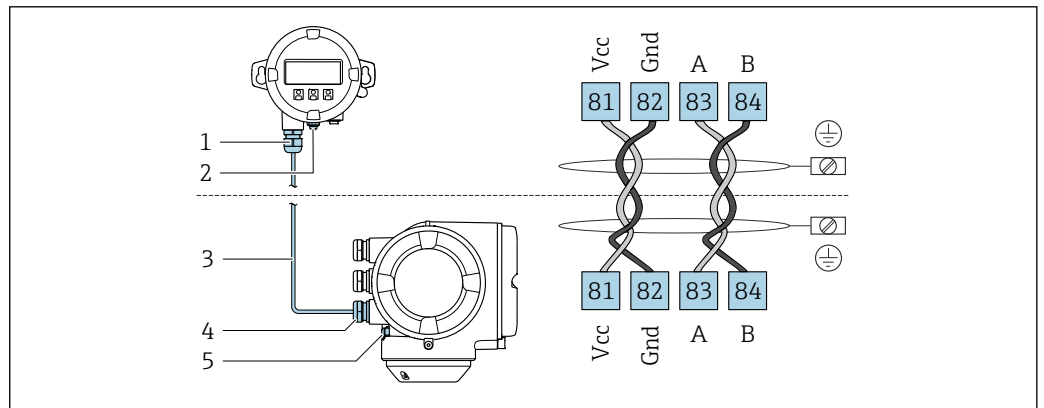
A0026781

- 1 Terminal connection for supply voltage
- 2 Terminal connection for signal transmission: PROFINET or EtherNet/IP (RJ45 connector)
- 3 Terminal connection to service interface (CDI-RJ45)
- 4 Terminal connection for potential equalization (PE)

- i** If the device has additional inputs/outputs, these are routed in parallel via the cable entry for connection to the service interface (CDI-RJ45).

Connecting the remote display and operating module DKX001

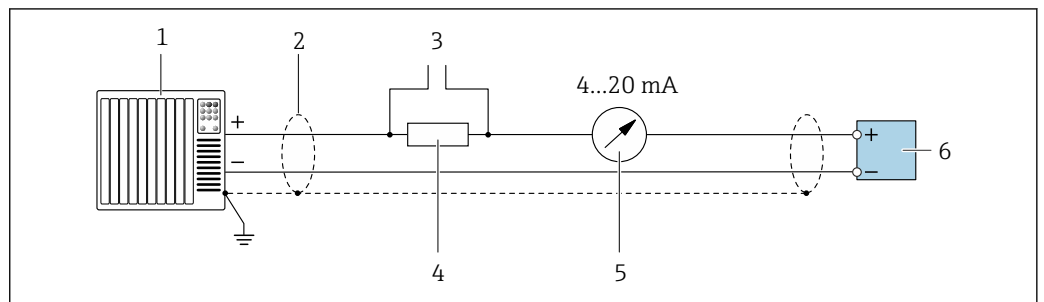
- i** The remote display and operating module DKX001 is available as an optional extra → 109..
 - The remote display and operating module DKX001 is only available for the following housing versions, order code for "Housing":
 - Option A "Aluminum, coated"
 - Option L "Cast, stainless"
 - The measuring instrument is always supplied with a dummy cover when the remote display and operating module DKX001 is ordered directly with the measuring instrument. Display or operation at the transmitter is not possible in this case.
 - If ordered subsequently, the remote display and operating module DKX001 may not be connected at the same time as the existing measuring instrument display module. Only one display or operation unit may be connected to the transmitter at any one time.



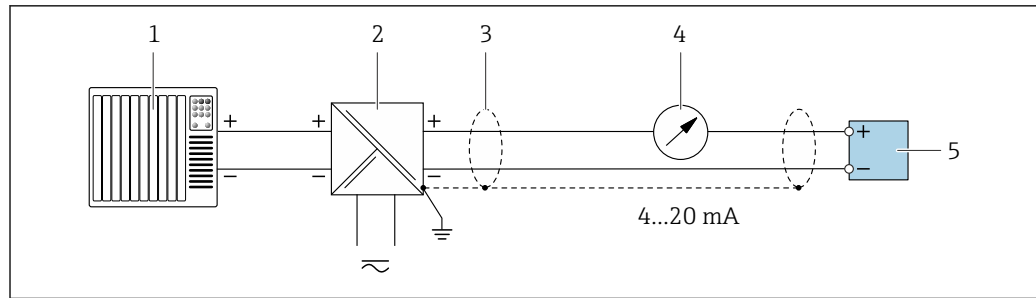
- 1 Remote display and operating module DKX001
- 2 Terminal connection for potential equalization (PE)
- 3 Connecting cable
- 4 Measuring instrument
- 5 Terminal connection for potential equalization (PE)

Connection examples

Current output 4 to 20 mA HART



- i** 2 Connection example for 4 to 20 mA HART current output (active)
 - 1 Automation system with current input (e.g. PLC)
 - 2 Ground cable shield at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications → 46
 - 3 Connection for HART operating devices → 91
 - 4 Resistor for HART communication ($\geq 250 \Omega$): observe maximum load → 14
 - 5 Analog display unit: observe maximum load → 14
 - 6 Transmitter

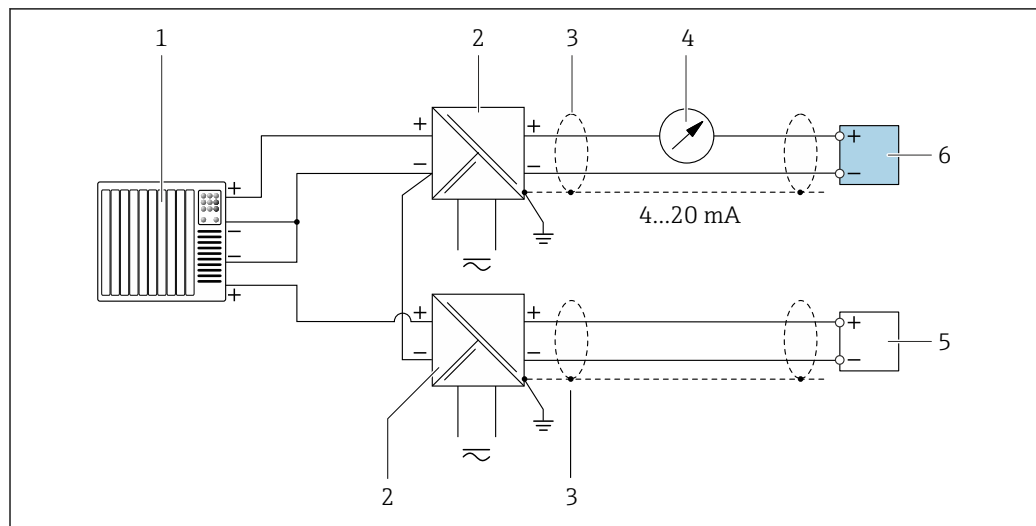


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3 Connection example for 4 to 20 mA HART current output (passive)

- 1 Automation system with current input (e.g. PLC)
- 2 Power supply
- 3 Ground cable shield at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications → 46
- 4 Analog display unit: observe maximum load → 14
- 5 Transmitter

HART input

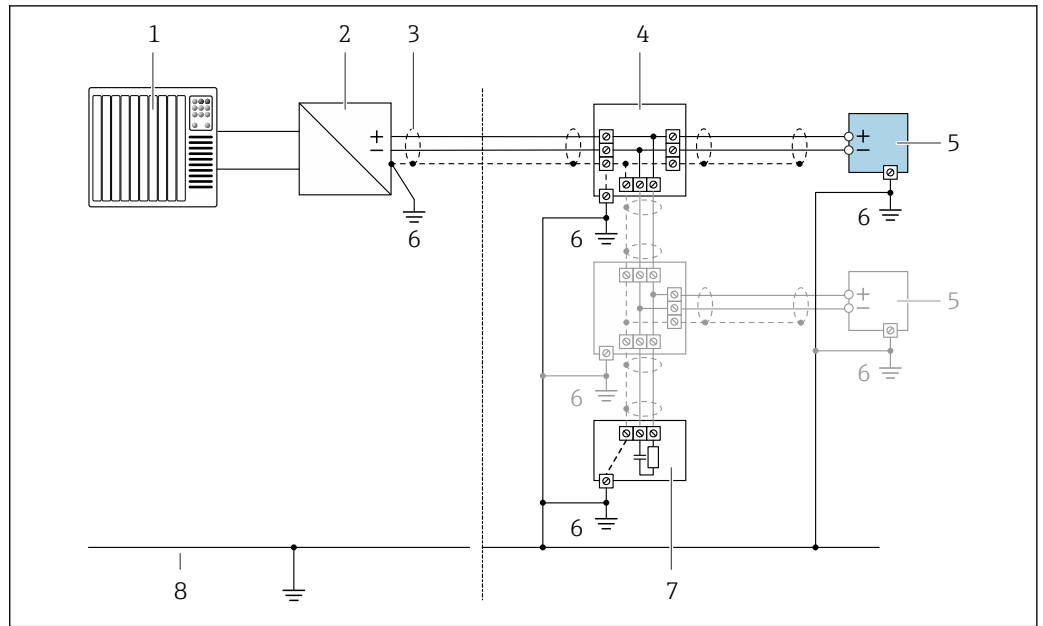


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4 Connection example for HART input with a common negative (passive)

- 1 Automation system with HART output (e.g. PLC)
- 2 Active barrier for power supply (e.g. RN221N)
- 3 Ground cable shield at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 4 Analog display unit: observe maximum load → 14
- 5 Pressure measuring device (e.g. Cerabar M, Cerabar S): observe requirements
- 6 Transmitter

PROFIBUS PA

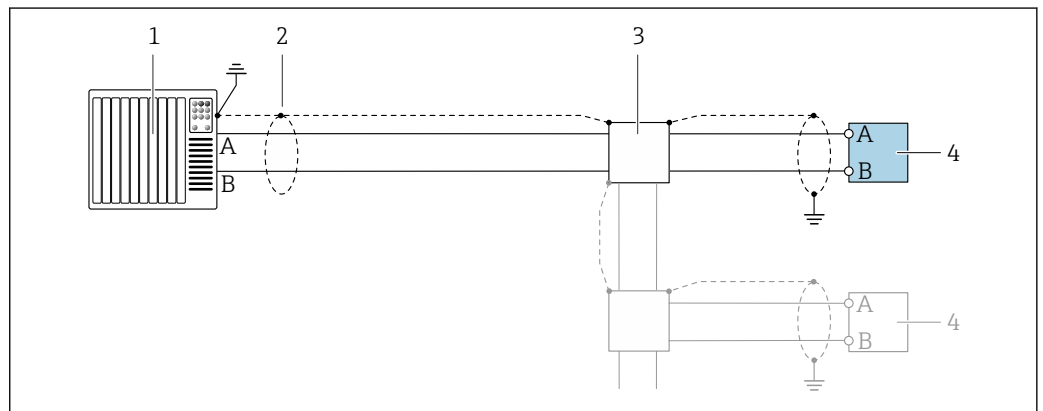


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5 Connection example for PROFIBUS PA

- 1 Control system (e.g. PLC)
- 2 PROFIBUS PA segment coupler
- 3 Cable shield provided at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 4 T-box
- 5 Measuring device
- 6 Local grounding
- 7 Bus terminator
- 8 Potential matching line

PROFIBUS DP



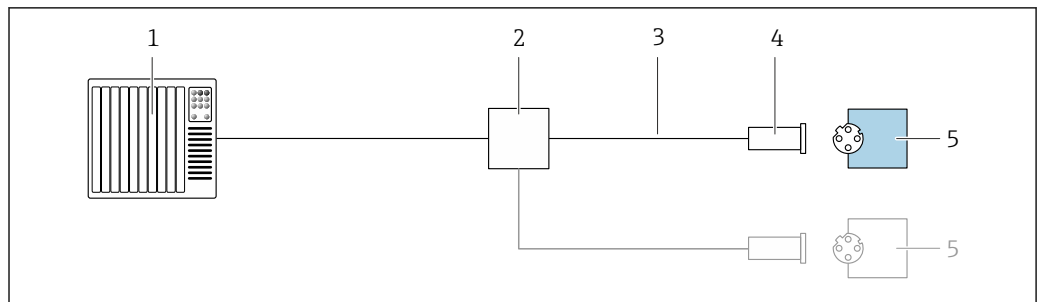
A0028765

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

- 1 Control system (e.g. PLC)
- 2 Cable shield provided at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 3 Distribution box
- 4 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.

EtherNet/IP

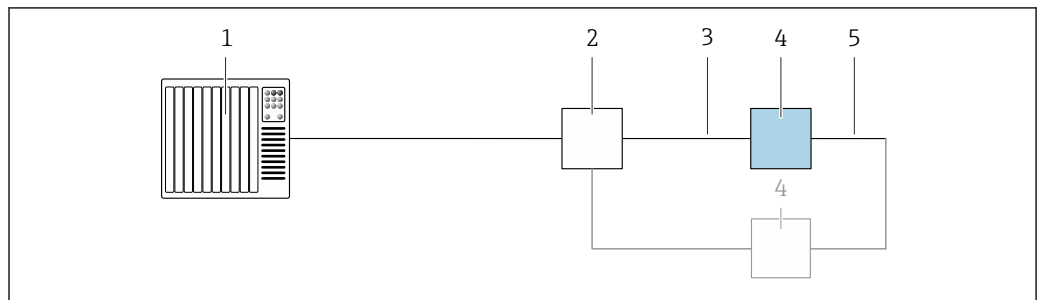


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7 Connection example for EtherNet/IP

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

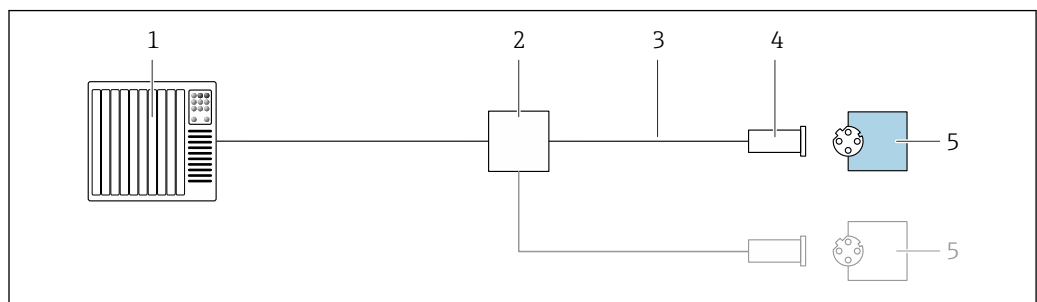
EtherNet/IP: DLR (Device Level Ring)



A0027544

- 1 Control system (e.g. PLC)
- 2 Ethernet switch
- 3 Observe cable specifications → 47
- 4 Transmitter
- 5 Connecting cable between the two transmitters

PROFINET

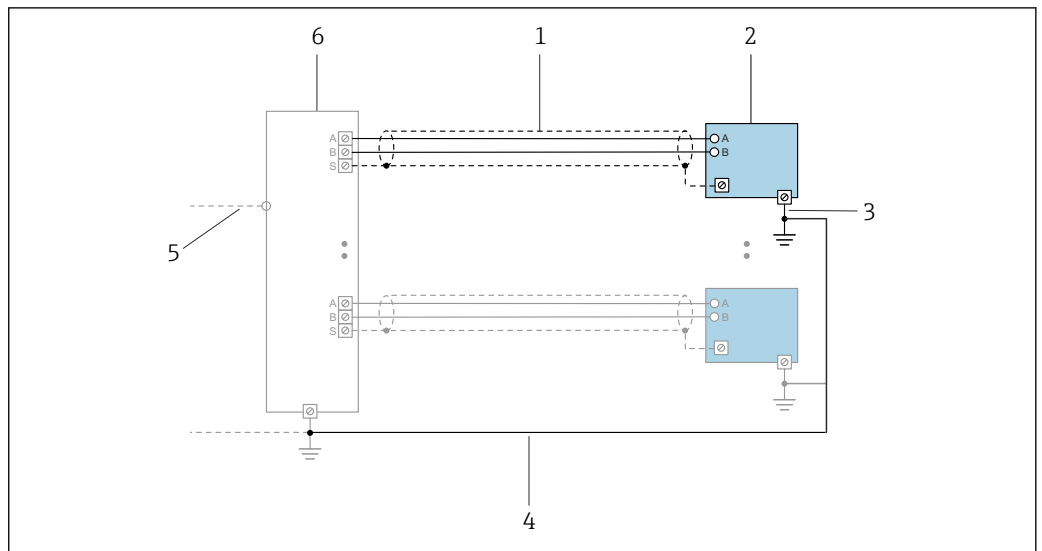


A0028767

8 Connection example for PROFINET

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

PROFINET with Ethernet-APL

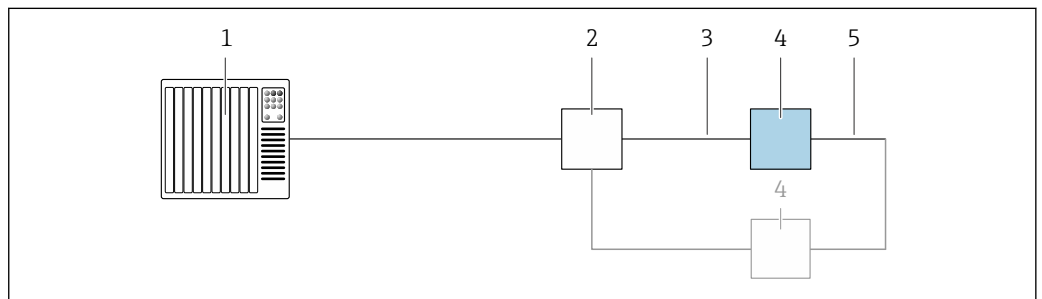


A0047536

9 Connection example for PROFINET with Ethernet-APL

- 1 Cable shield
- 2 Measuring device
- 3 Local grounding
- 4 Potential equalization
- 5 Trunk or TCP
- 6 Field switch

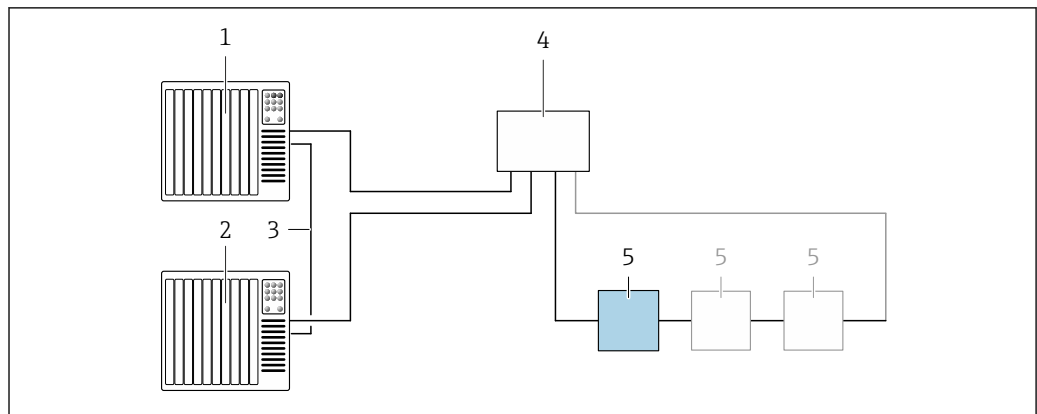
PROFINET: MRP (Media Redundancy Protocol)



A0027544

- 1 Control system (e.g. PLC)
- 2 Ethernet switch
- 3 Observe cable specifications → 47
- 4 Transmitter
- 5 Connecting cable between the two transmitters

PROFINET: system redundancy S2

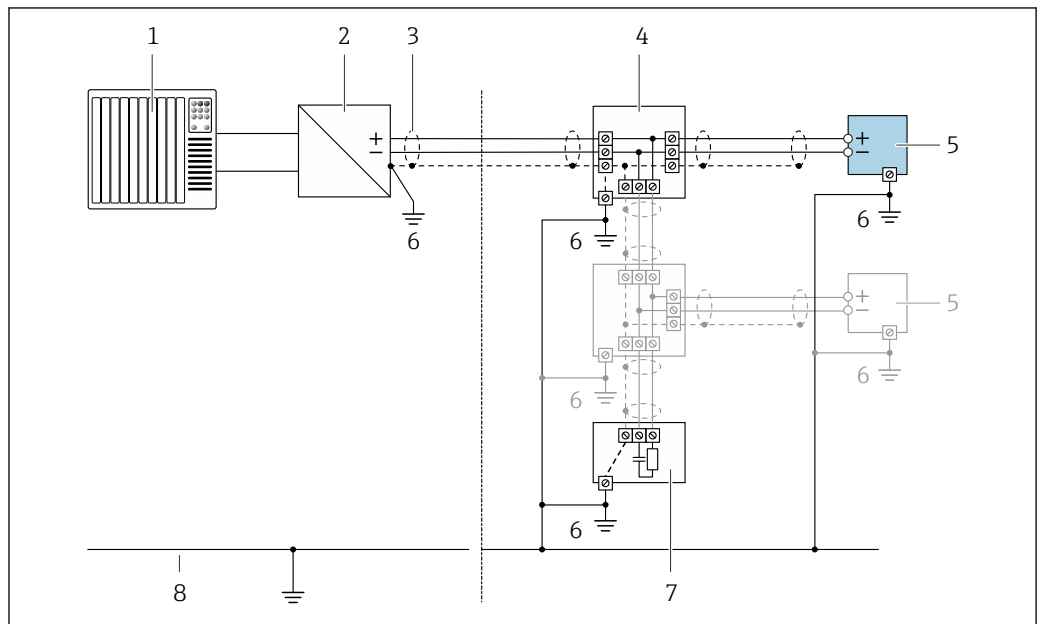


A0039553

10 Connection example for system redundancy S2

- 1 Control system 1 (e.g. PLC)
- 2 Synchronization of control systems
- 3 Control system 2 (e.g. PLC)
- 4 Industrial Ethernet Managed Switch
- 5 Transmitter

FOUNDATION Fieldbus

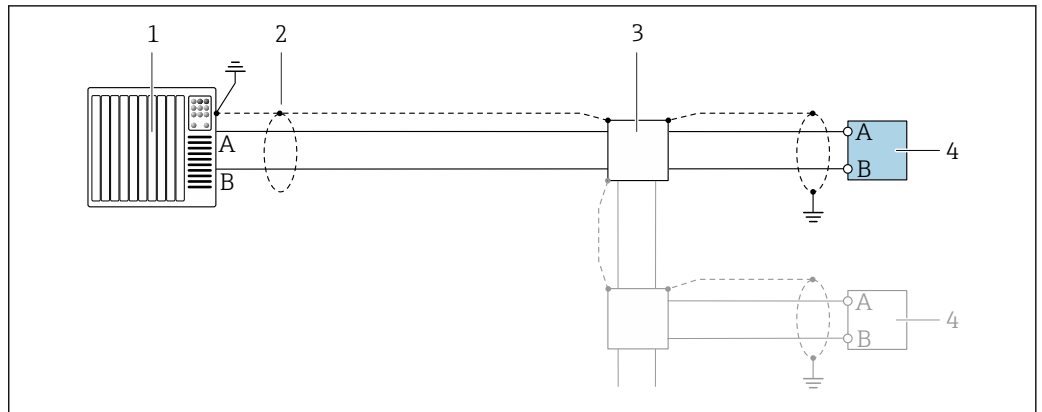


A0028768

11 Connection example for FOUNDATION Fieldbus

- 1 Control system (e.g. PLC)
- 2 Power Conditioner (FOUNDATION Fieldbus)
- 3 Cable shield provided at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications
- 4 T-box
- 5 Measuring device
- 6 Local grounding
- 7 Bus terminator
- 8 Potential matching line

Modbus RS485

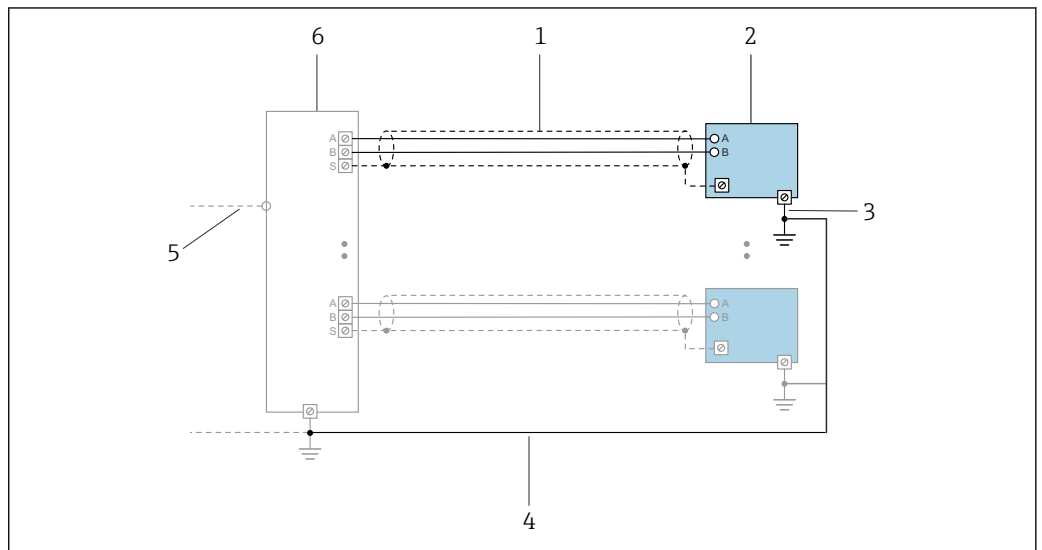


A0028765

12 Connection example for Modbus RS485, non-hazardous area and Zone 2; Class I, Division 2

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

Modbus with TCP-APL

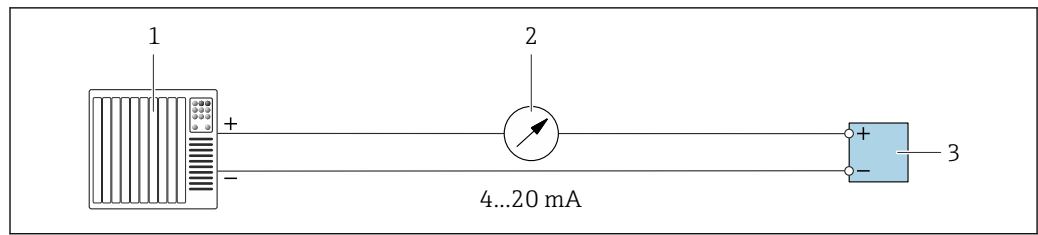


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13 Connection example for Modbus with TCP-APL

- 1 Cable shield
- 2 Measuring device
- 3 Local grounding
- 4 Potential equalization
- 5 Trunk or TCP
- 6 Field switch

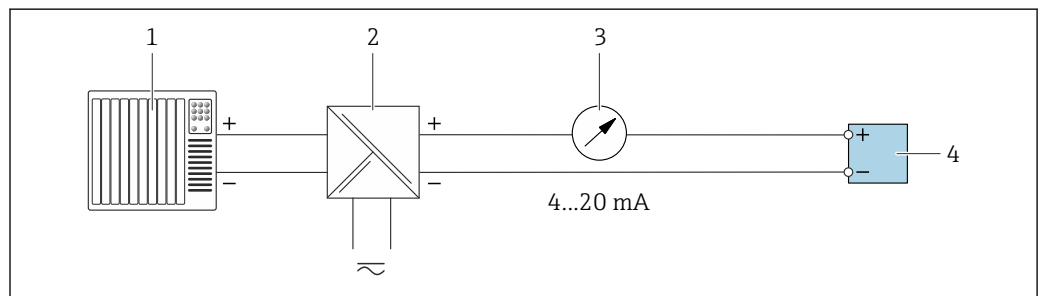
Current output 4-20 mA



A0028758

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

- 1 Automation system with current input (e.g. PLC)
- 2 Analog display unit: observe maximum load → 14
- 3 Transmitter

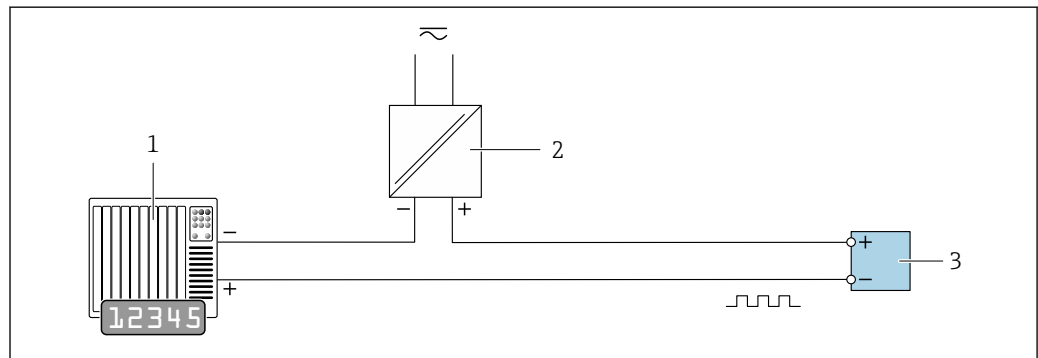


A0028759

15 Connection example for 4-20 mA current output (passive)

- 1 Automation system with current input (e.g. PLC)
- 2 Active barrier for power supply (e.g. RN221N)
- 3 Analog display unit: observe maximum load → 14
- 4 Transmitter

Pulse/frequency output

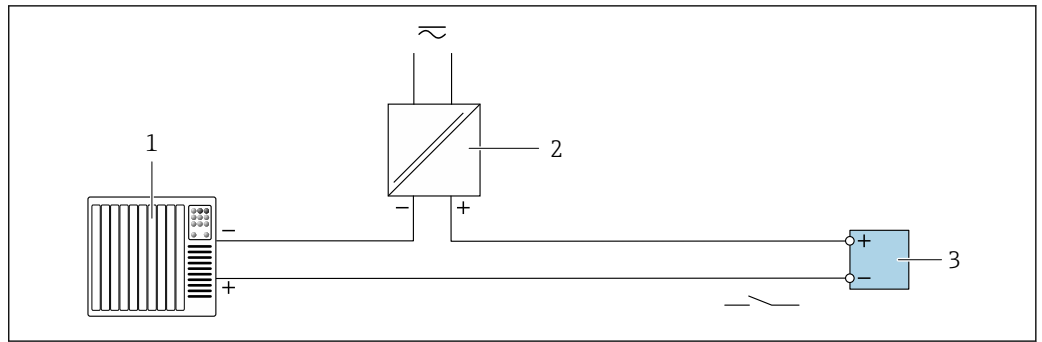


A0028761

16 Connection example for pulse/frequency output (passive)

- 1 Automation system with pulse/frequency input (e.g. PLC with 10 kΩ pull-up or pull-down resistor)
- 2 Power supply
- 3 Transmitter: observe input values → 17

Switch output

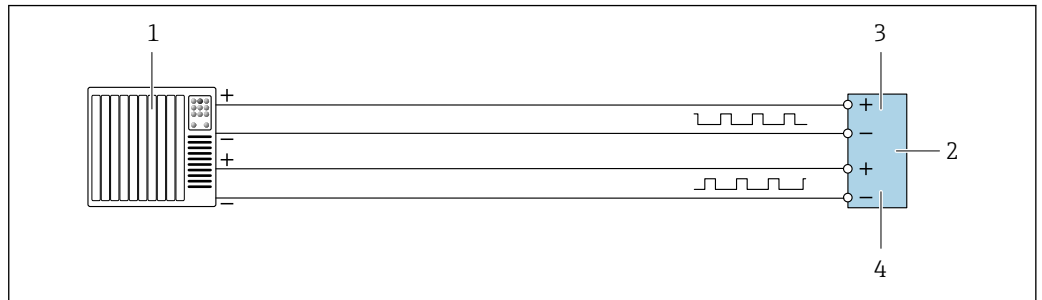


A0028760

17 Connection example for switch output (passive)

- 1 Automation system with switch input (e.g. PLC with a 10 kΩ pull-up or pull-down resistor)
- 2 Power supply
- 3 Transmitter: observe input values → 17

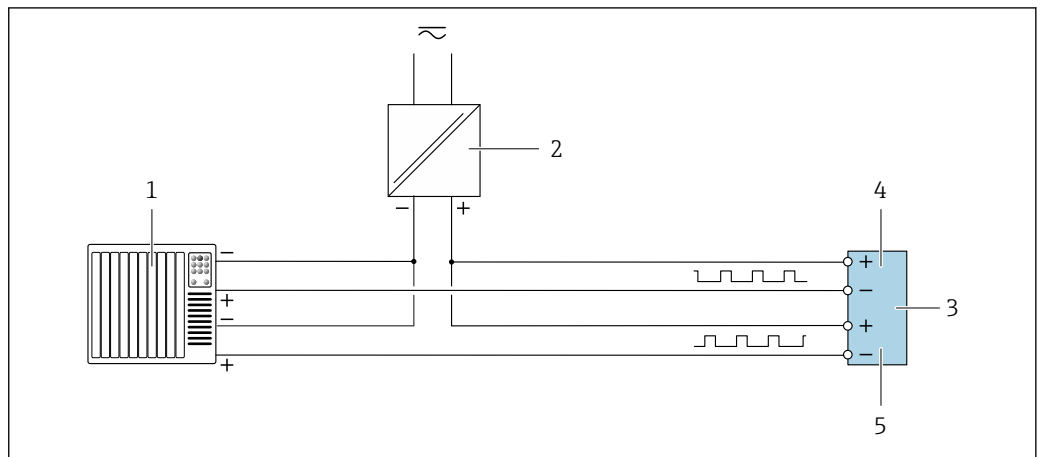
Double pulse output



A0029280

18 Connection example for double pulse output (active)

- 1 Automation system with double pulse input (e.g. PLC)
- 2 Transmitter: observe input values → 19
- 3 Double pulse output
- 4 Double pulse output (slave), phase-shifted

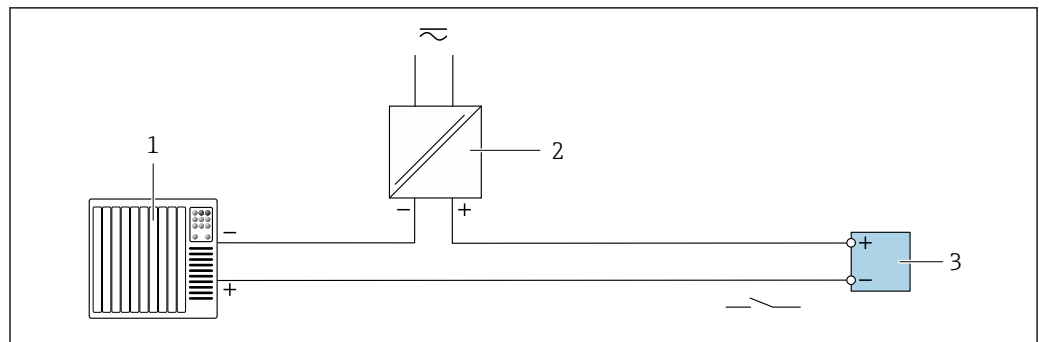


A0029279

19 Connection example for double pulse output (passive)

- 1 Automation system with double pulse input (e.g. PLC with a 10 kΩ pull-up or pull-down resistor)
- 2 Power supply
- 3 Transmitter: observe input values → 19
- 4 Double pulse output
- 5 Double pulse output (slave), phase-shifted

Relay output

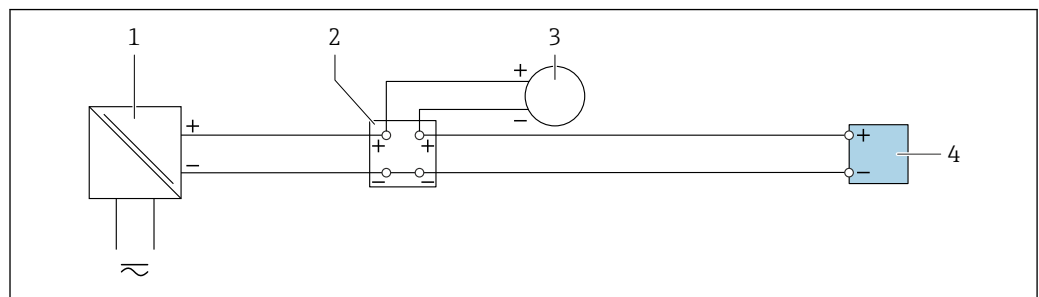


A0028760

20 Connection example for relay output (passive)

- 1 Automation system with relay input (e.g. PLC)
- 2 Power supply
- 3 Transmitter: observe input values → 19

Current input

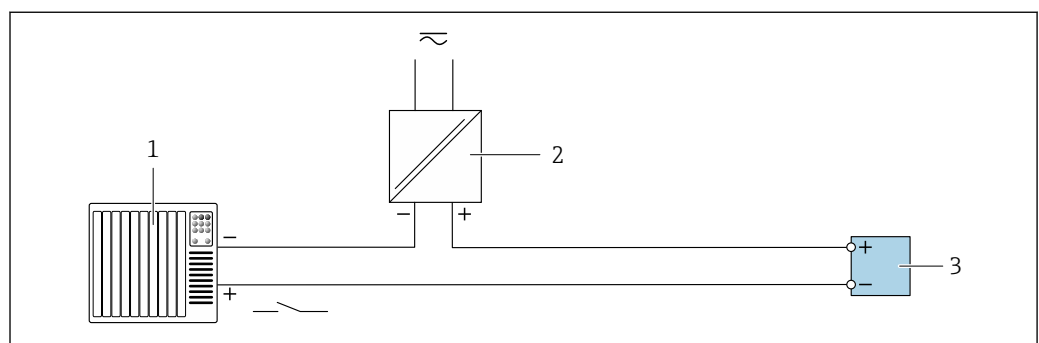


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21 Connection example for 4 to 20 mA current input

- 1 Power supply
- 2 Terminal box
- 3 External measuring device (to read in pressure or temperature, for instance)
- 4 Transmitter

Status input



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22 Connection example for status input

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

Potential equalization

Requirements

For potential equalization:

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

Terminals

Spring-loaded terminals: Suitable for strands and strands with ferrules.
 Conductor cross-section 0.2 to 2.5 mm² (24 to 12 AWG).

Cable entries

- Cable gland: M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)
- Thread for cable entry:
 - NPT ½"
 - G ½"
 - M20
- Device plug for digital communication: M12
 Only available for certain device versions → 32.

Pin assignment, device plug

FOUNDATION Fieldbus

	Pin	Assignment		Coding	Plug/socket
	1	+	Signal +	A	Plug
	2	-	Signal -		
	3		Grounding		
	4		Not assigned		

PROFIBUS PA

	Pin	Assignment		Coding	Plug/socket
	1	+	PROFIBUS PA +	A	Plug
	2		Grounding		
	3	-	PROFIBUS PA -		
	4		Not assigned		



Recommended plug:

- Binder, series 713, part no. 99 1430 814 04
- Phoenix, part no. 1413934 SACC-FS-4QO SH PBPA SCO

PROFINET

	Pin	Assignment		Coding	Plug/socket
	1	+	TD +	D	Socket
	2	+	RD +		
	3	-	TD -		
	4	-	RD -		
	Coding		Plug/socket		
	D		Socket		



Recommended plug:

- Binder, series 825, part no. 99 3729 810 04
- Phoenix, part no. 1543223 SACC-M12MSD-4Q

PROFINET with Ethernet-APL

	Pin	Assignment	Coding	Plug/socket
	1	APL signal -	A	Socket
	2	APL signal +		
	3	Cable shield ¹		
	4	Not used		
Metal plug housing	Cable shield			
¹ If a cable shield is used				

- i** Recommended plug:
- Binder, series 713, part no. 99 1430 814 04
 - Phoenix, part no. 1413934 SACC-FS-4QO SH PBPA SCO

EtherNet/IP

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

- i** Recommended plug:
- Binder, series 825, part no. 99 3729 810 04
 - Phoenix, part no. 1543223 SACC-M12MSD-4Q

Service interface for

Order code for "Accessories mounted", option **NB**: Adapter RJ45 M12 (service interface)

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

- i** Recommended plug:
- Binder, series 825, part no. 99 3729 810 04
 - Phoenix, part no. 1543223 SACC-M12MSD-4Q

Cable specification

Permitted temperature range

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

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

Standard installation cable is sufficient.


Protective grounding cable for the outer ground terminal

Conductor cross-section < 2.1 mm² (14 AWG)

The use of a cable lug enables the connection of larger cross-sections.

The grounding impedance must be less than 2 Ω .

Signal cable

 For custody transfer, all signal lines must be shielded cables (tinned copper braiding, optical coverage $\geq 85\%$). The cable shield must be connected on both sides.

Current output 4 to 20 mA HART

Shielded twisted-pair cable.

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

PROFIBUS PA

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

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

PROFIBUS DP

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

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

EtherNet/IP

Twisted-pair Ethernet CAT 5 or better.

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

PROFINET

Only PROFINET cables.

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


Ethernet-APL

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

 See <https://www.profibus.com> Ethernet-APL White Paper "

FOUNDATION Fieldbus


Twisted, shielded two-wire cable.

 For further information on planning and installing FOUNDATION Fieldbus networks see:

- Operating Instructions for "FOUNDATION Fieldbus Overview" (BA00013S)
- FOUNDATION Fieldbus Guideline
- IEC 61158-2 (MBP)

Modbus RS485

Shielded twisted-pair cable.

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

Current output 0 /4 to 20 mA (excluding HART)

Standard installation cable is sufficient.

Pulse /frequency /switch output

Standard installation cable is sufficient.

Relay output

Standard installation cable is sufficient.

Current input 4 to 20 mA

Standard installation cable is sufficient.

Status input

Standard installation cable is sufficient.

Connecting cable for transmitter - remote display and operating module DKX001*Standard cable*

A standard cable can be used as the connecting cable.

Standard cable	4 cores (2 pairs); pair-stranded with common shield
Shielding	Tin-plated copper-braid, optical cover $\geq 85\%$
Capacitance: core/shield	Maximum 1 000 nF for Zone 1; Class I, Division 1
L/R	Maximum 24 $\mu\text{H}/\Omega$ for Zone 1; Class I, Division 1
Cable length	Maximum 300 m (1 000 ft), see the following table

Cross-section	Cable length for use in: <ul style="list-style-type: none"> ■ Non-hazardous area ■ Hazardous area: Zone 2; Class I, Division 2 ■ Hazardous area: Zone 1; Class I, Division 1
0.34 mm ² (22 AWG)	80 m (270 ft)
0.50 mm ² (20 AWG)	120 m (400 ft)
0.75 mm ² (18 AWG)	180 m (600 ft)
1.00 mm ² (17 AWG)	240 m (800 ft)
1.50 mm ² (15 AWG)	300 m (1 000 ft)

Optionally available connecting cable

Standard cable	2 × 2 × 0.34 mm ² (22 AWG) PVC cable ¹⁾ with common shield (2 pairs, pair-stranded)
Flame resistance	According to DIN EN 60332-1-2
Oil-resistance	According to DIN EN 60811-2-1
Shielding	Tin-plated copper-braid, optical cover $\geq 85\%$
Capacitance: core/shield	≤ 200 pF/m
L/R	≤ 24 $\mu\text{H}/\Omega$
Available cable length	10 m (35 ft)
Operating temperature	When mounted in a fixed position: -50 to $+105$ °C (-58 to $+221$ °F); when cable can move freely: -25 to $+105$ °C (-13 to $+221$ °F)



1) UV radiation can impair the cable outer sheath. Protect the cable from direct sunshine where possible.

Overvoltage protection

Mains voltage fluctuations	→ 33
Overvoltage category	Overvoltage category II
Short-term, temporary overvoltage	Between cable and ground up to 1200 V, for max. 5 s
Long-term, temporary overvoltage	Between cable and ground up to 500 V

Performance characteristics



Reference operating conditions

- Error limits based on ISO 11631
 - Water
 - +15 to +45 °C (+59 to +113 °F)
 - 2 to 6 bar (29 to 87 psi)
 - Data as indicated in the calibration protocol
 - Accuracy based on accredited calibration rigs according to ISO 17025
-  To obtain measured errors, use the *Applicator* sizing tool →  111

Maximum measurement error

o.r. = of reading; 1 g/cm³ = 1 kg/l; T = medium temperature

Base accuracy

 Design fundamentals →  53

Mass flow and volume flow (liquids)

- ±0.05 % o.r. (optional)
- ±0.10 % o.r. (standard)

Mass flow (gases)

±0.25 % o.r.

Mass flow (cryogenic liquids and gases under -100 °C (-148 °F))

±0.35 % o.r. (order code for "Measuring tube material", option LA)


Density (liquids)

Standard density

- ±0.2 kg/m³ (±0.0002 g/cm³)
- Valid in density range: 0 to 2 000 kg/m³

Premium density (DN 25 (1")); order code for "Application package", option EI)

- ±0.1 kg/m³
- Valid in density range: 0 to 3 000 kg/m³

For additional information, see the Special Documentation on the advanced density function →  113

For highly accurate density measurement, the pitch and roll angle and pressure compensation must be configured.

For highly accurate density measurement, avoid significant tensile stresses due to the installation and ensure the flow velocity in the nominal diameter is > 0.1 m/s (0.33 ft/s).

Density (cryogenic liquids and gases under -100 °C (-148 °F))

±0.03 g/cm³ (order code for "Measuring tube material", option LA)

Temperature

±0.1 °C ± 0.003 · T °C (±0.18 °F ± 0.003 · (T - 32) °F)

Zero point stability

DN		Zero point stability	
[mm]	[in]	[kg/h]	[lb/min]
25	1	0.36	0.013
50	2	1.3	0.048
80	3	4.4	0.162
100	4	11.5	0.42
150	6	16	0.59

DN		Zero point stability	
[mm]	[in]	[kg/h]	[lb/min]
200	8	24	0.88
250	10	50	1.84

Flow values

Flow values as turndown parameters depending on nominal diameter.

SI units

DN	1:1	1:10	1:20	1:50	1:100	1:500
[mm]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]	[kg/h]
25	20 000	2 000	1 000	400	200	40
50	80 000	8 000	4 000	1 600	800	160
80	200 000	20 000	10 000	4 000	2 000	400
100	550 000	55 000	27 500	11 000	5 500	1 100
150	850 000	85 000	42 500	17 000	8 500	1 700
200	1 500 000	150 000	75 000	30 000	15 000	3 000
250	2 400 000	240 000	120 000	48 000	24 000	4 800

US units

DN	1:1	1:10	1:20	1:50	1:100	1:500
[inch]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]	[lb/min]
1	735	73	37	15	7	1
2	2939	294	147	59	29	6
3	7349	735	367	147	73	15
4	20209	2021	1010	404	202	40
6	31232	3123	1562	625	312	62
8	55115	5511	2756	1102	551	110
10	88183	8818	4409	1764	882	176

Accuracy of outputs

The outputs have the following base accuracy specifications.

Current output

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

Pulse/frequency output

o.r. = of reading

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

Repeatability

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

Base repeatability

 Design fundamentals →  53

Mass flow and volume flow (liquids)

±0.025 % o.r.

Mass flow (gases)

±0.20 % o.r.

Mass flow (cryogenic liquids and gases under -100 °C (-148 °F))

±0.175 % o.r. (order code for "Measuring tube material", option LA)

Density (liquids)

- ±0.1 kg/m³ / ±0.0001 g/cm³
- Premium density: ±0.02 kg/m³ / ±0.00002 g/cm³

Density (cryogenic liquids and gases under -100 °C (-148 °F))

±0.015 g/cm³ (order code for "Measuring tube material", option LA)

Temperature

±0.05 °C ± 0.0025 · T °C (±0.09 °F ± 0.0015 · (T-32) °F)

Response time

The response time depends on the configuration (damping).

Influence of ambient temperature

Current output

Temperature coefficient	Max. 1 µA/°C
--------------------------------	--------------

Pulse/frequency output

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

Influence of medium temperature

Mass flow

o.f.s. = of full scale value

If there is a difference between the temperature at zero adjustment and the process temperature, the additional measurement error of the sensors is typically

DN 25 (1"): ±0.0001 % o.f.s./°C (±0.00005 % o.f.s./°F)

DN 50 to 250 (2 to 10"): ±0.00015 % o.f.s./°C (±0.000075 % o.f.s./°F)

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

Density

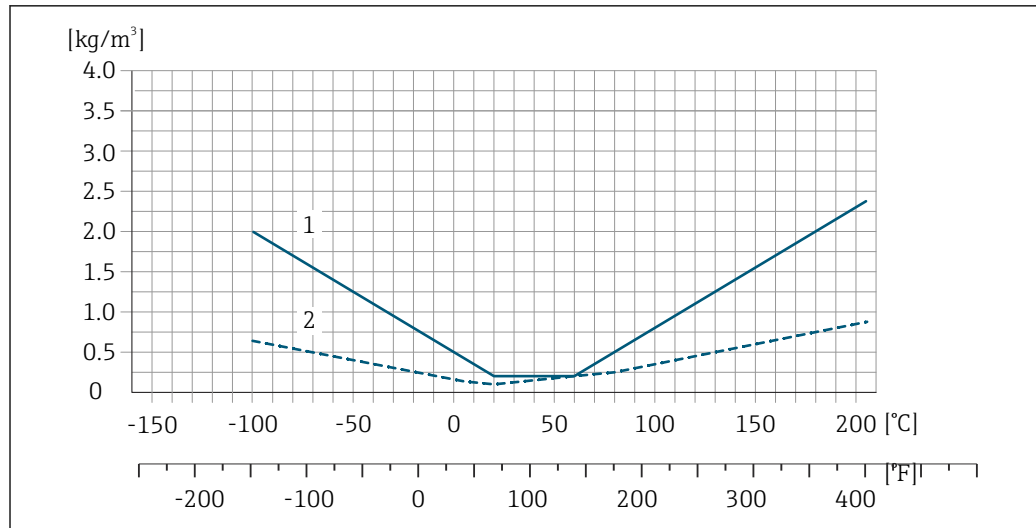
If there is a difference between the density calibration temperature and the process temperature, the measurement error of the sensors is typically ±0.015 kg/m³/°C (±0.0075 kg/m³/°F) outside of +20 to +60 °C (+68 to +140 °F)

Premium density (order code for "Application package", option EI)

If there is a difference between the reference temperature of 20°C and the process temperature, the additional maximum measured error of the sensors is typically

±0.0025 kg/m³/°C (±0.00139 kg/m³/°F) within the temperature calibration range.

Outside the calibrated temperature range, the influence of the process temperature is typically ±0.005 kg/m³/°C (±0.00278 kg/m³/°F)



- 1 Standard density
2 Premium density


Temperature

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

Influence of medium pressure

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

o.r. = of reading

 It is possible to compensate for the effect by:

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

 Operating Instructions →  112.

Mass flow


DN		[% o.r./bar] ±0.0005	[% o.r./psi] ±0.00003
[mm]	[in]		
25	1	-0.0040	-0.000276
50	2	-0.0025	-0.000172
80	3	-0.0050	-0.000345
100	4	-0.0040	-0.000276
150	6	-0.0077	-0.000531
200	8	-0.0074	-0.000510
250	10	-0.0076	-0.000524

Density

DN		[% o.r./bar] ±0.0006 ±0.0003 ¹⁾	[% o.r./psi] ±0.00004 ±0.00002 ¹⁾
[mm]	[in]		
25	1	-0.0029	-0.000200
50	2	-0.0034	-0.000234
80	3	-0.0024	-0.000166
100	4	-0.0006	-0.000041
150	6	-0.0040	-0.000276

DN		[% o.r./bar] ±0.0006 ±0.0003 ¹⁾	[% o.r./psi] ±0.00004 ±0.00002 ¹⁾
[mm]	[in]		
200	8	-0.0015	-0.000103
250	10	-0.0048	-0.000331

1) Premium density

 The values for the influence of medium pressure are based on the density of water.

Design fundamentals

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

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

MeasValue = measured value; ZeroPoint = zero point stability

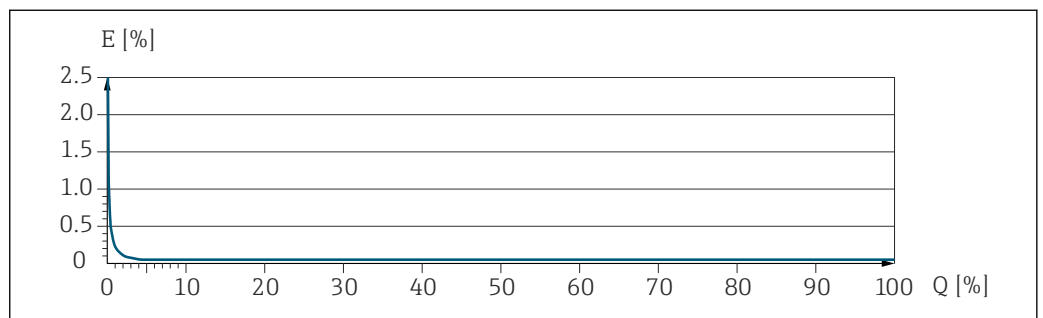
Calculation of the maximum measured error as a function of the flow rate

Flow rate	Maximum measured error in % o.r.
$\geq \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$ <small>A0021332</small>	$\pm \text{BaseAccu}$ <small>A0021339</small>
$< \frac{\text{ZeroPoint}}{\text{BaseAccu}} \cdot 100$ <small>A0021333</small>	$\pm \frac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$ <small>A0021334</small>

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

Flow rate	Maximum repeatability in % o.r.
$\geq \frac{1}{2} \cdot \frac{\text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$ <small>A0021335</small>	$\pm \text{BaseRepeat}$ <small>A0021340</small>
$< \frac{1}{2} \cdot \frac{\text{ZeroPoint}}{\text{BaseRepeat}} \cdot 100$ <small>A0021336</small>	$\pm \frac{1}{2} \cdot \frac{\text{ZeroPoint}}{\text{MeasValue}} \cdot 100$ <small>A0021337</small>

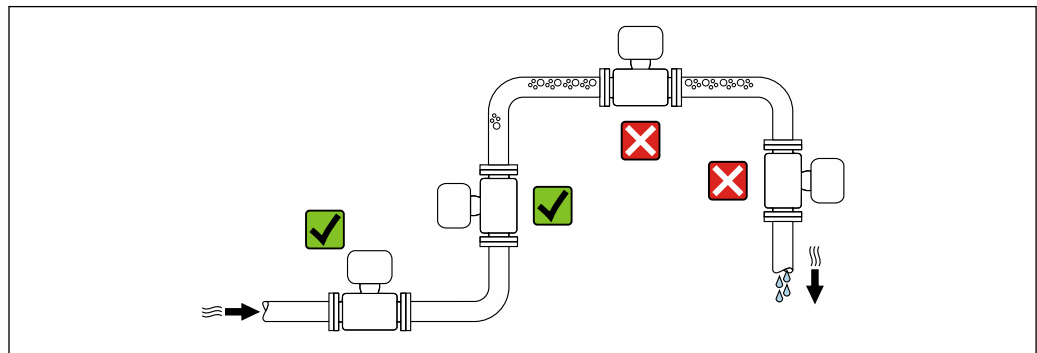
Example of maximum measurement error



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

Mounting

Installation point



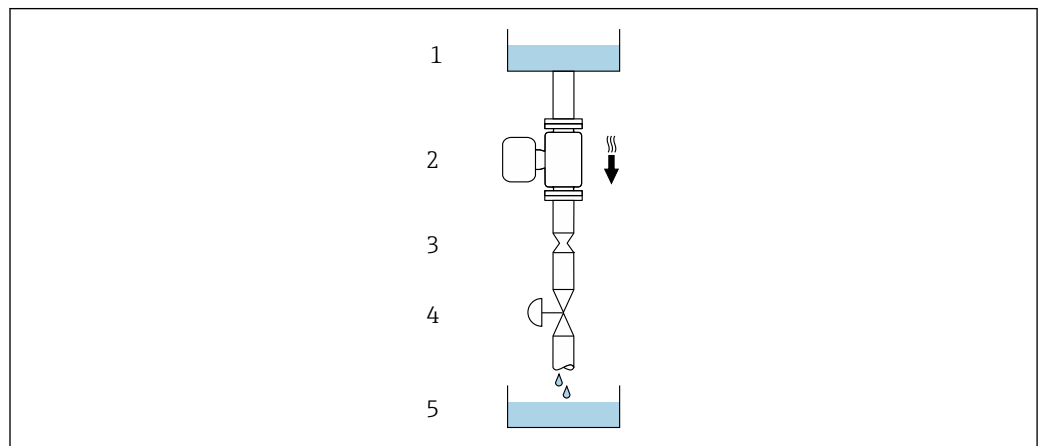
A0028772

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

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

Installation in down pipes

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



A0028773

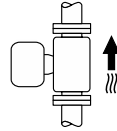
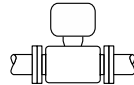
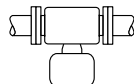

■ 23 Installation in a down pipe (e.g. for batching applications)

- 1 Supply tank
- 2 Sensor
- 3 Orifice plate, pipe restriction
- 4 Valve
- 5 Filling vessel

DN		Ø orifice plate, pipe restriction	
[mm]	[in]	[mm]	[in]
25	1	14	0.55
50	2	28	1.10
80	3	50	1.97
100	4	65	2.60
150	6	90	3.54
200	8	120	4.72
250	10	150	5.91

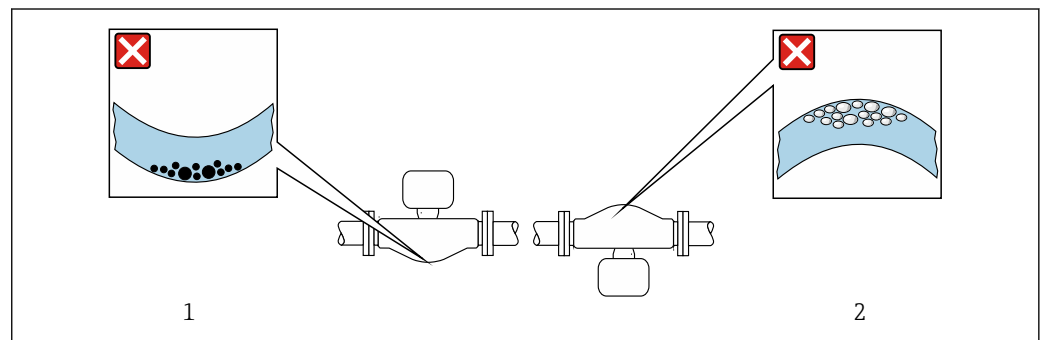
Orientation

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).

Orientation			Recommendation
A	Vertical orientation	 A0015591	✓✓ ¹⁾
B	Horizontal orientation, transmitter at top	 A0015589	✓✓ ²⁾ Exception: → ☒ 24, ☒ 55
C	Horizontal orientation, transmitter at bottom	 A0015590	✓✓ ³⁾ Exception: → ☒ 24, ☒ 55
D	Horizontal orientation, transmitter at side	 A0015592	✓✓ → ☒ 55 ⁴⁾

- 1) This orientation is recommended to ensure self-draining.
- 2) Applications with low process temperatures may reduce the ambient temperature. To maintain the minimum ambient temperature for the transmitter, this orientation is recommended.
- 3) Applications with high process temperatures may increase the ambient temperature. To maintain the maximum ambient temperature for the transmitter, this orientation is recommended.
- 4) Not recommended for inhomogeneous media.

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



☒ 24 Orientation of sensor with curved measuring tube

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

Inlet and outlet runs


No special precautions need to be taken for fittings that create turbulence, such as valves, elbows or T-pieces, as long as no cavitation occurs → ☒ 64.

Special installation instructions

Drainability

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

Hygienic compatibility

-  When installing in hygienic applications, please refer to the information in the "Certificates and approvals/hygienic compatibility" section → ☒ 104
- In the case of measuring devices with the order code for "Housing", option B "Stainless, hygienic", to seal the connection compartment cover, screw it closed finger-tight and tighten it by another 45° (corresponds to 15 Nm).

Rupture disk

Process-related information: → 63.

⚠ WARNING

Danger from medium escaping!

Medium escaping under pressure can cause injury or material damage.

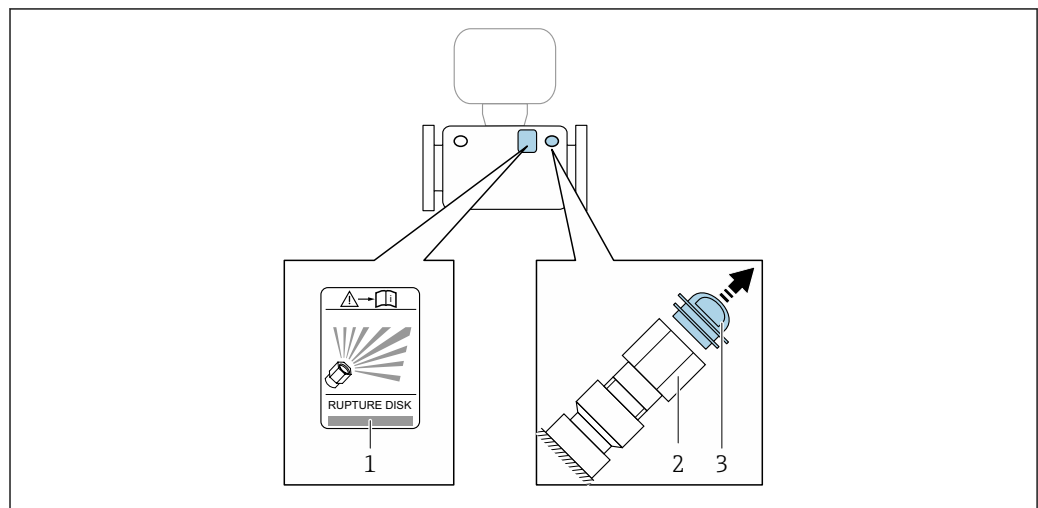
- ▶ Take precautions to prevent danger to persons and damage if the rupture disk is actuated.
- ▶ Observe the information on the rupture disk sticker.
- ▶ Make sure that the function and operation of the rupture disk is not impeded through the installation of the device.
- ▶ Do not use a heating jacket.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

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

The transportation guard must be removed.

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

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



A0030346

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

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

Zero verification and zero adjustment

All measuring instruments are calibrated in accordance with state-of-the-art technology. Calibration takes place under reference conditions → 49. Therefore, a zero adjustment in the field is generally not required.

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


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

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

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

Pitch and roll angles

If the device is used to measure the density of liquids, the pitch and roll angles must be taken into account during installation.

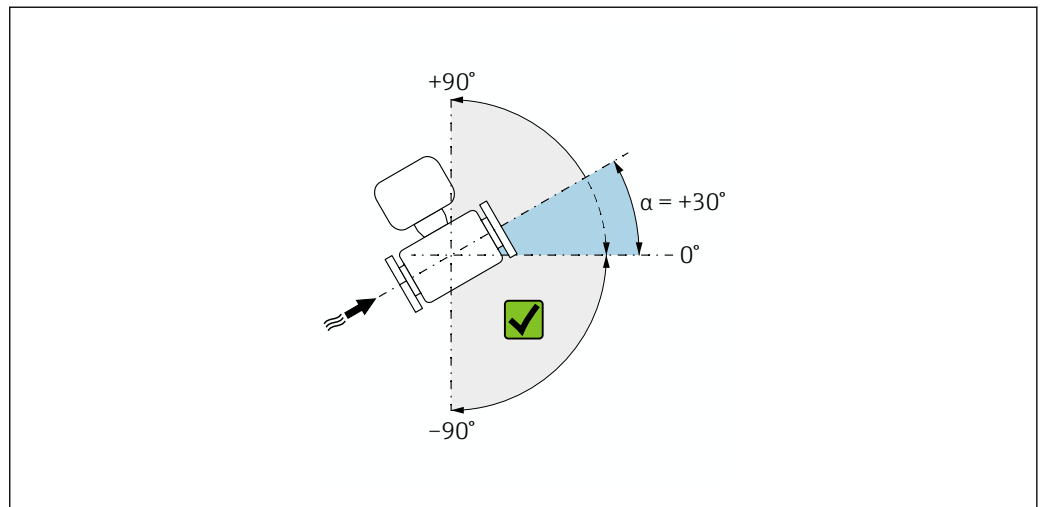
 For correct measurement, the pitch angle and roll angle must be determined during commissioning (with a tolerance of $\pm 10^\circ$) and entered in the pitch angle and roll angle parameters.

 For detailed information on density measurement, see the Special Documentation for the device →  113


Pitch angle

The technically relevant pitch angle is the angle shaded gray = -90 to $+90^\circ$.

Example (blue): Installation of the device with a pitch angle $\alpha = +30^\circ$



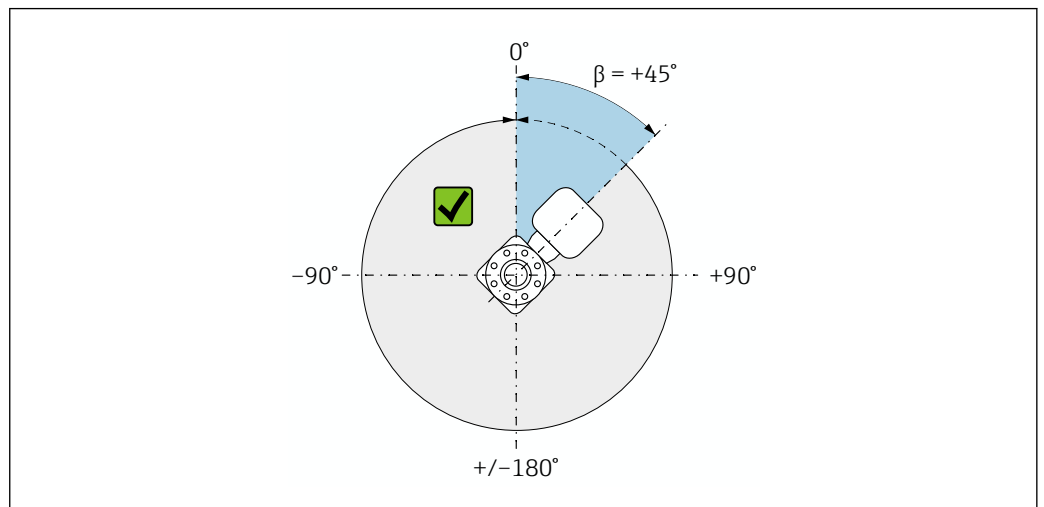
A0040032

 25 Side view with flow direction from left to right.


Roll angle

The technically relevant roll angle is the angle shaded gray = -180 to $+180^\circ$.

Example (blue): Installation of the device with a roll angle $\beta = +45^\circ$



A0040033

 26 Top view in flow direction

Environment

Ambient temperature range	Measuring device	<ul style="list-style-type: none"> ■ -40 to +60 °C (-40 to +140 °F) ■ Order code for "Test, certificate", option JP: -50 to +60 °C (-58 to +140 °F)
	Readability of the local display	-20 to +60 °C (-4 to +140 °F) The readability of the display may be impaired at temperatures outside the temperature range.



Dependency of ambient temperature on medium temperature → 59

- ▶ If operating outdoors:
Avoid direct sunlight, particularly in warm climatic regions.

Storage temperature

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

Relative humidity The device is suitable for use outdoors and indoors with a relative humidity of 4 to 95 %.

Operating height According to EN 61010-1

- ≤ 2 000 m (6 562 ft)
- > 2 000 m (6 562 ft) with additional overvoltage protection (e.g. Endress+Hauser HAW Series)

Degree of protection

Transmitter

- IP66/67, Type 4X enclosure, suitable for pollution degree 4
- When the housing is open: IP20, Type 1 enclosure, suitable for pollution degree 2
- Display module: IP20, Type 1 enclosure, suitable for pollution degree 2

Optional

DN 25 to 100: order code for "Sensor options", option CM "IP69"

External WLAN antenna

IP67

Shock and vibration resistance

Vibration sinusoidal, in accordance with IEC 60068-2-6

- 2 to 8.4 Hz, 3.5 mm peak
- 8.4 to 2 000 Hz, 1 g peak

Vibration broad-band random, according to IEC 60068-2-64

- 10 to 200 Hz, 0.003 g²/Hz
- 200 to 2 000 Hz, 0.001 g²/Hz
- Total: 1.54 g rms

Shock half-sine, according to IEC 60068-2-27

6 ms 30 g

Rough handling shocks according to IEC 60068-2-31

Internal cleaning

- CIP cleaning
- SIP cleaning

Options




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

Mechanical load

Transmitter housing:

- Protect against mechanical effects, such as shock or impact
- Do not use as a ladder or climbing aid

Electromagnetic compatibility (EMC)

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

Process


Medium temperature range

Standard version	-50 to +205 °C (-58 to +401 °F)	Order code for "Measuring tube mat., wetted surface", option SA, SB
Low-temperature version	-196 to +150 °C (-320 to +302 °F)	Order code for "Measuring tube mat., wetted surface", option LA

NOTICE
Material fatigue due to excessive temperature difference!
 ► Maximum temperature difference of media used: 300 K

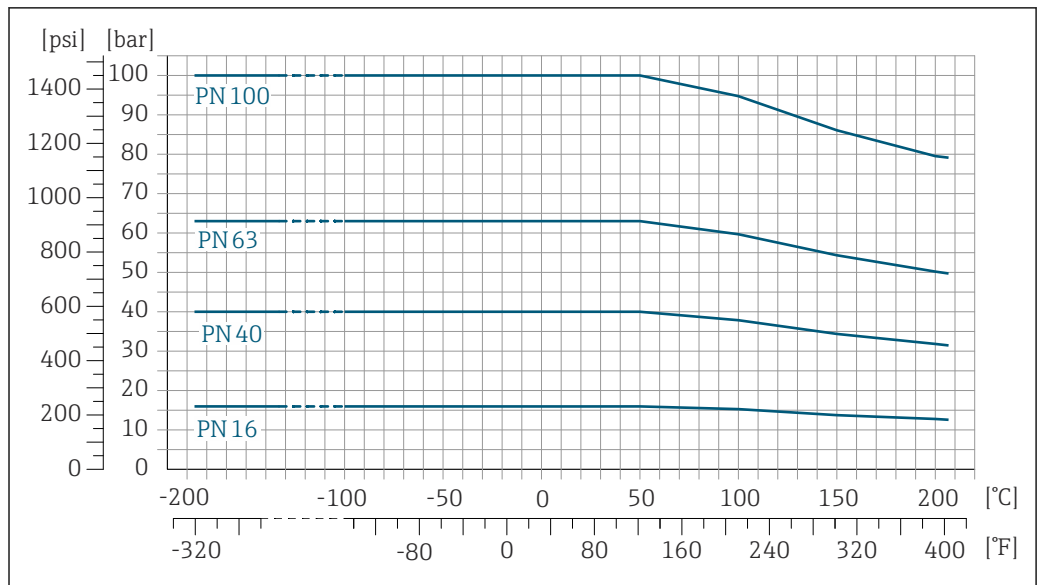
Pressure-temperature ratings

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

-  Pressure-temperature ratings with the +151 to +205 °C (+304 to +401 °F) temperature range are only for measuring devices with the extended temperature version.

1) The cleaning refers to the measuring instrument only. Any accessories supplied are not cleaned.

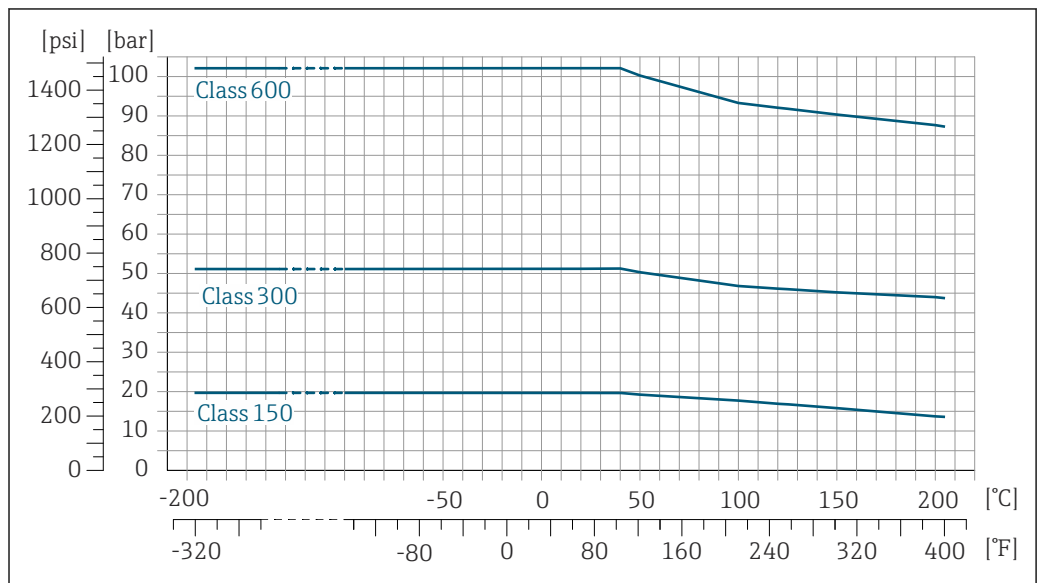
Flange similar to EN 1092-1 (DIN 2501)



A0029636-EN

27 With flange material 1.4404 (F316/F316L)

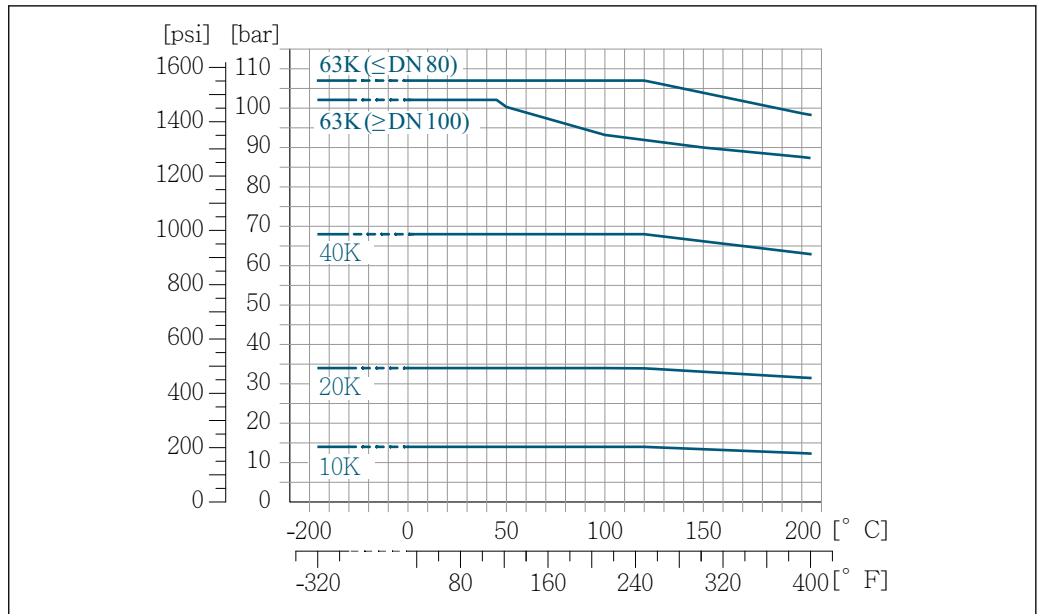
Flange similar to ASME B16.5



A0029638-EN

28 With flange material 1.4404 (F316/F316L)

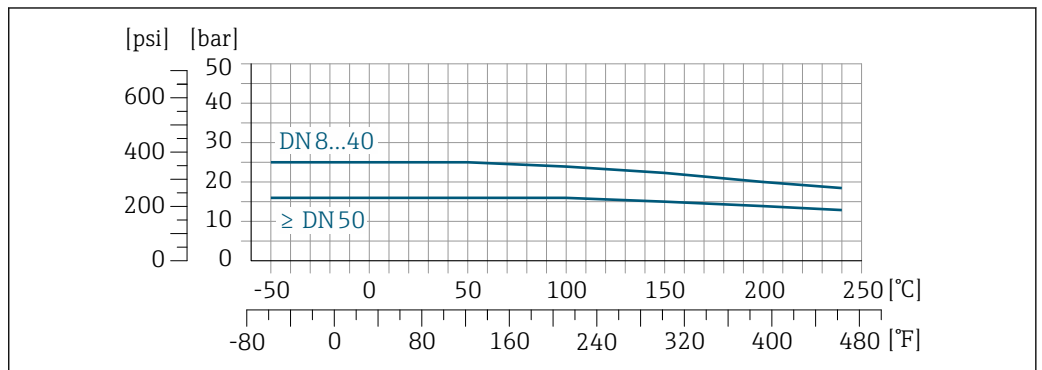
Flange JIS B2220



29 With flange material 1.4404 (F316/F316L)

A0029639-EN

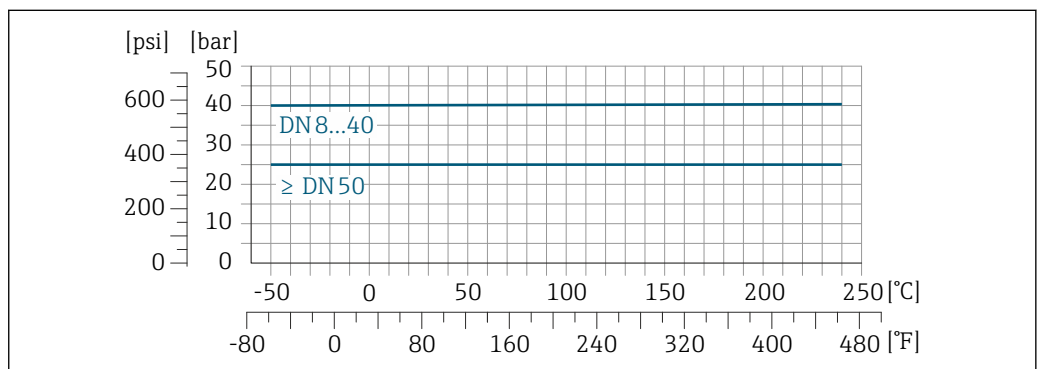
Flange DIN 11864-2 Form A



30 With connection material 1.4404 (316/316L)

A0028782-EN

Threaded adapter DIN 11851

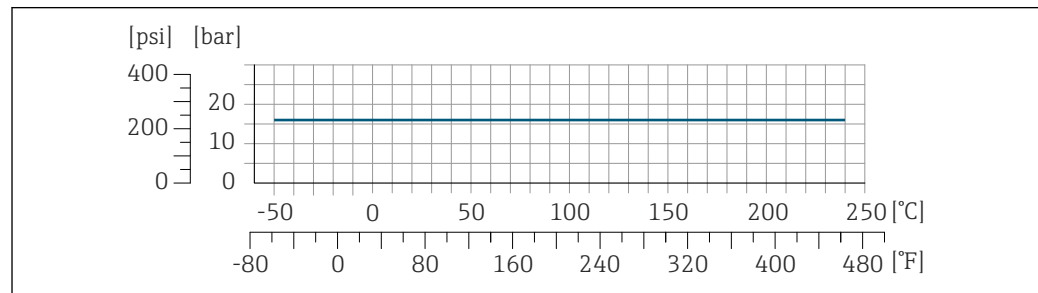


31 With connection material 1.4404 (316/316L)

A0028794-EN

DIN 11851 allows for applications up to +140 °C (+284 °F) if suitable sealing materials are used. Please take this into account when selecting seals and counterparts, as these components can limit the pressure and temperature range.

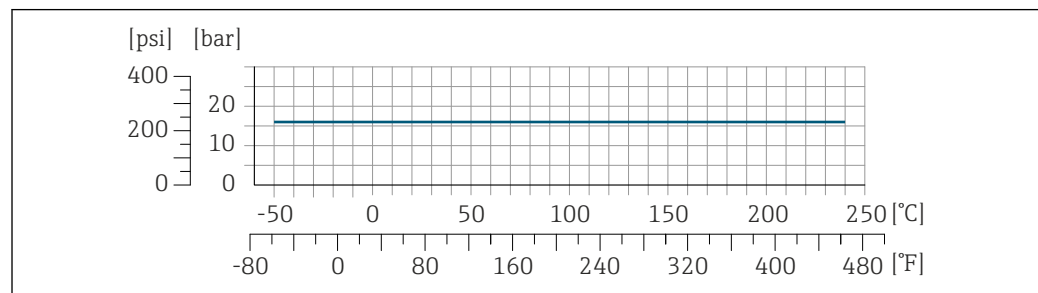
Threaded adapter ISO 2853



A0028799-EN

32 With connection material 1.4404 (316/316L)

Threaded adapter SMS 1145

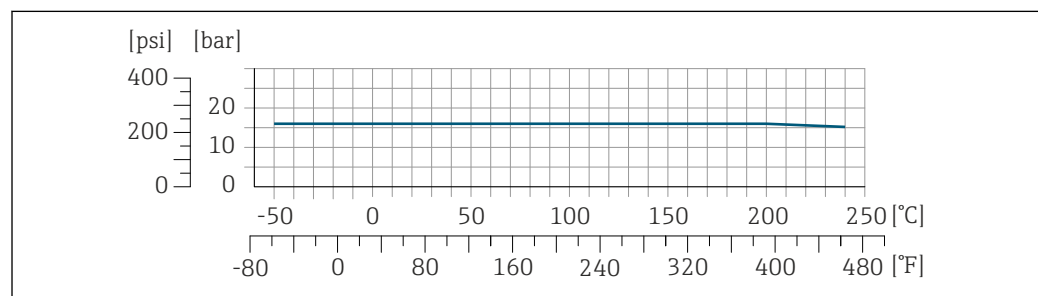


A0028800-EN

33 With connection material 1.4404 (316/316L)

SMS 1145 allows for applications up to 16 bar (232 psi) if suitable sealing materials are used. Please take this into account when selecting seals and counterparts, as these components can limit the pressure and temperature range.

Tri-Clamp



A0032216-EN

The clamp connections are suitable up to a maximum pressure of 16 bar (232 psi). Please observe the operating limits of the clamp and seal used as they can be over 16 bar (232 psi). The clamp and seal are not included in the scope of supply.


Sensor housing

The sensor housing is filled with helium and protects the electronics and mechanics inside.


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

In the event of a tube failure, the pressure level inside the sensor housing will rise according to the operating process pressure. If the user judges that the sensor housing burst pressure does not

provide an adequate safety margin, the device can be fitted with a rupture disk. This prevents excessively high pressure from forming inside the sensor housing. Therefore, the use of a rupture disk is strongly recommended in applications involving high gas pressures, and particularly in applications in which the process pressure is greater than 2/3 of the sensor housing burst pressure.

If there is a need to drain the leaking medium into a discharge device, the sensor should be fitted with a rupture disk. Connect the discharge to the additional threaded connection →  76.

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

 Do not open the purge connections unless the containment can be filled immediately with a dry, inert gas. The use of helium at low pressure is recommended for purging.

Maximum pressure: 0.5 bar (7.3 psi)

Burst pressure of the sensor housing

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

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

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

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

DN		Sensor housing burst pressure	
[mm]	[in]	[bar]	[psi]
25	1	220	3 191
50	2	160	2 320
80	3	150	2 175
100	4	120	1 740
150	6	120	1 740
200	8	100	1 450
250	10	100	1 450

For information on the dimensions: see the "Mechanical construction" section →  66



Rupture disk

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

For information on the dimensions: see the "Mechanical construction" section (accessories) →  76

Flow limit



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

 For an overview of the full scale values for the measuring range, see the "Measuring range" section →  10

- The minimum recommended full scale value is approx. 1/20 of the maximum full scale value
- In most applications, 20 to 50 % of the maximum full scale value can be considered ideal
- A low full scale value must be selected for abrasive media (such as liquids with entrained solids): flow velocity < 1 m/s (< 3 ft/s).

 To calculate the flow limit, use the *Applicator* sizing tool →  111

Pressure loss

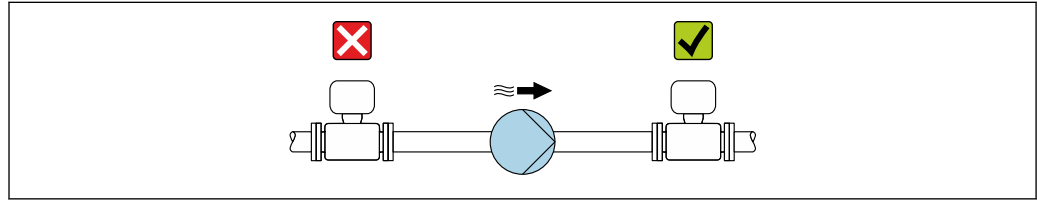
 To calculate the pressure loss, use the *Applicator* sizing tool →  111

Static pressure

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

For this reason, the following mounting locations are recommended:

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



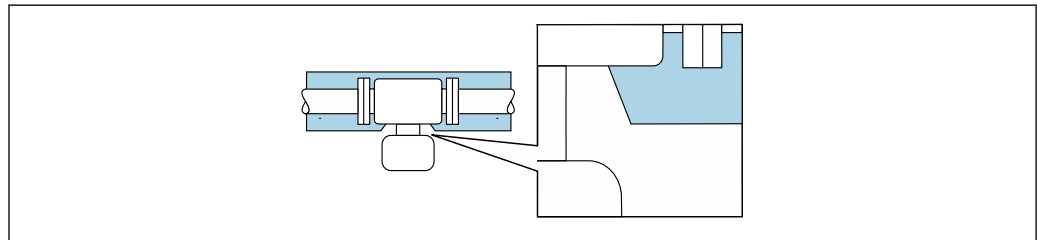
A0028777

Thermal insulation


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


NOTICE**Electronics overheating on account of thermal insulation!**

- ▶ Recommended orientation: horizontal orientation, transmitter housing pointing downwards.
- ▶ Do not insulate the transmitter housing .
- ▶ Maximum permissible temperature at the lower end of the transmitter housing: 80 °C (176 °F)
- ▶ Regarding thermal insulation with an exposed extended neck: We advise against insulating the extended neck to ensure optimal heat dissipation.



A0034391

 34 Thermal insulation with exposed extended neck

 Low-temperature version: It is generally not necessary to insulate the transmitter housing . If insulation is provided, the rules that apply are the same as those for thermal insulation.

Heating

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

Heating options


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

NOTICE**Danger of overheating when heating**

- ▶ Ensure that the temperature at the lower end of the transmitter housing does not exceed 80 °C (176 °F).
- ▶ Ensure that sufficient convection takes place at the transmitter neck.
- ▶ When using in potentially explosive atmospheres, observe the information in the device-specific Ex documentation. For detailed information on the temperature tables, see the separate document entitled "Safety Instructions" (XA) for the device.
- ▶ Consider the "830 ambient temperature too high" and "832 electronics temperature too high" process diagnostics if overheating cannot be ruled out based on a suitable system design.

Vibrations

The operational reliability of the measuring system is not affected by plant vibrations.

2) The use of parallel electric band heaters is generally recommended (bidirectional electricity flow). Particular considerations must be made if a single-wire heating cable is to be used. Additional information is provided in the document EA01339D "Installation instructions for electrical trace heating systems" →  114

Custody transfer

The measuring device is optionally tested in accordance with OIML R117/R81 and has an EU type evaluation certificate which authorizes the use in EU type-examination certificates according to Measuring Instruments Directive 2014/32/EU for service subject to legal metrological control ("custody transfer") for liquids other than water and cryogenic liquids (Annex VII).

The measuring device is optionally tested according to OIML R137 and has an EU type-examination certificate according to Measuring Instruments Directive 2014/32/EU for service subject to legal metrological control ("custody transfer") as a gas meter (Annex IV).

The device is used with a legally controlled totalizer display on the local display and optionally with outputs subject to legal metrological control.

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

Generally a measuring device subject to legal metrological control is secured against tampering by seals on the transmitter or sensor. These seals may normally only be opened by a representative of the competent authority for legal metrology controls.

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

Detailed ordering information is available from your local Endress+Hauser sales center for national approvals, which are based on the OIML certificates, for applications with liquids other than water or cryogenic liquids.

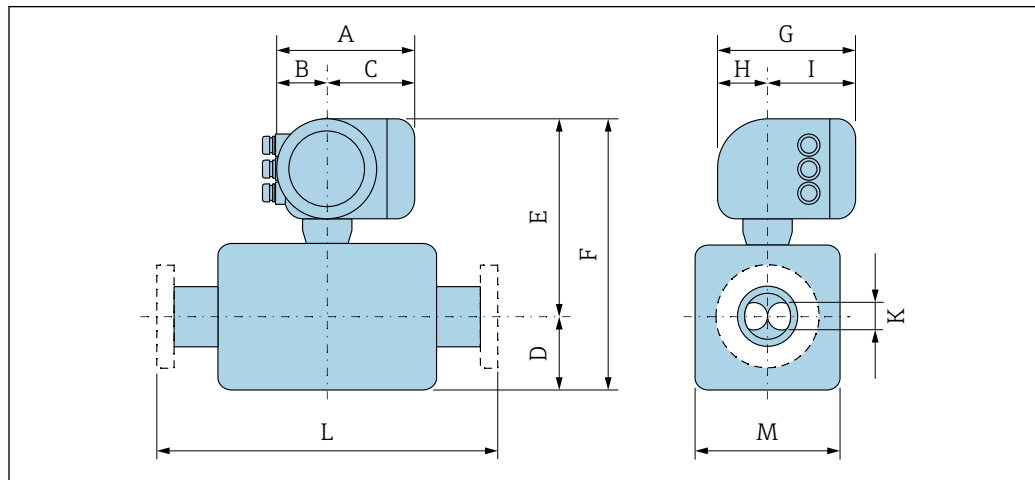


More information is provided in the supplementary documentation.

Mechanical construction

Dimensions in SI units

Compact version



A0033786

Order code for "Housing", option A "Aluminum, coated"

DN	A ¹⁾	B ¹⁾	C	D	E	F	G ²⁾	H	I	K	L	M
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	169	68	101	217	331.5	548.5	200	59	141 ²⁾	15.2	³⁾	73
50	169	68	101	408	352	760	200	59	141 ²⁾	28.0	³⁾	115
80	169	68	101	524	379	903	200	59	141 ²⁾	43.3	³⁾	169
100	169	68	101	655	405	1060	200	59	141 ²⁾	68.9	³⁾	220
150	188	85	103	626	484	1110	217	58	159 ⁴⁾	56.7	³⁾	244
200	188	85	103	790	527	1315	217	58	159 ⁴⁾	68.9	³⁾	324
250	188	85	103	887	540	1427	217	58	159 ⁴⁾	90.1	³⁾	356

- 1) Depending on the cable gland used: values up to + 30 mm
- 2) For version without local display: values - 30 mm
- 3) Depending on the process connection
- 4) For version without local display: values - 40 mm

Order code for "Housing", option A "Aluminum, coated"; Ex d

DN	A ¹⁾	B ¹⁾	C	D	E	F	G ²⁾	H	I ²⁾	K	L	M
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	188	85	103	217	332	549	217	58	159	15.2	³⁾	73
50	188	85	103	408	353	761	217	58	159	28.0	³⁾	115
80	188	85	103	524	380	904	217	58	159	43.3	³⁾	169
100	188	85	103	655	405	1060	217	58	159	68.9	³⁾	220
150	188	85	103	626	484	1110	217	58	159	56.7	³⁾	244
200	188	85	103	790	527	1315	217	58	159	68.9	³⁾	324
250	188	85	103	887	540	1427	217	58	159	90.1	³⁾	356

- 1) Depending on the cable gland used: values up to + 30 mm
- 2) For version without local display: values - 40 mm
- 3) Depending on the process connection

Order code for "Housing", option B "Stainless, hygienic"

DN	A ¹⁾	B ¹⁾	C	D	E	F	G ²⁾	H	I ²⁾	K	L	M
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	183	73	110	217	331.5	548.5	200	65	135	15.2	³⁾	73
50	183	73	110	408	352	760	200	65	135	28.0	³⁾	115
80	183	73	110	524	379	903	200	65	135	43.3	³⁾	169
100	183	73	110	655	405	1060	200	65	135	68.9	³⁾	220

- 1) Depending on the cable gland used: values up to + 30 mm
- 2) For version without local display: values - 13 mm
- 3) Depending on the process connection

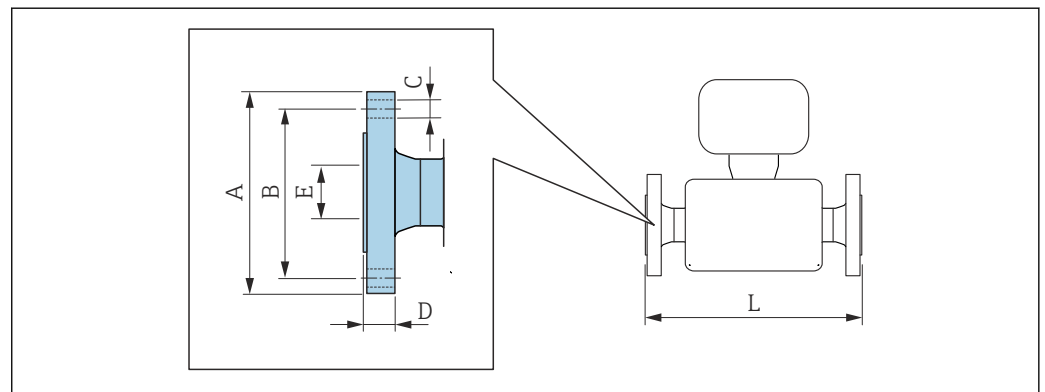
Order code for "Housing", option L "Cast, stainless"

DN	A ¹⁾	B	C	D	E	F	G	H	I	K	L	M
[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
25	186	85	101	217	331.5	548.5	217	60	157	15.2	²⁾	73
50	186	85	101	408	352	760	217	60	157	28.0	²⁾	115
80	186	85	101	524	379	903	217	60	157	43.3	²⁾	169
100	186	85	101	655	405	1060	217	60	157	68.9	²⁾	220
150	186	85	101	626	484	1110	217	60	157	56.7	²⁾	244
200	186	85	101	790	527	1315	217	60	157	68.9	²⁾	324
250	186	85	101	887	540	1427	217	60	157	90.1	²⁾	356

- 1) Depending on the cable gland used: values up to + 30 mm
- 2) Depending on the process connection

Flange connections

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



A0015621

 Length tolerance for dimension L in mm:
+1.5/-2.0

Flange similar to EN 1092-1 (DIN 2501 / DIN 2512N): PN16 1.4404 (F316/F316L): order code for "Process connection", option D1S						
Flange with groove similar to EN 1092-1 Form D (DIN 2512N): PN16 1.4404 (F316/F316L): order code for "Process connection", option D5S						
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
100	220	180	8 × Ø18	20	107.1	1 128
150	285	240	8 × Ø22	22	159.3	1 136/1 330 ¹⁾
200	340	295	12 × Ø22	24	206.5	1 343
250	405	355	12 × Ø26	26	260.4	1 775
Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm						

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

Flange similar to EN 1092-1 (DIN 2501): PN16 with reduction in nominal diameter 1.4404 (F316/F316L)								
Flange DN [mm]	Device Reduction to DN [mm]	Order code "Process connection", Option	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
100	80	DHS	220	180	8 × Ø18	20	107.1	874
150	100	DJS	285	240	8 × Ø22	22	159.3	1 167
200	150	DLS	340	295	12 × Ø22	24	206.5	1 267
Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm								

Flange similar to EN 1092-1 (DIN 2501 / DIN 2512N): PN 40 1.4404 (F316/F316L): order code for "Process connection", option D2S						
Flange with groove similar to EN 1092-1 Form D (DIN 2512N): PN 40 1.4404 (F316/F316L): order code for "Process connection", option D6S						
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
25	115	85	4 × Ø14	18	28.5	440
50	165	125	4 × Ø18	20	54.5	715
80	200	160	8 × Ø18	24	82.5	840
100	235	190	8 × Ø22	24	107.1	1 128
150	300	250	8 × Ø26	28	159.3	1 176/1 370 ¹⁾
200	375	320	12 × Ø30	34	206.5	1 395
250	450	385	12 × Ø33	38	258.8	1 845
Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm						

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

Flange similar to EN 1092-1 (DIN 2501): PN 40 with reduction in nominal diameter 1.4404 (F316/F316L)								
Flange DN [mm]	Device Reduction to DN [mm]	Order code "Process connection", Option	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
80	50	DGS	200	160	8 × Ø18	24	82.5	840
100	80	DIS	235	190	8 × Ø22	24	107.1	874

**Flange similar to EN 1092-1 (DIN 2501): PN 40 with reduction in nominal diameter
1.4404 (F316/F316L)**

Flange DN [mm]	Device Reduction to DN [mm]	Order code "Process connection", Option	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
150	100	DKS	300	250	8 × Ø26	28	159.3	1 167
200	150	DMS	375	320	12 × Ø30	34	206.5	1 267

Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm

**Flange similar to EN 1092-1 (DIN 2501 / DIN 2512N): PN 63
1.4404 (F316/F316L): order code for "Process connection", option D3S**

**Flange with groove similar to EN 1092-1 Form D (DIN 2512N): PN 63
1.4404 (F316/F316L): order code for "Process connection", option D7S**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
50	180	135	4 × Ø22	26	54.5	724
80	215	170	8 × Ø22	28	81.7	875
100	250	200	8 × Ø26	30	106.3	1 128
150	345	280	8 × Ø33	36	157.1	1 216/1 410 ¹⁾
200	415	345	12 × Ø36	42	204.9	1 439
250	470	400	12 × Ø36	46	255.4	1 885

Surface roughness (flange): EN 1092-1 Form B1 (DIN 2526 Form C), Ra 3.2 to 12.5 µm

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

**Flange similar to EN 1092-1 (DIN 2501 / DIN 2512N): PN 100
1.4404 (F316/F316L): order code for "Process connection", option D4S**

**Flange with groove similar to EN 1092-1 Form D (DIN 2512N): PN 100
1.4404 (F316/F316L): order code for "Process connection", option D8S**

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
25	140	100	4 × Ø18	24	28.5	470
50	195	145	4 × Ø26	28	53.9	740
80	230	180	8 × Ø26	32	80.9	885
100	265	210	8 × Ø30	36	104.3	1 128
150	355	290	12 × Ø33	44	154.0	1 256/1 450 ¹⁾
200	430	360	12 × Ø36	52	199	1 479
250	505	430	12 × Ø39	60	248	1 949

Surface roughness (flange): EN 1092-1 Form B2 (DIN 2526 Form E), Ra 0.8 to 3.2 µm

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

Flange similar to ASME B16.5: Class 150 1.4404 (F316/F316L)						
<i>Order code for "Process connection", option AAS</i>						
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
25	110	79.4	4 × Ø15.7	14.2	26.7	440
50	150	120.7	4 × Ø19.1	19.1	52.6	715
80	190	152.4	4 × Ø19.1	23.9	78.0	840
100	230	190.5	8 × Ø19.1	23.9	102.4	1128
150	280	241.3	8 × Ø22.2	25.9	154.1	1203/1398 ¹⁾
200	345	298.5	8 × Ø22.2	29	202.7	1423
250	405	362	12 × Ø25.4	30.6	254.5	1832
Surface roughness (flange): Ra 3.2 to 6.3 µm						

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

Flange similar to ASME B16.5: Class 150 with reduction in nominal diameter 1.4404 (F316/F316L)								
Flange DN [mm]	Device Reduction to DN [mm]	Order code "Process connection", Option	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
80	50	AJS	190	152.4	4 × Ø19.1	23.9	78.0	720
100	80	ALS	230	190.5	8 × Ø19.1	23.9	102.4	874
150	100	ANS	280	241.3	8 × Ø22.4	25.4	154.2	1167
200	150	APS	345	298.5	8 × Ø22.2	29	202.7	1266
250	200	AVS	405	362	12 × Ø25.4	30.6	254.6	1408/ 1832 ¹⁾
300	250	AXS	485	431.8	12 × Ø25.4	32.2	304.8	1935
Surface roughness (flange): Ra 3.2 to 6.3 µm								

1) Installed length such as Promass F, DN 250 (order code for "Sensor option", option CO)

Flange similar to ASME B16.5: Class 300 1.4404 (F316/F316L)						
<i>Order code for "Process connection", option ABS</i>						
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
25	125	88.9	4 × Ø19.1	17.5	26.7	440
50	165	127	8 × Ø19.1	22.3	52.6	715
80	210	168.3	8 × Ø22.3	28.4	78.0	840
100	255	200	8 × Ø22.3	31.7	102.4	1128
150	320	269.9	12 × Ø22.2	37	154.1	1223/1417 ¹⁾
200	380	330.2	12 × Ø25.4	41.7	202.7	1443
250	445	387.4	16 × Ø28.5	48.1	254.5	1863
Surface roughness (flange): Ra 3.2 to 6.3 µm						

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

Flange similar to ASME B16.5: Class 300 with reduction in nominal diameter 1.4404 (F316/F316L)								
Flange DN [mm]	Device Reduction to DN [mm]	Order code "Process connection", Option	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
80	50	AKS	210	168.3	8 × Ø22.3	28.4	78.0	732
100	80	AMS	255	200	8 × Ø22.3	31.7	102.4	894
150	100	AOS	320	269.9	12 × Ø22.3	36.5	154.2	1 187
200	150	AQS	380	330.2	12 × Ø25.4	41.7	202.7	1 266
250	200	AWS	445	374.4	16 × Ø28.6	48.1	254.6	1439/ 1863 ¹⁾
300	250	AZS	520	450.8	16 × Ø31.8	51.3	304.8	1 935

Surface roughness (flange): Ra 3.2 to 6.3 µm

1) Installed length such as Promass F, DN 250 (order code for "Sensor option", option CO)

Flange similar to ASME B16.5: Class 600 1.4404 (F316/F316L) Order code for "Process connection", option ACS						
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
25	125	88.9	4 × Ø19.1	23.9	24.3	490
50	165	127	8 × Ø19.1	31.8	49.2	742
80	210	168.3	8 × Ø22.2	40.0	73.7	900
100	275	215.9	8 × Ø25.4	48.4	97.3	1 158
150	355	292.1	12 × Ø28.5	54.7	154.1	1 273/1 467 ¹⁾
200	420	349.2	12 × Ø31.8	62.6	202.7	1 499
250	510	431.8	16 × Ø35	70.5	254.5	1 946

Surface roughness (flange): Ra 3.2 to 6.3 µm

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

Flange JIS B2220: 10K 1.4404 (F316/F316L) Order code for "Process connection", option NDS						
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
50	155	120	4 × Ø19	16	50	715
80	185	150	8 × Ø19	18	80	832
100	210	175	8 × Ø19	18	100	1 128
150	280	240	8 × Ø23	22	150	1 160/1 354 ¹⁾
200	330	290	12 × Ø23	22	200	1 379
250	400	355	12 × Ø25	24	250	1 775

Surface roughness (flange): Ra 3.2 to 6.3 µm

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

Flange JIS B2220: 20K 1.4404 (F316/F316L) <i>Order code for "Process connection", option NES</i>						
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
25	125	90	4 × Ø19	16	25	440
50	155	120	8 × Ø19	18	50	715
80	200	160	8 × Ø23	22	80	832
100	225	185	8 × Ø23	24	100	1128
150	305	260	12 × Ø25	28	150	1192/1386 ¹⁾
200	350	305	12 × Ø25	30	200	1379
250	430	380	12 × Ø27	34	250	1845
Surface roughness (flange): Ra 1.6 to 3.2 µm						

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

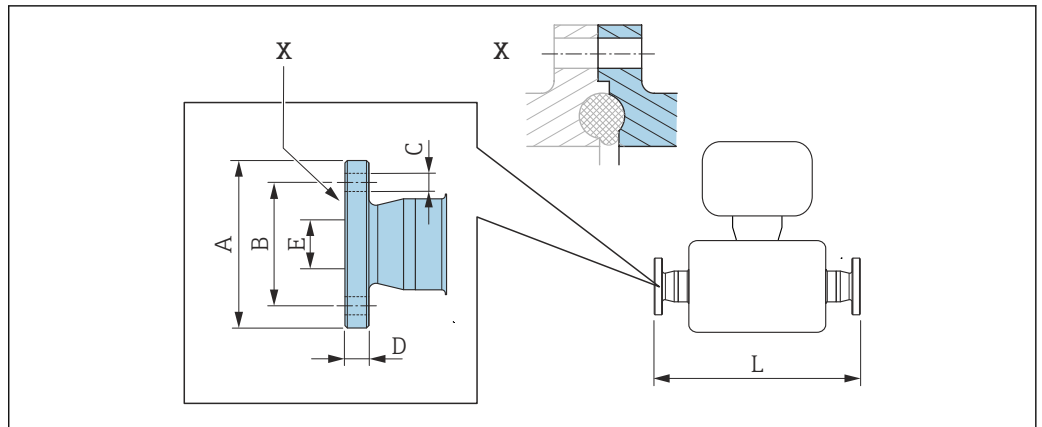
Flange JIS B2220: 40K 1.4404 (F316/F316L) <i>Order code for "Process connection", option NGS</i>						
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
25	130	95	4 × Ø19	22	25	485
50	165	130	8 × Ø19	26	50	760
80	210	170	8 × Ø23	32	75	890
100	250	205	8 × Ø25	36	100	1168
150	355	295	12 × Ø33	44	150	1304/1498 ¹⁾
200	405	345	12 × Ø33	50	200	1459
Surface roughness (flange): Ra 1.6 to 3.2 µm						

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

Flange JIS B2220: 63K 1.4404 (F316/F316L) <i>Order code for "Process connection", option NHS</i>						
DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
25	140	100	4 × Ø23	27	22	494
50	185	145	8 × Ø23	34	48	775
80	230	185	8 × Ø25	40	73	915
100	270	220	8 × Ø27	44	98	1168
150	365	305	12 × Ø33	54	146	1334/1528 ¹⁾
200	425	360	12 × Ø33	60	190.9	1479
Surface roughness (flange): Ra 1.6 to 3.2 µm						

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

Fixed flange DIN 11864-2



A0015627

35 Detail X: Asymmetrical process connection; the part shown in blue is provided by the supplier.

i Length tolerance for dimension L in mm:
+1.5 / -2.0

Flange DIN11864-2 Form A, for pipe according to DIN11866 series A, flange with notch 1.4404 (316/316L)

Order code for "Process connection", option KCS

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
25	70	53	4 × Ø9	10	26	454
50	94	77	4 × Ø9	10	50	720
80	133	112	8 × Ø11	12	81	900
100	159	137	8 × Ø11	14	100	1128

3A version available: order code for "Additional approval", option LP in conjunction with Ra ≤ 0.76 µm: order code for "Measuring tube material", option SB, SJ

Flange DIN11864-2 Form A, for pipe according to DIN11866 series A, flange with notch with nominal diameter reduction 1.4404 (316/316L)

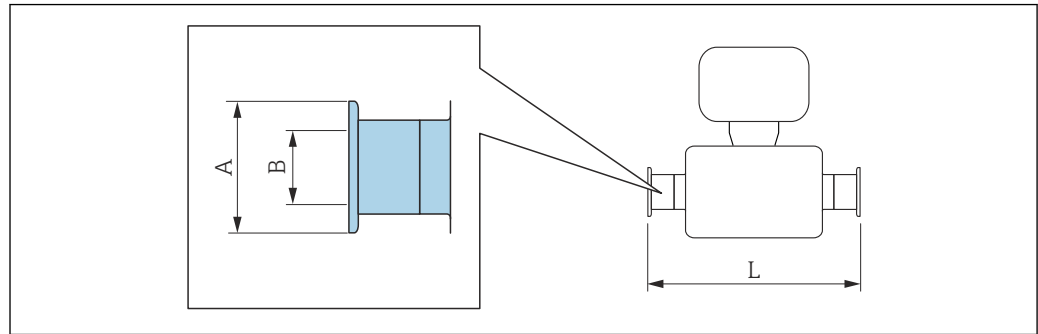
Order code for "Process connection", option KAS

Flange DN [mm]	Device Reduction to DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	L [mm]
40	25	82	65	4 × Ø9	10	38	454

3A version available: order code for "Additional approval", option LP in conjunction with Ra ≤ 0.76 µm: order code for "Measuring tube material", option SB, SJ

Clamp connections

Tri-Clamp



A0015625

i Length tolerance for dimension L in mm:
+1.5/-2.0

Tri-Clamp for pipe according to DIN 11866 series C 1.4404 (316/316L)

Order code for "Process connection", option FTS

DN [mm]	Clamp [in]	A [mm]	B [mm]	L [mm]
25	1	50.4	22.1	434
50	2	63.9	47.5	720
80	3	90.9	72.9	900
100	4	118.9	97.4	1128

3A version available: order code for "Additional approval", option LP in conjunction with
Ra ≤ 0.76 µm: order code for "Measuring tube material", option SB, SJ

Tri-Clamp (1½), for pipe according to DIN 11866 series C with nominal diameter reduction 1.4404 (316L)

Order code for "Process connection", option FAS

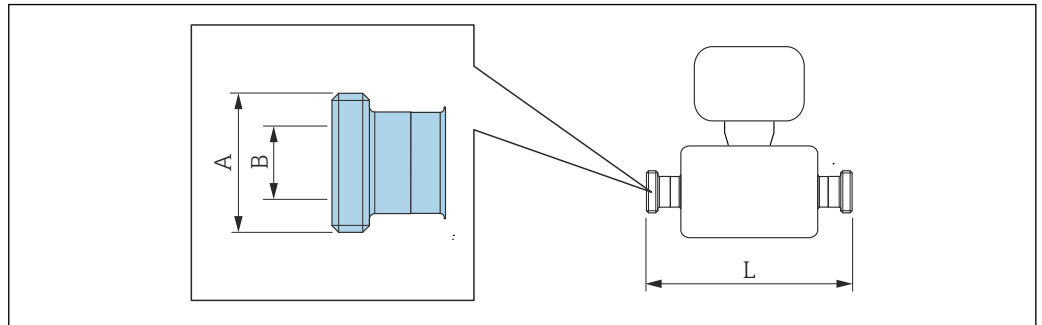
Tri-Clamp DN [mm]	Device Reduction to DN [mm]	Clamp [in]	A [mm]	B [mm]	L [mm]
40	25	1½ ¹⁾	50.4	34.80	434

3A version available: order code for "Additional approval", option LP in conjunction with
Ra ≤ 0.76 µm: order code for "Measuring tube material", option SB, SJ

1) The connection corresponds to the hygienic clamp dimensions according to ASME BPE.

Glands

Threaded adapter DIN 11851, DIN11864-1, SMS 1145



A0015628

i Length tolerance for dimension L in mm:
+1.5/-2.0

Threaded adapter DIN 11851, for pipe according to DIN11866 series A 1.4404 (316/316L) Order code for "Process connection", option FMW			
DN [mm]	A [in]	B [mm]	L [mm]
25	Rd 52 × 1/6	26	434
50	Rd 78 × 1/6	50	720
80	Rd 110 × 1/4	81	900
100	Rd 130 × 1/4	100	1128

3A version available: order code for "Additional approval", option LP in conjunction with Ra ≤ 0.76 µm: order code for "Measuring tube material", option SB, SJ

Threaded adapter DIN11864-1 Form A, for pipe according to DIN11866 series A 1.4404 (316/316L) Order code for "Process connection", option FLW			
DN [mm]	A [in]	B [mm]	L [mm]
25	Rd 52 × 1/8	26	434
50	Rd 78 × 1/6	50	720
80	Rd 110 × 1/4	81	900
100	Rd 130 × 1/4	100	1128

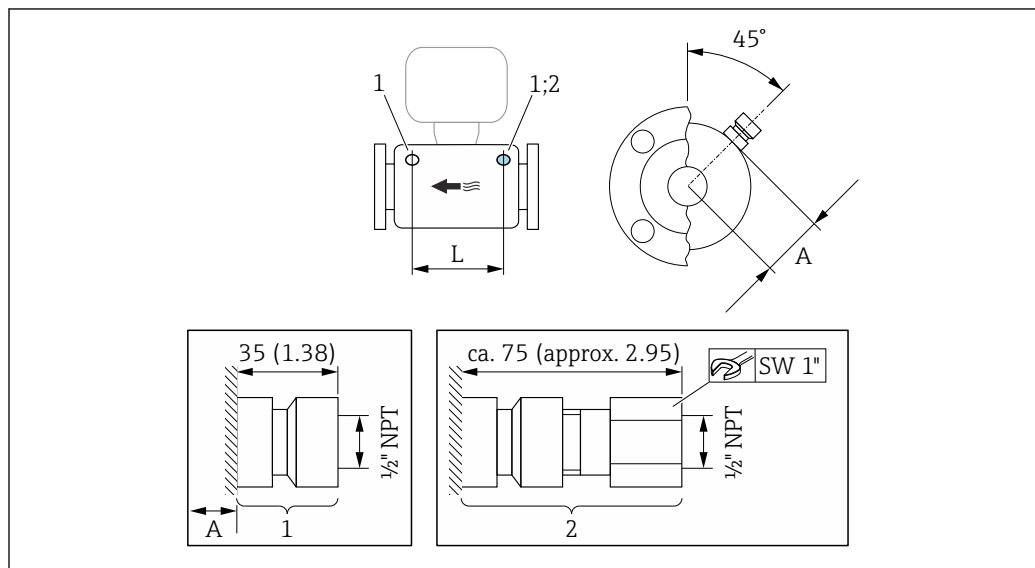
3A version available: order code for "Additional approval", option LP in conjunction with Ra ≤ 0.76 µm: order code for "Measuring tube material", option SB, SJ

Threaded adapter SMS 1145 1.4404 (316/316L) Order code for "Process connection", option SCS			
DN [mm]	A [in]	B [mm]	L [mm]
25	Rd 40 × 1/6	22.6	434
50	Rd 70 × 1/6	48.6	720
80	Rd 98 × 1/6	72.9	900

Threaded adapter SMS 1145 1.4404 (316/316L) Order code for "Process connection", option SCS			
DN [mm]	A [in]	B [mm]	L [mm]
100	Rd 132 × 1/6	97.6	1128
3A version available: order code for "Additional approval", option LP in conjunction with Ra ≤ 0.76 µm: order code for "Measuring tube material", option SB, SJ			

Accessories

Rupture disk/purge connections



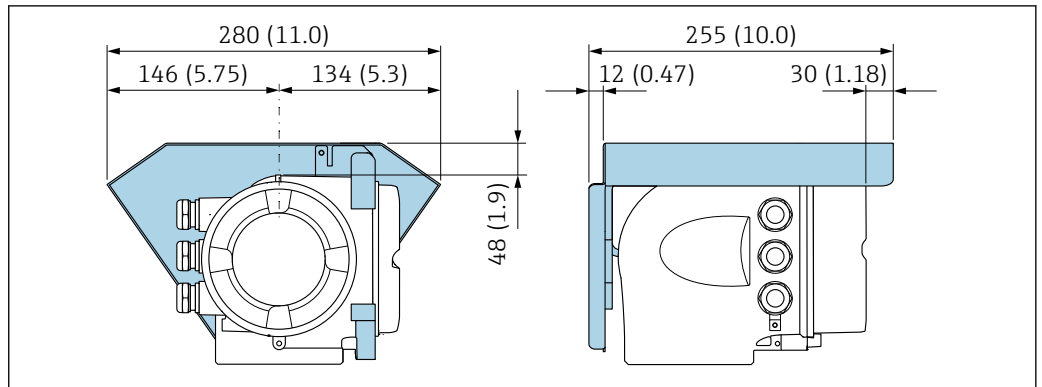
A0030349

36 Engineering unit mm (in)

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

DN	A	L
[mm]	[mm]	[mm]
25	32	240
50	53	452
80	80	380
100	106	584
150	118.5	584
200	158.5	584
250	174.3	584

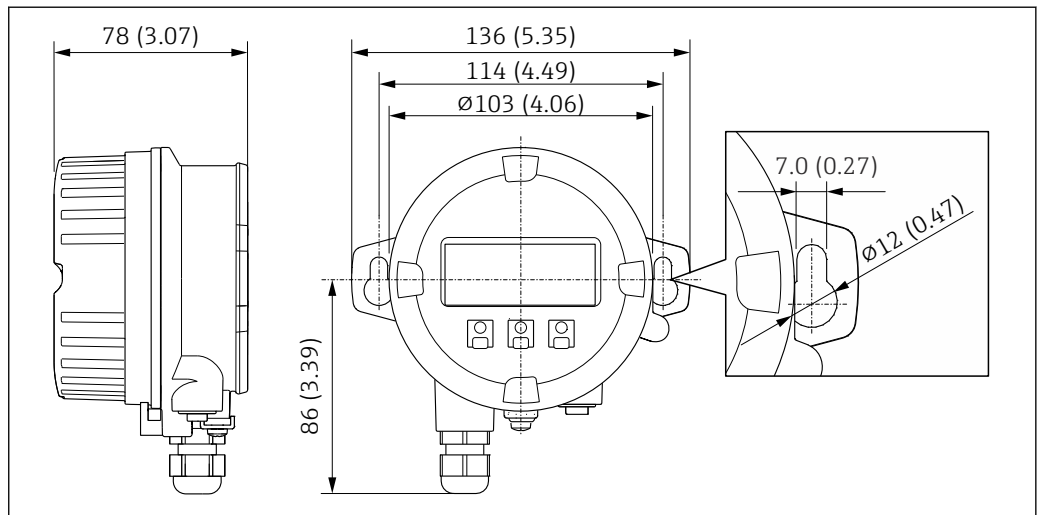
Weather protection cover



A0029553

37 Engineering unit mm (in)

Remote display and operating module DKX001



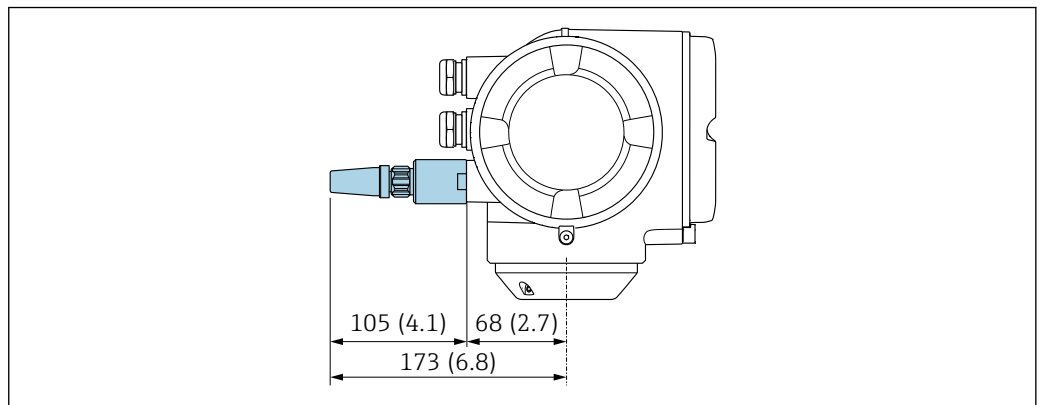
A0028921

38 Engineering unit mm (in)

External WLAN antenna

i The external WLAN antenna is not suitable for use in hygienic applications.

External WLAN antenna mounted on device

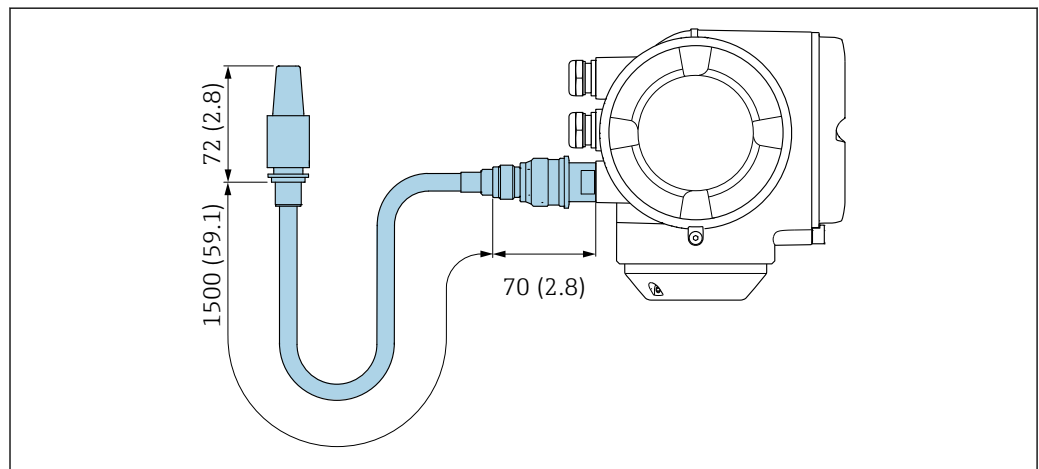


A0028923

39 Engineering unit mm (in)

External WLAN antenna mounted with cable

The external WLAN antenna can be mounted separately from the transmitter if the transmission/reception conditions at the transmitter mounting location are poor.

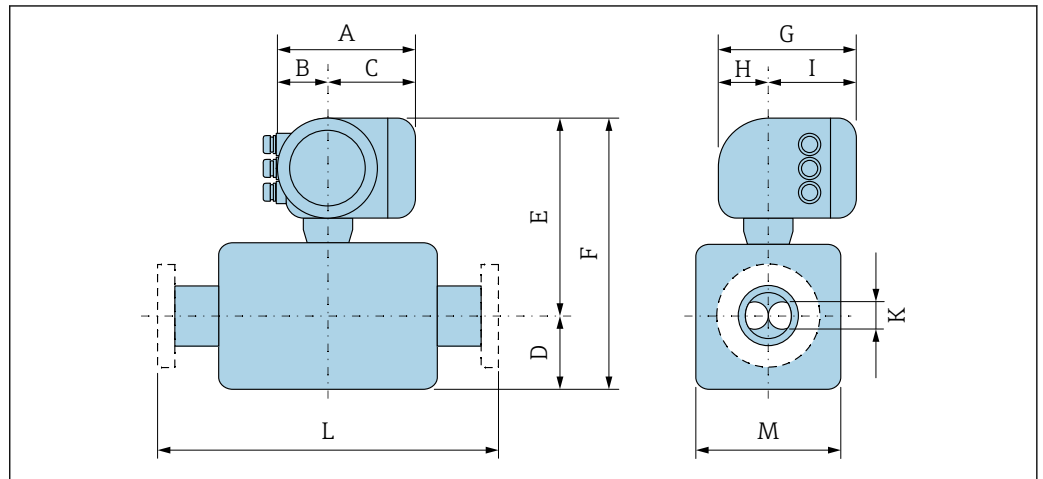


A0033597

40 Engineering unit mm (in)

Dimensions in US units

Compact version



A0033786

Order code for "Housing", option A "Aluminum, coated"

DN	A ¹⁾	B ¹⁾	C	D	E	F	G ²⁾	H	I	K	L	M
[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
1	6.65	2.68	3.98	8.54	13.05	21.60	7.87	2.32	5.55 ²⁾	0.60	³⁾	2.87
2	6.65	2.68	3.98	16.06	13.86	29.92	7.87	2.32	5.55 ²⁾	1.10	³⁾	4.53
3	6.65	2.68	3.98	20.63	14.92	35.55	7.87	2.32	5.55 ²⁾	1.70	³⁾	6.65
4	6.65	2.68	3.98	25.79	15.95	41.73	7.87	2.32	5.55 ²⁾	2.71	³⁾	8.66
6	7.4	3.35	4.06	24.65	19.06	43.7	8.54	2.28	6.26 ⁴⁾	2.23		9.61
8	7.4	3.35	4.06	31.10	20.75	51.77	8.54	2.28	6.26 ⁴⁾	2.71	³⁾	12.76
10	7.4	3.35	4.06	34.92	21.26	56.18	8.54	2.28	6.26 ⁴⁾	3.55	³⁾	14.02

- 1) Depending on the cable gland used: values up to + 1.18 in
- 2) For version without local display: values - 1.18 in
- 3) Depending on the process connection
- 4) For version without local display: values - 1.57 in

Order code for "Housing", option A "Aluminum, coated"; Ex d

DN	A ¹⁾	B	C	D	E	F	G ²⁾	H	I	K	L	M
[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
1	7.40	3.35	4.06	8.54	13.07	21.61	8.54	2.28	6.26	0.60	³⁾	2.87
2	7.40	3.35	4.06	16.06	13.9	29.96	8.54	2.28	6.26	1.10	³⁾	4.53
3	7.40	3.35	4.06	20.63	14.96	35.59	8.54	2.28	6.26	1.70	³⁾	6.65
4	7.40	3.35	4.06	25.79	15.94	41.73	8.54	2.28	6.26	2.71	³⁾	8.66
6	7.4	3.35	4.06	24.65	19.06	43.7	8.54	2.28	6.26	2.23	³⁾	9.61
8	7.4	3.35	4.06	31.10	20.75	51.77	8.54	2.28	6.26	2.71	³⁾	12.76
10	7.4	3.35	4.06	34.92	21.26	56.18	8.54	2.28	6.26	3.55	³⁾	14.02

- 1) Depending on the cable gland used: values up to + 1.18 in
- 2) For version without local display: values - 1.57 in
- 3) Depending on the process connection

Order code for "Housing", option B "Stainless, hygienic"

DN	A ¹⁾	B	C	D	E	F	G ²⁾	H	I	K	L	M
[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
1	7.20	2.87	4.33	8.54	13.05	21.60	7.87	2.56	5.31	0.60	³⁾	2.87
2	7.20	2.87	4.33	16.06	13.86	29.92	7.87	2.56	5.31	1.10	³⁾	4.53
3	7.20	2.87	4.33	20.63	14.92	35.55	7.87	2.56	5.31	1.70	³⁾	6.65
4	7.20	2.87	4.33	25.79	15.95	41.73	7.87	2.56	5.31	2.71	³⁾	8.66

1) Depending on the cable gland used: values up to + 1.18 in

2) For version without local display: values - 0.51 in

3) Depending on the process connection

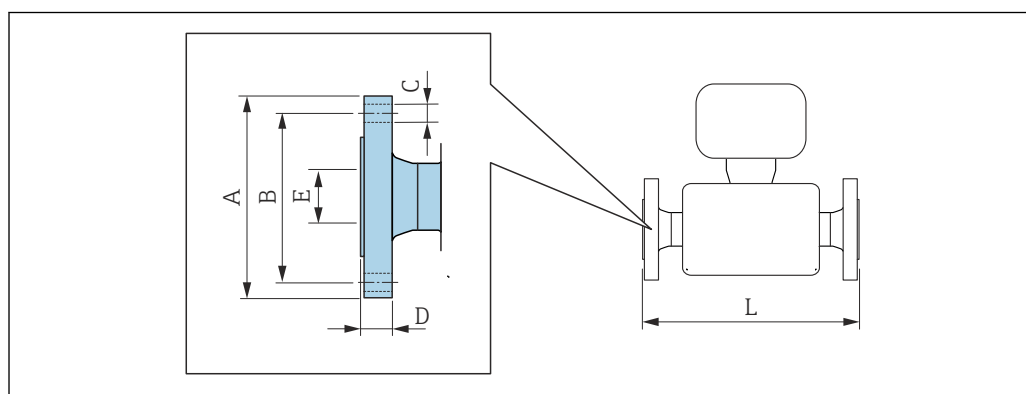
Order code for "Housing", option L "Cast, stainless"

DN	A ¹⁾	B	C	D	E	F	G	H	I	K	L	M
[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]	[in]
1	7.32	3.35	3.98	8.54	13.05	21.59	8.54	2.36	6.18	0.60	²⁾	2.87
2	7.32	3.35	3.98	16.06	13.86	29.92	8.54	2.36	6.18	1.10	²⁾	4.53
3	7.32	3.35	3.98	20.63	14.92	35.55	8.54	2.36	6.18	1.70	²⁾	6.65
4	7.32	3.35	3.98	25.79	15.94	41.73	8.54	2.36	6.18	2.71	²⁾	8.66
6	7.32	3.35	3.98	24.65	19.06	43.7	8.54	2.36	6.18	2.23	²⁾	9.61
8	7.32	3.35	3.98	31.10	20.75	51.77	8.54	2.36	6.18	2.71	²⁾	12.76
10	7.32	3.35	3.98	34.92	21.26	56.18	8.54	2.36	6.18	3.55	²⁾	14.02

1) Depending on the cable gland used: values up to + 1.18 mm

2) Depending on the process connection

Fixed flange connections ASME B16.5



i Length tolerance for dimension L in inches:
+0.06/-0.08

Flange similar to ASME B16.5: Class 150 1.4404 (F316/F316L) Order code for "Process connection", option AAS						
DN	A	B	C	D	E	L
[in]	[in]	[in]	[in]	[in]	[in]	[in]
1	4.33	3.13	4 × Ø0.62	0.56	1.05	17.32
2	5.91	4.75	4 × Ø0.75	0.75	2.07	28.15

Flange similar to ASME B16.5: Class 150 1.4404 (F316/F316L)						
<i>Order code for "Process connection", option AAS</i>						
DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	L [in]
3	7.48	6.00	4 × Ø0.75	0.94	3.07	33.07
4	9.06	7.50	8 × Ø0.75	0.94	4.03	44.41
6	11.02	9.5	8 × Ø0.87	1.02	6.07	47.36/55.04 ¹⁾
8	13.58	11.75	8 × Ø0.87	1.14	7.98	56.02
10	15.94	14.25	12 × Ø1	1.2	10.02	72.13
Surface roughness (flange): Ra 126 to 248 µin						

1) Installed length such as Promass F, DN 6" (order code for "Sensor option", option CN)

Flange similar to ASME B16.5: Class 150 with reduction in nominal diameter 1.4404 (F316/F316L)								
Flange DN [in]	Device Reduction to DN [in]	Order code "Process connection", Option	A [in]	B [in]	C [in]	D [in]	E [in]	L [in]
3	2	AJS	7.48	6	4 × Ø0.75	0.94	3.07	28.35
4	3	ALS	9.06	7.5	8 × Ø0.75	0.94	4.03	34.41
6	4	ANS	11.02	9.5	8 × Ø0.88	1	6.07	45.94
8	6	APS	13.58	11.75	8 × Ø0.87	1.14	7.98	49.84
10	8	AVS	15.94	14.25	12 × Ø1	1.2	10.02	55.43/ 72.13 ¹⁾
12	10	AXS	19.09	17	12 × Ø1	1.27	12	76.18
Surface roughness (flange): Ra 126 to 248 µin								

1) Installed length such as Promass F, DN 10" (order code for "Sensor option", option CO)

Flange similar to ASME B16.5: Class 300 1.4404 (F316/F316L)						
<i>Order code for "Process connection", option ABS</i>						
DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	L [in]
1	4.92	3.50	4 × Ø0.75	0.69	1.05	17.32
2	6.50	5.00	8 × Ø0.75	0.88	2.07	28.15
3	8.27	6.63	8 × Ø0.88	1.12	3.07	33.07
4	10.04	7.87	8 × Ø0.88	1.25	4.03	44.41
6	12.6	10.63	12 × Ø0.87	1.46	6.07	48.15/55.79 ¹⁾
8	14.96	13	12 × Ø1	1.64	7.98	56.81
10	17.52	15.25	16 × Ø1.12	1.89	10.02	73.35
Surface roughness (flange): Ra 126 to 248 µin						

1) Installed length such as Promass F, DN 150 (order code for "Sensor option", option CN)

Flange similar to ASME B16.5: Class 300 with reduction in nominal diameter 1.4404 (F316/F316L)								
Flange DN [in]	Device Reduction to DN [in]	Order code "Process connection", Option	A [in]	B [in]	C [in]	D [in]	E [in]	L [in]
3	2	AKS	8.27	6.63	8 × Ø0.88	1.12	3.07	28.82
4	3	AMS	10.04	7.87	8 × Ø0.88	1.25	4.03	35.2
6	4	AOS	12.6	10.63	12 × Ø0.88	1.44	6.07	46.73
8	6	AQS	14.96	13	12 × Ø1	1.64	7.98	49.84
10	8	AWS	17.52	14.74	16 × Ø1.13	1.89	10.02	56.65/ 73.35 ¹⁾
12	10	AZS	20.47	17.75	16 × Ø1.25	2.02	12	76.18

Surface roughness (flange): Ra 126 to 248 µin

1) Installed length such as Promass F, DN 10" (order code for "Sensor option", option CO)

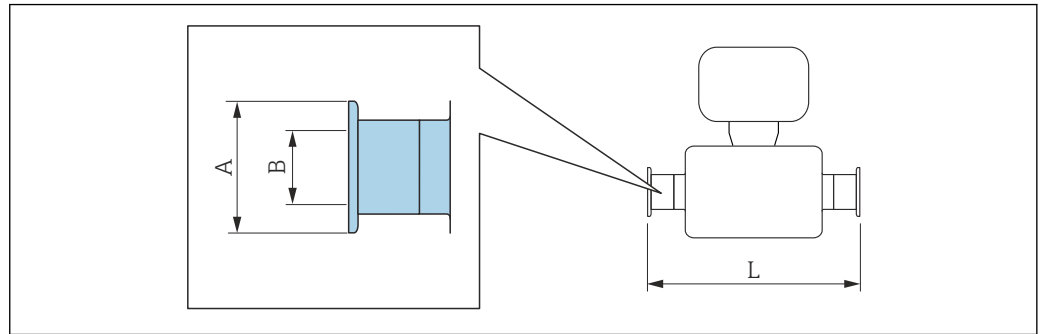
Flange similar to ASME B16.5: Class 600 1.4404 (F316/F316L) Order code for "Process connection", option ACS						
DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	L [in]
1	4.92	3.50	4 × Ø0.75	0.94	0.96	19.29
2	6.50	5.00	8 × Ø0.75	1.25	1.94	29.21
3	8.27	6.63	8 × Ø0.87	1.57	2.90	35.43
4	10.83	8.50	8 × Ø1.00	1.91	3.83	45.59
6	13.98	11.5	12 × Ø1.12	2.15	6.07	50.12/57.76 ¹⁾
8	16.54	13.75	12 × Ø1.25	2.46	7.98	59.02
10	20.08	17	16 × Ø1.38	2.78	10.02	76.61

Surface roughness (flange): Ra 126 to 248 µin


1) Installed length such as Promass F, DN 6" (order code for "Sensor option", option CN)

Clamp connections

Tri-Clamp



A0015625

 Length tolerance for dimension L in inches:
+0.06/-0.08

Tri-Clamp for pipe according to DIN 11866 series C 1.4404 (316/316L)					
<i>Order code for "Process connection", option FTS</i>					
DN [in]	Clamp [in]	A [in]	B [in]	L [in]	
1	1	1.98	0.87	17.09	
2	2	2.52	1.87	28.35	
3	3	3.58	2.87	35.43	
4	4	4.68	3.83	44.41	

3A version available: order code for "Additional approval", option LP in conjunction with
Ra ≤ 30 µin: order code for "Measuring tube material", option SB, SJ

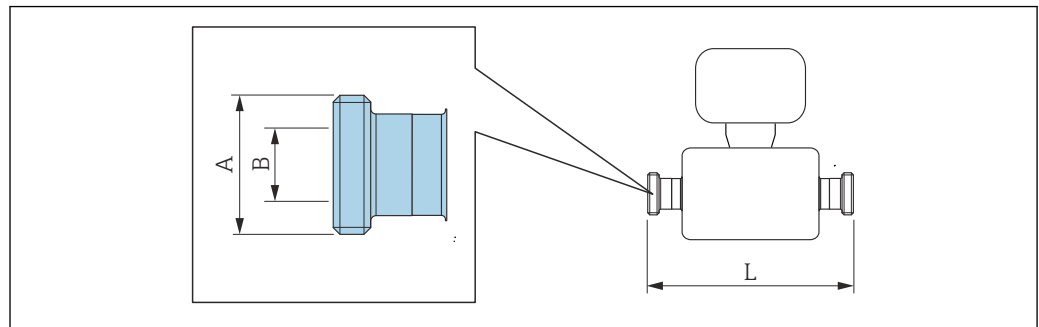
Tri-Clamp (1½), for pipe according to DIN 11866 series C with nominal diameter reduction 1.4404 (316L)					
<i>Order code for "Process connection", option FAS</i>					
DN [in]	Reduction to DN [in]	Clamp [in]	A [in]	B [in]	L [in]
1½	1	1½ ¹⁾	1.98	1.37	- ²⁾

3A version available: order code for "Additional approval", option LP in conjunction with
Ra ≤ 30 µin: order code for "Measuring tube material", option SB, SJ

- 1) The connection corresponds to the hygienic clamp dimensions according to ASME BPE.
- 2) Information on the installed length is available from your Endress+Hauser sales organization.

Glands

Threaded adapter SMS 1145



A0015628

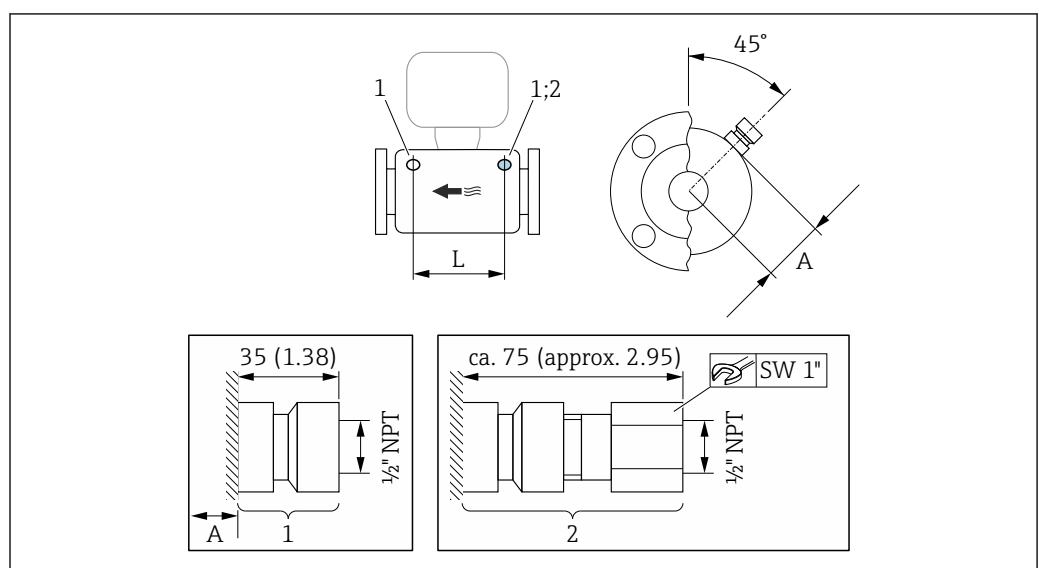
i Length tolerance for dimension L in inches:
+0.06/-0.08

Threaded adapter SMS 1145 1.4404 (316/316L) Order code for "Process connection", option SCS			
DN [in]	A [in]	B [in]	L [in]
1	Rd 40 × 1/6	0.904	17.36
2	Rd 70 × 1/6	1.944	28.80
3	Rd 98 × 1/6	2.916	36.00
4	Rd 132 × 1/6	3.904	45.12

3A version available: order code for "Additional approval", option LP in conjunction with Ra ≤ 30 µm: order code for "Measuring tube material", option SB, SJ

Accessories

Rupture disk/purge connections



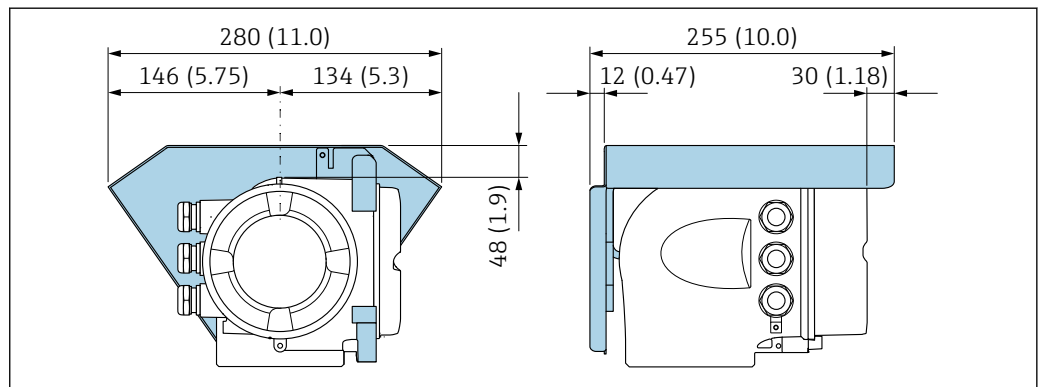
A0030349

41 Engineering unit mm (in)

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

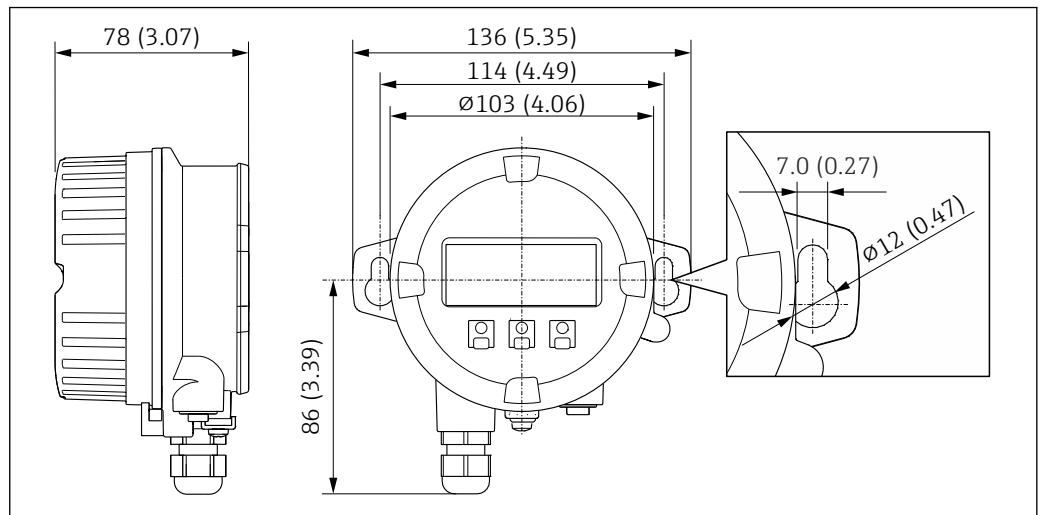
DN	A	L
[in]	[in]	[in]
1	1.26	9.45
2	2.09	17.8
3	3.15	14.96
4	4.17	22.99
6	4.67	22.99
8	6.24	22.99
10	6.86	22.99

Weather protection cover



42 Engineering unit mm (in)

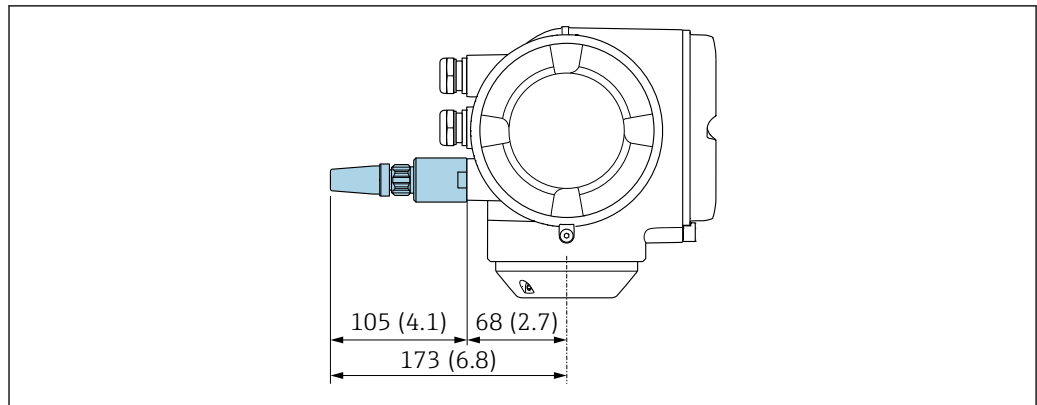
Remote display and operating module DKX001



43 Engineering unit mm (in)

External WLAN antenna

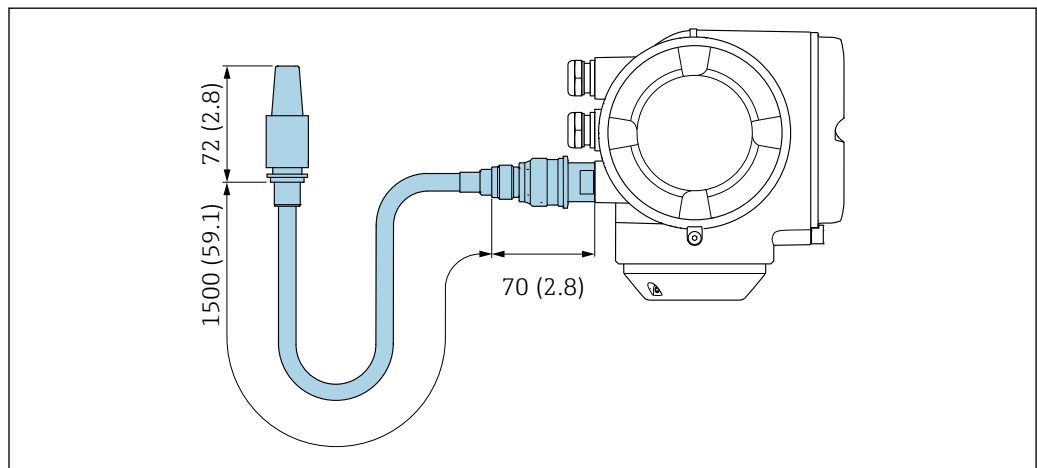
i The external WLAN antenna is not suitable for use in hygienic applications.

External WLAN antenna mounted on device

44 Engineering unit mm (in)

External WLAN antenna mounted with cable

The external WLAN antenna can be mounted separately from the transmitter if the transmission/reception conditions at the transmitter mounting location are poor.



45 Engineering unit mm (in)

Weight

All values (weight exclusive of packaging material) refer to devices with EN/DIN PN 40 flanges. Weight specifications including transmitter as per order code for "Housing", option A "Aluminum, coated".

Different values due to different transmitter versions:

- Transmitter version for the hazardous area
(Order code for "Housing", option A "Aluminum, coated"; Ex d): +2 kg (+4.4 lbs)
- Cast transmitter version, stainless
(Order code for "Housing", option L "Cast, stainless"): +6 kg (+13 lbs)
- Transmitter version for hygienic area
(Order code for "Housing", option B "Stainless, hygienic"): +0.2 kg (+0.44 lbs)

Weight in SI units

DN [mm]	Weight [kg]
25	11
50	33
80	60
100	149

DN [mm]	Weight [kg]
150	166
200	296
250	483

Weight in US units

DN [in]	Weight [lbs]
1	24
2	73
3	132
4	329
6	366
8	653
10	1065

Materials

Transmitter housing

Order code for "Housing":

- Option **A** "Aluminum, coated": aluminum, AlSi10Mg, coated
- Option **B** "Stainless, hygienic": stainless steel, 1.4404 (316L)
- Option **L** "Cast, stainless": cast, stainless steel, 1.4409 (CF3M) similar to 316L

Window material

Order code for "Housing":

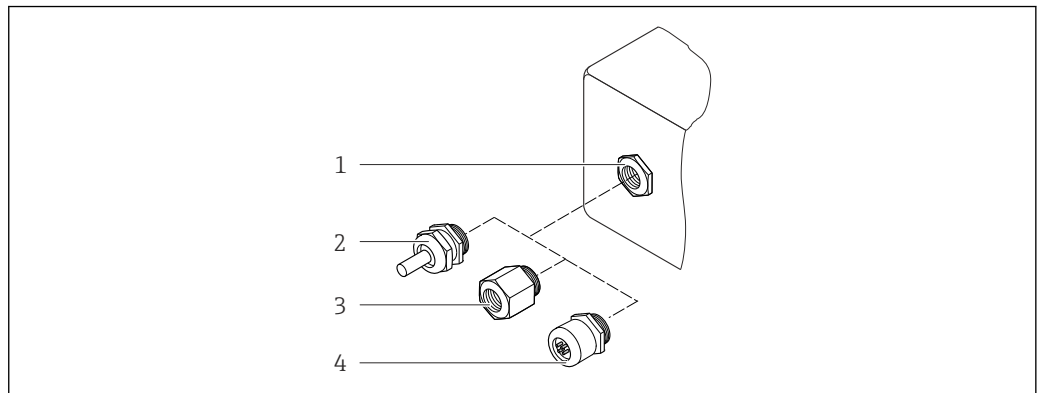
- Option **A** "Aluminum, coated": glass
- Option **B** "Stainless, hygienic": polycarbonate
- Option **L** "Cast, stainless": glass

Seals

Order code for "Housing":

- Option **B** "Stainless, hygienic": EPDM and silicone

Cable entries/cable glands



46 Possible cable entries/cable glands

- 1 Female thread M20 × 1.5
- 2 Cable gland M20 × 1.5
- 3 Adapter for cable entry with female thread G ½" or NPT ½"
- 4 Device plug

Order code for "Housing", option A "Aluminum, coated"

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

Cable entry/cable gland	Material
Compression fitting M20 × 1.5	Non-Ex: plastic
	Z2, D2, Ex d/de: brass with plastic
Adapter for cable entry with female thread G ½"	Nickel-plated brass
Adapter for cable entry with female thread NPT ½"	

Order code for "Housing", option B "Stainless, hygienic"

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

Cable entry/cable gland	Material
Cable gland M20 × 1.5	Plastic
Adapter for cable entry with female thread G ½"	Nickel-plated brass
Adapter for cable entry with female thread NPT ½"	

Order code for "Housing", option L "Cast, stainless"

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

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

Device plug

Electrical connection	Material
Plug M12×1	<ul style="list-style-type: none"> ▪ Socket: Stainless steel, 1.4404 (316L) ▪ Contact housing: Polyamide ▪ Contacts: Gold-plated brass

Sensor housing



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

Measuring tubes

Stainless steel, 1.4404 (316/316L); manifold: stainless steel, 1.4404 (316/316L)

Process connections

Flanges according to EN 1092-1 (DIN 2501) / according to ASME B16.5 / as per JIS B2220:
Stainless steel, 1.4404 (F316/F316L)

 Available process connections →  89

Seals

Welded process connections without internal seals

Accessories

Protective cover

Stainless steel, 1.4404 (316L)

External WLAN antenna

- Antenna: ASA plastic (acrylonitrile styrene acrylate) and nickel-plated brass
- Adapter: Stainless steel and nickel-plated brass
- Cable: Polyethylene
- Plug: Nickel-plated brass
- Angle bracket: Stainless steel

Process connections

Fixed flange connections:

- EN 1092-1 (DIN 2501) flange
- EN 1092-1 (DIN 2512N) flange
- ASME B16.5 flange
- JIS B2220 flange



Process connection materials → 88

Surface roughness

All data refer to parts in contact with the medium.

The following surface roughness categories can be ordered:

Category	Method	Option(s) order code "Measuring tube mat., wetted surface"
Not polished	–	SA, LA
Ra ≤ 0.76 µm (30 µin) ¹⁾	Mechanically polished ²⁾	SB
Ra ≤ 0.76 µm (30 µin) ¹⁾	Mechanically polished ²⁾ , welds in as-welded condition	SJ

1) Ra according to ISO 21920

2) Except for inaccessible welds between pipe and manifold

Display and user interface

Operation concept

Operator-oriented menu structure for user-specific tasks

- Commissioning
- Operation
- Diagnosis
- Expert level

Quick and safe commissioning

- Guided menus ("Make-it-run" wizards) for applications
- Menu guidance with brief descriptions of the individual parameter functions
- Access to the device via web server
- WLAN access to the device via mobile handheld terminal, tablet or smart phone

Reliable operation

- Operation in local language
- Uniform operating philosophy applied to device and operating tools
- If replacing electronic modules, transfer the device configuration via the integrated memory (HistoROM backup) which contains the process and measuring device data and the event logbook. No need to reconfigure.

Efficient diagnostics increase measurement reliability

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

Languages

Can be operated in the following languages:

- Via local operation
English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Korean, Vietnamese, Czech, Swedish
- Via web browser
English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Vietnamese, Czech, Swedish
- Via "FieldCare", "DeviceCare" operating tool: English, German, French, Spanish, Italian, Chinese, Japanese

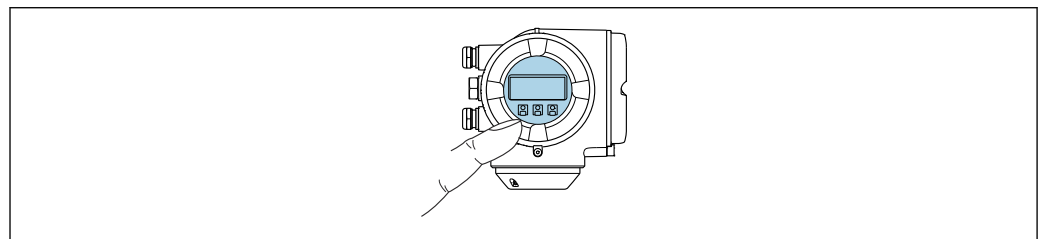
Onsite operation

Via display module


Features:

- Order code for "Display; operation", option F "4-line, illuminated, graphic display; touch control"
- Order code for "Display; operation", option G "4-line, illuminated, graphic display; touch control + WLAN"

 Information about WLAN interface →  98






A0026785

 47 Operation with touch control

Display elements

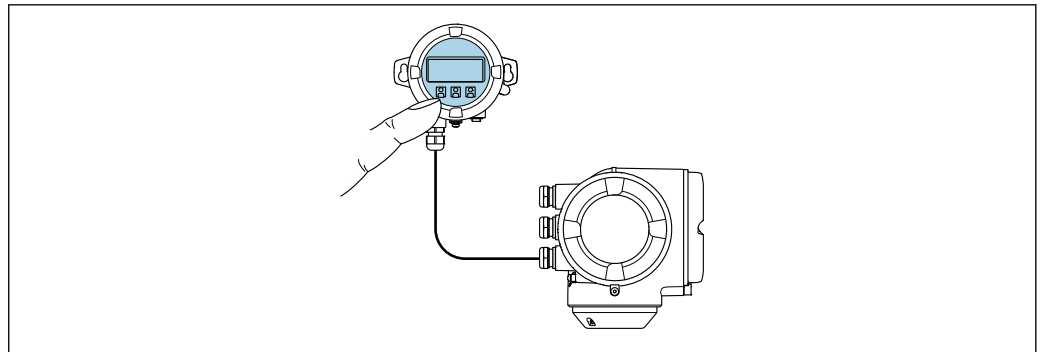
- 4-line, illuminated, graphic display
- White background lighting; switches to red in event of device errors
- Format for displaying measured variables and status variables can be individually configured

Operating elements

- External operation via touch control (3 optical keys) without opening the housing:   
- Operating elements also accessible in the various zones of the hazardous area

Via remote display and operating module DKX001

- i** The remote display and operating module DKX001 is available as an optional extra → 109..
 - The remote display and operating module DKX001 is only available for the following housing versions, order code for "Housing":
 - Option A "Aluminum, coated"
 - Option L "Cast, stainless"
 - The measuring instrument is always supplied with a dummy cover when the remote display and operating module DKX001 is ordered directly with the measuring instrument. Display or operation at the transmitter is not possible in this case.
 - If ordered subsequently, the remote display and operating module DKX001 may not be connected at the same time as the existing measuring instrument display module. Only one display or operation unit may be connected to the transmitter at any one time.



48 Operation via remote display and operating module DKX001

Display and operating elements

The display and operating elements correspond to those of the display module → 90.

Housing material

The housing material of the display and operating module DKX001 depends on the choice of transmitter housing material.

Transmitter housing		Remote display and operating module
Order code for "Housing"	Material	Material
Option A "Aluminum, coated"	AlSi10Mg, coated	AlSi10Mg, coated
Option L "Cast, stainless"	Cast stainless steel, 1.4409 (CF3M) similar to 316L	1.4409 (CF3M)

Cable entry

Corresponds to the choice of transmitter housing, order code for "Electrical connection".

Connecting cable

→ 48

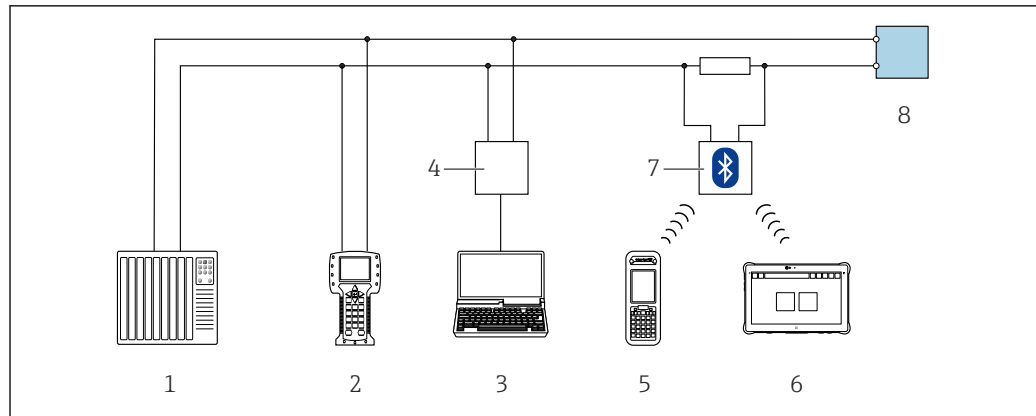
Dimensions

→ 77

Remote operation

Via HART protocol

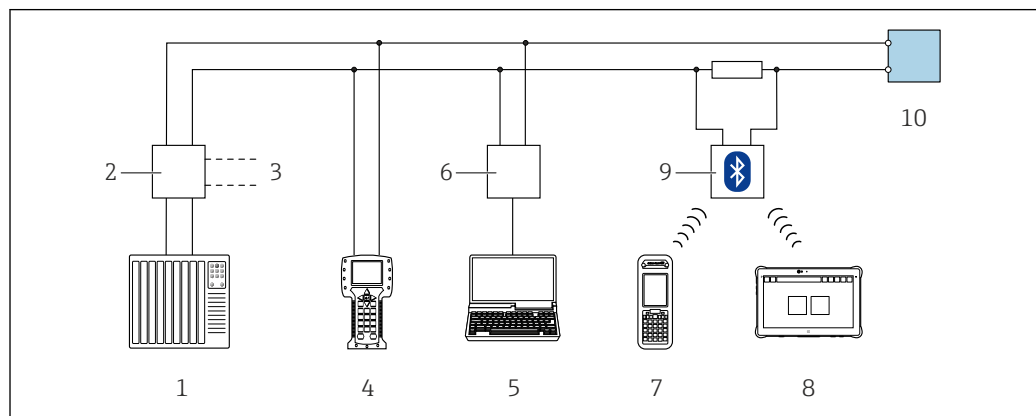
This communication interface is available in device versions with a HART output.



A0028747

49 Options for remote operation via HART protocol (active)

- 1 Control system (e.g. PLC)
- 2 Field Communicator 475
- 3 Computer with web browser (e.g. Microsoft Edge) to access the integrated device web server or computer with operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM) with COM DTM "CDI Communication TCP/IP"
- 4 Commubox FXA195 (USB)
- 5 Field Xpert SFX350 or SFX370
- 6 Field Xpert SMT70
- 7 VIATOR Bluetooth modem with connecting cable
- 8 Transmitter



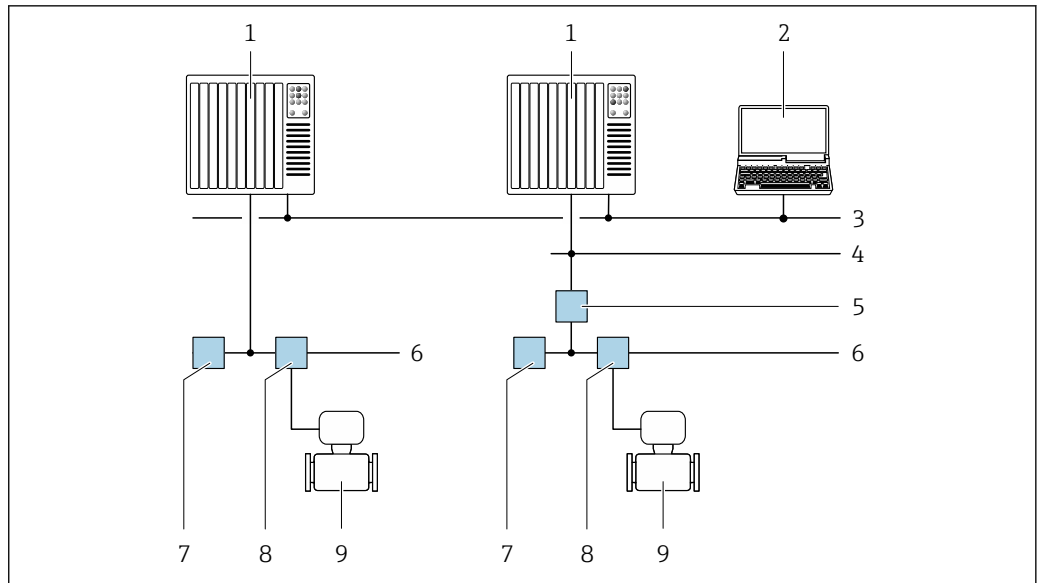
A0028746

50 Options for remote operation via HART protocol (passive)

- 1 Control system (e.g. PLC)
- 2 Transmitter power supply unit, e.g. RN221N (with communication resistor)
- 3 Connection for Commubox FXA195 and Field Communicator 475
- 4 Field Communicator 475
- 5 Computer with web browser (e.g. Microsoft Edge) to access the integrated device web server or computer with operating tool (e.g. FieldCare, DeviceCare, AMS Device Manager, SIMATIC PDM) with COM DTM "CDI Communication TCP/IP"
- 6 Commubox FXA195 (USB)
- 7 Field Xpert SFX350 or SFX370
- 8 Field Xpert SMT70
- 9 VIATOR Bluetooth modem with connecting cable
- 10 Transmitter

Via FOUNDATION Fieldbus network

This communication interface is available in device versions with FOUNDATION Fieldbus.



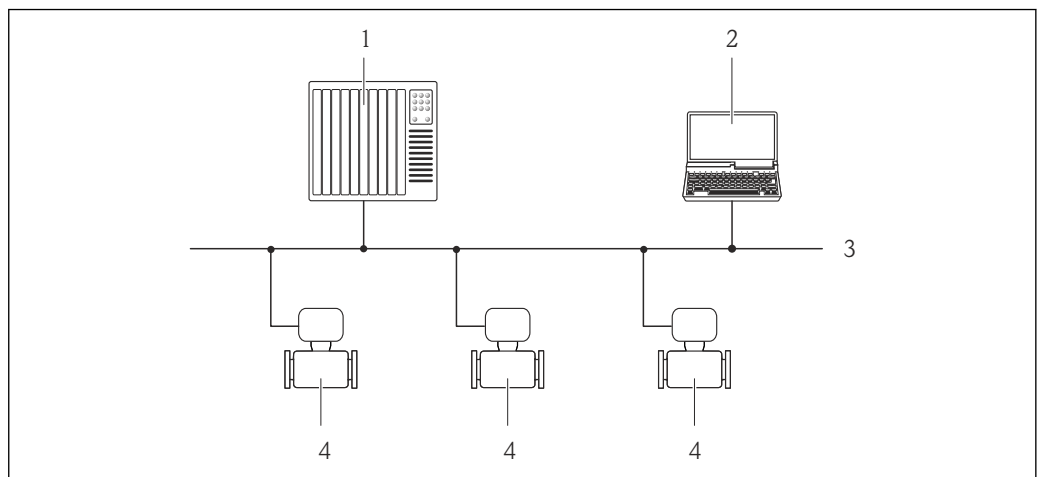
A0028837

51 Options for remote operation via FOUNDATION Fieldbus network

- 1 Automation system
- 2 Computer with FOUNDATION Fieldbus network card
- 3 Industry network
- 4 High Speed Ethernet FF-HSE network
- 5 Segment coupler FF-HSE/FF-H1
- 6 FOUNDATION Fieldbus FF-H1 network
- 7 Power supply FF-H1 network
- 8 T-box
- 9 Measuring device

Via PROFIBUS DP network

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



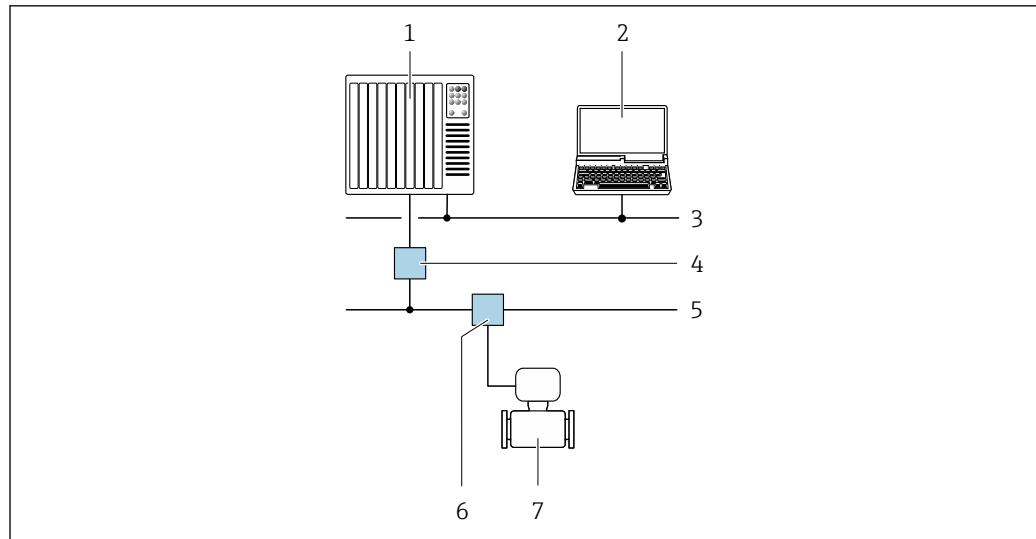
A0020903

52 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 PROFIBUS PA network

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



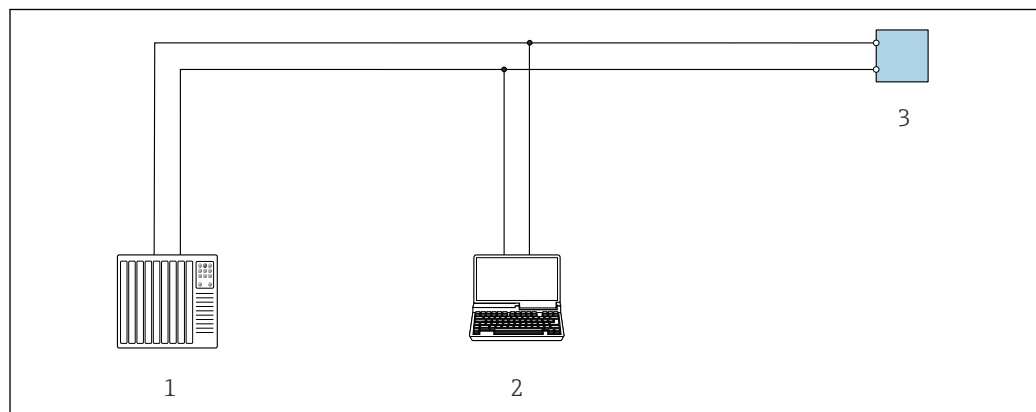
A0028838

53 Options for remote operation via PROFIBUS PA network

- 1 Automation system
- 2 Computer with PROFIBUS network card
- 3 PROFIBUS DP network
- 4 Segment coupler PROFIBUS DP/PA
- 5 PROFIBUS PA network
- 6 T-box
- 7 Measuring device

Via Modbus RS485 protocol

This communication interface is available in device versions with a Modbus RS485 output.



A0029437

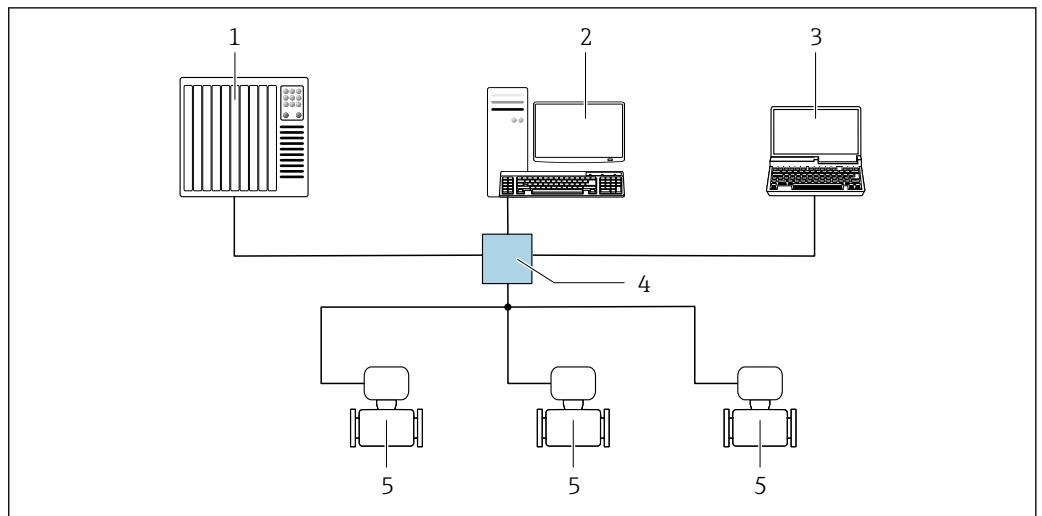
54 Options for remote operation via Modbus RS485 protocol (active)

- 1 Control system (e.g. PLC)
- 2 Computer with web browser (e.g. Microsoft Edge) to access the integrated device web server or with operating tool (e.g. FieldCare, DeviceCare) with COM DTM "CDI Communication TCP/IP" or Modbus DTM
- 3 Transmitter

Via EtherNet/IP network

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

Star topology



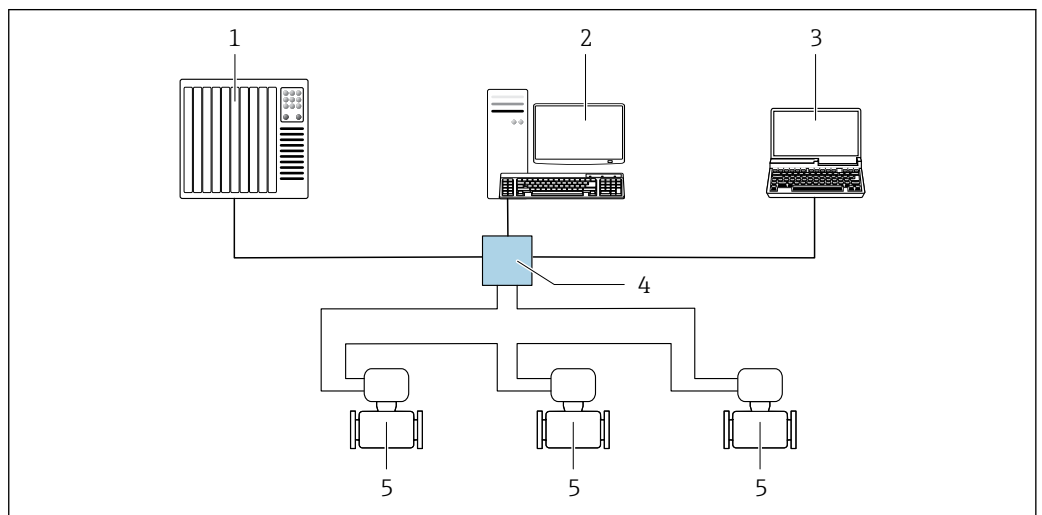
A0032078

55 Options for remote operation via EtherNet/IP network: star topology

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

Ring topology

The device is integrated via the terminal connection for signal transmission (output 1) and the service interface (CDI-RJ45).



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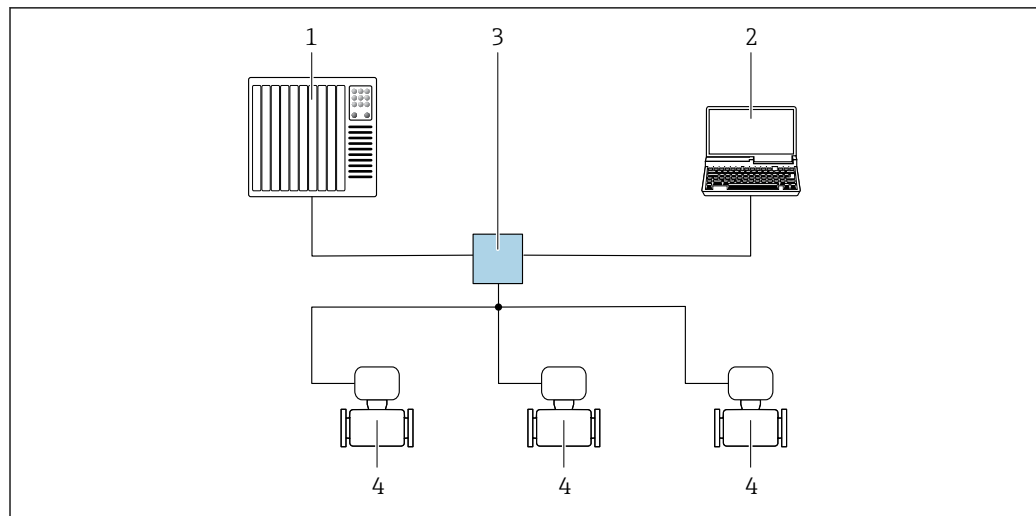
56 Options for remote operation via EtherNet/IP network: ring topology

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

Via PROFINET network

This communication interface is available in device versions with PROFINET.

Star topology



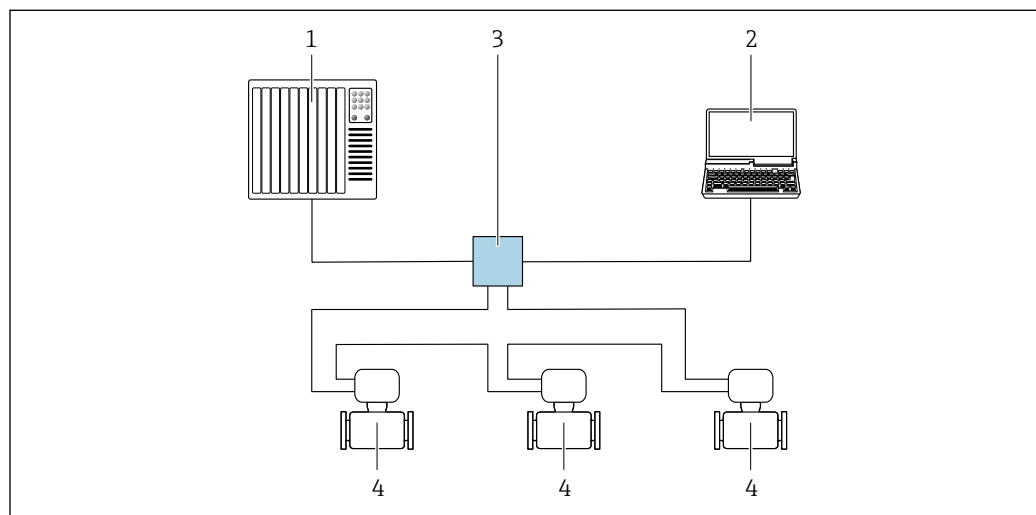
A0026545

57 Options for remote operation via PROFINET network: star topology

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

Ring topology

The device is integrated via the terminal connection for signal transmission (output 1) and the service interface (CDI-RJ45).

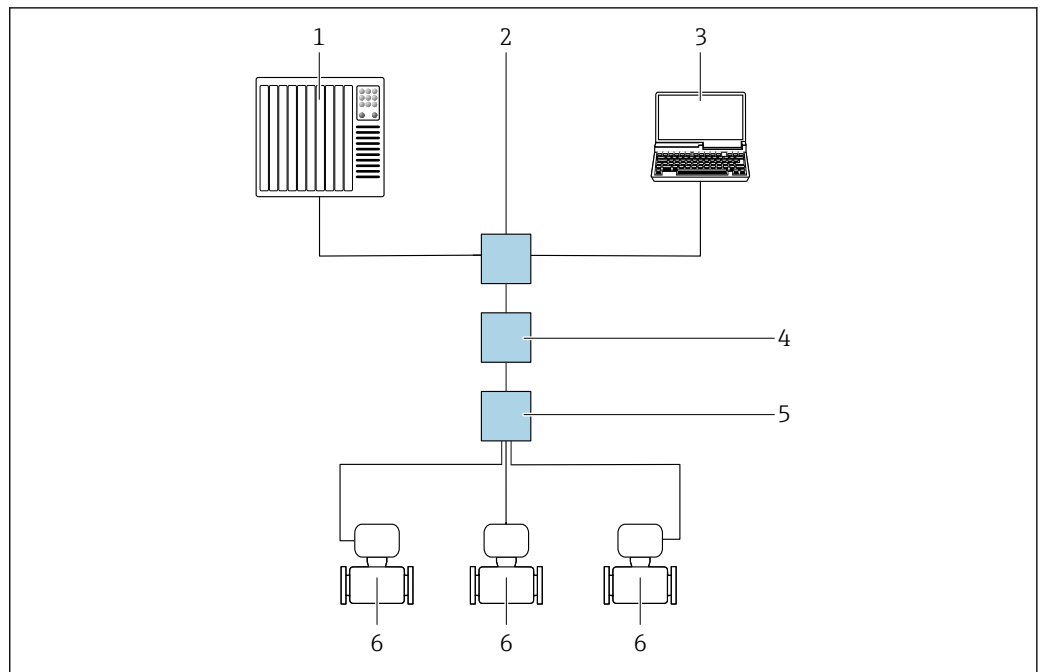


A0033719

58 Options for remote operation via PROFINET network: ring topology

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

Via APL network



A0046117

59 Options for remote operation via APL network

- 1 Automation system, e.g. Simatic S7 (Siemens)
- 2 Ethernet switch, e.g. Scalance X204 (Siemens)
- 3 Computer with Web browser (e.g. Internet Explorer) for access to integrated Web server or computer with operating tool (e.g. FieldCare, DeviceCare with PROFINET COM DTM or SIMATIC PDM with FDI-Package)
- 4 APL power switch (optional)
- 5 APL field switch
- 6 Measuring device

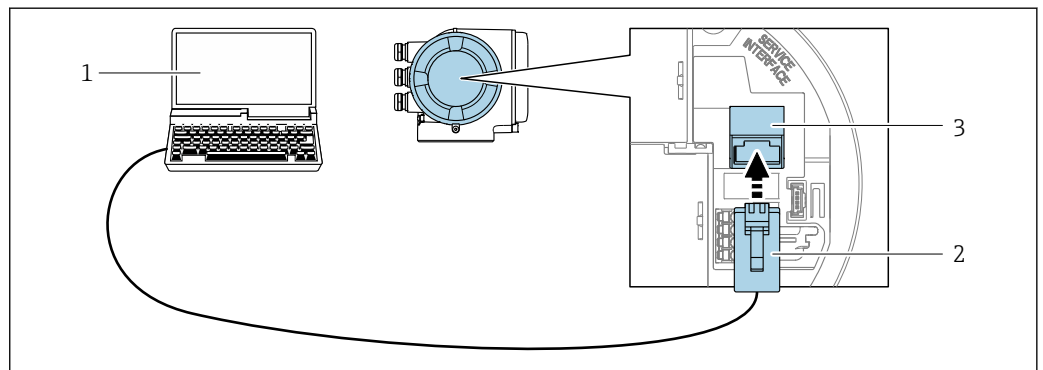
Service interface

Via service interface (CDI-RJ45)

A point-to-point connection can be established to configure the device onsite. With the housing open, the connection is established directly via the service interface (CDI-RJ45) of the device.

i An adapter for the RJ45 to the M12 plug is optionally available for the non-hazardous area: Order code for "Accessories", option **NB**: "Adapter RJ45 M12 (service interface)"

The adapter connects the service interface (CDI-RJ45) to an M12 plug mounted in the cable entry. The connection to the service interface can be established via an M12 plug without opening the device.



A0027563

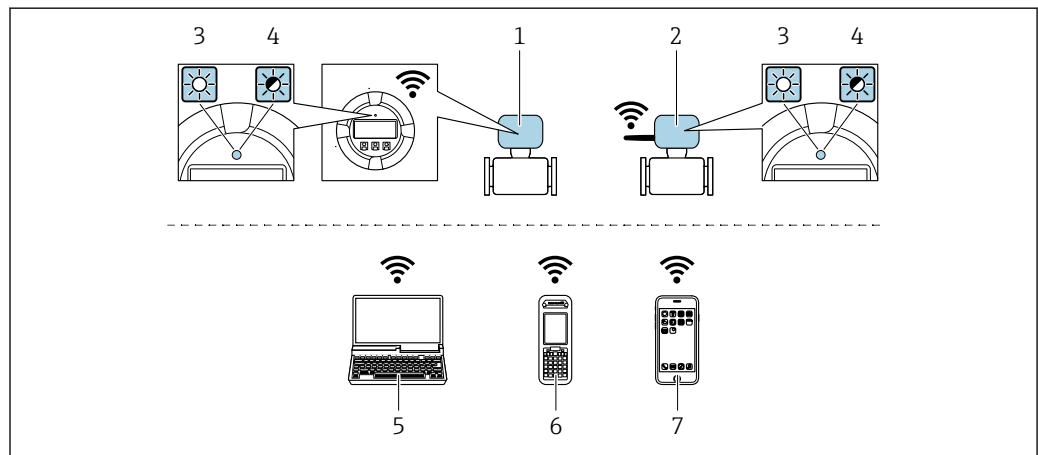
60 Connection via service interface (CDI-RJ45)

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

Via WLAN interface

The optional WLAN interface is available on the following device version:

Order code for "Display; operation", option G "4-line, illuminated; touch control + WLAN"



A0034570

- 1 Transmitter with integrated WLAN antenna
- 2 Transmitter with external WLAN antenna
- 3 LED lit constantly: WLAN reception is enabled on measuring device
- 4 LED flashing: WLAN connection established between operating unit and measuring device
- 5 Computer with WLAN interface and web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated device web server or with operating tool (e.g. FieldCare, DeviceCare)
- 6 Mobile handheld terminal with WLAN interface and web browser (e.g. Microsoft Internet Explorer, Microsoft Edge) for accessing the integrated device web server or operating tool (e.g. FieldCare, DeviceCare)
- 7 Smart phone or tablet (e.g. Field Xpert SMT70)

Function	WLAN: IEEE 802.11 b/g (2.4 GHz) <ul style="list-style-type: none"> ▪ Access Point with DHCP server (factory setting) ▪ Network
Encryption	WPA2-PSK AES-128 (in accordance with IEEE 802.11i)
Configurable WLAN channels	1 to 11
Degree of protection	IP67
Available antennas	<ul style="list-style-type: none"> ▪ Internal antenna ▪ External antenna (optional) <p>In the event of poor transmission/reception conditions at the place of installation. Available as an accessory .</p> <p>i Only 1 antenna is active at any one time!</p>
Range	<ul style="list-style-type: none"> ▪ Internal antenna: typically 10 m (32 ft) ▪ External antenna: typically 50 m (164 ft)
Materials (external antenna)	<ul style="list-style-type: none"> ▪ Antenna: ASA plastic (acrylonitrile styrene acrylate) and nickel-plated brass ▪ Adapter: Stainless steel and nickel-plated brass ▪ Cable: Polyethylene ▪ Plug: Nickel-plated brass ▪ Angle bracket: Stainless steel

Network integration



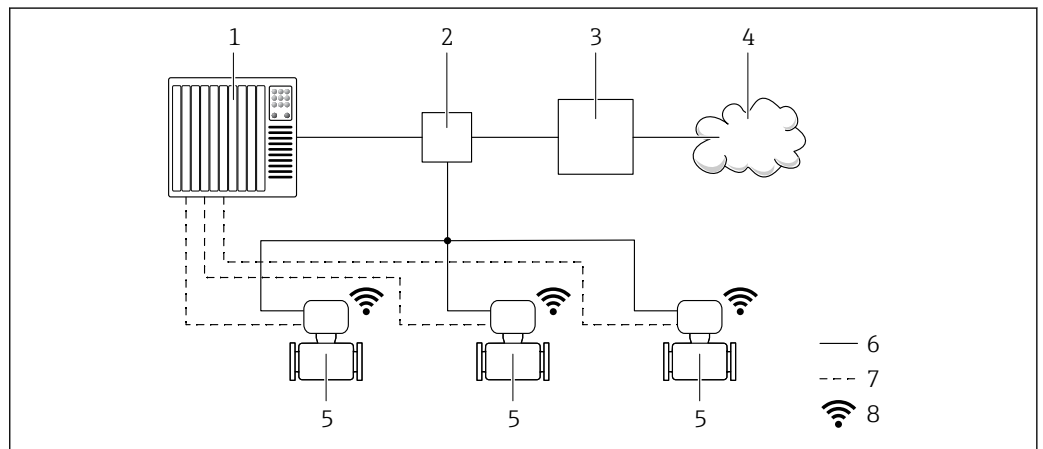
Network integration is only available for the HART communication protocol.

With the optional "OPC-UA Server" application package, the device can be integrated into an Ethernet network via the service interface (CDI-RJ45 and WLAN) and communicate with OPC-UA clients. If the device is used in this way, IT security must be considered.




Transmitters with an Ex de approval may **not** be connected via the service interface (CDI-RJ45)!
Order code for "Approval transmitter + sensor", options (Ex de):
BA, BB, C1, C2, GA, GB, MA, MB, NA, NB

For permanent access to device data and for device configuration via the Web server, the device is incorporated directly in a network via the service interface (CDI-RJ45). In this way, the device can be accessed any time from the control station. The measured values are processed separately via the inputs and outputs through the automation system.






- 1 Automation system, e.g. Simatic S7 (Siemens)
- 2 Ethernet switch
- 3 Edge Gateway
- 4 Cloud
- 5 Measuring device
- 6 Ethernet network
- 7 Measured values via inputs and outputs
- 8 Optional WLAN interface


 The optional WLAN interface is available on the following device version:
Order code for "Display; operation", option **G** "4-line, backlit, graphic display; touch control + WLAN"


 Special Documentation for the OPC-UA Server application package →  113.

Supported operating tools

Different operating tools can be used for local or remote access to the measuring device. Depending on the operating tool used, access is possible with different operating units and via a variety of interfaces.

Supported operating tools	Operating unit	Interface	Additional information
Web browser	Notebook, PC or tablet with Web browser	<ul style="list-style-type: none"> ▪ CDI-RJ45 service interface ▪ WLAN interface ▪ Ethernet-based fieldbus (EtherNet/IP, PROFINET) 	Special Documentation for device →  113
DeviceCare SFE100	Notebook, PC or tablet with Microsoft Windows system	<ul style="list-style-type: none"> ▪ CDI-RJ45 service interface ▪ WLAN interface ▪ Fieldbus protocol 	→  111
FieldCare SFE500	Notebook, PC or tablet with Microsoft Windows system	<ul style="list-style-type: none"> ▪ CDI-RJ45 service interface ▪ WLAN interface ▪ Fieldbus protocol 	→  111

Supported operating tools	Operating unit	Interface	Additional information
Field Xpert	SMT70/77/50	<ul style="list-style-type: none"> ■ All fieldbus protocols ■ WLAN interface ■ Bluetooth ■ CDI-RJ45 service interface 	Operating Instructions BA01202S Device description files: Use update function of handheld terminal
SmartBlue app	Smartphone or tablet with iOS or Android	WLAN	→  111

 Other operating tools based on FDT technology with a device driver such as DTM/iDTM or DD/EDD can be used for device operation. These operating tools are available from the individual manufacturers. Integration into the following operating tools, among others, is supported:

- FactoryTalk AssetCentre (FTAC) from Rockwell Automation → www.rockwellautomation.com
- Process Device Manager (PDM) from Siemens → www.siemens.com
- Asset Management Solutions (AMS) from Emerson → www.emersonprocess.com
- FieldCommunicator 375/475 from Emerson → www.emersonprocess.com
- Field Device Manager (FDM) from Honeywell → www.process.honeywell.com
- FieldMate from Yokogawa → www.yokogawa.com
- PACTWare → www.pactware.com

The related device description files are available: www.endress.com → Download Area

Web server



With the integrated web server, the device can be operated and configured via a web browser using Ethernet-APL, and via the service interface (CDI-RJ45) or WLAN interface. The structure of the operating menu is the same as for the local display. In addition to the measured values, status information on the device is displayed and can be used to monitor device health. Furthermore the device data can be managed and the network parameters can be configured.

Access to the network is required for the Ethernet-APL connection.

A device that has a WLAN interface (can be ordered as an option) is required for the WLAN connection: order code for "Display; operation", option G "4-line, illuminated; touch control + WLAN". The device acts as an Access Point and enables communication by computer or a mobile handheld terminal.


Supported functions

Data exchange between the operating unit (such as a notebook, for example,) and measuring instrument:

- Upload the configuration from the measuring instrument (XML format, configuration backup)
- Save the configuration to the measuring instrument (XML format, restore configuration)
- Export event list (.csv file)
- Export parameter settings (.csv file or PDF file, document the measuring point configuration)
- Export the Heartbeat Technology verification report (PDF file, only available with the **Heartbeat Verification** →  107 application package)
- Flash firmware version for device firmware upgrade, for example
- Download driver for system integration
- Visualize up to 1000 saved measured values (only available with the **Extended HistoROM** application package →  107)

HistoROM data management

The measuring device features HistoROM data management. HistoROM data management comprises both the storage and import/export of key device and process data, making operation and servicing far more reliable, secure and efficient.

 When the device is delivered, the factory settings of the configuration data are stored as a backup in the device memory. This memory can be overwritten with an updated data record, for example after commissioning.

Additional information on the data storage concept

There are different types of data storage units in which device data are stored and used by the device:

	HistoROM backup	T-DAT	S-DAT
Available data	<ul style="list-style-type: none"> ▪ Event logbook, e.g. diagnostic events ▪ Parameter data record backup ▪ Device firmware package ▪ Driver for system integration for exporting via web server, e.g.: <ul style="list-style-type: none"> ▪ GSD for PROFIBUS DP ▪ GSD for PROFIBUS PA ▪ GSDML for PROFINET ▪ EDS for EtherNet/IP ▪ DD for FOUNDATION Fieldbus 	<ul style="list-style-type: none"> ▪ Measured value logging ("Extended HistoROM" order option) ▪ Current parameter data record (used by firmware at run time) ▪ Indicator (minimum/maximum values) ▪ Totalizer value 	<ul style="list-style-type: none"> ▪ Sensor data: e.g. nominal diameter ▪ Serial number ▪ Calibration data ▪ Device configuration (e.g. SW options, fixed I/O or multi I/O)
Storage location	Fixed on the user interface PC board in the connection compartment	Can be plugged into the user interface PC board in the connection compartment	In the sensor plug in the transmitter neck part

Data backup

Automatic

- The most important device data (sensor and transmitter) are automatically saved in the DAT modules
- If the transmitter or measuring device is replaced: once the T-DAT containing the previous device data has been exchanged, the new measuring device is ready for operation again immediately without any errors
- If exchanging the electronics module (e.g. I/O electronics module): Once the electronics module has been replaced, the software of the module is compared against the current device firmware. The module software is upgraded or downgraded where necessary. The electronics module is available for use immediately afterwards and no compatibility problems occur.

Manual

Additional parameter data record (complete parameter settings) in the integrated device memory HistoROM backup for:

- Data backup function
Backup and subsequent restoration of a device configuration in the device memory HistoROM backup
- Data comparison function
Comparison of the current device configuration with the device configuration saved in the device memory HistoROM backup

Data transmission

Manual

- Transfer of a device configuration to another device using the export function of the specific operating tool, e.g. with FieldCare, DeviceCare or Web server: to duplicate the configuration or to store in an archive (e.g. for backup purposes)
- Transmission of the drivers for system integration via Web server, e.g.:
 - GSD for PROFIBUS DP
 - GSD for PROFIBUS PA
 - GSDML for PROFINET
 - EDS for EtherNet/IP
 - DD for FOUNDATION Fieldbus

Event list

Automatic

- Chronological display of up to 20 event messages in the events list
- If the **Extended HistoROM** application package (order option) is enabled: up to 100 event messages are displayed in the events list along with a time stamp, plain text description and remedial measures
- The events list can be exported and displayed via a variety of interfaces and operating tools e.g. DeviceCare, FieldCare or Web server

Data logging**Manual**

If the **Extended HistorOM** application package (order option) is enabled:

- Recording of 1 to 4 channels of up to 1 000 measured values (up to 250 measured values per channel)
- User configurable recording interval
- Export the measured value log via a variety of interfaces and operating tools e.g. FieldCare, DeviceCare or web server

Certificates and approvals

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

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

CE mark

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

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

UKCA marking

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

Contact address Endress+Hauser UK:
Endress+Hauser Ltd.
Floats Road
Manchester M23 9NF
United Kingdom
www.uk.endress.com


RCM marking

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

Ex approval

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

Devices with the order code for "Approval; transmitter + sensor", option BA, BB, BC or BD have equipment protection level (EPL) Ga/Gb (Zone 0 in the measuring tube).

 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:

Ex db eb

Category	Type of protection
II1/2G	Ex db eb ia IIC T6...T1 Ga/Gb Ex db eb ia IIB T6...T1 Ga/Gb
II2G	Ex db eb ia IIC T6...T1 Gb Ex db eb ia IIB T6...T1 Gb

Ex db

Category	Type of protection
II1/2G	Ex db ia IIC T6...T1 Ga/Gb Ex db ia IIB T6...T1 Ga/Gb
II2G	Ex db ia IIC T6...T1 Gb Ex db ia IIB T6...T1 Gb

Ex ec

Category	Type of protection
II3G	Ex ec IIC T5...T1 Gc

Ex tb

Category	Type of protection
II2D	Ex tb IIIC T** °C Db

cCSA_{US}

Currently, the following versions for use in hazardous areas are available:

IS (Ex i) and XP (Ex d)

- Class I, II, III Division 1 Groups A-G
- Class I, II, III Division 1 Groups C-G

NI (Ex ec)

Class I Division 2 Groups A - D

Ex db eb

- Class I, Zone 1 AEx/ Ex db eb ia IIC T6...T1 Ga/Gb
Class I, Zone 1 AEx/ Ex db eb ia IIB T6...T1 Ga/Gb
- Class I, Zone 1 AEx/Ex db eb ia IIC T6...T1 Gb
Class I, Zone 1 AEx/Ex db eb ia IIB T6...T1 Gb

Ex db


- Class I, Zone 1 AEx/ Ex db ia IIC T6...T1 Ga/Gb
Class I, Zone 1 AEx/ Ex db ia IIB T6...T1 Ga/Gb
- Class I, Zone 1 AEx/ Ex db ia IIC T6...T1 Gb
Class I, Zone 1 AEx/ Ex db ia IIB T6...T1 Gb

Ex ec

Class I, Zone 2 AEx/ Ex ec IIC T5...T1 Gc

Ex tb

Zone 21 AEx/ Ex tb IIIC T** °C Db

Hygienic compatibility	<ul style="list-style-type: none"> ▪ 3-A approval <ul style="list-style-type: none"> ▪ Only measuring instruments with the order code for "Additional approval", option LP "3A" have 3-A approval. ▪ The 3-A approval refers to the measuring instrument. ▪ When installing the measuring instrument, ensure that no liquid can accumulate on the outside of the measuring instrument. A remote display module must be installed in accordance with the 3-A Standard. ▪ Accessories (e.g. heating jacket, weather protection cover, wall holder unit) must be installed in accordance with the 3-A Standard. Each accessory can be cleaned. Disassembly may be necessary under certain circumstances. ▪ EHEDG-tested Only devices with the order code for "Additional approval", option LT "EHEDG" have been tested and meet the requirements of the EHEDG. To meet the requirements for EHEDG certification, the device must be used with process connections in accordance with the EHEDG position paper entitled "Easy cleanable Pipe couplings and Process connections" (www.ehedg.org). To meet the requirements for EHEDG certification, the device must be installed in a position that ensures drainability. ▪ FDA ▪ Food Contact Materials Regulation (EC) 1935/2004 <p> Observe the special installation instructions</p>
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HART certification	<p>HART interface</p> <p>The measuring device is certified and registered by the FieldComm Group. The measuring system meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> ▪ Certified according to HART 7 ▪ The device can also be operated with certified devices of other manufacturers (interoperability)
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FOUNDATION Fieldbus certification	<p>FOUNDATION Fieldbus interface</p> <p>The measuring device is certified and registered by the FieldComm Group. The measuring system meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> ▪ Certified in accordance with FOUNDATION Fieldbus H1 ▪ Interoperability Test Kit (ITK), revision version 6.2.0 (certificate available on request) ▪ Physical Layer Conformance Test ▪ The device can also be operated with certified devices of other manufacturers (interoperability)
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Certification PROFIBUS	<p>PROFIBUS interface</p> <p>The measuring device is certified and registered by the PNO (PROFIBUS Nutzerorganisation e.V./ PROFIBUS User Organization). The measuring system meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> ▪ Certified according to PA Profile 3.02 ▪ The device can also be operated with certified devices of other manufacturers (interoperability)
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EtherNet/IP certification	<p>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:</p> <ul style="list-style-type: none"> ▪ 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)
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Certification PROFINET	<p>PROFINET interface</p> <p>The measuring device is certified and registered by the PNO (PROFIBUS Nutzerorganisation e.V. / PROFIBUS User Organization). The measuring system meets all the requirements of the following specifications:</p> <ul style="list-style-type: none"> ▪ Certified according to: <ul style="list-style-type: none"> ▪ Test specification for PROFINET devices ▪ PROFINET Security Level 2– Netload Class 2 0 Mbps ▪ The device can also be operated with certified devices of other manufacturers (interoperability) ▪ The device supports PROFINET S2 system redundancy.
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PROFINET with Ethernet-APL certification**PROFINET interface**

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

- Certified according to:
 - Test specification for PROFINET devices
 - PROFINET PA Profile 4
 - PROFINET netload robustness Class 2 10 Mbit/s
 - APL conformance test
- The device can also be operated with certified devices of other manufacturers (interoperability)
- The device supports PROFINET S2 system redundancy.

Pressure Equipment Directive

The measuring devices can be ordered with or without PED or PESR. If a device with PED or PESR is required, this must be ordered explicitly. For devices with nominal diameters less than or equal to DN 25 (1"), this is neither possible nor necessary. A UK order option must be selected for PESR under the order code for "Approvals".

- With the marking
 - a) PED/G1/x (x = category) or
 - b) PESR/G1/x (x = category)
 on the sensor nameplate, Endress+Hauser confirms compliance with the "Essential Safety Requirements"
 - a) specified in Annex I of the Pressure Equipment Directive 2014/68/EU or
 - b) Schedule 2 of Statutory Instruments 2016 No. 1105.
- Devices bearing this marking (PED or PESR) are suitable for the following types of medium:
 - Media in Group 1 and 2 with a vapor pressure greater than, or smaller and equal to 0.5 bar (7.3 psi)
 - Unstable gases
- Devices not bearing this marking (without PED or PESR) are designed and manufactured according to sound engineering practice. They meet the requirements of
 - a) Art. 4 Para. 3 of the Pressure Equipment Directive 2014/68/EU or
 - b) Part 1, Para. 8 of Statutory Instruments 2016 No. 1105.
 The scope of application is indicated
 - a) in diagrams 6 to 9 in Annex II of the Pressure Equipment Directive 2014/68/EU or
 - b) Schedule 3, Para. 2 of Statutory Instruments 2016 No. 1105.

Radio approval

The measuring device has radio approval.



For detailed information on the radio approval, see the Special Documentation → 113

Measuring instrument approval

The measuring device is approved as a component in measuring systems (MI-005) in service subject to legal metrological control in accordance with the European Measuring Instruments Directive 2014/32/EU (MID).

The measuring device is qualified to OIML R117 and has an OIML Certificate of Conformity (optional).

Additional certification**CRN approval**

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

Tests and certificates

- ISO 23277 ZG2x (PT)+ISO 10675-1 ZG1 (RT) measuring pipe (PT) + process connection (RT) weld seam, Heartbeat Technology verification report
- Penetrant + radiographic testing ASME B31.3 NFS(RT) measuring pipe (PT) + process connection (RT) weld seam, Heartbeat Technology verification report
- Penetrant + radiographic testing ASME VIII Div.1 (RT) measuring pipe (PT) + process connection (RT) weld seam, Heartbeat Technology verification report
- Visual+penetrant+radiographic testing NORSOK M-601 (RT) measuring pipe (VT+PT) +process connection (VT+RT) weld seam, Heartbeat Technology verification report
- ISO 23277 ZG2x (PT)+ISO 10675-1 ZG1 (DR) measuring pipe (PT) + process connection (DR) weld seam, Heartbeat Technology verification report

- Penetrant + radiographic testing ASME B31.3 NFS(DR) measuring pipe (PT) + process connection (DR) weld seam, Heartbeat Technology verification report
- Penetrant + radiographic testing ASME VIII Div.1(DR) measuring pipe (PT) + process connection (DR) weld seam, Heartbeat Technology verification report
- Visual +penetrant+radiographic testing NORSOK M-601 (DR) measuring pipe (VT+PT) +process connection (VT+DR) weld seam, Heartbeat Technology verification report

Testing of welded connections

Option	Test standard				Component	
	ISO 23277 AL2x (PT) ISO 10675-1 AL1 (RT, DR)	ASME B31.3 NFS	ASME VIII Div.1 Appx. 4+8	NORSOK M-601	Measuring pipe	Process connection
KF	x				PT	RT
KK		x			PT	RT
KP			x		PT	RT
KR				x	VT, PT	VT, RT
K1	x				PT	DR
K2		x			PT	DR
K3			x		PT	DR
K4				x	VT, PT	VT, DR
PT = penetrant testing, RT = radiographic testing, VT = visual testing, DR = digital radiography All options with test report						

External standards and guidelines

- EN 60529
Degrees of protection provided by enclosures (IP code)
- IEC/EN 60068-2-6
Environmental influences: Test procedure - Test Fc: vibrate (sinusoidal).
- IEC/EN 60068-2-31
Environmental influences: Test procedure - Test Ec: shocks due to rough handling, primarily for devices.
- EN 61010-1
Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements
- EN 61326-1/-2-3
EMC requirements for electrical equipment for measurement, control and laboratory use
- NAMUR NE 21
Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment
- NAMUR NE 32
Data retention in the event of a power failure in field and control instruments with microprocessors
- NAMUR NE 43
Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53
Software of field devices and signal-processing devices with digital electronics
- NAMUR NE 80
The application of the pressure equipment directive to process control devices
- NAMUR NE 105
Specifications for integrating fieldbus devices in engineering tools for field devices
- NAMUR NE 107
Self-monitoring and diagnosis of field devices
- NAMUR NE 131
Requirements for field devices for standard applications
- NAMUR NE 132
Coriolis mass meter
- ETSI EN 300 328
Guidelines for 2.4 GHz radio components.
- EN 301489
Electromagnetic compatibility and radio spectrum matters (ERM).

Ordering information

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

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



Product Configurator - the tool for individual product configuration

- Up-to-the-minute configuration data
- Depending on the device: Direct input of 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

Application packages

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

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



Detailed information on the application packages:
Special Documentation → 113

Diagnostic functionality

Order code for "Application package", option EA "Extended HistorOM"

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 (standard 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.
- Measured value logs can be accessed via the local display or operating tool e.g. FieldCare, DeviceCare or Web server.



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

Heartbeat Technology

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

Heartbeat Verification

Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".

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

Heartbeat Monitoring

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

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



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

Concentration measurement

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

Calculation and outputting of fluid concentrations.

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

- Choice of predefined fluids (e.g. various sugar solutions, acids, alkalis, salts, ethanol etc.).
- Common or user-defined units (°Brix, °Plato, % mass, % volume, mol/l etc.) for standard applications.
- Concentration calculation from user-defined tables.



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

Advanced density function

Order code for "Application package", option EH "Advanced density function"

Advanced software functions for density measurement:

- Easy integration into existing density applications with integrated time period signal (TPS).
- Two density values shown simultaneously on the local display.
- Advanced density coefficients for optimum recalibrations.



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

Premium density and extended density function

Order code for "Application package", option EI "Premium density, +/- 0.1 kg/m³ + extended density function"

Highest density measurement accuracy thanks to premium density calibration and extended software functions for density measurement:

- Easy integration into existing density applications with integrated time period signal (TPS).
- Two density values shown simultaneously on the local display.
- Advanced density coefficients for optimum recalibrations.



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

Petroleum

Order code for "Application package", option EJ "Petroleum"

The most important parameters for the Oil & Gas Industry can be calculated and displayed with this application package.

- Corrected volume flow and calculated reference density in accordance with the "API Manual of Petroleum Measurement Standards, Chapter 11.1"
- Water content, based on density measurement
- Weighted mean of the density and temperature



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

Petroleum & locking function

Order code for "Application package", option EM "Petroleum & locking function"

The most important parameters for the Oil & Gas Industry can be calculated and displayed with this application package. It is also possible to lock the settings.

- Corrected volume flow and calculated reference density in accordance with the "API Manual of Petroleum Measurement Standards, Chapter 11.1"
- Water content, based on density measurement
- Weighted mean of the density and temperature



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

OPC-UA Server

Order code for "Application package", option EL "OPC-UA Server"

The application package provides an integrated OPC-UA server for comprehensive device services for IoT and SCADA applications.






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







Accessories

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



Device-specific accessories

For the transmitter





Accessories	Description
Proline 300 transmitter	<p>Transmitter for replacement or storage. Use the order code to define the following specifications:</p> <ul style="list-style-type: none"> ▪ Approvals ▪ Output ▪ Input ▪ Display/operation ▪ Housing ▪ Software <p> Order code: 8X3BXX</p> <p> Installation Instructions EA01200D</p>
Remote display and operating module DKX001	<ul style="list-style-type: none"> ▪ If ordered directly with the measuring device: Order code for "Display; operation", option O "Remote display 4-line, illuminated; 10 m (30 ft) cable; touch control" ▪ If ordered separately: <ul style="list-style-type: none"> ▪ Measuring device: order code for "Display; operation", option M "W/o, prepared for remote display" ▪ DKX001: Via the separate product structure DKX001 ▪ If ordered subsequently: DKX001: Via the separate product structure DKX001 <p>Mounting bracket for DKX001</p> <ul style="list-style-type: none"> ▪ If ordered directly: order code for "Accessory enclosed", option RA "Mounting bracket, pipe 1/2" ▪ If ordered subsequently: order number: 71340960 <p>Connecting cable (replacement cable) Via the separate product structure: DKX002</p> <p> Further information on display and operating module DKX001 →  91.</p> <p> Special Documentation SD01763D</p>







External WLAN antenna	<p>External WLAN antenna with 1.5 m (59.1 in) connecting cable and two angle brackets. Order code for "Accessory enclosed", option P8 "Wireless antenna wide area".</p> <ul style="list-style-type: none">  <ul style="list-style-type: none"> ▪ The external WLAN antenna is not suitable for use in hygienic applications. ▪ Additional information regarding the WLAN interface →  98.  Order number: 71351317  Installation Instructions EA01238D
Weather protection cover	<p>Is used to protect the measuring device from the effects of the weather: e.g. rainwater, excess heating from direct sunlight.</p> <ul style="list-style-type: none">  Order number: 71343505  Installation Instructions EA01160D

For the sensor



Accessories	Description
Heating jacket	<p>Is used to stabilize the temperature of the fluids in the sensor. Water, water vapor and other non-corrosive liquids are permitted for use as fluids.</p> <ul style="list-style-type: none">  If using oil as a heating medium, please consult with Endress+Hauser. <p>Use the order code with the product root DK8003.</p> <ul style="list-style-type: none">  Special Documentation SD02161D

Communication-specific accessories





Accessories	Description
Commubox FXA195 HART	<p>For intrinsically safe HART communication with FieldCare via the USB port.</p> <ul style="list-style-type: none">  Technical Information TI00404F
HART loop converter HMX50	<p>Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values.</p> <ul style="list-style-type: none">  <ul style="list-style-type: none"> ▪ Technical Information TI00429F ▪ Operating Instructions BA00371F
Fieldgate FXA42	<p>Transmission of the measured values of connected 4 to 20 mA analog measuring instruments, as well as digital measuring instruments</p> <ul style="list-style-type: none">  <ul style="list-style-type: none"> ▪ Technical Information TI01297S ▪ Operating Instructions BA01778S ▪ Product page: www.endress.com/fxa42
Field Xpert SMT50	<p>The Field Xpert SMT50 tablet PC for device configuration enables mobile plant asset management in the non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress.</p> <p>This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle.</p> <ul style="list-style-type: none">  <ul style="list-style-type: none"> ▪ Technical Information TI01555S ▪ Operating Instructions BA02053S ▪ Product page: www.endress.com/smt50



Field Xpert SMT70	<p>The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in hazardous and non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress.</p> <p>This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage the field instruments throughout their entire life cycle.</p> <ul style="list-style-type: none">  Technical Information TI01342S  Operating Instructions BA01709S  Product page: www.endress.com/smt70
Field Xpert SMT77	<p>The Field Xpert SMT77 tablet PC for device configuration enables mobile plant asset management in areas categorized as Ex Zone 1.</p> <ul style="list-style-type: none">  Technical Information TI01418S  Operating Instructions BA01923S  Product page: www.endress.com/smt77

Service-specific accessories


Accessories	Description
Applicator	<p>Software for selecting and sizing Endress+Hauser measuring instruments:</p> <ul style="list-style-type: none"> ▪ Choice of measuring instruments for industrial requirements ▪ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and measurement accuracy. ▪ Graphic display of the calculation results ▪ Determination of the partial order code, administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. <p>Applicator is available: Via the Internet: https://portal.endress.com/webapp/applicator</p>
Netilion	<p>IloT ecosystem: Unlock knowledge</p> <p>With the Netilion IloT ecosystem, Endress+Hauser allows you to optimize your plant performance, digitize workflows, share knowledge, and enhance collaboration.</p> <p>Drawing upon decades of experience in process automation, Endress+Hauser offers the process industry an IloT ecosystem designed to effortlessly extract insights from data. These insights allow process optimization, leading to increased plant availability, efficiency, and reliability - ultimately resulting in a more profitable plant.</p> <p>www.netilion.endress.com</p>
FieldCare	<p>FDT-based plant asset management tool from Endress+Hauser.</p> <p>It can configure all intelligent field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.</p> <ul style="list-style-type: none">  Operating Instructions BA00027S and BA00059S
DeviceCare	<p>Tool to connect and configure Endress+Hauser field devices.</p> <ul style="list-style-type: none">  Innovation brochure IN01047S

System components


Accessories	Description
Memograph M graphic data manager	<p>The Memograph M graphic data manager provides information on all the relevant measured variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick.</p> <ul style="list-style-type: none">  Technical Information TI00133R  Operating Instructions BA00247R
Cerabar M	<p>The pressure transmitter for measuring the absolute and gauge pressure of gases, steam and liquids. It can be used to read in the operating pressure value.</p> <ul style="list-style-type: none">  Technical Information TI00426P and TI00436P  Operating Instructions BA00200P and BA00382P

Accessories	Description
Cerabar S	The pressure transmitter for measuring the absolute and gauge pressure of gases, steam and liquids. It can be used to read in the operating pressure value.  <ul style="list-style-type: none"> ▪ Technical Information TI00383P ▪ Operating Instructions BA00271P
iTEMP	The temperature transmitters can be used in all applications and are suitable for the measurement of gases, steam and liquids. They can be used to read in the medium temperature.  "Fields of Activity" document FA00006T

Supplemental documentation

-  For an overview of the scope of the associated Technical Documentation, refer to the following:
- *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
 - *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

Standard documentation

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

Brief Operating Instructions

Brief Operating Instructions for the sensor

Measuring instrument	Documentation code
Proline Promass Q	KA01262D

Brief Operating Instructions for the transmitter

Measuring device	Documentation code							PROFINET with Ethernet-APL
	HART	FOUNDATION Fieldbus	PROFIBUS PA	PROFIBUS DP	Modbus RS485	EtherNet/IP	PROFINET	
Proline 300	KA01309D	KA01229D	KA01227D	KA01386D	KA01311D	KA01339D	KA01341D	KA01517D

Operating Instructions

Measuring device	Documentation code							PROFINET with Ethernet-APL
	HART	FOUNDATION Fieldbus	PROFIBUS PA	PROFIBUS DP	Modbus RS485	EtherNet/IP	PROFINET	
Promass Q 300	BA01490D	BA01523D	BA01512D	BA01862D	BA01501D	BA01733D	BA01744D	BA02116D

Description of Device Parameters

Measuring device	Documentation code							PROFINET with Ethernet-APL
	HART	FOUNDATION Fieldbus	PROFIBUS PA	PROFIBUS DP	Modbus RS485	EtherNet/IP	PROFINET	
Promass 300	GP01057D	GP01094D	GP01058D	GP01134D	GP01059D	GP01114D	GP01115D	GP01168D

**Supplementary device-
dependent documentation****Safety instructions**

Safety instructions for electrical equipment for hazardous areas.

Contents	Documentation code
ATEX/IECEX Ex d/Ex de	XA01405D
ATEX/IECEX Ex ec	XA01439D
cCSAus XP	XA01373D
cCSAus Ex d/ Ex de	XA01372D
cCSAus Ex nA	XA01507D
INMETRO Ex d/Ex de	XA01468D
INMETRO Ex ec	XA01470D
NEPSI Ex d/Ex de	XA01469D
NEPSI Ex nA	XA01471D
EAC Ex d/Ex de	XA01656D
EAC Ex nA	XA01657D
JPN Ex d	XA01778D

Remote display and operating module DKX001

Contents	Documentation code
ATEX/IECEX Ex i	XA01494D
ATEX/IECEX Ex ec	XA01498D
cCSAus IS	XA01499D
cCSAus Ex nA	XA01513D
INMETRO Ex i	XA01500D
INMETRO Ex ec	XA01501D
NEPSI Ex i	XA01502D
NEPSI Ex nA	XA01503D

Functional Safety Manual

Contents	Documentation code
Proline Promass 300	SD01727D

Special documentation

Contents	Documentation code
Information on the Pressure Equipment Directive	SD01614D
Remote display and operating module DKX001	SD01763D
Radio approvals for WLAN interface for A309/A310 display module	SD01793D
OPC-UA server ¹⁾	SD02039D
Overrun measurement	SD02342D

1) This Special Documentation is only available for device versions with a HART output.

Contents	Documentation code							
	HART	FOUNDATION Fieldbus	PROFIBUS PA	PROFIBUS DP	Modbus RS485	PROFINET	Ethernet/IP	PROFINET over Ethernet-APL
Web server	SD01662D	SD01665D	SD01664D	SD02226D	SD01663D	SD01969D	SD01968D	SD02762D
Heartbeat Technology	SD01642D	SD01696D	SD01698D	SD02202D	SD01697D	SD01988D	SD01982	SD02731D
Concentration measurement	SD01644D	SD01706D	SD01708D	SD02212D	SD01707D	SD02005D	SD02004D	SD02735D
Petroleum	SD02097D	–	SD02291D	SD02216D	SD02098D	SD02099D	SD02096D	SD02739D
Petroleum & locking function	SD02499D	–	–	–	SD02500D	–	–	SD02739D
Extended density function	SD02354D	–	–	–	SD02354D	–	–	SD02354D
Gas fraction handler	SD02584D	–	–	–	SD02584D	SD02584D	–	SD02584D
Custody transfer	SD01688D	–	–	–	SD01689D	–	–	–

Installation instructions

Contents	Note
Installation instructions for spare part sets and accessories	Documentation code: specified for each individual accessory → 109.

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