

Technical Information

Proline Prosonic Flow I 400

Ultrasonic transit time flowmeter



Insertion meter with Heartbeat Technology and web server for the water and wastewater industry

Application

- The measuring principle is independent of density and conductivity
- Bidirectional flow measurement of water and wastewater

Device properties

- Supports two parallel measurement paths
- For large diameters: DN 200 to 4000 (8 to 160")
- Medium temperatur: -40 to +80 °C (-40 to +176 °F)
- Transmitter housing made of durable polycarbonate or aluminium
- Remote version for wall mounting
- Integrated data logger: measured values monitoring

Your benefits

- Low capital investment – cost-effectiveness increases with pipe diameter (up to DN 4000/160")
- Long-term stable signal – maintenance-free direct installation of the sensor into the medium
- Process transparency – diagnostic capability
- Safe operation – no need to open the device due to display with touch control, background lighting
- Full remote access – web server
- Integrated diagnostics, verification and monitoring – Heartbeat Technology

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Document information

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.
	Protective Earth (PE) A terminal which must be connected to ground prior to establishing any other connections. The ground terminals are situated inside and outside the device: <ul style="list-style-type: none"> ▪ Inner ground terminal: Connects the protective earth to the mains supply. ▪ Outer ground terminal: Connects the device to the plant grounding system.




Communication-specific symbols

Symbol	Meaning
	Wireless Local Area Network (WLAN) Communication via a wireless, local network.
	Bluetooth Wireless data transmission between devices over a short distance.
	LED Light emitting diode is off.
	LED Light emitting diode is on.
	LED Light emitting diode is flashing.

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

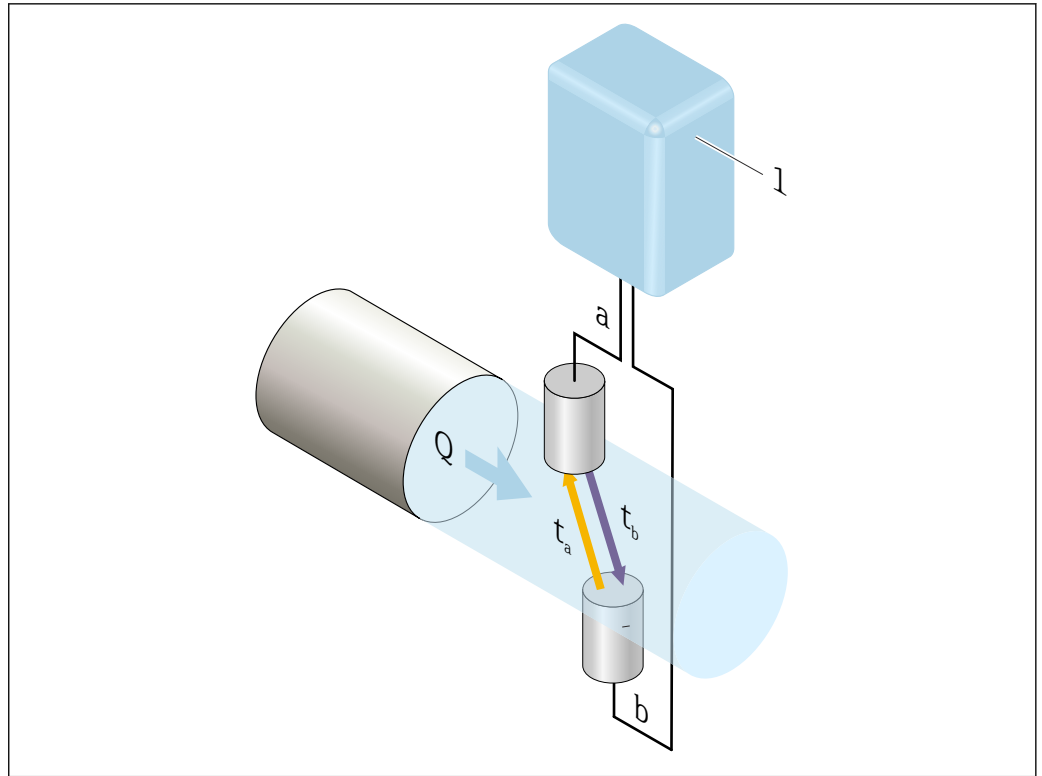
Function and system design

Measuring principle

The measuring system uses a measurement method based on the transit time difference. In this measurement method, acoustic signals (ultrasonic) are transmitted between two sensors. Signal transmission is bidirectional, i.e. the sensor operates as both a sound transmitter and a sound receiver.

As the speed of propagation of the sound waves is slower against the flow direction than in the flow direction, this results in a transit time difference. This transit time difference is directly proportional to the flow velocity.

The measuring system calculates the volume flow of the medium from the measured transit time difference and the pipe cross-sectional area. The sound velocity of the medium is simultaneously measured along with the transit time difference. With this additional measured variable, it is possible to differentiate between different media or monitor the medium quality.




A0045261

- 1 Transmitter
- a Sensor
- b Sensor
- Q Volume flow
- Δt Transit time difference $\Delta t = t_a - t_b$; flow velocity $v \sim \Delta t$

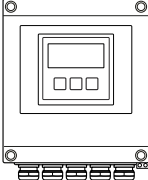
Measuring system

The measuring system consists of a transmitter and one or two sensor sets. The transmitter and sensor sets are mounted in physically separate locations. They are interconnected by sensor cables.


The sensors function as sound generators and sound receivers. The sensors in a sensor pair are always arranged opposite one another and send/receive the ultrasonic signals directly (1-traverse positioning) →  7.

The transmitter serves to control the sensor sets, to prepare, process and evaluate the measuring signals, and to convert the signals to the desired output variable.

Transmitter

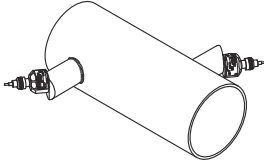
<p>Proline 400</p>  <p style="text-align: right; font-size: small;">A0045222</p>	<p>Device versions and materials: Remote version: wall-mount housing</p> <ul style="list-style-type: none"> ■ Polycarbonate plastic ■ Aluminum, AlSi10Mg, coated <p>Configuration:</p> <ul style="list-style-type: none"> ■ External operation via four-line, illuminated local display with touch control and guided menus ("Make-it-run" wizards) for applications ■ Via operating tools (e.g. FieldCare) ■ Via Web browser (e.g. Microsoft Internet Explorer)
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Sensor cables

Sensor cables can be ordered in different lengths →  48

- Length: max. 30 m (90 ft)
- Cable with a common shield and individual shielded cores

Sensor


<p>Prosonic Flow I <i>DN 200 to 4000 (8 to 160")</i></p>  <p style="text-align: right; font-size: small;">A0009697</p>	<ul style="list-style-type: none"> ■ Measurement of: <ul style="list-style-type: none"> ■ Pure liquids or slightly contaminated liquids ■ Water, e.g. drinking water, industrial water, saltwater, de-ionized water and cooling and heating water ■ Nominal diameter range: DN 200 to 4000 (8 to 160") ■ Materials: <ul style="list-style-type: none"> ■ Sensor holder: Stainless steel 1.4308 (CF-8) ■ Sensor housing: Stainless steel 1.4301 (304)
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Accessories for mounting

The necessary installation clearances must be determined for the sensors. Information about the medium and the exact pipe dimensions is required to determine these values. The values for the sound velocity of the following media are saved in the transmitter:

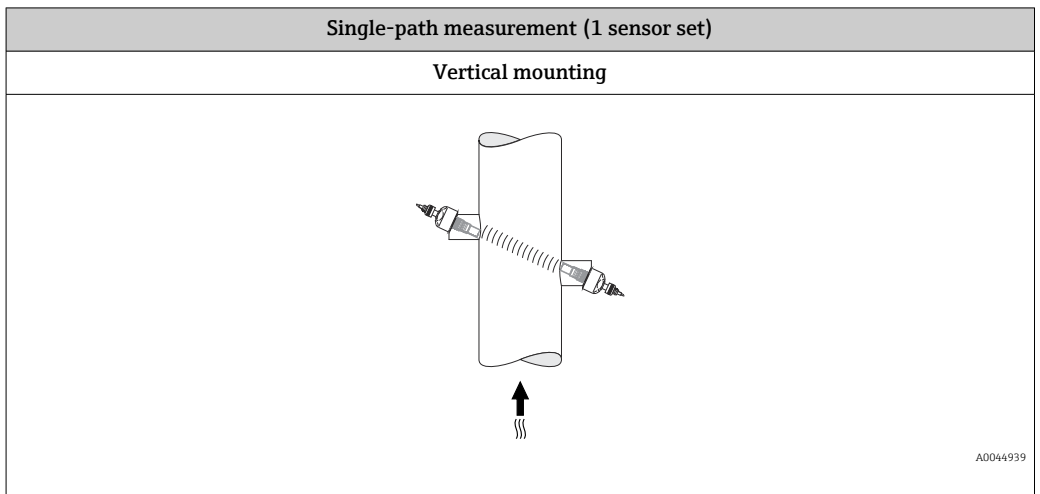
Medium
<ul style="list-style-type: none"> ■ Water ■ Seawater ■ Distilled water

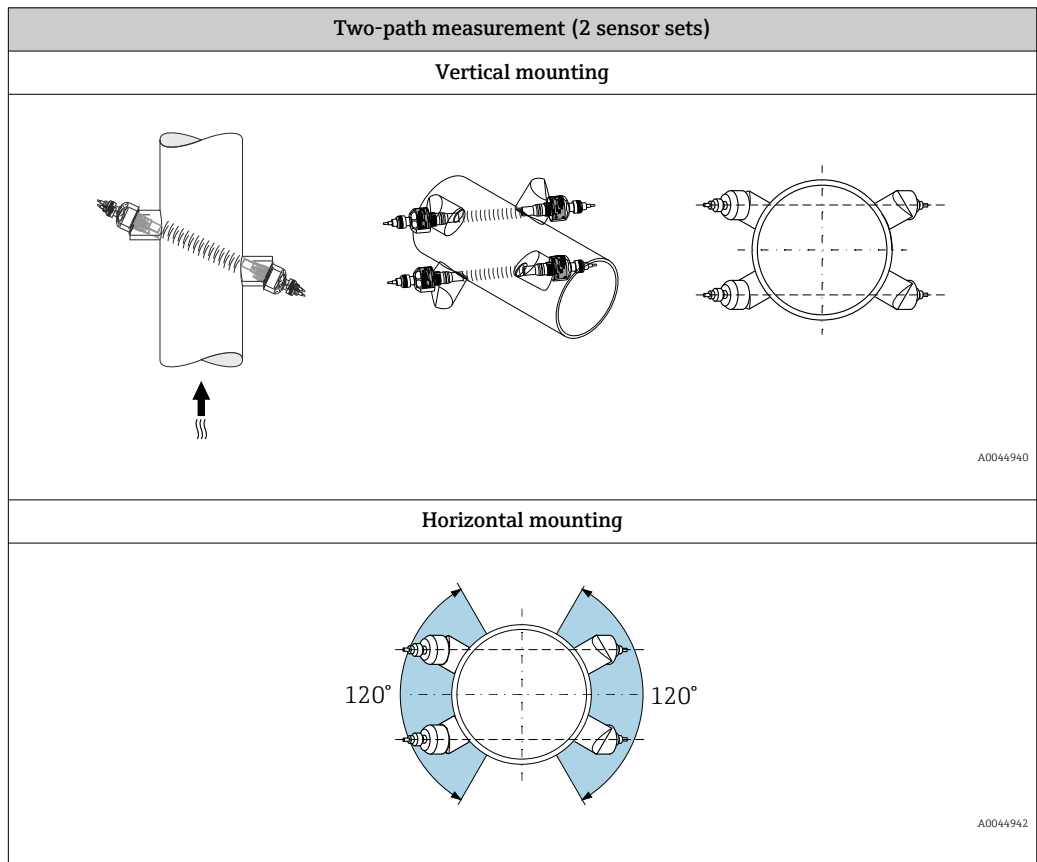
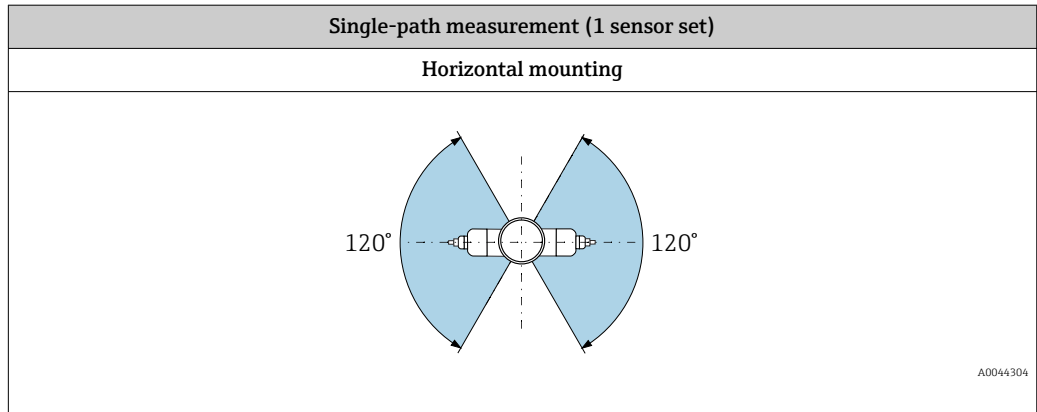
Sensor set selection and arrangement

 If mounting horizontally, always mount the sensor set so that it is offset at an angle of at least $\pm 30^\circ$ to the top of the measuring pipe to avoid incorrect measurements caused by empty space at the top of the pipe.

The sensors can be arranged in different ways:

- Mounting arrangement for measurement with 1 sensor set (1 measuring path):
 The sensors are located on opposite sides of the pipe (offset by 180°)
- Mounting arrangement for measurement with 2 sensor sets (2 measuring paths):
 1 sensor of each sensor set is located on the opposite side of the pipe



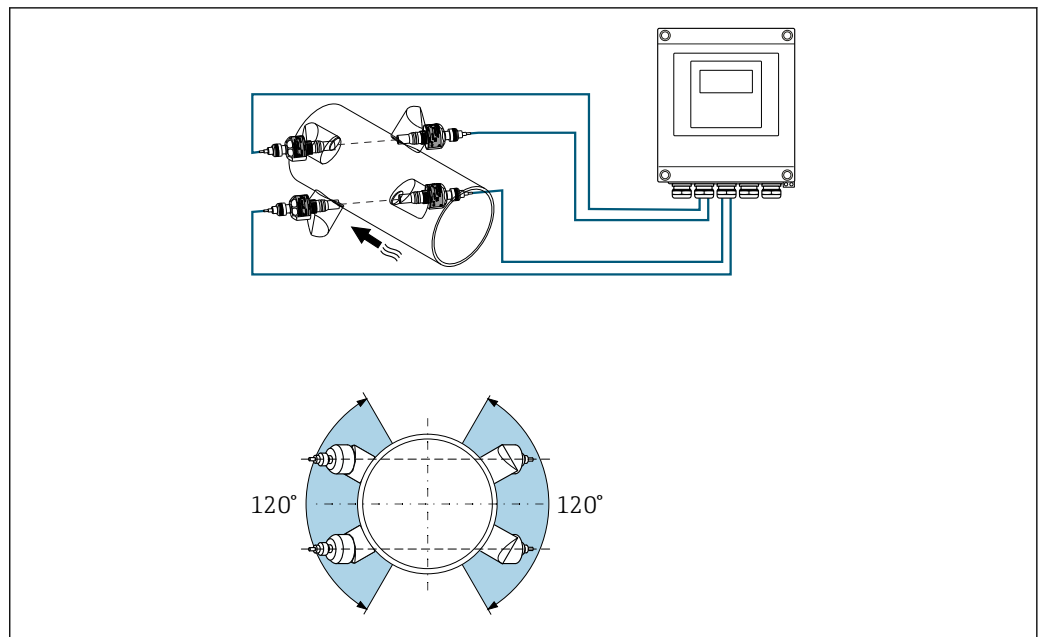


Operation

Single-path measurement

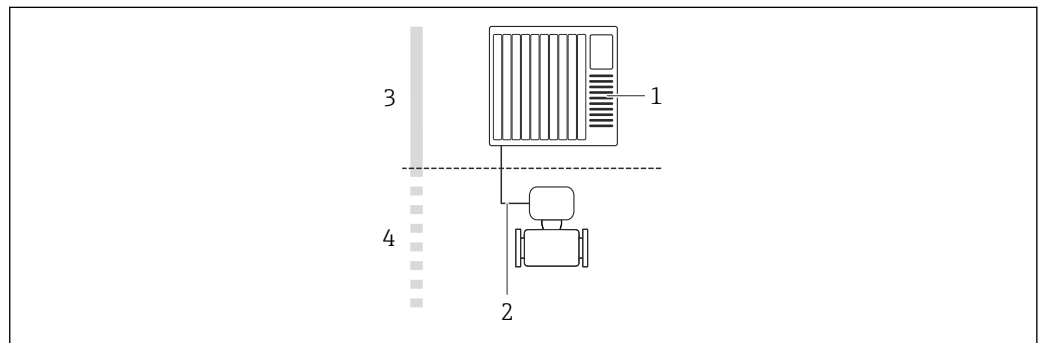
→ 11, 22

Two-path measurement



1 Two-path measurement: example for the horizontal arrangement of the sensor sets at a measuring point

Equipment architecture



2 Possibilities for integrating measuring devices into a system

- 1 Control system (e.g. PLC)
- 2 4 to 20 mA HART, pulse/frequency/switch output
- 3 Non-hazardous area
- 4 Non-hazardous area and Zone 2/Div. 2

Security




IT security

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

IT security measures, which provide additional protection for the device 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. An overview of the most important functions is provided in the following section:

Function/interface	Factory setting	Recommendation
Write protection via hardware write protection switch	Not enabled	On an individual basis following risk assessment
Access code (also applies for Web server login or FieldCare connection) →  10	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) →  10	Serial number	Assign a customized WLAN passphrase during commissioning
WLAN mode	Access point	On an individual basis following risk assessment
Web server →  10	Enabled	On an individual basis following risk assessment
CDI-RJ45 service interface	–	On an individual basis following risk assessment

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.

User-specific access code

Write access to the device parameters via the local display 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.

General notes on the use of passwords

- The access code and network key supplied with the device should be changed during commissioning.
- Follow the general rules for generating a secure password when defining and managing the access code or 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 via the service interface (CDI-RJ45) or the WLAN interface.



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

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




For detailed information on device parameters, see:
The "Description of Device Parameters" document

Input

Measured variable	Direct measured variables								
	<ul style="list-style-type: none"> ▪ Volume flow ▪ Flow velocity ▪ Sound velocity 								
	Calculated measured variables								
	Mass flow								
Measuring range	<p>$v = 0$ to 15 m/s (0 to 50 ft/s)</p> <p> To calculate the measuring range, use the <i>Applicator</i> sizing tool →  50</p>								
Operable flow range	Over 150 : 1								
Input signal	<p>External measured values</p> <p>Interfaces that allow externally measured variables (temperature, density) to be transmitted to the measuring device are optionally available for the device.</p> <p><i>HART protocol</i></p> <p>The measured values are written from the automation system to the measuring device via the HART protocol. The temperature and density measuring device must support the following protocol-specific functions:</p> <ul style="list-style-type: none"> ▪ HART protocol ▪ Burst mode <p>Status input</p> <table border="1"> <tr> <td>Maximum input values</td> <td> <ul style="list-style-type: none"> ▪ DC 30 V ▪ 6 mA </td> </tr> <tr> <td>Response time</td> <td>Configurable: 5 to 200 ms</td> </tr> <tr> <td>Input signal level</td> <td> <ul style="list-style-type: none"> ▪ Low signal (low): DC -3 to +5 V ▪ High signal (high): DC 12 to 30 V </td> </tr> <tr> <td>Assignable functions</td> <td> <ul style="list-style-type: none"> ▪ Off ▪ Reset totalizers 1-3 separately ▪ Reset all totalizers ▪ Flow override </td> </tr> </table>	Maximum input values	<ul style="list-style-type: none"> ▪ DC 30 V ▪ 6 mA 	Response time	Configurable: 5 to 200 ms	Input signal level	<ul style="list-style-type: none"> ▪ Low signal (low): DC -3 to +5 V ▪ High signal (high): DC 12 to 30 V 	Assignable functions	<ul style="list-style-type: none"> ▪ Off ▪ Reset totalizers 1-3 separately ▪ Reset all totalizers ▪ Flow override
Maximum input values	<ul style="list-style-type: none"> ▪ DC 30 V ▪ 6 mA 								
Response time	Configurable: 5 to 200 ms								
Input signal level	<ul style="list-style-type: none"> ▪ Low signal (low): DC -3 to +5 V ▪ High signal (high): DC 12 to 30 V 								
Assignable functions	<ul style="list-style-type: none"> ▪ Off ▪ Reset totalizers 1-3 separately ▪ Reset all totalizers ▪ Flow override 								

Output

Output signal	Current output								
	<table border="1"> <tr> <td>Current output</td> <td> Can be set as: <ul style="list-style-type: none"> ▪ 4 to 20 mA NAMUR ▪ 4 to 20 mA US ▪ 4 to 20 mA HART ▪ 0 to 20 mA </td> </tr> <tr> <td>Maximum output values</td> <td> <ul style="list-style-type: none"> ▪ DC 24 V (no flow) ▪ 22.5 mA </td> </tr> <tr> <td>Load</td> <td>250 to 700 Ω</td> </tr> <tr> <td>Resolution</td> <td>0.38 μA</td> </tr> </table>	Current output	Can be set as: <ul style="list-style-type: none"> ▪ 4 to 20 mA NAMUR ▪ 4 to 20 mA US ▪ 4 to 20 mA HART ▪ 0 to 20 mA 	Maximum output values	<ul style="list-style-type: none"> ▪ DC 24 V (no flow) ▪ 22.5 mA 	Load	250 to 700 Ω	Resolution	0.38 μ A
Current output	Can be set as: <ul style="list-style-type: none"> ▪ 4 to 20 mA NAMUR ▪ 4 to 20 mA US ▪ 4 to 20 mA HART ▪ 0 to 20 mA 								
Maximum output values	<ul style="list-style-type: none"> ▪ DC 24 V (no flow) ▪ 22.5 mA 								
Load	250 to 700 Ω								
Resolution	0.38 μ A								

Damping	Adjustable: 0 to 999.9 s
Assignable measured variables	<ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Sound velocity ▪ Flow velocity ▪ Electronic temperature <p> The range of options increases if the measuring device has one or more application packages.</p>

Pulse/frequency/switch output

Function	<ul style="list-style-type: none"> ▪ With the order code for "Output; Input", option H: output 2 can be set as a pulse or frequency output ▪ With the order code for "Output; Input", option I: output 2 and 3 can be set as a pulse, frequency or switch output
Version	Passive, open collector
Maximum input values	<ul style="list-style-type: none"> ▪ DC 30 V ▪ 250 mA
Voltage drop	At 25 mA: ≤ DC 2 V
Pulse output	
Pulse width	Adjustable: 0.05 to 2 000 ms
Maximum pulse rate	10 000 Impulse/s
Pulse value	Adjustable
Assignable measured variables	<ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow
Frequency output	
Output frequency	Adjustable: 0 to 12 500 Hz
Damping	Adjustable: 0 to 999 s
Pulse/pause ratio	1:1
Assignable measured variables	<ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Sound velocity ▪ Flow velocity ▪ Electronic temperature
Switch output	
Switching behavior	Binary, conductive or non-conductive
Switching delay	Adjustable: 0 to 100 s
Number of switching cycles	Unlimited
Assignable functions	<ul style="list-style-type: none"> ▪ Off ▪ On ▪ Diagnostic behavior ▪ Limit value <ul style="list-style-type: none"> ▪ Volume flow ▪ Mass flow ▪ Sound velocity ▪ Flow velocity ▪ Totalizer 1-3 ▪ Electronic temperature ▪ Flow direction monitoring ▪ Status ▪ Low flow cut off

Signal on alarm

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

Current output 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 ▪ Freely 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 ▪ Freely definable value between: 0 to 22.5 mA
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HART current output

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

Pulse output	
Failure mode	Choose from: <ul style="list-style-type: none"> ▪ Actual value ▪ No pulses
Frequency output	
Failure mode	Choose from: <ul style="list-style-type: none"> ▪ Actual value ▪ 0 Hz ▪ Defined value: 0 to 12 500 Hz
Switch output	
Failure mode	Choose from: <ul style="list-style-type: none"> ▪ Current status ▪ Open ▪ Closed

Local display



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

 Status signal as per NAMUR recommendation NE 107

Interface/protocol

- Via digital communication:
 - HART protocol
- 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 →  42

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

Galvanic isolation The following connections are galvanically isolated from each other:

- Inputs
- Outputs
- Power supply

Protocol-specific data

HART

Manufacturer ID	0x11
Device type ID	0x1169
HART protocol revision	7
Device description files (DTM, DD)	Information and files under: www.endress.com
HART load	Min. 250 Ω
Dynamic variables PV, SV, TV, QV	<ul style="list-style-type: none"> ▪ Read out the dynamic variables via HART command 3 ▪ The measured variables can be freely assigned to the dynamic variables
Device variables	<ul style="list-style-type: none"> ▪ Read out the device variables via HART command 9 ▪ The measured variables can be freely assigned ▪ A maximum of 8 device variables can be transmitted
System integration	Operating Instructions for the device

Power supply

Terminal assignment

Transmitter: 0 to 20 mA/4 to 20 mA HART

The sensor can be ordered with terminals.

Connection methods available		Possible options for order code "Electrical connection"
Outputs	Power supply	
Terminals	Terminals	<ul style="list-style-type: none"> ▪ Option A: coupling M20x1 ▪ Option B: thread M20x1 ▪ Option C: thread G ½" ▪ Option D: thread NPT ½"

Supply voltage

Order code "Power supply"	Terminal numbers	terminal voltage		Frequency range
Option L (wide range power unit)	1 (L+/L), 2 (L-/N)	DC 24 V	±25%	-
		AC 24 V	±25%	50/60 Hz, ±4 Hz
		AC 100 to 240 V	-15 to +10%	50/60 Hz, ±4 Hz

Signal transmission for current output 0 to 20 mA/4 to 20 mA HART and other outputs and inputs

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

Supply voltage

Transmitter

Order code for "Power supply"	terminal voltage		Frequency range
Option L	DC 24 V	±25%	-
	AC 24 V	±25%	50/60 Hz, ±4 Hz
	AC 100 to 240 V	-15 to +10%	50/60 Hz, ±4 Hz

Power consumption

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

Current consumption

Transmitter

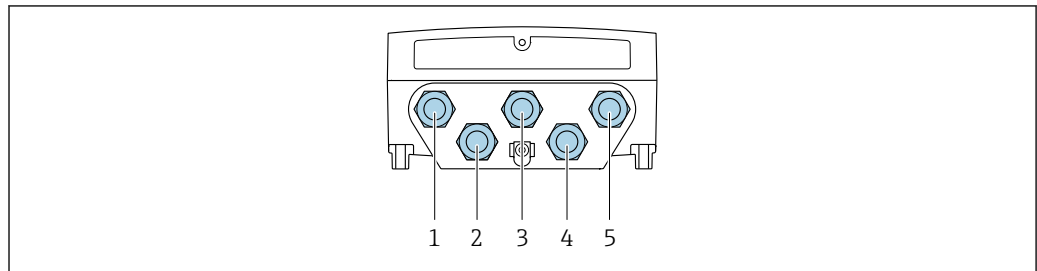
Order code for "Power supply"	Maximum Current consumption	Maximum switch-on current
Option L: AC 100 to 240 V	145 mA	25 A (< 5 ms)
Option L: AC/DC 24 V	350 mA	27 A (< 5 ms)

Power supply failure


- Totalizers stop at the last value measured.
- 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.

Electrical connection

Connecting the transmitter



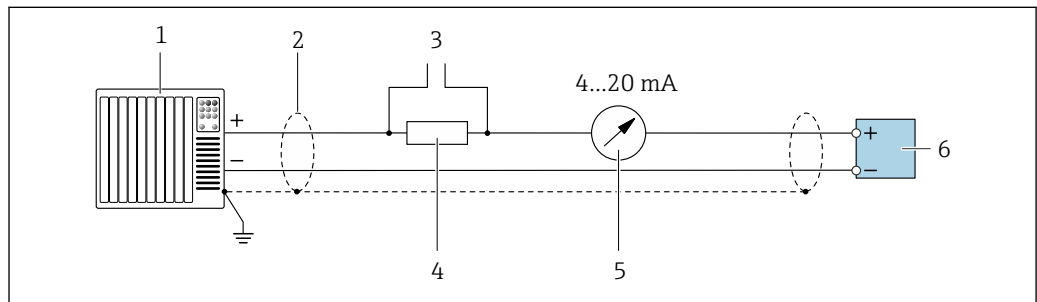
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 3 Wall-mount housing, remote version: connection of supply voltage and signal transmission


- 1 Cable entry for supply voltage
- 2 Cable entry for sensor cable
- 3 Cable entry for sensor cable
- 4 Cable entry for signal transmission
- 5 Cable entry for signal transmission





Connection examples

Current output 4 to 20 mA HART

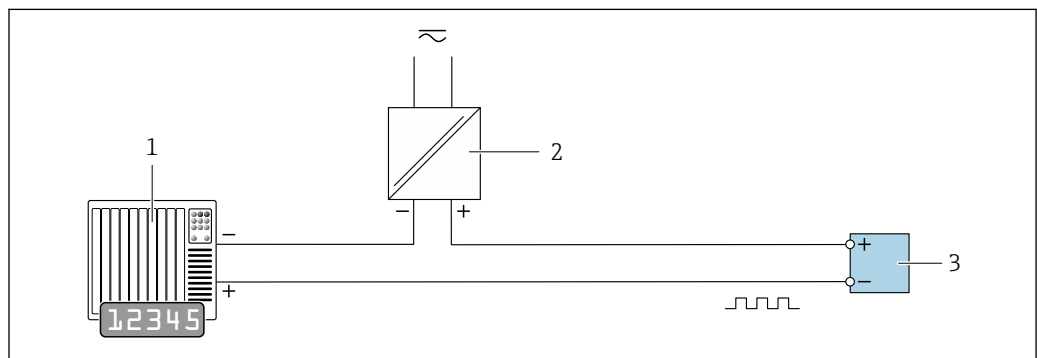


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 4 Connection example for 4 to 20 mA HART current output (active)


- 1 Automation system with current input (e.g. PLC)
- 2 Ground the cable shield at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications →  18
- 3 Connection for HART operating devices →  42
- 4 Resistor for HART communication ($\geq 250 \Omega$): observe maximum load →  11
- 5 Analog display unit: observe maximum load →  11
- 6 Transmitter

Pulse/frequency output

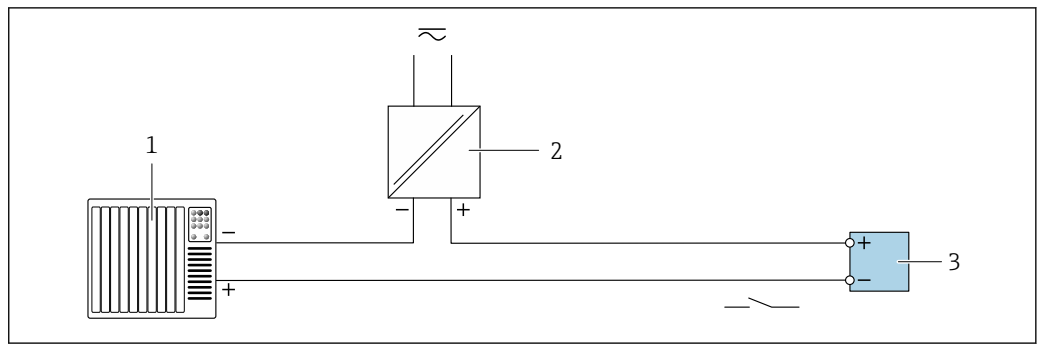


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 5 Connection example for pulse/frequency output (passive)

- 1 Automation system with pulse/frequency input (e.g. PLC)
- 2 Power supply
- 3 Transmitter: Observe input values →  12

Switch output

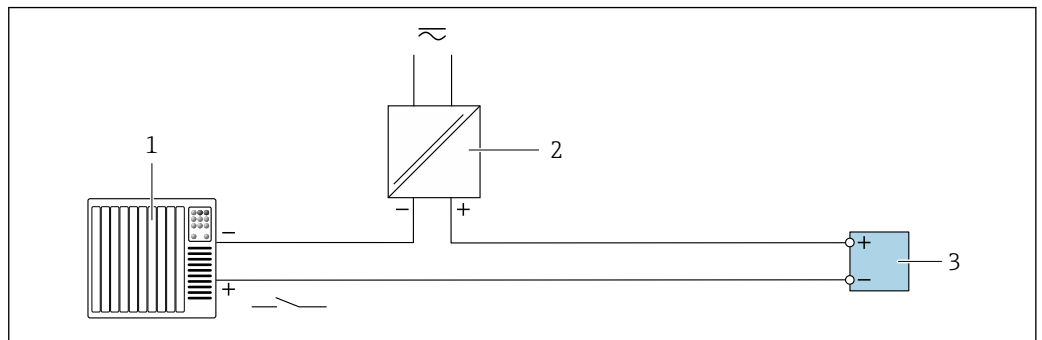


A0028760

6 Connection example for switch output (passive)

- 1 Automation system with switch input (e.g. PLC)
- 2 Power supply
- 3 Transmitter: Observe input values → 12

Status input



A0028764

7 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 like the pipe material and grounding
- Connect the sensor and transmitter to the same electrical potential
- Use a ground cable with a minimum cross-section of 6 mm² (0.0093 in²) for the potential equalization connections

Terminals

Transmitter

Supply voltage cable: plug-in spring terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)

Cable entries

Cable entry thread

- M20 x 1.5
- Via adapter:
 - NPT 1/2"
 - G 1/2"

Cable gland

M20 x 1.5 with cable ϕ 6 to 12 mm (0.24 to 0.47 in)



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

Cable specification

Permitted temperature range

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

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

Standard installation cable is sufficient.

Signal cable

Current output 0/4 to 20 mA

Standard installation cable is sufficient.

Current output 4 to 20 mA HART

A shielded cable is recommended. Observe grounding concept of the plant.

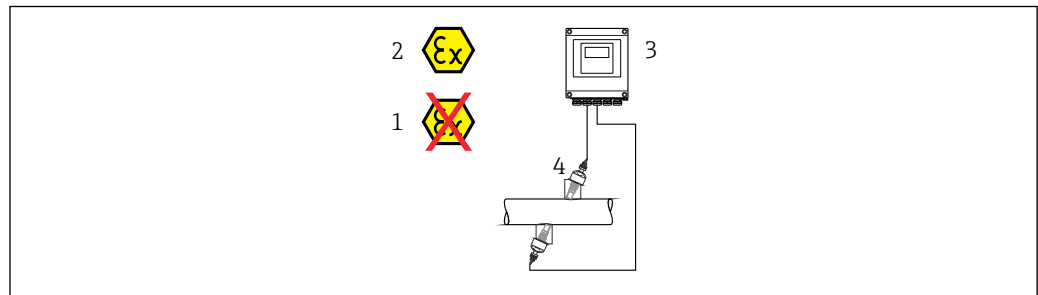
Pulse/frequency/switch output

Standard installation cable is sufficient.

Status input

Standard installation cable is sufficient.

Connecting cable between the transmitter and sensor



A0045277

- 1 Non-hazardous area
- 2 Hazardous area: Zone 2; Class I, Division 2
- 3 Proline 400 transmitter
- 4 Sensor set with sensor cable to transmitter 400 → 18
Transmitter and sensor installed in the hazardous area: Zone 2; Class I, Division 2

Sensor cable for sensor - transmitter



Standard cable	TPE halogen-free: -40 to +80 °C (-40 to +176 °F)
Cable length (max.)	30 m (90 ft)
Cable lengths (available for order)	5 m (15 ft), 10 m (30 ft), 15 m (45 ft), 30 m (90 ft)
Operating temperature	Depends on the device version and how the cable is installed: Standard version: <ul style="list-style-type: none"> ■ Cable, fixed installation ¹⁾: minimum -40 °C (-40 °F) ■ Cable, movable: minimum -25 °C (-13 °F)

1) Compare details under the "Standard cable" row

Performance characteristics

Reference operating conditions

- Error limits following ISO/DIS 11631
- Specifications as per measurement report
- Accuracy information is based on accredited calibration rigs that are traced to ISO 17025.

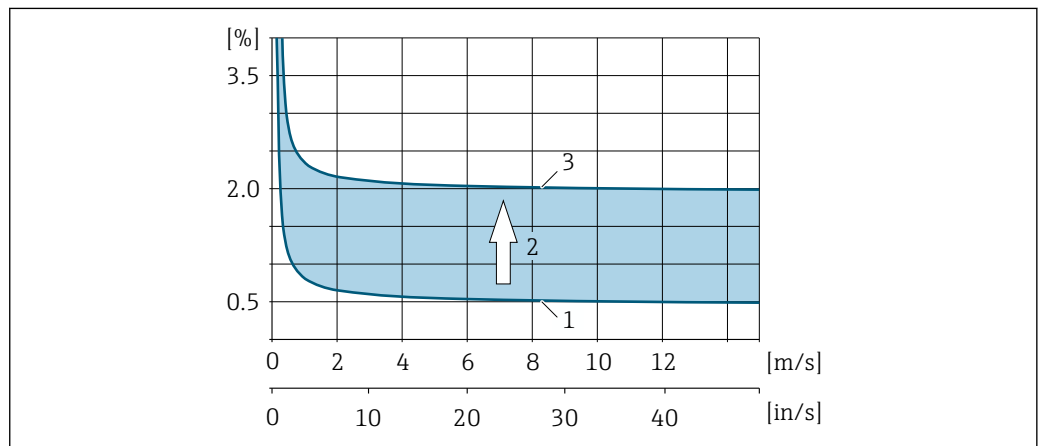
 To obtain measured errors, use the *Applicator* sizing tool →  50


Maximum measured error

o.r. = of reading

The measured error depends on a number of factors. A distinction is made between the measured error of the device (0.5% o.r.) and an additional installation-specific measured error (typically 1.5% o.r.) that is independent of the device.

The installation-specific measured error depends on the installation conditions on site, such as the nominal diameter, accuracy of sensor mounting (sensor holder welding), real pipe geometry or medium. The sum of the two measured errors is the measured error at the measuring point.



 8 Example of the measured error in a pipe with a nominal diameter DN > 200 (8")

- 1 Measured error of measuring device: 0.5% o.r. ± 3 mm/s (0.12 in/s)
- 2 Measured error due to installation conditions: typically 1.5% o.r.
- 3 Measured error at the measuring point: 0.5% o.r. ± 3 mm/s (0.12 in/s) + 1.5% o.r. = 2% o.r. ± 3 mm/s (0.12 in/s)

Measured error at the measuring point

The measured error at the measuring point is made up of the measured error of the device (0.5% o.r.) and the measured error resulting from the installation conditions on site. With a flow velocity > 0.3 m/s (1 ft/s) and a Reynolds number > 10 000, the following are typical error limits:

Nominal diameter	Device error limits	+	Installation-specific error limits (typical)	→	Error limits at the measuring point (typical)	Field calibration ¹⁾
≥ DN 200 (8")	±0.5% o.r. ± 3 mm/s (0.12 in/s)	+	±1.5% o.r.	→	±2% o.r. ± 3 mm/s (0.12 in/s)	±0.5% o.r. ± 3 mm/s (0.12 in/s)

1) Adjustment in relation to a reference with correction values written back to the transmitter

Measurement report

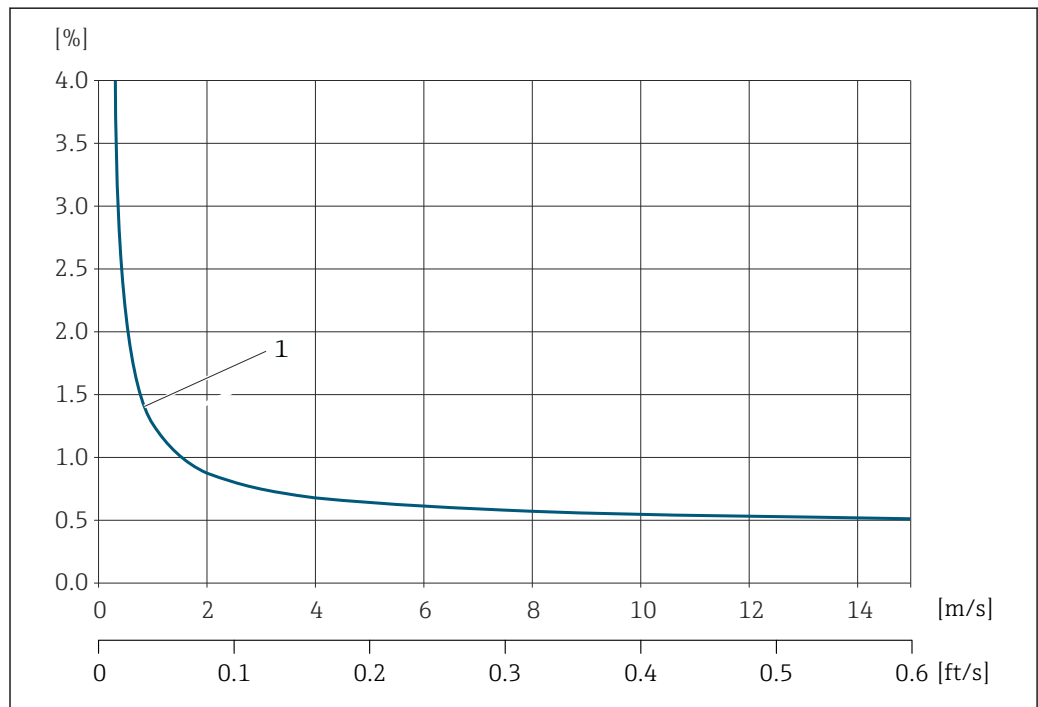
If required, the device can be supplied with a factory measurement report. A measurement is performed under reference conditions to verify the performance of the device. Here, the sensors are mounted on a pipe with a nominal diameter of DN 250 (10") or 400 (16").

With a flow velocity of > 0.3 m/s (1 ft/s) and a Reynolds number > 10 000, the following error limits are guaranteed with the measurement report:

Nominal diameter	Device error limits
250 (10"); single-path	±0.5% o.r. ± 3 mm/s (0.12 in/s)
400 (16"); dual-path	±0.5% o.r. ± 3 mm/s (0.12 in/s)

i The specification applies for Reynolds numbers $Re \geq 10\,000$. Larger measured errors can occur for Reynolds numbers $Re < 10\,000$.

Example for max. measured error (volume flow)



9 Example for max. measured error (volume flow) in % o.r.

1 Pipe diameter ≥ 250 (10")

Repeatability

o.r. = of reading

±0.3% for flow velocities >0.3 m/s (1 ft/s)

Influence of ambient temperature

Current output

o.r. = of reading

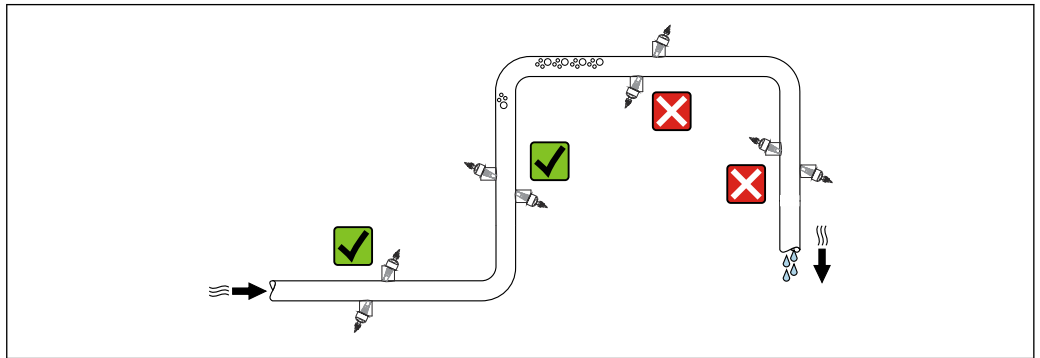
Temperature coefficient	Max. ±0.005 % o.r./°C
-------------------------	-----------------------

Pulse/frequency output

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

Mounting

Mounting location

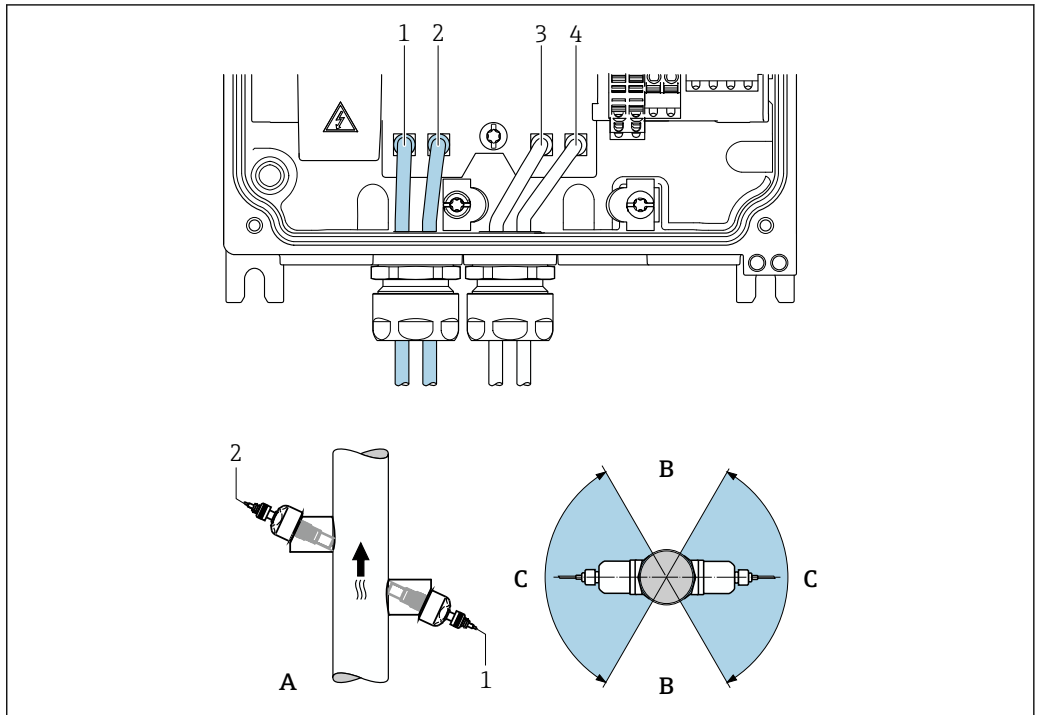


A0045279

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.

Orientation



A0045281

10 Orientation views

- 1 Channel 1 upstream
- 2 Channel 1 downstream
- 3 Channel 2 upstream
- 4 Channel 2 downstream
- A Recommended orientation with upward direction of flow
- B Non-recommended installation range with horizontal orientation (60°)
- C Recommended installation range max. 120°

Vertical

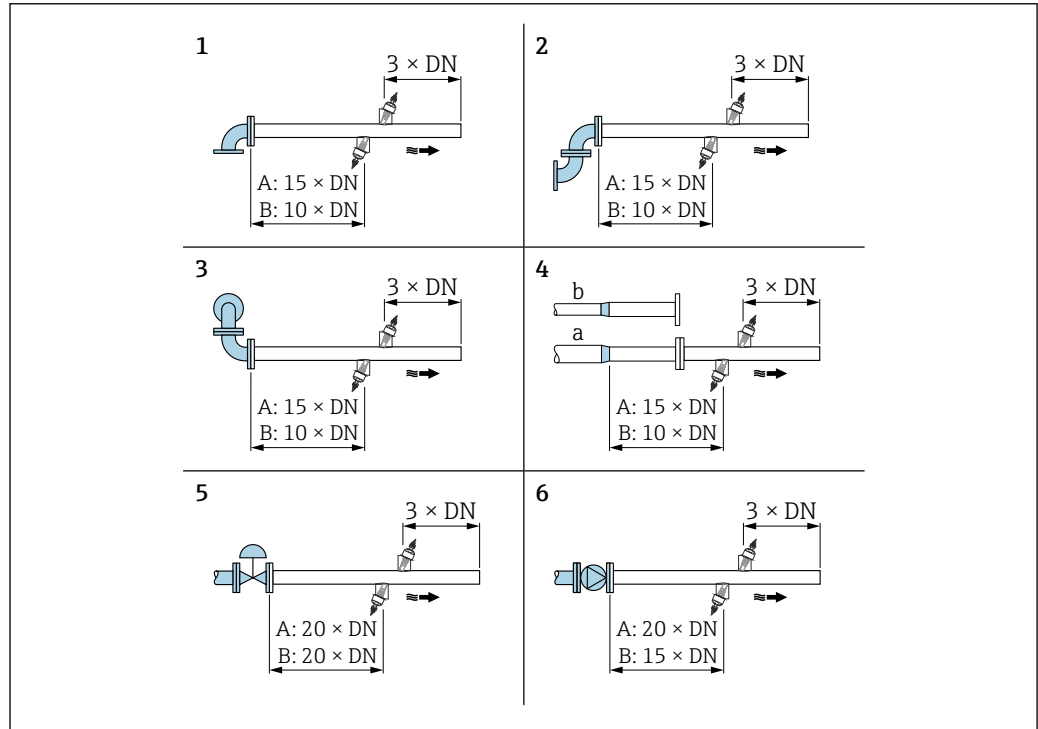
Recommended orientation with upward direction of flow (View A). With this orientation, entrained solids will sink and gases will rise away from the sensor area when the medium is not flowing. Furthermore, the pipe can be completely drained and protected against the buildup of deposits.

Horizontal

In the recommended installation range with a horizontal orientation (View B), gas and air accumulations at the top of the pipe and interference from deposit buildup at the bottom of the pipe can influence the measurement to a lesser degree.

Inlet and outlet runs

If possible, the sensor should be installed upstream from valves, T-sections, pumps etc. If this is not possible, the inlet and outlet runs indicated below must be maintained at the very minimum in order to attain the specified level of accuracy of the measuring device. If there are several flow disturbances present, the longest specified inlet run must be maintained.



11 Minimum inlet and outlet runs for various flow obstructions (A: single-path measurement, B: two-path measurement)

- 1 Pipe bend
- 2 Two pipe bends (on one plane)
- 3 Two pipe bends (on two planes)
- 4a Reduction
- 4b Extension
- 5 Control valve (2/3 open)
- 6 Pump

Mounting the sensor

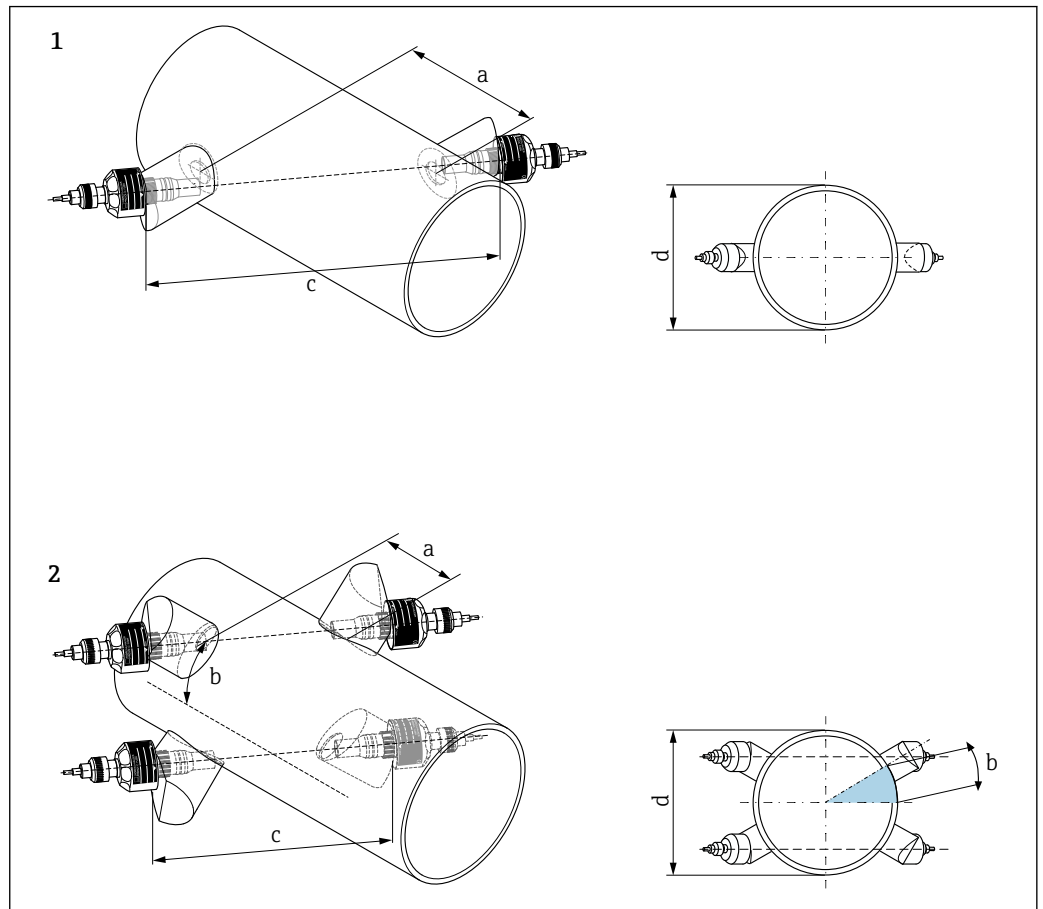
Sensor configuration and settings

DN 200 to 4000 (8 to 160")	
Single-path version [mm (in)]	Two-path version [mm (in)]
Sensor distance ¹⁾	Sensor distance ¹⁾
Path length → 12, 23	Path length → 12, 23 Arc length → 12, 23

1) Depends on the conditions at the measuring point (measuring pipe etc.). The sensor mounting position can be determined via FieldCare or Applicator. See also the **Result Sensor Type / Sensor Distance** parameter in the **Measuring point** submenu

Determining the sensor mounting positions

Mounting description



A0044950

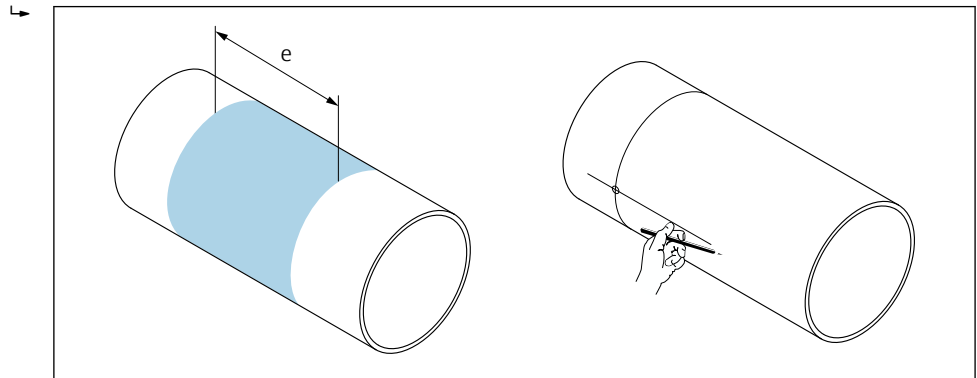
12 Sensor mounting: terminology

- 1 Single-path version
- 2 Two-path version
- a Sensor distance
- b Arc length
- c Path length
- d Measuring pipe outer diameter

Sensor holder for single-path version

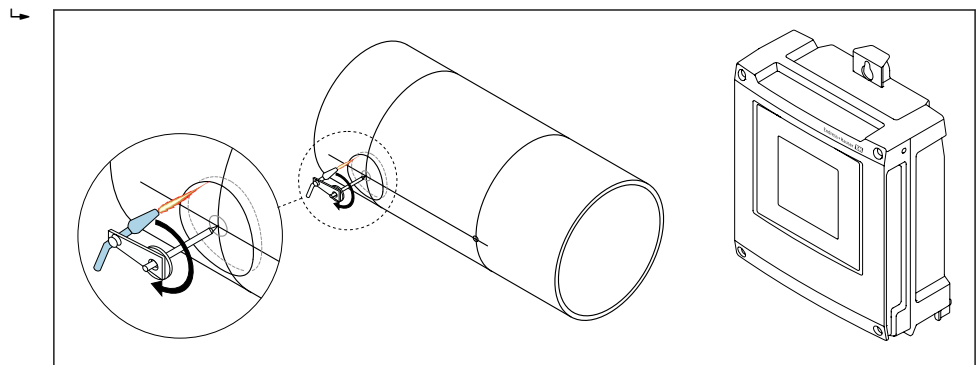
Procedure:

1. Determine the mounting area (e) on the pipe section (space required at measuring point approx. 1x pipe diameter).
2. Draw a center line on the measuring pipe at the mounting location and mark the first drill hole (drill hole diameter: 65 mm (2.56 in)). Make the center line longer than the hole to be drilled.



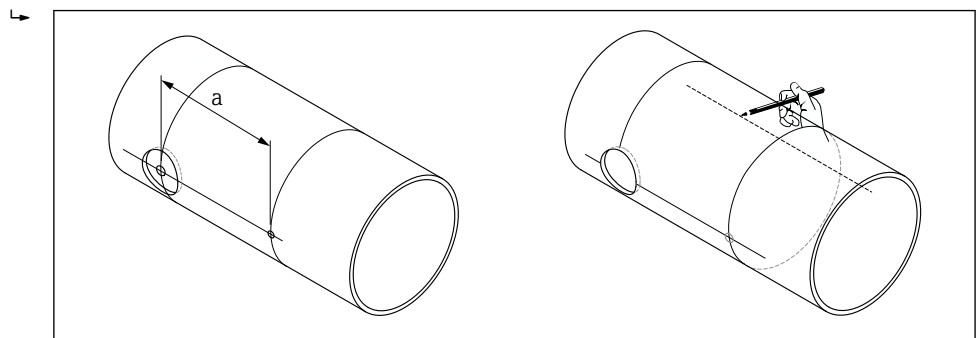
A0044951

3. Cut the first drill hole with a plasma cutter for example. Measure the wall thickness of the measuring pipe if it is not already known.
4. Determine the sensor distance → 22.



A0044952

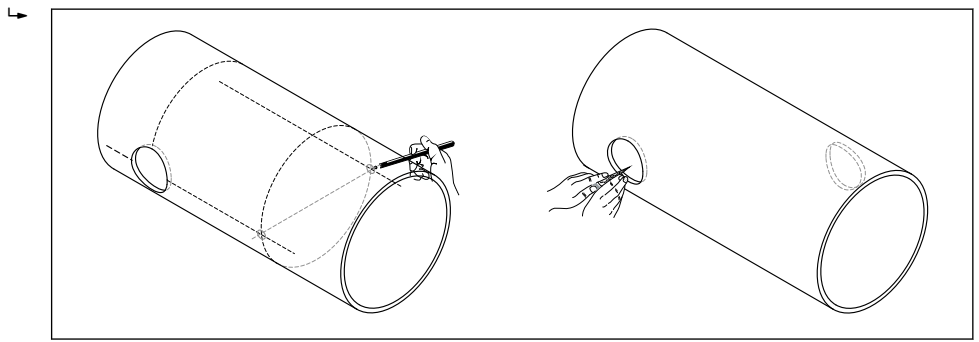
5. Starting from the center line of the first drill hole, plot the sensor distance (a).
6. Project the center line onto the rear of the measuring pipe and draw the line.



A0044953

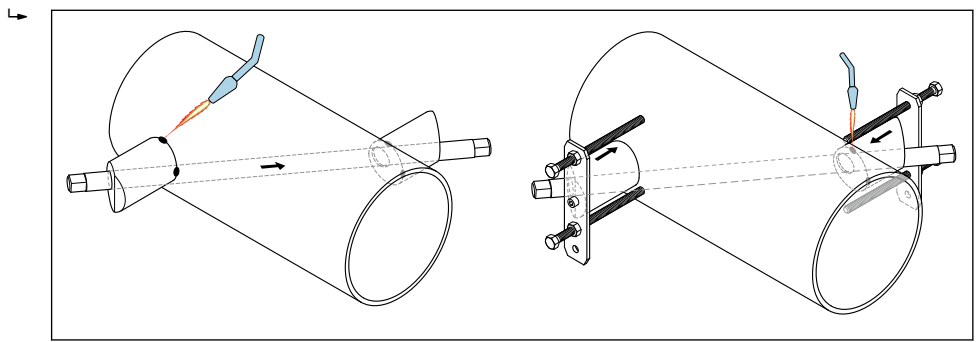
7. Mark the drill hole on the rear center line.

8. Cut out the second drill hole and prepare the holes (deburr, clean) to weld in the sensor holders.

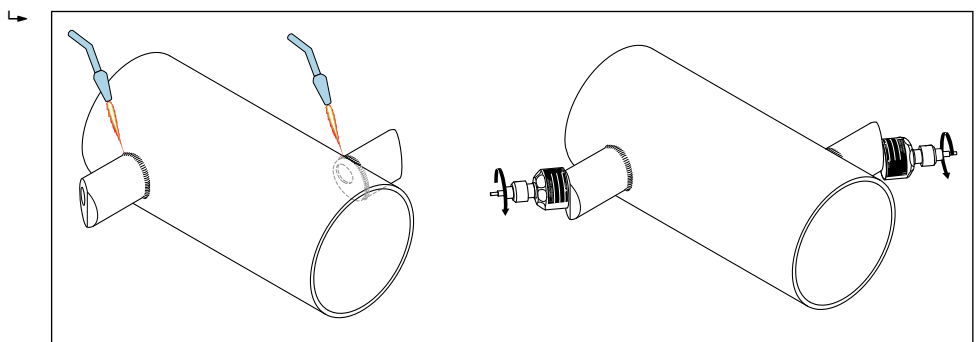


9. Insert the sensor holders into both holes. To set the weld-in depth, both sensor holders can be fixed in place with the special tool to regulate the insertion depth (optionally available → 48) and then aligned using the path rod. The sensor holder must be flush with the inside of the measuring pipe.

10. Spot-weld both sensor holders. To align the path rod, screw the two guides into the sensor holders.



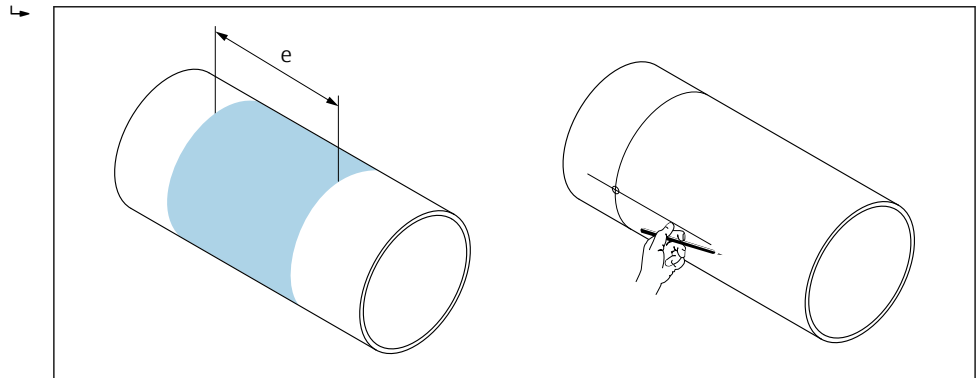
11. Weld in both sensor holders.
12. Check the distance between the drill holes again and determine the path length → 22.
13. Screw the sensors into the sensor holders by hand. If using a tool, do not tighten by more than 30 Nm.
14. Guide the sensor cable plugs into the openings provided for this purpose and tighten the plugs manually to the end stop.



Sensor holder for two-path version

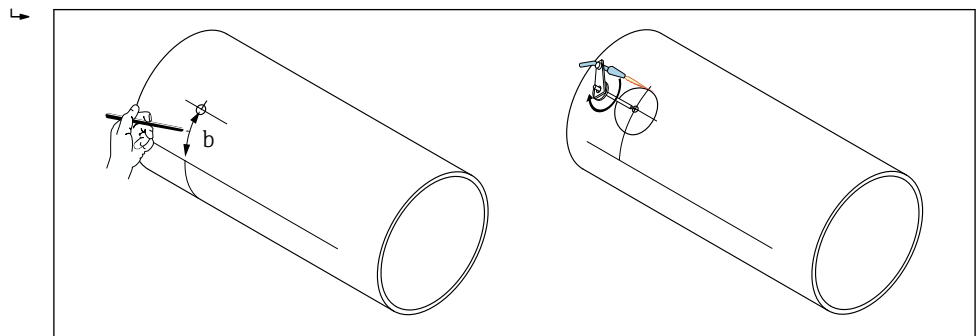
Procedure:

1. Determine the mounting area (e) on the pipe section (space required at measuring point approx. 1x pipe diameter).
2. Mark the center line on the measuring pipe at the mounting location.



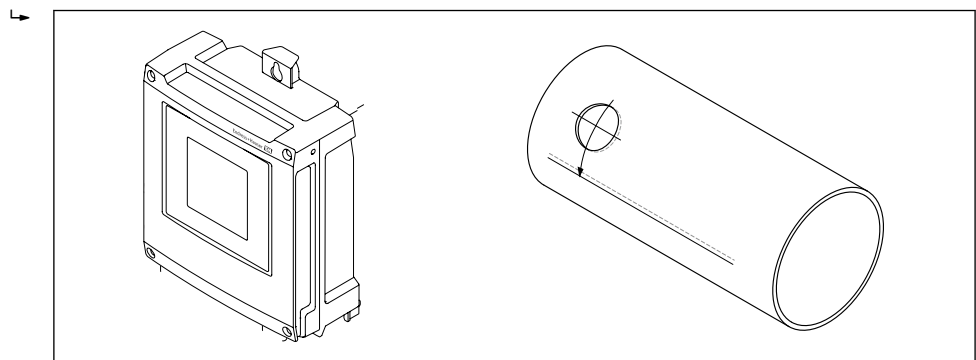
A0044951

3. At the mounting location of the sensor holder, mark the arc length (b) to one side of the center line. Take approximately 1/12 of the pipe circumference as the measure for the length of the arc. Mark the first drill hole (drill hole diameter: 81 to 82 mm (3.19 to 3.23 in)). Make the center line longer than the hole to be drilled.
4. Cut the first drill hole with a plasma cutter for example. Measure the wall thickness of the measuring pipe if it is not already known.



A0044957

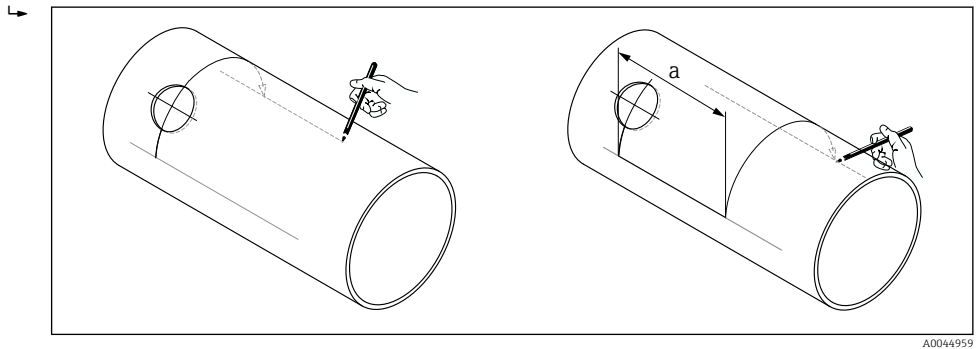
5. Determine the sensor distance and arc length → 22.
6. Correct the center line with the arc length determined.



A0044958

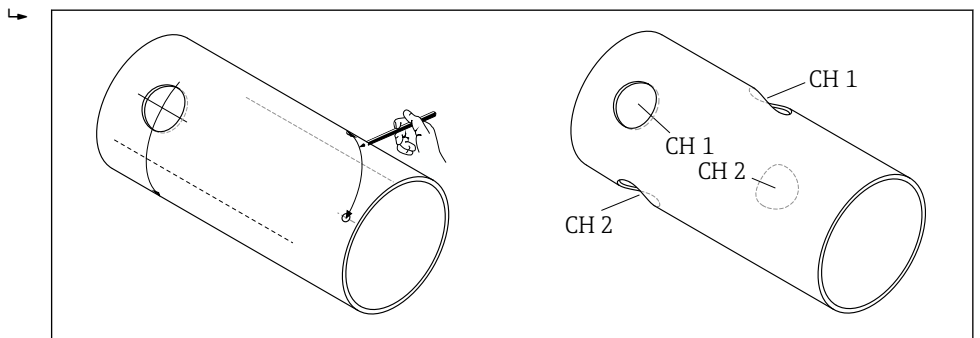
7. Project the corrected center line onto the opposite side of the pipe and draw the line (half pipe circumference).

8. Mark the sensor distance on the center line and project it onto the center line on the rear of the pipe.



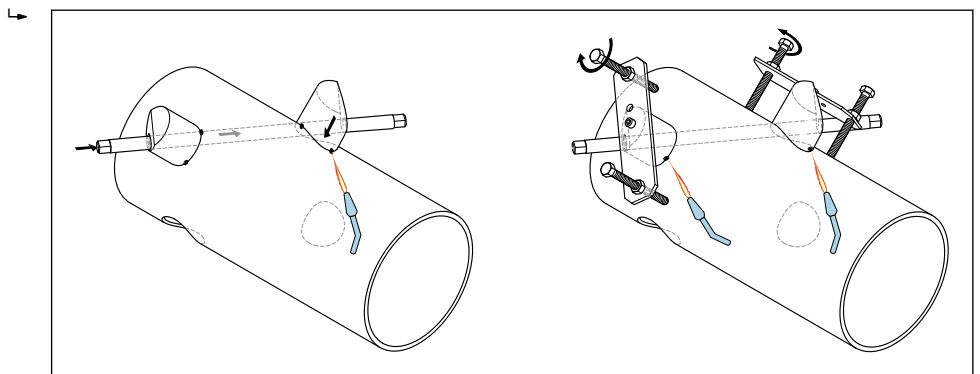
A0044959

9. Mark the length of the arc to both sides of the center line and mark the drill holes.
10. Cut out the drill holes and prepare the holes (deburr, clean) to weld in the sensor holders. The holes for the sensor holders are in pairs (CH 1 - CH 1 and CH 2 - CH 2).



A0044960

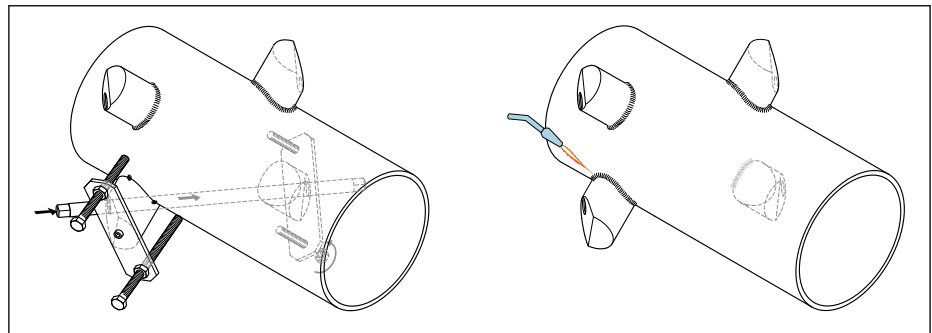
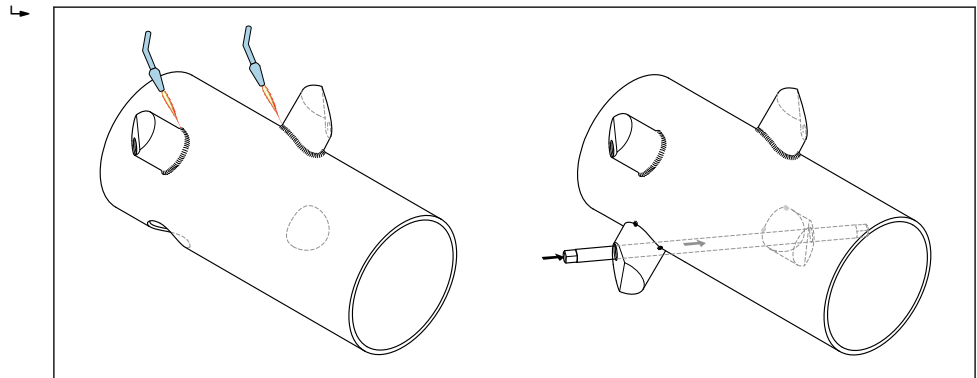
11. Insert sensor holders into the first two drill holes and align with the path rod (alignment tool). Spot-weld with the welding machine and then securely weld both sensor holders. To align the path rod, screw the two guides into the sensor holders.



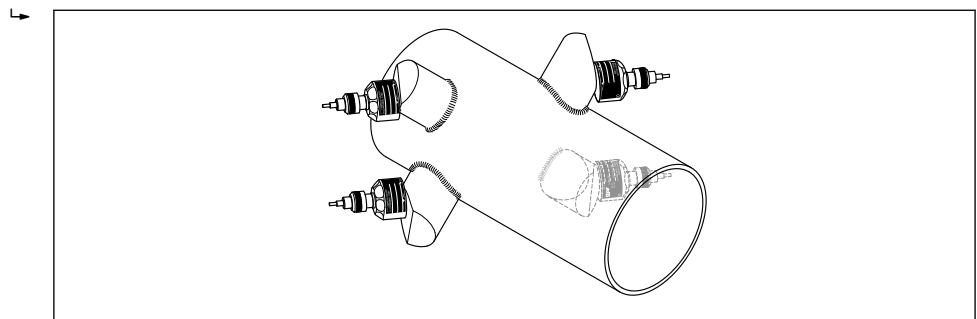
A0044961

12. Weld in both sensor holders.
13. Check the path length, sensor distances and arc lengths once again. Any deviations from the correct length can be entered later as correction factors when commissioning the measuring point.

14. Insert the second pair of sensor holders into the two remaining drill holes as explained in step 11 and then weld in place.

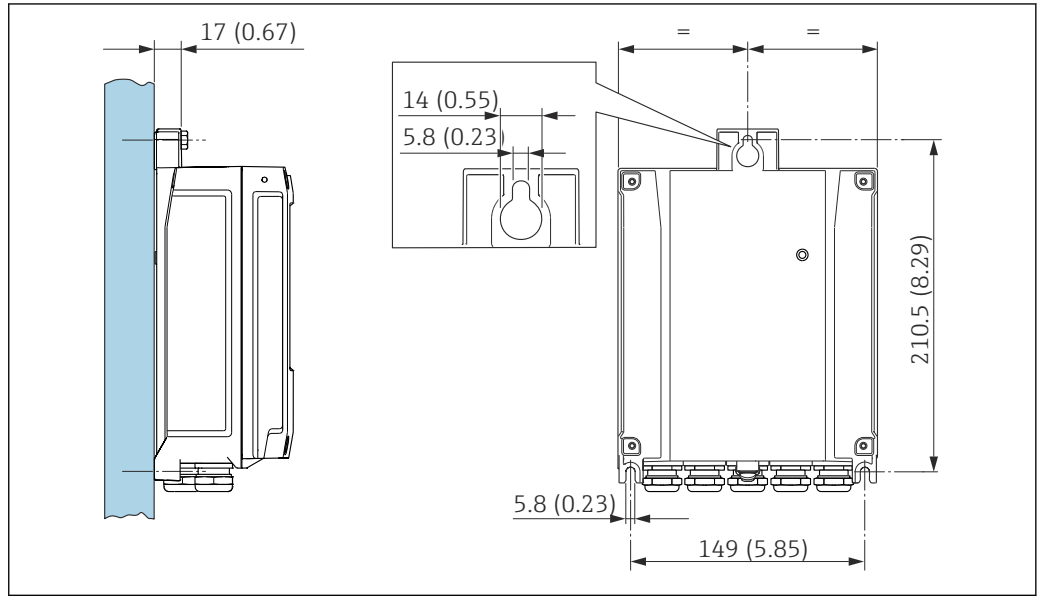


15. Screw the sensors into the sensor holders by hand. If using a tool, do not tighten by more than 30 Nm.
16. Guide the sensor cable plugs into the openings provided for this purpose and tighten the plugs manually to the end stop.



Mounting the transmitter housing

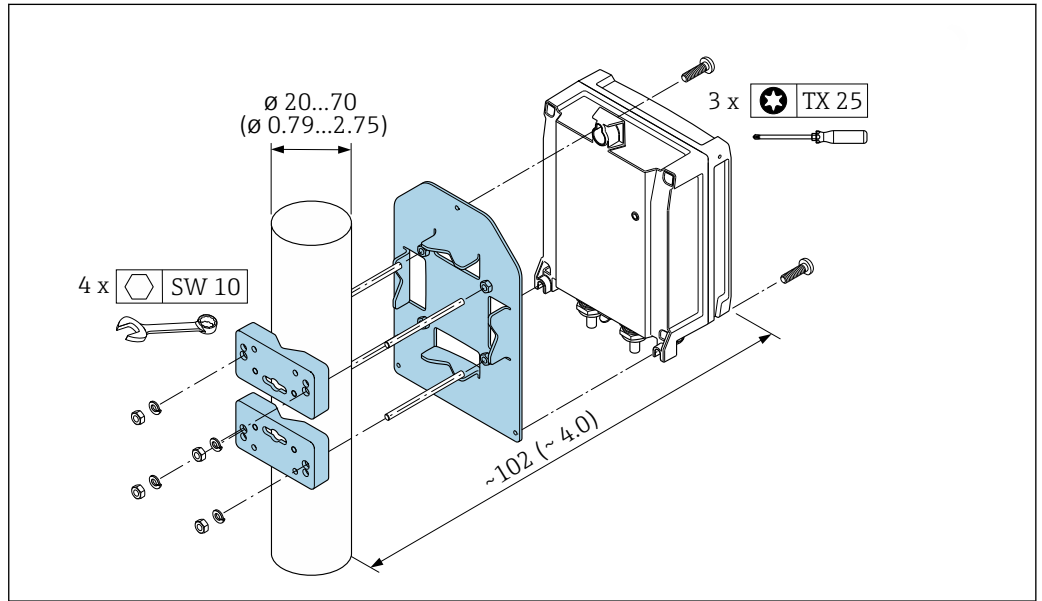
Wall mounting



A0020523

13 Engineering unit mm (in)

Post mounting



A0029051

14 Engineering unit mm (in)

Special mounting instructions

Display guard

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

Environment

Ambient temperature range	Transmitter	-40 to +60 °C (-40 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.
	Sensor	Standard: -40 to +80 °C (-40 to +176 °F)
	Sensor cable (connection between transmitter and sensor)	Standard: TPE halogen-free: -40 to +80 °C (-40 to +176 °F)



In principle, it is permitted to insulate the sensors mounted on the pipe. In the case of insulated sensors, make sure that the process temperature does not exceed or drop below the specified cable temperature.

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

Storage temperature The storage temperature for all components (except display modules) corresponds to the ambient temperature range → 30.

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

Sensor

- Standard: IP66/67, Type 4X enclosure, suitable for pollution degree 4
- Optionally available: IP68, Type 6P enclosure, suitable for pollution degree 4

External WLAN antenna

IP67

Vibration- and shock-resistance

Vibration sinusoidal, according to IEC 60068-2-6

- 2 to 8.4 Hz, 7.5 mm peak
- 8.4 to 2 000 Hz, 2 g peak

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

- 10 to 200 Hz, 0.01 g²/Hz
- 200 to 2 000 Hz, 0.003 g²/Hz
- Total: 2.70 g rms

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

6 ms 50 g

Rough handling shocks according to IEC 60068-2-31

Electromagnetic compatibility (EMC)

- As per IEC/EN 61326
- Complies with emission limits for industry as per EN 55011 (Class A)



Details are provided in the Declaration of Conformity.

Process

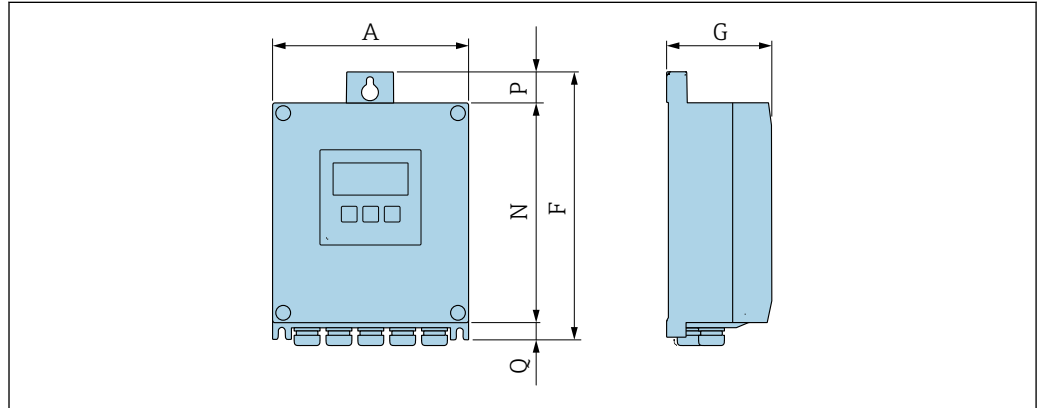
Medium temperature range	Sensor version	Frequency	Temperature
	I-100-A	1 MHz	-40 to +80 °C (-40 to +176 °F)
Sound velocity range	600 to 2 100 m/s (1 969 to 6 890 ft/s)		
Medium pressure range	Maximum nominal pressure PN 16 (16 bar (232 psi))		
Pressure loss	There is no pressure loss.		

Mechanical construction

Dimensions in SI units

Transmitter remote version

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



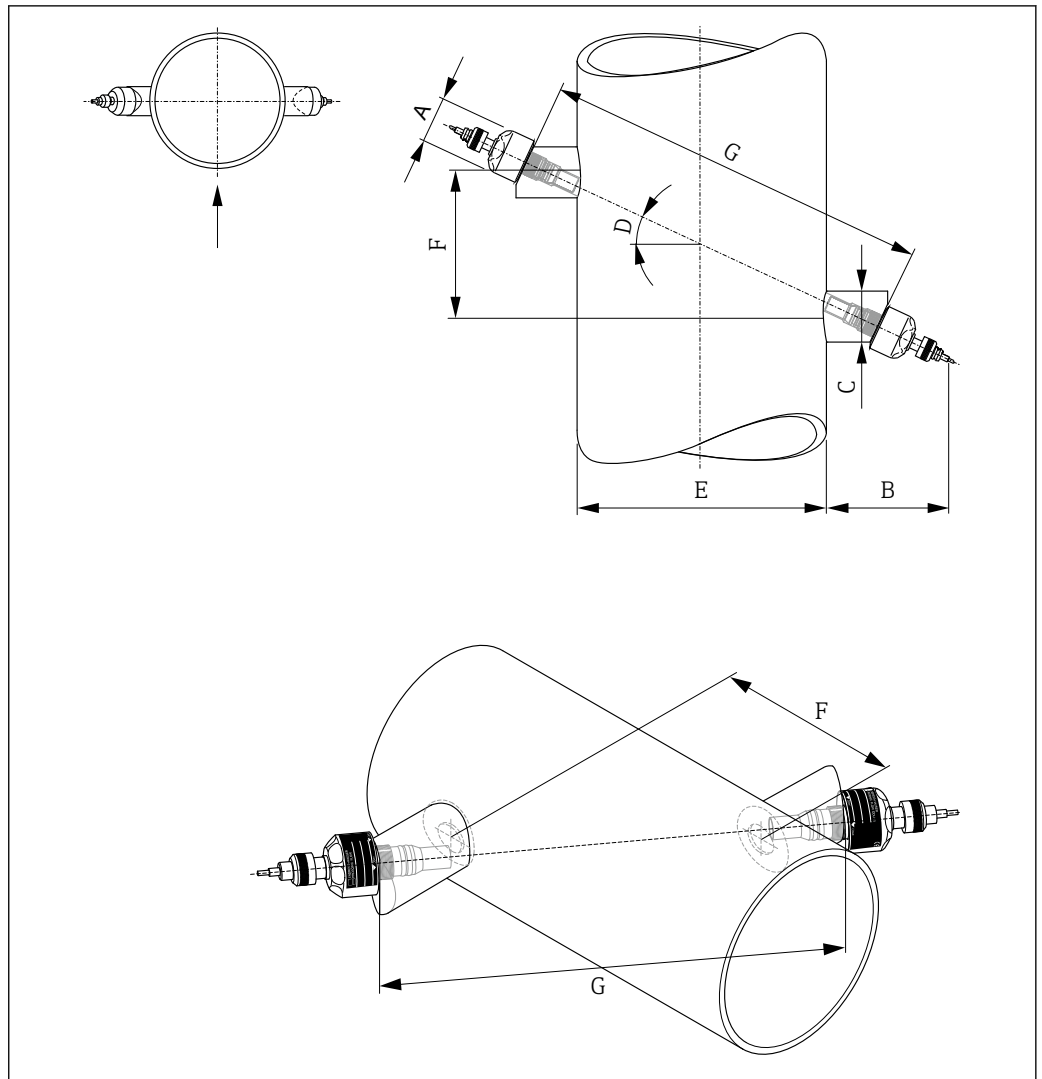
Order code for "Transmitter housing", option P "Remote, aluminum, coated"

A [mm]	F [mm]	G [mm]	N [mm]	P [mm]	Q [mm]
167	232	80	187	24	21

Order code for "Transmitter housing", option N "Remote, polycarbonate"

A [mm]	F [mm]	G [mm]	N [mm]	P [mm]	Q [mm]
177	234	90	197	17	22

Sensor remote version

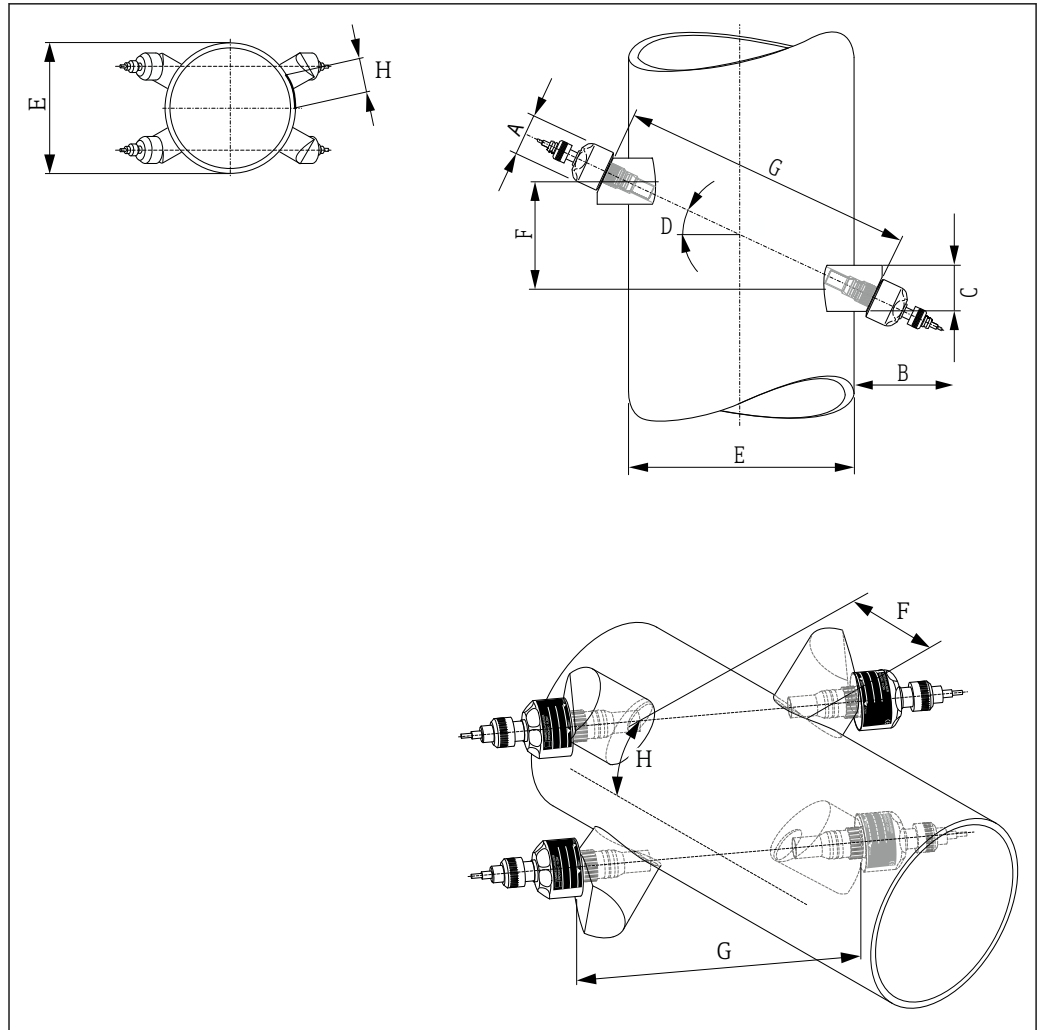


A0044968

15 Single-path installation version

A [mm]	B [mm]	C [mm]	D [°]	E [mm]	F ¹⁾ [mm]	G ¹⁾ [mm]
∅ 58	150	65	25	Measuring pipe outer diameter	Sensor distance	Path length

1) Can be determined via Applicator or FieldCare



A0044969

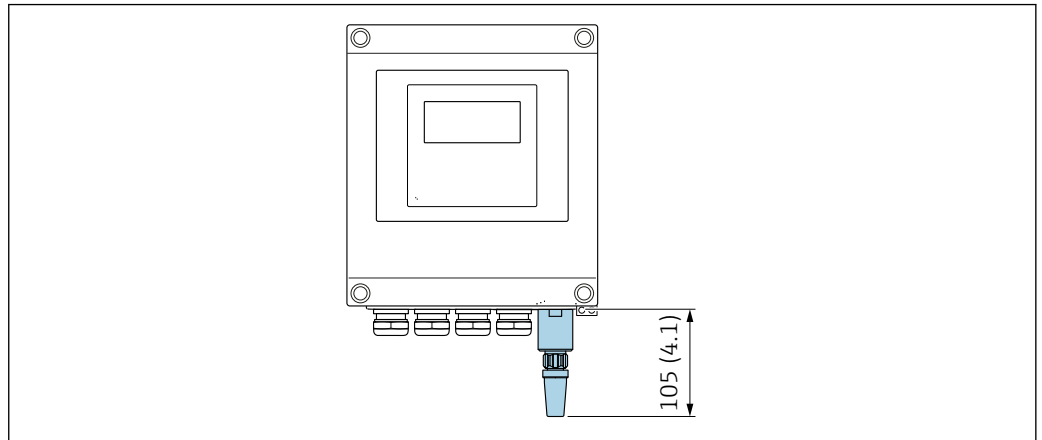
16 Two-path installation version

A	B	C	D	E	F ¹⁾	G ¹⁾	H ¹⁾
[mm]	[mm]	[mm]	[°]	[mm]	[mm]	[mm]	[mm]
∅ 58	150	80	25	Measuring pipe outer diameter	Sensor distance	Path length	Arc length

1) Can be determined via Applicator or FieldCare

Accessories

External WLAN antenna mounted on device

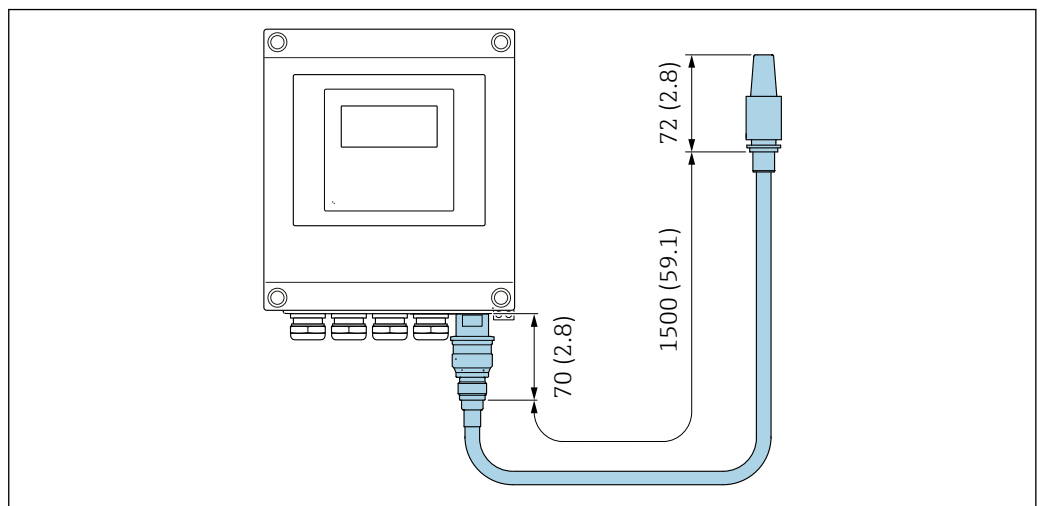


A0033607

17 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.



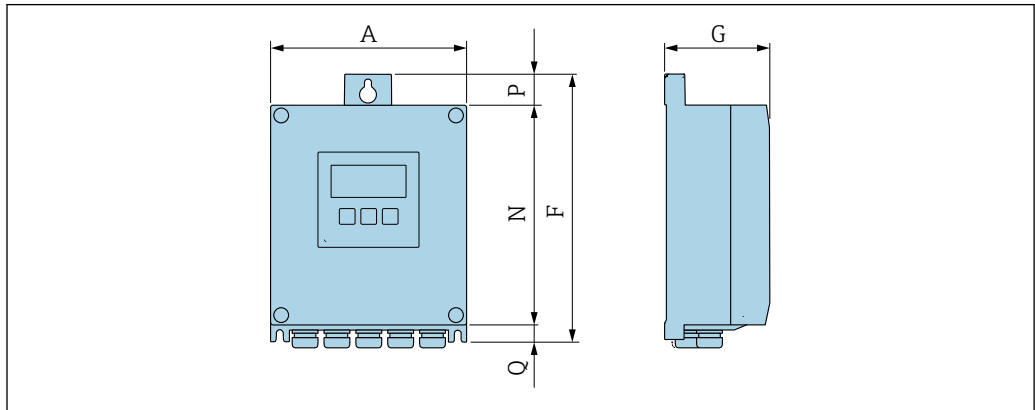
A0033606

18 Engineering unit mm (in)

Dimensions in US units

Transmitter remote version

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



A0033789

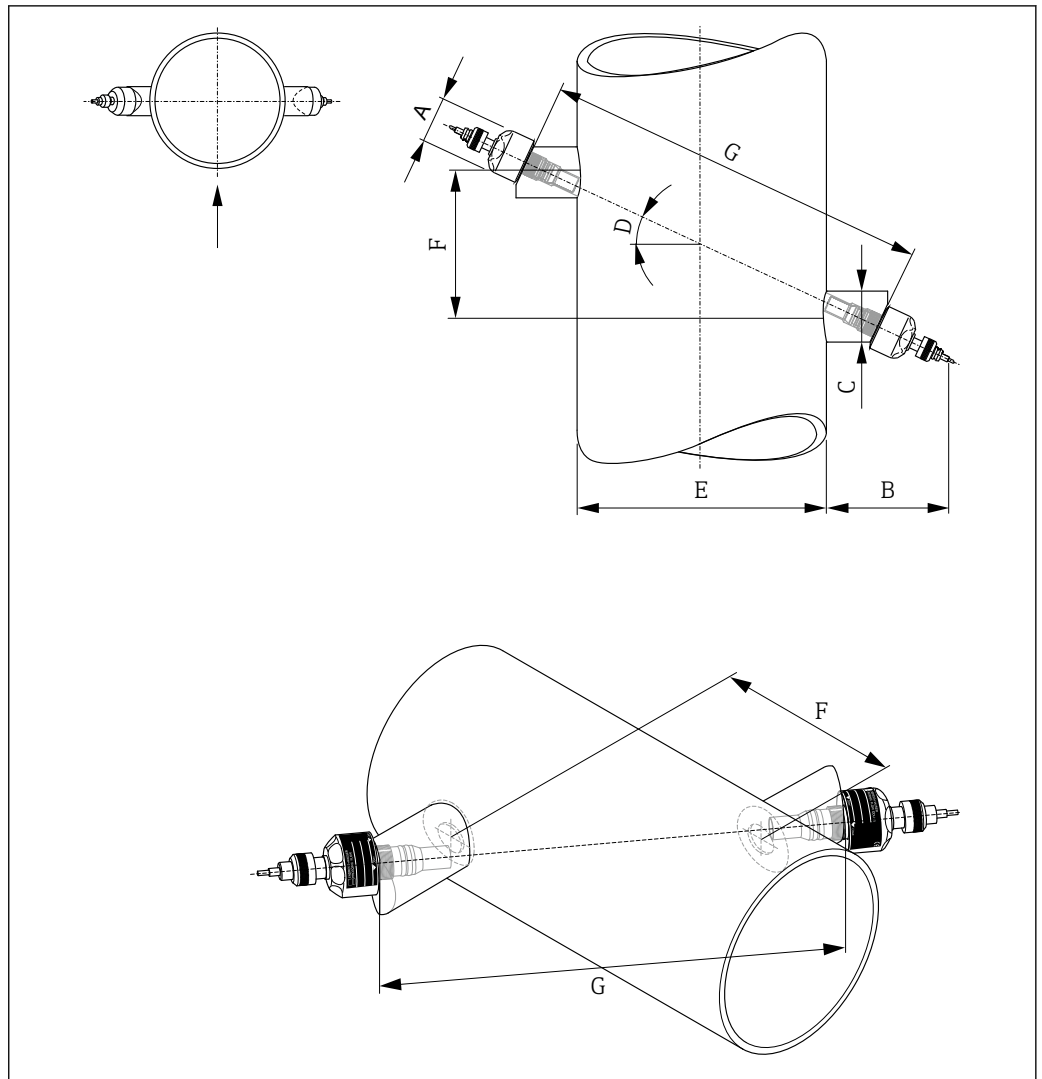
Order code for "Transmitter housing", option P "Remote, aluminum, coated"

A [in]	F [in]	G [in]	N [in]	P [in]	Q [in]
6.57	9.13	3.15	7.36	0.94	0.83

Order code for "Transmitter housing", option N "Remote, polycarbonate"

A [in]	F [in]	G [in]	N [in]	P [in]	Q [in]
6.97	9.21	3.54	7.76	0.67	0.87

Sensor remote version

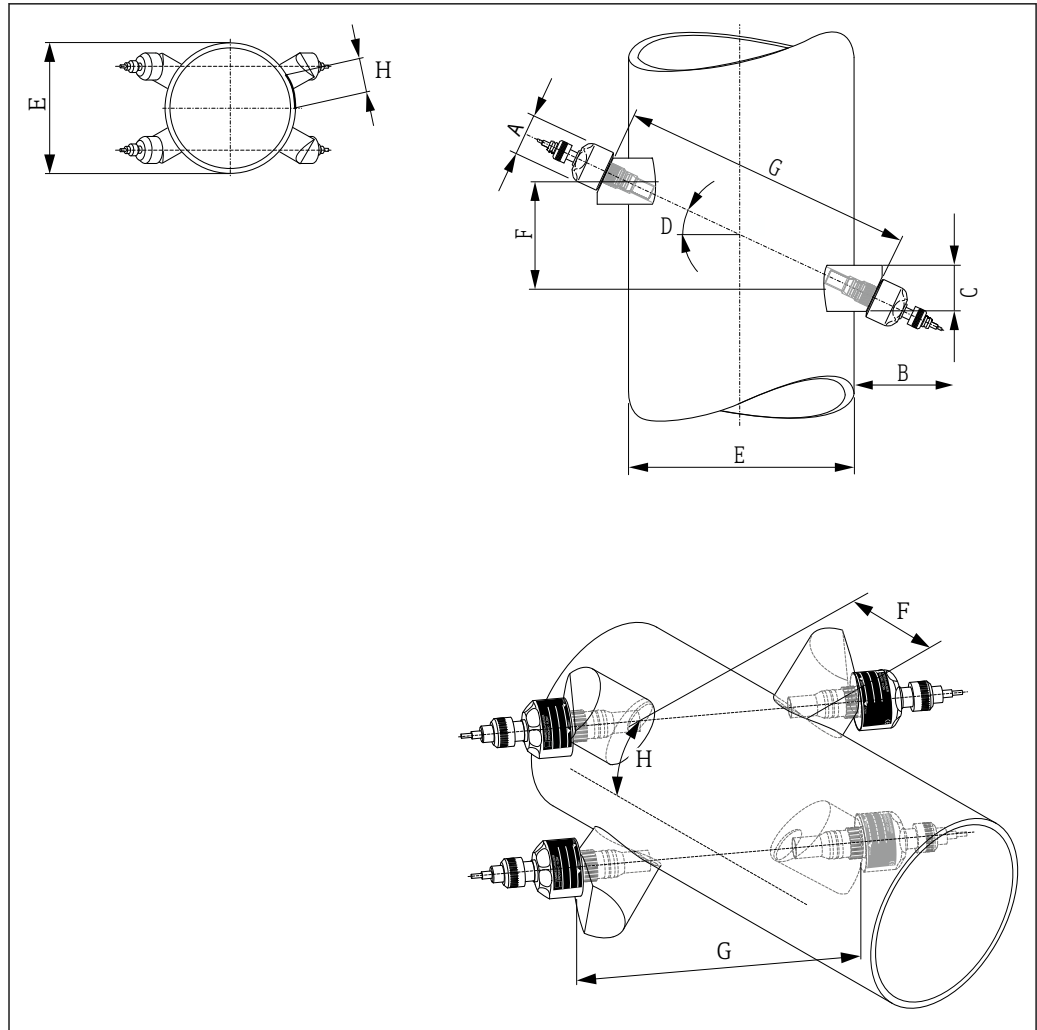


A0044968

19 Single-path installation version

A	B	C	D	E	F ¹⁾	G ¹⁾
[in]	[in]	[in]	[°]	[in]	[in]	[in]
∅ 2.28	5.91	2.56	25	Measuring pipe outer diameter	Sensor distance	Path length

1) Can be determined via Applicator or FieldCare



A0044969

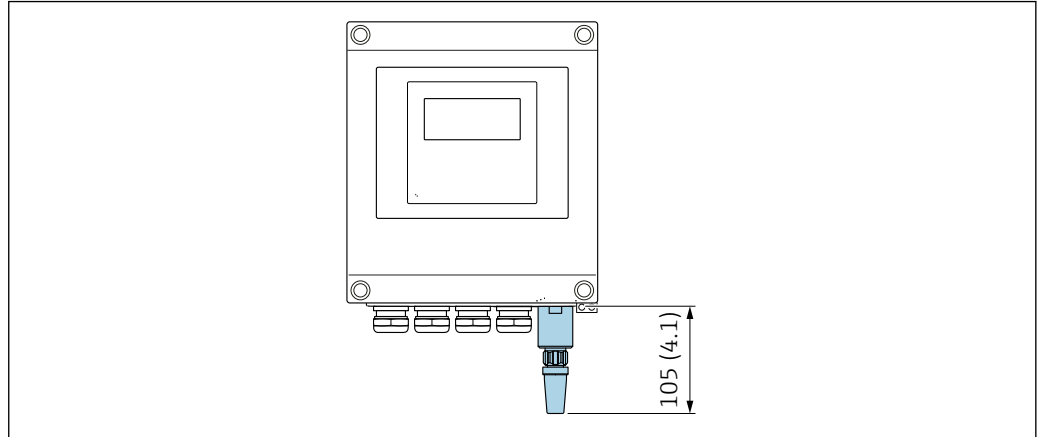
20 Two-path installation version

A	B	C	D	E	F ¹⁾	G ¹⁾	H ¹⁾
[in]	[in]	[in]	[°]	[in]	[in]	[in]	[in]
∅ 2.28	5.91	3.15	25	Measuring pipe outer diameter	Sensor distance	Path length	Arc length

1) Can be determined via Applicator or FieldCare

Accessories

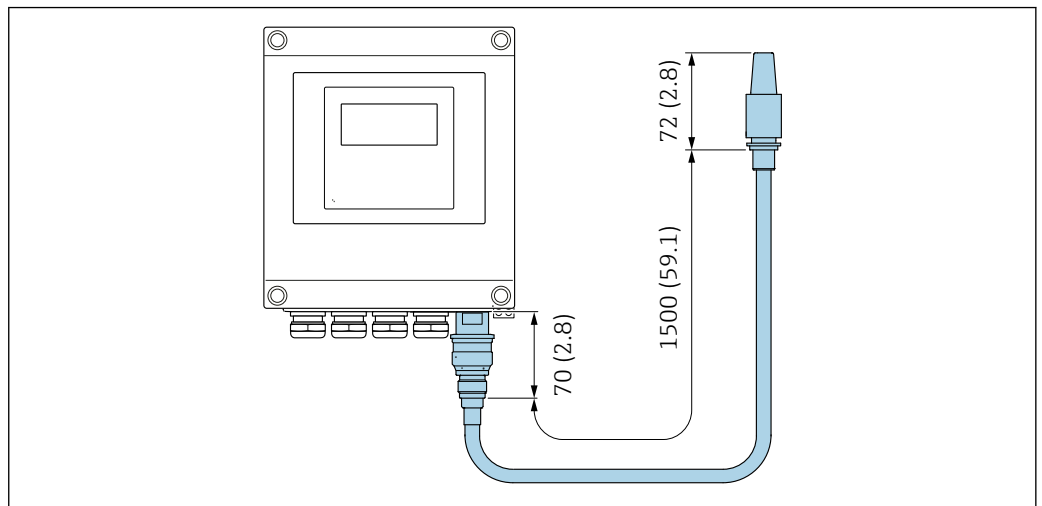
External WLAN antenna mounted on device



21 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.



22 Engineering unit mm (in)

Weight

Weight specifications excluding packaging material.

Transmitter

- Proline 400 polycarbonate plastic: 1.2 kg (2.65 lb)
- Proline 400 aluminum, coated: 6.0 kg (13.2 lb)

Sensor

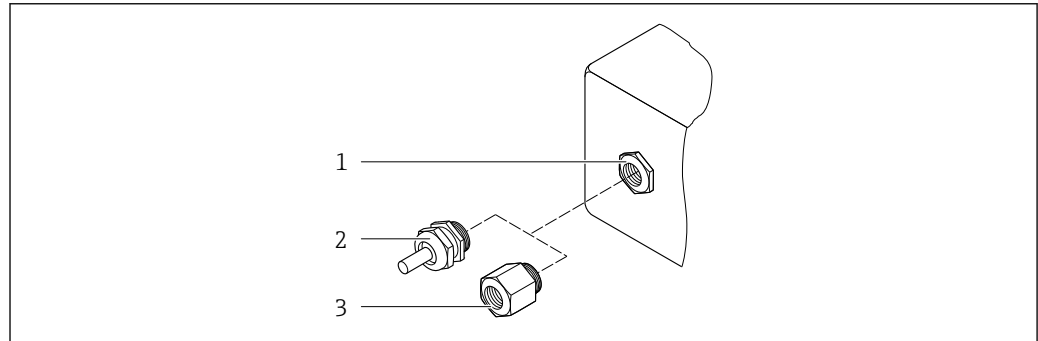
Including mounting material

- Single path installation version: 4.5 kg (9.92 lb)
- Two-path installation version: 9 kg (19.9 lb)

Materials

Remote version (wall-mount housing)

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

Cable entries/cable glands

A0020640

23 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"

remote version

Cable entry/cable gland	Material
Cable gland M20 × 1.5	<ul style="list-style-type: none"> ■ Plastic ■ Nickel-plated brass
Cable gland of sensor cable	Nickel-plated brass
Power cable gland	Plastic
Adapter for cable entry with female thread G ½" or NPT ½"	Nickel-plated brass

Sensor - transmitter cable

i UV rays can impair the cable outer sheath. Protect the cable from exposure to sun as much as possible.

- Sensor cable, TPE halogen-free
- Cable sheath: TPE halogen-free
 - Cable plug: nickel-plated brass

Ultrasonic transducer

- Holder: stainless steel 1.4301 (304), 1.4404 (316L)
- Housing: stainless steel 1.4301 (304), 1.4404 (316L)

Accessories*External WLAN antenna*

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

Operability

Operating concept

Operator-oriented menu structure for user-specific tasks

- Commissioning
- Operation
- Diagnostics
- Expert level

Fast 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 diagnostic behavior increases measurement availability

- 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, Bahasa (Indonesian), Vietnamese, Czech, Swedish
- Via "FieldCare", "DeviceCare" operating tool:
English, German, French, Spanish, Italian, Chinese, Japanese
- Via Web browser (only available for device versions with HART, PROFIBUS DP and EtherNet/IP):
English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Bahasa (Indonesian), Vietnamese, Czech, Swedish

Local operation

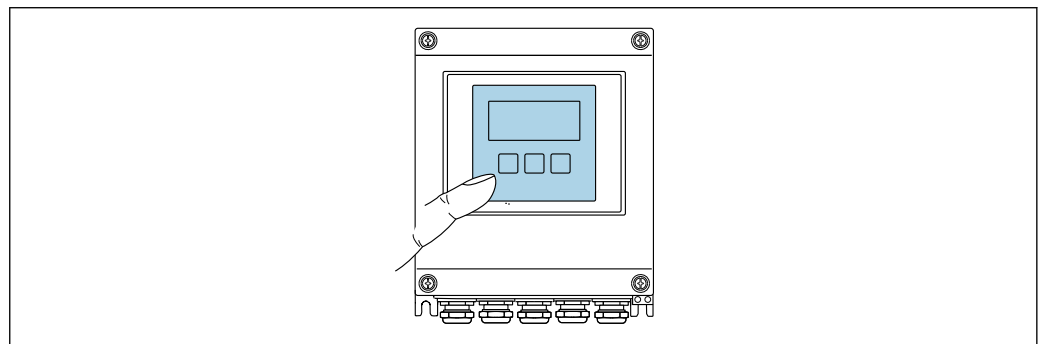
Via display module

Equipment:

- Standard features 4-line, illuminated, graphic display; touch control
- Order code for "Display; operation", option G "4-line, illuminated; Touch Control +WLAN" offers standard equipment features in addition to access via Web browser



Information about WLAN interface → 42



24 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
- Permitted ambient temperature for the display: -20 to +60 °C (-4 to +140 °F)
The readability of the display may be impaired at temperatures outside the temperature range.

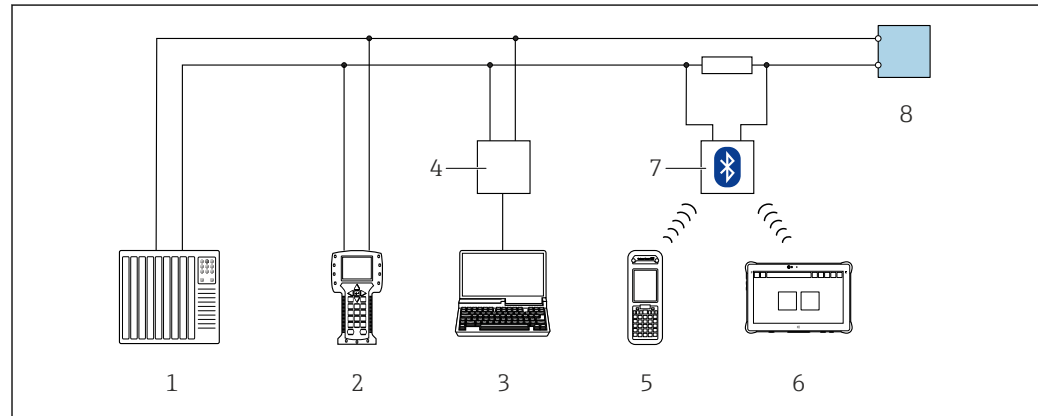
Operating elements

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

Remote operation

Via HART protocol

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



25 Options for remote operation via HART protocol

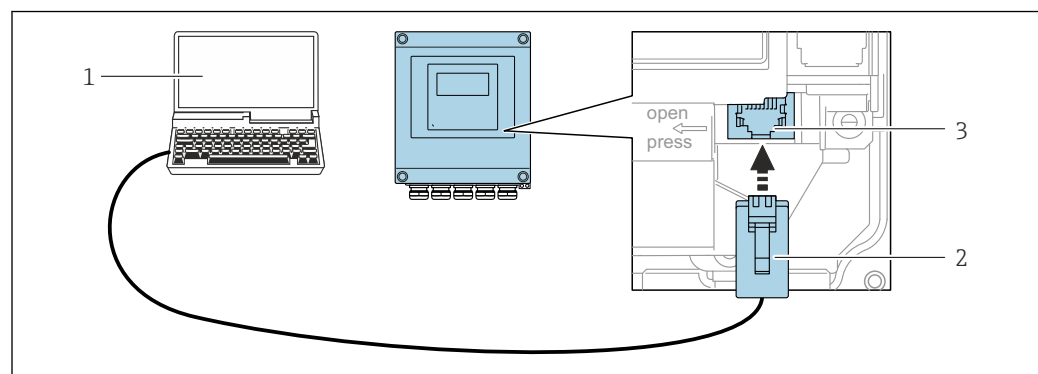
- 1 Control system (e.g. PLC)
- 2 Field Communicator 475
- 3 Computer with operating tool (e.g. FieldCare, AMS Device Manager, SIMATIC PDM)
- 4 Commubox FXA195 (USB)
- 5 Field Xpert SFX350 or SFX370
- 6 Field Xpert SMT70
- 7 VIATOR Bluetooth modem with connecting cable
- 8 Transmitter

Service interface

Via service interface (CDI-RJ45)

This communication interface is present in the following device version:

- Order code for "Output", option H: 4 to 20 mA HART, pulse/frequency output, switch output
- Order code for "Output", option I: 4 to 20 mA HART, 2 x pulse/frequency/switch output, status input



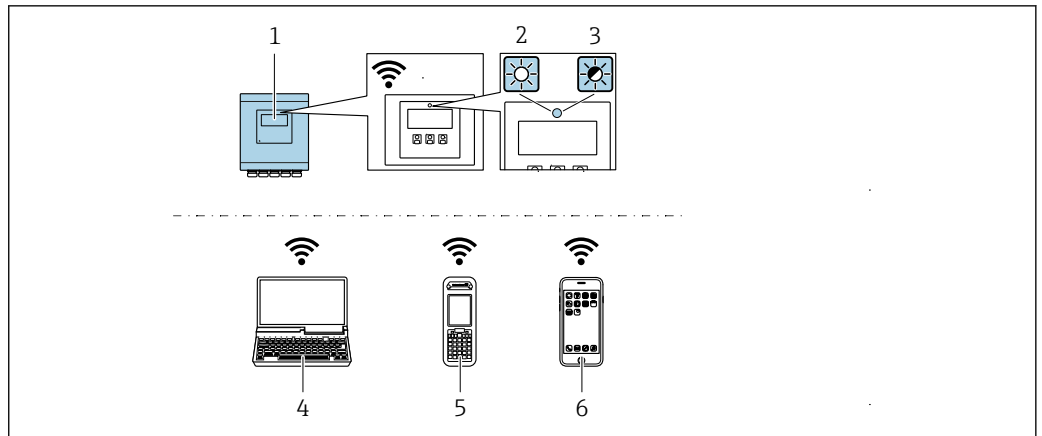
26 Connection via service interface (CDI-RJ45)

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

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"



A0043149


- 1 Transmitter with integrated WLAN antenna
- 2 LED lit constantly: WLAN reception is enabled on measuring device
- 3 LED flashing: WLAN connection established between operating unit and measuring device
- 4 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)
- 5 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)
- 6 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 (default setting) ■ Network
Encryption	WPA2-PSK AES-128 (in accordance with IEEE 802.11i)
Configurable WLAN channels	1 to 11
Degree of protection	IP67
Available antenna	Internal antenna
Range	Typically 10 m (32 ft)

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 	Special Documentation for the device
DeviceCare SFE100	Notebook, PC or tablet with Microsoft Windows system	<ul style="list-style-type: none"> ■ CDI-RJ45 service interface ■ WLAN interface ■ Fieldbus protocol 	→ 50

Supported operating tools	Operating unit	Interface	Additional information
FieldCare SFE500	Notebook, PC or tablet with Microsoft Windows system	<ul style="list-style-type: none"> ■ CDI-RJ45 service interface ■ WLAN interface ■ Fieldbus protocol 	→  50
Device Xpert	Field Xpert SFX 100/350/370	Fieldbus protocol HART	Operating Instructions BA01202S Device description files: Use update function of handheld terminal

 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.honeywellprocess.com
- FieldMate from Yokogawa → www.yokogawa.com
- PACTWare → www.pactware.com

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


Web server

Thanks to the integrated Web server the device can be operated and configured via a Web browser and via a standard Ethernet switch (RJ45) or via a WLAN interface. The structure of the operating menu is the same as the menu on the local display. In addition to the measured values, status information about the device is also displayed and allows the user to monitor the status of the device. Furthermore the device data can be managed and the network parameters can be configured.

A device that has a WLAN interface (can be ordered as an option) is required for the WLAN connection: order code for "Display", 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 the measuring device:

- Upload the configuration from the measuring device (XML format, create configuration back-up)
- Save the configuration to the measuring device (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 verification log (PDF file, only available with the "Heartbeat Verification" application package)
- Flash firmware version for device firmware upgrade, for instance
- Download driver for system integration
- Display up to 1000 saved measured values (only available with the **Extended HistoROM** application package →  47)

 Web server special documentation

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.

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 such as diagnostic events for example ▪ Device firmware package 	<ul style="list-style-type: none"> ▪ Measured value logging ("Extended HistoROM" order option) ▪ Current parameter data record (used by firmware at run time) ▪ Peakhold indicator (min/max values) ▪ Totalizer values 	<ul style="list-style-type: none"> ▪ Sensor data: etc. ▪ Serial number ▪ Device configuration (e.g. SW options, fixed I/O or multi I/O)
Storage location	Fixed on the user interface board in the connection compartment	Attachable to the user interface board in the connection compartment	Fixed on the sensor connection board

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 the sensor is replaced: once the sensor has been replaced, new sensor data are transferred from the S-DAT in the measuring device and the measuring device is ready for operation again immediately without any errors

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)

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:



- Record up to 1 000 measured values via 1 to 4 channels
- User configurable recording interval
- Record up to 250 measured values via each of the 4 memory channels
- 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 via the Product Configurator at www.endress.com.

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

The **Configuration** button opens the Product Configurator.

CE mark	<p>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.</p> <p>Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.</p>
UKCA marking	<p>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.</p> <p>Contact address Endress+Hauser UK: Endress+Hauser Ltd. Floats Road Manchester M23 9NF United Kingdom www.uk.endress.com</p>
RCM mark	<p>The measuring system meets the EMC requirements of the "Australian Communications and Media Authority (ACMA)".</p>
Ex approval	<p>The devices are certified for use in hazardous areas and the relevant safety instructions are provided in the separate "Control Drawing" document. Reference is made to this document on the nameplate.</p>
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)
Radio approval	<p>The measuring device has radio approval.</p> <p> For detailed information regarding radio approval, see the Special Documentation →  51</p>
Other standards and guidelines	<ul style="list-style-type: none"> ■ EN 60529 Degrees of protection provided by enclosures (IP code) ■ EN 61010-1 Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements ■ IEC/EN 61326-2-3 Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements). ■ ANSI/ISA-61010-1 (82.02.01) Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1 General Requirements ■ CAN/CSA-C22.2 No. 61010-1-12 Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use - Part 1 General Requirements ■ NAMUR NE 32 Data retention in the event of a power failure in field and control instruments with microprocessors ■ NAMUR NE 43 Standardization of the signal level for the breakdown information of digital transmitters with analog output signal. ■ NAMUR NE 53 Software of field devices and signal-processing devices with digital electronics ■ NAMUR NE 105 Specifications for integrating fieldbus devices in engineering tools for field devices ■ NAMUR NE 107 Self-monitoring and diagnosis of field devices ■ NAMUR NE 131 Requirements for field devices for standard applications

Ordering information

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

1. Click Corporate
2. Select the country
3. Click Products
4. Select the product using the filters and search field
5. Open the product page

The Configuration button to the right of the product image opens the Product Configurator.



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 for the device → 51

Diagnostics functions

Package	Description
Extended HistoROM	<p>Comprises extended functions concerning the event log and the activation of the measured value memory.</p> <p>Event log: Memory volume is extended from 20 message entries (standard version) to up to 100 entries.</p> <p>Data logging (line recorder):</p> <ul style="list-style-type: none"> ■ 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.

Heartbeat Technology







Package	Description
Heartbeat Verification +Monitoring	<p>Heartbeat Verification Meets the requirement for traceable verification to DIN ISO 9001:2008 Chapter 7.6 a) "Control of monitoring and measuring equipment".</p> <ul style="list-style-type: none"> ▪ 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. <p>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:</p> <ul style="list-style-type: none"> ▪ Draw conclusions - using these data and other information - about the impact the measuring application has on the measuring performance over time. ▪ Schedule servicing in time. ▪ Monitor the process or product quality, e.g. gas pockets.

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
Transmitter Prosonic Flow 400	<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> For details, see Installation Instructions EA00104D</p>
Post mounting kit	Post mounting kit for transmitter.
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">  The external WLAN antenna is not suitable for use in hygienic applications. ▪ Additional information regarding the WLAN interface →  42. <p> Order number: 71351317</p> <p> Installation Instructions EA01238D</p>
Sensor cable Proline 400 Sensor – transmitter	<p>The sensor cable can be ordered directly with the measuring device (order code for "Cable") or as an accessory (order number DK9017).</p> <p>The following cable lengths are available: Temperature: -40 to +80 °C (-40 to +176 °F)</p> <ul style="list-style-type: none"> ▪ Option AA: 5 m (15 ft) ▪ Option AB: 10 m (30 ft) ▪ Option AC: 15 m (45 ft) ▪ Option AD: 30 m (90 ft) <p> Possible cable length for a Proline 400 sensor cable: Max. 30 m (90 ft)</p>



For the sensor

Accessories	Description
Sensor set (DK9018)	Sensor set 1 MHz (I-100)
Sensor holder set (DK9014)	Sensor holder set 1 MHz
Installation set (DK9016)	<ul style="list-style-type: none"> ▪ Installation set, DN200-DN1800, 8"-72" ▪ Installation set, DN1800-DN4000, 72"-160"
Conduit adapter set (DK9003)	<ul style="list-style-type: none"> ▪ Without conduit adapter + sensor cable gland ▪ Conduit adapter M20x1.5 + sensor cable gland ▪ Conduit adapter NPT1/2" + sensor cable gland ▪ Conduit adapter G1/2" + sensor cable gland


Communication-specific accessories

Accessories	Description
Commubox FXA195 HART	<p>For intrinsically safe HART communication with FieldCare via the USB interface.</p> <p> Technical Information TI00404F</p>
Commubox FXA291	<p>Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop.</p> <p> Technical Information TI405C/07</p>
HART Loop Converter HMX50	<p>Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values.</p> <p> <ul style="list-style-type: none"> ▪ Technical Information TI00429F ▪ Operating Instructions BA00371F </p>
Wireless HART adapter SWA70	<p>Is used for the wireless connection of field devices. The WirelessHART adapter can be easily integrated into field devices and existing infrastructures, offers data protection and transmission safety and can be operated in parallel with other wireless networks with minimum cabling complexity.</p> <p> Operating Instructions BA00061S</p>
Fieldgate FXA42	<p>Is used to transmit the measured values of connected 4 to 20 mA analog measuring devices, as well as digital measuring devices</p> <p> <ul style="list-style-type: none"> ▪ Technical Information TI01297S ▪ Operating Instructions BA01778S ▪ Product page: www.endress.com/fxa42 </p>
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. 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> <p> <ul style="list-style-type: none"> ▪ Technical Information TI01342S ▪ Operating Instructions BA01709S ▪ Product page: www.endress.com/smt70 </p>
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> <p> <ul style="list-style-type: none"> ▪ Technical Information TI01418S ▪ Operating Instructions BA01923S ▪ Product page: www.endress.com/smt77 </p>


Service-specific accessories

Accessory	Description
Applicator	<p>Software for selecting and sizing Endress+Hauser measuring devices:</p> <ul style="list-style-type: none"> Choice of measuring devices with industrial requirements Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and accuracy. Graphic illustration 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:</p> <ul style="list-style-type: none"> Via the Internet: https://portal.endress.com/webapp/applicator As a downloadable DVD for local PC installation.
W@M	<p>W@M Life Cycle Management</p> <p>Improved productivity with information at your fingertips. Data relevant to a plant and its components is generated from the first stages of planning and during the asset's complete life cycle.</p> <p>W@M Life Cycle Management is an open and flexible information platform with online and on-site tools. Instant access for your staff to current, in-depth data shortens your plant's engineering time, speeds up procurement processes and increases plant uptime.</p> <p>Combined with the right services, W@M Life Cycle Management boosts productivity in every phase. For more information, see: www.endress.com/lifecyclemanagement</p>
FieldCare	<p>FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.</p> <p> Operating Instructions BA00027S and BA00059S</p>
DeviceCare	<p>Tool for connecting and configuring Endress+Hauser field devices.</p> <p> Innovation brochure IN01047S</p>

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> <p> <ul style="list-style-type: none"> Technical Information TI00133R Operating Instructions BA00247R </p>

Documentation

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

Standard documentation

Brief Operating Instructions

Brief Operating Instructions for the sensor

Measuring device	Documentation code
Proline Prosonic Flow I	KA01511D

Brief Operating Instructions for the transmitter

Measuring device	Documentation code
	HART
Proline 400	KA01510D

Operating Instructions

Measuring device	Documentation code
	HART
Prosonic Flow I 400	BA02085D

Description of device parameters

Measuring device	Documentation code
	HART
Prosonic Flow I 400	GP01166D

Supplementary device-dependent documentation **Special Documentation**

Contents	Documentation code
	HART
Radio approvals for WLAN interface for A309/A310 display module	SD01793D
Heartbeat Technology	SD02712D
Web server	SD02713D

Installation Instructions

Content	Comment
Installation instructions for spare part sets and accessories	Documentation code: specified for each individual accessory → 48.

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