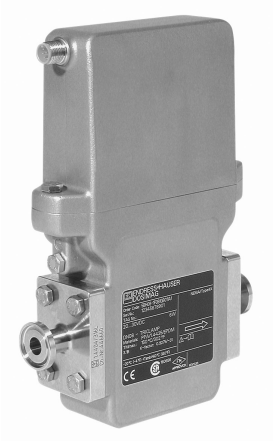
Technical Information
Dosimag

Electromagnetic flowmeter



Flowmeter with maximum repeatability and ultra-compact sensor with hygienic design

Application

- The measuring principle is virtually independent of pressure, density, temperature and viscosity
- For demanding dosing and filling applications

Device properties
- Wetted materials CIP, SIP cleanable
- Nominal diameter: DN 4 to 15 (⅛ to ½")
- Measuring device conform to FDA
- Pulse/frequency/switch output, Modbus RS485
- ATEX, cCSAus
- Excellent and easy cleanable transmitter

Your benefits

- High process safety – high measuring accuracy and repeatability in shortest filling time
- Energy-saving flow measurement – no pressure loss due to cross-section constriction
- Maintenance-free – no moving parts
- Versatile and time-saving wiring – plug connector
- Industry-optimized – ultra-compact design
- For hygiene requirements – stainless steel housing

Endress+Hauser
People for Process Automation

Table of contents

Document information

Symbols used

Electrical symbols

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

Symbols for certain types of information

Symbol	Meaning
✓	**Permitted** Indicates procedures, processes or actions that are permitted.
✓✓	**Preferred** Indicates procedures, processes or actions that are preferred.
✗	**Forbidden** Indicates procedures, processes or actions that are forbidden.
i	**Tip** Indicates additional information.
📖	**Reference to documentation** Refers to the corresponding device documentation.
	Reference to page Refers to the corresponding page number.
	Reference to graphic Refers to the corresponding graphic number and page number.
	Visual inspection

Symbols in graphics

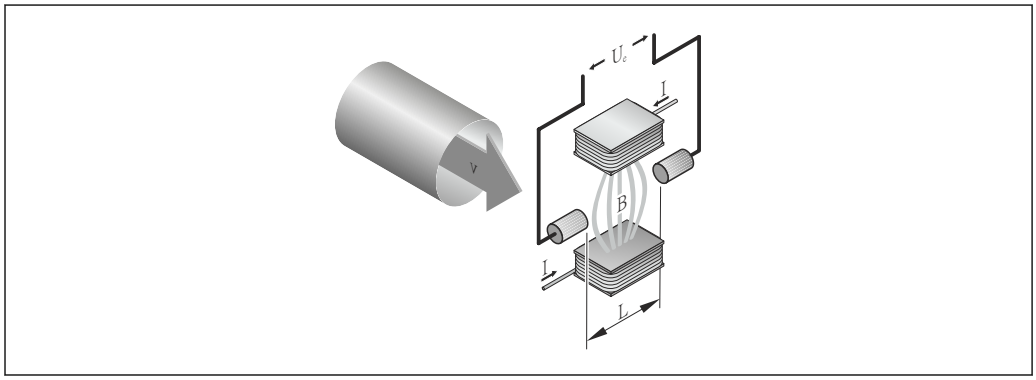
Symbol	Meaning
1, 2, 3,...	Item numbers
1. , 2. , 3. ...	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections
≋➡ A0013441	Flow direction

Symbol	Meaning
 A0011187	**Hazardous area** Indicates a hazardous area.
 A0011188	**Safe area (non-hazardous area)** Indicates the non-hazardous area.

Function and system design

Measuring principle

In accordance with *Faraday's law of magnetic induction* a voltage is induced in a conductor which is moved through a magnetic field.



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

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

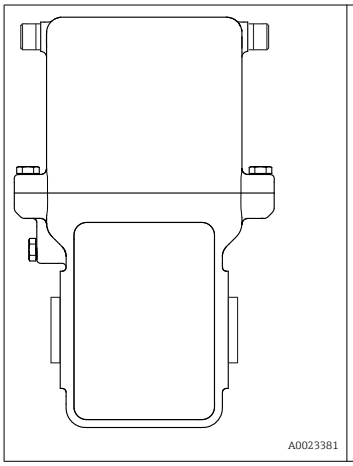
Formulae for calculation

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

Measuring system

Transmitter and sensor

The transmitter and sensor form a single unit.



- Nominal diameter range: DN 4 (5/32"), 8 (5/16"), 15 (½")
- Materials:
  - Transmitter and sensor housing: stainless steel 1.4308 (304)
  - Measuring tube: stainless steel 1.4301 (304)
  - Liner: PFA
  - O-rings: EPDM, silicone, Viton
  - Electrodes: 1.4435 (316L); option Alloy C22, 2.4602 (UNS N06022)

Input

Measured variable

Direct measured variables

Volume flow (proportional to induced voltage)

Measuring range

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

Electrical conductivity: 5 to 10 000 µS/cm

Flow characteristic values in SI units

Nominal diameter	Recommended flow	Factory settings	
	Maximum full scale value	Pulse value	Low flow cut off (v ~ 0.04 m/s)
[mm]	[l/s]	[ml]	[ml/s]
4	0.14	0.005	0.5
8	0.5	0.02	2
15K [1]	1.2	0.1	7
15	1.66	0.1	7

1) Conical version (corresponds to DN 12)

Flow characteristic values in US units

Nominal diameter	Recommended flow	Factory settings	
	Maximum full scale value	Pulse value	Low flow cut off (v ~ 0.13 ft/s)
[in]	[gal/s]	[oz fl]	[oz fl/s]
5/32	0.035	0.0002	0.02
5/16	0.13	0.001	0.08
½K [1]	0.32	0.004	0.25
½	0.44	0.004	0.25

1) Conical version (corresponds to DN 12)

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

Recommended measuring range

"Flow limit" section (→ 21)

Operable flow range

Over 1000 : 1

Status input

Assignable functions	▪ Off ▪ Start batch ▪ Start & stop batch ▪ Reset totalizer 1 ▪ Reset totalizer 2 ▪ Reset totalizer 3 ▪ Reset all totalizers ▪ Flow override
Response time	Range of adjustment: 10 to 200 ms
Active level	▪ High ▪ Low
Value status input	Displays the current input signal level of the status input.

Output

Output signal

Pulse/frequency/switch output (option 3)

Version	Passive, open emitter
Maximum input values	▪ DC 30 V ▪ 25 mA
Voltage drop	For 25 mA: ≤ DC 2 V
Operating mode	
Assignable functions	▪ Off ▪ Pulse ▪ Automatic pulse ▪ Frequency ▪ Switch
Channel 2	▪ Off ▪ Redundant 0° ▪ Redundant 90° ▪ Redundant 180°
Pulse output	
Pulse width	Adjustable: 0.05 to 3.75 ms
Maximum pulse rate	10 000 Impulse/s
Value per pulse	Adjustable
Assignable measured variables	▪ Off ▪ Volume flow
Frequency output	
Output frequency	Adjustable: 0 to 10 000 Hz
Damping	Adjustable: 0 to 999.9 s
Pulse/pause ratio	1:1
Assignable measured variables	Volume flow
Switch output	

Switching behavior	Binary, conductive or non-conductive
Switching delay	Adjustable: 0 to 100 s
Number of switching cycles	Unlimited
Assignable functions	▪ Off ▪ On ▪ Diagnostic behavior – Alarm – Alarm and warning – Warning ▪ Limit value: – Off – Volume flow – Flow velocity ▪ Status Low flow cut off

Switch output (option 4 and 5)

Switch output	
Assignable functions	▪ Open ▪ Closed ▪ Batching
Switch status	▪ Open ▪ Closed

Batch output (option 4 and 5)

Batch control	Functions: ▪ Start ▪ Stop
Quantity last batch	Total measured quantity including the drip quantity of the last batch. Unit: selected unit
Time last batch	Duration of the last batch up to the end of drip quantity measurement. Unit: s
Close time last batch	Closing duration for the last batch from the switch-off time up to the end of drip quantity measurement. Unit: ms
Quantity last drip	Drip quantity of the last batch Unit: selected unit
Current drip correction quantity	Drip correction quantity for the next batch Unit: selected unit
Overall batching quantity	Total of all measured batching processes Unit: selected unit
Batch counter	Number of batching processes Unit: number
Reset overall batching quantity	Functions: ▪ Resetting ▪ Cancel
Batch profile	Functions: Profile 1 to 6
Assignable measured variables	Functions ▪ Off ▪ Volume flow
Batch quantity	Set the batch quantity. Input range: 0 to X Unit: selected unit

Fixed compensation quantity	Set the fixed compensation quantity. Input range: X to X Unit: selected unit
Batch unit	Functions: ▪ cm^3 ▪ dm^3 ▪ m^3 ▪ ml ▪ l ▪ hl ▪ ml ▪ af ▪ ft^3 ▪ fl oz (us) ▪ gal (us) ▪ Mgal ▪ bbl (us) ▪ bbl (imp) ▪ gal (imp) ▪ Mgal (imp) ▪ g ▪ kg ▪ lb ▪ User mass ▪ User vol. ▪ kgal (us)
Drip correction mode	Functions: ▪ Off ▪ Low flow cutoff or fixed time ▪ Fixed time
Measuring time drip quantity	Input range: 0.01 to 100 s
Filter depth drip median	Functions: ▪ Off ▪ Median 3 ▪ Median 5 ▪ Median 7
Average drip correction quantity	Input range: 1 to 100
Batch levels	Functions: ▪ One-level ▪ Two-level ▪ One-level and blow out
Start level 2	Input range: 0 to 100 %
Stop level 2	Input range: 100 to 0 %
Blow out delay	Input range: 1 to 100 s
Blow out duration	Input range: 1 to 100 s
Maximum batch time	Input range: 1 to 1 000 000 s
Maximum flow rate	Set the maximum flow. Input range: 0 to X Unit: selected unit
Disable time pressure shock suppression	Input range: 0 to 100 s

Modbus RS485 (option 4 and 5)

Physical interface	In accordance with EIA/TIA-485-A standard

Signal on alarm

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

Pulse/frequency/switch output (option 3)

Pulse output	
Failure mode	Choose from: ▪ Actual value ▪ No pulses
Frequency output	
Failure mode	Choose from: ▪ Actual value ▪ 0 Hz ▪ Defined value0 to 10 000 Hz
Switch output	
Failure mode	Choose from: ▪ Current status ▪ Open ▪ Closed

Modbus RS485 (option 4 and 5)

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

Low flow cut off

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

Galvanic isolation

- Option 3 (PFS output): all outputs are galvanically isolated from one another.
- Option 4: batch output at supply potential.
- Option 5: batch outputs and auxiliary input at supply potential.

Protocol-specific data

Modbus RS485 (option 4 and 5)

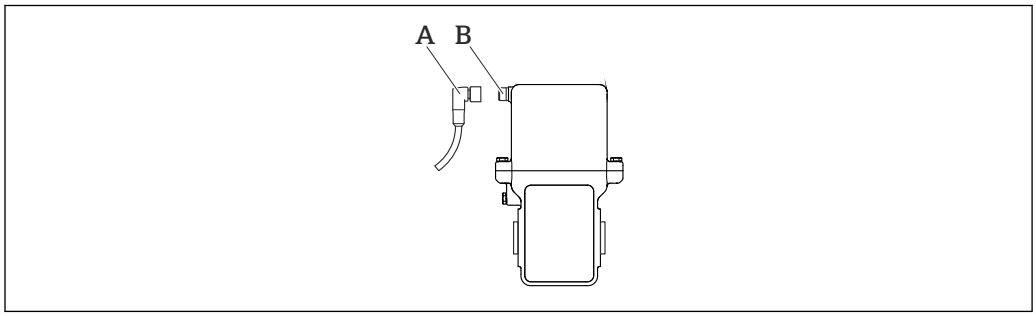
Protocol	Modbus Applications Protocol Specification V1.1
Device type	Slave
Slave address range	1 to 247
Broadcast address range	0
Function codes	▪ 03: Read holding register ▪ 04: Read input register ▪ 06: Write single registers ▪ 08: Diagnostics ▪ 16: Write multiple registers ▪ 23: Read/write multiple registers ▪ 43: Read device identification
Broadcast messages	Supported by the following function codes: ▪ 06: Write single registers ▪ 16: Write multiple registers ▪ 23: Read/write multiple registers
Supported baud rate	▪ 1 200 BAUD ▪ 2 400 BAUD ▪ 4 800 BAUD ▪ 9 600 BAUD ▪ 19 200 BAUD ▪ 38 400 BAUD ▪ 57 600 BAUD ▪ 115 200 BAUD

Data transfer mode	▪ ASCII ▪ RTU
Data access	Each device parameter can be accessed via Modbus RS485. For Modbus register information

Power supply

Pin and socket assignment

Pulse/frequency/status output (option 3)



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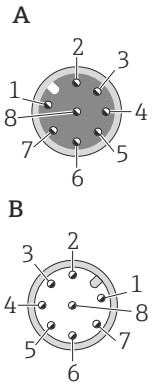
1 Connection (option 3)

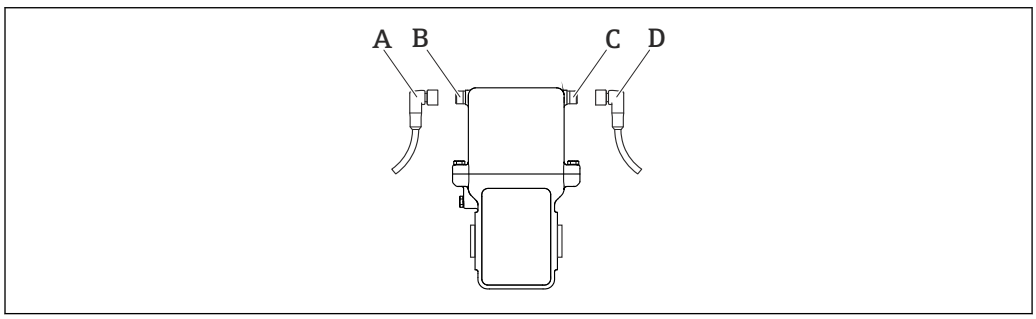
Option 3: Pulse/frequency/status output

RSE8 M12 × 1



Pin	Assignment	
1	L+	Supply voltage: 24 V_{DC} nominal voltage (20 to 30 V_{DC}), 4.5 W
2	+	RX service interface (may not be connected during normal operation)
3	+	TX service interface (may not be connected during normal operation)
4	L-	Supply voltage: 24 V_{DC} nominal voltage (20 to 30 V_{DC}), 4.5 W
5	+	Pulse/frequency/status output (max. 30 V)
6	–	Pulse/frequency/status output 1 (max. 25 mA)
7	–	Pulse/frequency/status output 2 (max. 25 mA)
8	–	GND service interface (may not be connected during normal operation)
Coding	**Plug/socket**	
A	A: Socket B: Plug	

Modbus RS485/batching option (option 4 and 5)



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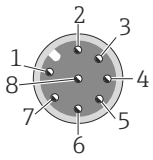
2 Connections for Modbus RS485/batching option (option 4 and 5)

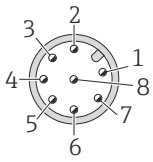
Option 4 and 5: Modbus RS485/batching option

RSE8 M12 × 1

A



B

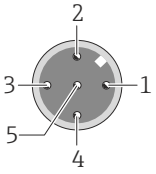


Pin	Assignment	
1	L+	Supply voltage: 24 V_{DC} nominal voltage (20 to 30 V_{DC}), 4.5 W (+500 mA per batch output)
2	+	RX service interface (may not be connected during normal operation)
3	+	TX service interface (may not be connected during normal operation)
4	L-	Supply voltage: 24 V_{DC} nominal voltage (20 to 30 V_{DC}), 4.5 W (+500 mA per batch output)
5		N.C.
6	A	Modbus RS485
7	B	Modbus RS485
8	–	GND service interface (may not be connected during normal operation)
Coding	**Plug/socket**	
A	A: Socket B: Plug	

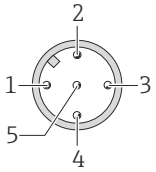
Option 4: Modbus RS485/1 batch output

RSE5 M12 × 1

C



D

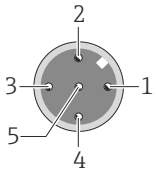


Pin	Assignment	
1	+	AUX
2	–	AUX
3	–	Batch output
4	+	Batch output
5		N.C.
Coding	**Plug/socket**	
A	C: Socket D: Plug	

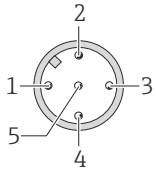
Option 5: Modbus RS485/2 batch outputs

RSE5 M12 × 1

C



D



Pin	Assignment	
1	+	AUX
2	+	Batch output 2
3	–	Batch / AUX
4	+	Batch output 1
5		N.C.
Coding	**Plug/socket**	
A	C: Socket D: Plug	

Supply voltage

Transmitter and sensor

24 V_{DC} Nominal voltage (20 to 30 V_{DC})

- The power supply may not exceed a maximum short-circuit current of 50 A.
- The measuring device may only be connected to SELV, PELV or CLASS 2 circuits.

Power consumption

Transmitter and sensor

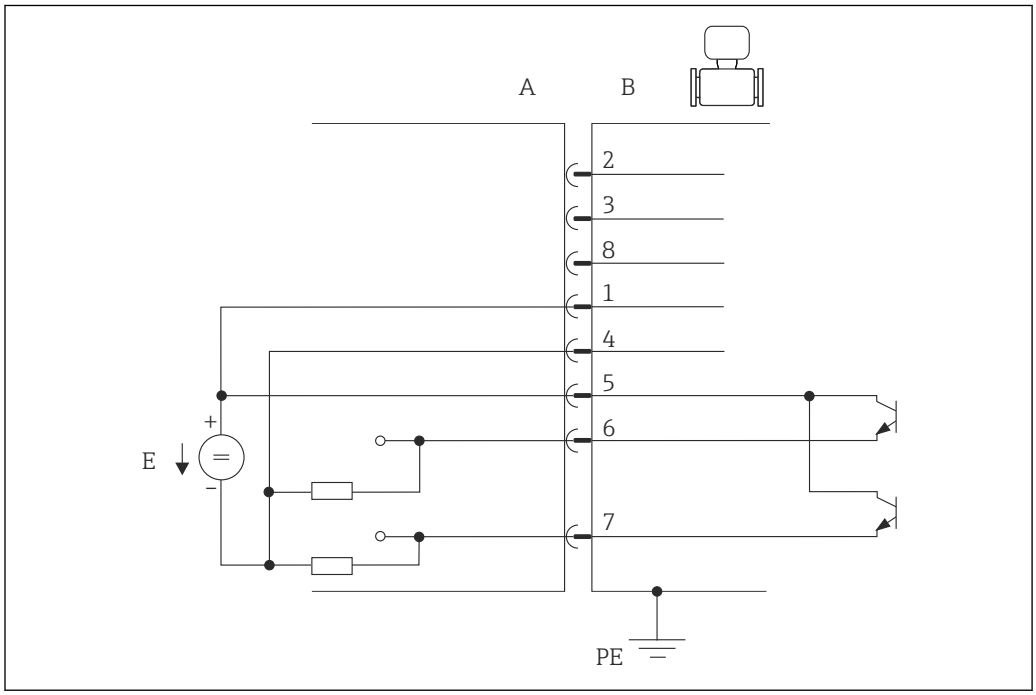
DC: max. 4.5 W (incl. sensor) + 500 mA per batch output

Switch-on current: max. 1 A (< 6 ms)

Electrical connection

M12 socket × 1 for supply voltage and signal outputs.

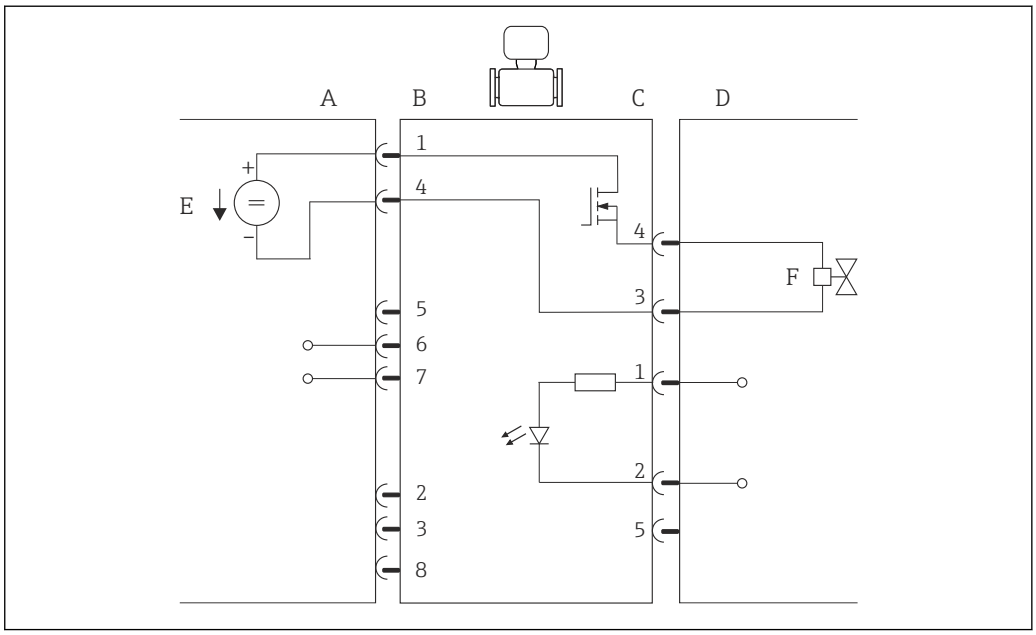
Connection option 3



3 8-pin device connection

A Socket, input
B Connector, input
1 Supply voltage +
2 Service interface
3 Service interface
4 Supply voltage –
5 (+) pulse/frequency/status output
6 (–) pulse/frequency/status output
7 (–) pulse/frequency/status output
8 Service interface
E PELV or SELV power supply

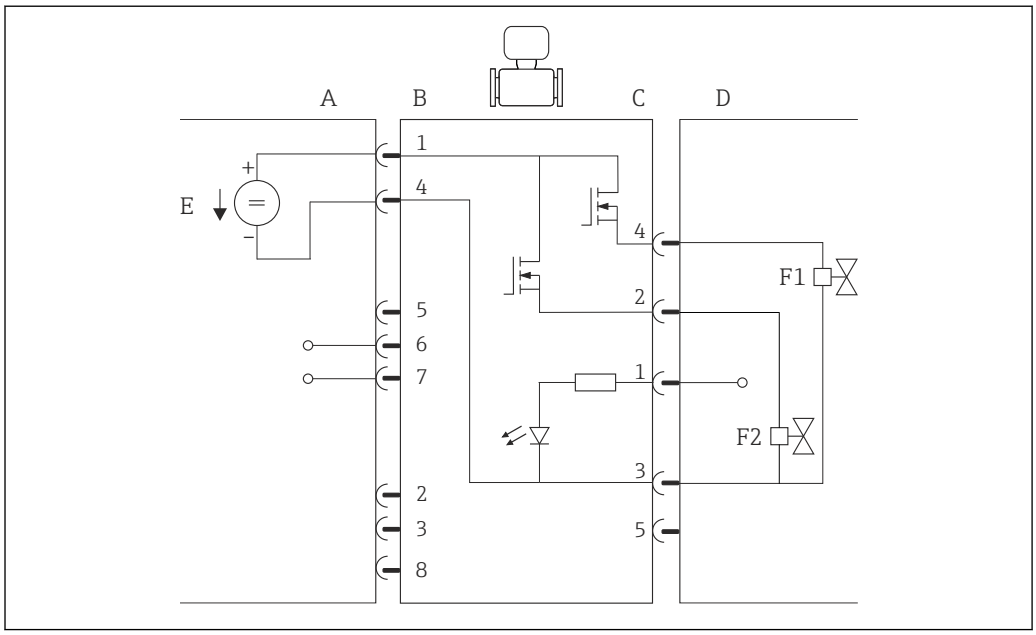
Connection option 4



4 *Batch option with 1 valve*

A Socket, input
B Connector, input
B.1 Supply voltage +
B.2 Service interface
B.3 Service interface
B.4 Supply voltage –
B.5 N.C.
B.6 Modbus A
B.7 Modbus B
B.8 Service interface
C Socket, batch output
C.1 AUX +
C.2 AUX –
C.3 Batch –
C.4 Batch output +
C.5 N.C.
D Connector, batch output
E PELV or SELV power supply
F Valve

Connection option 5

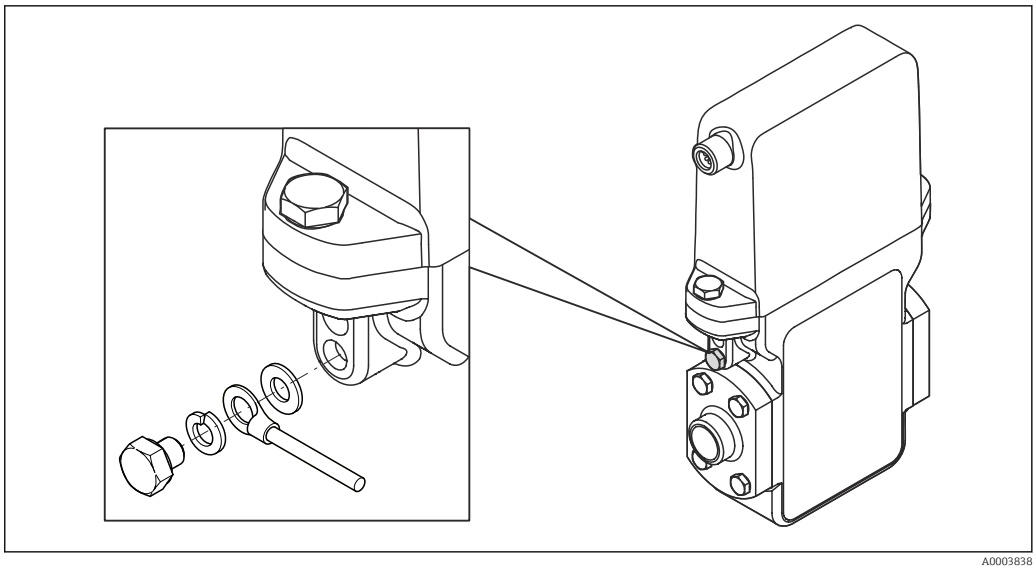


5 Batch option with 2 valves

A Socket, input
B Connector, input
B.1 Supply voltage +
B.2 Service interface
B.3 Service interface
B.4 Supply voltage –
B.5 N.C.
B.6 Modbus A
B.7 Modbus B
B.8 Service interface
C Socket, batch output
C.1 AUX +
C.2 Batch output 2 +
C.3 AUX - / batch 1 and 2 –
C.4 Batch output 1 +
C.5 N.C.
D Connector, batch output
E PELV or SELV power supply
F1 Valve 1
F2 Valve 2

Ground connection

The ground connection is via a cable lug that must be mechanically connected to the ground connection of the measuring device.



6 *Ground connection*

Potential equalization

No potential matching is needed for grounded steel lines.

In the case of devices for hazardous areas, pay attention to the information in the Ex-specific supplementary documentation.

Cable specification

Use connecting cables with a cross-section of at least 0.25 mm² (e.g. AWG23). The temperature specification of the cable must be at least 20 °C higher than the ambient temperature in the application.

Performance characteristics

Reference operating conditions

In accordance with DIN EN 29104
- Medium temperature: +28 ± 2 °C (+82 ± 4 °F)
- Ambient temperature: +22 ± 2 °C (+72 ± 4 °F)
- Warm-up period:30 min

Installation
- Inlet run > 10x DN
- Outlet run > 5x DN
- Sensor and transmitter grounded.
- The sensor is centered in the pipe.

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

Maximum measured error

Error limits under reference operating conditions

o.r. = of reading

Volume flow
- ±0.25 % o.r. ± 1 to 4 m/s (3.3 to 13 ft/s) or
- ±0.5 % o.r. ± 1 mm/s (0.04 in/s) or
- ±5 % o.r.

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

Accuracy of outputs

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

Repeatability

o.r. = of reading

DN 15 (200 ml/s), DN 8 (50 ml/s), DN 4 (10 ml/s); 400 µS/cm

Batch time "t_a" [s]	Relative standard deviation in relation to the batched volume [%]
1.5 s < t_a < 3 s	0.4
3 s < t_a < 5 s	0.2
5 s < t_a	0.1

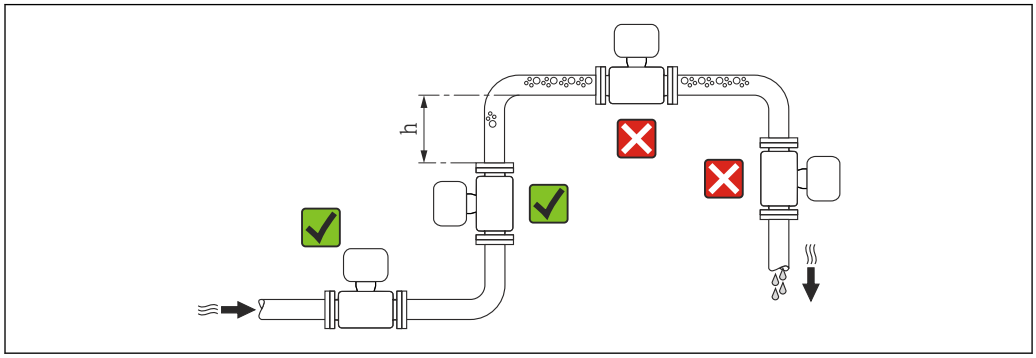
DN 15K (200 ml/s); 400 µS/cm

Batch time "t_a" [s]	Relative standard deviation in relation to the batched volume [%]
1.5 s < t_a < 3 s	0.25
3 s < t_a < 5 s	0.12
5 s < t_a	0.08

Installation

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

Mounting location



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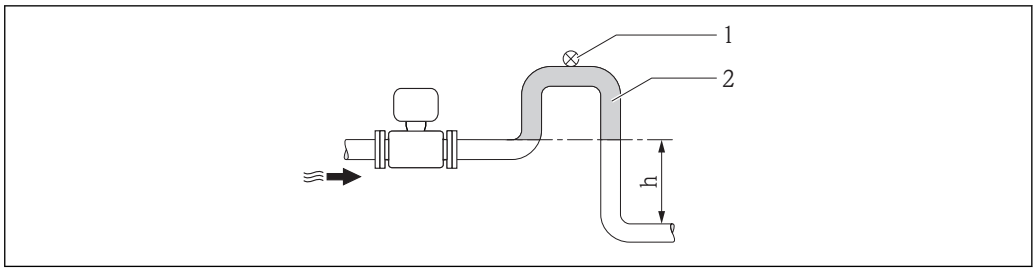
Preferably install the sensor in an ascending pipe, and ensure a sufficient distance to the next pipe elbow: h ≥ 2 × DN

To prevent measuring errors arising from accumulation of gas bubbles in the measuring tube, avoid the following mounting locations in the pipe:
- Highest point of a pipeline.
- Directly upstream of a free pipe outlet in a down pipe.

Installation in down pipes

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

For information on the liner's resistance to partial vacuum (→ 21)

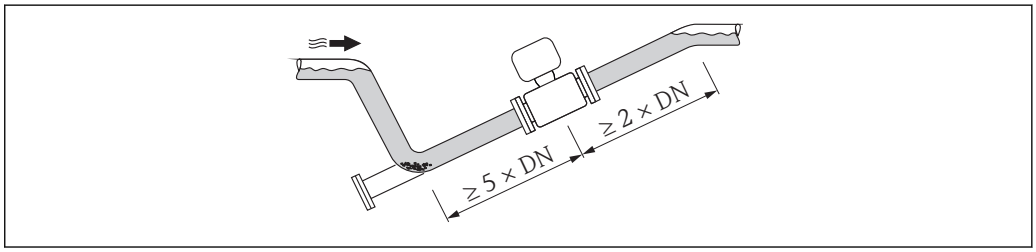


7 *Installation in a down pipe*

1 Vent valve
2 Pipe siphon
h Length of down pipe

Installation in partially filled pipes

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



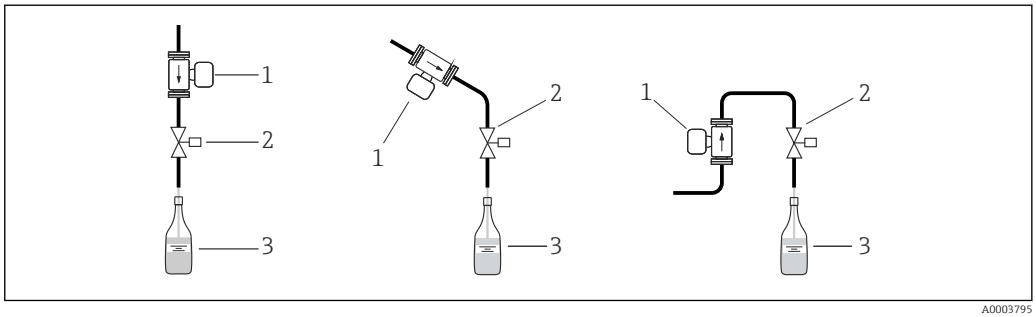
Orientation

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

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

Batching systems

Optimum measurement takes place when the pipe system is completely filled with the medium.

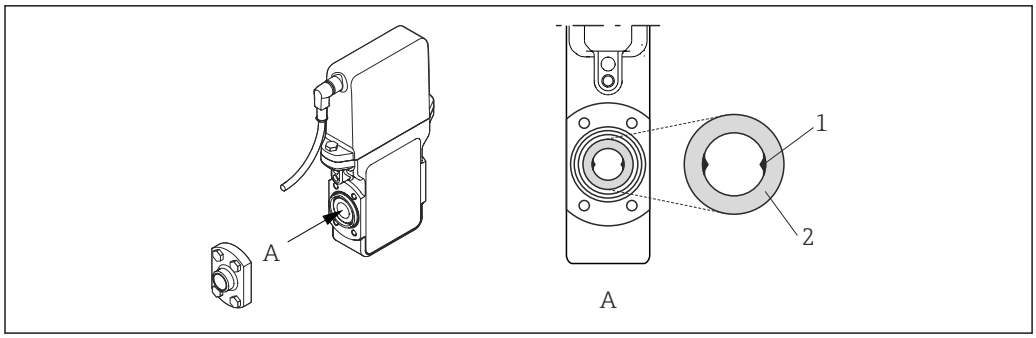


8 *Batching system*

1 Measuring device
2 Batch valve
3 Vessel

Horizontal

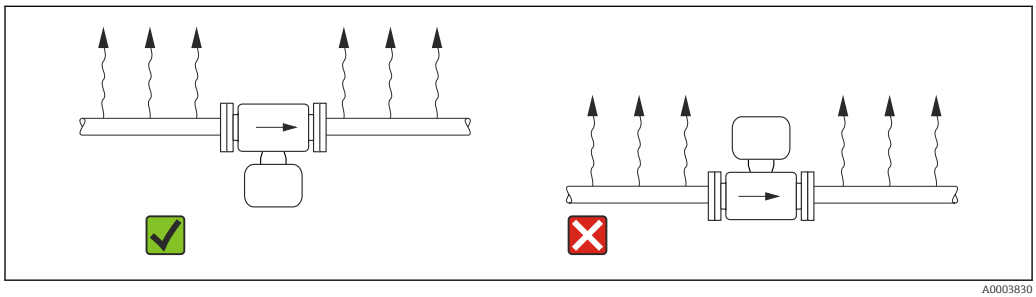
The measuring electrode plane must be horizontal. This prevents brief insulation of the two measuring electrodes by entrained air bubbles.



9 *Horizontal installation*

1 Measuring electrodes
2 Liner

In the event of extreme heating (e.g. for CIP or SIP cleaning processes), we recommend you install the measuring device in such a way that the transmitter part is pointing downwards. This reduces the risk of the electronic components overheating.

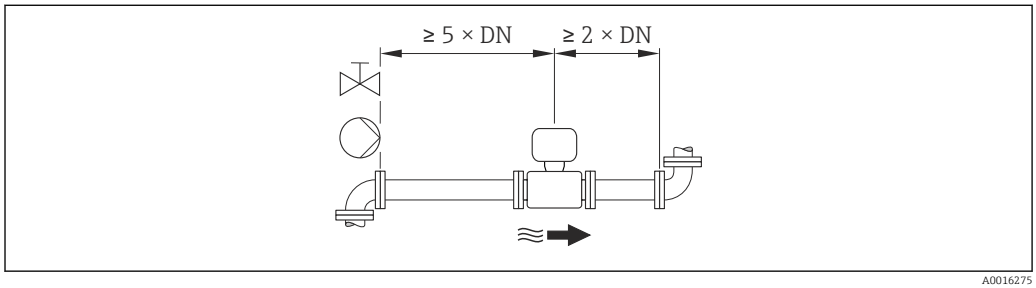


10 *Recommended orientation in the event of extreme heating*

Inlet and outlet runs

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

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



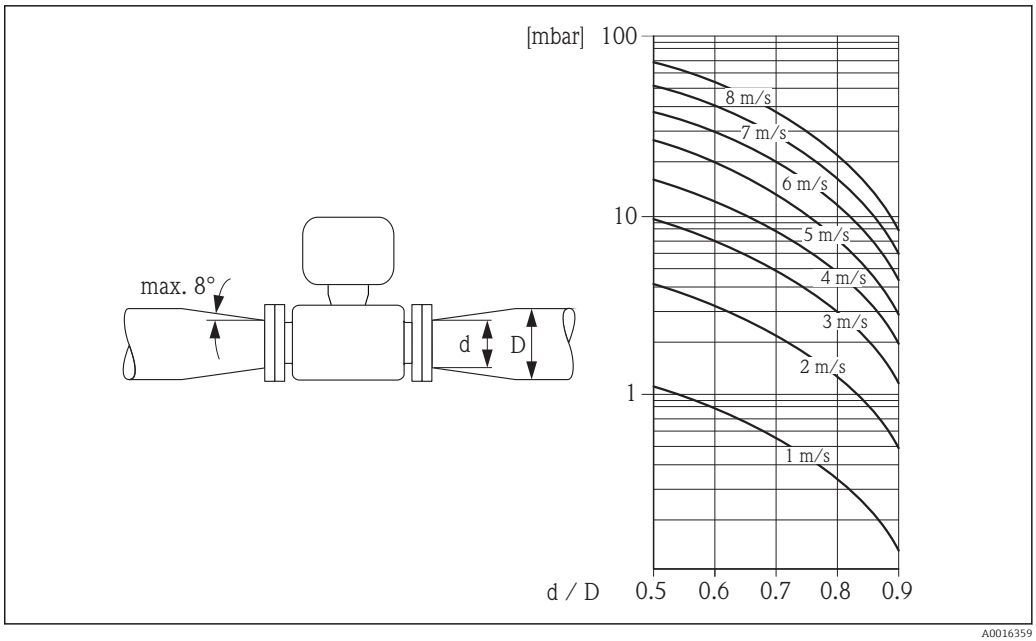
Adapters

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

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

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

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



Environment

Ambient temperature range

Transmitter	−40 to +60 °C (−40 to +140 °F)
Sensor	−40 to +60 °C (−40 to +140 °F)
Liner	Do not exceed or fall below the permitted temperature range of the liner (→ 🖹 20).

Temperature tables

The following interdependencies between the permitted ambient and fluid temperatures apply when operating the device in hazardous areas:

Ex nA

SI units

	°C				
	T5 [100 °C]	**T4 [135 °C]**	**T3 [200 °C]**	**T2 [300 °C]**	**T1 [450 °C]**
Ambient temperature T_a	60	50	45	45	45
Maximum medium temperature T_m	70	105	130	130	130

US units

	°F				
	T5 [212 °F]	**T4 [275 °F]**	**T3 [392 °F]**	**T2 [572 °F]**	**T1 [842 °F]**
Ambient temperature T_a	140	122	113	113	113
Maximum medium temperature T_m	158	221	266	266	266

The minimum **medium temperature** is −20 °C (−4 °F).

The minimum **ambient temperature** is −40 °C (−40 °F).

Storage temperature

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

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

Degree of protection

Transmitter and sensor
As standard: IP67, type 4X enclosure

Shock resistance

Acceleration up to 2 g following IEC 60068-2-6

Vibration resistance

Acceleration up to 2 g following IEC 60068-2-6

Interior cleaning

- Cleaning in place (CIP)
- Sterilization in place (SIP)

Electromagnetic compatibility (EMC)

According to IEC/EN 61326

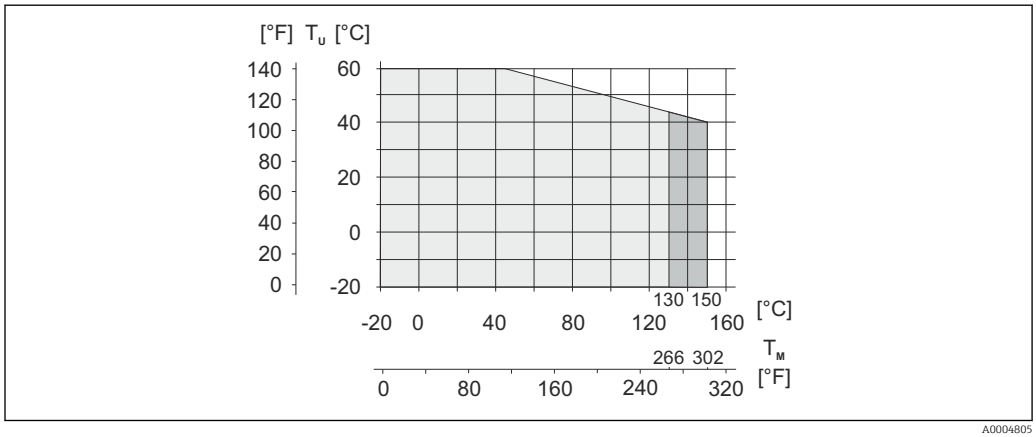
For details refer to the Declaration of Conformity.

Process

Medium temperature range

- Sensor:–20 to +130 °C (–4 to +266 °F)
- Cleaning: +150 °C (+302 °F) / 60 min for CIP and SIP processes

Seals:
- EPDM: –20 to +130 °C (–4 to +266 °F) (max. +150 °C (302 °F) for cleaning
- Silicon:–20 to +130 °C (–4 to +266 °F)
- Viton:0 to +150 °C (+32 to +302 °F)



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T_U Ambient temperature

T_M Medium temperature

Light-gray area: standard fluid temperature range

Dark-gray area: fluid temperature range for cleaning

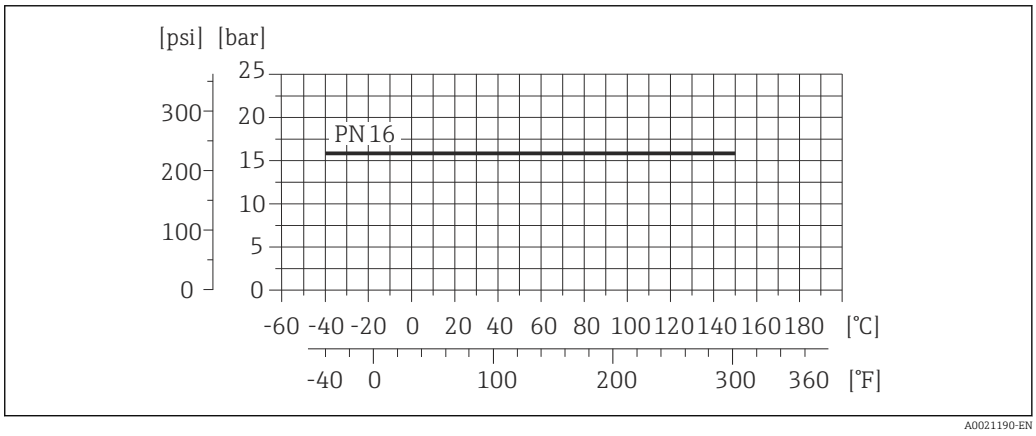
Conductivity

- ≥ 5 µS/cm for liquids in general
- 10 µS/cm for demineralized water

Pressure-temperature ratings

Permitted process pressure: 16 bar (232 psi)

Process connection: weld-in nipple according to DIN 11850, ODT/SMS; Clamp L14 AM7



11 *Process connection material: 1.4404 (316L) (with molded seal)*

Pressure tightness

Liner: PFA

Nominal diameter		Limit values for absolute pressure in [mbar] ([psi]) for fluid temperatures:	
[mm]	[in]	+25 °C (+77 °F)	+150 °C (+302 °F)
4 to 15	5/32 to ½	< 1 mbar (0.402 inH_2O) (0)	< 1 mbar (0.402 inH_2O) (0)

Flow limit

The diameter of the pipe and the flow rate determine the nominal diameter of the sensor. The optimum velocity of flow is between 2 to 3 m/s (6.56 to 9.84 ft/s). Also match the velocity of flow (v) to the physical properties of the fluid:
- v < 2 m/s (6.56 ft/s): for abrasive fluids (e.g. cleaning agent)
- v > 2 m/s (6.56 ft/s): for fluids producing buildup (e.g. liquids that contain oil and sugar)

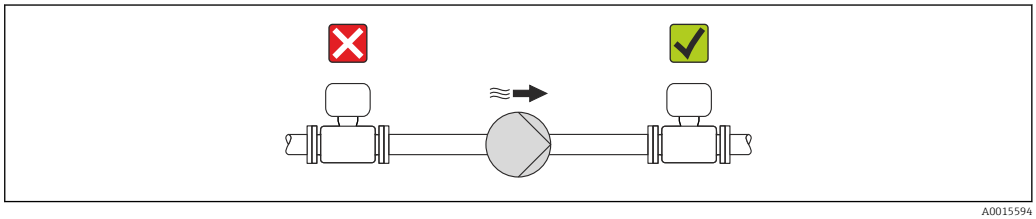
A necessary increase in the flow velocity can be achieved by reducing the sensor nominal diameter.

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

Pressure loss

- For DN 8 (5/16") and DN 15 (½") no pressure loss occurs if the sensor is installed in a pipe with the same nominal diameter.
- Pressure losses for configurations incorporating adapters according to DIN EN 545 (→ 18)

System pressure



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

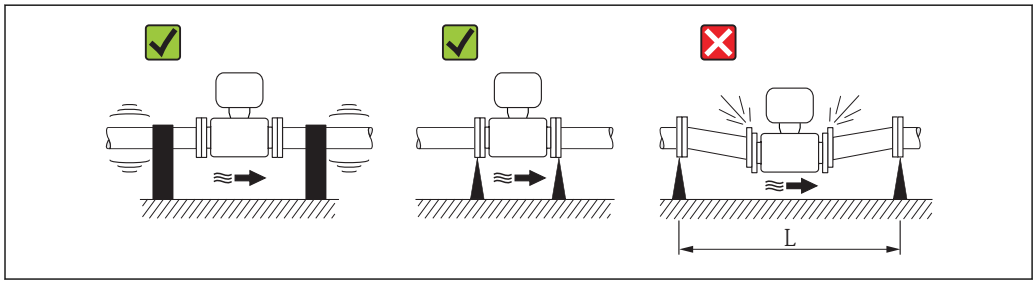
Furthermore, install pulse dampers if reciprocating, diaphragm or peristaltic pumps are used.

- For information on the liner's resistance to partial vacuum (→ 21)
- Information on the shock resistance of the measuring system (→ 20)
- Information on the vibration resistance of the measuring system (→ 20)

Vibrations

In the event of very strong vibrations, the pipe and sensor must be supported and fixed.

Information on the shock resistance of the measuring system (→ 20)
Information on the vibration resistance of the measuring system (→ 20)



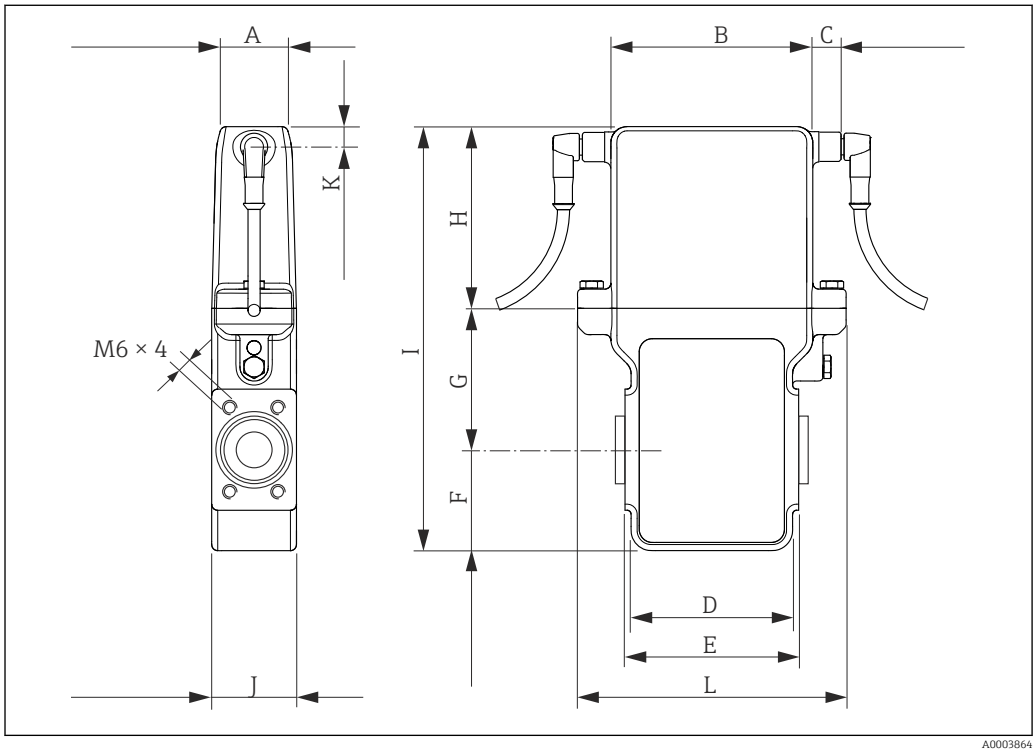
12 *Measures to avoid device vibrations (L > 10 m (33 ft))*

Mechanical construction

Design, dimensions

Compact version

Order code for "Housing", option B "Compact IP67 NEMA4X, stainless steel"

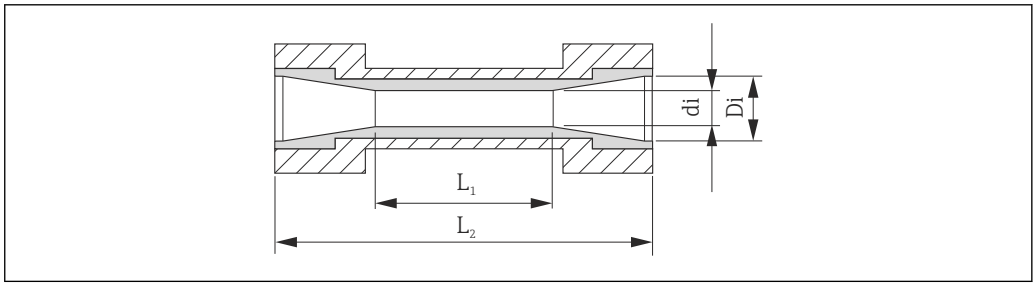


Dimensions in SI units

L [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	H [mm]	I [mm]	J [mm]	K [mm]
133	33.4	100	12	80	86	50	70	90	210	42	10

Dimensions in US units

L [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G [in]	H [in]	I [in]	J [in]	K [in]
5.24	1.31	3.94	0.47	3.15	3.39	1.97	2.76	3.54	8.27	1.65	0.39



13 *Measuring tube dimensions*

Dimensions in SI units

DN [mm]	L_1 [mm]	L_2 [1] [mm]	di [mm]	Di [mm]
4	44	90	4.5	9
8	–	90	9	9
15K [2]	20	90	12	16
15	–	90	16	16

1) Total length depends on the process connections
2) Conical version (corresponds to DN 12)

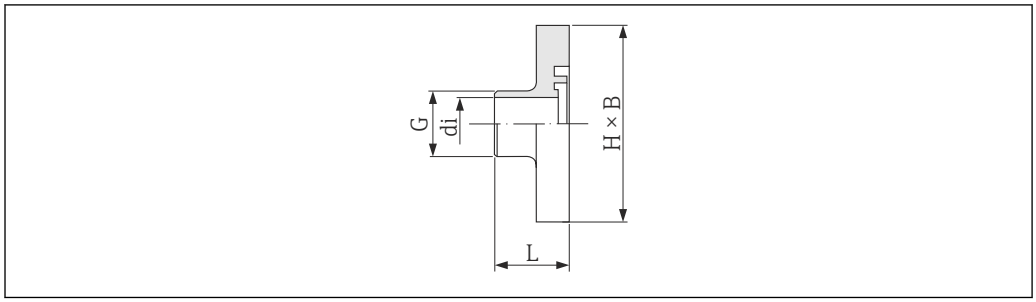
Dimensions in US units

DN [in]	L_1 [in]	L_2 [1] [in]	di [in]	Di [in]
5/32	1.73	3.54	0.17	0.35
5/16	–	3.54	0.35	0.35
½K [2]	0.79	3.54	0.47	0.63
½	–	3.54	0.63	0.63

1) Total length depends on the process connections
2) Conical version (corresponds to DN 12)

Process connections in SI units

Weld-in nipples



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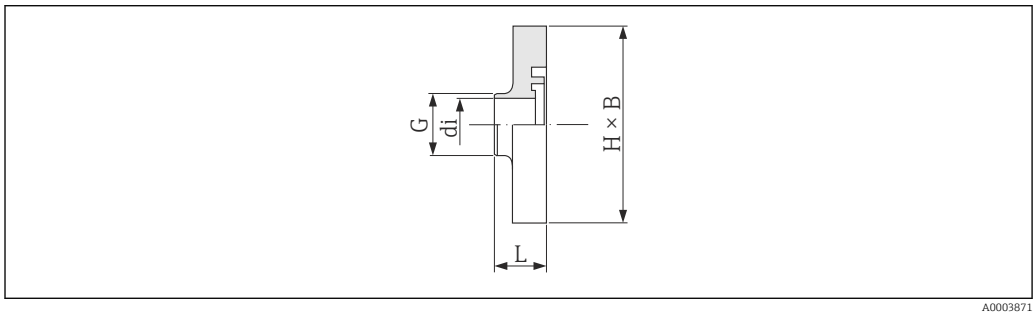
DN sensor [mm]	Suits pipe DIN 11850	di [mm]	G [mm]	L [mm]	H x B [mm]
4 8	14 × 2	9	14	23.3	60 × 42
15K [1)] 15	20 × 2	16	20	23.3	60 × 42

1) Conical version (corresponds to DN 12)

- Length = (2 × L) + 86 mm
- It is essential to take the internal diameters of the measuring tube and process connection (di) into account when cleaning with pigs!

Weld-in nipple ODT/SMS



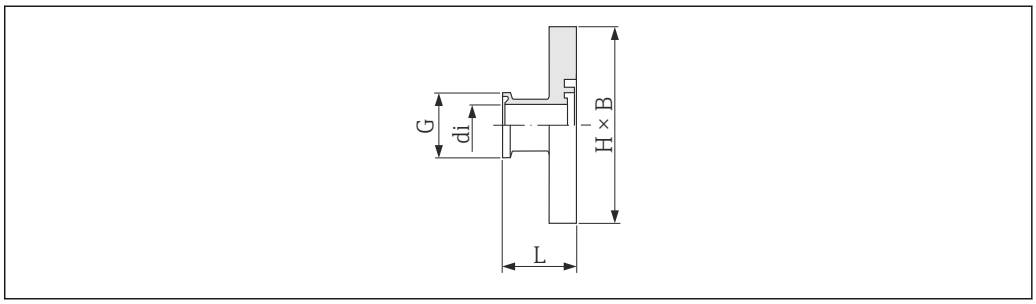
A0003871

DN sensor [mm]	Suits pipe ODT/SMS	di [mm]	G [mm]	L [mm]	H × B [mm]
4 8	12.7 × 1.65	9	12.7	16.1	60 × 42
15K [1)] 15	19.1 × 1.65	16	19.1	16.1	60 × 42

1) Conical version (corresponds to DN 12)

- Length = (2 × L) + 86 mm
- It is essential to take the internal diameters of the measuring tube and process connection (di) into account when cleaning with pigs!

Tri-Clamp



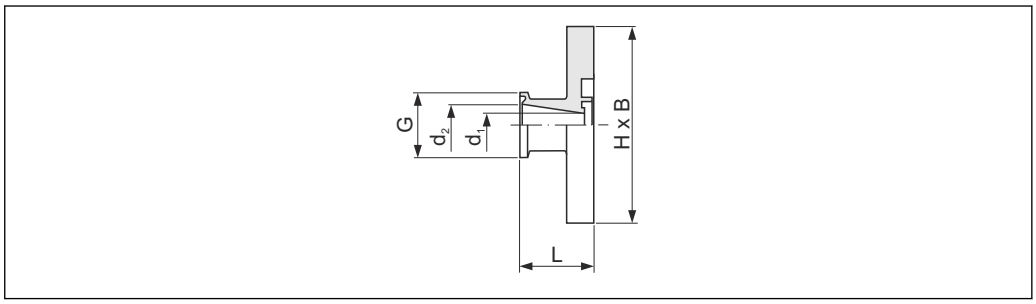
A0003872

DN sensor [mm]	Suits pipe ODT/SMS	di [mm]	G [mm]	L [mm]	H × B [mm]
4 8	12.7 × 1.65	9.4	25.0	28.5	60 × 42
15K [1)] 15	19.1 × 1.65	15.8	25.0	28.5	60 × 42

1) Conical version (corresponds to DN 12)

- Length = (2 × L) + 86 mm
- It is essential to take the internal diameters of the measuring tube and process connection (di) into account when cleaning with pigs!

Tri-Clamp (conical)



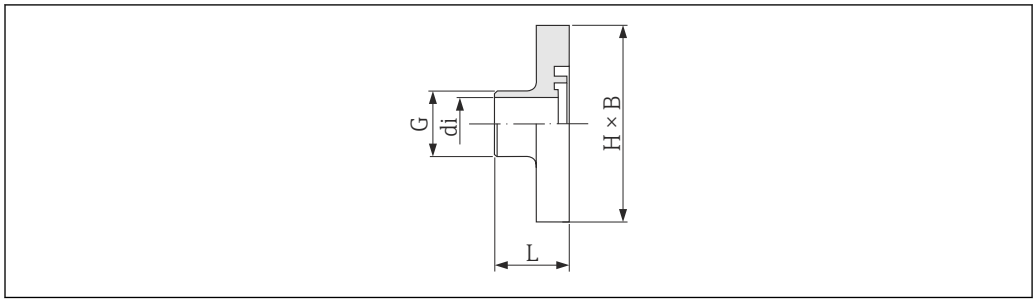
A0003878

DN sensor [mm]	Suits pipe DIN 11850	d_1 [mm]	d_2 [mm]	G [mm]	L [mm]	H × B [mm]
4 8	Pipe 19.1 × 1.65	9	15.8	25.0	28.5	60 × 42

- Length = (2 × L) + 86 mm
- It is essential to take the internal diameters of the measuring tube and process connection (di) into account when cleaning with pigs!

Process connections in US units

Weld-in nipples



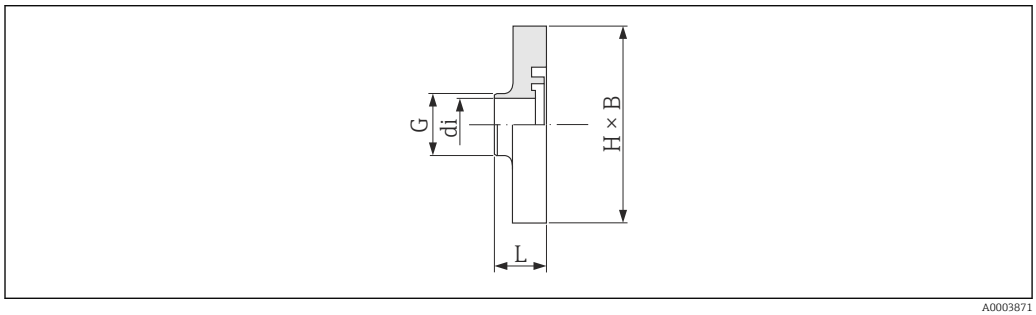
A0003870

DN sensor [in]	Suits pipe DIN 11850	di [in]	G [in]	L [in]	H × B [in]
5/32 5/16	14 × 2	0.35	0.55	0.92	2.36 × 1.65
½K 1) ½	20 × 2	0.63	0.79	0.92	2.36 × 1.65

1) Conical version (corresponds to DN 12)

- Length = (2 × L) + 86 mm
- It is essential to take the internal diameters of the measuring tube and process connection (di) into account when cleaning with pigs!

Weld-in nipple ODT/SMS



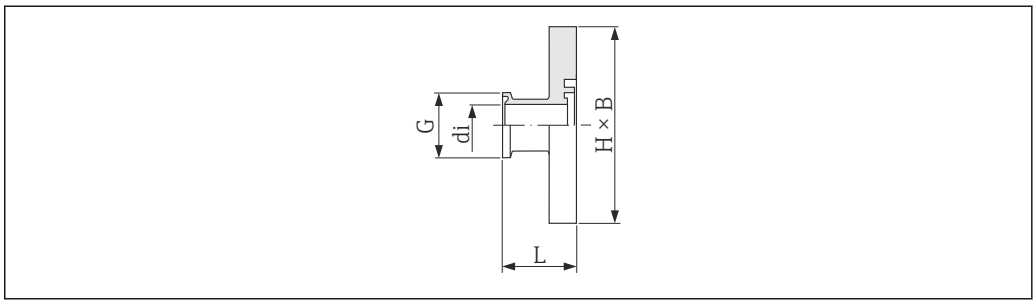
A0003871

DN sensor [in]	Suits pipe ODT/SMS	di [in]	G [in]	L [in]	H × B [in]
5/32 5/16	12.7 × 1.65	0.35	0.5	0.63	2.36 × 1.65
½K 1) ½	19.1 × 1.65	0.63	0.75	0.63	2.36 × 1.65

1) Conical version (corresponds to DN 12)

- Length = (2 × L) + 86 mm
- It is essential to take the internal diameters of the measuring tube and process connection (di) into account when cleaning with pigs!

Tri-Clamp



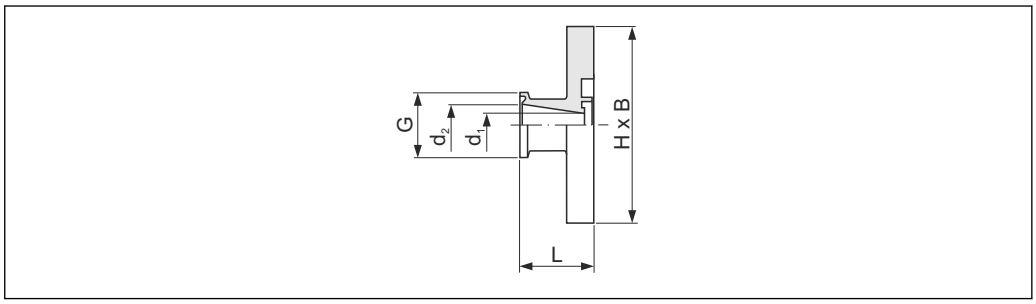
A0003872

DN sensor [in]	Suits pipe ODT	di [in]	G [in]	L [in]	H × B [in]
5/32 5/16	ODT ½	0.37	0.98	1.12	2.36 × 1.65
½K 1) ½	ODT ¾	0.62	0.98	1.12	2.36 × 1.65

1) Conical version (corresponds to DN 12)

- Length = (2 × L) + 86 mm
- It is essential to take the internal diameters of the measuring tube and process connection (di) into account when cleaning with pigs!

Tri-Clamp (conical)



A0003878

DN sensor [in]	Suits pipe ODT	d_1 [in]	d_2 [in]	G [in]	L [in]	H × B [in]
5/32 5/16	ODT ¾	0.35	0.62	1.12	2.36 × 1.65	2.36 × 1.65

- Length = (2 × L) + 86 mm
- It is essential to take the internal diameters of the measuring tube and process connection (di) into account when cleaning with pigs!

Weight

Compact version

Weight in SI units

DN [mm]	Weight [kg]
4	2.8
8	2.8
15	2.8

Weight in US units

DN [in]	Weight [lbs]
5/32	6.17
5/16	6.17
½	6.17

Materials

Transmitter housing

Stainless steel 1.4308 (304)

Transmitter and sensor housing

Acid-resistant and alkali-resistant external surface, stainless steel 1.4308 (304)

Measuring tube

Stainless steel 1.4301 (304)

Liner

PFA

Process connections

- Weld-in nipple: 1.4404 (316L)
- Weld-in nipple, aseptic: 1.4404 (316L)
- Tri-Clamp: 1.4404 (316L)

List of all available process connections (→ 28)

Seals

Molded seal (EPDM, silicone, Viton)

Fitted electrodes

- Standard: stainless steel 1.4435 (316L)
- Optional: Alloy C22, 2.4602 (UNS N06022)

Process connections

With aseptic molded seal:
- Weld-in nipple (DIN 11850, ODT / SMS)
- Tri-Clamp (L14 AM7)

For information on the materials of the process connections (→ 28)

Operability

Local display

The measuring device does not have a display or display elements.

Remote operation

Operation takes place via Endress+Hauser's DeviceCare and FieldCare configuration and service programs. This can be used to configure functions and read off measured values.

In the case of measuring devices with the batching option it is also possible to configure and read measured values via Modbus.

Certificates and approvals

CE mark

The measuring system is in conformity with the statutory requirements of the applicable EC Directives. These are listed in the corresponding EC Declaration of Conformity along with the standards applied.

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

C-Tick symbol

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

Ex approval

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

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

ATEX

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

Ex nA

Category	Type of protection
II3G	Ex nA IIC T5-T1 Gc

cCSAus

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

NI

Category	Type of protection
Class I Division 2 Groups ABCD	NI (non-incendive version)

Sanitary compatibility

- 3A approval and EHEDG-certified
- Seals → in conformity with FDA

Pressure Equipment Directive

- With the PED/G1/x (x = category) marking on the sensor nameplate, Endress+Hauser confirms compliance with the "Essential Safety Requirements" specified in Annex I of the Pressure Equipment Directive 97/23/EC.
- Devices bearing this marking (PED) are suitable for the following types of medium: Media in Group 1 and 2 with a vapor pressure greater than, or smaller and equal to0.5 bar (7.3 psi)
- Devices not bearing this marking (PED) are designed and manufactured according to good engineering practice. They meet the requirements of Art.3 Section 3 of the Pressure Equipment Directive 97/23/EC. The range of application is indicated in tables 6 to 9 in Annex II of the Pressure Equipment Directive.

Other standards and guidelines

- EN 60529
  Degrees of protection provided by enclosures (IP code)
- EN 61010-1
  Safety requirements for electrical equipment for measurement, control and laboratory use
- IEC/EN 61326
  Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements).
- CSA-C22.2 No. 142-M1987
  Process Control Equipment
- CAN/CSA-C22.2 No. 1010.1-92
  Safety Requirements for Electrical Equipment for Measuring, Control and Laboratory Use. Pollution degree 2, Installation Category I
- ANSI/ISA-S82.01
  Safety Standard for Electrical and Electronic Test, Measuring, Controlling and related Equipment - General Requirements. Pollution degree 2, Installation Category I

Ordering information

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

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

Accessories

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

Device-specific accessories

For the sensor

Accessories	Description
Seal set	For regular replacement of the seals on the process connections.
Housing seal	To seal the transmitter
Mounting kit	Consists of: ▪ 2 process connections ▪ Threaded fasteners ▪ Seals

Communication-specific accessories

Accessories	Description
Adapter connection	Adapter connections for installing on other electrical connections
RSE8 adapter	RSE8 connection jack, 8-pin adapter (RSE8), 24 V DC, pulse, status
RSE5 adapter	RSE8 connection jack, 5-pin adapter (RSE5), 24 V DC, pulse, status
RSE4 adapter	RSE8 connection jack, 4-pin adapter (RSE4), 24 V DC, pulse

FXA 291	Service interface connecting cable from the device to the PC for using the “DeviceCare” operating software
RSE8 supply cable	RKWTN8-56/5 P92 cable

Service-specific accessories

Accessories	Description
Applicator	Software for selecting and sizing Endress+Hauser measuring devices: ▪ Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, accuracy or process connections. ▪ Graphic illustration of the calculation results Administration, documentation and access to all project-related data and parameters over the entire life cycle of a project. Applicator is available: ▪ Via the Internet: https://wapps.endress.com/applicator ▪ On CD-ROM for local PC installation.
W@M	Life cycle management for your plant W@M supports you with a wide range of software applications over the entire process: from planning and procurement, to the installation, commissioning and operation of the measuring devices. All the relevant device information, such as the device status, spare parts and device-specific documentation, is available for every device over the entire life cycle. The application already contains the data of your Endress+Hauser device. Endress +Hauser also takes care of maintaining and updating the data records. W@M is available: ▪ Via the Internet: www.endress.com/lifecyclemanagement ▪ On CD-ROM for local PC installation.
DeviceCare and FieldCare	FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition. For details, see Operating Instructions BA00027S and BA00059S
Commubox FXA291	Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop. For details, see "Technical Information" TI00405C

Supplementary documentation

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

Standard documentation

Brief Operating Instructions

Measuring device	Documentation code
Dosimag	KA01175D

Operating Instructions

Measuring device	Documentation code	
	Pulse/frequency/status output Option 3	Modbus RS485 Option 4 and 5
Dosimag	BA00098D	BA01321D

Supplementary device-dependent documentation

Safety Instructions

Contents	Documentation code
ATEX Ex nA	XA01332D
cCSAus NI	FES0231

Special Documentation

Contents	Documentation code
Modbus RS485 Register Information	SD01148D

Registered trademarks

Modbus®
Registered trademark of SCHNEIDER AUTOMATION, INC.

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VITON ®
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