

# Electromagnetic Flow Measuring System – Two-wire, loop-powered *promag 23 H*

**Flow measurement in hygiene, food and beverage or process applications**



## Features and benefits

- Nominal diameters DN 2...100
- PFA lining for cleaning temperatures up to +150 °C (+180 °C in preparation)
- Guaranteed product quality, because suitable for CIP/SIP cleaning and piggable
- 3A approval and EHEDG-tested
- Measuring accuracy:  $\pm 0.5\%$
- Robust field housing, IP 67
- "Touch control": operation without opening the housing - also in Ex environment
- Quick Setup menu for straightforward commissioning in the field (in preparation)
- Connecting to all mainstream transmitter power supplies and input cards of process control systems

- Communication: HART is standard
- Intrinsically safe Ex ia for installation in zone 1 (ATEX, FM, CSA, etc.)
- Transmitter supply:
  - Non-Ex environment: 12...30 V
  - Ex environment: 13.9...30 V
- Reduced installation and operation costs

## Application

All fluids with a minimum conductivity of  $\geq 50 \mu\text{S}/\text{cm}$  can be measured:

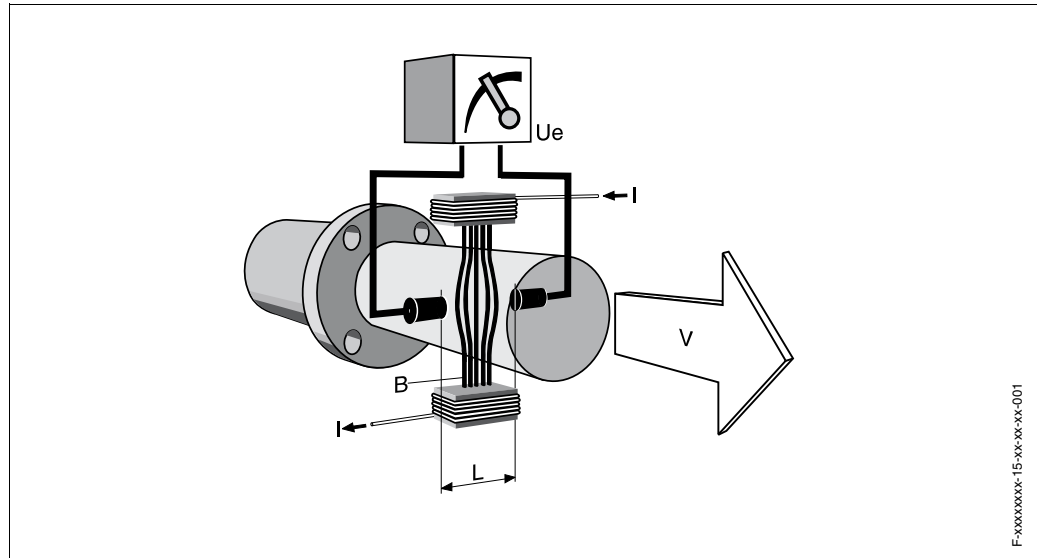
- beverages, e.g. fruit juice, beer, wine
- salt solutions
- acids, alkalis, etc.

## Function and system design

### Measuring principle

*Faraday's law of induction* states that a voltage is induced in a conductor moving in a magnetic field.

In electromagnetic measuring, the flowing medium corresponds to the moving conductor. The induced voltage is proportional to the flow velocity and is detected by two measuring electrodes and transmitted to the amplifier. Flow volume is computed on the basis of the pipe's diameter. The constant magnetic field is generated by a switched direct current of alternating polarity.



$$U_e = B \cdot L \cdot v$$

$$Q = A \cdot v$$

$U_e$  = induced voltage  
 $B$  = magnetic induction (magnetic field)  
 $L$  = electrode gap  
 $v$  = flow velocity  
 $Q$  = volume flow  
 $A$  = pipe cross-section  
 $I$  = current

### Measuring system

The measuring system consists of a transmitter and a sensor (compact version).

- Promag 23 transmitter
- Promag H sensor (DN 2...100)

## Input variables

### Measured variable

Flow rate (proportional to induced voltage)

### Measuring range

Typically  $v = 0.01 \dots 10$  m/s with the specified measuring precision

### Operable flow range

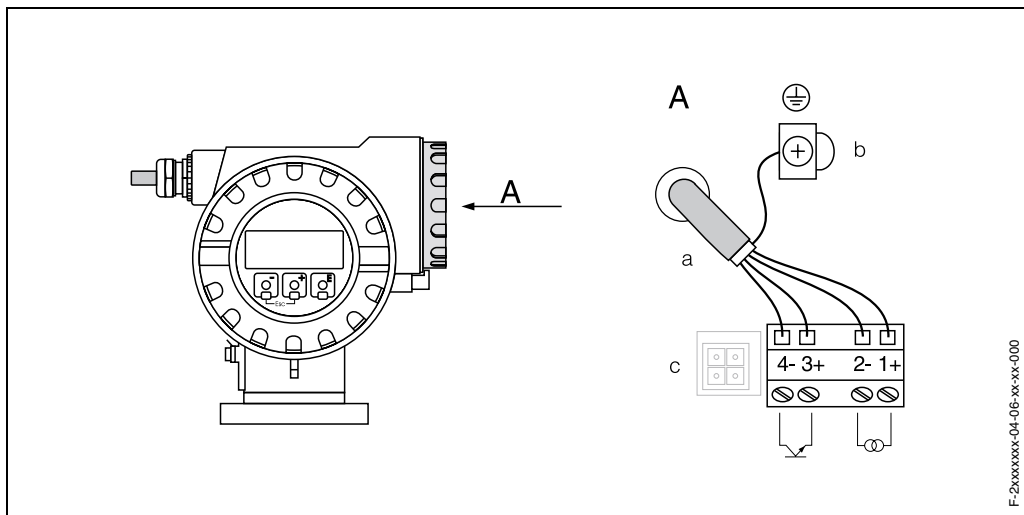
Over 1000 : 1

## Output variables

<b>Output signal</b>	<ul style="list-style-type: none"> <li>• Applied direct current 4...20 mA. Input from DC voltage source. Terminal voltage: 12...30 V, 13.9...30 V (Ex i) Resolution: 4.4 <math>\mu</math>A</li> <li>• Pulse/frequency output: open collector, passive, galvanically isolated, 30 V DC, 10 mA, configurable as status output: e.g. for error message, empty pipe detection, direction of flow, limit value <i>Frequency output:</i> full scale frequency 2...10000 Hz (<math>f_{\max} = 12500</math> Hz), on/off ratio 1:1, pulse width max. 10 s. <i>Pulse output:</i> pulse value and pulse polarity adjustable, pulse width adjustable (0.05...2 s), above a fre- quency of 1 / (2 x pulse width) the on/off ratio is 1:1, pulse frequency max. 50 Hz</li> <li>• Ex i version: <ul style="list-style-type: none"> <li>– Power-supply and signal circuits and pulse output with "intrinsically safe" protection rating, EEx ia IIC and EEx ia IIB, only for connection to certified, intrinsically safe circuits with the fol- lowing maximum values: <math>U_i = 30</math> V, <math>I_i = 150</math> mA, <math>P_i = 810</math> mW Effective internal inductance: negligible Effective internal capacitance: <math>C_i \leq 25</math> nF</li> <li>– Pulse output: Maximum values: <math>U_i = 30</math> V, <math>I_i = 10</math> mA, <math>P_i = 1</math> W Effective internal inductance: negligible Effective internal capacitance: negligible</li> </ul> </li> </ul>
<b>Signal on alarm</b>	<ul style="list-style-type: none"> <li>• Current output → failure response selectable</li> <li>• Pulse/frequency output → failure response selectable</li> <li>• Status output → "non-conductive" by fault or power supply failure</li> </ul>
<b>Load</b>	<p>With HART generally: <math>R_L \geq 250 \Omega</math></p> <p>Non-Ex environment: <math>R_L = \frac{U_S - 12}{0,022}</math></p> <p>Ex environment: <math>R_L = \frac{U_S - 13,9}{0,022}</math></p> <p><math>R_L</math> = load, load resistance <math>U_S</math> = supply voltage (12...30 V, 13.9...30 V for Ex i)</p>
<b>Low flow cutoff</b>	Switch points for low flow cutoff are selectable
<b>Galvanic isolation</b>	Inputs/outputs are galvanically isolated from sensor and from each other.

## Power supply

### Electrical connection measuring unit



- a Signal cable (the Ex version requires the use of separate cables for transmitter supply and frequency output):  
Terminal No. **1+ / 2-**: transmitter supply / current output  
Terminal No. **3+ / 4-**: pulse / frequency output
- b Grounding terminal for signal-cable shield
- c Service plug

Outputs / inputs	Terminal No.	
	1+ / 2-	3+ / 4-
23**_***** <b>W</b>	Current output HART	-
23**_***** <b>A</b>	Current output HART	Pulse/frequency output

### Potential equalisation

Sensor and medium must have the same electrical potential in order to ensure measuring accuracy and avoid corrosion damage to the electrodes. In the case of the Promag H sensor, this is always ensured by the metallic, medium-wetted process connections. Consequently, the standard versions require no special measures for potential equalisation.

#### Caution:

If the process connections are made of a synthetic material, grounding rings have to be used to ensure that potential is equalised. Grounding rings are available as accessories.

### Cable entry

- Cable entry M20 x 1.5 (8...12 mm)
- Threads for cable entries, Pg 13.5 (5...15 mm), 1/2" NPT, G 1/2"

### Cable specifications

Use shielded cables.

### Supply voltage

Non-Ex environment: 12...30 V  
Ex environment (Ex i): 13.9...30 V

### Power supply failure

- T-DAT™ saves measuring system data if power supply fails
- S-DAT™ = exchangeable data storage chip which stores the data of the sensor: nominal diameter, serial number, calibration factor, zero point, etc.

## Measuring accuracy

### Reference conditions

To DIN 19200 and VDI/VDE 2641:

- Medium temperature:  $+28\text{ °C} \pm 2\text{ K}$
- Ambient temperature:  $+22\text{ °C} \pm 2\text{ K}$
- Warm-up time: 30 minutes

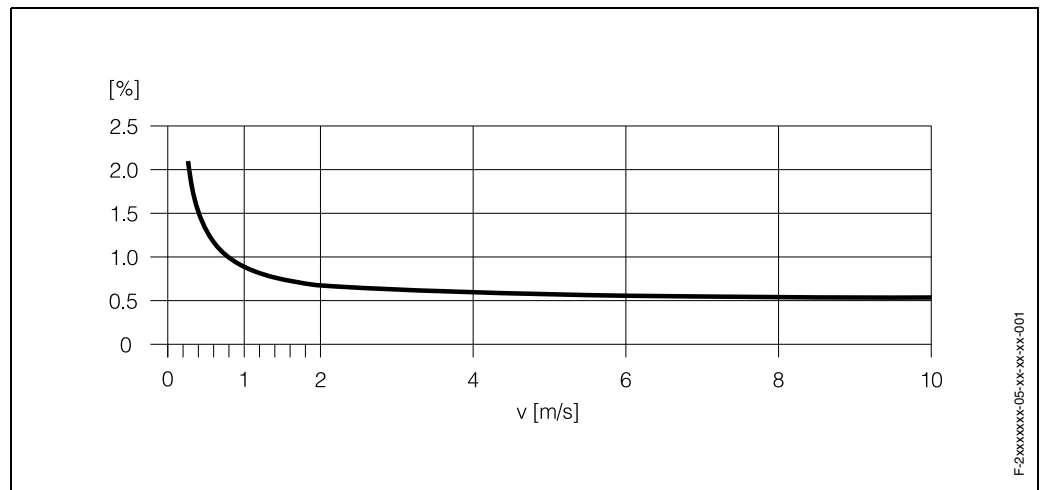
Installation:

- Inlet run  $> 10 \times \text{DN}$
- Outlet run  $> 5 \times \text{DN}$
- Sensor and transmitter grounded.
- Sensor centered relative to the pipe.

### Measured error

Signal output:  $\pm 0.5\%$  o.r.  $\pm 4\text{ mm/s}$  (o.r. = of reading)

Supply-voltage fluctuations have no effect within the specified range.



Measuring error in [%] of reading

### Repeatability

$\pm 0.25\%$  o.r.  $\pm 2\text{ mm/s}$  (o.r. = of reading)

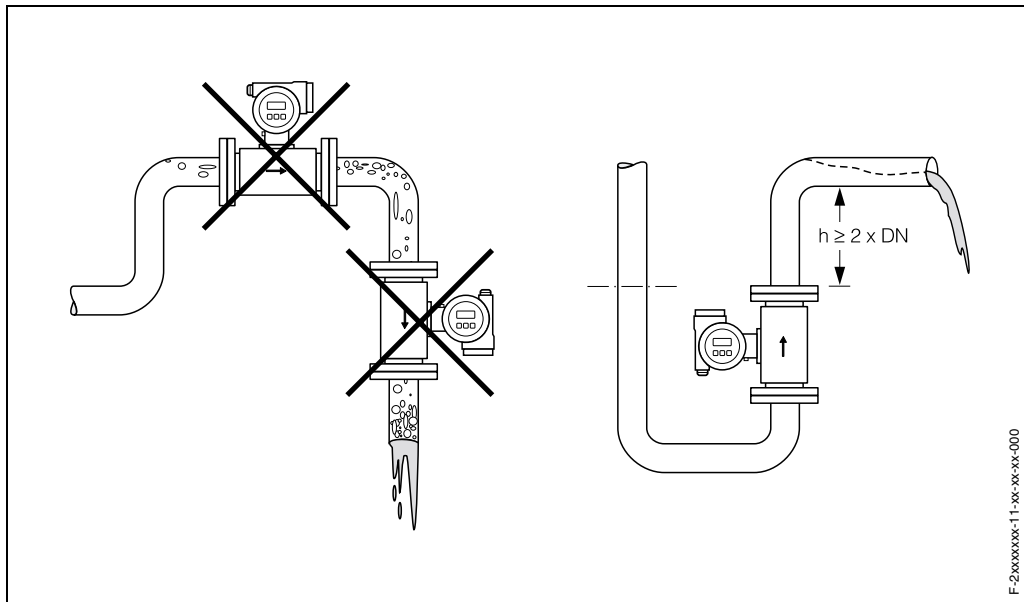
## Conditions for operation (installation conditions)

### Installation instructions

#### Mounting location

Correct measuring is possible only if the pipe is full. Avoid the following locations:

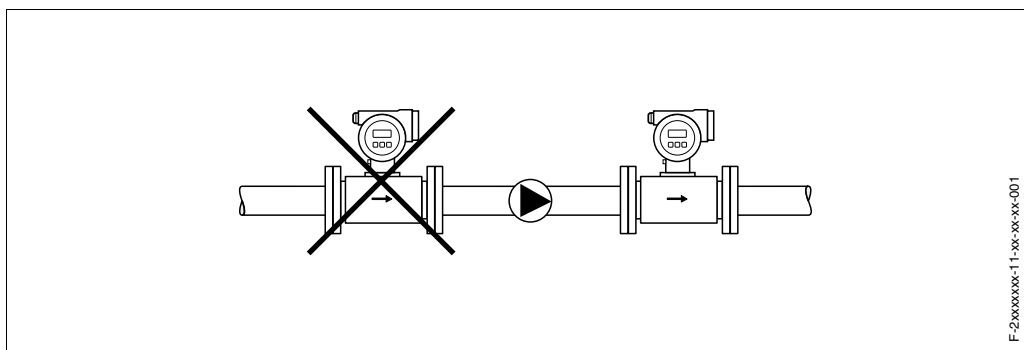
- Highest point in the run. Risk of air accumulating
- Directly upstream from an open pipe outlet in a down pipe.



#### Installation of pumps

Do not install the sensor on the intake side of a pump. This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube.

It might be necessary to install pulse dampers in systems incorporating reciprocating, diaphragm or peristaltic pumps. Information on the measuring system's resistance to vibration and surge can be found on Page 10.

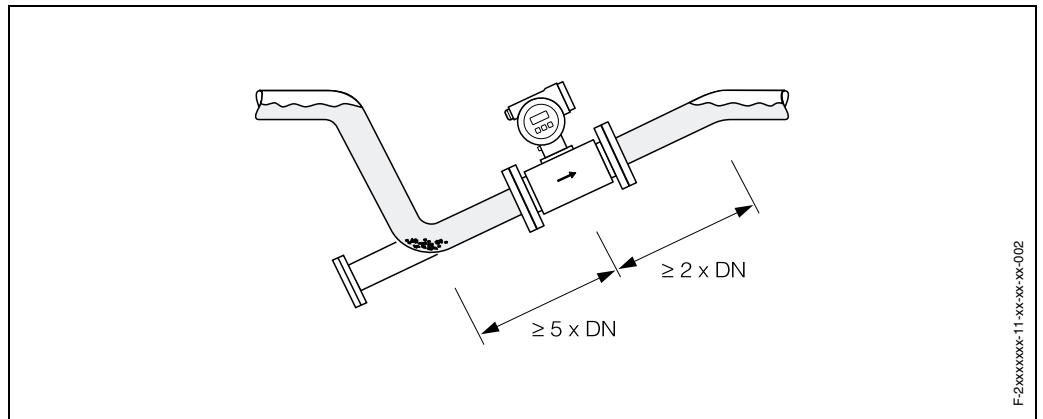


**Partially filled pipes**

Partially filled pipes with gradients necessitate a drain-type configuration. The Empty Pipe Detection (EPD) function offers additional protection by detecting empty or partially filled pipes.

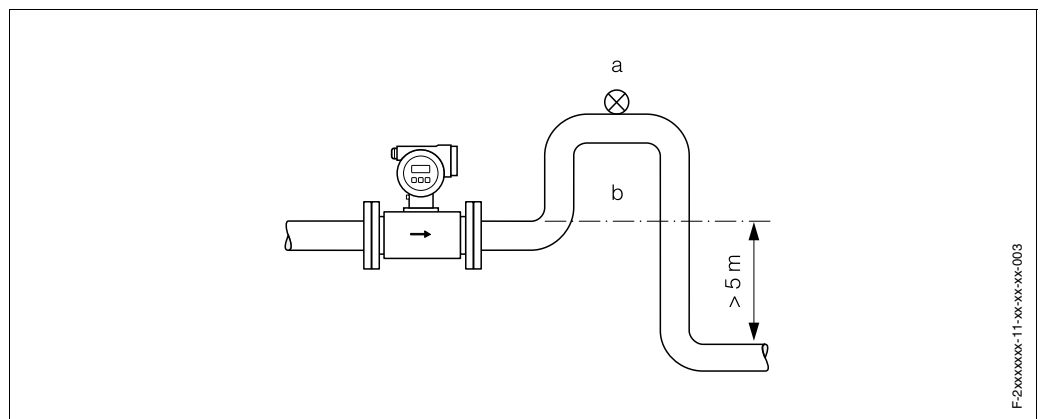
Caution:

Risk of solids accumulating. Do not install the sensor at the lowest point in the drain. It is advisable to install a cleaning valve.



**Down pipes**

Install a siphon (b) or a vent valve (a) downstream of the sensor in down pipes longer than 5 meters. This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. This measures also prevent the system losing prime, which could cause air inclusions.



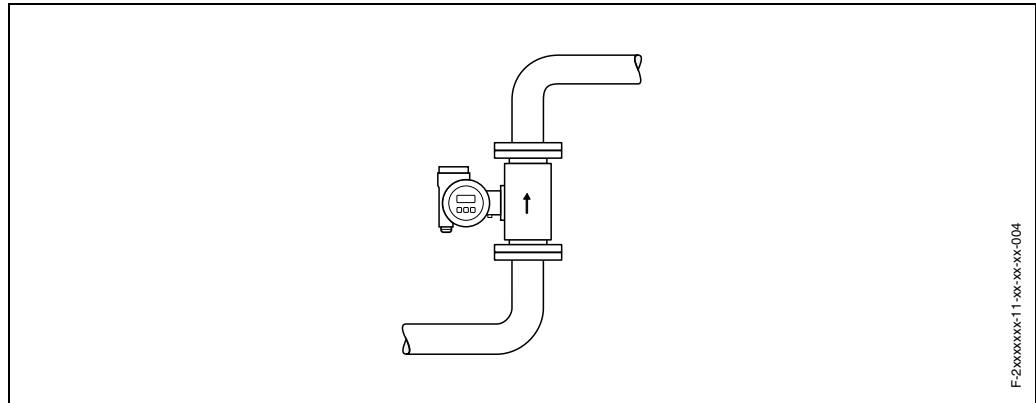
*a = vent valve, b = siphon*

### Orientation

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

#### *Vertical orientation:*

This orientation is ideal for self-emptying piping systems and for use in conjunction with Empty Pipe Detection.

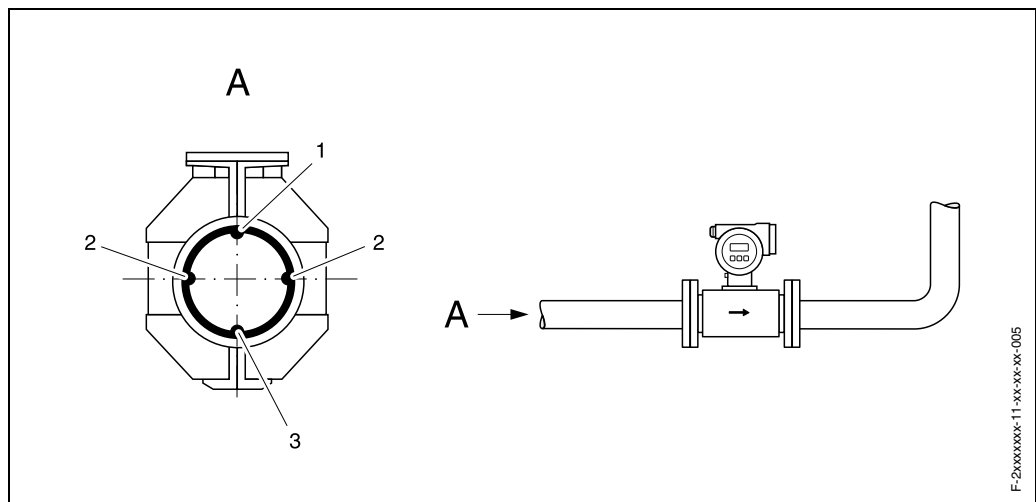


#### *Horizontal orientation:*

The measuring electrodes should be on a horizontal plane. This prevents brief insulation of the two electrodes by entrained air bubbles.

#### Caution:

Empty Pipe Detection functions correctly only when the measuring device is installed horizontally and the transmitter housing is facing upward. Otherwise there is no guarantee that Empty Pipe Detection will respond if the measuring tube is only partially filled or empty.



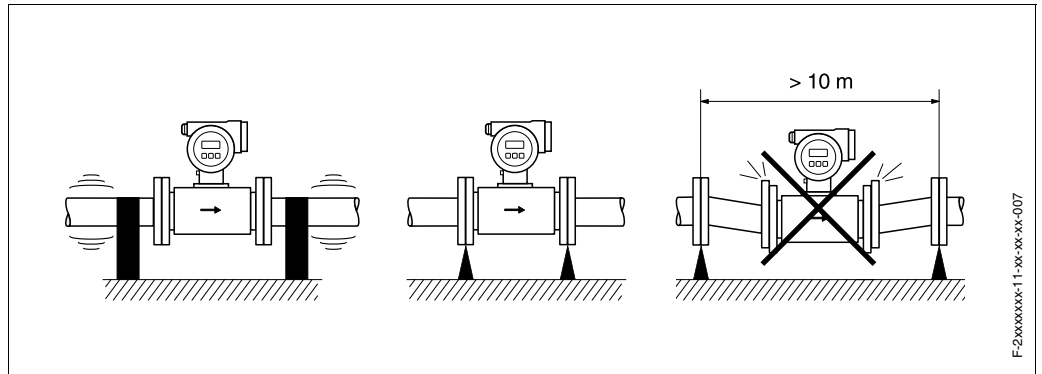
- 1 = EPD electrode (Empty Pipe Detection)
- 2 = Measuring electrodes (signal detection)
- 3 = Reference electrode (potential equalisation)

**Vibrations**

Secure the piping and the sensor if vibration is severe.

Caution:

It is advisable to install sensor and transmitter separately if vibration is excessively severe. Information on resistance to vibration and shock can be found on Page 10.

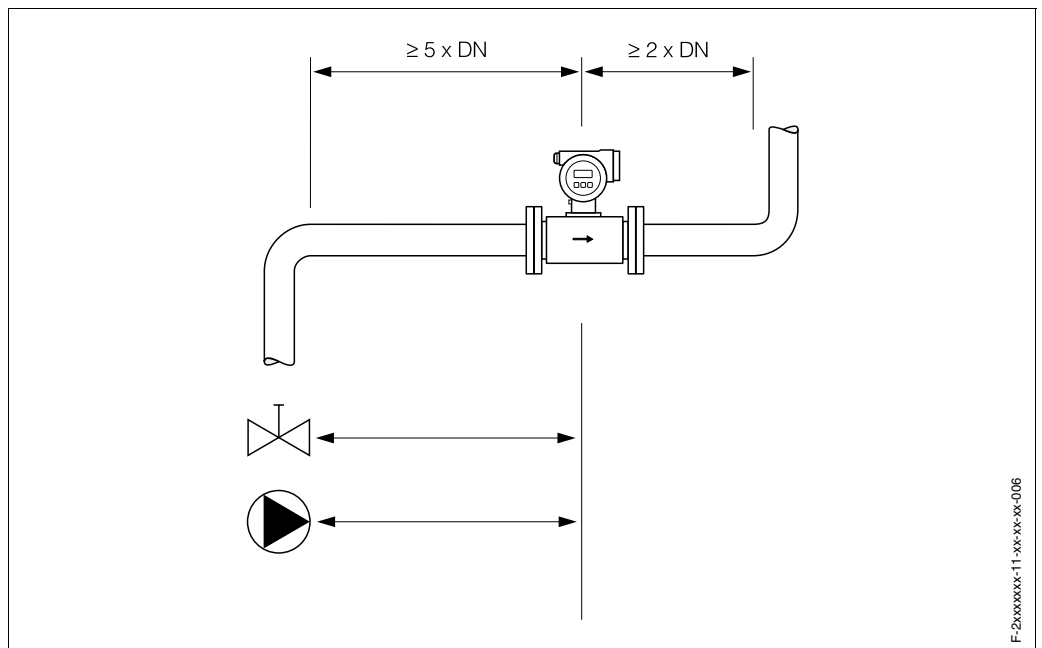


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**Inlet and outlet runs**

If possible, install the sensor well clear of fittings such as valves, T-pieces, elbows, etc. Compliance with the following requirements for the inlet and outlet runs is necessary in order to ensure measuring accuracy:

- Inlet run:  $\geq 5 \times \text{DN}$
- Outlet run:  $\geq 2 \times \text{DN}$



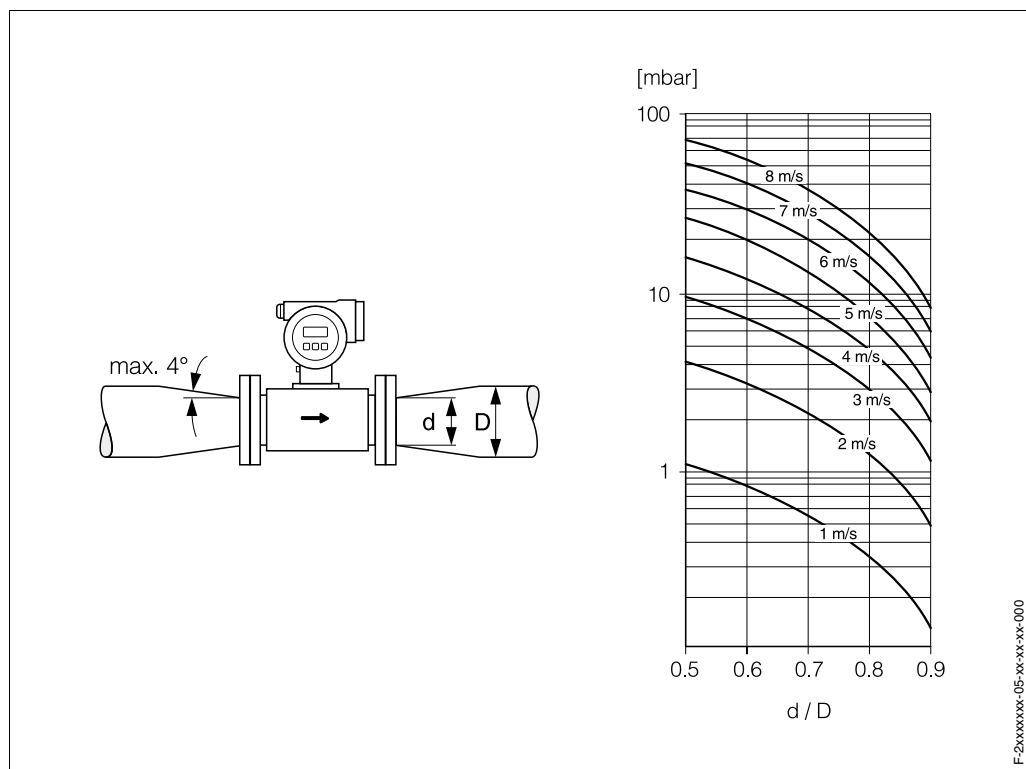
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## Adapters

Suitable adapters to DIN 28545 (reducers and expanders) 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. The nomogram applies to fluids of viscosity similar to water.

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



## Conditions for operation (ambient conditions)

<b>Ambient temperature</b>	-20...+60 °C
	Install the device at a shady location. Avoid direct sunlight, particularly in warm climatic regions.
<b>Storage temperature</b>	-10...+50 °C (preferably +20 °C)
<b>Degree of protection</b>	IP 67 (NEMA 4X)
<b>Shock and vibration resistance</b>	Acceleration up to 2 g by analogy with IEC 68-2-6
<b>CIP cleaning</b>	Possible
<b>SIP cleaning</b>	Possible
<b>Electromagnetic compatibility (EMC)</b>	To EN 61326 and NAMUR recommendation NE 21

## Conditions for operation (process conditions)

### Medium temperature range

The permissible medium temperature depends on the sensor and the sealing material:

Sensor:

- -20...+150° C (+180 °C in preparation) for DN 2...25
- -20...+150° C for DN 40...100

Seal:

- EPDM: -20...+130° C
- Silicone: -20...+150° C
- Viton: -20...+150° C
- Kalrez: -20...+150° C

### Conductivity

Minimum conductivity  $\geq 50 \mu\text{S/cm}$  (for fluids in general)

### Medium pressure range (nominal pressure)

The permissible nominal pressure depends on the process connection and seal:

- 40 bar: flange, welding adapter (with O-ring seal)
- 16 bar: all other process connections

### Flow limit

The diameter of the pipe and the flow rate determine the nominal diameter of the sensor. The optimum velocity of flow is 2...3 m/s.

Nominal diameter		Flow in [m <sup>3</sup> /h]		
[mm]	[inch]	Flow at v = 0.3 m/s	Default at v ~ 2.5 m/s	Flow at v = 10 m/s
2	1/12"	0.0034	0.0283	0.1131
4	5/32"	0.0136	0.1131	0.4524
8	5/16"	0.0543	0.4524	1.810
15	1/2"	0.1909	1.590	6.362
25	1"	0.5301	4.418	17.67
32	1 1/4"	0.8686	7.238	28.95
40	1 1/2"	1.357	11.31	45.24
50	2"	2.121	17.67	70.69
65	2 1/2"	3.584	29.87	119.5
80	3"	5.429	45.24	181.0
100	4"	8.482	70.69	282.7

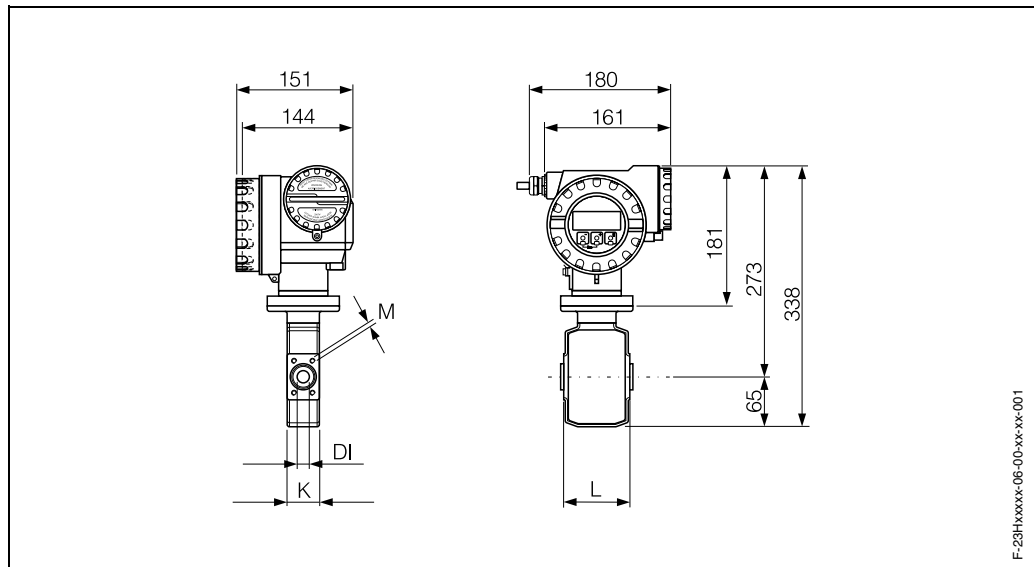
### Pressure loss

- Nominal diameter DN 8 and larger: no pressure loss if the sensor is installed in a pipe of the same nominal diameter.
- Pressure losses for configurations incorporating adapters (reducers, expanders) → see Page 10

## Mechanical construction

### Design / dimensions

### Promag H / DN 2...25

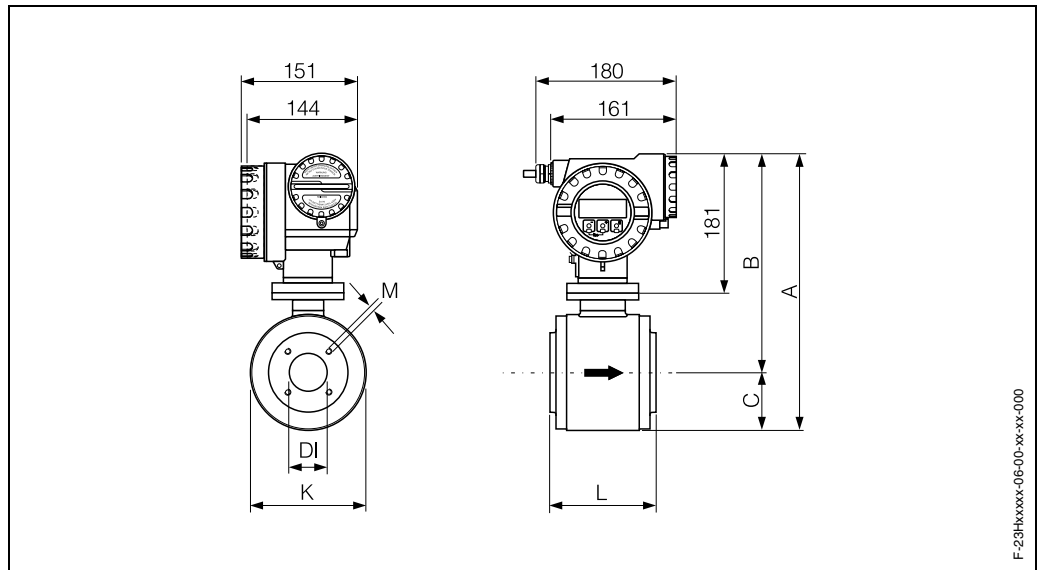


DN		PN **	DI	L	K	M	Weight
DIN [mm]	ANSI [inch]	DIN [bar]	[mm]	[mm]	[mm]	[mm]	[kg]
2	–	16/40	2.25	86	42	M 6x4	4.9
4	–	16/40	4.5	86	42	M 6x4	4.9
8	–	16/40	9.0	86	42	M 6x4	4.9
15	–	16/40	16.0	86	42	M 6x4	4.9
–	1"	16/40	22.6	86	52	M 6x4	4.9
25	–	16/40	26.0	86	52	M 6x4	4.9

Fitting length depends on process connections → Page 14 ff.

\*\* The permissible nominal pressure depends on the process connection and seal:  
 – 40 bar: flange, welding adapter (with O-ring seal)  
 – 16 bar: all other process connections

Promag H / DN 40...100

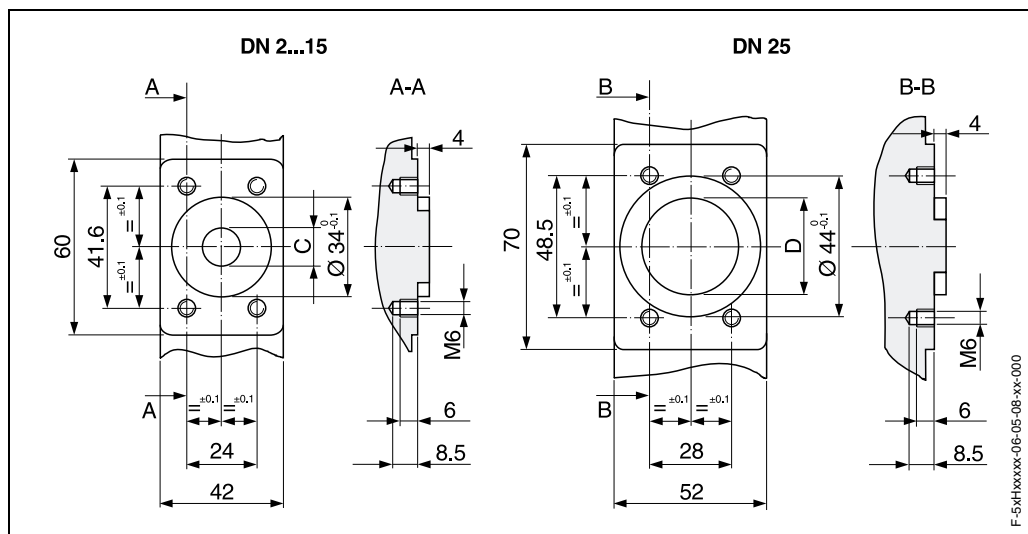


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DN		PN	DI	L	A	B	C	K	M	Weight
DIN [mm]	ANSI [inch]	DIN [bar]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]
40	1 1/2"	16	35.3	140	340	276	64	128	M 6x4	6.2
50	2"	16	48.1	140	365	288	77	153	M 8x4	8.7
65	2 1/2"	16	59.9	140	365	288	77	153	M 8x4	8.7
80	3"	16	72.6	200	415	313	102	203	M 12x4	18.7
100	4"	16	97.5	200	415	313	102	203	M 12x4	18.7

Fitting length depends on process connections → Page 21 ff.

Front view of Promag H / DN 2...25 (without process connection)



DN	C [mm]	D (DIN) [mm]	D (ANSI) [mm]
2...8	9	-	-
15	16	-	-
25	-	26	22.6

Process connections with O-ring seals (DN 2...25 )

Welding adapters ISO 2463 1.4404 / 316L 5*H*-B*****	DN [mm]	di [mm]	G [mm]	L [mm]	H x B [mm]
	2...8	10.3	13.5	20.3	60 x 42
	15	18.1	21.3	20.3	60 x 42
	25	29.7	33.7	20.3	70 x 52
Fitting length = (2 x L) + 86 mm					

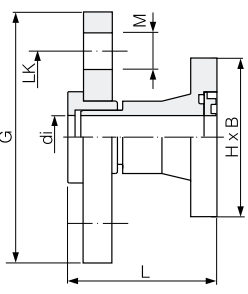
Welding adapters IPS 1.4404 / 316L 5*H*-C*****	DN [mm]	di [mm]	G [mm]	L [mm]	H x B [mm]
	1/4"	9.0	13.5	20.3	60 x 42
	1/2"	16.0	21.3	20.3	60 x 42
	1"	27.2	33.7	22.3	70 x 52
Fitting length = (2 x L) + 86 mm					

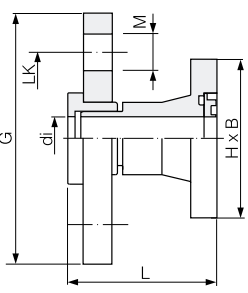
<b>Flange DIN 2635 / PN 40</b> <b>1.4404 / 316L</b> 5*H**-D*****	DN		di [mm]	G [mm]	L [mm]	LK [mm]	M [mm]	H x B [mm]
	Pipe	Flange						
	2..8	10	13.6	90	56.2	60	14	60 x 42
	15	15	17.3	95	56.2	65	14	60 x 42
	25	25	28.5	115	56.2	85	14	70 x 52
Fitting length = $(2 \times L) + 86$ mm Fitting length to DVGW (200 mm)								

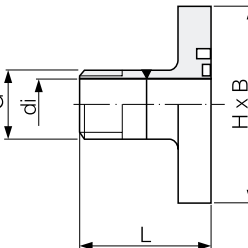
<b>Flange ANSI 16.5 / CI 150</b> <b>1.4404 / 316L</b> 5*H**-E*****	DN		di [mm]	G [mm]	L [mm]	LK [mm]	M [mm]	H x B [mm]
	Pipe	Flange						
	2..8	1/2"	15.7	89	66.0	60.5	15.7	60 x 42
	15	1/2"	16.0	89	66.0	60.5	15.7	60 x 42
	25	1"	26.7	108	71.8	79.2	15.7	70 x 52
Fitting length = $(2 \times L) + 86$ mm								

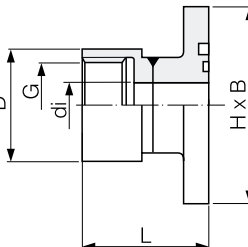
<b>Flange JIS B2238 / 20K</b> <b>1.4404 / 316L</b> 5*H**-F*****	DN		di [mm]	G [mm]	L [mm]	LK [mm]	M [mm]	H x B [mm]
	Pipe	Flange						
	2..8	10	10	90	67	65	15	60 x 42
	15	15	16	95	67	70	15	60 x 42
	25	25	26	125	67	95	19	70 x 52
Fitting length = $(2 \times L) + 86$ mm								

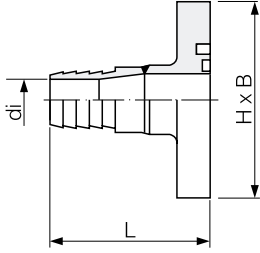
<b>Flange DIN 2501 / PN 16</b> <b>PVDF</b> 5*H**-G*****	DN		di [mm]	G [mm]	L [mm]	M [mm]	LK [mm]	H x B [mm]
	Pipe	Flange						
	2..8	15	15.7	95	57	14	65	60 x 42
	15	15	15.7	95	57	14	65	60 x 42
	25	25	27.3	115	57	14	85	70 x 52
- Fitting length = $(2 \times L) + 86$ mm - Fitting length to DVGW (200 mm) - The requisite grounding rings can be ordered as accessories, order code: DK5HR-****								

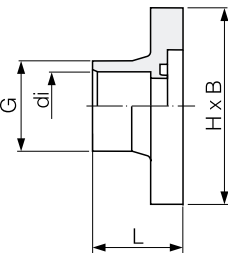
Flange ANSI 16.5 / CI 150 PVDF 5*H**-H*****	DN		di	G	L	M	LK	H x B
	Pipe	Flange	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
	2...8	1/2"	15.7	95	57	16	60	60 x 42
	15	1/2"	15.7	95	57	16	60	60 x 42
	25	1"	27.3	115	57	16	79	70 x 52
- Fitting length = (2 x L) + 86 mm - The requisite grounding rings can be ordered as accessories. Order code: DK5HR-****								

Flange JIS B2238 / 10K PVDF 5*H**-J*****	DN		di	G	L	M	LK	H x B
	Pipe	Flange	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
	2...8	15	15.7	95	57	15	70	60 x 42
	15	15	15.7	95	57	15	70	60 x 42
	25	25	27.3	125	57	19	90	70 x 52
- Fitting length = (2 x L) + 86 mm - The requisite grounding rings can be ordered as accessories. Order code: DK5HR-****								

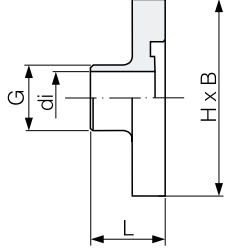
External thread ISO 228 / DIN 2999, 1.4404 / 316L 5*H**-K*****	DN	di	G	L	H x B
	[mm]	[mm]	[inch]	[mm]	[mm]
	2...8	10	3/8"	40	60 x 42
	15	16	1/2"	40	60 x 42
	22	25	1"	40	70 x 52
Fitting length = (2 x L) + 86 mm					

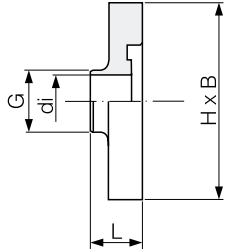
Internal thread ISO228 / DIN 2999, 1.4404 / 316L 5*H**-L*****	DN	di	G	D	L	H x B
	[mm]	[mm]	[inch]	[mm]	[mm]	[mm]
	2...8	8.9	3/8"	22	45	60 x 42
	15	16.0	1/2"	27	45	60 x 42
	22	27.2	1"	40	49	70 x 52
Fitting length = (2 x L) + 86 mm						

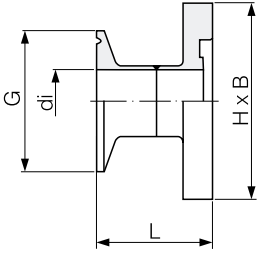
<b>Hose adapter</b> <b>1.4404 / 316L</b> 5*H**-M/N/P*****	<b>DN</b>	<b>di</b>	<b>LW</b>	<b>L</b>	<b>H x B</b>
	[mm]	[mm]	[mm]	[mm]	[mm]
	2...8	10.0	13	49	60 x 42
	15	12.6	16	49	60 x 42
	15	16.0	19	49	70 x 52
- Fitting length = (2 x L) + 86 mm - LW = inside diameter of hose					

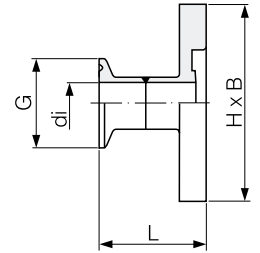
<b>Adhesive coupling</b> <b>PVC</b> 5*H**-R/S*****	<b>DN</b>	<b>di</b>	<b>G</b>	<b>L</b>	<b>H x B</b>
	[mm]	[mm]	[mm]	[mm]	[mm]
	2...8 (1/2")	21.5	27.3	28.0	60 x 42
	15 (20 x 2)	20.2	27.0	38.5	60 x 42
- Fitting length = (2 x L) + 86 mm - The requisite grounding rings can be ordered as accessories. Order code: DK5HR-****					

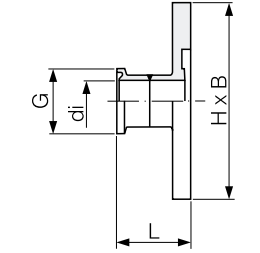
**Process connections with aseptic shaped seals (DN 2...25 )**

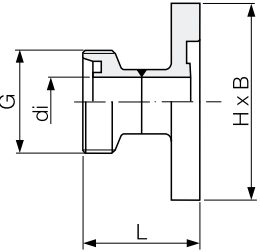
<b>Welding adapters DIN 11850</b> <b>1.4404 / 316L</b> 5*H**-U*****	<b>DN</b>	<b>di</b>	<b>G</b>	<b>L</b>	<b>H x B</b>
	[mm]	[mm]	[mm]	[mm]	[mm]
	2...8	10	14	23.3	60 x 42
	15	16	20	23.3	60 x 42
	25	26	30	23.3	70 x 52
- Fitting length = (2 x L) + 86 mm - If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 12) and process connection (di) into account.					

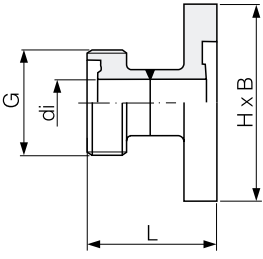
<b>Welding adapters ODT/SMS</b> <b>1.4404 / 316L</b> 5*H**-V*****	<b>DN</b>	<b>di</b>	<b>G</b>	<b>L</b>	<b>H x B</b>
	[mm]	[mm]	[mm]	[mm]	[mm]
	1/2"	9.4	12.7	16.1	60 x 42
	3/4"	15.8	19.1	16.1	60 x 42
	1"	22.1	25.4	16.1	70 x 52
- Fitting length = (2 x L) + 86 mm - If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 12) and process connection (di) into account.					

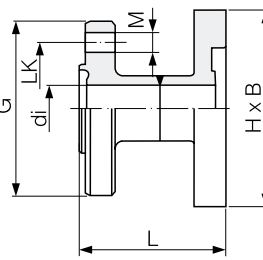
Clamp, ISO 2852 1.4404 / 316L 5*H**-W*****	DN [mm]	di [mm]	G [mm]	L [mm]	H x B [mm]
	25	22.6	50.5	44.5	70 x 52
	<ul style="list-style-type: none"> <li>- Fitting length = (2 x L) + 86 mm</li> <li>- If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 12) and process connection (di) into account.</li> </ul>				

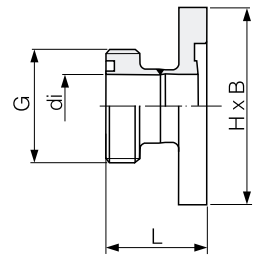
Clamp, DIN 32676 1.4404 / 316L 5*H**-0*****	DN [mm]	di [mm]	G [mm]	L [mm]	H x B [mm]
	2...8	10	34.0	41.0	60 x 42
	15	16	34.0	41.0	60 x 42
	25	26	50.5	44.5	70 x 52
	<ul style="list-style-type: none"> <li>- Fitting length = (2 x L) + 86 mm</li> <li>- If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 12) and process connection (di) into account.</li> </ul>				

Tri-Clamp for ODT 1.4404 / 316L 5*H**-1*****	DN [mm]	di [mm]	G [mm]	L [mm]	H x B [mm]
	1/2"	9.4	25.0	28.5	60 x 42
	3/4"	15.8	25.0	28.5	60 x 42
	1"	22.1	50.4	28.5	70 x 52
	<ul style="list-style-type: none"> <li>- Fitting length = (2 x L) + 86 mm</li> <li>- If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 12) and process connection (di) into account.</li> </ul>				

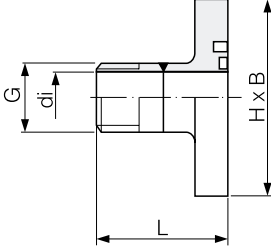
Threaded union DIN 11851 1.4404 / 316L 5*H**-2*****	DN [mm]	di [mm]	G [mm]	L [mm]	H x B [mm]
	2...8	10	Rd 28 x 1/8"	44	60 x 42
	15	16	Rd 34 x 1/8"	44	60 x 42
	25	26	Rd 52 x 1/6"	52	70 x 52
	<ul style="list-style-type: none"> <li>- Fitting length = (2 x L) + 86 mm</li> <li>- If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 12) and process connection (di) into account.</li> </ul>				

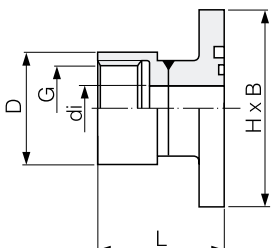
<b>Threaded union DIN 11864-1</b> <b>1.4404 / 316L</b> 5*H**-3******	DN		di	G	L	H x B
	[mm]	[mm]				
	2...8	10	Rd 28 x 1/8"	42	60 x 42	
	15	16	Rd 34 x 1/8"	42	60 x 42	
	25	26	Rd 52 x 1/6"	37	70 x 52	
- Fitting length = (2 x L) + 86 mm - If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 12) and process connection (di) into account.						

<b>Flange DIN 11864-2</b> <b>1.4404 / 316L</b> 5*H**-4******	DN		di	G	L	LK	M	H x B
	Pipe	Flange						
	2...8	10	10	54	48.5	37	9	60 x 42
	15	15	16	59	48.5	42	9	60 x 42
	25	25	26	70	48.5	53	9	70 x 52
- Fitting length = (2 x L) + 86 mm - If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 12) and process connection (di) into account.								

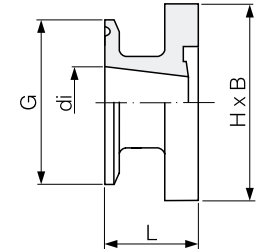
<b>Threaded union SMS 1145</b> <b>1.4404 / 316L</b> 5*H**-5******	DN	di	G	L	H x B
	[mm]	[mm]	[mm]	[mm]	[mm]
	1"	22.1	Rd 40 x 1/6"	35.8	70 x 52
	- Fitting length = (2 x L) + 86 mm - If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 12) and process connection (di) into account.				

**Process connections orderable only as accessories (with O-ring seal, DN 2...25)**

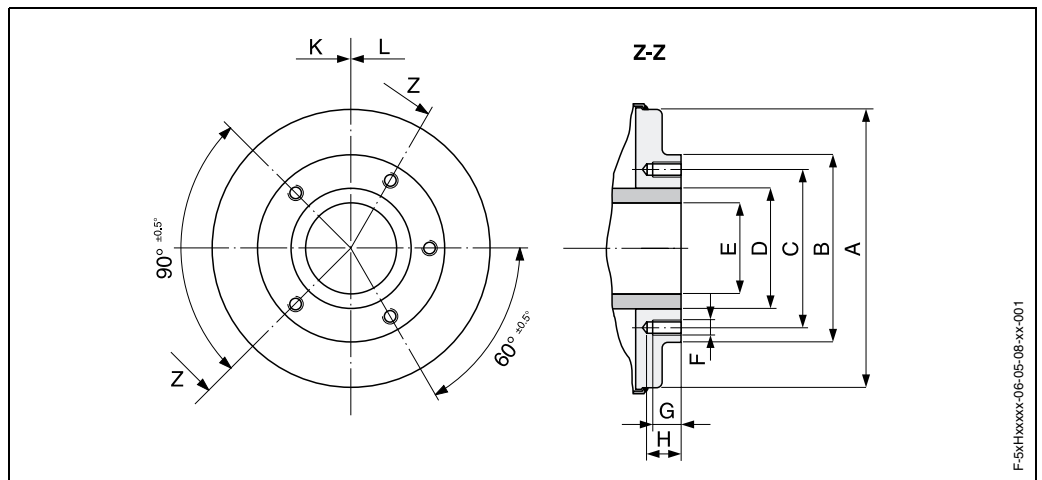
<b>External thread NPT</b> 1.4404 / 316L DKH**-GD**	<b>DN</b> [mm]	<b>di</b> [mm]	<b>G</b> [inch]	<b>L</b> [mm]	<b>H x B</b> [mm]
	2...8	10	3/8"	50	60 x 42
	15	16	1/2"	50	60 x 42
	22	25	1"	55	70 x 52
Fitting length = (2 x L) + 86 mm					

<b>Internal thread NPT</b> 1.4404 / 316L DKH**-GC**	<b>DN</b> [mm]	<b>di</b> [mm]	<b>G</b> [inch]	<b>D</b> [mm]	<b>L</b> [mm]	<b>H x B</b> [mm]
	2...8	8.9	3/8"	22	45	60 x 42
	15	16.0	1/2"	27	45	60 x 42
	22	27.2	1"	40	49	70 x 52
Fitting length = (2 x L) + 86 mm						

**Process connections orderable only as accessories (with aseptic shaped seal)**

<b>Tri-Clamp for ODT</b> 1.4404 / 316L DKH**-HF**	<b>DN</b> [mm]	<b>di</b> [mm]	<b>G</b> [mm]	<b>L</b> [mm]	<b>H x B</b> [mm]
	1" (DN 15)	22.1	50.4	28.5	60 x 42
	- Fitting length = (2 x L) + 86 mm - If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 12) and process connection (di) into account.				

Front view of Promag H / DN 40...100 (without process connection)



DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	N [mm]	L [mm]	K [mm]
40	122.0	86	71.0	51.0	35.3	M 8	15	18	–	4
50	147.0	99	83.5	63.5	48.1	M 8	15	18	–	4
65	147.0	115	100.0	76.1	59.9	M 8	15	18	6	–
80	197.0	141	121.0	88.9	72.6	M 12	15	20	–	4
100	197.0	162	141.5	114.3	97.5	M 12	15	20	6	–

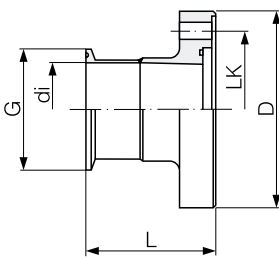
Process connections with aseptic shaped seals (DN 40...100)

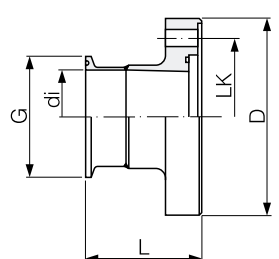
Welding adapters DIN 11850 1.4404 / 316L 5*H**-U*****	DN [mm]	di [mm]	G [mm]	D [mm]	L [mm]	L1 [mm]	LK [mm]
		40	38.0	43	92	42	19
	50	50.0	55	105	42	19	83.5
	65	66.0	72	121	42	21	100.0
	80	81.0	87	147	42	24	121.0
	100	100.0	106	168	42	24	141.5

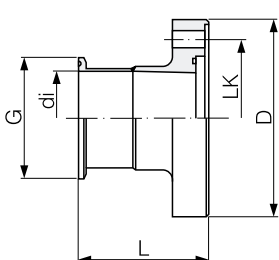
– Fitting length = (2 x L) + 140 mm (DN 40...65) / + 200 mm (DN 80...100)  
 – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 13) and process connection (di) into account.

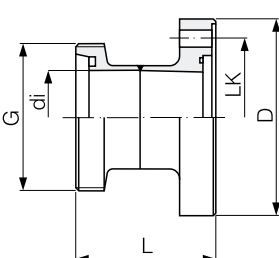
Welding adapters ODT 1.4404 / 316L 5*H**-V*****	DN [mm]	di [mm]	G [mm]	D [mm]	L [mm]	L1 [mm]	LK [mm]
		40	35.3	40	92	42	19
	50	48.1	55	105	42	19	83.5
	65	59.9	66	121	42	21	100.0
	80	72.6	79	147	42	24	121.0
	100	97.5	104	168	42	24	141.5

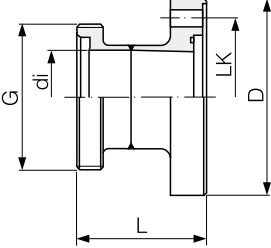
– Fitting length = (2 x L) + 140 mm (DN 40...65) / + 200 mm (DN 80...100)  
 – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 13) and process connection (di) into account.

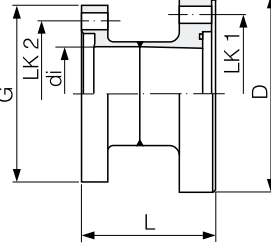
Clamp ISO 2852 1.4404 / 316L 5*H**_W*****	DN	di	G	D	L	LK
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
	40	35.6	50.5	92	68.5	71.0
	50	48.6	64.0	105	68.5	83.5
	65	60.3	77.5	121	68.5	100.0
	80	72.9	91.0	147	68.5	121.0
	100	97.6	119.0	168	68.5	141.5
– Fitting length = (2 x L) + 140 mm (DN 40..65) / + 200 mm (DN 80..100) – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 13) and process connection (di) into account.						

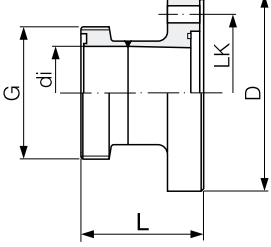
Clamp DIN 32676 1.4404 / 316L 5*H**_0*****	DN	di	G	D	L	LK
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
	40	38	50.5	92	61.5	71.0
	50	50	64.0	105	61.5	83.5
	65	66	91.0	121	68.0	100.0
	80	81	106.0	147	68.0	121.0
	100	100	119.0	168	68.0	141.5
– Fitting length = (2 x L) + 140 mm (DN 40..65) / + 200 mm (DN 80..100) – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 13) and process connection (di) into account.						

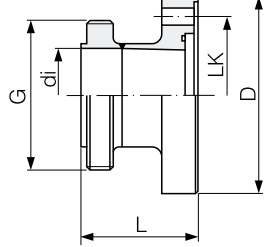
Tri-Clamp for ODT 1.4404 / 316L 5*H**_1*****	DN		di	G	D	L	LK
	[mm]	[inch]	[mm]	[mm]	[mm]	[mm]	[mm]
	40	1 1/2"	34.8	50.4	92	68.6	71.0
	50	2"	47.5	63.9	105	68.6	83.5
	65	–	60.2	77.4	121	68.6	100.0
	80	3"	72.9	90.9	147	68.6	121.0
	100	4"	97.4	118.9	168	68.6	141.5
– Fitting length = (2 x L) + 140 mm (DN 40..65) / + 200 mm (DN 80..100) – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 13) and process connection (di) into account.							

Threaded union DIN 11851 1.4404 / 316L 5*H**_2*****	DN	di	G	D	L	LK
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
	40	38	65 x 1/6"	92	72	71.0
	50	50	78 x 1/6"	105	74	83.5
	65	66	95 x 1/6"	121	78	100.0
	80	81	110 x 1/4"	147	83	121.0
	100	100	130 x 1/4"	168	92	141.5
– Fitting length = (2 x L) + 140 mm (DN 40..65) / + 200 mm (DN 80..100) – If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 13) and process connection (di) into account.						

<b>Threaded union DIN 11864-1</b> <b>1.4404 / 316L</b> 5*H**-3******	<b>DN</b> [mm]	<b>di</b> [mm]	<b>G</b> [mm]	<b>D</b> [mm]	<b>L</b> [mm]	<b>LK</b> [mm]
	40	38	65 x 1/6"	92	71	71.0
	50	50	78 x 1/6"	105	71	83.5
	65	66	95 x 1/6"	121	76	100.0
	80	81	110 x 1/4"	147	82	121.0
	100	100	130 x 1/4"	168	90	141.5
- Fitting length = (2 x L) + 140 mm (DN 40..65) / + 200 mm (DN 80..100) - If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 13) and process connection (di) into account.						

<b>Flange DIN 11864-2</b> <b>1.4404 / 316L</b> 5*H**-4******	<b>DN</b> [mm]	<b>di</b> [mm]	<b>G</b> [mm]	<b>D</b> [mm]	<b>L</b> [mm]	<b>LK1</b> [mm]	<b>LK2</b> [mm]
	40	38	82	92	64	71.0	65
	50	50	94	105	64	83.5	77
	65	66	113	121	64	100.0	95
	80	81	133	147	66	121.0	112
	100	100	159	168	66	141.5	137
- Fitting length = (2 x L) + 140 mm (DN 40..65) / + 200 mm (DN 80..100) - If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 13) and process connection (di) into account.							

<b>Threaded union SMS 1145</b> <b>1.4404 / 316L</b> 5*H**-5******	<b>DN</b> [mm]	<b>di</b> [mm]	<b>G</b> [mm]	<b>D</b> [mm]	<b>L</b> [mm]	<b>LK</b> [mm]
	40	35.5	60 x 1/6"	92	63	71.0
	50	48.5	70 x 1/6"	105	65	83.5
	65	60.5	85 x 1/6"	121	70	100.0
	80	72.0	98 x 1/6"	147	75	121.0
	100	97.6	132 x 1/6"	168	70	141.5
- Fitting length = (2 x L) + 140 mm (DN 40..65) / + 200 mm (DN 80..100) - If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 13) and process connection (di) into account.						

<b>Threaded union ISO 2853</b> <b>1.4404 / 316L</b> 5*H**-6******	<b>DN</b> [mm]	<b>di</b> [mm]	<b>G</b> [mm]	<b>D</b> [mm]	<b>L</b> [mm]	<b>LK</b> [mm]
	40	35.6	50.6	92	61.5	71.0
	50	48.6	64.1	105	61.5	83.5
	65	60.3	77.6	121	61.5	100.0
	80	72.9	91.1	147	61.5	121.0
	100	97.6	118.1	168	61.5	141.5
- Fitting length = (2 x L) + 140 mm (DN 40..65) / + 200 mm (DN 80..100) - If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube (Page 13) and process connection (di) into account.						

**Weight** see Page 12 ff.

**Materials** Transmitter housing: powder-coated die-cast aluminum

Sensor housing: 1.4301

Flange material:

- All connections 1.4404 / 316L
- Flanges (DIN, ANSI, JIS) made of PVDF
- Adhesive coupling, PVC

Electrode material:

Standard: 1.4435, optional: Hastelloy C-22, tantalum, platinum/rhodium 80/20 (up to DN 25 only)

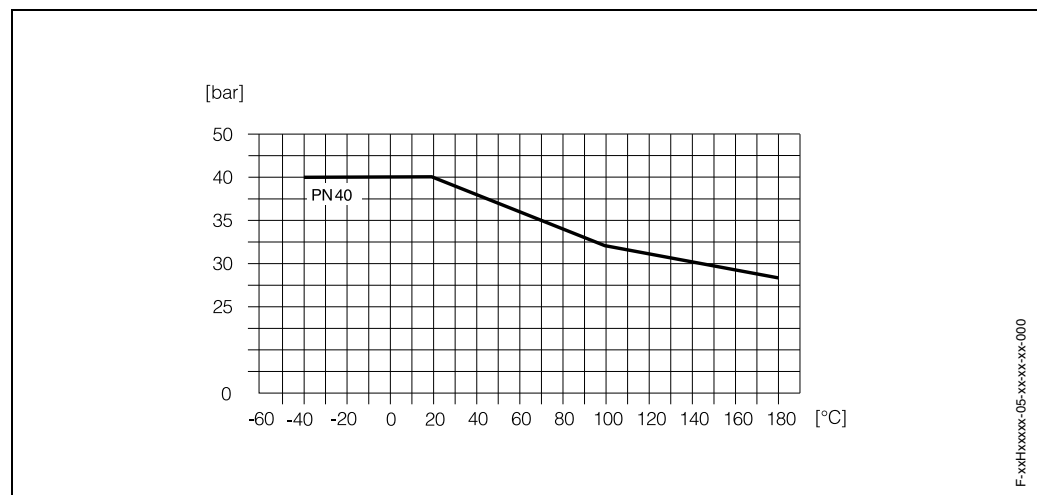
Seal material:

- DN 2...25: O-ring (EPDM, Viton, Kalrez) or shaped seal (EPDM, silicone, Viton)
- DN 40...100: shaped seal (EPDM, silicone)

### Material load curves

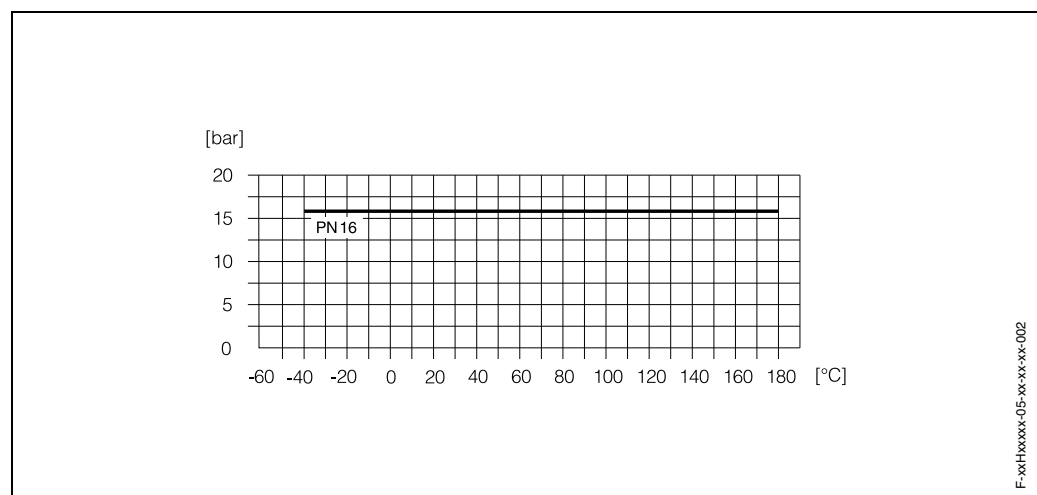
#### Welding adapters, 1.4404/316L (with O-ring)

to ISO 2463, IPS, ISO 228 / DIN 2999

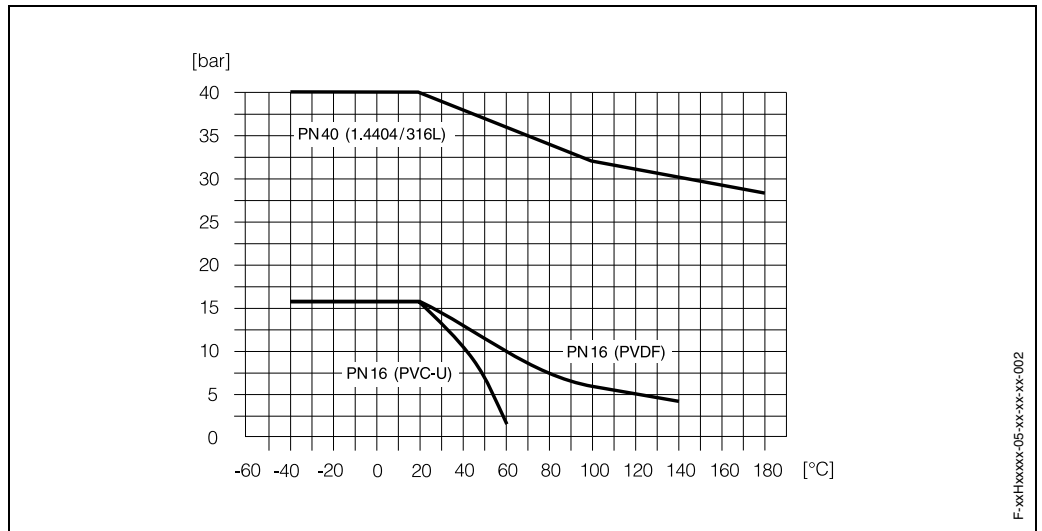


#### Welding adapters, 1.4404/316L (with shaped seal)

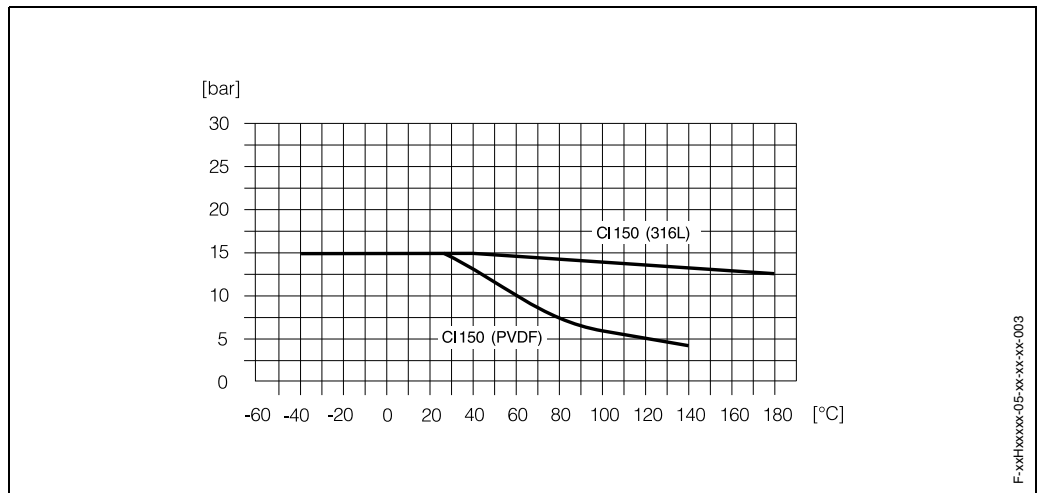
to DIN 11850, ODT, Clamp (ODT, ISO 2852, DIN 32676), threaded union (DIN 11851, DIN 11864-1, ISO 2853, SMS1145), flange DIN 11864-2



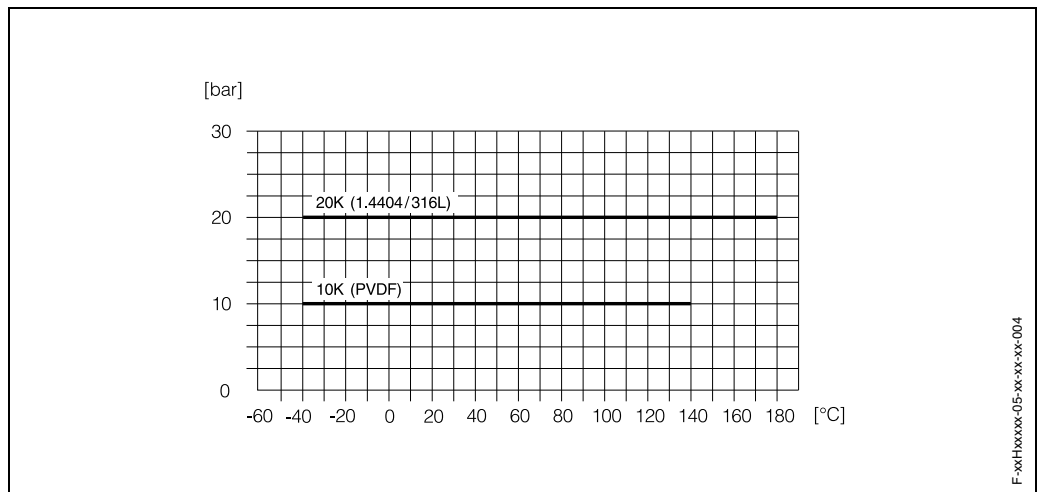
**Flange material: 1.4404 / 316L, PVDF; adhesive coupling: PVC-U**  
to DIN 2635 and 2501



**Flange material: 316L, PVDF**  
to ANSI B16.5



**Flange material: 1.4404 / 316L, PVDF**  
to JIS B2238



<b>Fitted electrodes</b>	<p>Measuring electrodes and EPD electrodes</p> <ul style="list-style-type: none"> <li>• Standard with: 1.4435, Hastelloy C-22, tantalum, platinum/rhodium</li> <li>• DN 2...4: without EPD electrode</li> </ul>
<b>Process connection</b>	<ul style="list-style-type: none"> <li>• With O-ring: welding adapters (ISO 2463, IPS), flanges (DIN, ANSI, JIS), PVDF flanges (DIN, ANSI, JIS), external thread, internal thread, hose adapters, PVC adhesive couplings</li> <li>• With shaped seal: welding adapters (DIN 11850, ODT), clamps (ODT, ISO 2852, DIN 32676), threaded fasteners (DIN 11851, DIN 11864-1, ISO 2853, SMS 1145), flanges (DIN 11864-2)</li> </ul>
<b>Display and user interface</b>	
<b>Display elements</b>	<ul style="list-style-type: none"> <li>• Liquid-crystal display: four lines with 16 characters per line</li> <li>• Custom configurations for presenting different measured-value and status variables</li> </ul>
<b>Operating elements</b>	<ul style="list-style-type: none"> <li>• Local operation with three virtual sensor keys (-, +, E)</li> <li>• Application-specific Quick Setup menus for straightforward commissioning (in preparation)</li> </ul>
<b>Remote operation</b>	Remote operation via HART

## Certificates and approvals

<b>Ex approval</b>	Information on the currently available Ex-rated versions (ATEX, FM, CSA, etc.) is available on request from your E+H sales outlet. All information relevant to explosion protection is available in separate Ex documents that you can order as necessary.
<b>Sanitary compatibility</b>	<p>3A approval and EHEDG-tested</p> <p>Seals in conformity with FDA (except Kalrez seals)</p>
<b>CE mark</b>	The measuring system is in conformity with the statutory requirements of the EC Directives. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.
<b>Other standards and guidelines</b>	<p>EN 60529: Degrees of protection by housing (IP code)</p> <p>EN 61010: "Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures".</p> <p>EN 61326 (IEC 1326): Electromagnetic compatibility (EMC requirements)</p> <p>NAMUR NE 21: Association for Standards for Control and Regulation in the Chemical Industry</p>

## Ordering information

The E+H service organization can provide detailed ordering information and information on the order codes on request.

## Accessories

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Various accessories, which can be ordered separately from Endress+Hauser, are available for the transmitter and the sensor. The E+H service organisation can provide detailed information on request.

## Supplementary documentation

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- System Information Promag (SI 028D/06/en)
- Technical Information Promag 23 P (TI 049D/06/en)
- Operating Instructions Promag 23 (BA 045D/06/en and BA 050D/06/en)
- Supplementary documentation on Ex-ratings: ATEX, FM, CSA, etc.

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