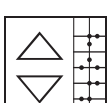
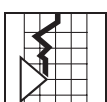
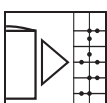
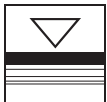


Electromagnetic Flow Measuring System - Two-wire, loop powered *promag 23 H*

Flow measurement in food, beverage,
pharmaceutical, or process applications



Features and benefits

- Nominal diameters 1/12" to 4"
- PFA for cleaning temperatures up to 300°F
- Guaranteed product quality suitable for CIP/SIP cleaning and piggable
- 3-A authorized and EHEDG-tested
- Robust field housing, NEMA 4X (IP 67)
- Measuring accuracy: $\pm 0.5\%$
- Touch Control: operation without opening the housing, also in hazardous areas
- Connection to all mainstream transmitter power supplies and input cards of process control systems
- Communication via HART® is standard
- Intrinsically safe for installation in Division 1 (FM, CSA, ATEX, etc.)
- Transmitter supply:
 - Non-hazardous areas: 12 to 30 VDC
 - Hazardous areas: 13.9 to 30 VDC
- Reduced installation and operation cost

Application

- All fluids with a minimum conductivity of $\geq 50 \mu\text{S/cm}$ can be measured:
- Beverages, e.g. fruit juice, beer, wine
 - Acids
 - Alkalis
 - Salt solutions

Endress + Hauser

The Power of Know How



Function and system design

Measuring principle

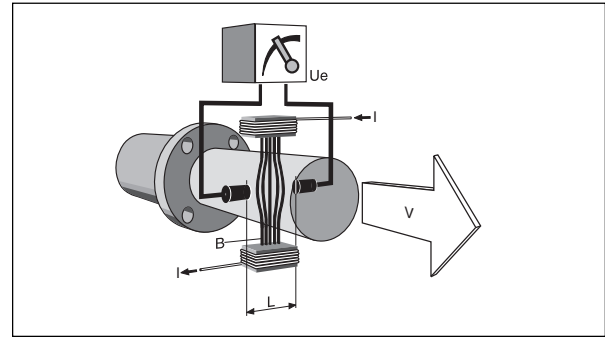
Faraday's law of induction states that a voltage is induced in a conductor moving in a magnetic field.

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 strength



Measuring system

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

- Promag 23 transmitter
- Promag H sensor, 1/12" to 4"

Input variables

Measured variable

Flow rate (proportional to induced voltage)

Measuring range

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

Operable flow range

Over $1000 : 1$

Output variables

Output signal

- Applied direct current 4 to 20 mA. Input from DC voltage source.
Terminal voltage, 12 to 30 VDC; Intrinsically safe version, 13.9 to 30 VDC
Resolution: $4.4 \mu\text{A}$
- Pulse/frequency output:
Open collector, passive, galvanically isolated, 30 VDC, 100 mA (250 mA / 20 ms), configurable as:
 - Status output:* e.g. for error message, empty pipe detection, direction of flow, limit value.
 - Frequency output:* full scale frequency 500 to 10,000 Hz ($f_{\text{max}} = 12,500$ Hz), on/off ratio 1:1, pulse width max. 10 s.
 - Pulse output:* pulse value and pulse polarity adjustable, pulse width adjustable (0.01 to 10 s), above a frequency of $1 / (2 \times \text{pulse width})$ the on/off ratio is 1:1, pulse frequency max. 50 Hz.

Intrinsically safe version: power supply and signal circuits and pulse output with "intrinsically safe" protection rating, only for connection to certified, intrinsically safe circuits with the following maximum values: $U_i = 30$ V, $I_i = 150$ mA, $P_i = 810$ mW. Effective internal inductance is negligible, effective internal capacitance, $C_i \leq 25$ nF. Pulse output: maximum values: $U_i = 30$ V, $I_i = 10$ mA, $P_i = 1$ W. Effective internal inductance is negligible, effective internal capacitance is negligible.

Signal on alarm

- Current output → failure response selectable
- Pulse/frequency output → failure response selectable
- Status output → non-conductive by fault or power supply failure

Low flow cutoff

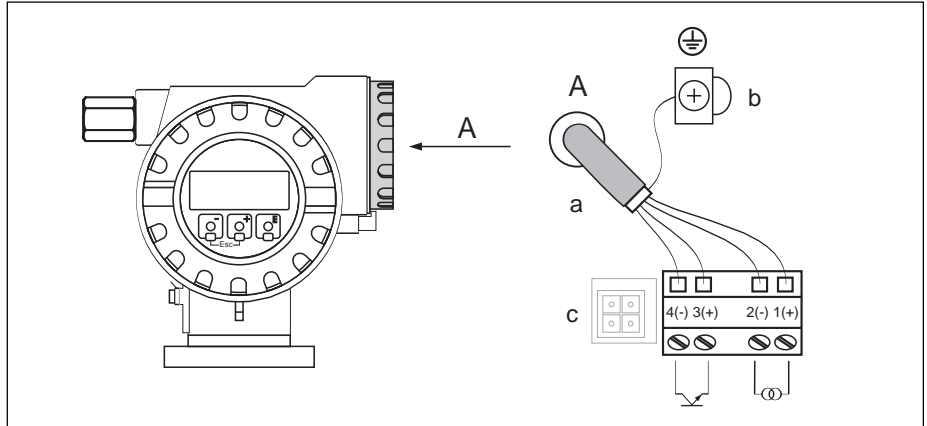
Switch points for low flow cutoff are selectable

Galvanic isolation

Outputs are galvanically isolated from sensor and each other.

Power supply

Electrical connection measuring unit



- A = View A (field housing)
- a Signal cable (the intrinsically safe 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***-*****W	Current output HART	-
23***-*****A	Current output HART	Pulse/frequency output

Mandatory:

A common connecting cable carries power supply voltage and measuring output signal:
Current output (passive) galvanically isolated: 12 to 30 VDC (IS, 13.9 to 30 VDC), 4 to 20 mA.

Optional:

A binary output can be used as an option, and configured as a standard pulse output, a frequency output or a switching output:
Frequency output (passive) galvanically isolated: maximum 30 VDC, 100 mA, open collector.

- Frequency operating mode: limit frequency 500 to 10,000 Hz ($f_{max} = 12,500$ Hz)
- Pulse operating mode: pulse frequency maximum 50 Hz
- Status operating mode: yes

Shielded signal cables are recommended as standard practice.

Load

The load can be calculated as follows:

$$\text{Non-hazardous area: } R_L[\Omega] = \frac{U_s[V] - U_v[V]}{I_M[A]} = \frac{U_s[V] - 12[V]}{0.022[A]}$$

$$\text{Intrinsically safe area: } R_L[\Omega] = \frac{U_s[V] - U_v[V]}{I_M[A]} = \frac{U_s[V] - 13.9[V]}{0.022[A]}$$

$R_L[\Omega]$ = Maximum load resistance, load (cable resistance)

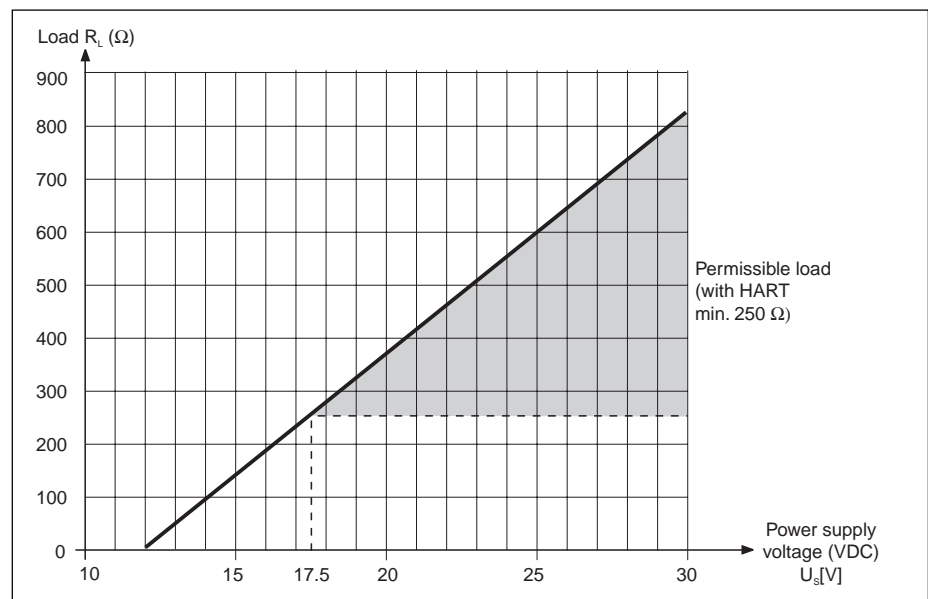
$U_s[V]$ = External supply voltage of 12 to 30 VDC (outgoing supply voltage, transmitter supply unit)

$U_v[V]$ = Minimum supply voltage of 12 VDC, 13.9 VDC for intrinsically safe unit (required supply voltage, transmitter)

$I_M[A]$ = Maximum signal transmission current (failsafe mode current output: 22 mA maximum current)

Caution!

The minimum load resistance (R_L) necessary for a data transfer via HART® protocol by way of the current signal cable is 250Ω. The minimum external supply voltage (U_s) therefore, has to be 17.5 VDC (non-hazardous)



Load at the analog current output (non-hazardous)

R_L maximum load resistance (with HART®, minimum 250Ω)

U_s external supply voltage (non-hazardous)

Cable entry

1/2" NPT

Cable specifications

Use shielded cables

Supply voltage

Non-hazardous area, 12 to 30 VDC (with HART®: 17.5 to 30 VDC)

Intrinsically safe area, 13.9 to 30 VDC (with HART®: 19.4 to 30 VDC)

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.

Potential equalization

Perfect measurement is only ensured when the medium and the sensor have the same electrical potential.

Metal process connections

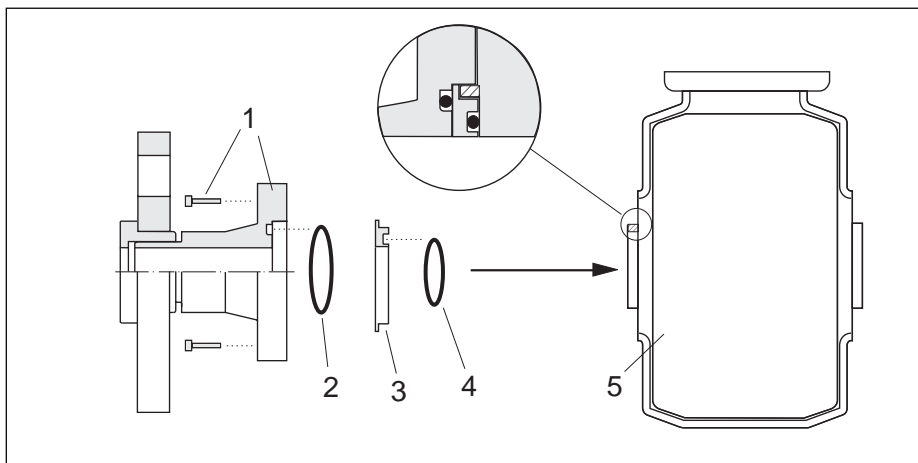
Potential matching usually takes place over the metallic process connection in contact with the medium process connections which are mounted directly on the measuring sensor. This usually means that additional potential matching measures are unnecessary.

NOTE:

For installation in metal pipes, it is advisable to connect the ground terminal of the transmitter housing to the piping.

Plastic process connections

For plastic process connections, potential matching must be ensured between sensor and medium using additional grounding rings. If these ground rings are missing, this can influence accuracy or destroy the measuring sensor through the electrochemical decomposition of the electrodes.



1 = Allen screw (process connection)
 2 = O-ring seal (process connection)
 3 = Plastic washer (spacer) or grounding ring

4 = O-ring seal (process connection)
 5 = Sensor

When using grounding rings, note the following points:

- Depending on the option ordered, plastic washers may be installed at the process connections instead of grounding rings. These plastic washers serve only as spacers and have no ground equalization function. In addition, they provide a sealing function at the interface between the sensor and process connection. For this reason, with process connections without grounding rings, these plastic washers/seals must not be removed, or must always be installed.
- Grounding rings can be ordered separately from Endress+Hauser as an accessory. Ensure the grounding rings specified are compatible with the electrode material of the sensor. Otherwise, the danger exists that the electrodes could be destroyed by electrochemical corrosion. Refer to Page 19 for material data.
- Grounding rings, including seals, are mounted inside the process connection. This has no influence on the installation length. Refer to Page 14 for grounding ring dimensions.

Measuring accuracy

Reference conditions

To DIN 19200 and VDI/VDE 2641:

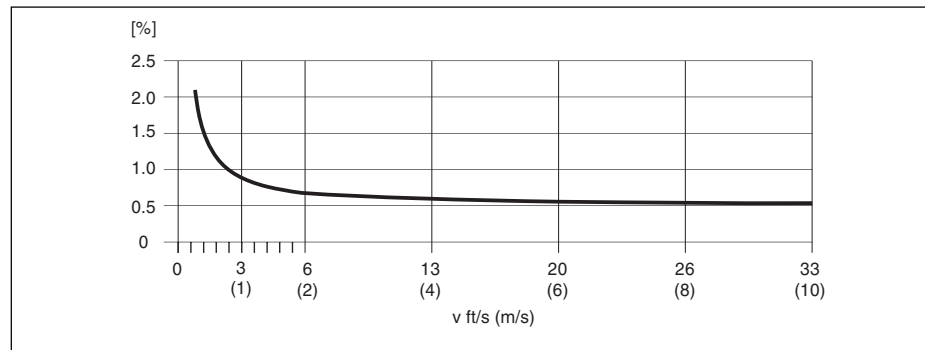
- Medium temperature: $+28\text{ °C} \pm 2\text{ K}$
- Ambient temperature: $+22\text{ °C} \pm 2\text{ K}$
- Warm-up time: 30 minutes

Installation:

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

Measured error

Signal output: $\pm 0.5\%$ o.r. $\pm 0.04\%$ of max. full scale (o.r. = of reading), fluctuations in voltage supply have no effect within the specified range.



Measured error in [%] of reading

Repeatability

$\pm 0.25\%$ o.r. $\pm 0.02\%$ of max. full scale (o.r. = of reading)

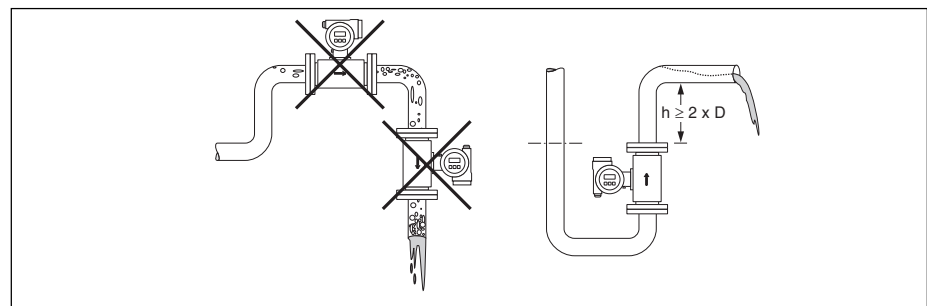
Installation conditions

Installation instructions

Mounting location

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

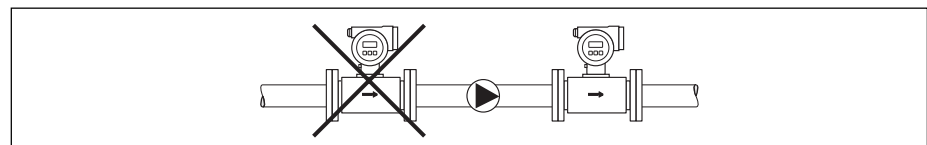
- Highest point in the run. Risk of air accumulating
- Directly upstream from an open pipe outlet in a down pipe



Installation of pumps

Do not install the sensor on the inlet 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. The sensor is shock and vibration resistant for acceleration up to 2 g in accordance with IEC 68-2-6.

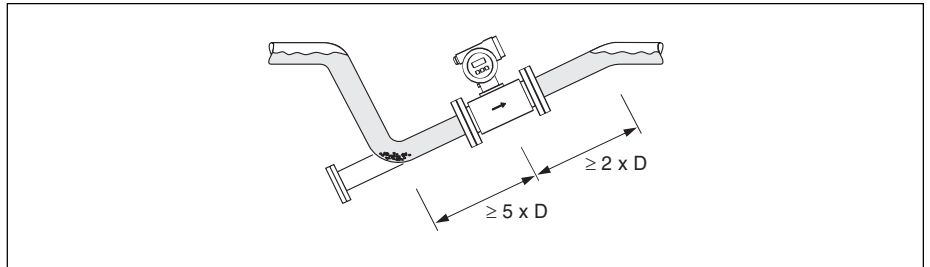


Partially filled pipes

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.

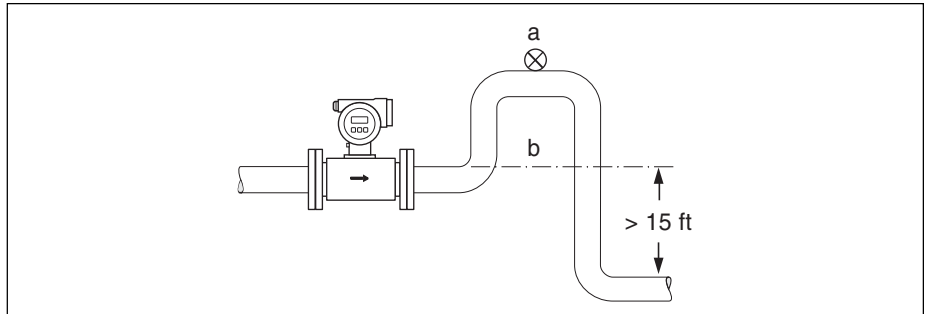
Caution:

To avoid the 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 15 feet (5 meters). This precaution is to avoid low pressure and the consequent risk of damage to the lining of the measuring tube. These measures also prevent the system losing prime, which could cause air inclusions.



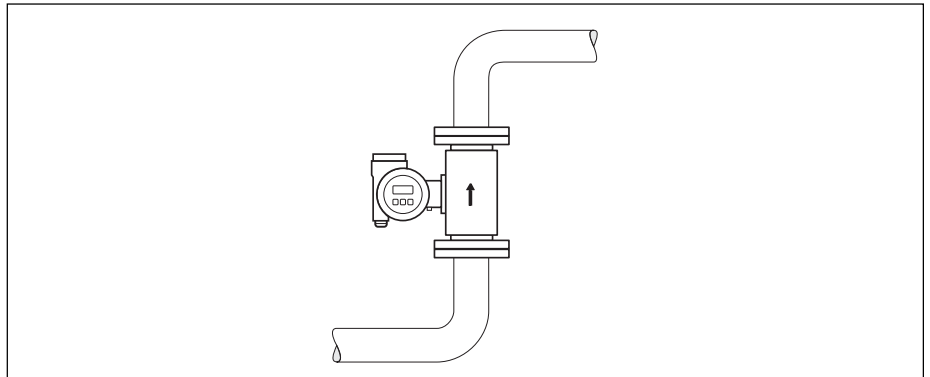
a = vent valve, b = siphon

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.

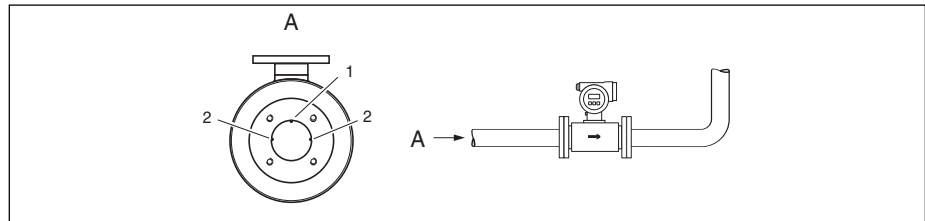


Horizontal orientation:

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

Caution:

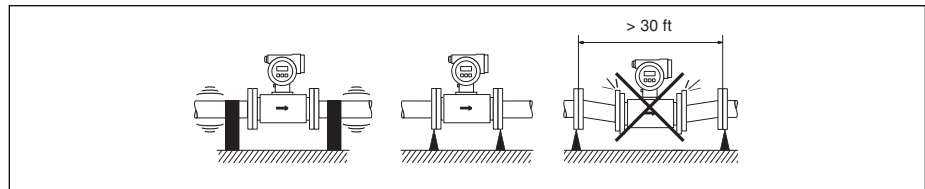
Empty Pipe Detection functions correctly only when the measuring device is installed horizontally and the transmitter housing is facing upward. Otherwise, there is no guarantee that Empty Pipe Detection will respond if the measuring tube is only partially filled or empty.



1 = EPD electrode (Empty Pipe Detection) except for 1/12" and 5/32" sizes
2 = Measuring electrodes (signal detection)

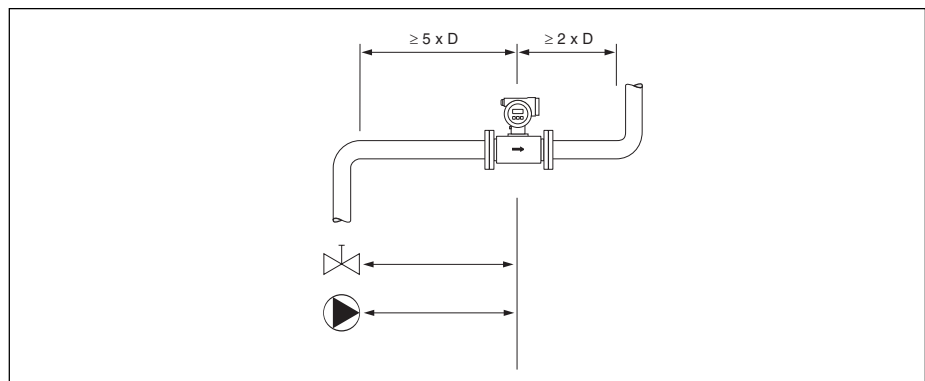
Vibrations

Secure the piping and the sensor if vibration is severe. The sensor is shock and vibration resistant for acceleration up to 2 g in accordance with IEC 68-2-6.

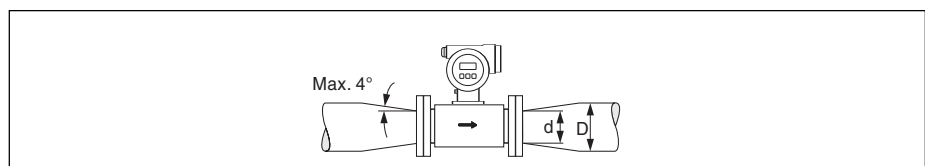
**Inlet and outlet runs**

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 $\geq 5 \times$ pipe diameter
- Outlet run $\geq 2 \times$ pipe diameter

**Adapter pieces**

With the help of the appropriate adapter pieces (reducers and expanders) the sensor can be mounted in a pipeline of a larger diameter. For slowly flowing fluids, the resulting higher velocity increases the measuring accuracy.



Ambient conditions

Ambient temperature	-5° to +120°F (-20° to +60°C) for sensor and transmitter Install the device at a shady location. Avoid direct sunlight, particularly in warm climatic regions.
Storage temperature	15° to + 120°F (-10° to +50°C), 70°F (20°C) is the preferable storage temperature.
Degree of protection	NEMA 4X (IP 67)
Shock and vibration resistance	Acceleration up to 2 g in accordance with IEC 68-2-6
CIP cleaning	Possible
SIP cleaning	Possible
Electromagnetic compatibility (EMC)	To EN 61326 and NAMUR recommendation NE 21

Process conditions

Medium temperature range	The permissible medium temperature depends on the sensor and the sealing material: Sensor: <ul style="list-style-type: none"> -5° to +300°F (-20° to +150°C) Seal: <ul style="list-style-type: none"> EPDM: -5° to +265°F (-20° to +130°C) Silicone: -5° to +300°F (-20° to +150°C) Viton: -5° to +300°F (-20° to +150°C) Kalrez: -5° to +300°F (-20° to +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: <ul style="list-style-type: none"> 580 psig (40 bar) for flanges, weld nipples (with O-ring seal) 230 psig (16 bar) for all other process connections

Pressure tightness (liner)

Size	Measuring tube lining	Resistance to partial vacuum of measuring tube lining limit values for abs. pressure (psia) at various fluid temperatures				
		75°F	175°F	212°F	265°F	300°F
1/12" to 4"	PFA	0	0	0	0	0

Pressure loss

For nominal diameters of 5/16" and larger, no pressure loss if the sensor is installed in a pipe of the same nominal diameter. Pressure losses occur in configurations incorporating adapters (reducers, expanders). Contact your Endress+Hauser representative or Endress+Hauser for information.

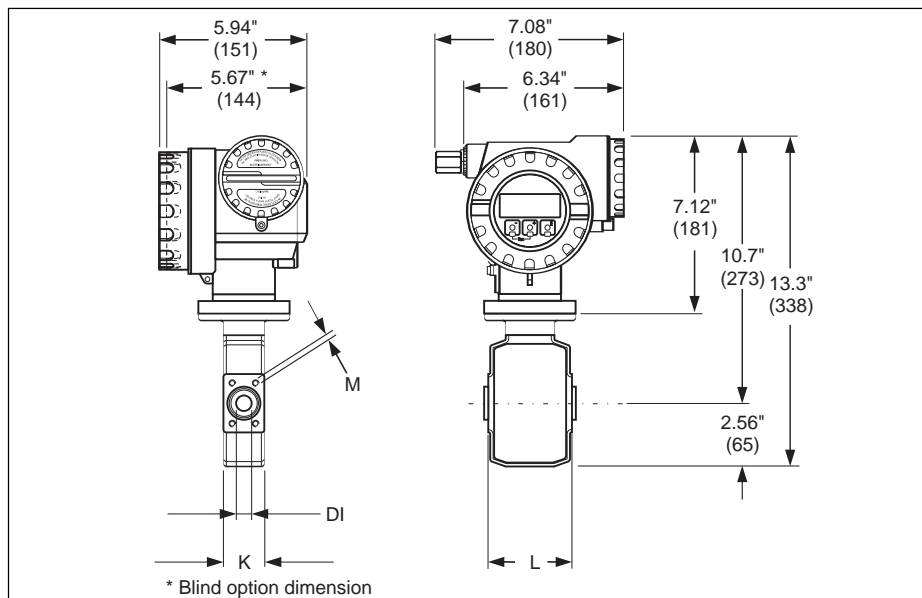
Flow limit

As a rule, the pipeline diameter determines the sensor diameter. With a known flowrate and the help of the Endress+Hauser Flow Applicator, the best size can be selected. Generally, a velocity range of 6 to 10 ft/sec should be selected.

Nominal diameter		Recommended flow rate Min./max. full scale value (v ~ 1.0 or 33 ft/s)	Factory settings		
inch	mm		Full scale value (v ~ 8 ft/s)	Pulse weighting (~ 2 pulses/s)	Creepage (~ 0.1 ft/s)
1/12	2	0.015 to 0.5 gpm	0.1 gpm	0.001 gal	0.002 gpm
5/32	4	0.07 to 2 gpm	0.5 gpm	0.005 gal	0.008 gpm
5/16	8	0.25 to 8 gpm	2 gpm	0.02 gal	0.025 gpm
1/2	15	1.0 to 27 gpm	6 gpm	0.05 gal	0.10 gpm
1	25	2.5 to 80 gpm	18 gpm	0.20 gal	0.25 gpm
1-1/2	40	7 to 190 gpm	50 gpm	0.50 gal	0.75 gpm
2	50	10 to 300 gpm	75 gpm	0.50 gal	1.25 gpm
2-1/2	65	16 to 500 gpm	130 gpm	1 gal	2.0 gpm
3	80	24 to 800 gpm	200 gpm	2 gal	2.5 gpm
4	100	40 to 1250 gpm	300 gpm	2 gal	4.0 gpm

Mechanical construction

Dimensions / mounting details Promag H, 1/12" to 1"



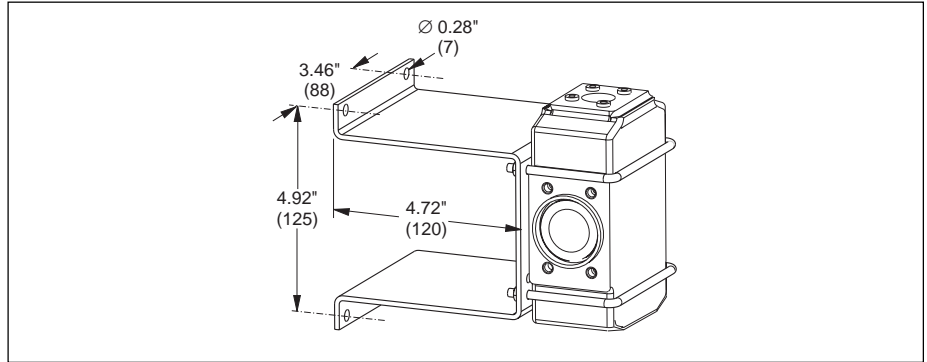
Nominal Size		Pressure **		DI		L		K		M	Weight	
inches	mm	psig	DIN (bar)	in	mm	in	mm	in	mm	mm	lb	kg
1/12	2	230 / 580	16/40	0.09	2.25	3.39	86	1.69	43	M 6x4	11	4.9
5/32	4	230 / 580	16/40	0.18	4.5	3.39	86	1.69	43	M 6x4	11	4.9
5/16	8	230 / 580	16/40	0.35	9	3.39	86	1.69	43	M 6x4	11	4.9
1/2	15	230 / 580	16/40	0.63	16	3.39	86	1.69	43	M 6x4	11	4.9
1	25	230 / 580	16/40	0.89	22.6	3.39	86	2.09	53	M 6x4	11	4.9

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

NOTE: Fitting length depends on process connections selected.

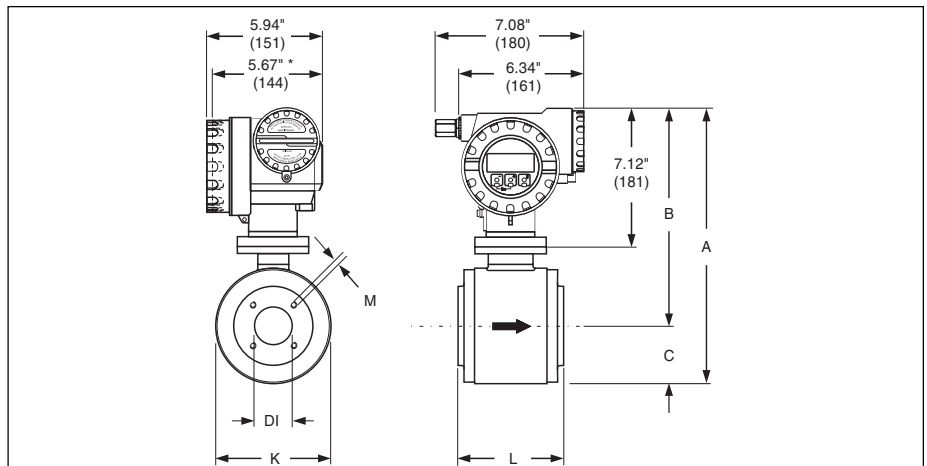
Dimensions in inches (mm)

**Wall mounting kit
for 1/12" to 1" sensors**



Dimensions in inches (mm)

**Dimensions / mounting details
Promag H, 1-1/2" to 4"**



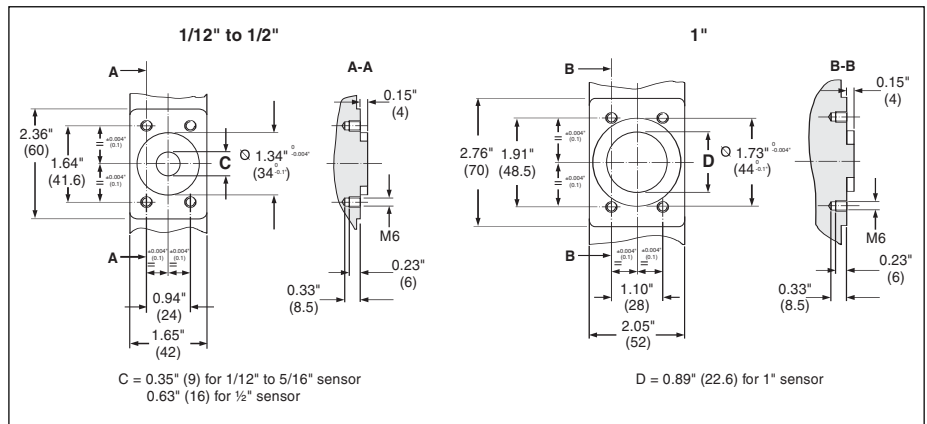
* Blind option dimension

Nominal Size		Pressure		DI		L		A		B		C		K		M		Weight	
inches	mm	psig	DIN (bar)	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	mm	lb	kg	
1-1/2	40	230	16	1.39	35.3	5.51	140	13.4	340	10.9	276	2.52	64	5.04	128	M 6x4	14	6.2	
2	50	230	16	1.89	48.1	5.51	140	14.4	365	11.3	288	3.03	77	6.02	153	M 8x4	19	8.7	
2-1/2	65	230	16	2.36	59.9	5.51	140	14.4	365	11.3	288	3.03	77	6.02	153	M 8x4	19	8.7	
3	80	230	16	2.86	72.6	7.87	200	16.3	415	12.3	313	4.02	102	7.99	203	M 12x4	41	18.7	
4	100	230	16	3.84	97.5	7.87	200	16.3	415	12.3	313	4.02	102	7.99	203	M 12x4	41	18.7	

NOTE: Fitting length depends on process connections selected.

Dimensions in inches (mm)

**Front view of the Promag H
(1/12" to 1") without process
connections**

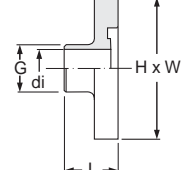


Dimensions in inches (mm)

Process connections with O-ring seals, 1/12" to 1"

Weld nipples IPS, 316L SS

5*H**-C*****

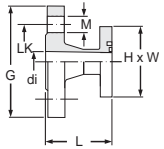


Meter Size	di		G		L		H x W	
	in	mm	in	mm	in	mm	in	mm
1/12" to 5/16"	0.35	9.0	0.53	13.5	0.80	20.3	2.36 x 1.65	60 x 42
1/2"	0.63	16.0	0.84	21.3	0.80	20.3	2.36 x 1.65	60 x 42
1"	1.07	27.2	1.33	33.7	0.88	22.3	2.76 x 2.05	70 x 52

Fitting length = (2 x L) + 3.39" (86 mm)

ANSI Class 150 B16.5 flanges, 316L SS

5*H**-E*****

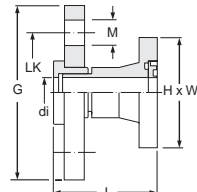


Meter Size	Flange Size	di		G		L		LK		M		H x W	
		in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
1/12" to 5/16"	1/2"	0.62	15.7	3.50	89	2.60	66.0	2.38	60.5	0.62	15.7	2.36 x 1.65	60 x 42
1/2"	1/2"	0.63	16.0	3.50	89	2.60	66.0	2.38	60.5	0.62	15.7	2.36 x 1.65	60 x 42
1"	1"	1.05	26.7	4.25	108	2.83	71.8	3.12	79.2	0.62	15.7	2.76 x 2.05	70 x 52

Fitting length = (2 x L) + 3.39" (86 mm)

ANSI Class 150 B16.5 flanges, PVDF

5*H**-H*****

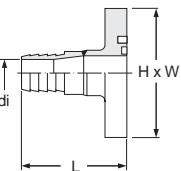


Meter Size	Flange Size	di		G		L		LK		M		H x W	
		in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
1/12" to 5/16"	1/2"	0.62	15.7	3.74	95	2.24	57	2.36	60	0.63	16	2.36 x 1.65	60 x 42
1/2"	1/2"	0.62	15.7	3.74	95	2.24	57	2.36	60	0.63	16	2.36 x 1.65	60 x 42
1"	1"	1.07	27.3	4.53	115	2.24	57	3.11	79	0.63	16	2.76 x 2.05	70 x 52

Fitting length = (2 x L) + 3.39" (86 mm)
The required grounding rings can be ordered as accessories;
order code: DK5HR-****

Hose connection, 316L SS

5*H**-M/N/P*****

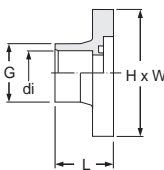


Meter Size	di		LW		L		H x W	
	in	mm	in	mm	in	mm	in	mm
1/12" to 5/16"	0.39	10.0	0.51	13	1.93	49	2.36 x 1.65	60 x 42
1/2"	0.49	12.6	0.63	16	1.93	49	2.36 x 1.65	60 x 42
1/2"	0.63	16.0	0.75	19	1.93	49	2.76 x 2.05	70 x 52

Fitting length = (2 x L) + 3.39" (86 mm)
LW = inside diameter of hose.

Adhesive coupling, PVC

5*H**-R*****



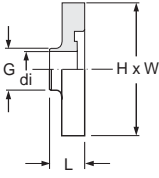
Meter Size	Pipe Size	di		G		L		H x W	
		in	mm	in	mm	in	mm	in	mm
1/12" to 5/16"	1/2"	0.85	21.5	1.07	27.3	1.10	28.0	2.36 x 1.65	60 x 42

Fitting length = (2 x L) + 3.39" (86 mm)
The required grounding rings can be ordered as accessories;
order code: DK5HR-****

Process connections with aseptic gasket seals, 1/12" to 1"

Weld nipples ODT, 316L SS

5*H**-V*****

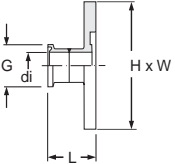


Meter Size	Tube Size	di		G		L		H x W	
		in	mm	in	mm	in	mm	in	mm
1/12" to 5/16"	1/2"	0.37	9.4	0.50	12.7	0.63	16.1	2.36 x 1.65	60 x 42
1/2"	3/4"	0.62	15.8	0.75	19.1	0.63	16.1	2.36 x 1.65	60 x 42
1"	1"	0.87	22.1	1.00	25.4	0.63	16.1	2.76 x 2.05	70 x 52

Fitting length = (2 x L) + 3.39" (86 mm)
 If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube and process connection (di) into account.

Tri-clamp® for ODT, 316L SS

5*H**-1*****



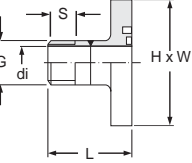
Meter Size	Tube Size	di		G		L		H x W	
		in	mm	in	mm	in	mm	in	mm
1/12" to 5/16"	1/2"	0.37	9.4	0.98	25.0	1.12	28.5	2.36 x 1.65	60 x 42
1/2"	3/4"	0.62	15.8	0.98	25.0	1.12	28.5	2.36 x 1.65	60 x 42
1"	1"	0.87	22.1	1.98	50.4	1.12	28.5	2.76 x 2.05	70 x 52

Fitting length = (2 x L) + 3.39" (86 mm)
 If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube and process connection (di) into account.

Process connections available as accessories (with O-ring seal, 1/12" to 1")

External thread NPT, 316L SS

DKH**-GD**

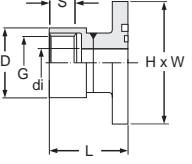


Meter Size	di		G in	L		S	H x W		
	in	mm		in	mm		in	mm	
1/12" to 5/16"	0.39	10	3/8	1.97	50	0.61	15.5	2.36 x 1.65	60 x 42
1/2"	0.63	16	1/2	1.97	50	0.79	20.0	2.36 x 1.65	60 x 42
1"	0.98	25	1	2.16	55	0.98	25.0	2.76 x 2.05	70 x 52

Fitting length = (2 x L) + 3.39" (86 mm)

Internal thread NPT, 316L SS

DKH**-GC**



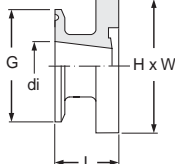
Meter Size	di		G in	D		L		S	H x W		
	in	mm		in	mm	in	mm		in	mm	
1/12" to 5/16"	0.35	8.9	3/8	0.87	22	1.77	45	0.52	13	2.36 x 1.65	60 x 42
1/2"	0.63	16.0	1/2	1.06	27	1.77	45	0.55	14	2.36 x 1.65	60 x 42
1"	1.07	27.2	1	1.57	40	1.93	49	0.67	17	2.76 x 2.05	70 x 52

Fitting length = (2 x L) + 3.39" (86 mm)

Process connections available as accessories (with aseptic gasket seal)

Tri-clamp® for ODT, 316L SS

DKH**-HF**

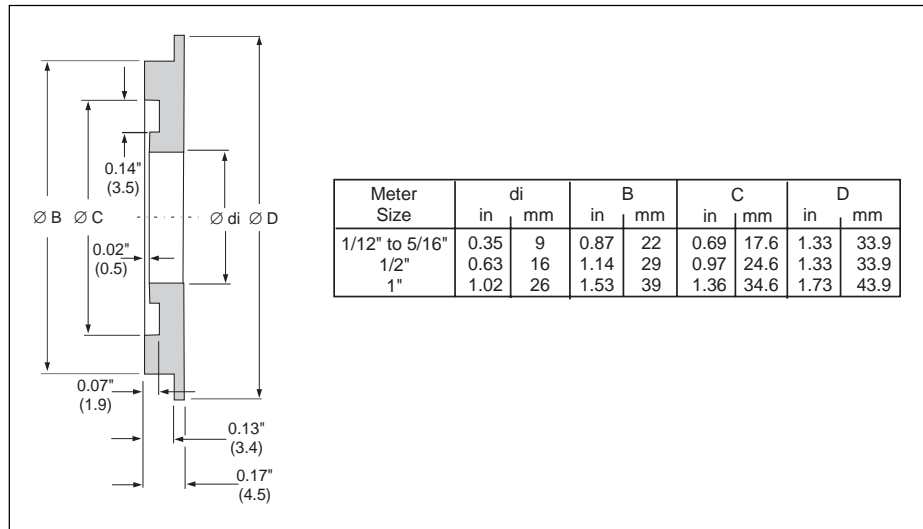


Meter Size	Tube Size	di		G		L		H x W	
		in	mm	in	mm	in	mm	in	mm
1/2"	1"	0.87	22.1	1.98	50.4	1.12	28.5	2.36 x 1.65	60 x 42

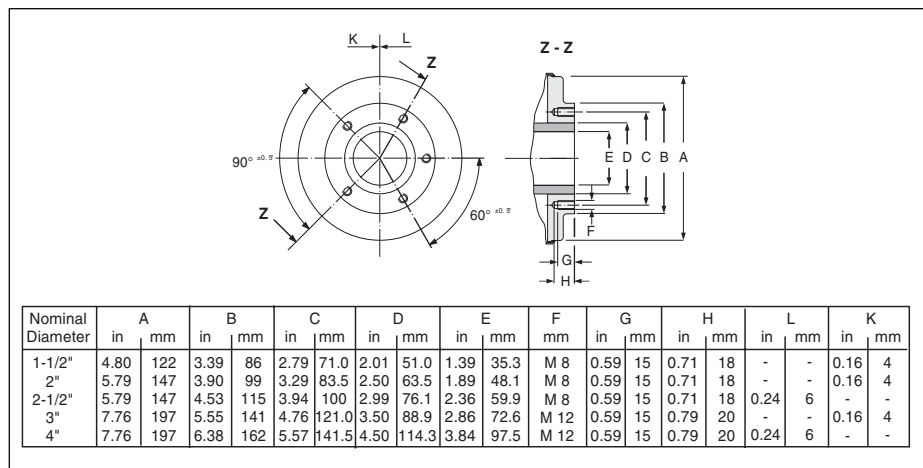
Fitting length = (2 x L) + 3.39" (86 mm)
 If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube and process connections (di) into account.

Ground rings available as accessories (PVDF flange / PVC adhesive coupling)

Ground ring 316L SS, Alloy C-22, or Titanium (Pt/Rh-coated)
DK5HR-**** (refer to Accessories, page 19)

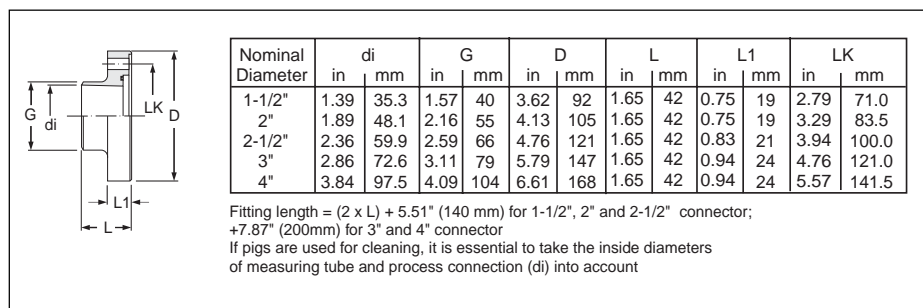


Front view of Promag H (1-1/2" to 4") without process connection



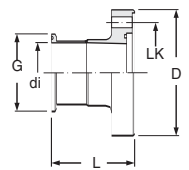
Process connections with aseptic gasket seals, 1-1/2" to 4"

Weld nipples for ODT, 316L SS
5"H**-V*****



Tri-clamp® for ODT, 316L SS

5*H**-1*****



Nominal Diameter	di		G		D		L		LK	
	in	mm	in	mm	in	mm	in	mm	in	mm
1-1/2"	1.37	34.8	1.98	50.4	3.62	92	2.70	68.6	2.79	71.0
2"	1.87	47.5	2.52	63.9	4.13	105	2.70	68.6	3.29	83.5
2-1/2"	2.37	60.2	3.05	77.4	4.76	121	2.70	68.6	3.94	100.0
3"	2.87	72.9	3.58	90.9	5.79	147	2.70	68.6	4.76	121.0
4"	3.83	97.4	4.68	118.9	6.61	168	2.70	68.6	5.57	141.5

Fitting length = (2 x L) + 5.51" (140 mm) for 1-1/2", 2" and 2-1/2" connector;
 +7.87" (200mm) for 3" and 4" connector
 If pigs are used for cleaning, it is essential to take the inside diameters of measuring tube and process connection (di) into account

Weight

Refer to pages 10 and 11

Materials

Transmitter housing:
 Powder coated die-cast aluminum

Display window:
 Glass (polycarbonate available upon request)

Sensor housing:
 304 SS

Wall mounting (holder panel):
 304 SS

Measuring tube:
 304 or 304L SS

- Process connections:
- All connections, 316L SS
 - Flanges, PVDF
 - Adhesive coupling, PVC

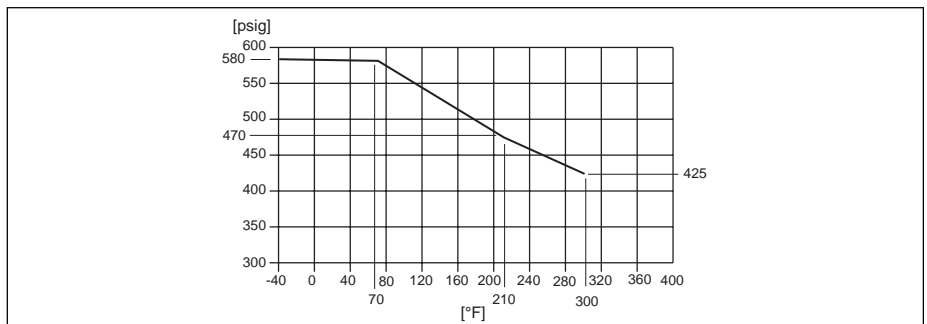
- Ground rings:
- Standard, 316L SS
 - Optional; tantalum, platinum (base material titanium Grade 2, platinum coating minimum 470 µin (12 µm)), Alloy C-22

- Electrodes:
- Standard, 316L SS
 - Optional; Alloy C-22, tantalum, platinum/rhodium 80/20 (up to 1" only)

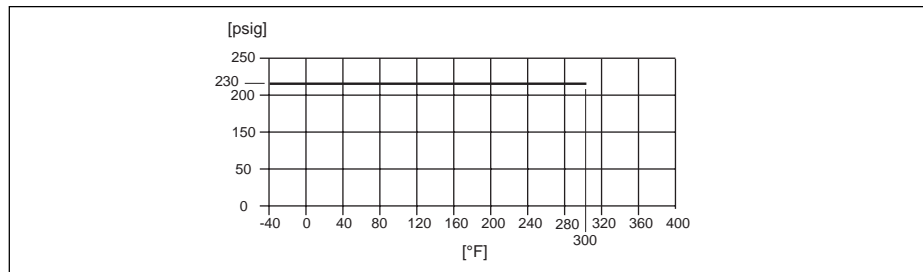
- Seals:
- 1/12" to 1", O-ring (EPDM, Viton, Kalrez) or gasket seal (EPDM, silicone, Viton)
 - 1-1/2" to 4", gasket seal (EPDM, silicone)

Material load curves

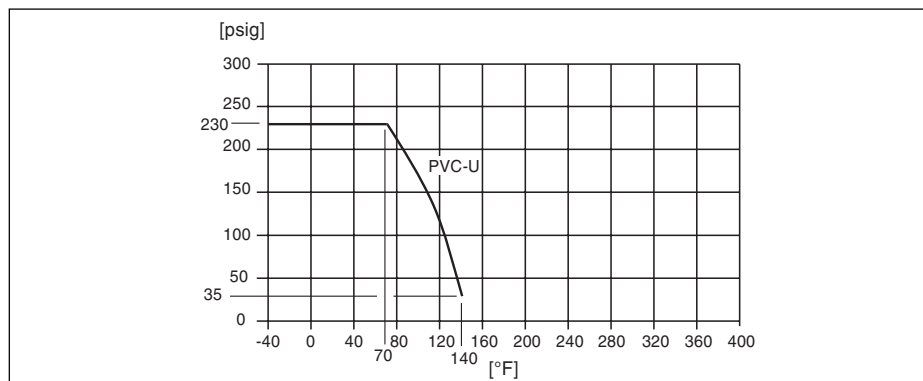
Weld nipples, 316L SS (with O-ring) to IPS



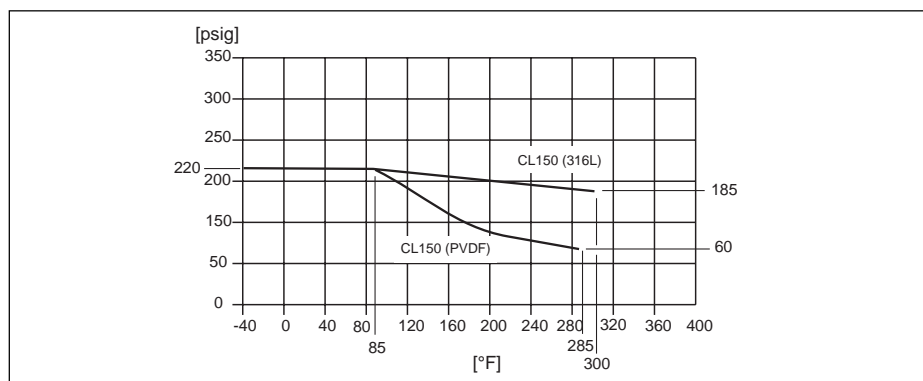
Weld nipples, 316L SS (with gasket seal) to ODT, clamp (ODT)



Adhesive coupling, PVC-U



Flange, 316L SS and PVDF to ANSI B 16.5



Fitted electrodes

Measuring and Empty Pipe Detection (EPD) electrodes:

- Standard, 316L SS, Alloy C-22, tantalum, or platinum/rhodium
- 1/12" and 5/32" without EPD electrode

Process connections

- With O-ring: weld nipples (IPS), ANSI flanges (316L SS, PVDF), external thread, internal thread, hose adapters, and PVC adhesive couplings
- With gasket seal: weld nipples (ODT), Tri-clamp® (ODT)

Surface roughness

- PFA liner: $\leq 12 \mu\text{in}$ ($0.3 \mu\text{m}$)
- Electrodes:
 - 316L SS, Alloy C-22: $\leq 16 \mu\text{in}$ ($0.4 \mu\text{m}$)
 - Tantalum, platinum/rhodium: $\leq 32 \mu\text{in}$ ($0.8 \mu\text{m}$)
- Process connection Promag H: $\leq 32 \mu\text{in}$ ($0.8 \mu\text{m}$)

Surface roughness relates to wetted parts

Human interface

Display elements	<ul style="list-style-type: none">• Liquid crystal display, four lines with 16 characters per line• Custom configurations for presenting different measured value and status variables• Flow rate: 5 digits with sign and units• Two totalizers (7-digit plus 7-digit overflow with sign and units)
Operating elements	<ul style="list-style-type: none">• Local operation with Touch Control (-, +, E)
Remote operation	Remote operation via HART®

Certificates and approvals

Hazardous area approvals	Information on the currently available hazardous area rated versions (FM, CSA, ATEX, etc.) is available on request from Endress+Hauser. All information relevant to explosion protection is available in separate documentation.
Sanitary compatibility	3-A authorized and EHEDG tested. Seals in conformity with FDA (except Kalrez seals)
CE mark	By attaching the CE mark, Endress+Hauser confirms that the instrument fulfills all the requirements of the relevant EC directives.
Other standards and guidelines	Housing protection ratings (IP code), EN 60529 "Protection Measures for Electrical Equipment for Measurement, Control, Regulation and Laboratory Procedures", EN 61010 Electromagnetic compatibility (EMC requirements), EN 61326 (IEC 1326) Association for Standards for Control Regulation in the Chemical Industry, NAMUR NE 21.

Ordering information

Promag 23 H Two-wire Electromagnetic flowmeter

Promag 23 H -

Nominal Diameter

- 1 02 1/12", PFA liner
 04 5/32", PFA liner
 08 5/16", PFA liner
 15 1/2", PFA liner
 22 1", PFA liner
 40 1-1/2", PFA liner
 50 2", PFA liner
 65 2-1/2", PFA liner
 80 3", PFA liner
 1H 4", PFA liner
- 2 Process Connection
For o-ring seal
 A Without process connectors
 C Weld nipple for IPS pipe, 316L SS
 E Class 150 ANSI B16.5, 316L SS flanges
 H Class 150 ANSI, PVDF flanges
 M Connection for 13 mm ID hose, 316L SS
 N Connection for 16 mm ID hose, 316L SS
 P Connection for 19 mm ID hose, 316L SS
 R Adhesive coupling for 1/2" pipe, PVC
For gasket seal
 V Weld nipples for ODT, 316L SS
 1 Tri-clamp® for ODT, 316L SS
 9 Other
- 3 Seal Material / Application Limits
 A EPDM o-ring seal / Up to 1" only
 B Viton o-ring seal / Up to 1" only
 C Kalrez o-ring seal / Up to 1" only
 F EPDM gasket seal / All sizes
 G Viton gasket seal / Up to 1" only
 H Silicone gasket seal, standard / All sizes
 0 Without seal (only without process connection)
 9 Other
- 4 Electrodes / Material / Grounding rings
 0 Measuring and EPD electrodes / 316L SS (1/12" and 5/32", no EPD electrode)
 1 Measuring and EPD electrodes / Alloy C-22, up to 1" only (1/12" and 5/32", no EPD electrode)
 2 Measuring and EPD electrodes / tantalum, up to 1" only (1/12" and 5/32", no EPD electrode)
 5 Measuring and EPD electrodes / Platinum/Rhodium 80/20%, up to 1" only (1/12" and 5/32", no EPD electrode)
 A 316L SS electrodes and grounding rings (only for process connection H and R)
 (1/12" and 5/32", no EPD)
 B Alloy C-22 electrodes and grounding rings (only for process connection H and R)
 (1/12" and 5/32", no EPD)
 9 Other

5 Calibration

- A 0.5% calibration, 3-point
 D SCS/A2LA 3-point 0.5% calibration (ISO/IEC 17025) with certificate traceable according to ISO 9000 (specify flow range)

9 Other

6 Certificates

- 1 Standard, no certificate
 2 3.1B material certificate for pipe and flanges (up to 1" for pipe, weld nipples / flanges)
 (for > 1", weld nipples only)
 3 2.3 pressure test certificate (1.5 x PN, 3 minutes)
 4 3.1B material certificate and 2.3 pressure test certificate (for weld nipples and flanges)
 5 CRN approval (only for process connections E, 1)
 8 CRN approval, 3.1B material and pressure test certificate (1.5 x PN) (only for process connection E)

7 Approvals

- A For use in non-hazardous areas
 N FM intrinsically safe, Class I, II, III; Div. 1, Grps A-G / CSA Class I, II, III; Div. 1, Grps A-G
 R FM non-incendive, Class I, Div. 2, Grps A-D / CSA Class I, Div. 2, Grps A-D
 Dust ignition proof, Class II, III; Div. 1, Grps E-G / CSA Class II, III; Div. 1, Grps E-G

8 Protection Type / Version

- A NEMA 4X (IP 67) / Compact, aluminum field housing
 9 Other

9 Cable for Remote Verison

- 0 Without cable

10 Cable Entries

- 2 1/2" NPT
 B 2 pieces, 1/2" NPT
 X Sensor only
 9 Other

11 Display / Power Supply / Operation

- 0 Without display / loop-powered / remote configuration only
 2 With display / loop-powered / Touch Control operation
 X Sensor only (without transmitter)
 9 Other

12 Software

- A Standard, English/German
 X Sensor only

13 Outputs / Inputs

- W Current / HART®
 A Current / HART®, passive pulse
 X Sensor only

Accessories

Promag 23 H Accessories

Various accessories, which can be ordered from Endress+Hauser, are available for the transmitter and the sensor. Contact your local representative or Endress+Hauser for detailed information.

DKH Process connection sets

A set includes 2 process connections and 2 seals

DKH -

1	2	3	4

Nominal Diameter

- | | | |
|---|--------------------|-------------------------------|
| 1 | 02 | 1/12" |
| | 04 | 5/32" |
| | 08 | 5/16" |
| | 15 | 1/2" |
| | 22 | 1" |
| 2 | Process Connection | |
| | GC | Internal thread for NPT pipe |
| | GD | External thread for NPT pipe |
| 3 | Seal Material | |
| | A | EPDM o-ring seal |
| | B | Viton o-ring seal |
| | C | Kalrez o-ring seal |
| | 9 | Other |
| 4 | Certificates | |
| | 1 | Standard without certificates |
| | 9 | Other |

DK5HR Grounding ring sets

A set includes 2 grounding rings

DK5HR -

1	2	3

Nominal Diameter

- | | | |
|---|---------------------------|--|
| 1 | H8 | 1/12" to 5/16" |
| | 15 | 1/2" |
| | 22 | 1" |
| 2 | Grounding ring / Material | |
| | 1 | Grounding ring for 316L SS electrodes / 316L SS |
| | 2 | Grounding ring for Alloy C-22 electrodes / Alloy C-22 |
| | 5 | Grounding ring for Tantalum electrodes / Titanium (Pt/Rh coated) |
| 3 | Seals | |
| | 0 | Without seal |
| | 9 | Other |

DK5HA - Adapter for replacement of Promag A sensors

DK5HS - Seal sets

DK5HW - Weld in tool

DK5HM - Wall mounting set for 1" and smaller sensors

Supplemental documentation

- Promag 23 P Technical Information (TI 049D/24/ae)
- Promag 23 H Operating Instructions (BA 045D/06/en and BA 050D/06/en)
- Hazardous Area Approvals Documentation (FM, CSA, ATEX, etc.)

For application and selection assistance,
call 888-ENDRESS

For total support of your installed base,
24 hours a day, call 800-642-8737

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Endress+Hauser
The Power of Know How

