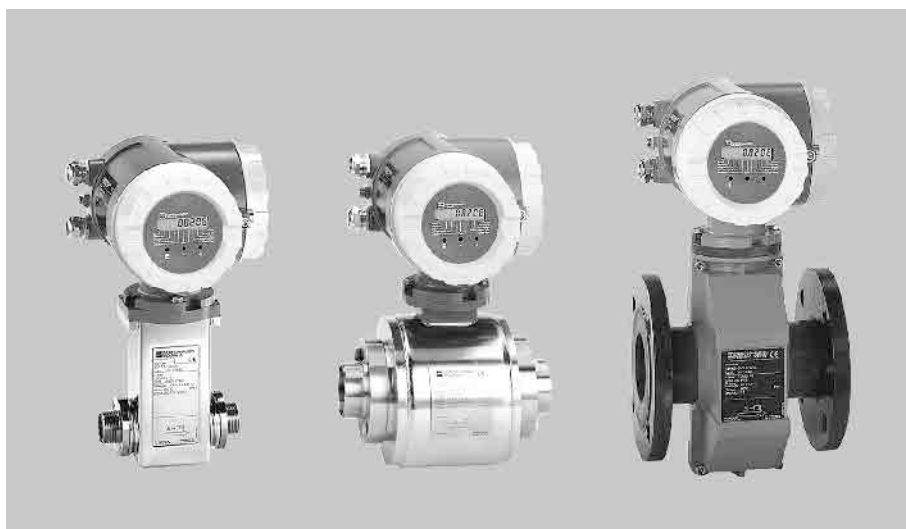


Electromagnetic Flow Measuring System

promag 30 (Model '99)



Flexible System

- Wide choice of materials for process connections and measuring tube linings, compatible to the fluid
- Transmitter housing and display can be rotated to fit the orientation

Operational Security

- ISO 9001 manufacturer
- High electromagnetic compatibility (EMC)
- High operating integrity through self-monitoring
- Data protection with EEPROM on power failure (without batteries)
- Auxiliary input for Positive Zero Return (PZR) and totalizer reset
- Empty Pipe Detection (EPD)

Easy to Operate

- Local display: all important variables easily read off
- E+H operating matrix: instrument functions easily configurable

Measure Precisely

- Measuring error: $\pm 0.5\%$ or $\pm 0.2\%$
- 1000:1 operable flow range
- Excellent repeatability

Install Anywhere

- Robust, shock-resistant aluminium housing, resistant to acids and caustics
- IP 67 protection for compact and remote versions (optional IP 68 sensor)
- Wide size range DN 2...2000 ($\frac{1}{12}$...78")
- Flanged version with ISO meter lengths
- Modular, hygienic sensor for food and pharmaceutical applications
- Ex versions for use in Ex Zones 1 and 2

Endress + Hauser

Nothing beats know-how



Measuring System

Fields of Application

With the Promag 30 (Model '99) flow-meter most liquids can be measured provided they have a minimum conductivity of $\geq 5 \mu\text{S/cm}$, e.g.

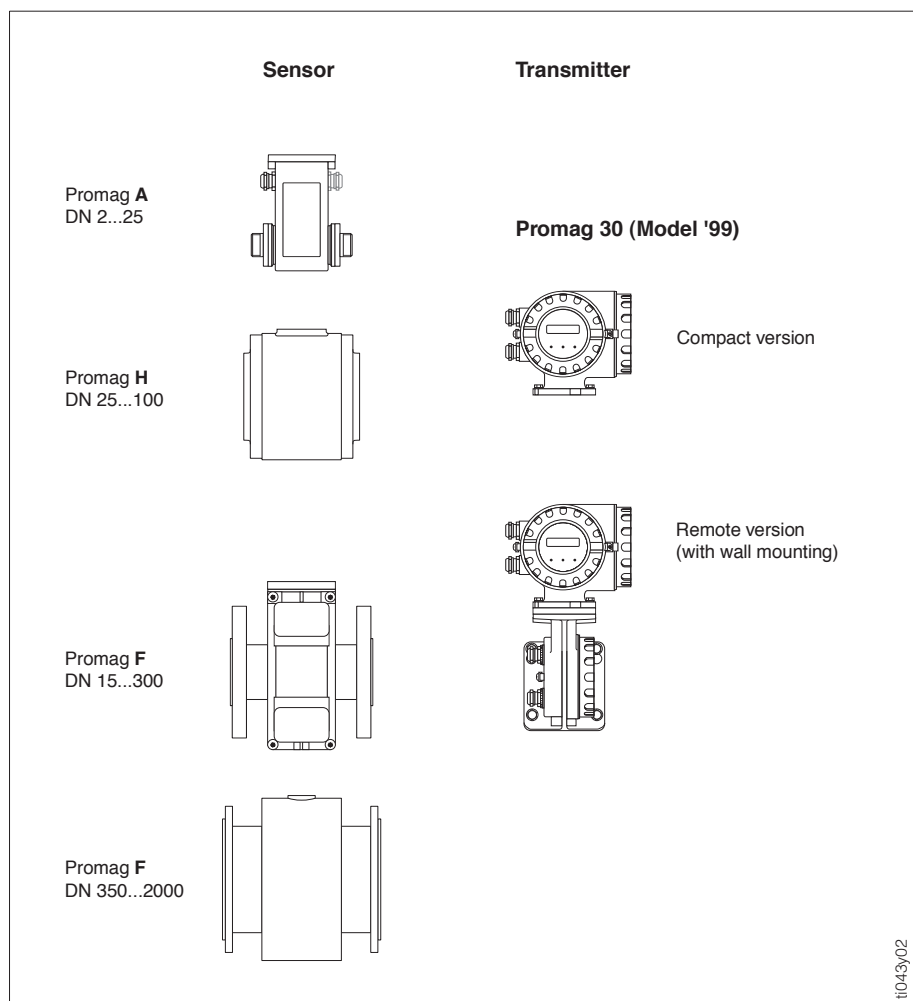
- acids, alkalis, pastes, pulps,
- drinking water, waste water, sewage sludge,
- milk, beer, wine, mineral water, yoghurt, molasses, etc.

A minimum conductivity of $\geq 20 \mu\text{S/cm}$ is required for measuring demineralised water.

Ex Versions

Promag 30 (Model '99) is available as a remote version with the following Ex approvals:

- Sensor in Ex Zone 1
- Transmitter in Ex Zone 2



Measuring System

The measuring system consists of:

- Promag 30 (Model '99) transmitter
- Promag A, H or F sensor

The Promag 30 measuring system is mechanically and electronically designed for maximum flexibility with the transmitters and sensors being combined in any variation. The wide range of materials and process connections (fittings; flanges DIN, ANSI, JIS; Tri-Clamp, etc.) ensure that the measuring point can adjust to both plant and process conditions.

The Promag 31 F / 31 H Measuring System

The Promag 30 is also available under the following designations and approvals:

Promag 31 F

- PTB approval for custody transfer with cold water and wastewater (either for approval or approved for custody transfer)
- Heat measurement approval, Swiss certification to OIML R72/R75

Promag 31 H

- PTB approval to DIN 19217 (OIML 117) for custody transfer with beer, original wort, milk.

Function

Measuring Principle

According to Faraday's Law of Magnetic Induction, a voltage is induced into a conductor which moves in a magnetic field. With the electromagnetic measuring principle, the flowing fluid is the moving conductor. The induced voltage is proportionally related to the flow velocity and is fed to the measuring amplifier by a pair of electrodes. Using the pipe cross-sectional area, the flow volume is calculated.

The DC magnetic field is generated by a switched direct current of alternating polarity. Together with the patented "Integrated Autozero Circuit", this guarantees a stable zero point, and makes the measurement fluid-independent and insensitive to entrained solid particles. Every meter is factory calibrated with the most modern calibration rigs, traceable to national standards.

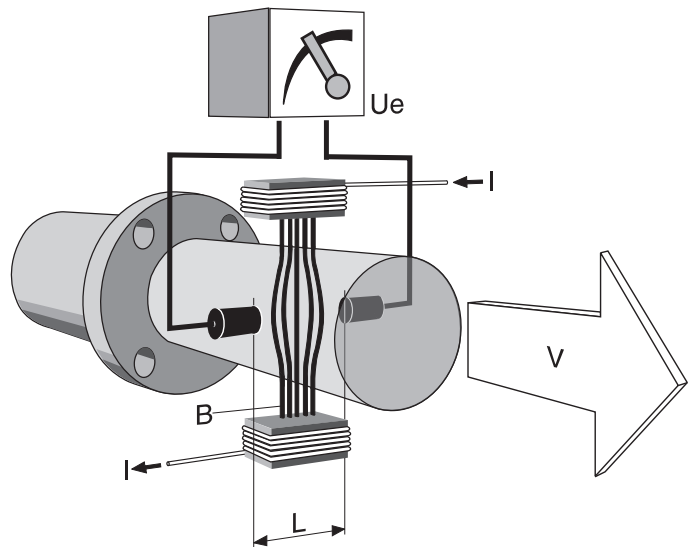
Function of the Promag 30 (Model '99)

The Promag transmitter converts the measured values coming from the sensor into standardised output signals. The following outputs are available for these signals:

- Current output
(full scale value freely selectable)
- Pulse output
(pulse value freely selectable)
- Status output:
 - Indication of system or process errors
 - Indication of flow direction
- Auxiliary input:
 - Positive zero return
 - Totalizer reset

Promag 30 also has the following features:

- Empty Pipe Detection (EPD) detects and indicates partially filled or empty measuring tubes.
- The special electrode cleaning circuitry (EEC) ensures accurate flow measurement even with conductive build-up in the measuring tube (e.g. magnetite).



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

$$Q = v \cdot A$$

U_e = induced voltage
 B = magnetic induction (magnetic field)
 L = distance between electrodes
 v = flow velocity
 Q = volume flow
 A = pipe cross-section

Operation

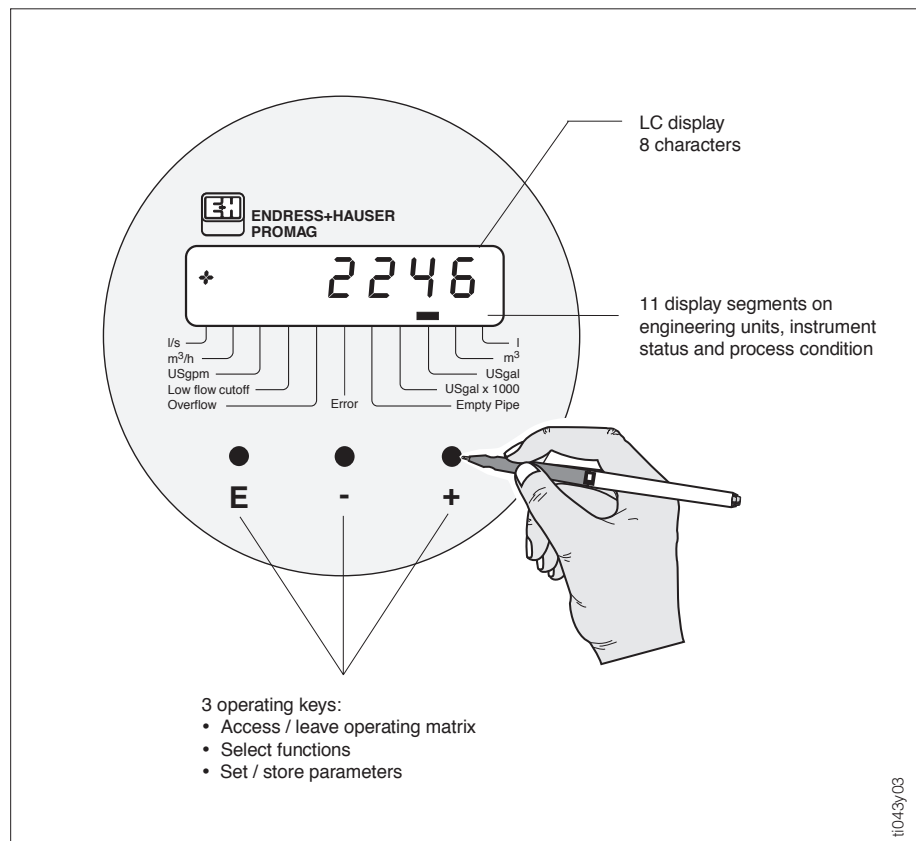
Display and Operation

The Promag 30 measuring system is equipped with a large local display. This ensures that all important variables can be read off and controlled directly at the measuring point:

- Flow rate and/or totalized flow
- Technical units
- Process conditions:
 - falling below creep limit
 - signal outputs exceeded
- Display of system errors

Three operating keys are used for selecting and setting all functions of the instrument.

The E+H operating matrix allows quick and easy access to all individual functions.



Functions (Operating matrix)

User interface

- Function code (display)
- Flow rate units
- Totalizer units

Current output

- Full scale value (freely adjustable)
- Time constant (freely selectable)
- Current range 0/4...20 mA

Pulse output

- Pulse value (freely adjustable)

Status output

- Function

Auxiliary input

- Function

Display

- Totalizer reset
- Display mode
- Display damping
- Totalizer overflows

Process parameter

- Creep suppression
- Empty Pipe Detection (EPD)
- Electrode cleaning (ECC), optional

Diameter Selection

As a rule, the pipe diameter determines the sensor nominal diameter.

A necessary increase in velocity can be achieved through a reduction of the sensor diameter (see page 8). The higher installation expense is normally balanced by the lower sensor cost.

The flow velocity (v) is also to be determined by the fluid's physical properties:

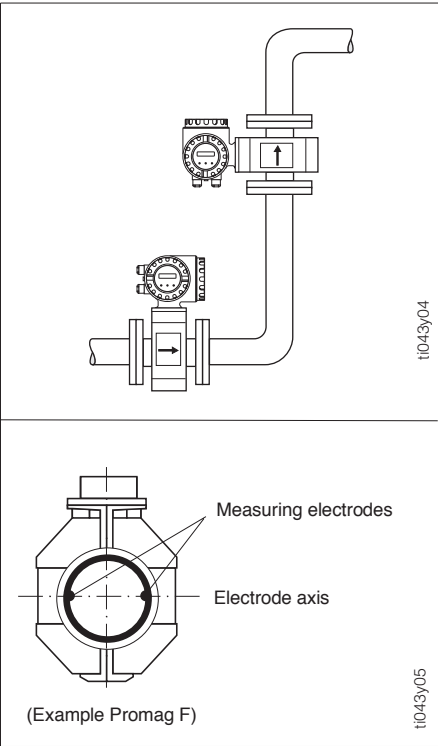
- $v < 2$ m/s: with abrasive fluids, e.g. potter's clay, lime milk, ore slurry
- $v > 2$ m/s: with fluids causing build up, e.g. wastewater slurry etc.

The table below summarizes the minimum and maximum end values (incl. factory settings).

Full scale values (current output)								
DN	l/s			m ³ /h		USgpm		
	Min.	Factory setting	Max.	Min.	Max.	Min.	Factory setting	Max.
2	0.00094	0.008	0.031	0.0034	0.1131	0.015	0.1	0.498
4	0.0038	0.03	0.126	0.0136	0.4524	0.060	0.5	1.99
8	0.015	0.10	0.50	0.0543	1.810	0.239	2	7.97
15	0.053	0.45	1.77	0.1908	6.362	0.840	7	28.0
25	0.147	1	4.91	0.5301	17.67	2.33	20	77.8
32	0.241	2	8.04	0.8685	28.95	3.82	30	127.5
40	0.377	3	12.6	1.357	45.24	5.98	50	199.2
50	0.589	5	19.6	2.121	70.69	9.34	80	311.2
65	0.995	8	33.2	3.584	119.5	15.8	150	526.0
80	1.51	10	50.3	5.429	181.0	23.9	200	796.7
100	2.36	20	78.5	8.482	282.7	37.4	300	1245
125	3.68	30	122.7	13.25	441.8	58.4	500	1945
150	5.30	45	176.7	19.09	636.2	84.0	700	2801
200	9.42	80	314.2	33.93	1130	149.4	1000	4980
250	14.7	100	490.9	53.01	1767	233.4	2000	7781
300	21.2	150	706.9	76.34	2545	336.1	3000	11204
350	28.9	250	962.1	103.9	3464	457.5	4000	15250
400	37.7	300	1256.6	135.7	4524	597.5	5000	19918
450	47.7	400	1590.4	171.8	5726	756.3	6500	25209
500	58.9	500	1963.4	212.1	7069	933.7	8000	31122
600	84.8	700	2827.4	305.4	10179	1345	10000	44816
700	115.4	950	3848.5	415.6	13854	1830	15000	60999
750	132.5	1000	4417.9	477.1	15904	2101	15000	70025
800	150.7	1000	5026.5	542.9	18096	2390	20000	79672
900	190.8	1500	6361.7	687.1	22902	3025	25000	100835
1000	235.6	2000	7854.0	848.2	28274	3735	30000	124488
1050	259.7	2000	8659.0	935.2	31172	4117	35000	137248
1200	339.2	3000	11310	1222	40715	5379	50000	179263
1350	429.4	3500	14313	1546	51530	6806	55000	226880
1400	461.8	4000	15393	1663	55418	7320	60000	243997
1500	530.1	4500	17671	1909	63617	8403	70000	280098
1600	603.1	5000	20106	2172	72382	9561	80000	318690
1700	680.9	5500	22698	2451	81713	10793	90000	359771
1800	763.4	6500	25447	2748	91609	12100	100000	403342
2000	942.4	8000	31416	3393	113097	14939	100000	497953
Minimum full scale → flow rate = 0.3 m/s Maximum full scale → flow rate = 10 m/s Factory settings → flow rate ~ 2.5 m/s (I = 20 mA)								

Mounting

In order to measure correctly and to prevent damage, please observe the following installation instructions.



Mounting Position

Vertical mounting:

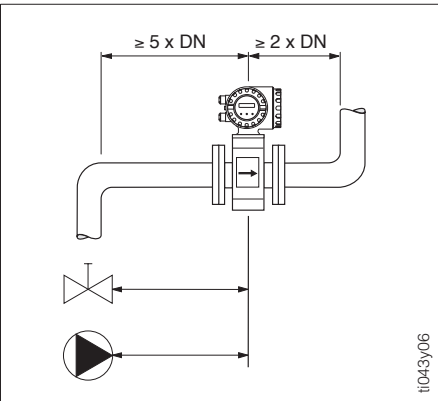
This is the recommended position with the flow upwards. Entrained solid particles sink and fatty components in the stationary fluid rise away from the measuring electrodes. This is the optimal position in empty pipe system and when using Empty Pipe Detection.

Horizontal mounting:

The axis of the electrodes must be horizontal, thus preventing brief insulation of the electrodes by entrained air bubbles.

Electrode axis:

The plane in which the electrode axis lies with regard to the transmitter is identical for the Promag A, H and F sensors.



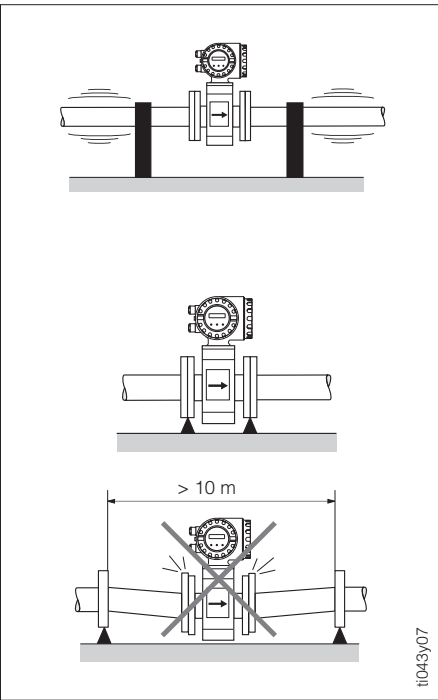
Inlet and Outlet Sections

The sensor should be mounted away from fittings such as valves, T-pieces, elbows, etc.

Inlet section: $\geq 5 \times DN$

Outlet section: $\geq 2 \times DN$

The inlet and outlet sections must be observed in order to maintain accuracy.

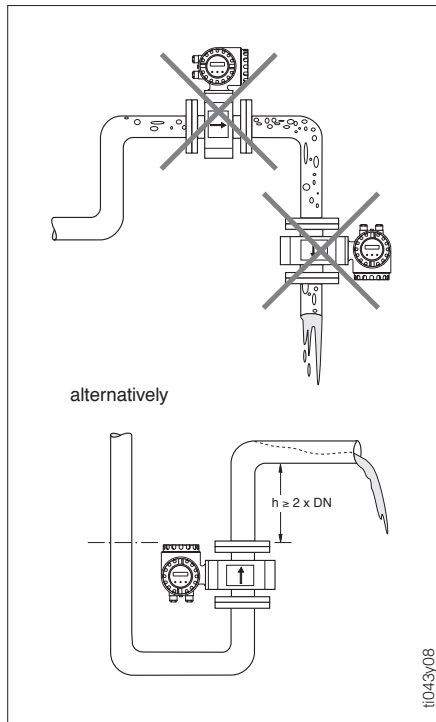


Vibration

The piping before and after the sensor should be securely fastened if there is excessive vibration. Information on shock and vibration resistance is found on page 24.

Excessive vibration necessitates separate mounting of the sensor and transmitter.

Mechanical support of the sensor is recommended for free runs of piping over 10 m long.

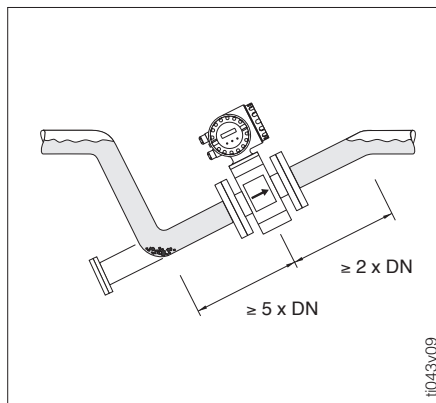


Mounting Location

Correct measurement is only possible when the pipe is full. The following locations should therefore be avoided:

- No installation at the highest point (air accumulation).
- No installation immediately before an open pipe outlet in a downward line. The alternative suggestion, however, permits such a location.

The alternative installation, however, permits a correct measurement.



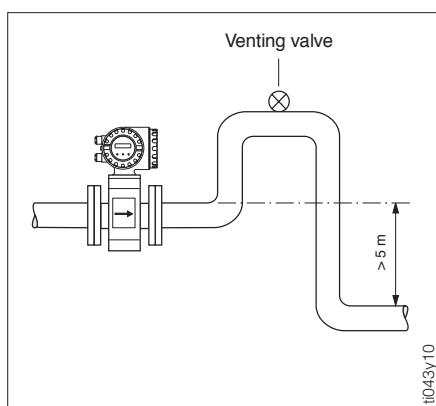
Partly Filled Pipes

For inclines a mounting similar to a drain should be adopted.

Added security is offered by Empty Pipe Detection in order to detect empty or partly filled pipes.

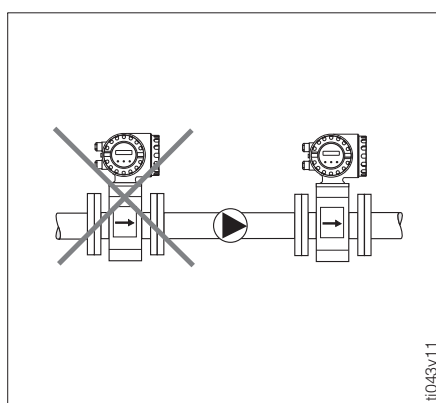
Note!

Danger of solids accumulation!
Do not mount the sensor at the lowest point of the drain. A cleaning valve should also be installed.



Downward Pipe

With the installation suggested opposite, partial vacuum is avoided even with a downward pipe > 5 m long (siphon, vent valve downstream of the sensor).



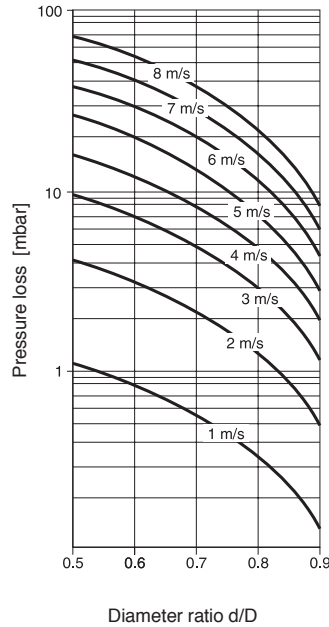
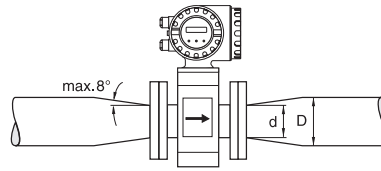
Installation of Pumps

Do not mount the sensors on the suction side of pumps.

This prevents low pressure and prevents possible damage to the lining of the measuring tube.

Pulse dampers should be installed when using reciprocal, diaphragm or peristaltic pumps.

Mounting



ti043y12

Adapters

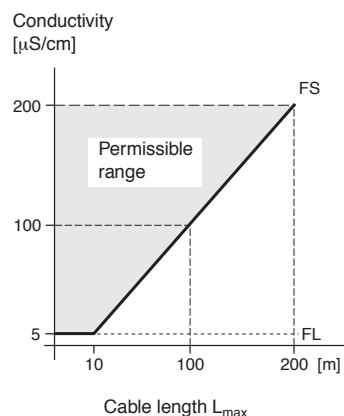
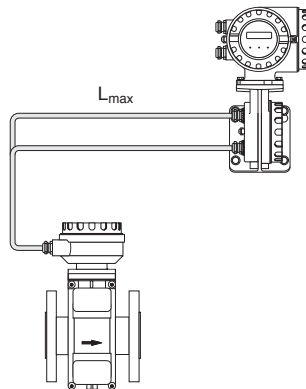
The sensor can also be mounted in a pipe with a larger nominal diameter when suitable adapters (reducers and expanders) to DIN 28545 are fitted. The resultant increase in the rate of flow increases the accuracy of measurement with slowly moving fluids.

The adjacent nomogram can be used to determine the pressure loss caused:

1. Determine the ratio of the diameter d/D .
2. From the nomogram read off the pressure loss at the flow velocity and d/D ratio.

Note!

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



ti043y13

Remote Version

Two different versions are available for the remote version:

FS version

- The permissible cable length greater than 10 meters is governed by the fluid conductivity (see Fig.).
- Permissible cable length of max. 10 meters if the instrument is equipped with an Empty Pipe Detection (EPD) electrode.
- The FS cable is recommended only for distances smaller than 20 m.

FL version

- All fluids with a minimum conductivity of $\geq 5 \mu\text{S/cm}$ (demineralised water $\geq 20 \mu\text{S/cm}$) can be measured independent of the cable length.
- Empty Pipe Detection (EPD) is not available with this version.

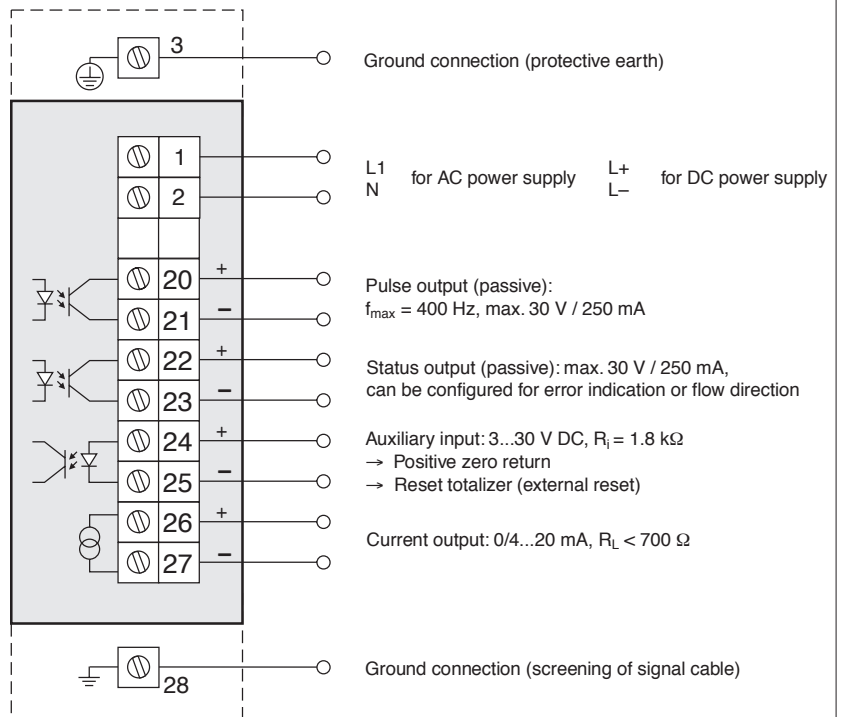
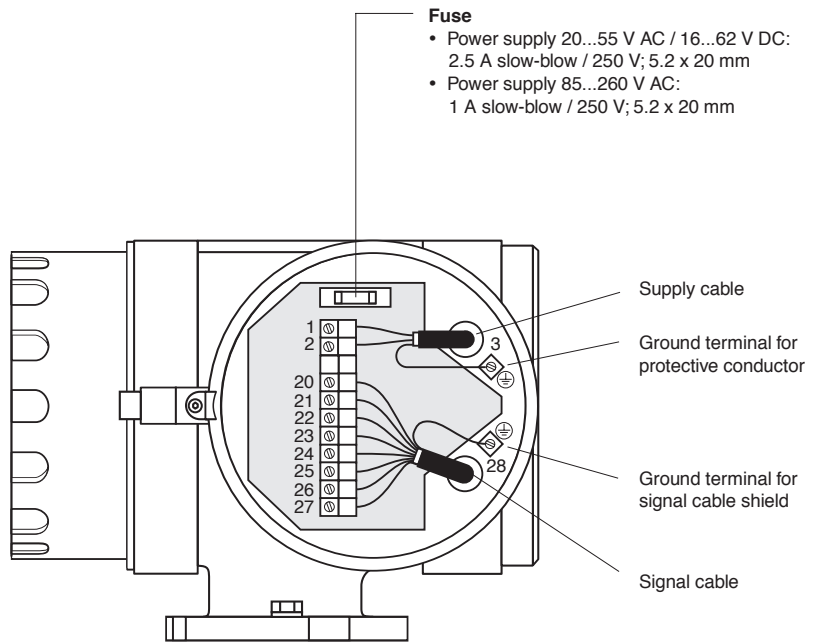
Please also note the following:

- Fasten the cable gland or lay it in a conduit. When the fluid conductivity is low, cable movements can cause serious changes in capacitance and thereby falsify the measuring signal.
- Do not run the cable in the vicinity of electrical machines or switching elements.
- Ensure potential equalisation between the transmitter and the sensor.

Remote version has to be mounted when:

- access is difficult
- space is restricted
- extreme process and ambient temperatures prevail (see page 24)
- there is severe vibration (see page 24)

Electrical Connection Transmitter

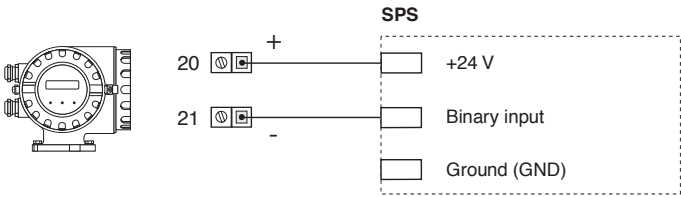


Note!

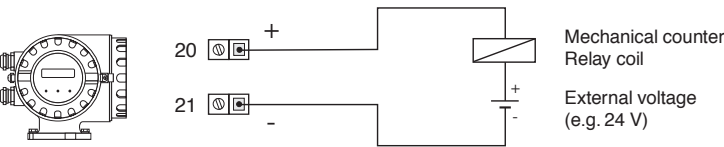
- Example connection diagrams for the pulse, current, status output and auxiliary input are given on the following page.
- The input and outputs for the power supply are galvanically separated from one other.

Electrical Connection Examples

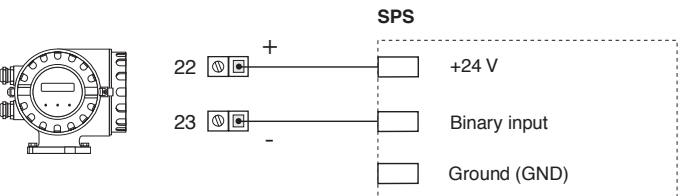
Pulse output



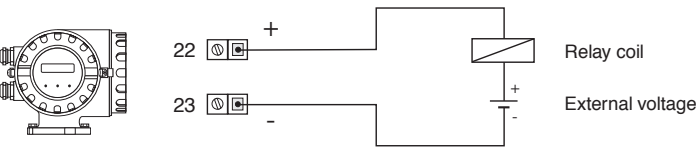
Relay / mechanical counter



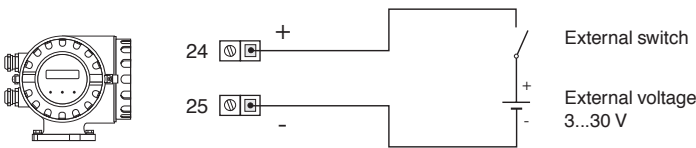
Status output



Relay

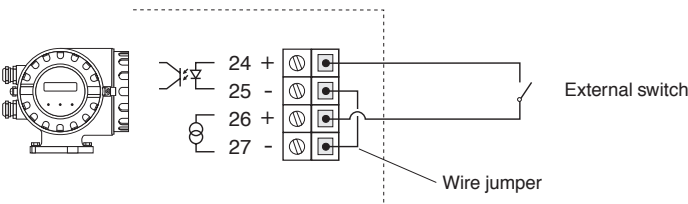


Auxiliary input



Current output as a power supply source

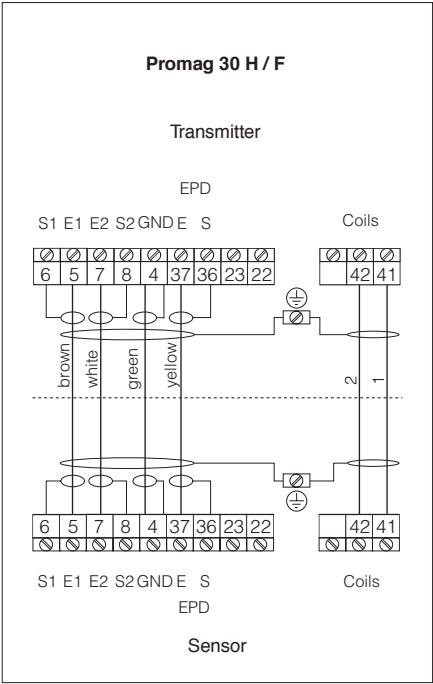
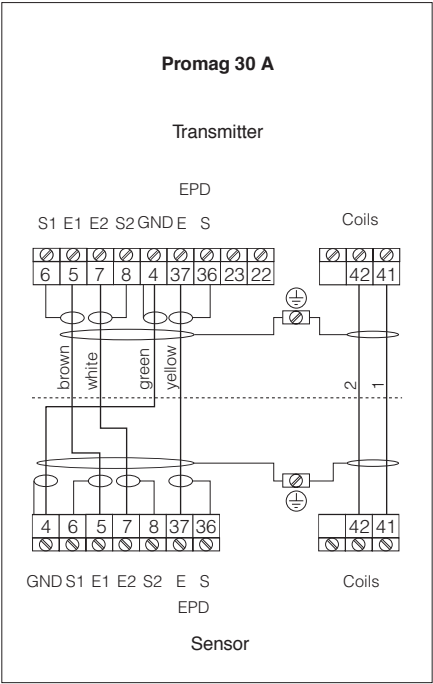
If the current output is not required, then this can be used as a power supply.
Set the current output to 4–20 mA.



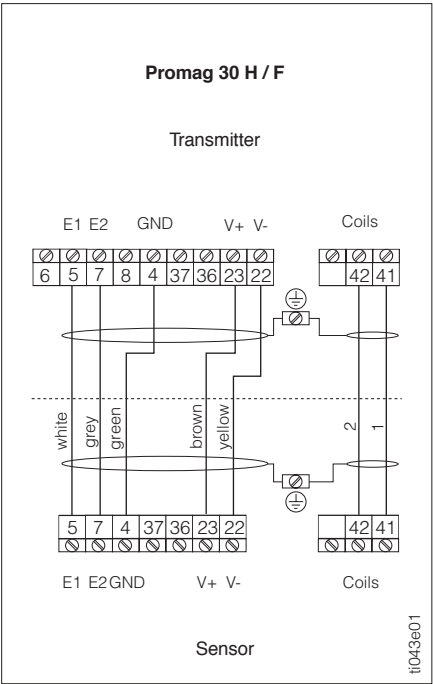
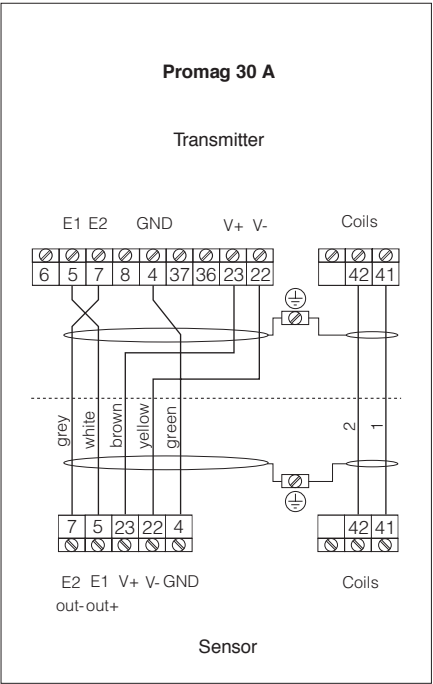
Caution!
Carefully note the specifications required for inputs and outputs (see page 22)

Electrical Connection
Remote Version

FS Version



FL Version



ti043e01

Cable Specifications

Remote Version "FS"

Coil cable:	2 x 0.75 mm ² PVC cable with common screen *	
	Conductor resistance	≤ 37 Ω/km
	Capacitance: core/core, screen grounded	≤ 120 pF/m
Signal cable:	3 x 0.38 mm ² PVC cable with common screen * and separately screened cores	
	With EPD (Empty Pipe Detection)	4 x 0.38 mm ² PVC cable
	Conductor resistance	≤ 50 Ω/km
	Capacitance: core/screen	≤ 420 pF/m

Permanent operation temperature: -20...+70 °C

* braided copper screening: Ø ~ 7 mm

Remote Version "FL"

Coil cable:	2 x 0.75 mm ² PVC cable with common screen *	
	Conductor resistance	≤ 37 Ω/km
	Capacitance: core/core, screen grounded	≤ 120 pF/m
Signal cable:	5 x 0.5 mm ² PVC cable with common screen *	
	Conductor resistance	≤ 37 Ω/km
	Capacitance: core/core, screen grounded	≤ 120 pF/m

Permanent operation temperature: -20...+70 °C

* braided copper screening (coil cable Ø ~ 7 mm; signal cable Ø ~ 9 mm)

Operation in Areas with Severe Electrical Interference

The Promag 30 measuring system fulfils all general safety requirements according to EN 61010 and electromagnetic compatibility (EMC) according to EN 50081 Part 1 and 2 / EN 50082 Part 1 and 2 when installed in accordance with the NAMUR recommendations.

Note!

- With the remote-mounted version the signal and coil cables between sensor and transmitter must always be screened and grounded at both ends.
- The cable must be resistant to an ambient temperature of max. +80 °C if the Promag H is operated at a process temperature of +150 °C.

Potential Equalisation

The sensor and the fluid must have roughly the same electrical potential to ensure that measurement is accurate and no galvanic corrosion takes place at the electrode. Normally the reference electrode in the sensor or the metal pipe ensures that the potentials are equalized.

Reference electrodes:

Promag A:

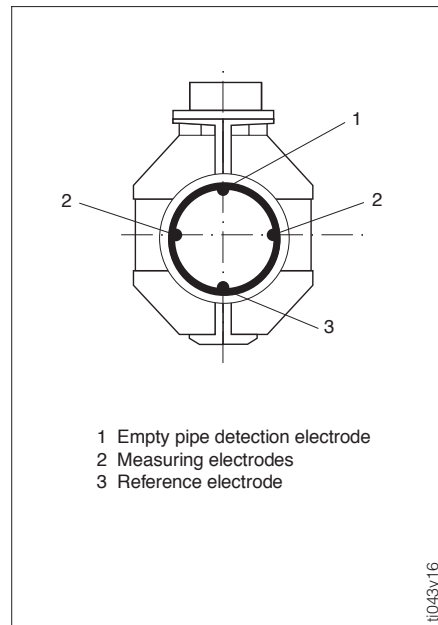
Always with reference electrode

Promag F:

Optional, depending on material

Promag H:

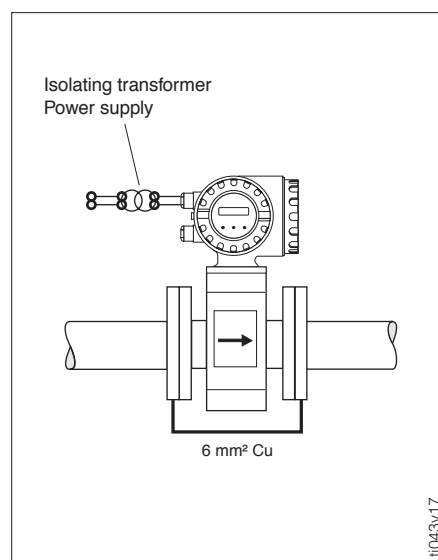
No reference electrode, as there is always a metallic connection to the fluid.



If the reference electrode is correctly grounded and the fluid flows through metallic, unlined and grounded piping, then it is sufficient to connect the grounding terminal of the Promag 30 transmitter housing to the potential equalisation line in order to prevent corrosion. The connection with the remote-mounted version is made at the ground terminal of the connection housing.

Caution!

Danger of permanent damage to the instrument! If the fluid cannot be grounded for operational reasons, ground disks are to be used.

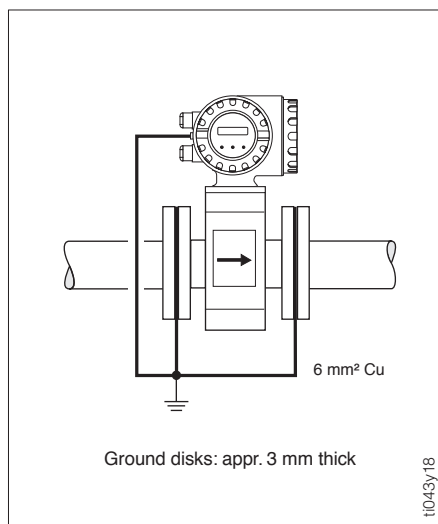


Potential Equalisation for Lined Pipes with Cathodic Protection

When the fluid cannot be earthed for operational reasons, the measuring unit must be installed that it is potential-free. Ensure that components of the piping are connected to one another (copper wire, 6 mm²).

All national regulations regarding potential free installation are to be observed (e.g. VDE 0100). Ensure that the mounting material used does not result in a conductive bond with the measuring unit and that the material can withstand the tightening torque used.

Potential Equalisation



Plastic or Lined Piping

Ground disks must always be used with non-conductive piping materials if compensation currents flow through the fluid. They can irreparably damage the reference electrode within a short time due to electrochemical corrosion.

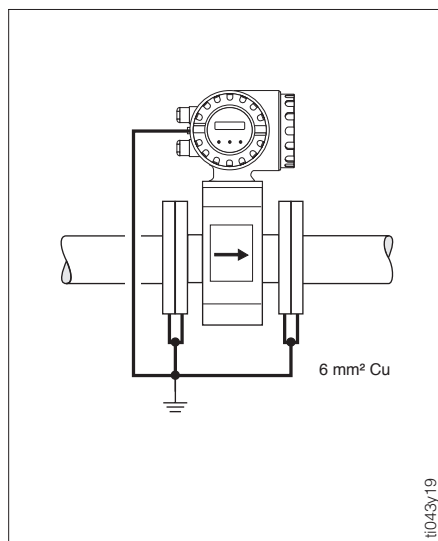
Such conditions occur especially if:

- the piping is insulated with electrically non-conductive materials and
- the piping is made of fibreglass or PVC through which flow highly concentrated acids and alkalis.

Caution!

Danger from damage due to electrochemical corrosion!

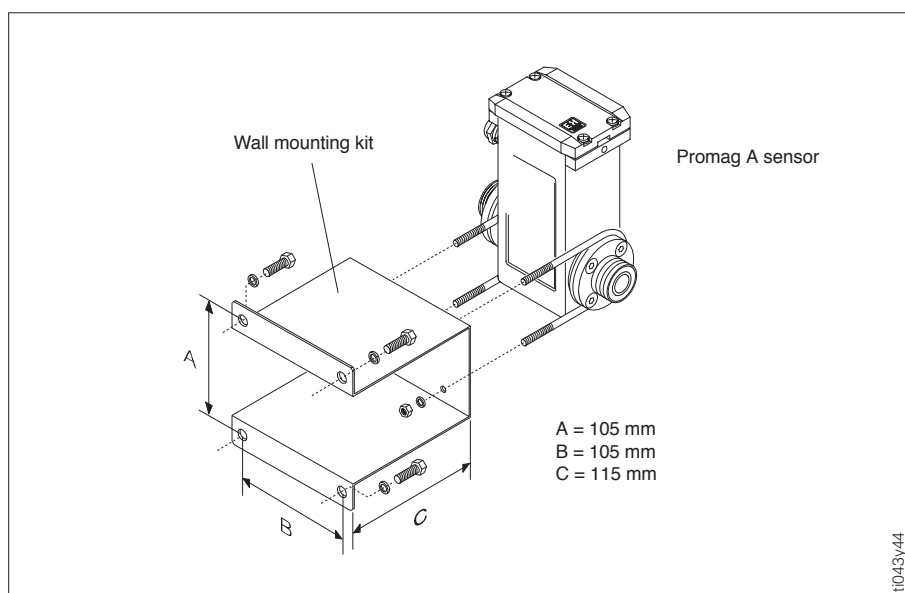
- Note the corrosion resistance of the ground disks.
- Note the electrochemical potential series in cases where the ground disks and the measuring electrodes are made of different material.



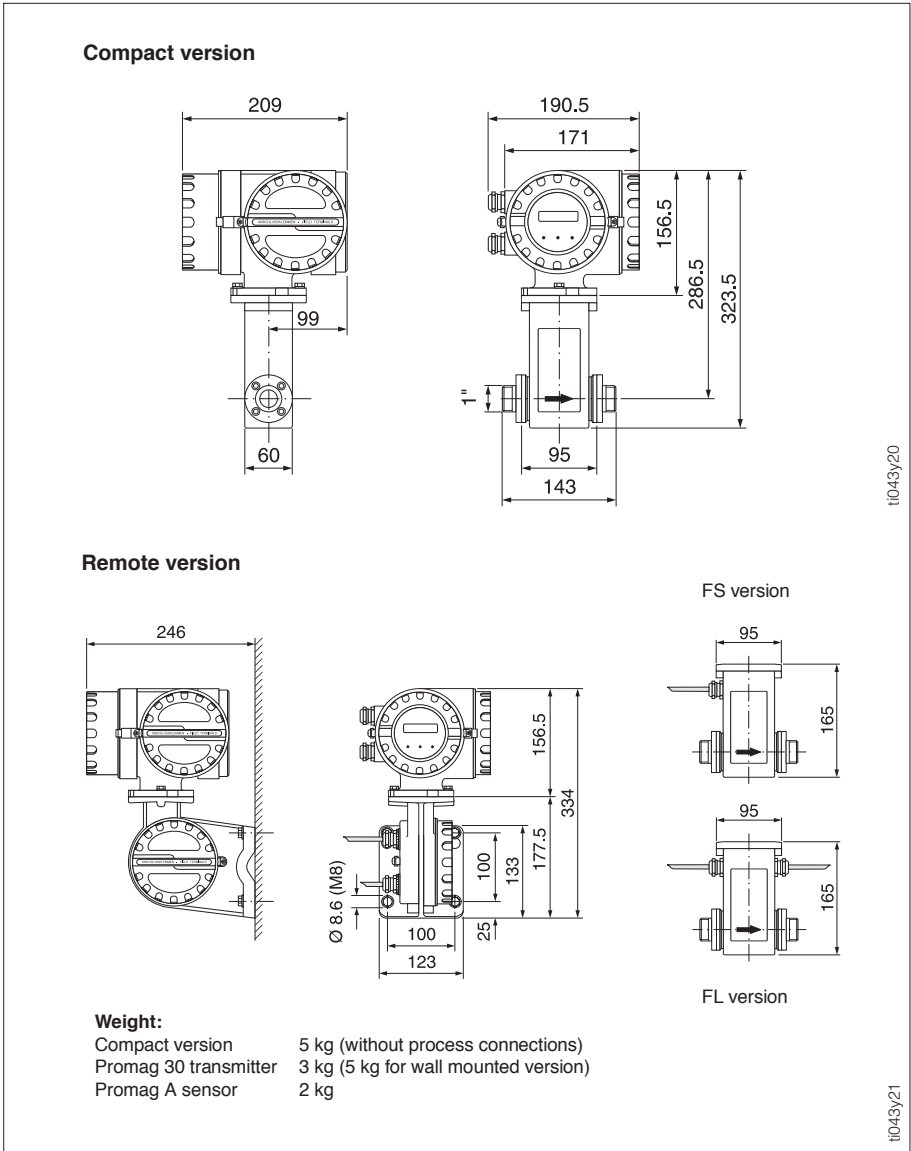
Equalising Currents in Unearthed Metal Pipes / Earthing in an Area with Severe Interference

The fluid may be earthed. In order to make the most of the electromagnetic compatibility (EMC) of the Promag 30, it is advisable to provide two flange-to-flange links and to connect them jointly with the transmitter housing to earth potential.

Wall mounting kit Promag A



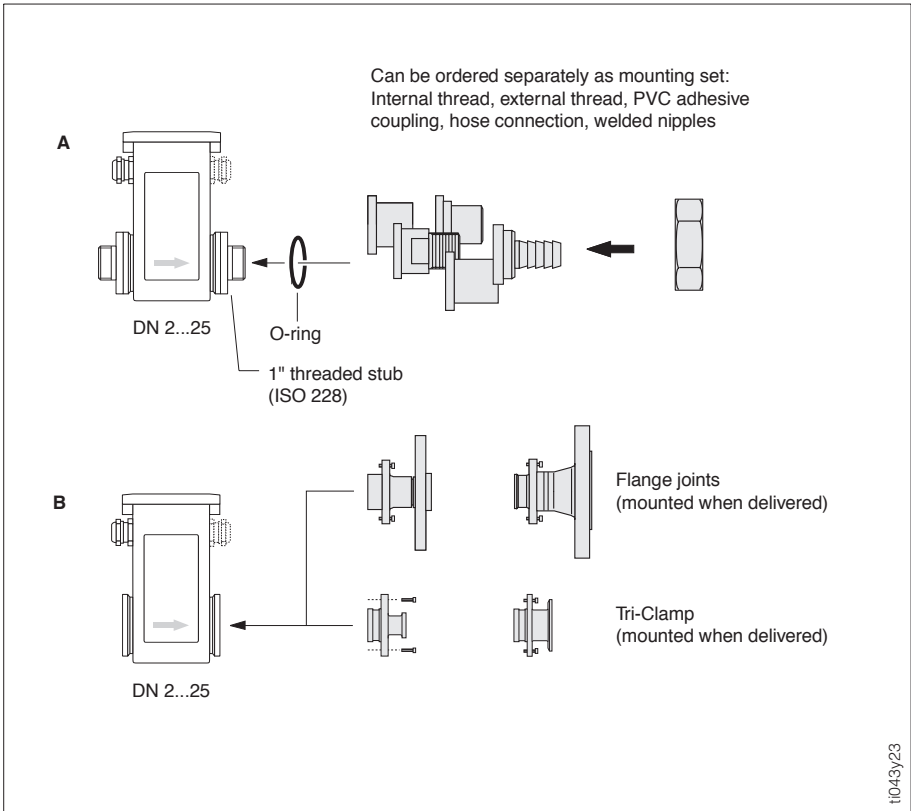
Dimensions Promag 30 A



Process connections Promag A
(Dimensions: see page 16)

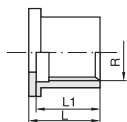
A Mounting set:
coupling nut on a 1" threaded
stub

B Screw-in process connections
(instead of threaded stub)



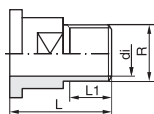
Process Connections Promag A

Internal thread
standard thread:
ISO 228/DIN 2999



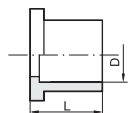
DN	L	L1	Thread
2...15	20	18	1/2"
2...15	20	18	1/2" NPT
25	45	22	1"
25	45	22	1" NPT

External thread
standard thread:
ISO 228/DIN 2999



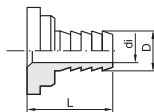
DN	L	L1	di	Thread
2...15	35	13.2	16.1	1/2"
2...15	42	20.0	16.1	1/2" NPT
25	50	16.8	22.0	1"
25	60	25.0	22.0	1" NPT

PVC adhesive coupling



DN	L	D	Pipe connection
2...15	19	20.0	20 · 2
2...15	20	21.5	1/2"
25	66	25.0	25 · 2
25	69	32.0	32 · 2.5
25	69	33.5	1"

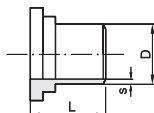
Hose connection



DN	L	D	di	LW
2...15	30	14.5	8.9	13
2...15	30	17.5	12.6	16
2...15	30	21.0	16.1	19

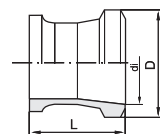
LW = Internal diameter hose

Welded nipple
DN 2...15



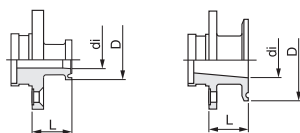
DN	L	D	s	Pipe connection
2...15	20	21.3	2.6	1/2"
2...15	20	21.3	2.6	18 · 1

Welded nipple
DN 25



DN	L	D	di	Pipe connection
25	30	33.7	26.0	1"
25	30	33.7	26.0	28 · 1
25	20	25.4	22.1	25.4 · 1.6 / 1"

Tri-Clamp
Stainless steel
1.4404/316L

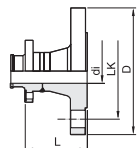


DN	L	D	di	Pipe connection
2...8	24	25.0	9.5	1/2"
15	24	25.0	16.0	3/4"
2...8	24	50.4	22.1	1"
15	24	50.4	22.1	1"
25	24	50.4	22.1	1"

Flange
Stainless steel 1.4404/316L
with joint dimensions to
DIN 2501/ANSI B16.5/JIS B2210

DN 2...15:
with DN 15 or 1/2" flanges

DN 25:
with DN 25 or 1" flanges



Flange to DIN 2501, PN 40

DN	L	D	di	LK
2...8	51.8	95	17.3	65
15	51.8	95	17.3	65
25	51.8	115	28.5	85

Flange to ANSI B16.5

	Class 150					Class 300		
DN	L	D	LK	di	L	D	LK	
2...8	61.6	88.9	60.5	15.8	61.6	95.2	66.5	
15	61.6	88.9	60.5	15.8	61.6	95.2	66.5	
25	67.4	108.0	79.2	26.6	73.8	123.9	88.9	

Flange to JIS B2210

DN	L	D	di	LK
2...8	62.5	95	15	70
15	62.5	95	16	70
25	62.5	115	25	90

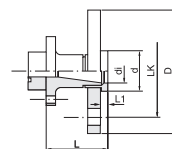
Face-to-face length to DVGW (200 mm)

Flange
PVDF with joint dimensions to
DIN 2501/ANSI B16.5/JIS B2210

DN 2...15:
with DN 15 or 1/2" flanges

DN 25:
with DN 25 or 1" flanges

Length:
2 x L + 143 mm
2 x L + 95 mm (for flanged or
Tri-Clamp version)



All dimensions in [mm]

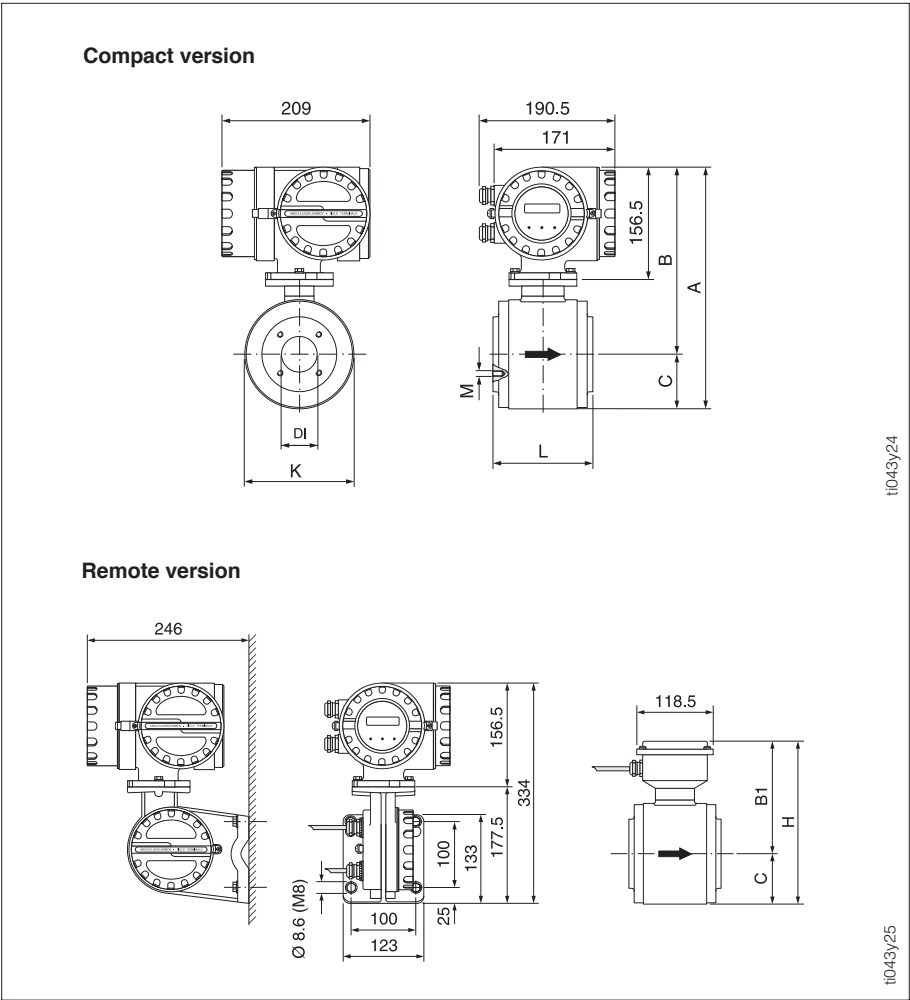
Flange to DIN 2501/ANSI B16.5/JIS B2210
PN 16/Class 150/10K

DN	L	L1	D	d	di	DIN LK	ANSI LK	JIS LK
2...8	52.7	6	95	34	16.2	65	60.5	70
15	52.7	6	95	34	16.2	65	60.5	70
25	52.7	7	115	50	27.2	85	79.2	90

Face-to-face length to DVGW (200 mm)

y22-01...10

Dimensions Promag 30 H

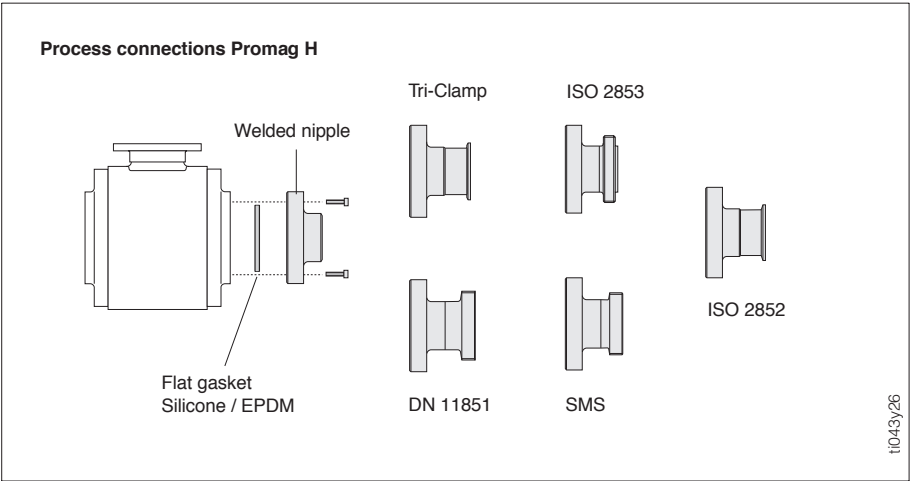


DN		DI **	PN	L	A	B	B1	C	K	H	M	Weight*
[mm]	[inch]	[mm]	DIN [bar]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[kg]
25 DIN	—	26.0	16	140	318	254.0	158.5	64.0	128	222.5	M 6x4	6.0
25	1"	22.6	16	140	318	254.0	158.5	64.0	128	222.5	M 6x4	6.0
40	1 1/2"	35.3	16	140	318	254.0	158.5	64.0	128	222.5	M 6x4	6.5
50	2"	48.1	16	140	343	266.5	171.0	76.5	153	247.5	M 8x4	9.0
65	2 1/2"	59.9	16	140	343	266.5	171.0	76.5	153	247.5	M 8x4	9.0
80	3"	72.6	16	200	393	291.5	196.0	101.5	203	297.5	M 12x4	19.0
100	4"	97.5	16	200	393	291.5	196.0	101.5	203	297.5	M 12x4	18.5

** Internal diameter of tube

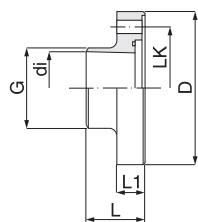
Weight:
 Compact version * see table above
 Promag 30 transmitter 3 kg (5 kg for wall mounted version)
 Sensor connection housing approx. 1 kg

Process connections
 Promag H
 (Dimensions: see page 18)



Process Connections Promag H

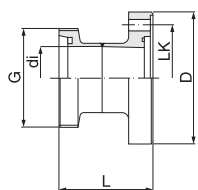
Welded nipple



y27-01...06

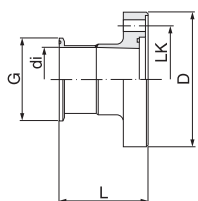
DN	D	G	di ¹⁾	L	L1	LK
25	75	27	22.6	42	19	56.0
25 DIN	79	31	26.0	42	19	60.0
40	92	40	35.3	42	19	71.0
40 DIN	92	43	38.0	42	19	71.0
50	105	55	48.1	42	19	83.5
50 DIN	105	55	50.0	42	19	83.5
65	121	66	59.9	42	21	100.0
65 DIN	121	72	66.0	42	21	100.0
80	147	79	72.6	42	24	121.0
80 DIN	147	87	81.0	42	24	121.0
100	168	104	97.5	42	24	141.5
100 DIN	168	106	100.0	42	24	141.5

DIN 11851



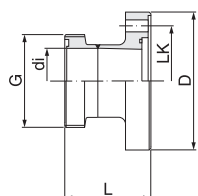
DN	di ¹⁾	G	D	L	LK
25	26	52 x 1/6"	79	68	60.0
40	38	65 x 1/6"	92	72	71.0
50	50	78 x 1/6"	105	74	83.5
65	66	95 x 1/6"	121	78	100.0
80	81	110 x 1/4"	147	83	121.0
100	100	130 x 1/4"	168	92	141.5

Tri-Clamp



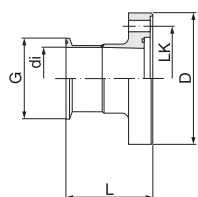
DN	ANSI	di ¹⁾	G	D	L	LK
25	1"	22.1	50.4	75	68.6	56.0
40	1 1/2"	34.8	50.4	92	68.6	71.0
50	2"	47.5	63.9	105	68.6	83.5
65	—	60.2	77.4	121	68.6	100.0
80	3"	72.9	90.9	147	68.6	121.0
100	4"	97.4	118.9	168	68.6	141.5

SMS 1145



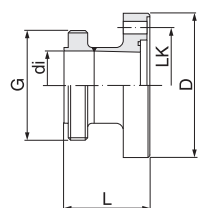
DN	di ¹⁾	G	D	L	LK
25	22.5	40 x 1/6"	75	60	56.0
40	35.5	60 x 1/6"	92	63	71.0
50	48.5	70 x 1/6"	105	65	83.5
65	60.5	85 x 1/6"	121	70	100.0
80	72.0	98 x 1/6"	147	75	121.0
100	97.6	132 x 1/6"	168	70	141.5

ISO 2852



DN	di ¹⁾	G	D	L	LK
25	22.6	50.5	75	68.5	56.0
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

ISO 2853



DN	di ¹⁾	G	D	L	LK
25	22.6	37.1	75	61.5	56.0
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

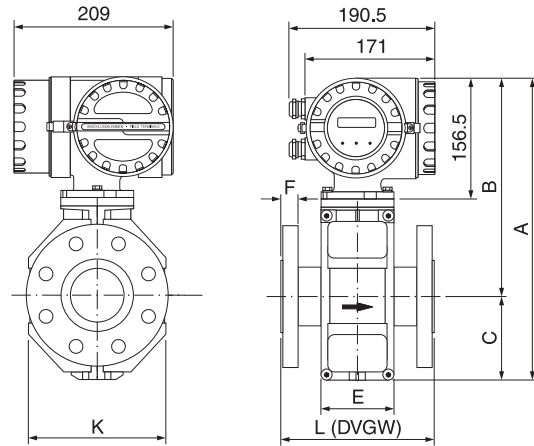
Length:
DN 25... 65 = 2 x L + 136 mm
DN 80...100 = 2 x L + 196 mm

¹⁾ Please note the internal diameter (di, DI) when cleaning the piping with a scraper!

Dimensions

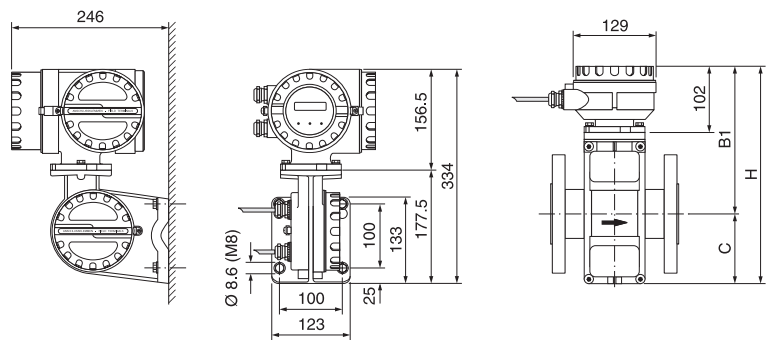
Promag 30 F DN 15...300

Compact version



ti043y28

Remote version



ti043y29

DN		PN			L ¹⁾	A	B	C	K	E	F		H	B1	Weight ²⁾
[mm]	[inch]	DIN	ANSI Class	JIS							DIN [mm]	ANSI [mm]			
15	1/2"	40	150	20K	200	340.5	256.5	84	120	94	14	11.2	286	202	6.5
25	1"	40	150	20K	200	340.5	256.5	84	120	94	16	14.2	286	202	7.3
32	—	40	—	20K	200	340.5	256.5	84	120	94	18	—	286	202	8.0
40	1 1/2"	40	150	20K	200	340.5	256.5	84	120	94	18	17.5	286	202	9.4
50	2"	40	150	10K	200	340.5	256.5	84	120	94	20	19.1	286	202	10.6
65	—	16	—	10K	200	390.5	281.5	109	180	94	18	—	336	227	12.0
80	3"	16	150	10K	200	390.5	281.5	109	180	94	20	23.9	336	227	14.0
100	4"	16	150	10K	250	390.5	281.5	109	180	94	22	23.9	336	227	16.0
125	—	16	—	10K	250	471.5	321.5	150	260	140	24	—	417	267	21.5
150	6"	16	150	10K	300	471.5	321.5	150	260	140	24	25.4	417	267	25.5
200	8"	10	150	10K	350	526.5	346.5	180	324	156	26	28.4	472	292	35.3
250	10"	10	150	10K	450	576.5	371.5	205	400	156	28	30.2	522	317	48.5
300	12"	10	150	10K	500	626.5	396.5	230	460	166	28	31.8	572	342	57.5

¹⁾ The length is always identical independently of the chosen pressure rating.

Weight:

Compact version ²⁾

Promag 30 transmitter

Sensor connection housing

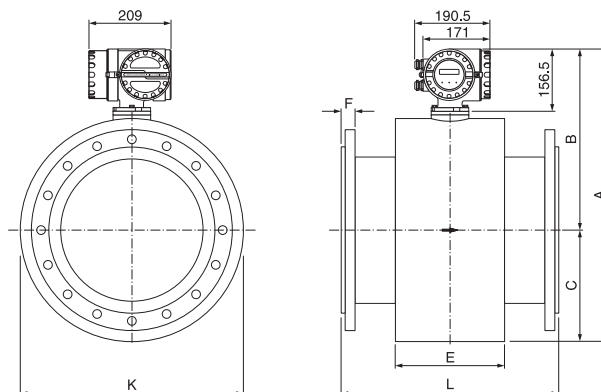
see table above

3 kg (5 kg for wall mounted version)

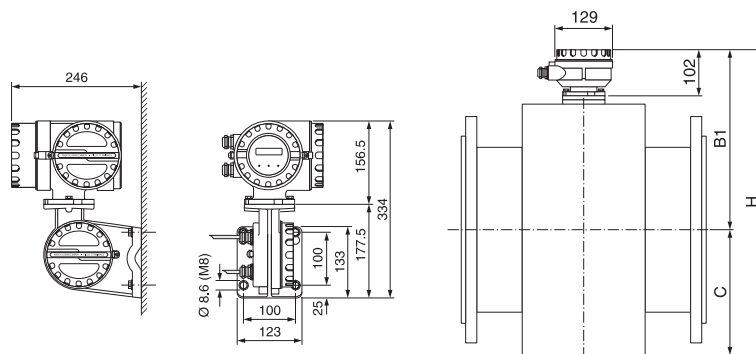
approx. 1 kg

Promag 30 F DN 350...2000

Compact version



Remote version



DN		PN			L ¹⁾	A	B	C	K	E	F			H	B1	Weight ²⁾
[mm]	[inch]	DIN [bar]	ANSI [Class]	AWWA [Class]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	DIN [mm]	ANSI [mm]	AWWA [mm]	[mm]	[mm]	[kg]
350	14"	10	150	—	550	738	456.0	282.0	564	276	26	34.9	—	683.5	401.5	110
400	16"	10	150	—	600	790	482.0	308.0	616	276	26	36.5	—	735.5	427.5	130
450	18"	—	150	—	650	840	507.0	333.0	666	292	—	39.7	—	785.5	452.5	240
500	20"	10	150	—	650	891	532.5	358.5	717	292	28	42.9	—	836.5	478.0	170
600	24"	10	150	—	780	995	584.5	410.5	821	402	28	47.6	—	940.5	530.0	230
700	28"	10	—	D	910	1198	686.0	512.0	1024	589	30	—	33.3	1143.5	631.5	350
750	30"	—	—	D	975	1198	686.0	512.0	1024	626	—	—	34.9	1143.5	631.5	450
800	32"	10	—	D	1040	1241	707.5	533.5	1067	647	32	—	38.1	1186.5	653.0	450
900	36"	10	—	D	1170	1394	784.0	610.0	1220	785	34	—	41.3	1339.5	729.5	600
1000	40"	10	—	D	1300	1546	860.0	686.0	1372	862	34	—	41.3	1491.5	805.5	720
1050	42"	—	—	D	1365	1598	886.0	712.0	1424	912	—	—	44.5	1543.5	831.5	1050
1200	48"	6	—	D	1560	1796	985.0	811.0	1622	992	28	—	44.5	1741.5	930.5	1200
1350	54"	—	—	D	1755	1998	1086.0	912.0	1824	1252	—	—	54.0	1943.5	1031.5	2150
1400	—	6	—	—	1820	2148	1161.0	987.0	1974	1252	32	—	—	2093.5	1106.5	1800
1500	60"	—	—	D	1950	2196	1185.0	1011.0	2022	1392	—	—	57.2	2141.5	1130.5	2600
1600	—	6	—	—	2080	2286	1230.0	1056.0	2112	1482	34	—	—	2231.5	1175.5	2500
1650	66"	—	—	D	2145	2360	1267.0	1093.0	2186	1482	—	—	63.5	2305.5	1212.5	3700
1800	72"	6	—	D	2340	2550	1362.0	1188.0	2376	1632	36	—	66.7	2495.5	1307.5	3300
2000	78"	6	—	D	2600	2650	1412.0	1238.0	2476	1732	38	—	69.9	2595.5	1357.5	4100

¹⁾ Thickness of the flange face includes sealing strip. The length is always identical independently of the chosen pressure rating.

Weight:

Compact version ²⁾

Compact version
Promag 30 transmitter

Sensor connection housing

see table above

3 kg (5 kg for wall mounted version)

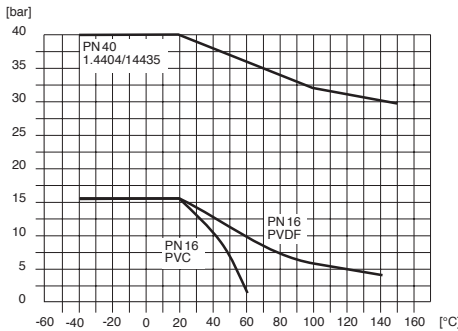
approx. 1 kg

Material Load Curves (p-T-Diagrams)

Promag A

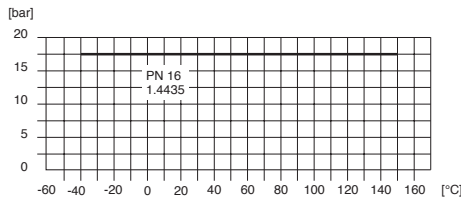
DIN 2413 and 2505

Flange material: Steel 1.4404/1.4435, PVDF, PVC



Promag H

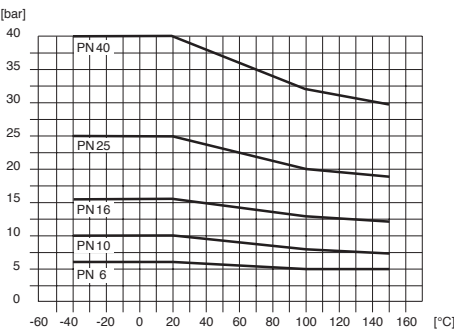
Welded nipple material: Steel 1.4404/316L



Promag F

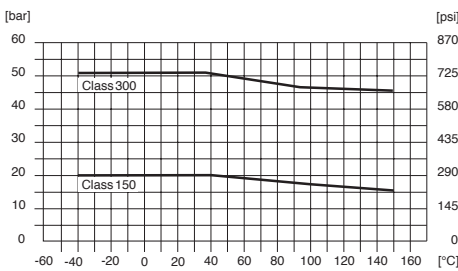
DIN 2413 and 2505

Flange material: Steel 37.2



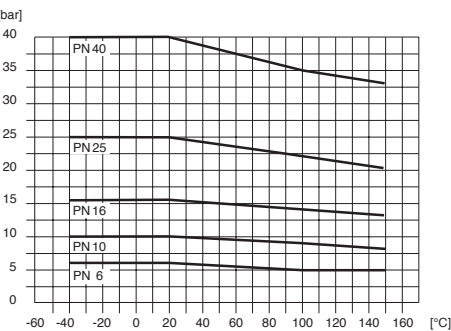
ANSI B16.5

Flange material: Steel A105



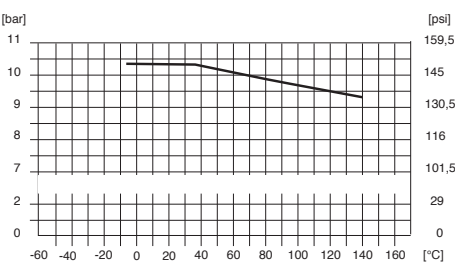
DIN 2413 and 2505

Flange material: Stainless steel 1.4571



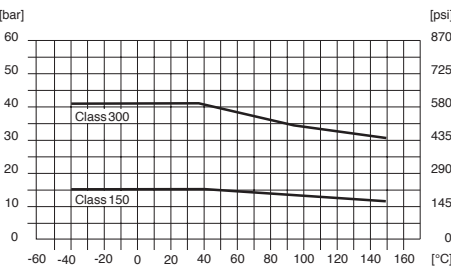
AWWA C 207, Class D

Flange material: Steel A105



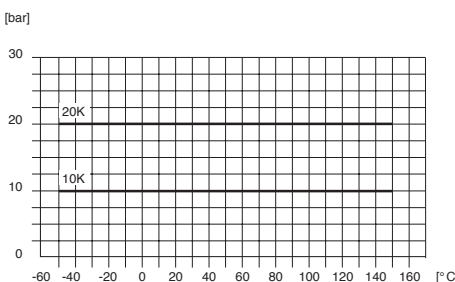
ANSI B16.5

Flange material: Steel 316L



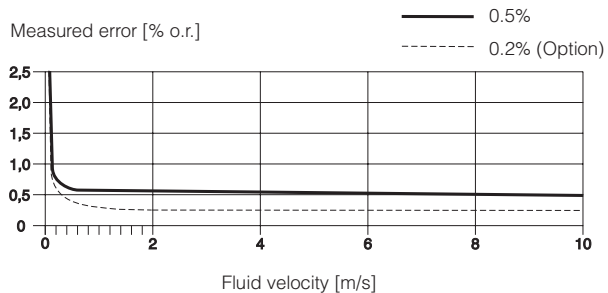
JIS B2210

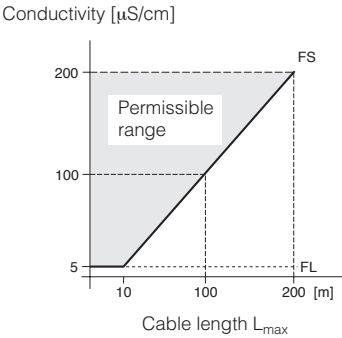
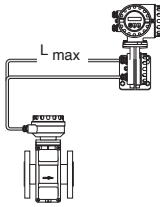
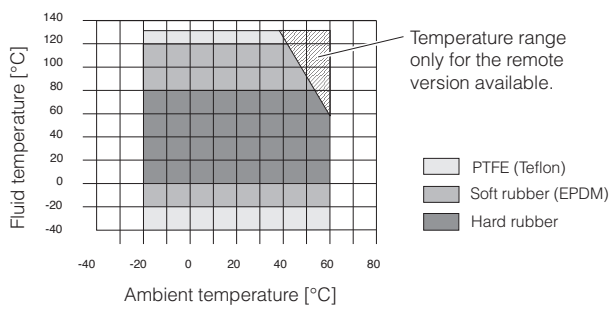
Flange material: S20C / SUS 316L



Technical Data

Application	
<i>Instrument name</i>	Flow measuring system "Promag 30 (Model '99)"
<i>Instrument function</i>	Flow measurement of liquids in closed piping. Applications in measurement, control and regulation processes, for e.g. batching and dosing (> 10 s), etc.
Function and system design	
<i>Measuring principle</i>	Electromagnetic flow measurement according to Faraday's law (Generation of a voltage by induction in a magnetic field).
<i>Measuring system</i>	Instrument family "Promag 30 (Model '99)" consisting of: • Transmitter: Promag 30 • Sensor: Promag A (DN 2, 4, 8, 15, 25) Promag H (DN 25, 40, 50, 65, 80, 100) Promag F (DN 15...2000) Two versions are available: • Compact version • Remote version (FS or FL version)
Input variables	
<i>Measuring variable</i>	Flow velocity (proportional to induced voltage. Measured by two electrodes in the measuring tube)
<i>Measuring range</i>	Measuring range of electronics within $v = 0 \dots 12.5$ m/s The full scale value for the current output can be selected within the following limits (see also page 5): – Minimum full scale value at $v = 0.3$ m/s – Maximum full scale value at $v = 10$ m/s
<i>Operable flow range</i>	Over 1000 : 1 When the flow is pulsating, the amplifier is not overloaded above its set full scale value even with peak velocities of 12.5 m/s. Flow is measured between 0.01... > 10 m/s at the stated accuracy.
<i>Auxiliary input</i>	$U = 3 \dots 30$ V DC, $R_i = 1.8$ kΩ, galvanically isolated Configurable for positive zero return or totalizer reset.
Output variables	
<i>Output signal</i>	• <i>Current output:</i> 0/4...20 mA, galvanically isolated, $R_L < 700$ Ω, time constant selectable (0.5...95 s), full scale value freely selectable, temperature coefficient: typical 0.01% o.r./°C; resolution: 10 μA • <i>Pulse output (transistor output):</i> passive, $f_{max} = 400$ Hz, $U_{max} = 30$ V, $I_{max} = 250$ mA, galvanically isolated, pulse value selectable, pulse/pause ratio up to 0.5 Hz approx. 1:1 (the pulse width is limited to 1 s for pulse frequencies < 0.5 Hz) • <i>Status output (transistor output):</i> passive, $U_{max} = 30$ V, $I_{max} = 250$ mA Can be configured for: – indicating system errors (error), process errors (overflow, Empty Pipe) – flow direction indication

Output variables (continued)	
Signal on alarm	- Current output: The current is set to a defined value - Pulse output: no signal supplied - Status output: on "Error" → not conducting (open) on "Flow direction" → last status held (forward → not conducting; backward → conducting)
Load	$R_L < 700 \Omega$ (current output)
Creep suppression	Switch-on point at $v = 0.02$ m/s Switch-off point at $v = 0.04$ m/s Function can be switched off.
Accuracy	
Reference conditions	According to DIN 19200 and VDI/VDE 2641: Fluid temperature $+28^\circ\text{C} \pm 2\text{ K}$ Ambient temperature $+22^\circ\text{C} \pm 2\text{ K}$ Warm up period 30 minutes <i>Mounting:</i> – Inlet section $> 10 \times \text{DN}$ – Outlet section $> 5 \times \text{DN}$ – Transmitter and sensor are grounded. – The sensor is build-in centered into the piping.
Measured error	Pulse output: $\pm 0.5\%$ o.r. $\pm 0.01\%$ o.f.s. (full scale value = 10 m/s) Current output: additionally $\pm 10 \mu\text{A}$ (typical)  <i>Option:</i> Promag 30 A and F: $\pm 0.2\%$ o.r. $\pm 0.05\%$ of Q_k Q_k = desired reference flow quantity for calibration ($v = 2 \dots 10$ m/s). Q_k has to be noted for ordering. Deviations in power supply voltage have no influence on the specified ranges.
Repeatability	$\pm 0.1\%$ o.r. $\pm 0.005\%$ o.f.s. o.r. = of reading o.f.s. = of max. full scale value (see table on page 5)

Operating conditions	
Installation conditions	
<i>Installation instructions</i>	Orientation: vertical or horizontal Restrictions and other recommendations → see page 6 ff.
<i>Inlet and outlet sections</i>	Inlet section: $\geq 5 \times \text{DN}$ Outlet section: $\geq 2 \times \text{DN}$
<i>Connection cable length for remote version</i>	<i>FS version:</i> 0... 10 m → min. conductivity $\geq 5 \mu\text{S/cm}$ 10...200 m → min. conductivity = $f(L_{\text{max}})$ <i>FL version:</i> 0...200 m → min. conductivity $\geq 5 \mu\text{S/cm}$ <i>Instrument equipped with empty pipe detection (EPD):</i> max. cable length = 10 m Minimum conductivity for demineralised water: generally $\geq 20 \mu\text{S/cm}$ 
Ambient conditions	
<i>Ambient temperature</i>	−20...+60 °C (Transmitter and sensor) • An all-weather cover should be used to protect the housing from direct sunlight when mounting in the open. This is especially important in warmer climates and with high ambient temperatures. • Due to the danger of the transmitter electronics overheating, the transmitter and sensor are to be mounted separately with high ambient and fluid temperatures (see Figure). 
<i>Storage temperature</i>	−10...+50 °C (preferably at +20 °C)
<i>Degree of protection (EN 60529)</i>	IP 67 (NEMA 4X) Option: IP 68 (NEMA 6P) for sensor A and F
<i>Shock and vibration resistance</i>	Acceleration up to 2 g / 2 h per day; 10...100 Hz
<i>Electromagnetic compatibility (EMC)</i>	According to EN 50081 Part 1 and 2 (interference emission) / EN 50082 Part 1 and 2 (interference immunity) as well as to NAMUR recommendations

Operating conditions (continued)				
Process conditions				
Fluid temperature	The fluid temperature range depends on the sensor lining: Promag A −20...+130 °C PFA Promag H −20...+130 °C −20...+150 °C : PFA with EPDM gasket PFA with Silicone gasket Promag F −40...+130 °C −20...+120 °C 0...+ 80 °C PTFE (Teflon), DN 15...600 Soft rubber (EPDM), DN 25...2000 Hard rubber, DN 65...2000 (see Fig. on page 24)			
Nominal pressure	Promag A PN 40 Promag H PN 16 Promag F DIN PN 6 (DN 1200...2000) PN 10 (DN 200...1000) PN 16 (DN 65...150) PN 40 (DN 15...50) PN 16/25 (DN 200...300) PN 40 (DN 65...100, optional) ANSI Class 150 (1/2...24") Class 300 (1/2...6", optional) AWWA Class D (28...48") JIS 10K (DN 50...300) 20K (DN 15...40) 20K (DN 50...300, optional) Material load curves (p-T-load diagrams) → see page 21			
Conductivity	Minimum conductivity: ≥ 5 μS/cm (for liquids in general) ≥ 20 μS/cm (for demineralised water) With the remote version “FS” the conductivity required also depends on the length of the cable → see page 24 “Connection cable length”			
Pressure loss	• No pressure loss if sensor and piping have the same nominal diameter. • Pressure loss specifications when using adapters e.g. reducers or expanders → see page 8			
Mechanical construction				
Design / Dimensions	Dimensions → see pages 15–20			
Weight	See pages 15–20			
Materials	Transmitter housing: Powder-coated die-cast aluminium Sensor housing: Promag A 1.4435 incl. threaded stub Promag H 1.4301 Promag F DN 15...300: Powder-coated die-cast aluminium DN 350...2000: Coated steel			
(continued on next page)				

(continued on next page)

Technical Data

Mechanical construction (continued)		
<i>Materials (continued)</i>	<i>Process connections:</i> Promag A DIN → Stainless steel 1.4404, PVDF ANSI → 316L, PVDF JIS → 316L, PVDF Threaded stub: 1.4435, PVC 1.4404 / 316L Promag H DIN → Stainless steel 1.4571, St. 37-2 ANSI → A 105, 316L AWWA → A 105, A 36 JIS → S20C, SUS 316 L <i>Electrodes:</i> Promag A 1.4435; Platinum/Rhodium 80/20; Titan; Hastelloy C-22; Tantalum Promag H 1.4435 Promag F 1.4435; Platinum/Rhodium 80/20; Hastelloy C-22; Tantalum <i>Gasket material:</i> Promag A Viton, Kalrez (optional), Silicone (aseptic version) EPDM, Silicone no gaskets (Lining = 'gasket')	
<i>Electrodes fitted</i>	Promag A Measuring, reference and empty pipe detection electrodes. As standard with 1.4435, Hastelloy C-22, Tantalum Option with Platinum/Rhodium Promag H Measuring and empty pipe detection electrodes Promag F Measuring, reference and empty pipe detection electrodes. As standard with 1.4435, Hastelloy C-22, Tantalum	
<i>CIP cleanable</i>	Promag A	Yes (observe maximum temperature)
	Promag H	Yes (observe maximum temperature)
	Promag F	Yes (observe maximum temperature)
<i>SIP cleanable</i>	Promag A	No
	Promag H	Yes (observe maximum temperature)
	Promag F	No
<i>Process connections</i>	<i>Promag A:</i> Internal and external thread, PVC adhesive coupling, hose connection, welded nipple, aseptic welded nipples for pipelines according to DIN 11850, Tri-Clamp, flange connection (DIN, ANSI, JIS). <i>Promag H:</i> Welded nipples for OD tube, SMS, JIS, ISO and DIN 11850 tubes, DIN 11851 thread, SMS thread, ISO 2853 thread, Tri-Clamp, ISO 2852 connection. <i>Promag F:</i> Flange connection (DIN, ANSI, JIS)	
<i>Electrical connection</i>	• Wiring diagrams: see page 9 ff. • Cable specifications: see page 12 • Galvanic isolation: All circuits for inputs, outputs, power supply and sensors are galvanically isolated from one another.	
<i>Cable entries</i>	<i>Power supply and signal cable (output):</i> Cable glands PG 13.5 (5...15 mm) or threads for cable glands 1/2" NPT, M20 x 1.5 (8...15 mm), G 1/2" <i>Coil current cable and signal cable (remote version)</i> Promag A: Cable glands PG 11 (5...12 mm) or threads for cable glands 1/2" NPT, M20 x 1.5 (8...15 mm), G 1/2" Promag H: Cable glands PG 13.5 (5...15 mm) or threads for cable glands 1/2" NPT, M20 x 1.5 (8...15 mm), G 1/2" Promag F: Cable glands PG 13.5 (5...15 mm) or threads for cable glands 1/2" NPT, M20 x 1.5 (8...15 mm), G 1/2"	

User interface	
<i>Operation</i>	On-site operation: All functions of the E+H operating matrix can be selected and changed using three keys (E, -, +).
<i>Display</i>	– Eight character LC display – 11 display segments for indicating units and instrument status. – Damping of flow display can be adjusted: 0.5...20 s
<i>Communication</i>	none
Power supply	
<i>Supply voltage / Frequency</i>	85...260 V AC, 45...65 Hz 20... 55 V AC, 45...65 Hz 16... 62 V DC
<i>Power consumption</i>	AC: <15 VA (incl. sensor) DC: <15 W (incl. sensor) Current at make (Promag 30 X / 24 V DC): – max. 13.5 A (< 100 µs) – max. 6 A (< 5 ms)
<i>Power supply failure</i>	Bridges minimum 1 power cycle (22 ms) • EEPROM saves measuring system data on power failure (no batteries required). • DAT = replaceable data memory in which basic data of the sensor are stored: nominal diameter, SAPS (actual values), serial number, calibration factor, zero point, status EPD (yes/no), EPD calibration values.
Certificates and approvals	
<i>Ex approvals</i>	Information on Ex versions (e.g. CENELEC, SEV, FM, CSA) can be supplied by your E+H sales center on request. All explosion protection data are given in separate documentation available on request.
<i>Sanitary version</i>	– Sensor Promag A: 3A approval – Sensor Promag H (hygienic version): 3A approval and EHEDG tested
<i>Custody transfer</i>	<i>Promag 31 F</i> – PTB approval for custody transfer with cold water and wastewater (either for approval or approved for custody transfer) – Heat measurement approval, Swiss certification to OIML R72/R75 <i>Promag 31 H</i> – PTB approval to DIN 19217 (OIML 117) for custody transfer with beer, original wort, milk.
<i>CE mark</i>	By attaching the CE mark, Endress+Hauser confirms that the Promag 30 measurement system has been successfully tested and fulfils all legal requirements of the relevant CE directives.
Order information	
<i>Accessories</i>	• Post mounting set for transmitter (remote version): Order No. 50076905 • Wall mounting kit for Promag A sensor: Order No. 50064550
<i>Supplementary documentation</i>	System Information Promag (SI 010D/06/en) Operating Manual Promag 30 (BA 039D/06/en) * Operating Manual Promag 31 F – Cold water (BA 041D/06/en) * Supplementary Ex documentation: CENELEC, SEV, FM, CSA * Model '99
Other standards and guidelines	
EN 60529	Degree of protection by housing (IP code)
EN 61010	Protection Measures for Electronic Equipment for Measurement, Control, Regulation and Laboratory Procedures
EN 50081	Part 1 and 2 (interference emission)
EN 50082	Part 1 and 2 (interference immunity)
NAMUR	Association of Standards for Control and Regulation in the Chemical Industry

Subject to modification

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