



OPTIFLUX 4000 **Technical Datasheet**

Electromagnetic flow sensor

- Standard flow sensor for the process industry
- For demanding applications:
High temperatures, low conductivity, hazardous areas
- Robust and reliable



The documentation is only complete when used in combination with the relevant documentation for the converter.

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1.1 Standard solution for the process industry

The **OPTIFLUX 4000** electromagnetic flow sensor is the standard in the process industry and suitable even for demanding applications.



- ① All hazardous area approvals
- ② Housing and flanges available in stainless steel
- ③ Most dimensionally stable PFA liner with stainless steel mesh

Highlights

- Standard device in the process industry
- Robust and reliable
- More than 300,000 units operating in the field
- Works reliably under demanding conditions: High temperatures (up to 180°C / 356°F) and low conductivity (non-water from 1 µS/cm, water from 20 µS/cm)
- Quick and easy to install and operate
- Chemically resistant to alkaline solutions and acids

Industries

- Chemicals
- Pulp & Paper
- Water
- Wastewater
- Minerals & Mining
- Iron, Steel & Metals
- Pharmaceuticals
- Oil & gas

Applications

- For clean liquids
- For slurries and pastes with high solids content
- For abrasive and aggressive products

1.2 Options

The solution for any industry



The OPTIFLUX 4000 has been designed for measuring any application in any industry and is often referred to as "mother of all electromagnetic flowmeters", suitable for all standard and special applications, including "commercial" use according to European Directive MI-001 and -005. The level of precision complies with the industry demands, furthermore does the modular concept allow tailor-made solutions.

All meters are passing specific trials, measurements and tests that go beyond the legal specifications - and on which our customers can rely 100%. For example, we subject the converter electronics to a series of extensive temperature change tests, in which the converter is exposed to cyclical fluctuations (-20...+65°C / -4...+149°F) Every meter that leaves our factory is first wet-calibrated on our officially certified calibration rigs (EN 17025).

Communication



Electromagnetic flowmeters can be installed in random locations, demanding the instrument to be suitable for any kind of environment. These locations vary from indoor use (integrated in complex processes) to outdoor use (straight forward transport, but possibly buried or submerged). The ability to read the measured results on-site may be standard, but it does not always meet the current and actual needs of the user or operator. That is why this meter comes with optional, state-of-the-art bus communication systems. The stored data is transmitted by HART®, Profibus, Fieldbus or Modbus, and then forwarded to a management system.

Construction



The measuring tube of the sensor has a smooth, cylindrical shape. This design, consisting of a circular cross section (no internal or moving parts) and a homogeneous magnetic field, forms the basis for a flow-optimized pipe cross section, thereby providing reliable measurements that are largely independent of the flow profile. This design allows the sensor to measure the flow bi-directional. As an additional benefit, there is no possibility for product to build up and the free cross section sized to the customer pipeline creates no pressure drop. In addition, the required straight inlet and outlet runs are only 5D and 2D. The liner of the measuring tube is made of high tech plastic or hard rubber and is resistant to vacuum, corrosion, aging and abrasion. The surface and shape of the measuring tube also minimize mineral deposits, resulting in exemplary measurement quality - even over the long term.

Design and performance



Electromagnetic flowmeters have many important advantages over their mechanical counterparts: outstanding long-term stability, maximum process reliability, no maintenance - to name just a few. As a result, these meters can deliver precise and reliable measurements for many years. The flowmeter has extensive factory-set diagnostic functions that provide continuous self diagnosis in accordance with e.g. NAMUR, OIML, ISO/EN and MID. Converter operation is also monitored continuously, as are the sensor electrodes, the flow profile and electronic functions. Malfunctions and irregularities are detected and immediately displayed on the high-contrast, high-resolution display.

1.3 Measuring principle

An electrically conductive fluid flows inside an electrically insulating pipe through a magnetic field. This magnetic field is generated by a current, flowing through a pair of field coils. Inside of the fluid, a voltage U is generated:

$$U = v * k * B * D$$

in which:

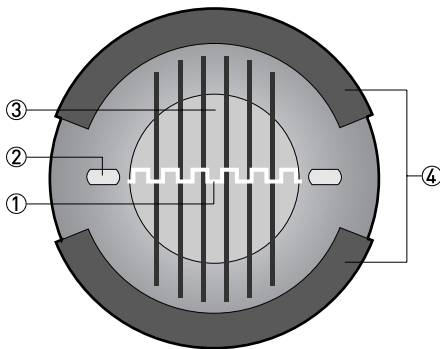
v = mean flow velocity

k = factor correcting for geometry

B = magnetic field strength

D = inner diameter of flow meter

The signal voltage U is picked off by electrodes and is proportional to the mean flow velocity v and thus the flow rate q . A signal converter is used to amplify the signal voltage, filter it and convert it into signals for totalising, recording and output processing.



- ① Induced voltage (proportional to flow velocity)
- ② Electrodes
- ③ Magnetic field
- ④ Field coils

2.1 Technical data

- *The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local representative.*
- *Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Download Center).*

Measuring system

Measuring principle	Faraday's law
Application range	Electrically conductive fluids
Measured value	
Primary measured value	Flow velocity
Secondary measured value	Volume flow

Design

Features	Fully welded maintenance-free sensor.
	Flange version with full bore flow tube
	Standard as well as higher pressure ratings
	Broad range of nominal sizes
	Industry specific insertion lengths
Modular construction	The measurement system consists of a flow sensor and a signal converter. It is available as compact and as separate version.
Compact version	With IFC 040 converter: OPTIFLUX 4040 C
	With IFC 100 converter: OPTIFLUX 4100 C
	With IFC 300 converter: OPTIFLUX 4300 C
Remote version	In wall (W) mount version with IFC 100 converter : OPTIFLUX 4100 W
	In field (F), wall (W) or rack (R) mount version with IFC 300 converter: OPTIFLUX 4300 F, W or R
Nominal diameter	With IFC 040 converter: DN10... 150 / 3/8... 6"
	With IFC 100 converter: DN2.5...1200 / 1/10...48"
	With IFC 300 converter: DN2.5...3000 / 1/10...120"
Measurement range	-12...+12 m/s / -40...+40 ft/s

Measuring accuracy

Reference conditions	Flow conditions similar to EN 29104
	Medium: water
	Electrical conductivity: $\geq 300 \mu\text{S/cm}$
	Temperature: 10...30°C / 50...86°F
	Inlet section: $\geq 5 \text{ DN}$
	Operating pressure: 1 bar / 14.5 psig
	Wet calibrated on EN 17025 accredited calibration rig by direct volume comparison
Accuracy curves	For detailed information on the measuring accuracy, see chapter "Measuring accuracy".
	Option: verification to MID MI-001 (Only in combination with IFC 300)
	Option: calibration according to OIML R49 (Only in combination with IFC 300)
	Related to volume flow (MV = Measured Value)
	These values are related to the pulse / frequency output
	The additional typical measuring deviation for the current output is $\pm 10 \mu\text{A}$
	With IFC 040 converter:
	$v < 1 \text{ m/s} / 3.3 \text{ ft/s}: \pm 5 \text{ mm/s}$
	$v > 1 \text{ m/s} / 3.3 \text{ ft/s}: \pm 0.5 \% \text{ of MV}$
	With IFC 100 converter:
	DN2.5...6: $\pm 0.4\% \text{ of MV} + 1 \text{ mm/s}$
	DN10...1200: $\pm 0.3\% \text{ of MV} + 1 \text{ mm/s}$
	With IFC 300 converter:
	DN2.5...6: $\pm 0.3\% \text{ of MV} + 2 \text{ mm/s}$
DN10...1600: $\pm 0.2\% \text{ of MV} + 1 \text{ mm/s}$	
DN1800...3000: $\pm 0.3\% \text{ of MV} + 2 \text{ mm/s}$	
Repeatability	$\pm 0.1\% \text{ of MV}$, minimum 1 mm/s
Long term stability	$\pm 0.1\% \text{ of MV}$
Special calibration	Better accuracies optional

Operating conditions

Temperature	
Process temperature	PTFE: -40...+180°C / -40...+356°F for remote versions
	PTFE: -40...+140°C / -40...+284°F for compact versions
	PFA: -40...+180°C / -40...+356°F for remote versions
	PFA: -40...+140°C / -40...+284°F for compact versions
	ETFE: -40...+120°C / -40...+248°F
	Hard rubber: -5...+80°C / 23...+176°F
	PU: -5...+85°C / 23...+185°F
	For Ex versions different temperatures are valid. Please check the relevant Ex documentation for details.
Ambient temperature	Standard (with aluminium converter housing): -40...+65°C / -40...+149°F (Protect electronics against self-heating with ambient temperatures above 55°C)
	Option (with stainless steel converter housing): -40...+55°C / -40...+130°F
	For Ex versions different temperatures are valid. Please check the relevant Ex documentation for details.
Storage temperature	-50...+70°C / -58...+158°F
Pressure	
EN 1092-1	DN2200...3000: PN 2.5
	DN1200...2000: PN 6
	DN200...1000: PN 10
	DN65 and DN100...150: PN 16
	DN2.5...50 and DN80: PN 40
	Other pressures on request
ISO insertion length	Optional for DN15...600
ASME B16.5	1/10...24": 150 lb RF
	Other pressures on request
JIS	DN50...1000: 10 K
	DN2.5...40: 20 K
	Other pressures on request
Vacuum load	For information on pressure limits depending on liner material see chapter "Vacuum load".
Pressure ranges for secondary containment	For DN25...150:
	Pressure resistant up to 40 bar / 580 psi
	Burst pressure up to approx. 160 bar / 2320 psi
Pressure drop	Negligible

Chemical properties	
Physical condition	Electrically conductive liquids
Electrical conductivity	Water: $\geq 20 \mu\text{S}/\text{cm}$
	Non water: $\geq 1 \mu\text{S}/\text{cm}$
Permissible gas content (volume)	$\leq 5\%$
Permissible solid content (volume)	$\leq 70\%$

Installation conditions

Installation	Take care that flow sensor is always fully filled
	For detailed information see chapter "Installation"
Flow direction	Forward and reverse.
	Arrow on flow sensor indicates positive flow direction.
Inlet run	$\geq 5 \text{ DN}$
Outlet run	$\geq 2 \text{ DN}$
Dimensions and weights	For detailed information see chapter "Dimensions and weights".

Materials

Sensor housing	DN2.5...15: Stainless steel 1.4408
	DN20: GTW-S 30
	DN25...3000: Sheet steel, polyurethane coated
	Other materials on request
Measuring tube	Austenitic stainless steel
Flange	Standard: Carbon steel, polyurethane coated
	Other materials on request
Liner	Standard
	DN2.5...15: PFA
	DN20: PTFE
	DN25...150: PFA
	DN200...3000: ETFE
	Option
	DN200...600: PTFE
	DN200...1800: PU
	DN200...3000: Hard rubber (Ex only)
	Other materials on request
Connection box (only remote versions)	Standard: polyurethane coated die-cast aluminium
	Option: Stainless steel
Measuring electrodes	Standard: Hastelloy® C
	Option: Platinum, stainless steel, titanium, tantalum, low noise
	Other materials on request

Grounding rings	Standard
	Stainless steel
	Option
	Hastelloy® C, titanium, tantalum
	Grounding rings can be omitted with virtual reference option for the IFC 300 converter.
Grounding electrodes (option)	Same material as measuring electrodes.

Process connections

Flange	
EN 1092-1	DN2.5...3000 in PN 2.5...40
ASME	1/10...120" in 150...2500 lb RF
JIS	DN2.5...1000 in JIS 10...20 K
Design of gasket surface	RF
	Other sizes or pressure ratings on request

Electrical connections

Signal cable	
Type A (DS)	Standard cable, double shielded. Max. length: 600 m / 1950 ft (dep. on electrical conductivity and measuring sensor). See documentation of the converter for more information.
Type B (BTS)	Optional cable, triple shielded. Max. length: 600 m / 1950 ft (dep. on electrical conductivity and measuring sensor). See documentation of the converter for more information.

Approvals and certificates

CE	
	This device fulfills the statutory requirements of the EC directives. The manufacturer certifies successful testing of the product by applying the CE mark.
Electromagnetic compatibility	Directive: 2004/108/EC, NAMUR NE21/04
	Harmonized standard: EN 61326-1 : 2006
Low voltage directive	Directive: 2006/95/EC
	Harmonized standard: EN 61010 : 2001
Pressure equipment directive	Directive: 97/23/EC
	Category I, II or SEP
	Fluid group 1
	Production module H

Hazardous areas	
ATEX	Please check the relevant Ex documentation for details.
	Compact version with IFC 040 C converter
	II 2 GD
	Compact version with IFC 100 C converter
	II 2 GD
	Compact version with IFC 300 C converter
	II 2 GD or II 2(1) GD
	Remote version
II 2 GD	
FM	In combination with IFC 300 converter
	Class I, Div 2, groups A, B, C and D
	Class II, Div 2, groups F and G
CSA	In combination with IFC 300 converter
	Class I, Div 2, groups A, B, C and D
IEC-Ex	Compact version with IFC 100 converter
	IIC T4
NEPSI	GYJ05234 / GYJ05237
	Ex me ia IIC T6...T3
	Ex de ia IIC T6...T3
	Ex qe ia IIC T6...T3
	Ex e ia IIC T6...T3
Other approvals and standards	
Custody transfer	Standard: without verification
	Only in combination with IFC 300 converter
	For diameters: DN25...500 (other diameters on request)
	Cold water
	MI-001 type examination certificate
	OIML R49 certificate of conformity
	Conformity with ISO 4064 and EN 14154
	Liquids other than water
	MI-005 type examination certificate
	OIML R117 certificate of conformity
Hygiene	PFA liner is FDA approved.
Protection category acc. to IEC 529 / EN 60529	Standard: IP 66/67 (NEMA 4/4X/6)
	Option: IP 68 (NEMA 6P)
	IP 68 is only available for separate design and with a stainless steel connection box
Vibration resistance	IEC 68-2-6
Random vibration test	IEC 68-2-34
Shock test	IEC 68-2-27

2.2 Vacuum load

Diameter	Max. pressure	Vacuum load in mbar abs. at a process temperature of								
[mm]	[bar]	40°C	60°C	70°C	80°C	90°C	100°C	120°C	140°C	180°C
Liner in PTFE										
DN10...20	50	0	0	0	0	0	0	500	750	1000
DN200...300	50	500	750	1000	1000	1000	1000	1000	1000	1000
DN350...600	50	800	1000	1000	1000	1000	1000	1000	1000	1000
Liner in PFA										
DN2.5...150	50	0	0	0	0	0	0	0	0	0
Liner in ETFE										
DN200...2000	150	100	100	100	100	100	100	100	-	-
Liner in Hard rubber										
DN200...300	150	250	400	400	400	-	-	-	-	-
DN350...3000	150	500	600	600	600	-	-	-	-	-
Liner in PU										
DN200...1800	1500	500	600	-	-	-	-	-	-	-

Diameter	Max. pressure	Vacuum load in psia at a process temperature of								
[inches]	[psi]	104°F	140°F	158°F	176°F	194°F	212°F	248°F	284°F	356°F
Liner in PTFE										
3/8...3/4"	725	0	0	0	0	0	0	7.3	10.9	14.5
8...12"	725	7.3	10.9	14.5	14.5	14.5	14.5	14.5	14.5	14.5
14...24"	725	11.6	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
Liner in PFA										
1/10...6"	725	0	0	0	0	0	0	0	0	0
Liner in ETFE										
8...72"	2176	1.5	1.5	1.5	1.5	1.5	1.5	1.5	-	-
Liner in Hard rubber										
8...12"	2176	3.6	5.8	5.8	5.8	-	-	-	-	-
14...120"	2176	7.3	8.7	8.7	8.7	-	-	-	-	-
Liner in PU										
8...72"	21756	7.3	8.7	-	-	-	-	-	-	-

2.3 MI-001

All new designs of water meters that are to be used for legal purposes in Europe require certification under the Measuring Instruments Directive (MID) 2004/22/EC. Annex MI-001 of the MID applies to: water meters intended for the measurement of volume of clean, cold or heated water in residential, commercial and light industrial use. A type examination certificate to the MID certificate is valid in all the countries of the European Union.

The OPTIFLUX 4300 has a type examination certificate to the MI-001 for DN25...300.

The EC type examination certificate for the OPTIFLUX 4300 is valid for the compact and the remote version and applies for forward and reverse flow.

According to MI-001 the maximum permissible error on volumes delivered between Q2 (transitional) flow rate and Q4 (overload) flow rate is $\pm 2\%$. The maximum permissible error on volumes delivered between Q1 (minimum) flow rate and Q2 (transitional) flow rate is $\pm 5\%$.

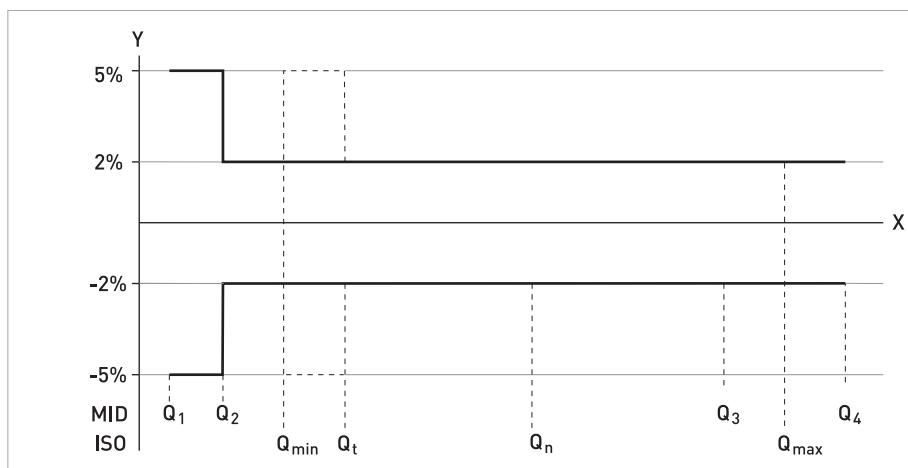


Figure 2-1: ISO flow rates added to figure as comparison towards MID

X: Flow rate; Y: Maximum measuring error [%]

2.4 MI-005

MI-005

DN	Span (R)	Flow rate [m ³ /h]			
		minimum Q1	Transitional Q2	Permanent Q3	Overload Q4
15	20	0.27	0.432	5.4	6.8
25	20	1.00	1.600	20.0	25.0
32	20	1.60	2.504	31.3	39.1
40	20	1.60	2.504	31.3	39.1
50	20	2.50	4.000	50.0	62.5
65	20	6.30	10.000	125.0	156.3
80	20	10.00	16.000	200.0	250.0
100	20	15.60	25.000	312.5	390.6
125	20	25.00	40.000	500.0	625.0
150	20	25.00	40.000	500.0	625.0
200	20	62.50	100.000	1250.0	1562.5
250	20	100.00	160.000	2000.0	2500.0
300	20	156.00	250.000	3125.0	3906.3
350	20	156.00	250.000	3125.0	3906.3
400	20	250.00	400.000	5000.0	6250.0
450	20	250.00	400.000	5000.0	6250.0
500	10	787.50	1260.000	7875.0	9843.8

2.5 OIML R49

The OIML R49 recommendation (2006) concerns water meters intended for the metering of cold potable water and hot water. The OPTIFLUX 4300 has a certificate of compliance with OIML R49, issued by NMI.

The OIML R49 recommendation sets out the conditions to which water meters shall comply to meet the requirements of the services of legal metrology in countries where these instruments are subject to state controls.

The measuring range of the water meter is determined by Q_3 (nominal flow rate) and "R" (ratio). The OPTIFLUX 4300 meets the requirements for water meters of accuracy class 1 and 2.

For accuracy class 1, the maximum permissible error for water meters is $\pm 1\%$ for the upper flow rate zone and $\pm 3\%$ for the lower flow rate zones.

For accuracy class 2, the maximum permissible error for water meters is $\pm 2\%$ for the upper flow rate zone and $\pm 5\%$ for the lower flow rate zones.

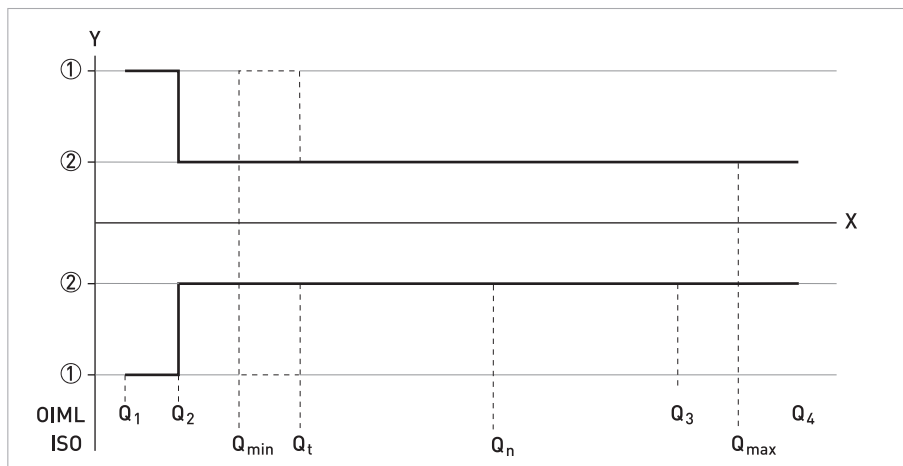


Figure 2-2: ISO flow rates added to figure as comparison towards OIML

X: Flow rate; Y: Maximum measuring error [%]

① $\pm 3\%$ for class 1, $\pm 5\%$ for class 2 devices

② $\pm 1\%$ for class 1, $\pm 2\%$ for class 2 devices

$$Q_1 = Q_3 / R$$

$$Q_2 = Q_1 * 1.6$$

$$Q_3 = Q_1 * R$$

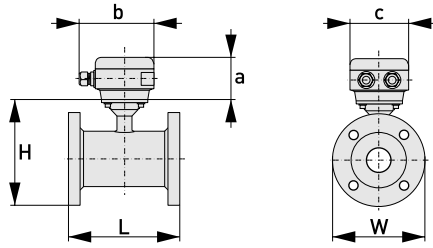
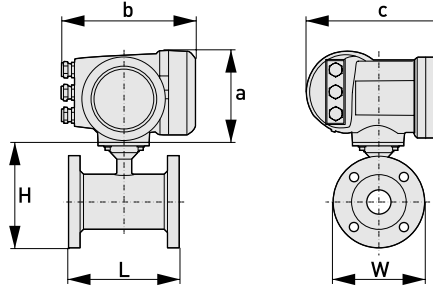
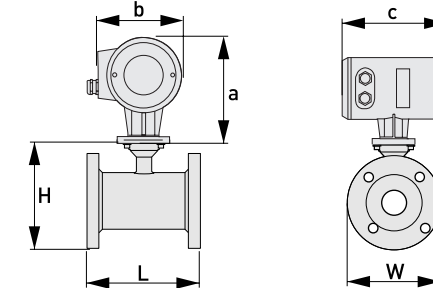
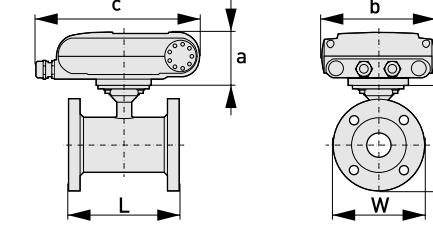
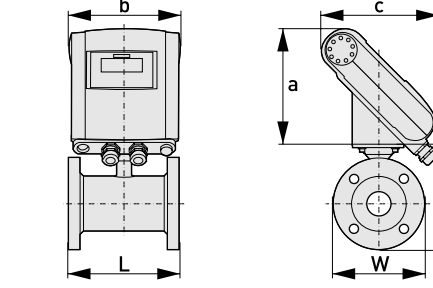
$$Q_4 = Q_3 * 1.25$$

2.6 OIML R117

OIML R117, Class 0.3

DN	Span (R)	Flow rate [m ₃ /h]			
		Minimum Q1	Transitional Q2	Permanent Q3	Overload Q4
25	20	1.0	1.6	20	25
50	20	2.5	4.0	50	63
80	20	10.0	16	200.0	250.0
100	20	15.6	25	312.5	390.6
150	20	25.0	40	500.0	625.0
250	20	100.0	160	2000.0	2500.0
500	10	787.5	1260	7875.0	9844.0

2.7 Dimensions and weights

Remote version		<p>a = 77 mm / 3.1"</p> <p>b = 139 mm / 5.5" ①</p> <p>c = 106 mm / 4.2"</p> <p>Total height = H + a</p>
Compact version with IFC 300		<p>a = 155 mm / 6.1"</p> <p>b = 230 mm / 9.1" ①</p> <p>c = 260 mm / 10.2"</p> <p>Total height = H + a</p>
Compact version with IFC 040		<p>a = 165 mm / 6.5"</p> <p>b = 136 mm / 5.3" ①</p> <p>c = 208 mm / 8.2"</p> <p>Total height = H + a</p>
Compact version with IFC 100 (0°)		<p>a = 82 mm / 3.2"</p> <p>b = 161 mm / 6.3"</p> <p>c = 257 mm / 10.1" ①</p> <p>Total height = H + a</p>
Compact version with IFC 100 (45°)		<p>a = 186 mm / 7.3"</p> <p>b = 161 mm / 6.3"</p> <p>c = 184 mm / 7.3" ①</p> <p>Total height = H + a</p>

① The value may vary depending on the used cable glands.

- All data given in the following tables are based on standard versions of the sensor only.
- Especially for smaller nominal sizes of the sensor, the converter can be bigger than the sensor.
- Note that for other pressure ratings than mentioned, the dimensions may be different.
- For full information on converter dimensions see relevant documentation.

EN 1092-1

Nominal size		Dimensions [mm]				Approx. weight [kg]
DN	PN [bar]	L		H	W	
		DIN	ISO			
2.5	40	130	-	142	90	3
4	40	130	-	142	90	3
6	40	130	-	142	90	3
10	40	130 ①	-	106	90	6
15	40	130 ①	200	106	95	6
20	40	150	200	158	105	7
25	40	150	200	140	115	4
32	40	150	200	157	140	5
40	40	150	200	166	150	5
50	40	200	200	186	165	9
65	16	200	200	200	185	9
80	40	200	200	209	200	12
100	16	250	250	237	220	15
125	16	250	250	266	250	19
150	16	300	300	300	285	27
200	10	350	350	361	340	34
250	10	400	450	408	395	48
300	10	500	500	458	445	58
350	10	500	550	510	505	78
400	10	600	600	568	565	101
450	10	600	-	618	615	111
500	10	600	-	671	670	130
600	10	600	-	781	780	165
700	10	700	-	898	895	248
800	10	800	-	1012	1015	331
900	10	900	-	1114	1115	430
1000	10	1000	-	1225	1230	507
1200	6	1200	-	1417	1405	555
1400	6	1400	-	1619	1630	765
1600	6	1600	-	1819	1830	1035
1800	6	1800	-	2027	2045	1470
2000	6	2000	-	2259	2265	1860

① 150 mm for construction according to order code VN03.

150 lb flanges

Nominal size		Dimensions [inches]			Approx. weight [lb]
ASME	PN [psi]	L	H	W	
1/10"	284	5.12	5.59	3.50	6
1/8"	284	5.12	5.59	3.50	6
1/4"	284	5.12	5.59	3.50	6
3/8"	284	5.12 ①	5.08	3.50	12
1/2"	284	5.12 ①	5.08	3.50	12
3/4"	284	5.91	5.28	3.88	18
1"	284	5.91	5.39	4.25	7
1 1/4"	284	5.91	5.98	4.62	7
1 1/2"	284	5.91	6.10	5.00	11
2"	284	7.87	7.05	5.98	18
3"	284	7.87	8.03	7.50	26
4"	284	9.84	9.49	9.00	40
5"	284	9.84	10.55	10.0	49
6"	284	11.81	11.69	11.0	64
8"	284	13.78	14.25	13.5	95
10"	284	15.75	16.3	16.0	143
12"	284	19.69	18.78	19.0	207
14"	284	27.56	20.67	21.0	284
16"	284	31.50	22.95	23.5	364
18"	284	31.50	24.72	25.0	410
20"	284	31.50	26.97	27.5	492
24"	284	31.50	31.38	32.0	675

① 5.91" for construction according to order code VN03

- Pressures at 20°C / 68°F.
- For higher temperatures, the pressure and temperature ratings are as per ASME B16.5 (up to 24") or ASME B16.47 (>24").
- Dimensions for other sizes on request.

300 lb flanges

Nominal size		Dimensions [inches]			Approx. weight [lb]
ASME	PN [psi]	L	H	W	
1/10"	741	5.12	5.59	3.75	6
1/8"	741	5.12	5.59	3.75	6
1/4"	741	5.12	5.59	3.75	6
3/8"	741	5.12 ①	5.24	3.75	15
1/2"	741	5.12 ①	5.24	3.75	15
3/4"	741	5.91	5.67	4.62	20
1"	741	5.91	5.71	4.87	11
1 1/2"	741	7.87	6.65	6.13	13
2"	741	9.84	7.32	6.50	22
3"	741	9.84	8.43	8.25	31
4"	741	11.81	10.00	10.0	44
6"	741	12.60	12.44	12.5	73
8"	741	15.75	15.04	15.0	157
10"	741	19.69	17.05	17.5	247
12"	741	23.62	20.00	20.5	375
14"	741	27.56	21.65	23.0	474
16"	741	31.50	23.98	25.5	639
20"	741	31.50	28.46	30.5	937
24"	741	31.50	33.39	36.0	1345

① 5.91" for construction according to order code VN03

- Pressures at 20°C / 68°F.
- For higher temperatures, the pressure and temperature ratings are as per ASME B16.5 (up to 24") or ASME B16.47 (>24").
- Dimensions for other sizes on request.

3.1 Intended use

The measurement of volumetric flowrate of electrically conductive fluids. Basic measurement is the flow velocity upon which all other measurements are based.

3.2 Installation conditions

3.2.1 Inlet and outlet

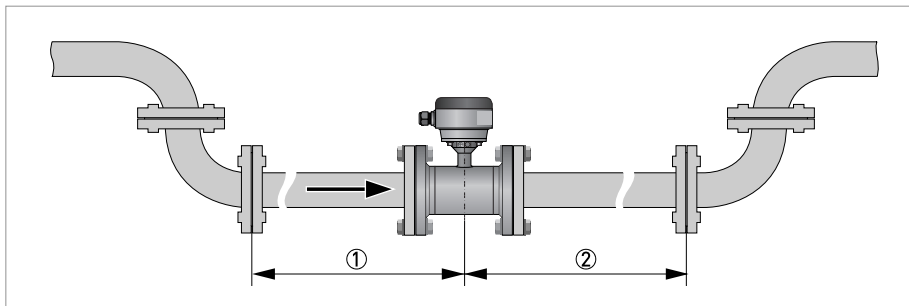


Figure 3-1: Recommended inlet and outlet sections

- ① ≥ 5 DN
- ② ≥ 2 DN

3.2.2 Mounting position

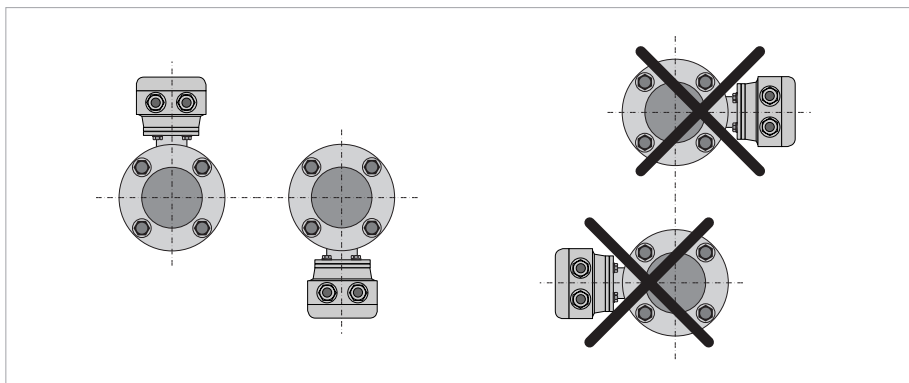


Figure 3-2: Mounting position

3.2.3 Flange deviation

Max. permissible deviation of pipe flange faces:
 $L_{max} - L_{min} \leq 0.5 \text{ mm} / 0.02''$

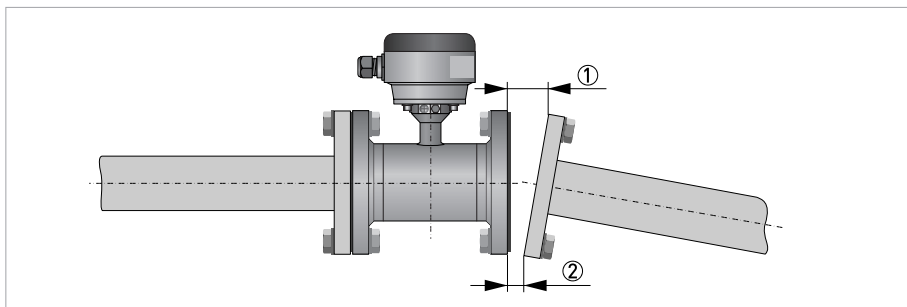


Figure 3-3: Flange deviation

- ① L_{max}
- ② L_{min}

3.2.4 T-section

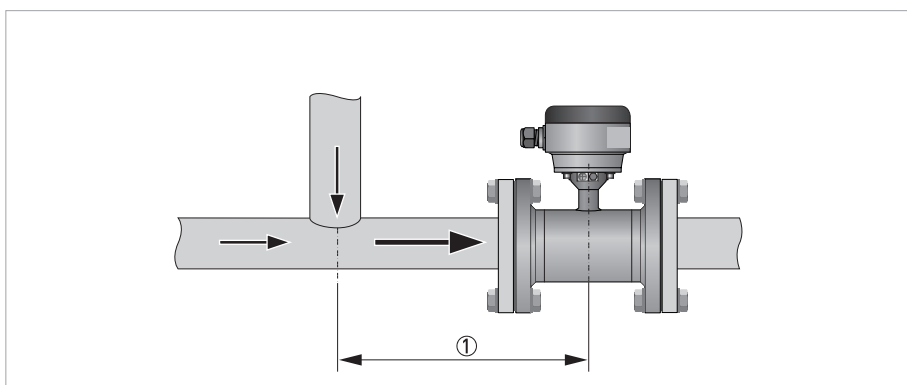


Figure 3-4: Distance after T-sections

- ① $\geq 10 \text{ DN}$

3.2.5 Vibration

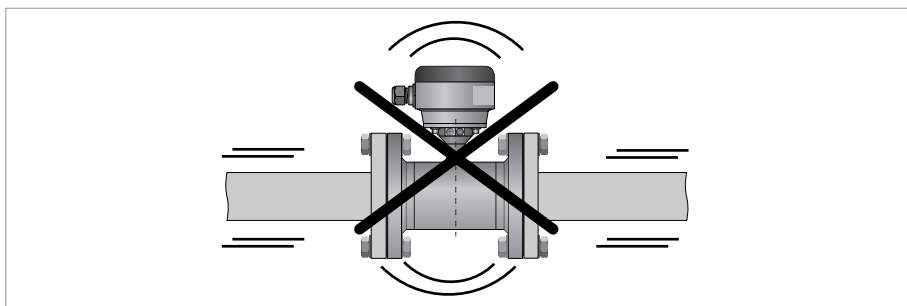


Figure 3-5: Avoid vibrations

3.2.6 Magnetic field

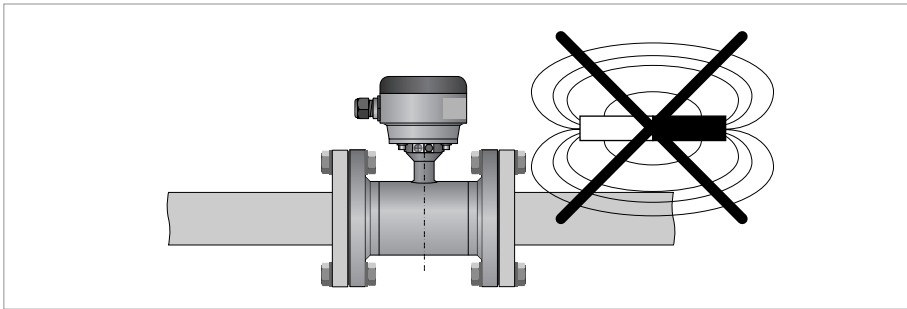


Figure 3-6: Avoid magnetic fields

3.2.7 Bends

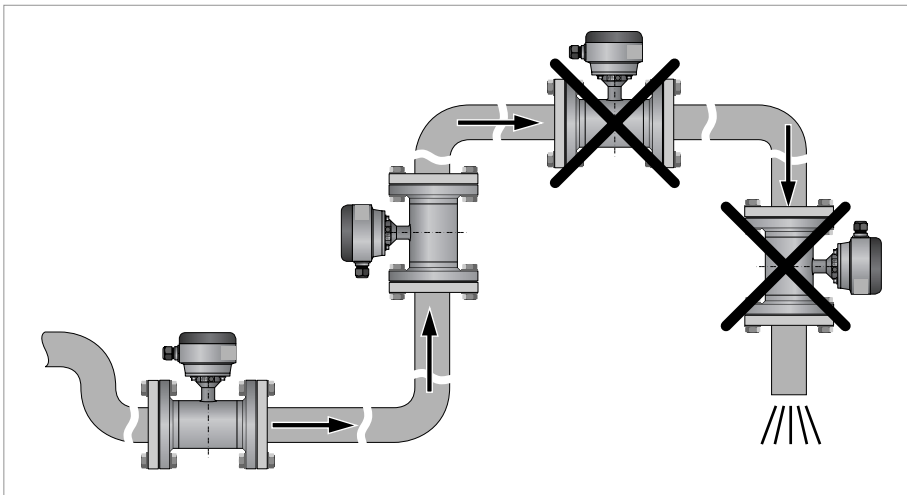


Figure 3-7: Installation in bending pipes

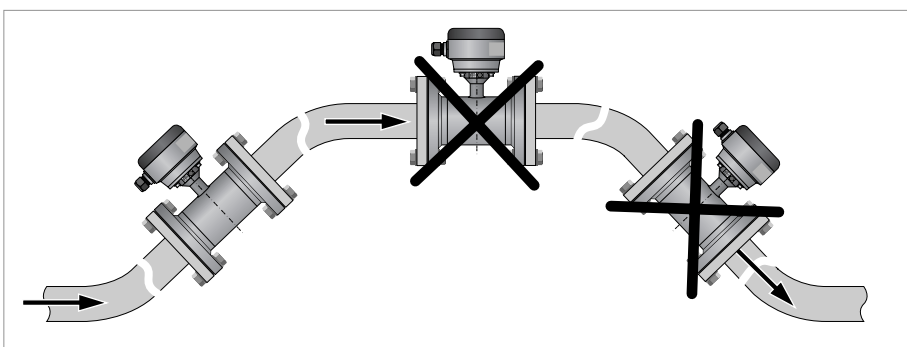


Figure 3-8: Installation in bending pipes

3.2.8 Open discharge

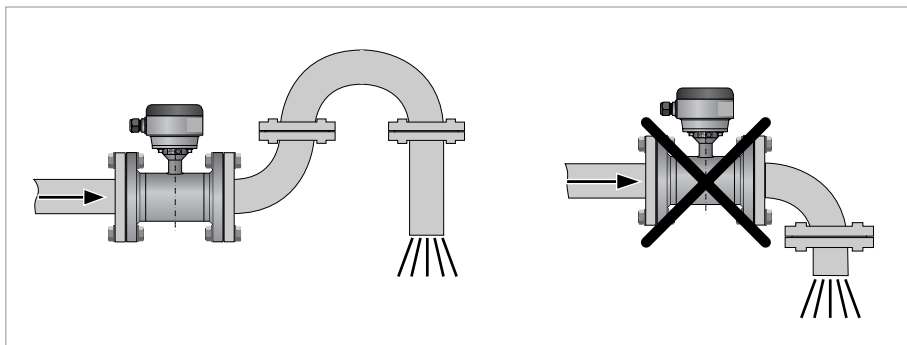


Figure 3-9: Installation before an open discharge

3.2.9 Control valve

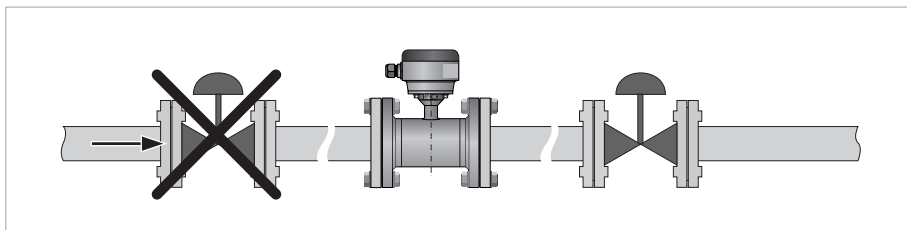


Figure 3-10: Installation before control valve

3.2.10 Air venting

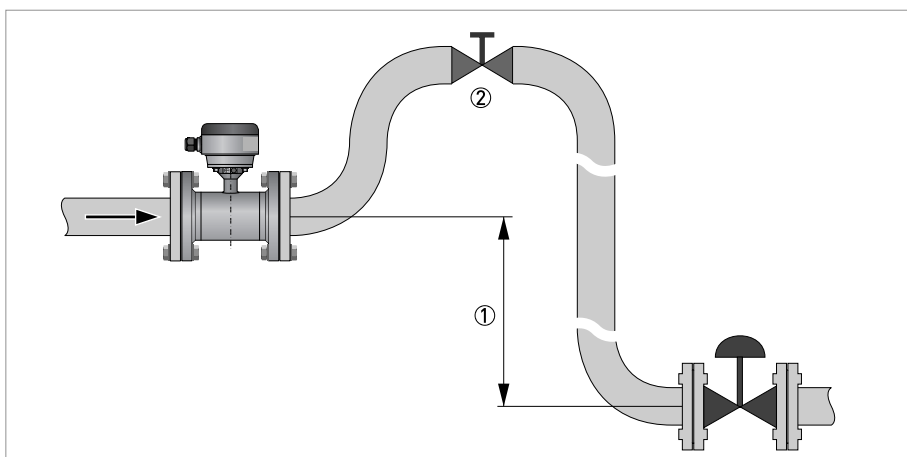


Figure 3-11: Air venting

- ① ≥ 5 m
- ② Air ventilation point

3.2.11 Pump

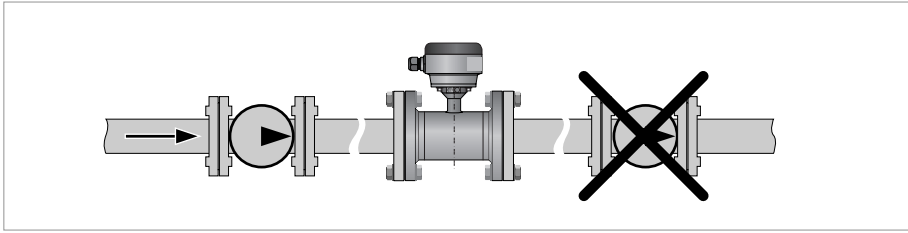


Figure 3-12: Installation after pump

4.1 Safety instructions

All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

Observe the national regulations for electrical installations!

For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.

Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

4.2 Grounding

The device must be grounded in accordance with regulations in order to protect personnel against electric shocks.

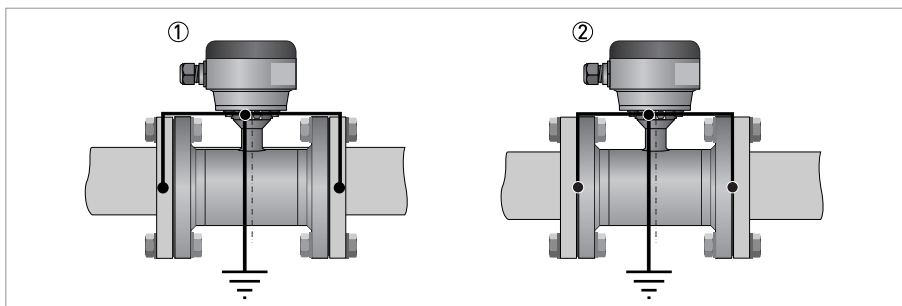


Figure 4-1: Grounding

- ① Metal pipelines, not internally coated. Grounding without grounding rings.
- ② Metal pipelines with internal coating and non-conductive pipelines. Grounding with grounding rings.

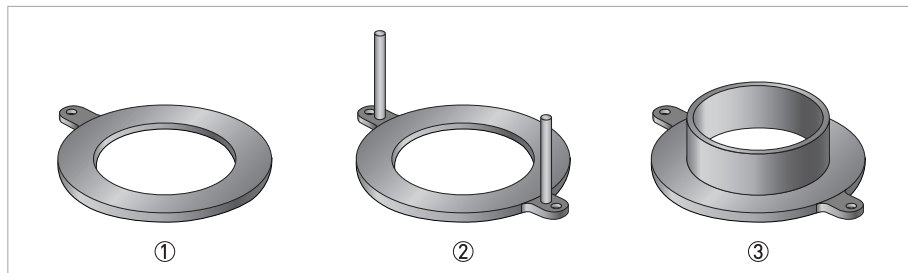


Figure 4-2: Different types of grounding rings

- ① Grounding ring number 1
- ② Grounding ring number 2
- ③ Grounding ring number 3

Grounding ring number 1:

- 3 mm / 0.1" thick (tantalum: 0.5 mm / 0.1")

Grounding ring number 2:

- 3 mm / 0.1" thick
- Prevents damage to the flanges during transport and installation
- Especially for flow sensors with PTFE liner

Grounding ring number 3:

- 3 mm / 0.1" thick
- With cylindrical neck (length 30 mm / 1.25" for DN10...150 / 3/8...6")
- Prevents damage to the liner when abrasive liquids are used

4.3 Virtual reference for IFC 300 (C, W and F version)

The virtual reference option on the IFC 300 flow converter provides complete isolation of the measurement circuit.

The benefits of virtual reference are that grounding rings or grounding electrodes can be omitted, safety increases by reducing the number of potential leakage points and the installation of the flowmeters is much easier.

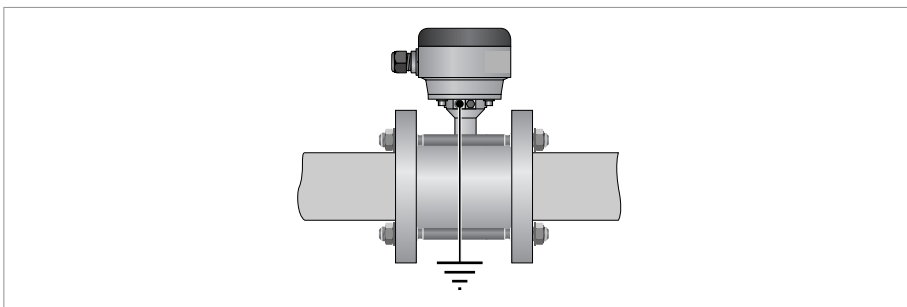
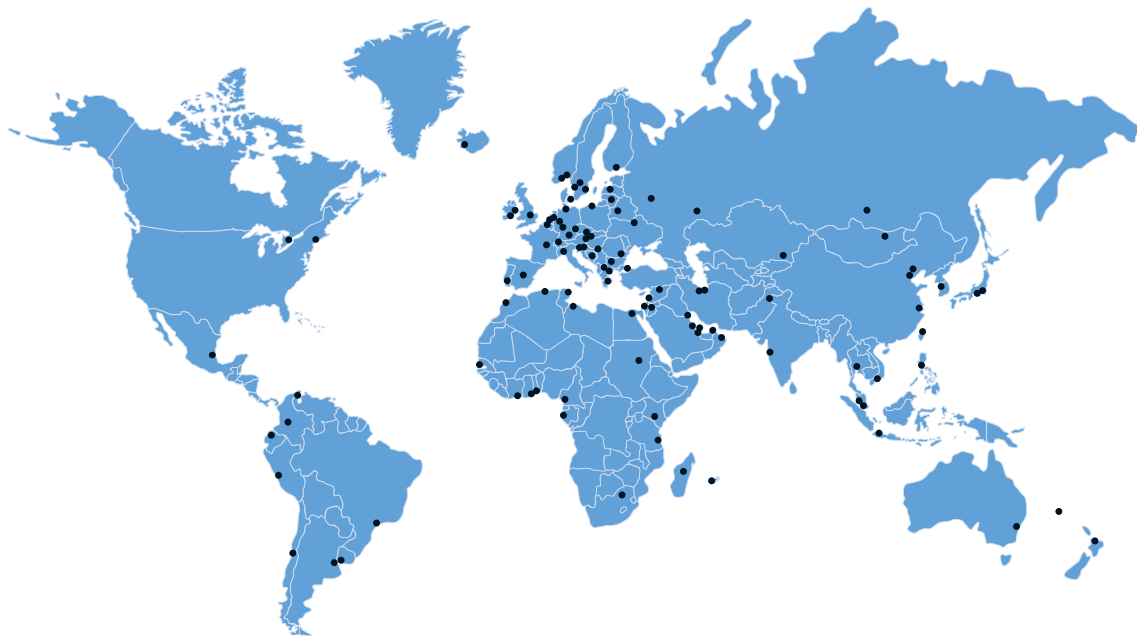


Figure 4-3: Virtual reference

Possible if:

- \geq DN10
- Electrical conductivity $\geq 200 \mu\text{S}/\text{cm}$
- Electrode cable max. 50m., type DS





KROHNE product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature meters
- Pressure meters
- Analysis products
- Measuring systems for the oil and gas industry
- Measuring systems for sea-going tankers

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