



OPTIFLUX 7300 Handbook

Electromagnetic flowmeter with non wetted electrodes and ceramic liner

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1.1 Intended use

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

The sensor includes a ceramic liner for high abrasion resistance and capacitive signal pick up for a lower minimum conductivity of the fluid.

1.2 Safety instructions from the manufacturer

1.2.1 Copyright and data protection

The contents of this document have been created with great care. Nevertheless, we provide no guarantee that the contents are correct, complete or up-to-date.

The contents and works in this document are subject to copyright. Contributions from third parties are identified as such. Reproduction, processing, dissemination and any type of use beyond what is permitted under copyright requires written authorisation from the respective author and/or the manufacturer.

The manufacturer tries always to observe the copyrights of others, and to draw on works created in-house or works in the public domain.

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We hereby expressly prohibit the use of the contact data published as part of our duty to publish an imprint for the purpose of sending us any advertising or informational materials that we have not expressly requested.

1.2.2 Disclaimer

The manufacturer will not be liable for any damage of any kind by using its product, including, but not limited to direct, indirect or incidental and consequential damages.

This disclaimer does not apply in case the manufacturer has acted on purpose or with gross negligence. In the event any applicable law does not allow such limitations on implied warranties or the exclusion of limitation of certain damages, you may, if such law applies to you, not be subject to some or all of the above disclaimer, exclusions or limitations.

Any product purchased from the manufacturer is warranted in accordance with the relevant product documentation and our Terms and Conditions of Sale.

The manufacturer reserves the right to alter the content of its documents, including this disclaimer in any way, at any time, for any reason, without prior notification, and will not be liable in any way for possible consequences of such changes.

1.2.3 Product liability and warranty

The operator shall bear responsibility for the suitability of the device for the specific purpose. The manufacturer accepts no liability for the consequences of misuse by the operator. Improper installation and operation of the devices (systems) will cause the warranty to be void. The respective "Standard Terms and Conditions" which form the basis for the sales contract shall also apply.

1.2.4 Information concerning the documentation

To prevent any injury to the user or damage to the device it is essential that you read the information in this document and observe applicable national standards, safety requirements and accident prevention regulations.

If this document is not in your native language and if you have any problems understanding the text, we advise you to contact your local office for assistance. The manufacturer can not accept responsibility for any damage or injury caused by misunderstanding of the information in this document.

This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device. Special considerations and precautions are also described in the document, which appear in the form of underneath icons.

1.2.5 Warnings and symbols used

Safety warnings are indicated by the following symbols.



DANGER!

This information refers to the immediate danger when working with electricity.



DANGER!

This warning refers to the immediate danger of burns caused by heat or hot surfaces.



DANGER!

This warning refers to the immediate danger when using this device in a hazardous atmosphere.



DANGER!

These warnings must be observed without fail. Even partial disregard of this warning can lead to serious health problems and even death. There is also the risk of seriously damaging the device or parts of the operator's plant.



WARNING!

Disregarding this safety warning, even if only in part, poses the risk of serious health problems. There is also the risk of damaging the device or parts of the operator's plant.



CAUTION!

Disregarding these instructions can result in damage to the device or to parts of the operator's plant.



INFORMATION!

These instructions contain important information for the handling of the device.



LEGAL NOTICE!

This note contains information on statutory directives and standards.



• **HANDLING**

This symbol designates all instructions for actions to be carried out by the operator in the specified sequence.

➔ **RESULT**

This symbol refers to all important consequences of the previous actions.

1.3 Safety instructions for the operator



WARNING!

*In general, devices from the manufacturer may only be installed, commissioned, operated and maintained by properly trained and authorized personnel.
This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device.*

2.1 Scope of delivery



INFORMATION!

Inspect the cartons carefully for damage or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.



INFORMATION!

Check the packing list to check if you received completely all that you ordered.

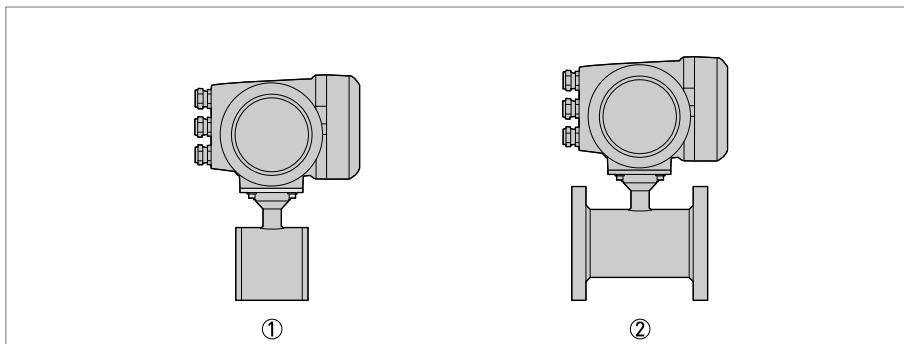


Figure 2-1: Available versions

- ① Sandwich version
- ② Flanged versions

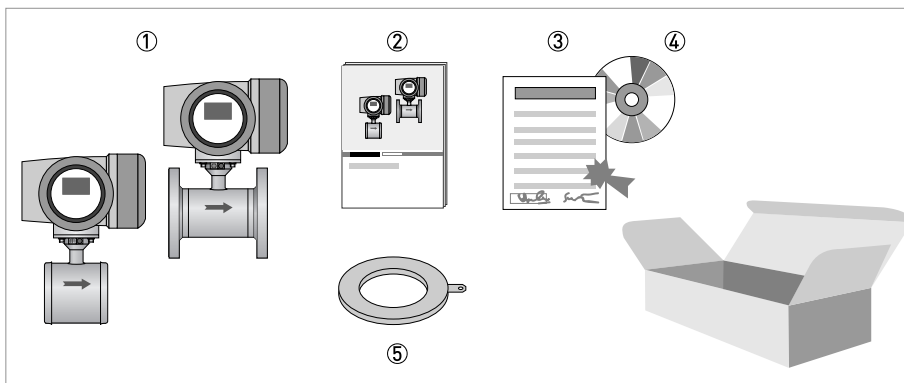


Figure 2-2: Scope of delivery

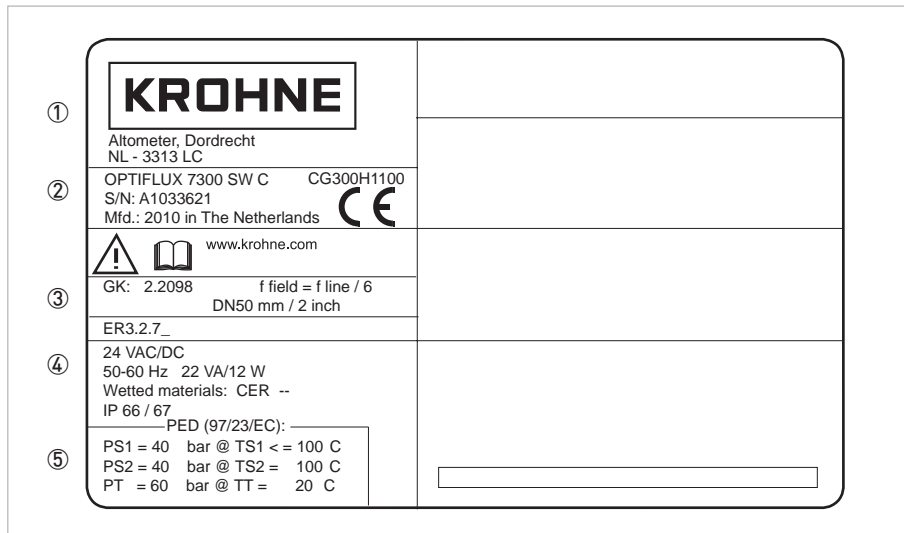
- ① Ordered flowmeter (sandwich or flanged version)
- ② Product documentation
- ③ Factory calibration report
- ④ CD-ROM with product documentation
- ⑤ Grounding rings (optionally)

2.2 Nameplates



INFORMATION!

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.



- ① Name and address of the manufacturer.
- ② Type designation of the flowmeter and CE sign with number(s) of notified body / bodies.
- ③ Calibration data.
- ④ Main supply data.
- ⑤ PED data.

3.1 Notes on installation

**INFORMATION!**

Inspect the cartons carefully for damage or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

**INFORMATION!**

Check the packing list to check if you received completely all that you ordered.

**INFORMATION!**

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.

3.2 Storage

- Store the device in a dry and dust-free location.
- Avoid lasting direct exposure to the sun.
- Store the device in its original packing.

3.3 Transport

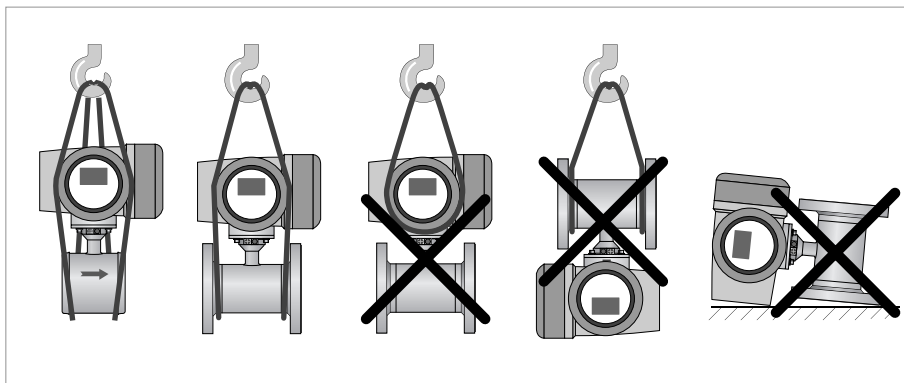


Figure 3-1: Transport

3.4 Installation conditions

3.4.1 Inlet and outlet

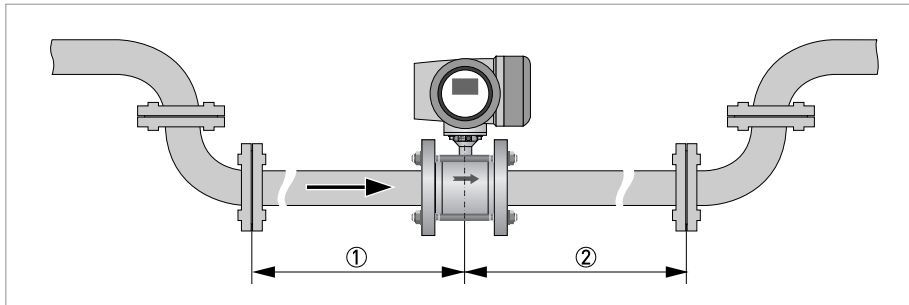


Figure 3-2: Recommended inlet and outlet sections

- ① ≥ 5 DN
- ② ≥ 2 DN

3.4.2 Mounting position

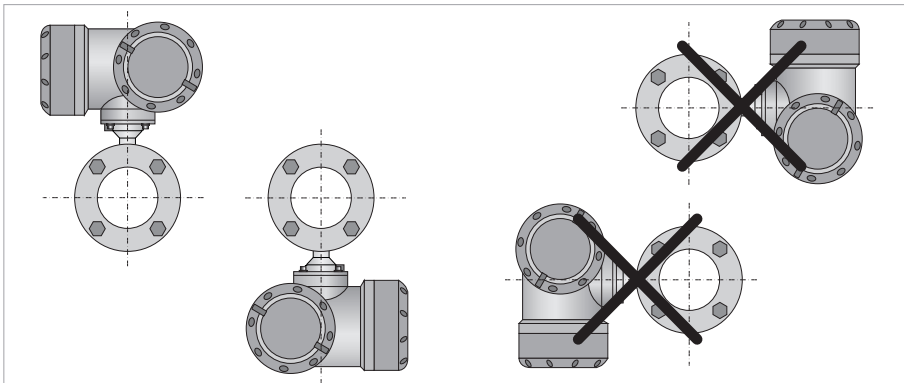


Figure 3-3: Mounting position

3.4.3 Flange deviation



CAUTION!

Max. permissible deviation of pipe flange faces:

$$L_{max} - L_{min} \leq 0.5 \text{ mm} / 0.02''$$

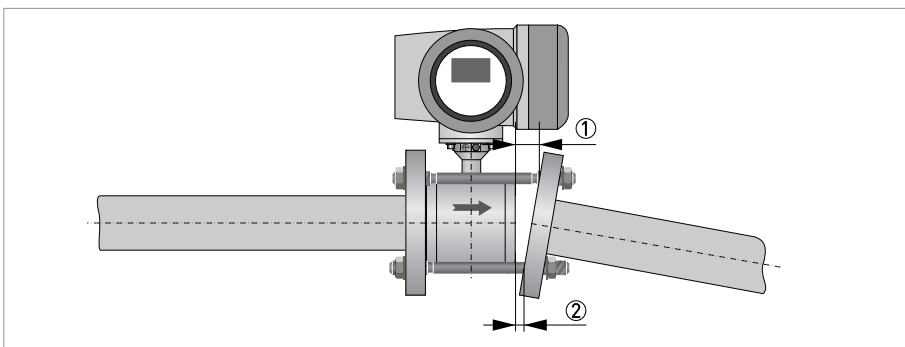


Figure 3-4: Flange deviation

- ① L_{max}
- ② L_{min}

3.4.4 T-section

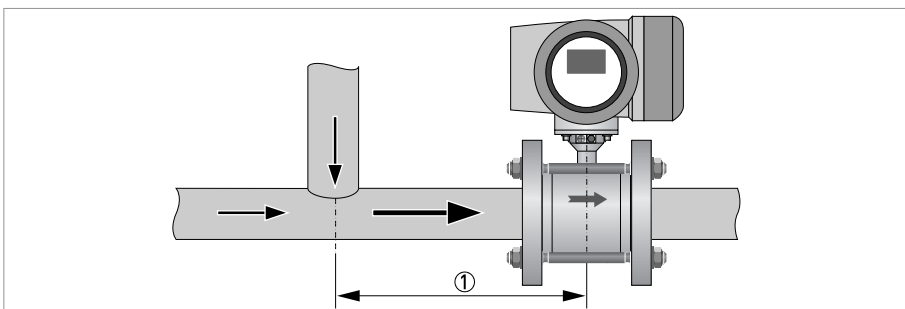


Figure 3-5: Distance after T-sections

- ① $\geq 10 \text{ DN}$

3.4.5 Vibration

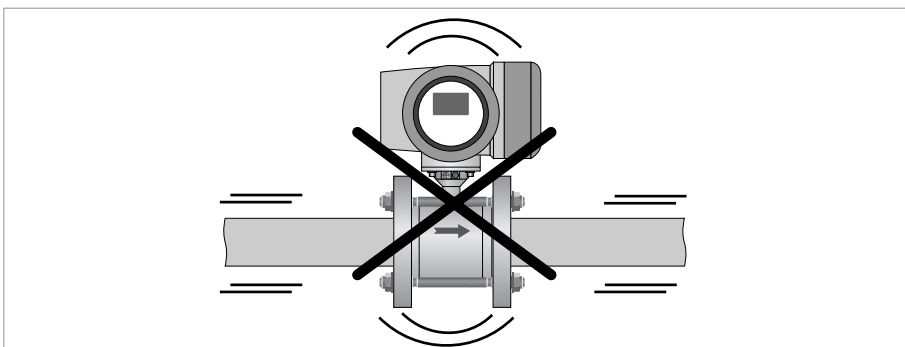


Figure 3-6: Avoid vibrations

3.4.6 Magnetic field

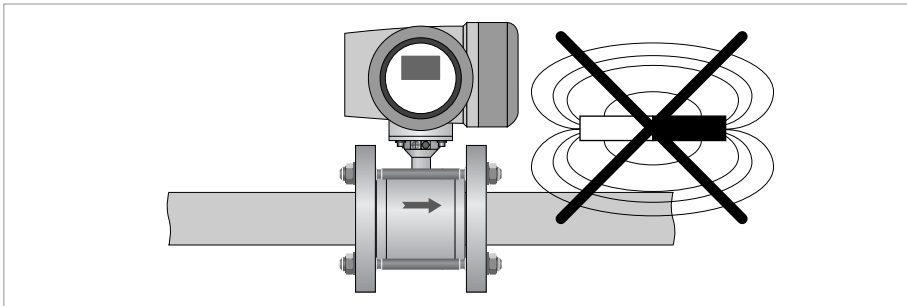


Figure 3-7: Avoid magnetic fields

3.4.7 Bends

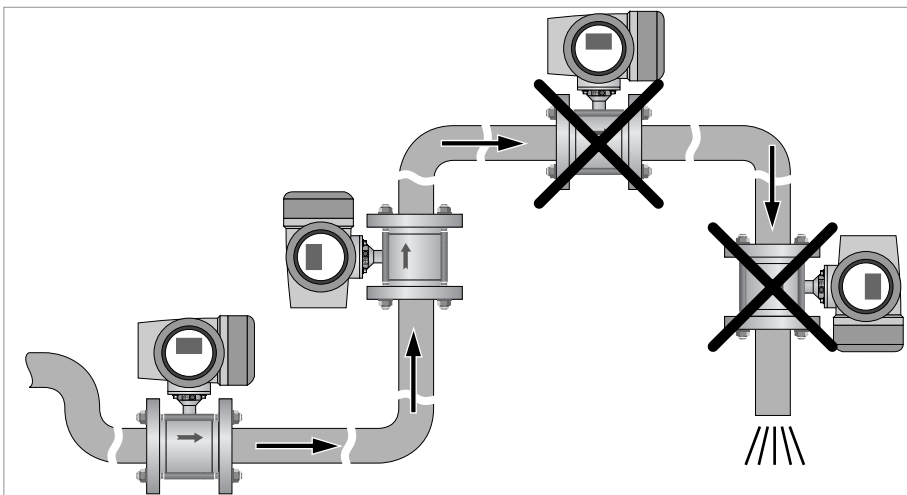


Figure 3-8: Installation in bending pipes

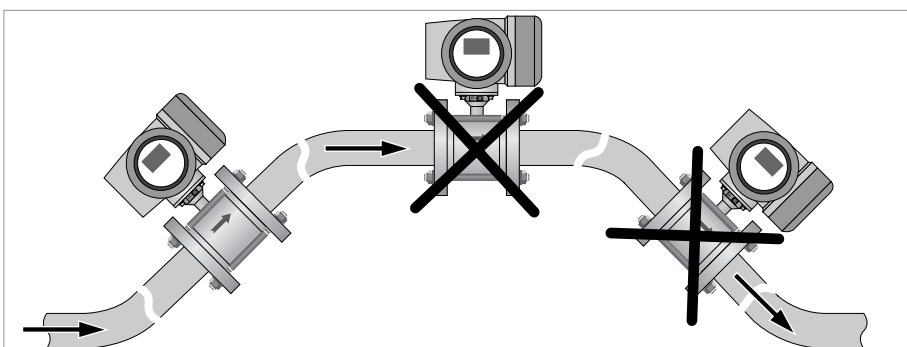


Figure 3-9: Installation in bending pipes

3.4.8 Open discharge

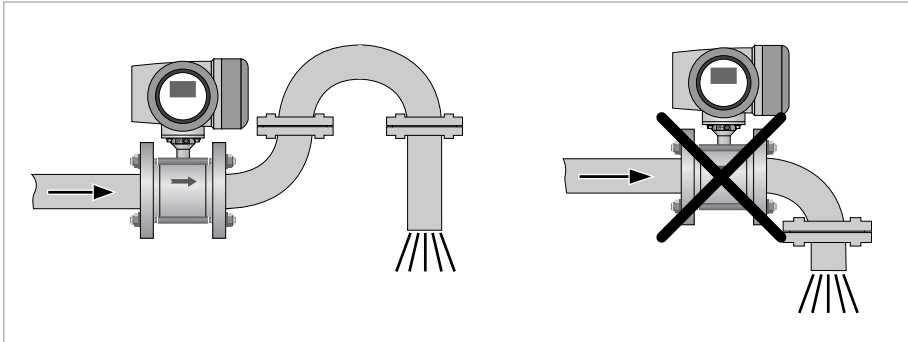


Figure 3-10: Installation before an open discharge

3.4.9 Control valve

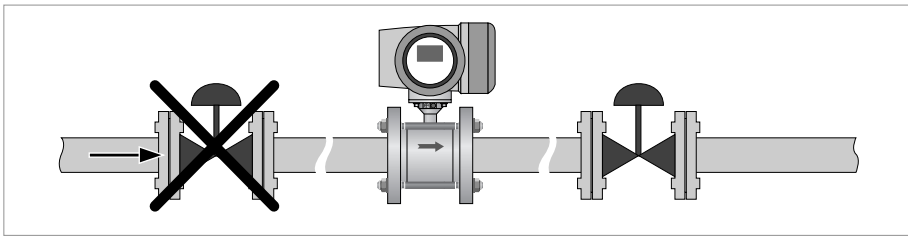


Figure 3-11: Installation before control valve

3.4.10 Air venting

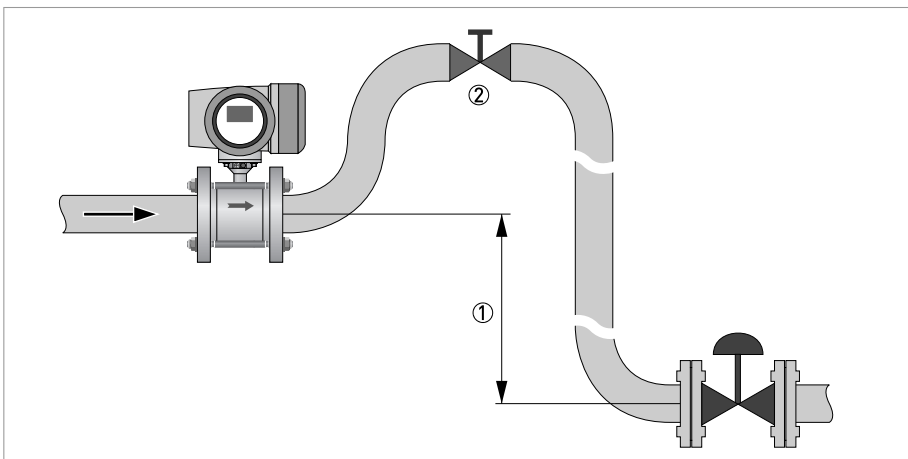


Figure 3-12: Air venting

- ① ≥ 5 m
- ② Air ventilation point

3.4.11 Pump

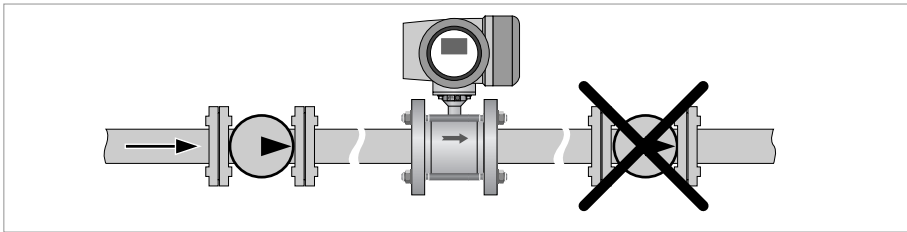


Figure 3-13: Installation after pump

3.4.12 Temperatures

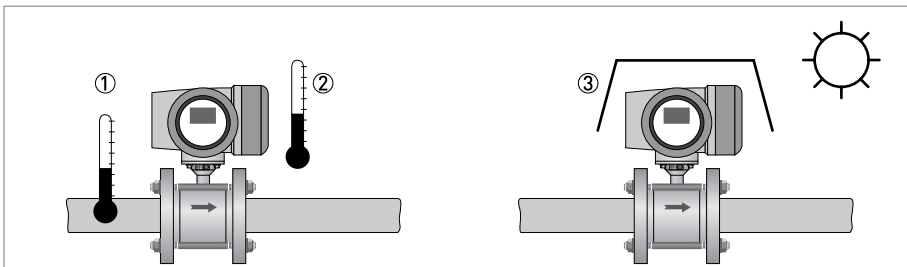


Figure 3-14: Temperatures

- ① Process temperature
- ② Ambient temperature
- ③ Sunshade



CAUTION!
Protect the device from direct sunlight.

Temperature range	Process [°C]		Ambient [°C]		Process [°F]		Ambient [°F]	
	min.	max.	min.	max.	min.	max.	min.	max.
Compact + IFC 300	-40	100	-40	65	-40	212	-40	149

3.5 Mounting

3.5.1 Torques and pressures sandwich versions



WARNING!

- Use stainless steel A2 / 6.9 class bolts.
- Make sure the connecting flanges are of type raised face (RF).

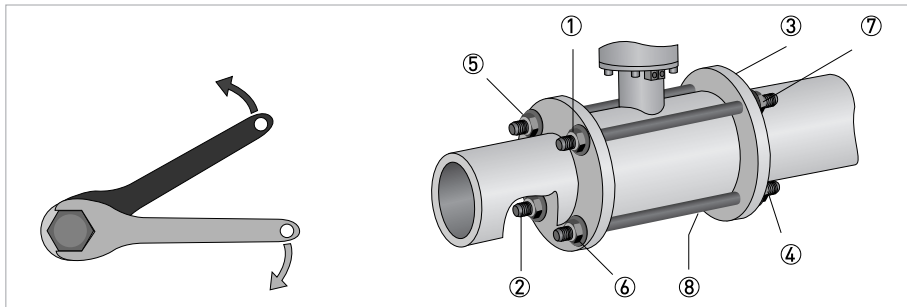


Figure 3-15: Tighten the bolts in fixed order, see picture.

Max. torque:

- Step 1: approx. 50% of max. torque
- Step 2: approx. 80% of max. torque
- Step 3: 100% of max. torque given in tables

EN 1092-1

Nominal size DN [mm]	Pressure rating	Max. allowable operating pressure [bar]
25...80	PN 40	40
100	PN 16	16
100	PN 25	25

ASME B 16.5

Nominal size [inch]	Pressure rating	Max. allowable operating pressure [psig]
1...4"	150 lb	230
1...3"	300 lb	580

EN 1092-1

Nominal size DN [mm]	Pipe flanges	Max. allowable torque with gaskets made of	
		Gylon® [Nm]	Chemotherm® [Nm]
25	PN 40	22	32
40	PN 40	47	66
50	PN 40	58	82
80	PN 40	48	69
100	PN 16	75	106
100	PN 25	94	133

ASME B 16.5

Nominal size DN [mm]	Pipe flanges	Max. allowable torque with gaskets made of	
		Gylon® [ftlb]	Chemotherm® [ftlb]
1"	150 lb	18	24
1 1/2"	150 lb	28	40
2"	150 lb	43	61
3"	150 lb	72	102
4"	150 lb	55	80

Nominal size DN [mm]	Pipe flanges	Max. allowable torque with gaskets made of	
		Gylon® [ftlb]	Chemotherm® [ftlb]
1"	300 lb	15	21
1 1/2"	300 lb	32	45
2"	300 lb	45	64
3"	300 lb	43	61
4"	300 lb	63	90

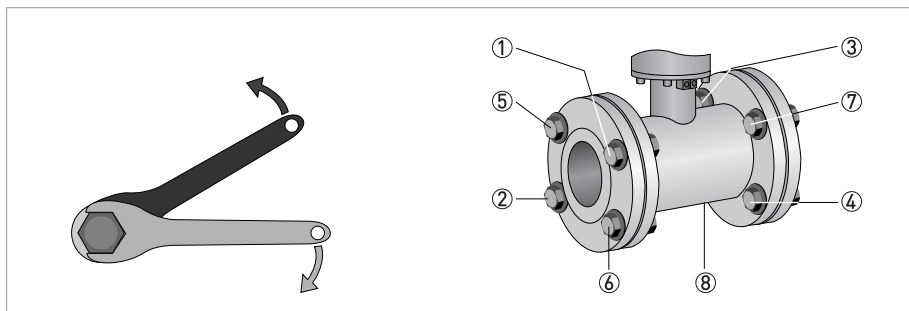
3.5.2 Torques and pressures flanged versions

**WARNING!**

Use stainless steel A2 / 6.9 class bolts.

Tighten the bolts in fixed order, see picture:

- Step 1: by hand
- Step 2: approx. 25% of max. torque
- Step 3: approx. 50% of max. torque
- Step 4: approx. 80% of max. torque
- Step 5: 100% of max. torque given in table

**INFORMATION!**

Diameters DN80 and DN100 have 8 holes per flange, please continue in the same way to tighten the other bolts.

**CAUTION!**

With the instrument, 4 PTFE sealing rings are included (2 to be used with installation, 2 as spare).

No other gaskets are required.

EN 1092-1

Nominal size DN [mm]	Pressure rating	Bolts	Max. torque [Nm]
25	PN 40	4 × M 12	73.5
40	PN 40	4 × M 16	178
50	PN 40	4 × M 16	178
80	PN 40	8 × M 16	178
100	PN 16	8 × M 16	178

ASME B 16.5

Nominal size [inch]	Flange class [lb]	Bolts	Max. torque [ftlb]
1	150	4 × 1/2"	40
1 1/2	150	4 × 1/2"	40
2	150	4 × 5/8"	96.84
3	150	4 × 5/8"	96.84
4	150	8 × 5/8"	96.84

Nominal size [inch]	Flange class [lb]	Bolts	Max. torque [ftlb]
1	300	4 × 3/4"	188.8
1 1/2	300	4 × 3/4"	188.8
2	300	8 × 5/8"	96.84
3	300	8 × 3/4"	188.8

4.1 Safety instructions



DANGER!

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



DANGER!

Observe the national regulations for electrical installations!



DANGER!

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



WARNING!

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.



INFORMATION!

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



DANGER!

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

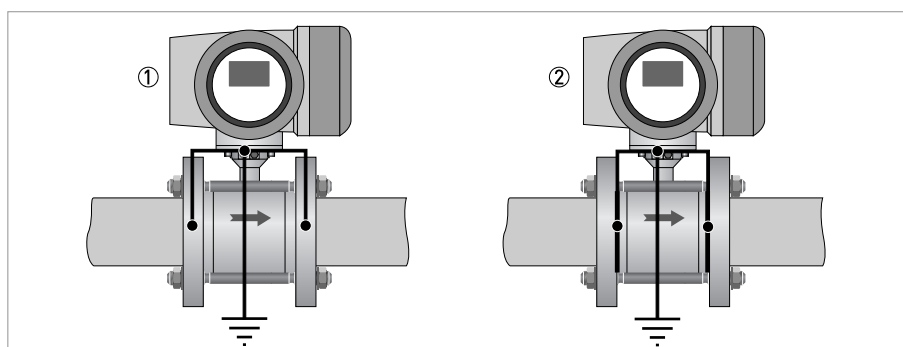


Figure 4-1: Grounding

- 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: Grounding ring number 1

Grounding ring number 1 (for type VN19):

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

4.3 Connection diagrams



INFORMATION!

For the connection diagrams please refer to the documentation of the applicable converter.

5.1 Spare parts availability

The manufacturer adheres to the basic principle that functionally adequate spare parts for each device or each important accessory part will be kept available for a period of 3 years after delivery of the last production run for the device.

This regulation only applies to spare parts which are subject to wear and tear under normal operating conditions.

5.2 Availability of services

The manufacturer offers a range of services to support the customer after expiration of the warranty. These include repair, maintenance, technical support and training.



INFORMATION!

For more precise information, please contact your local representative.

5.3 Returning the device to the manufacturer

5.3.1 General information

This device has been carefully manufactured and tested. If installed and operated in accordance with these operating instructions, it will rarely present any problems.



CAUTION!

Should you nevertheless need to return a device for inspection or repair, please pay strict attention to the following points:

- *Due to statutory regulations on environmental protection and safeguarding the health and safety of our personnel, manufacturer may only handle, test and repair returned devices that have been in contact with products without risk to personnel and environment.*
- *This means that the manufacturer can only service this device if it is accompanied by the following certificate (see next section) confirming that the device is safe to handle.*



CAUTION!

If the device has been operated with toxic, caustic, flammable or water-endangering products, you are kindly requested:

- *to check and ensure, if necessary by rinsing or neutralizing, that all cavities are free from such dangerous substances,*
- *to enclose a certificate with the device confirming that is safe to handle and stating the product used.*

5.3.2 Form (for copying) to accompany a returned device

Company:		Address:	
Department:		Name:	
Tel. no.:		Fax no.:	
Manufacturer's order no. or serial no.:			
The device has been operated with the following medium:			
This medium is:	water-hazardous		
	toxic		
	caustic		
	flammable		
	We checked that all cavities in the device are free from such substances.		
	We have flushed out and neutralized all cavities in the device.		
We hereby confirm that there is no risk to persons or the environment through any residual media contained in the device when it is returned.			
Date:		Signature:	
Stamp:			

5.4 Disposal



CAUTION!

Disposal must be carried out in accordance with legislation applicable in your country.

6.1 Measuring principle

An electrically conductive fluid flows inside an electrically insulated 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:

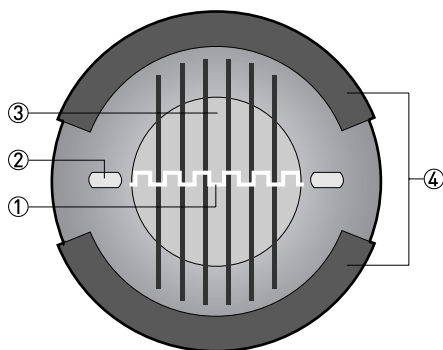
v = mean flow velocity

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 (capacitive)
- ③ Magnetic field
- ④ Field coils

6.2 Technical data



INFORMATION!

- 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	Farady's law of induction
Application range	Continuous measurement of the volumetric flow rate of electrically conductive liquids.
Measured value	
Primary measured value	Flow velocity
Secondary measured value	Volume flow, mass flow

Design

Features	Sandwich / flanged version with optimized flow tube
Modular construction	The measurement system consists of a flow sensor and a signal converter. It is available as compact version only. More information about the signal converter can be found in the documentation of the signal converter.
Compact version	With IFC 300 C / CAP converter: OPTIFLUX 7300 C
Nominal diameter	DN25, 40, 50, 80, 100 / 1", 1½", 2", 3" and 4".
Measurement range	-12...+12 m/s / -40...+40 ft/s
Signal converter	
Outputs / inputs	Current- (incl. HART®), pulse, frequency and/or status output, limit switch and/or control input, current input (depends on the I/O version)
Counters	2 (optional 3) internal counters with a max. of 8 counter places (e.g. for counting volume and/or mass units)
Verification	Intergrated verification, diagnostic functions: measuring device, process, measured value, empty pipe detection, stabilization.
Communication interfaces	Foundation Fieldbus, Profibus PA and DP, Modbus, HART®
User interface	
Display	LC Display, backlit white
	Size: 128 x 64 pixel, corresponds to 59 x 31 mm / 2.32" x 1.22"
	Display can be turned in steps of 90°
	Ambient temperature below -25°C / -13°F, may effect the readability of the display.
Operating elements	4 optical keys for operator control of the signal converter without opening the housing.
	Infrared interface for reading and writing all parameters with IR interface (option) without opening the housing.

Remote control	PACTware® (incl. Device Type Manager (DTM))
	HART® Hand Held Communicator from Emerson Process
	AMS® from Emerson Process
	PDM® from Siemens
	All DTMs and drivers are available free of charge from the manufacturer's website.
Display functions	
Operating menu	Setting the parameters using 2 measured value pages, 1 status page, 1 graphics page (measured values and graphics are freely adjustable).
Language display texts (as language package)	Standard: English, French, German, Dutch, Portuguese, Swedish, Spanish, Italian
	Eastern Europe: English, Slovenian, Czech, Hungarian
	Northern Europe: English, Danish, Polish
	China: English, Chinese
	Russia: English, Russian
Units	Metric, British and US units selectable as required from lists for volume / mass flow and counting, flow velocity, temperature.

Measuring accuracy

Reference conditions	Flow conditions: similar to EN 29104
	Medium: water
	Temperature: 20°C / 68°F
	In-/outlet section: 10 DN / 5 DN
	Flow velocity: > 1 m/s / > 3 ft/s
	Operating pressure: 1 bar / 14.5 psig
	Valve closing time variation: < 1 ms
	Wet calibrated on EN 17025 accredited calibration rig by direct volume comparison.
Maximum measuring error	±0.5% of measured value ±5 mm/s
	Related to volume flow.
	These values are related to the pulse / frequency output.
	The additional typical measuring deviation for the current output is ±10 µA.
Repeatability	±0.1% of MV, minimum 1 mm/s
Long term stability	±0.1% of MV
Special calibration	On request

Operating conditions

Temperature		
Process temperature	-40...100°C / -40...+212°F (up to 120°C / 248°F for up to 30 min.)	
	For Ex versions different temperature ranges are applicable. Please see the relevant Ex documentation for details.	
Maximum temperature change (shock)	Rising: 125°C / 257°F (in 10 min.); 120°C / 248°F (sudden change)	
	Falling: 100°C / 212°F (in 10 min.); 80°C / 176°F (sudden change)	
Ambient temperature	Non-Ex: -40...+65°C / -40...+149°F	
	Ex: -40...+60°C / -40...+140°F	
Storage temperature	-50...+70°C / -58...+158°F	
Pressure		
	OPTIFLUX 7300 C - SW	OPTIFLUX 7300 C - FL
Ambient pressure	Atmospheric	Atmospheric
Nominal flange pressure		
EN 1092-1	Standard:	Standard:
	DN100: PN 16	DN100: PN 16
	DN25...80: PN 40	DN25...80: PN 40
	Option:	Option:
	DN100: PN 25	-
ASME B16.5	Standard:	Standard:
	1...4": 150 lb	1...4": 150 lb
	Option:	Option:
	1...3": 300 lb	1...3": 300 lb
	4": 300 lb Max. pressure is 30 bar / 435 psig	
Vacuum load	0 mbar / 0 psig	0 mbar / 0 psig
Chemical properties		
Physical condition	Liquids	
Electrical conductivity	0.05 µS/cm	
	Demineralised cold water: ≥ 1 µS/cm	
Permissible gas content (volume)	≤ 5%	
Permissible solid content	≤ 70%	

Installation conditions

Installation	Take care that the 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	≥ 5 DN (without disturbing flow, after a single 90° bend)
	≥ 10 DN (after a double bend 2x90°)
	≥ 10 DN (behind a control valve)
Outlet run	≥ 2 DN
Dimensions and weights	For detailed information see chapter "Dimensions and weights".

Materials

	OPTIFLUX 7300 C - SW	OPTIFLUX 7300 C - FL
Sensor housing	Stainless steel AISI 304 (1.4306)	Stainless steel AISI 316 (1.4408)
Measuring tube	Ceramic	Ceramic
Flange	-	Stainless steel AISI 316 (1.4408)
Measuring electrodes	Non wetted, capacitive	Non wetted, capacitive
Grounding rings	Stainless steel, Hastelloy [®] C, Titanium, Tantalum	-
	Other materials on request.	-
Stud bolts and nuts	Standard: steel	-
	Option: stainless steel, rubber, centering sleeves	-
Gaskets	Gylon [®] , PTFE-PF 29, Chemotherm [®]	PTFE sealing rings
	Other materials on request.	-
Signal converter housing	Standard: die-cast aluminium (polyurethane-coated)	
	Option: stainless steel 316 L (1.4408)	

Process connections

	OPTIFLUX 7300 C - SW	OPTIFLUX 7300 C - FL
EN 1092-1	Standard	
	DN100 in PN 16	DN100 in PN 16
	DN25...80 in PN 40	DN25...80 in PN 40
	Option	
	Option: DN100 in PN 25	-
ASME	Standard	
	1...4" in 150 lb	1...4" in 150 lb
	Option	
	1...3" in 300 lb	1...3" in 300 lb
	4" in 300 lb Max. pressure is 30 bar / 435 psig	

Electrical connection

General	Electrical connection is carried out in conformity with the VDE 0100 directive "Regulations for electrical power installations with line voltages up to 1000 V" or equivalent national regulations.
Voltage	Standard
	100...230 VAC (-15% / +10%), 50/60 Hz
	Options
	24 VDC (-55% / +30%) 24 VAC/DC (AC: -15% / +10%, 50/60 Hz; DC: -25% / +30%)
Power consumption	AC: 22 VA
	DC: 12 W
Cable entries	Standard: M20 x 1.5 (8...12 mm)
	Option: ½" NPT, PF ½

Inputs and outputs

General	All outputs are electrically isolated from each other and from all other circuits.		
	All operating data and output values can be adjusted.		
Description of the used abbreviations	U_{ext} = external voltage R_L = load + resistance U_0 = terminal voltage I_{nom} = nominal current Safety limit values (Ex i): U_i = max. input voltage I_i = max. input current P_i = max. input power rating C_i = max. input capacity L_i = max. input inductivity		
Current output			
Output data	Volume flow, mass flow, diagnostics value, flow velocity, coil temperature.		
Settings	Without HART®		
	Q = 0%: 0...20 mA		
	Q = 100%: 10...21.5 mA		
	Error identifications: 10...21.5 mA		
	With HART®		
	Q = 0%: 4...20 mA		
	Q = 100%: 10...21.5 mA		
	Error identifications: 3.5...22 mA		
Operating Data	Basic I/Os	Modular I/Os	Ex i
Active	$U_{int, nom} = 24 \text{ VDC}$ $I \leq 22 \text{ mA}$ $R_L \leq 1 \text{ k}\Omega$		$U_{int, nom} = 20 \text{ VDC}$ $I \leq 22 \text{ mA}$ $R_L \leq 450 \Omega$
			$U_0 = 21 \text{ V}$ $I_0 = 90 \text{ mA}$ $P_0 = 0.5 \text{ W}$ $C_0 = 90 \text{ nF} /$ $L_0 = 2 \text{ mH}$ $C_0 = 110 \text{ nF} /$ $L_0 = 0.5 \text{ mH}$
Passive	$U_{ext} \leq 32 \text{ VDC}$ $I \leq 22 \text{ mA}$ $U_0 \geq 1.8 \text{ V}$ $R_L \leq (U_{ext} - U_0) / I_{max}$		$U_{ext} \leq 32 \text{ VDC}$ $I \leq 22 \text{ mA}$ $U_0 \geq 4 \text{ V}$ $R_L \leq (U_{ext} - U_0) / I_{max}$
			$U_i = 30 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 1 \text{ W}$ $C_i = 10 \text{ nF}$ $L_i \sim 0 \text{ mH}$

HART®			
Description	HART® protocol via active and passive current output.		
	HART® version: V5		
	Universal HART® parameter: completely integrated		
Load	≥ 250 Ω at HART® test point.		
	Note maximum load for current output!		
Multidrop operation	Yes, current output = 4mA		
	Multidrop address adjustable in operation menu 1...15		
Device driver	Available for FC 375, AMS, PDM, FDT/DTM		
Registration (HART® Communication Foundation)	Yes		
Pulse or frequency output			
Output data	Pulse output: volume flow, mass flow		
	Frequency output: volume flow, mass flow, diagnostic value, flow velocity, coil temperature		
Function	Adjustable as pulse or frequency output.		
Pulse rate/frequency	0.01...10000 pulses/s or Hz		
Settings	Pulses per volume or mass unit or max. frequency for 100% flow.		
	Pulse width: adjustable as automatic, symmetric or fixed (0.05...2000 ms)		
Operating data	Basic I/Os	Modular I/Os	Ex i
Active		$U_{nom} = 24 \text{ VDC}$ f_{max} in operating menu set to $f_{max} \leq 100 \text{ Hz}$: $I \leq 20 \text{ mA}$ open: $I \leq 0.05 \text{ mA}$ closed: $U_{0, nom} = 24 \text{ V}$ at $I = 20 \text{ mA}$	
		f_{max} in operating menu set to 100 Hz $< f_{max} \leq 10 \text{ kHz}$: $I \leq 20 \text{ mA}$ open: $I \leq 0.05 \text{ mA}$ closed: $U_{0, nom} = 22.5 \text{ V}$ at $I = 1 \text{ mA}$ $U_{0, nom} = 21.5 \text{ V}$ at $I = 10 \text{ mA}$ $U_{0, nom} = 19 \text{ V}$ at $I = 20 \text{ mA}$	

Passive	$U_{\text{ext}} \leq 32 \text{ VDC}$		
	f_{max} in operating menu set to $f_{\text{max}} \leq 100 \text{ Hz}$: $I \leq 100 \text{ mA}$ $R_{L, \text{max}} = 47 \text{ k}\Omega$ $R_{L, \text{min}} = (U_{\text{ext}} - U_0) / I_{\text{max}}$ open: $I \leq 0.05 \text{ mA}$ at $U_{\text{ext}} = 32 \text{ VDC}$ closed: $U_{0, \text{max}} = 0.2 \text{ V}$ at $I \leq 10 \text{ mA}$ $U_{0, \text{max}} = 2 \text{ V}$ at $I \leq 100 \text{ mA}$		
Passive	f_{max} in operating menu set to $100 \text{ Hz} < f_{\text{max}} \leq 10 \text{ kHz}$: $I \leq 20 \text{ mA}$ $R_{L, \text{max}} = 47 \text{ k}\Omega$ $R_{L, \text{min}} = (U_{\text{ext}} - U_0) / I_{\text{max}}$ open: $I \leq 0.05 \text{ mA}$ at $U_{\text{ext}} = 32 \text{ VDC}$ closed: $U_{0, \text{max}} = 1.5 \text{ V}$ at $I \leq 1 \text{ mA}$ $U_{0, \text{max}} = 2.5 \text{ V}$ at $I \leq 10 \text{ mA}$ $U_{0, \text{max}} = 5.0 \text{ V}$ at $I \leq 20 \text{ mA}$		
	NAMUR	-	Passive to EN 60947-5-6 open: $I_{\text{nom}} = 0.6 \text{ mA}$ closed: $I_{\text{nom}} = 3.8 \text{ mA}$
			Passive to EN 60947-5-6 open: $I_{\text{nom}} = 0.43 \text{ mA}$ closed: $I_{\text{nom}} = 4.5 \text{ mA}$ $U_i = 30 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 1 \text{ W}$ $C_i = 10 \text{ nF}$ $L_i \sim 0 \text{ mH}$

Low flow cut-off			
Function	Switching point and hysteresis separately adjustable for each output, counter and the display.		
Switching point	Set in increments of 0.1.		
	0....20% (current output, frequency output) or 0...±9.999 m/s (pulse output)		
Hysteresis	Set in increments of 0.1.		
	0...5% (current output, frequency output) or 0...5 m/s (pulse output)		
Time constant			
Function	The time constant corresponds to the elapsed time until 67% of the end value has been reached according to a step function.		
Settings	Set in increments of 0.1.		
	0...100 s		
Status output / limit switch			
Functions and settings	Adjustable as automatic measuring range conversion, display of flow direction, counter overflow, error, switching point or empty pipe detection.		
	Valve control with activated dosing function.		
	Status and/or control: ON or OFF		
Operating data	Basic I/Os	Modular I/Os	Ex i
Active	-	$U_{int} = 24 \text{ VDC}$ $I \leq 20 \text{ mA}$ open: $I \leq 0.05 \text{ mA}$ closed: $U_{0, nom} = 24 \text{ V}$ at $I = 20 \text{ mA}$	-
Passive	$U_{ext} \leq 32 \text{ VDC}$ $I \leq 100 \text{ mA}$ $R_{L, max} = 47 \text{ k}\Omega$ $R_{L, min} = (U_{ext} - U_0) / I_{max}$ open: $I \leq 0.05 \text{ mA}$ at $U_{ext} = 32 \text{ VDC}$ closed: $U_{0, max} = 0.2 \text{ V}$ at $I \leq 10 \text{ mA}$ $U_{0, max} = 2 \text{ V}$ at $I \leq 100 \text{ mA}$		-
NAMUR	-	Passive to EN 60947-5-6 open: $I_{nom} = 0.6 \text{ mA}$ closed: $I_{nom} = 3.8 \text{ mA}$	Passive to EN 60947-5-6 open: $I_{nom} = 0.43 \text{ mA}$ closed: $I_{nom} = 4.5 \text{ mA}$ $U_i = 30 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 1 \text{ W}$ $C_i = 10 \text{ nF}$ $L_i = 0 \text{ mH}$

Control input			
Function	Hold output values (e.g. when cleaning), set value of outputs to "zero", counter and error reset, range conversion.		
	Start of dosing when dosing function is activated.		
Operating data	Basic I/Os	Modular I/Os	Ex i
Active	-	$U_{int} = 24 \text{ VDC}$ Ext. contact open: $U_{0, nom} = 22 \text{ V}$ Ext. contact closed: $I_{nom} = 4 \text{ mA}$ Contact closed (on): $U_0 \geq 12 \text{ V}$ with $I_{nom} = 1.9 \text{ mA}$ Contact open (off): $U_0 \leq 10 \text{ V}$ with $I_{nom} = 1.9 \text{ mA}$	-
Passive	$8 \text{ V} \leq U_{ext} \leq 32 \text{ VDC}$ $I_{max} = 6.5 \text{ mA}$ at $U_{ext} \leq 24 \text{ VDC}$ $I_{max} = 8.2 \text{ mA}$ at $U_{ext} \leq 32 \text{ VDC}$ Contact closed (on): $U_0 \geq 8 \text{ V}$ with $I_{nom} = 2.8 \text{ mA}$ Contact open (off): $U_0 \leq 2.5 \text{ V}$ with $I_{nom} = 0.4 \text{ mA}$	$3 \text{ V} \leq U_{ext} \leq 32 \text{ VDC}$ $I_{max} = 9.5 \text{ mA}$ at $U_{ext} \leq 24 \text{ V}$ $I_{max} = 9.5 \text{ mA}$ at $U_{ext} \leq 32 \text{ V}$ Contact closed (on): $U_0 \geq 3 \text{ V}$ with $I_{nom} = 1.9 \text{ mA}$ Contact open (off): $U_0 \leq 2.5 \text{ V}$ with $I_{nom} = 1.9 \text{ mA}$	$U_{ext} \leq 32 \text{ VDC}$ $I \leq 6 \text{ mA}$ at $U_{ext} = 24 \text{ V}$ $I \leq 6.6 \text{ mA}$ at $U_{ext} = 32 \text{ V}$ On: $U_0 \geq 5.5 \text{ V}$ or $I \geq 4 \text{ mA}$ Off: $U_0 \leq 3.5 \text{ V}$ or $I \leq 0.5 \text{ mA}$
			$U_i = 30 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 1 \text{ W}$ $C_i = 10 \text{ nF}$ $L_i = 0 \text{ mH}$
NAMUR	-	Active to EN 60947-5-6 Terminals open: $U_{0, nom} = 8.7 \text{ V}$ Contact closed (on): $U_{0, nom} = 6.3 \text{ V}$ with $I_{nom} > 1.9 \text{ mA}$ Contact open (off): $U_{0, nom} = 6.3 \text{ V}$ with $I_{nom} < 1.9 \text{ mA}$ Detection of cable break: $U_0 \geq 8.1 \text{ V}$ with $I \leq 0.1 \text{ mA}$ Detection of cable short circuit: $U_0 \leq 1.2 \text{ V}$ with $I \geq 6.7 \text{ mA}$	-

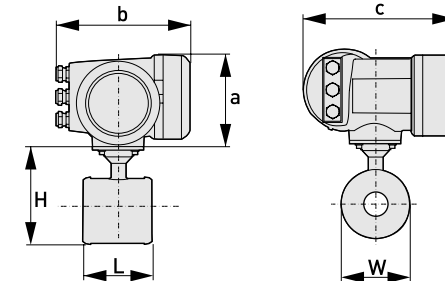
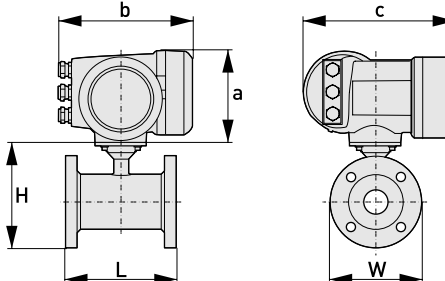
Current input			
Function	The following values can be delivered from the measuring sensor to the current input: temperature, pressure and current.		
Operating data	Basic I/Os	Modular I/Os	Ex i
Active	-	$U_{int, nom} = 24 \text{ VDC}$ $I \leq 22 \text{ mA}$ $I_{max} \leq 26 \text{ mA}$ (electronically limited) $U_{0, min} = 19 \text{ V}$ at $I \leq 22 \text{ mA}$ No HART®	$U_{int, nom} = 20 \text{ VDC}$ $I \leq 22 \text{ mA}$ $U_{0, min} = 14 \text{ V}$ at $I \leq 22 \text{ mA}$ No HART®
			$U_0 = 24.5 \text{ V}$ $I_0 = 99 \text{ mA}$ $P_0 = 0.6 \text{ W}$ $C_0 = 75 \text{ nF} / L_0 = 0.5 \text{ mH}$ No HART®
Passive	-	$U_{ext} \leq 32 \text{ VDC}$ $I \leq 22 \text{ mA}$ $I_{max} \leq 26 \text{ mA}$ (electronically limited) $U_{0, max} = 5 \text{ V}$ at $I \leq 22 \text{ mA}$ No HART®	$U_{ext} \leq 32 \text{ VDC}$ $I \leq 22 \text{ mA}$ $U_{0, max} = 4 \text{ V}$ at $I \leq 22 \text{ mA}$ No HART®
			$U_i = 30 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 1 \text{ W}$ $C_i = 10 \text{ nF}$ $L_i = 0 \text{ mH}$ No HART®
PROFIBUS DP			
Description	Galvanically isolated acc. to IEC 61158		
	Profile version: 3.01		
	Automatic data transmission rate recognition (max. 12 MBaud)		
	Bus address adjustable via local display at the measuring device.		
Function blocks	5 x analogue input, 3 x totalizer		
Output data	Volume flow, mass flow, volume counter 1 + 2, mass counter, velocity, coil temperature		
PROFIBUS PA			
Description	Galvanically isolated acc. to IEC 61158		
	Profiel version: 3.01		
	Current consumption: 10.5 mA		
	Permissible bus voltage: 9...32 V; in Ex application: 9...24 V		
	Bus interface with integrated reverse polarity protection.		
	Typical error current FDE (Fault Disconnection Electronic): 4.3 mA		
	Bus address adjustable via local display at the measuring device.		
Function blocks	5 x analogue input, 3 x totalizer		
Output data	Volume flow, mass flow, volume counter 1 + 2, mass counter, velocity, coil temperature		

FOUNDATION Fieldbus	
Description	Galvanically isolated acc. to IEC 61158
	Current consumption: 10.5 mA
	Permissible bus voltage: 9...32 V; in Ex application: 9...24 V
	Bus interface with integrated reverse polarity protection.
	Link Master function (LM) supported
	Tested with Interoperable Test Kit (ITK) version 5.1
Function blocks	3 x analogue input, 2x integrator
Output data	Volume flow, mass flow, volume counter 1 + 2, mass counter, velocity, coil temperature
Modbus	
Description	Modbus RTU, Master / Slave, RS485
Address range	1...247
Supported function codes	03, 04, 16
Broadcast	Supported with function code 16
Supported Baudrate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud

Approvals and certifications

CE	
	The 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 and A1, A2 NAMUR NE21/04
	Harmonized standard: EN 61326-1 : 2006
Low Voltage Directive	Directive: 2006/95/EC
	Harmonized standard: EN 61010 : 2002
Pressure Equipment Directive	Directive: 97/23/EC
	Category, I, II or SEP
	Fluid group 1
	Production module H
Other approvals and standards	
Non-Ex	Standard
Hazardous areas	
	Please check the relevant Ex documentation for details.
ATEX	KEMA 10 ATEX 0105 X
	For gas: zone 1 and 2, gasgroup IIC, temperature class T6...T4
	For dust: zone 21 and 22, maximum surface temperature T115°C
Protection category acc. to IEC 529 / EN 60529	IP 66/67 (NEMA 4/4X/6)
Hygiene	Ceramic measuring tube is conform FDA regulations.
Vibration resistance	IEC 68-2-6

6.3 Dimensions and weights

<p>Sandwich version</p>		<p>a = 155 mm / 6.1" b = 230 mm / 9.1" ① c = 260 mm / 10.2" Total height = H + a</p>
<p>Flanged version</p>		<p>a = 155 mm / 6.1" b = 230 mm / 9.1" ① c = 260 mm / 10.2" Total height = H + a</p>

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



INFORMATION!

- 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.

Sandwich version

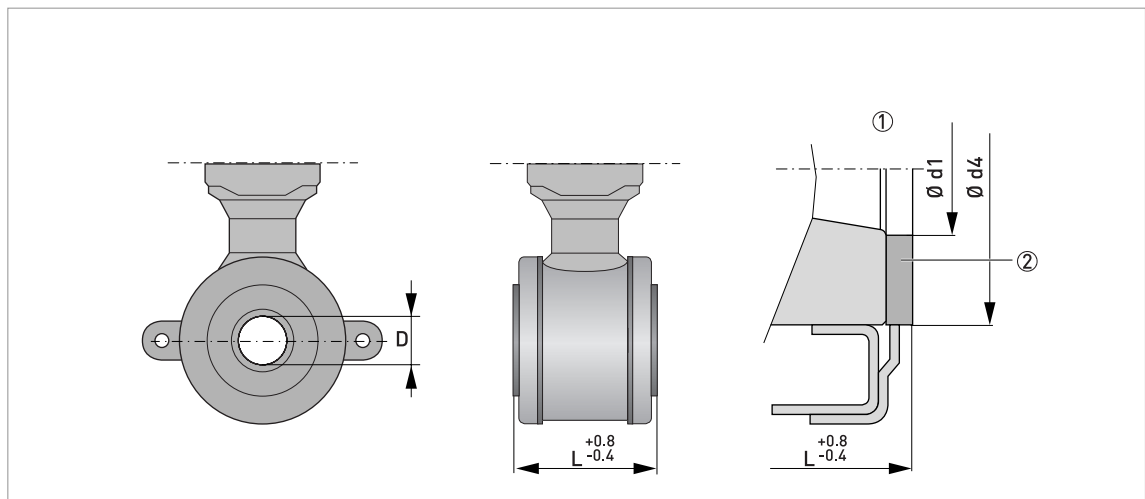


Figure 6-1: Construction details DN25...100

- ① Situation without grounding rings
 ② Gasket

Nominal size	Dimensions [mm]						Approx. weight [kg]
	DN	L	H	W	D	Ød1	
25	58 ①	116	68	20	26	46	1.6
40	83 ①	131	83	30	39	62	2.4
50	103 ①	149	101	40	51	74	2.9
80	153 ①	181	133	60	80	106	6.4
100	203 ①	206	158	80	101	133	8.8

① Total fitting length of flowmeter without rings: dimension L only.

**INFORMATION!**

The table below is valid for 150 and 300 lb.

Nominal size	Dimensions [inches]						Approx. weight [lb]
	ASME	L	H	W	D	Ød1	
1"	2.28 ①	4.57	2.68	0.79	1.02	1.81	3.53
1½"	3.27 ①	5.16	3.27	1.18	1.54	2.44	5.29
2"	4.06 ①	5.87	3.98	1.57	2.01	2.91	6.39
3"	6.02 ①	7.13	5.24	2.36	3.15	4.17	14.11
4"	7.99 ①	8.11	6.22	3.15	3.98	5.24	19.40

① Total fitting length of flowmeter without rings: dimension L only.

Flanged version

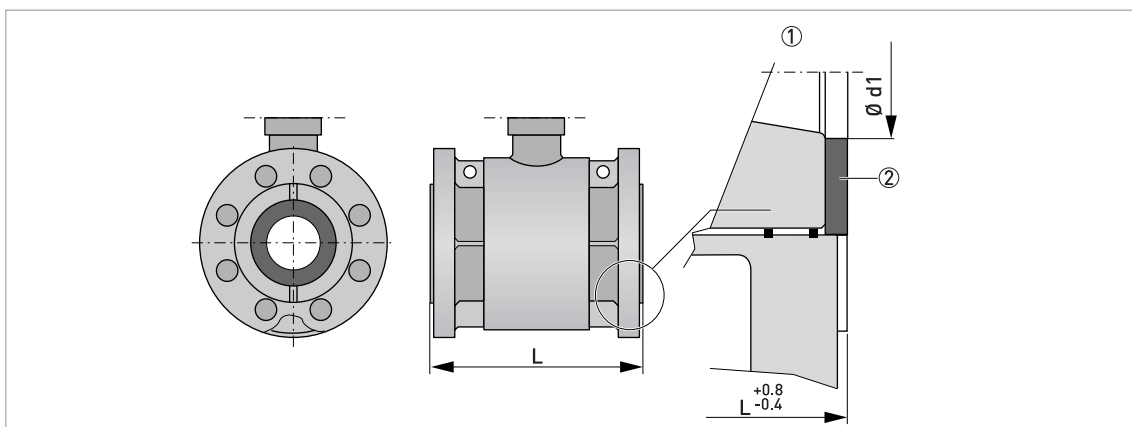


Figure 6-2: Construction details DN25...100

- ① Detail ceramics / flange / gaskets
- ② PTFE sealing ring

EN 1092-1

Nominal size	Dimensions [mm]					Approx. weight [kg]
	DN	L	H	W	D	
25	150	143	115	20	26	4
40	150	168	150	30	39	6
50	200	184	165	40	51	9
80	200	217	200	60	80	15
100	250	242	220	80	101	21

ASME B 16.5 150 lb

Nominal size	Dimensions [inches]					Approx. weight [lb]
inch	L	H	W	D	Ød1	
1"	5.91	5.47	4.25	0.79	1.02	8.8
1½"	5.91	6.18	5	1.18	1.54	13.2
2"	7.87	6.89	6	1.57	2.01	19.8
3"	7.87	8.39	7.5	2.36	3.15	33.1
4"	9.84	9.65	9	3.15	3.98	46.3

ASME B 16.5 300 lb

Nominal size	Dimensions [inches]					Approx. weight [lb]
inch	L	H	W	D	Ød1	
1"	5.91	5.91	4.92	0.79	1.02	8.8
2"	7.87	7.20	6.50	1.57	2.01	22.9
3"	7.87	8.86	8.27	2.36	3.15	40.6



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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