

OPTIFLUX 7300 Handbook

Electromagnetic flowmeter with non wetted electrodes and ceramic liner

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1.1 Intended use

CAUTION!
Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.

INFORMATION!
The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose.

The OPTIFLUX 7300 electromagnetic flowmeter is designed exclusively to measure the flow of electrically conductive, liquid media.
The sensor includes a ceramic liner for high abrasion resistance and capacitive signal pick up for a lower minimum conductivity of the fluid.

WARNING!
If the device is not used according to the operating conditions (refer to chapter Technical data), the intended protection could be affected.

1.2 Certification

Product marking

CE

Figure 1-1: Example of marking logo

The manufacturer certifies successful testing of the product by applying the conformity mark on the device.

This device fulfils the statutory requirements of the relevant directives.

For more information on the directives, standards and the approved certifications, please refer to the declaration of conformity supplied with the device or downloadable from the manufacturer's website.

1.3 Safety instructions from the manufacturer

1.3.1 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.

1.3.2 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.

1.3.3 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 or 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.

1.3.4 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 cannot 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 icons as shown below.

1.3.5 Warnings and symbols used

Safety warnings are indicated by the following symbols.



DANGER!
This warning 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.

1.4 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 packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

INFORMATION!
Do a check of the packing list to make sure that you have all the elements given in the order.

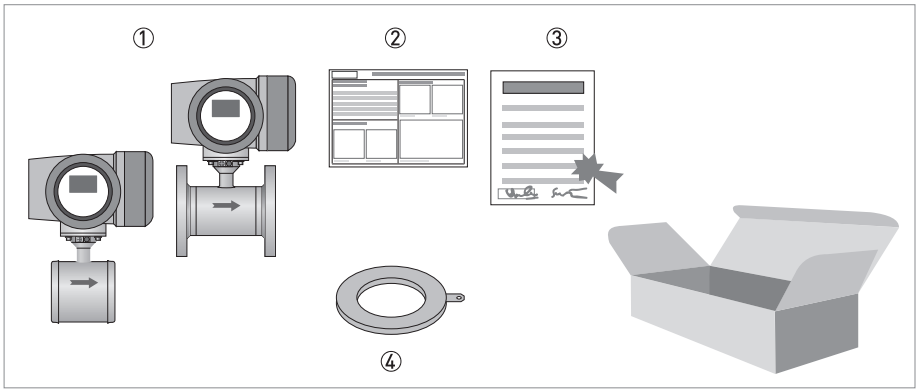


Figure 2-1: Scope of delivery

① Ordered flowmeter (sandwich or flanged version)
② Product documentation
③ Factory calibration report
④ Grounding rings (optionally)

INFORMATION!
Assembly materials and tools are not part of the delivery. Use the assembly materials and tools in compliance with the applicable occupational health and safety directives.

2.2 Device description

Your measuring device is supplied ready for operation. The factory settings for the operating data have been made in accordance with your order specifications.

The following version is available:

- Compact version (the signal converter is mounted directly on the measuring sensor)

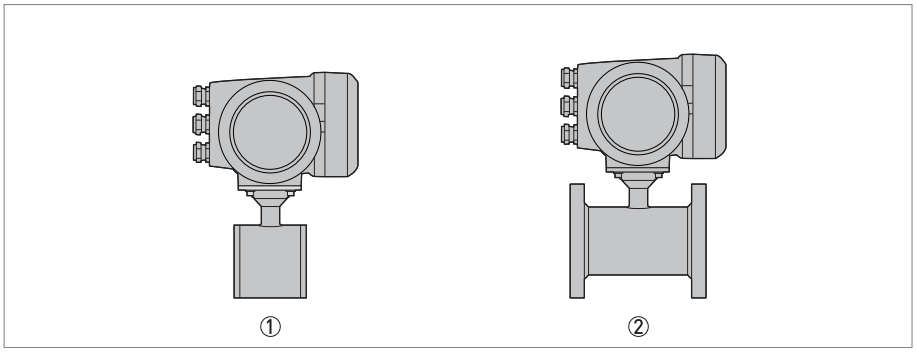


Figure 2-2: Available versions

① Sandwich version
② Flanged version

2.3 Nameplates (example)

INFORMATION!
Check the device nameplate to ensure that the device is delivered according to your order. Additional information (e.g. correct supply voltage), can be found in the documentation of the signal converter.

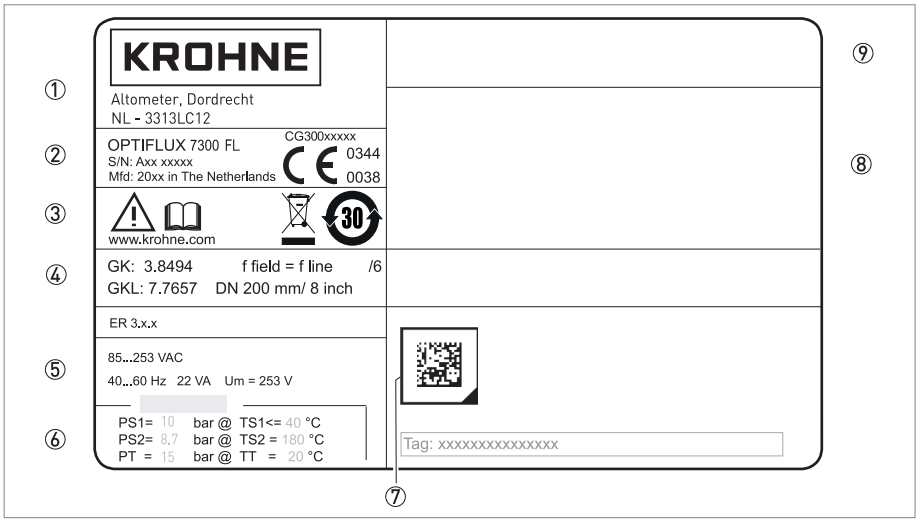


Figure 2-3: Nameplate (example)

① Name and address of the manufacturer
② Type designation of the flowmeter and CE sign with number(s) of notified body / bodies
③ Safety instructions, disposal and China RoHS marking
④ Calibration data, size and protection category
⑤ Mains supply data
⑥ PED data
⑦ Data Matrix
⑧ Approvals-related thresholds
⑨ Approvals-related information: Ex approval, EC type test certificate, hygienic approvals, etc.

Auto ID according to DIN specifications

The auto ID code (data matrix) guides you directly to the PICK server (Product Information Center KROHNE).
Scan the auto ID code on the device nameplate to download all product specific information.

- Handbooks, Quick Starts and Supplementary instructions
- Calibration certificates
- Factory settings as .bin file
- Parameter data sheets
- Digital nameplates

3.1 General notes on installation

INFORMATION!
Inspect the packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

INFORMATION!
Do a check of the packing list to make sure that you have all the elements given in the order.

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 packaging.
- Storage temperature: -50...+70°C / -58...+158°F

3.3 Transport

Compact version

- Do not lift the device by the signal converter housing.
- Do not use lifting chains.
- To transport the device, use lifting straps.

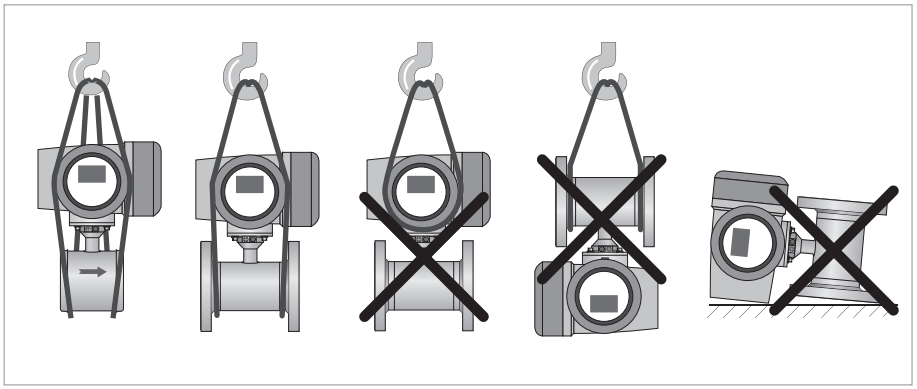


Figure 3-1: Transport

3.4 Pre-installation requirements

Make sure that you have all necessary tools available:

- Allen key (4 mm)
- Small screwdriver
- Wrench for cable glands
- Wrench for wall mounting bracket (remote version only)
- Torque wrench for installing flowmeter in pipeline

3.5 General requirements

INFORMATION!
The following precautions must be taken to ensure reliable installation.

- *Make sure that there is adequate space to the sides.*
- *Protect the signal converter from direct sunlight and install a sun shade if necessary.*
- *Signal converters installed in control cabinets require adequate cooling, e.g. by fan or heat exchanger.*
- *Do not expose the signal converter to intense vibrations and mechanical shocks. The measuring devices are tested for a vibration/shock level as described in the chapter "Technical data".*
- *Avoid magnetic field! Keep at least 5 DN distance between electromagnetic flow sensors.*

3.5.1 Vibrations

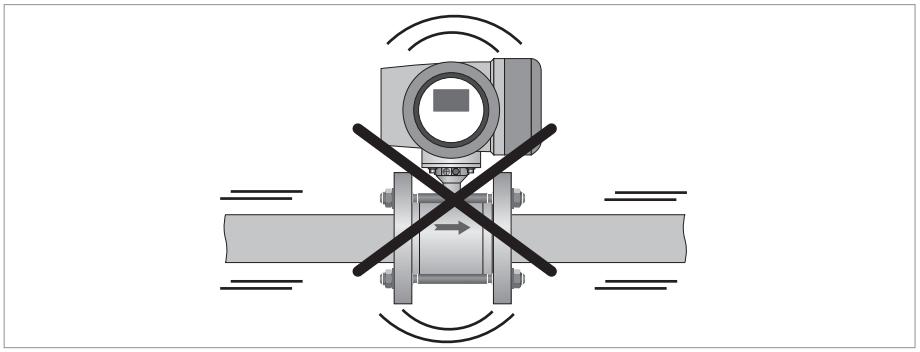


Figure 3-2: Avoid vibrations

3.5.2 Magnetic field

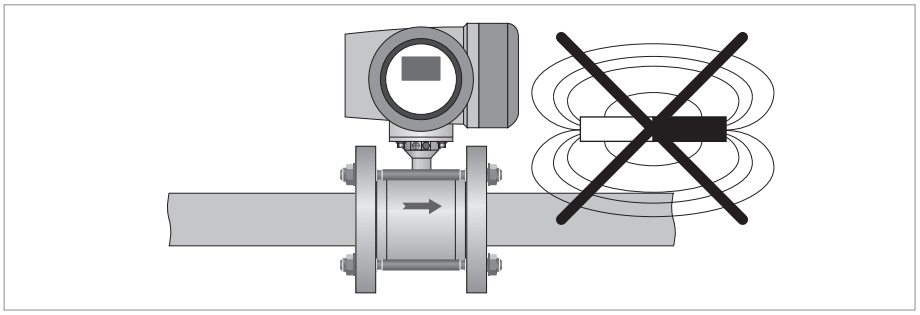


Figure 3-3: Avoid magnetic fields

3.6 Installation conditions

For the highest measuring accuracy, respect the recommended inlet and outlet lengths in the following paragraphs. The flow sensor in combination with the IFC 300 signal converter, can be installed in a 0D/0D configuration (no inlet and no outlet length).

3.6.1 Inlet and outlet

Use straight inlet and outlet pipe sections to prevent flow distortion or swirl, caused by bends and T-sections.

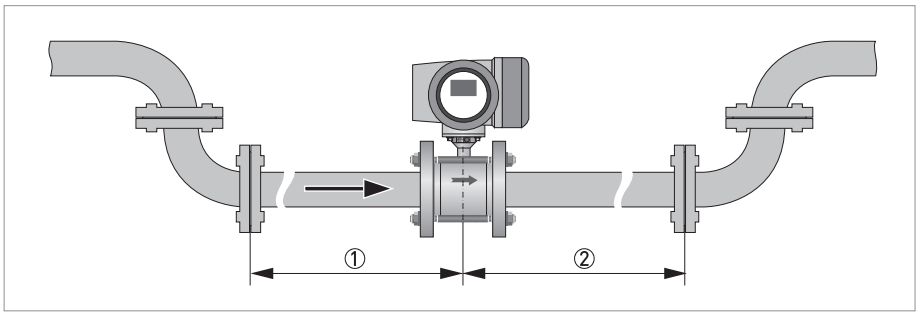


Figure 3-4: Recommended inlet and outlet sections

① Refer to chapter "Bends in 2 or 3 dimensions"
② ≥ 2 DN

3.6.2 Bends in 2 or 3 dimensions

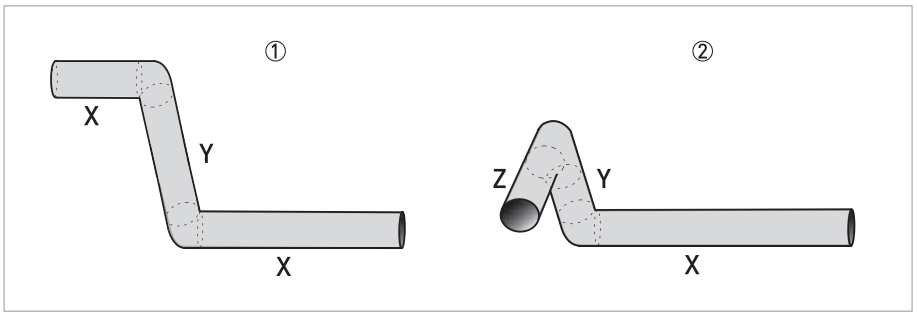


Figure 3-5: 2 and/or 3 dimensional bends upstream of the flowmeter

① 2 dimensions = X/Y
② 3 dimensions = X/Y/Z
Inlet length: using bends in 2 dimensions: ≥ 5 DN; when having bends in 3 dimensions: ≥ 10 DN

INFORMATION!
*2 dimensional bends occur in a vertical **or** horizontal plane (X/Y) only, while 3 dimensional bends occur in both vertical **and** horizontal plane (X/Y/Z).*

3.6.3 Bends

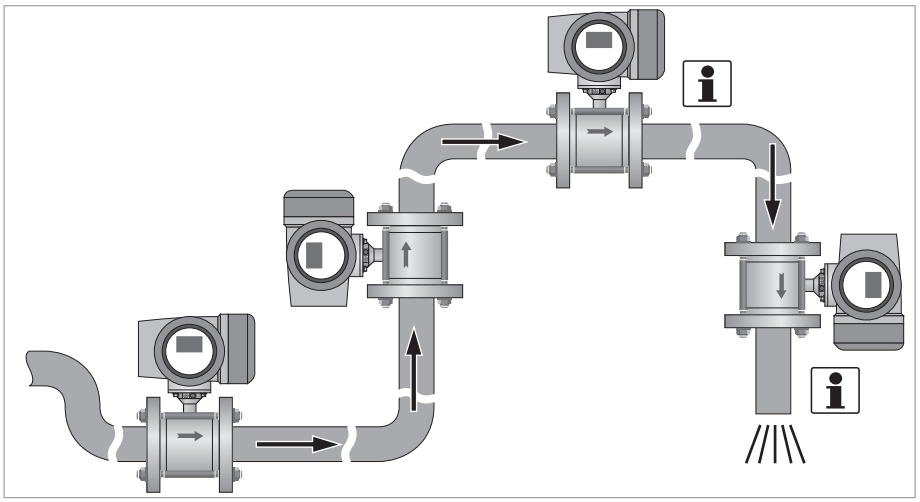


Figure 3-6: Installation in bending pipes (90°)

INFORMATION!
Recommended installation positions are at a lowered or ascending section of the pipeline installation. Installation at the highest point will enlarge the risk of flowmeter malfunction, because of air/gas bubbles.
Vertical installation in combination with an open discharge has to be avoided.
Vertical installation with a controlled back-pressure is possible.

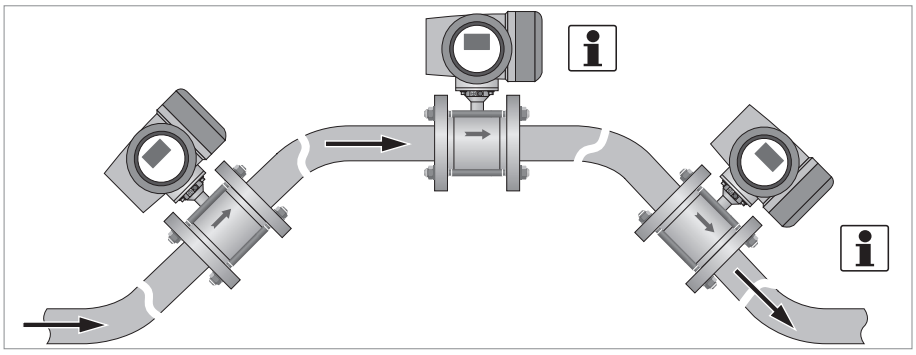


Figure 3-7: Installation in bending pipes (45°)

CAUTION!
Avoid draining or partial filling of the flow sensor.

INFORMATION!
Vertical installation on a descending slope in the pipeline is only recommended when the back-pressure is controlled.

3.6.4 T-section

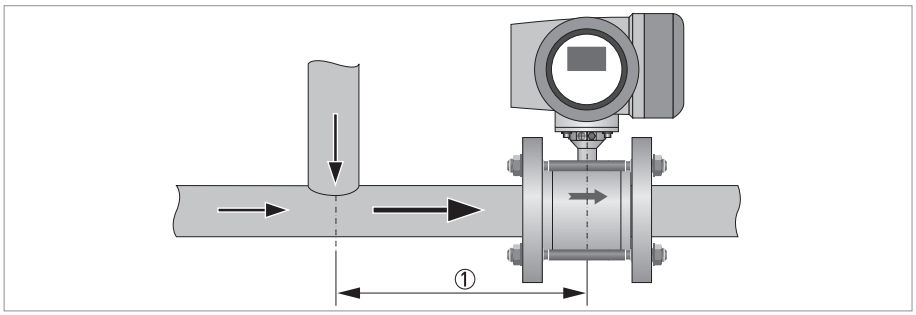


Figure 3-8: Distance after T-sections

① ≥ 10 DN

3.6.5 Open discharge

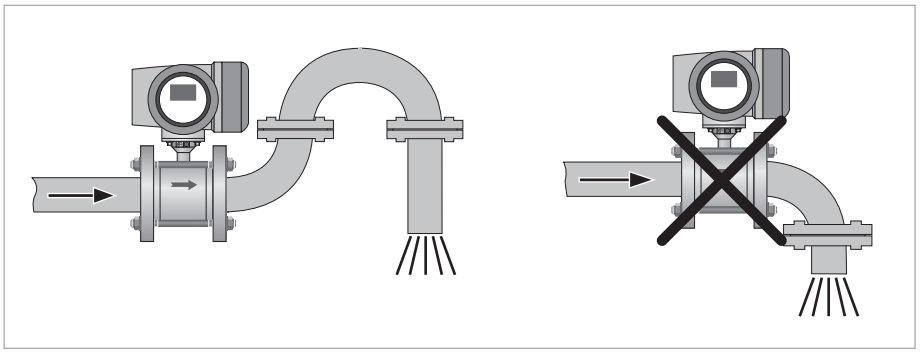


Figure 3-9: Installation before an open discharge

3.6.6 Pump

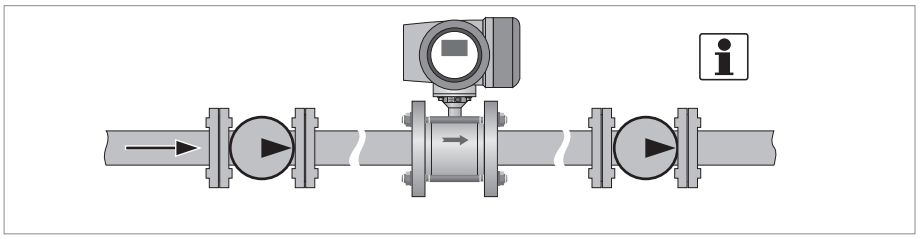


Figure 3-10: Installation after pump

INFORMATION!
Recommended position to install a flowmeter is downstream a pump (on a position where the flow disturbances of the pump are resolved).
An electromagnetic flowmeter can be installed in the suction line of a pump if there is no cavitation in the pipeline system.

3.6.7 Control valve

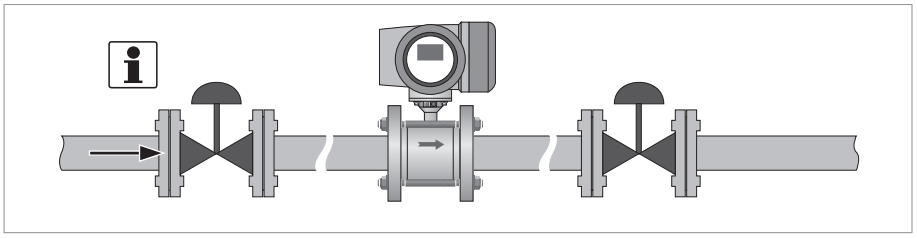


Figure 3-11: Installation before control valve

INFORMATION!
Recommended position to install a flowmeter is upstream a control valve.
An electromagnetic flowmeter can be installed downstream of the control valve if there is no cavitation in the pipeline system (e.g. flow profile disturbances are resolved).

3.6.8 Air venting

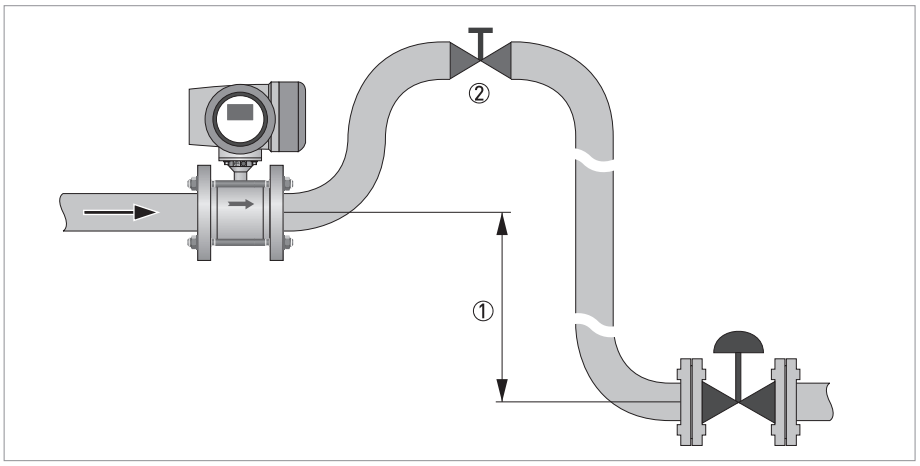


Figure 3-12: Air venting

① ≥ 5 m
② Air ventilation point

3.6.9 Temperatures

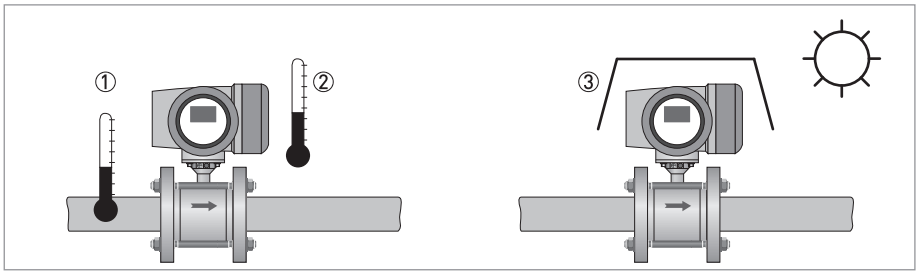


Figure 3-13: Temperatures

① Process temperature
② Ambient temperature
③ Sunshade

CAUTION!
Protect the device from direct sunlight.

3.6.10 Flange deviation

CAUTION!
Max. permissible deviation of pipe flange faces:
$L_{max} - L_{min} \leq 0.5$ *mm / 0.02"*

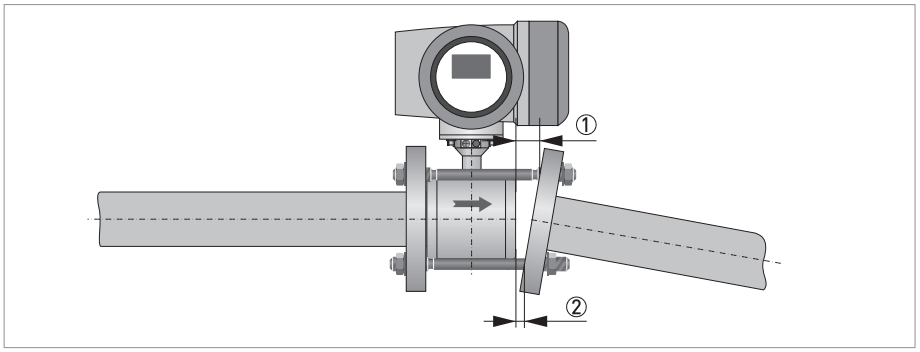


Figure 3-14: Flange deviation

① L_{max}
② L_{min}

3.6.11 Mounting position

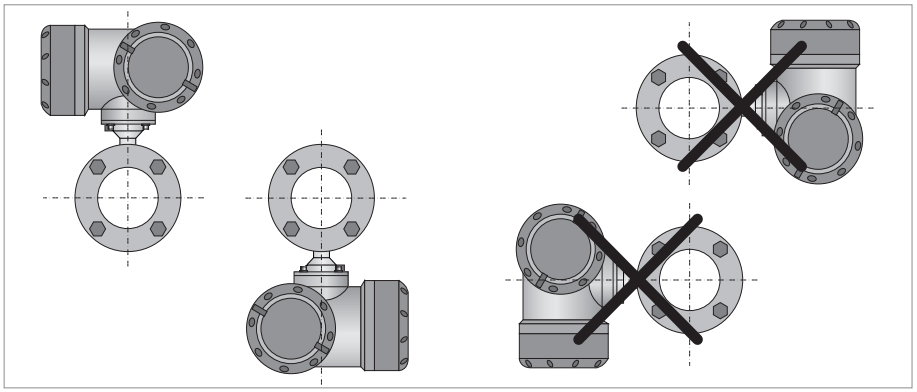


Figure 3-15: Mounting position

3.7 Mounting

CAUTION!
Please take care to use the proper gasket to prevent damaging the liner of the flowmeter.

3.7.1 Torques and pressures sandwich versions

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

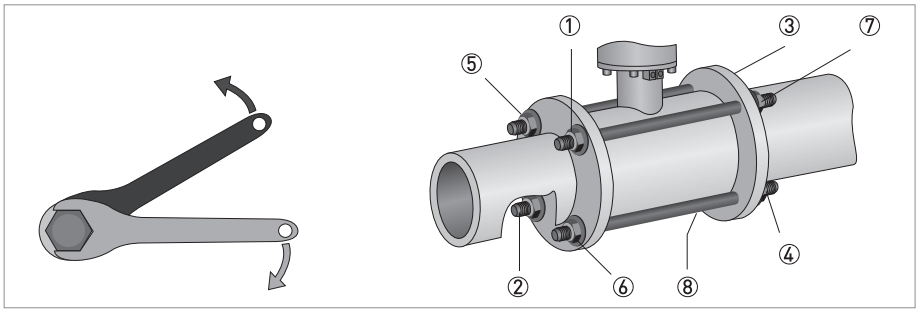


Figure 3-16: Tighten the bolts in fixed order, see picture.

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]	Counter flanges & bolts		Max. allowable torque			
			Gasket: Filled PTFE / PTFE / PF29		Gasket: Graphite	
	Rating	Size	Nm	ft-lb	Nm	ft-lb
25	PN 40	M12 x 141	22	16	32	24
40	PN 40	M16 x 176	47	35	66	49
50	PN 40	M16 x 203	58	43	82	60
80	PN 40	M16 x 261	48	35	69	51
100	PN 16	M16 x 303	75	55	106	78
100	PN 25	M20 x 176	94	69	133	98

ASME B 16.5 (150 lb)

Nominal size DN [inch]	Counter flanges & bolts		Max. allowable torque			
			Gasket: Filled PTFE / PTFE / PF29		Gasket: Graphite	
	Rating	Size	Nm	ftlb	Nm	ftlb
1"	150 lb	1/2"UNC x 142	24	18	33	24
1 1/2"	150 lb	1/2"UNC x 174	38	28	54	40
2"	150 lb	5/8"UNC x 215	58	43	83	61
3"	150 lb	5/8"UNC x 268	98	72	138	102
4"	150 lb	5/8"UNC x 318	75	55	108	80

ASME B 16.5 (300 lb)

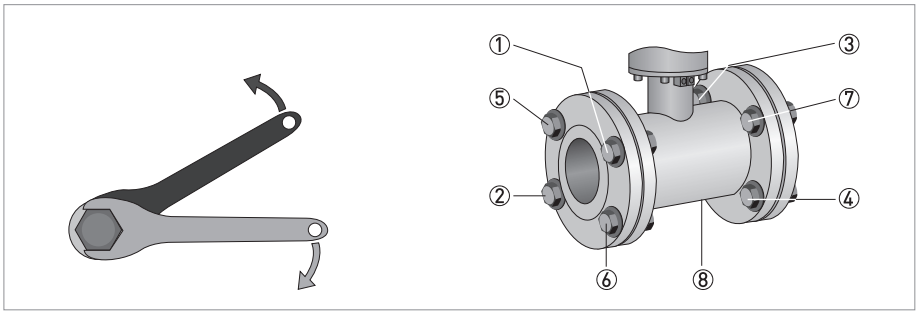
Nominal size DN [inch]	Counter flanges & bolts		Max. allowable torque			
			Gasket: Filled PTFE / PTFE / PF29		Gasket: Graphite	
	Rating	Size	Nm	ftlb	Nm	ftlb
1"	300 lb	1"	20	15	28	21
1 1/2"	300 lb	1 1/2"	43	32	61	45
2"	300 lb	2"	61	45	87	64
3"	300 lb	3"	58	43	83	61
4"	300 lb	4"	85	63	112	90

3.7.2 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]	Counter flanges		Recommended torque [Nm]	
	Rating	Bolts	Min.	Max.
25	PN 40	4 x M 12	50	70
40	PN 40	4 x M 16	100	175
50	PN 40	4 x M 16	100	175
80	PN 40	8 x M 16	100	175
100	PN 16	8 x M 16	100	175

ASME B 16.5 (150 lb)

Nominal size DN [inch]	Counter flanges		Recommended torque [ftlb]	
	Rating	Bolts	Min.	Max.
1"	150	4 x 1/2"	40	80
1 1/2"	150	4 x 1/2"	60	80
2"	150	4 x 5/8"	80	160
3"	150	4 x 5/8"	100	160
4"	150	8 x 5/8"	100	160

ASME B 16.5 (300 lb)

Nominal size DN [inch]	Counter flanges		Recommended torque [ftlb]	
	Rating	Bolts	Min.	Max.
1"	300	4 x 3/4"	40	180
1 1/2"	300	4 x 3/4"	60	180
2"	300	8 x 5/8"	80	96
3"	300	8 x 3/4"	100	180

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.

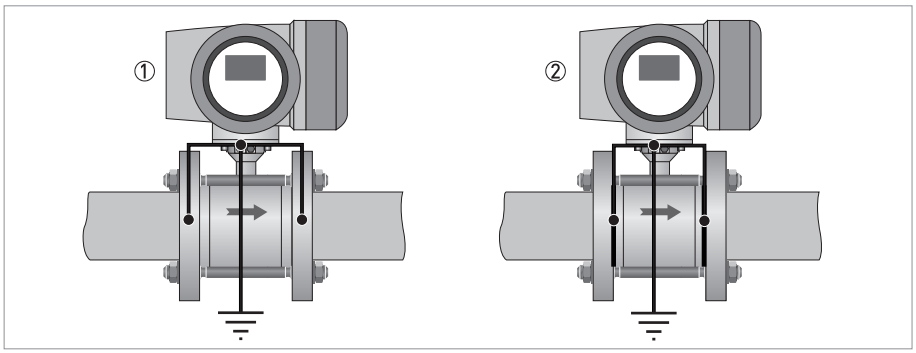


Figure 4-1: Grounding

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 / 0.12" thick (tantalum: 0.5 mm / 0.02")

4.3 Connection diagrams

INFORMATION!
For the connection diagrams, please refer to the documentation of the applicable signal 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 sales office.

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.



WARNING!
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 the personnel, the 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.*



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

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

5.3.2 Form (for copying) to accompany a returned device



CAUTION!
To avoid any risk for our service personnel, this form has to be accessible from outside of the packaging with the returned device.

Company:		Address:
Department:		Name:
Telephone number: Fax number:		Email address:
Manufacturer order number or serial number:		
The device has been operated with the following medium:		
This medium is:		radioactive
		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 caused by any residual media contained in this device when it is returned.		
Date:		Signature:
Stamp:		

5.4 Disposal



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

Separate collection of WEEE (Waste Electrical and Electronic Equipment):



According to the directive 2012/19/EU or UK Regulation 2013 No. 3113, the monitoring and control instruments marked with the WEEE symbol and reaching their end-of-life **must not be disposed of with other waste**.
The user must dispose of the WEEE to a designated collection point for the recycling of WEEE or send them back to our local organisation or authorised representative.

5.4.1 Disassembling and recycling



INFORMATION!
For information about disassembling and recycling, refer to the applicable documentation of the signal converter or consult product support.

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 flowmeter

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 totalizing, recording and output processing.

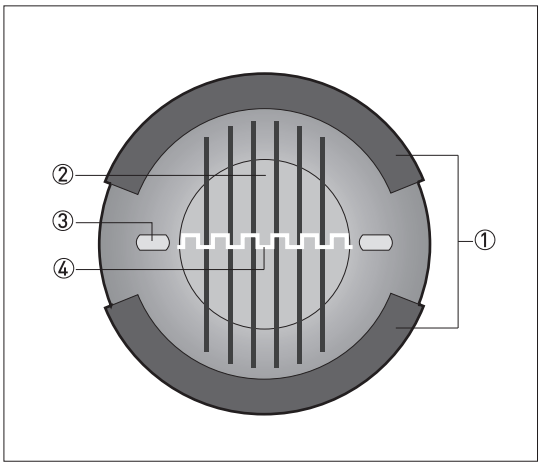


Figure 6-1: Measuring principle

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

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 sales office.*
- *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	This electromagnetic flowmeter is designed exclusively to measure the flow of electrically conductive, liquid media.
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", 1 1/2", 2", 3" and 4".
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
	Southern Europe: English, Turkish
	Northern Europe: English, Danish, Polish, Finnish, Norwegian
	China: English, German, Chinese
	Russia: English, German, 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
	Flow velocity: > 1 m/s / > 3 ft/s
	Valve closing time variation: < 1 ms
	Wet calibrated on EN 17025 accredited calibration rig by direct volume comparison.
Maximum measuring error	v ≤ 1 m/s: ± 5 mm/s
	v ≥ 1 m/s: ± 0.5% of measured value
	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	
Measurement range	-12...+12 m/s / -40...+40 ft/s	
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:	DN100: PN 25	-
ASME B16.5	**Standard:**	**Standard:**
	1...4": 150 lb	1...4": 150 lb
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	Electrically conductive liquids	
Electrical conductivity	Standard measurement	
	For detailed information refer to the relevant signal converter document.	
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; refer to *Installation* on page 12.
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 2 x 90°)
	≥ 10 DN (behind a control valve)
Outlet run	≥ 2 DN
Dimensions and weights	For detailed information; refer to *Dimensions and weights* on page 40.

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, PTFE white. Option: filled PTFE, blue (L-type).
	Other materials on request.	-
Signal converter housing	Standard: die-cast aluminium; standard coating	
	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	DN100 in PN 25	-
ASME	**Standard**	
	1...4" in 150 lb	1...4" in 150 lb
Option	1...3" in 300 lb	1"-2"-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: 1/2" NPT, PF 1/2

Inputs and outputs

General	All outputs are electrically isolated from each other and from all other circuits.		
	All operating data and output values van be adjusted.		
Description of the used abbreviations	V_{ext} = external voltage R_L = load + resistance V_o = terminal voltage I_{nom}= nominal current **Safety limit values (Ex i):** V_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	$V_{int, nom}$ = 24 VDC $I \leq 22$ mA $R_L \leq 1$ kΩ		$V_{int, nom}$ = 20 VDC $I \leq 22$ mA $R_L \leq 450$ Ω
			V_0 = 21 V I_0 = 90 mA P_0 = 0.5 W C_0 = 90 nF / L_0 = 2 mH C_0 = 110 nF / L_0 = 0.5 mH
Passive	$V_{ext} \leq 32$ VDC $I \leq 22$ mA $V_0 \geq 1.8$ V $R_L \leq (V_{ext} - V_0) / I_{max}$		$V_{ext} \leq 32$ VDC $I \leq 22$ mA $V_0 \geq 4$ V $R_L \leq (V_{ext} - V_0) / I_{max}$
			V_i = 30 V I_i = 100 mA P_i = 1 W C_i = 10 nF L_i ~ 0 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 = 4 mA		
	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 of fixed (0.05...2000 ms).		
Operating data	**Basic I/Os**	**Modular I/Os**	**Ex i**
Active		V_{nom} = 24 VDC	
		f_{max} in operating menu set to f_{max} ≤ 100 Hz: I ≤ 20 mA open: I ≤ 0.05 mA closed: $V_{0, nom}$ = 24 V at I = 20 mA	
		f_{max} in operating menu set to 100 Hz < f_{max} ≤ 10 kHz: I ≤ 20 mA open: I ≤ 0.05 mA closed: $V_{0, nom}$ = 22.5 V at I = 1 mA $V_{0, nom}$ = 21.5 V at I = 10 mA $V_{0, nom}$ = 19 V at I = 20 mA	

<table>
<tr><td rowspan="2">Passive</td><td colspan="2">V_{ext} ≤ 32 VDC</td><td rowspan="2"></td></tr>
<tr><td colspan="2">f_{max} in operating menu set to f_{max} ≤ 100 Hz:
I ≤ 100 mA

$R_{L, max}$ = 47 kΩ
$R_{L, min}$ = (V_{ext} - V_0) / I_{max}

open:
I ≤ 0.05 mA at V_{ext} = 32 VDC

closed:
$V_{0, max}$ = 0.2 V at I ≤ 10 mA
$V_{0, max}$ = 2 V at I ≤ 100 mA</td></tr>
<tr><td></td><td colspan="2">f_{max} in operating menu set to
100 Hz < f_{max} ≤ 10 kHz:
I ≤ 20 mA

$R_{L, max}$ = 47 kΩ
$R_{L, min}$ = (V_{ext} - V_0) / I_{max}

open:
I ≤ 0.05 mA at V_{ext} = 32 VDC

closed:
$V_{0, max}$ = 1.5 V at I ≤ 1 mA
$V_{0, max}$ = 2.5 V at I ≤ 10 mA
$V_{0, max}$ = 5.0 V at I ≤ 20 mA</td></tr>
<tr><td rowspan="2">NAMUR</td><td rowspan="2">-</td><td rowspan="2">Passive to
EN 60947-5-6

open:
I_{nom} = 0.6 mA

closed:
I_{nom} = 3.8 mA</td><td>Passive to
EN 60947-5-6

open:
I_{nom} = 0.43 mA

closed:
I_{nom} = 4.5 mA</td></tr>
<tr><td>V_i = 30 V
I_i = 100 mA
P_i = 1 W
C_i =10 nF
L_i ~ 0 mH</td></tr>
</table>

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	-	V_{int} = 24 VDC I ≤ 20 mA open: I ≤ 0.05 mA closed: $V_{0, nom}$ = 24 V at I = 20 mA	-
Passive	V_{ext} ≤ 32 VDC I ≤ 100 mA $R_{L, max}$ = 47 kΩ $R_{L, min} = (V_{ext} - V_0) / I_{max}$ open: I ≤ 0.05 mA at V_{ext} = 32 VDC closed: $V_{0, max}$ = 0.2 Vat I ≤ 10 mA $V_{0, max}$ = 2 Vat I ≤ 100 mA		-
NAMUR	-	Passive to EN 60947-5-6 open: I_{nom} = 0.6 mA closed: I_{nom} = 3.8 mA	Passive to EN 60947-5-6 open: I_{nom} = 0.43 mA closed: I_{nom} = 4.5 mA
			V_i = 30 V I_i = 100 mA P_i = 1 W C_i =10 nF L_i = 0 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	-	V_{int} = 24 VDC Ext. contact open: $V_{0, nom}$ = 22 V Ext. contact closed: I_{nom} = 4 mA Contact closed (on): $V_0 \geq$ 12 V with I_{nom} = 1.9 mA Contact open (off): $V_0 \leq$ 10 V with I_{nom} = 1.9 mA	-
Passive	8 V $\leq V_{ext} \leq$ 32 VDC I_{max} = 6.5 mA at $V_{ext} \leq$ 24 VDC I_{max} = 8.2 mA at $V_{ext} \leq$ 32 VDC Contact closed (on): $V_0 \geq$ 8 V with I_{nom} = 2.8 mA Contact open (off): $V_0 \leq$ 2.5 V with I_{nom} = 0.4 mA	3 V $\leq V_{ext} \leq$ 32 VDC I_{max} = 9.5 mA at $V_{ext} \leq$ 24 V I_{max} = 9.5 mA at $V_{ext} \leq$ 32 V Contact closed (on): $V_0 \geq$ 3 V with I_{nom} = 1.9 mA Contact open (off): $V_0 \leq$ 2.5 V with I_{nom} = 1.9 mA	$V_{ext} \leq$ 32 VDC $I \leq$ 6 mA at V_{ext} = 24 V $I \leq$ 6.6 mA at V_{ext} = 32 V On: $V_0 \geq$ 5.5 V or $I \geq$ 4 mA Off: $V_0 \leq$ 3.5 V or $I \leq$ 0.5 mA V_i = 30 V I_i = 100 mA P_i = 1 W C_i = 10 nF L_i = 0 mH
NAMUR	-	Active to EN 60947-5-6 Terminals open: $V_{0, nom}$ = 8.7 V Contact closed (on): $V_{0, nom}$ = 6.3 V with I_{nom} > 1.9 mA Contact open (off): $V_{0, nom}$ = 6.3 V with I_{nom} < 1.9 mA Detection of cable break: $V_0 \geq$ 8.1 V with $I \leq$ 0.1 mA Detection of cable short circuit: $V_0 \leq$ 1.2 V with $I \geq$ 6.7 mA	-

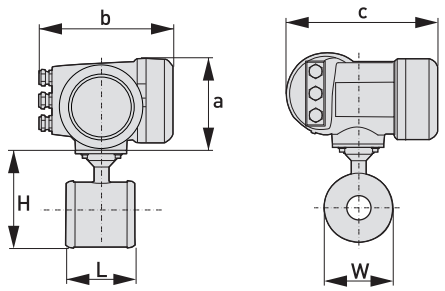
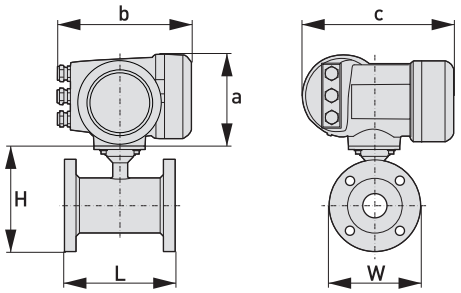
Current input			
Function	The following values can be delivered from the measuring sensor to the current input: temperature, pressure and current.		
Operating data	**Basic I/Os**	**Modular I/Os**	**Ex i**
Active	-	$V_{int, nom}$ = 24 VDC I ≤ 22 mA I_{max} ≤ 26 mA (electronically limited) $V_{0, min}$ = 19 V at I ≤ 22 mA No HART®	$V_{int, nom}$ = 20 VDC I ≤ 22 mA $V_{0, min}$ = 14 V at I ≤ 22 mA No HART®
			V_0 = 24.5 V I_0 = 99 mA P_0 = 0.6 W C_0 = 75 nF / L_0 = 0.5 mH No HART®
Passive	-	V_{ext} ≤ 32 VDC I ≤ 22 mA I_{max} ≤ 26 mA (electronically limited) $V_{0, max}$ = 5 V at I ≤ 22 mA No HART®	V_{ext} ≤ 32 VDC I ≤ 22 mA $V_{0, max}$ = 4 V at I ≤ 22 mA No HART®
			V_i = 30 V I_i = 100 mA P_i = 1 W C_i = 10 nF L_i = 0 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		
	Profile 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	
This device fulfils the statutory requirements of the relevant directives. The manufacturer certifies successful testing of the product by applying the conformity mark on the device.	
	For more information on the directives, standards and the approved certifications, please refer to the declaration of conformity supplied with the device or downloadable from the manufacturer's website.
Other approvals and standards	
Non-Ex	Standard
Hazardous areas	
ATEX	Please check the relevant Ex documentation for details.
	KEMA 10ATEX0105 X
	For gas: zone 1 and 2, gas group IIC, temperature class T6...T4
	For dust: zone 21 and 22, maximum surface temperature T115°C
NEPSI	GYJ18.1099X
Protection category acc. to IEC 60529	IP66/67, NEMA 4/4X/6
Hygiene	Ceramic measuring tube is conform FDA regulations.
Shock test	IEC 60068-2-27
	30 g for 18 ms
Vibration resistance	IEC 60068-2-64
	f = 20...2000 Hz, rms = 4.5 g, t = 30 min

6.3 Dimensions and weights

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

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 flow sensor only.*
- *Especially for smaller nominal sizes of the flow sensor, the signal converter can be bigger than the flow sensor.*
- *Note that for other pressure ratings than mentioned, the dimensions may be different.*
- *For full information on signal converter dimensions see relevant documentation.*

Sandwich version

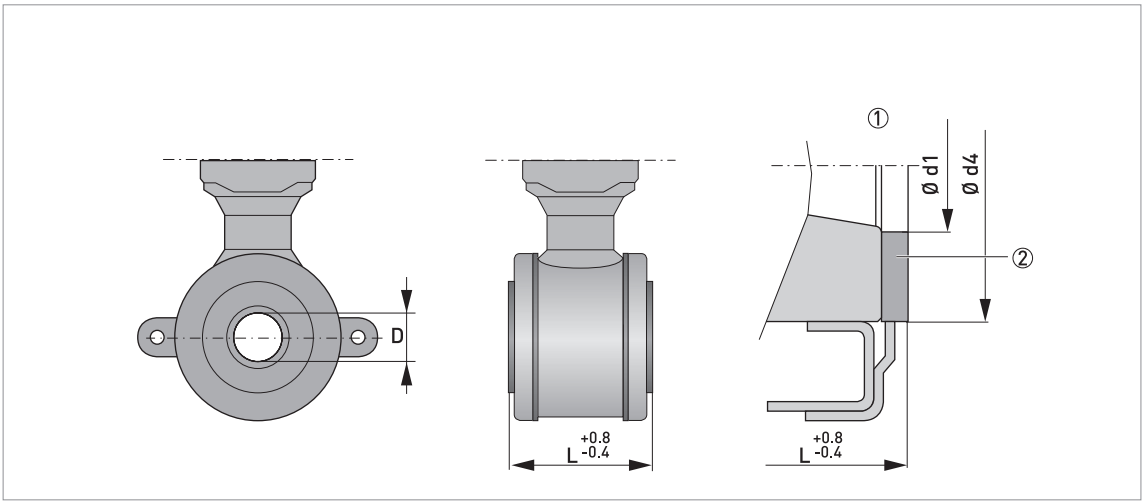


Figure 6-2: Construction details DN25...100 / 1...4"

① Situation without grounding rings
② Gasket

Nominal size	Dimensions [mm]						Approx. weight [kg]
DN	L	H	W	D	Ød1	Ød4	
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	Ød4	
1"	2.28 ①	4.57	2.68	0.79	1.02	1.81	3.53
1 1/2"	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

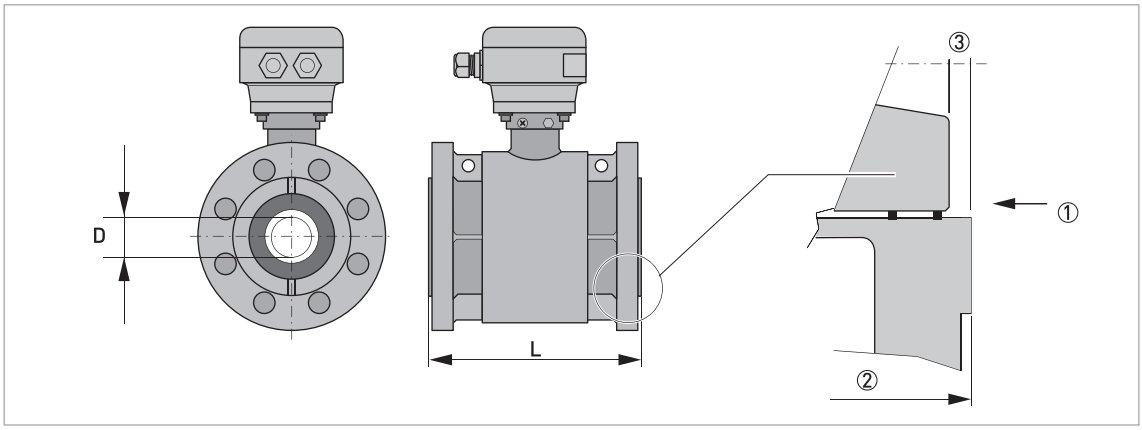


Figure 6-3: Construction details DN25...100 / 1...4"

① Detail ceramics, flange and gaskets, see options in following illustration
② Length tolerances (see table on following pages)

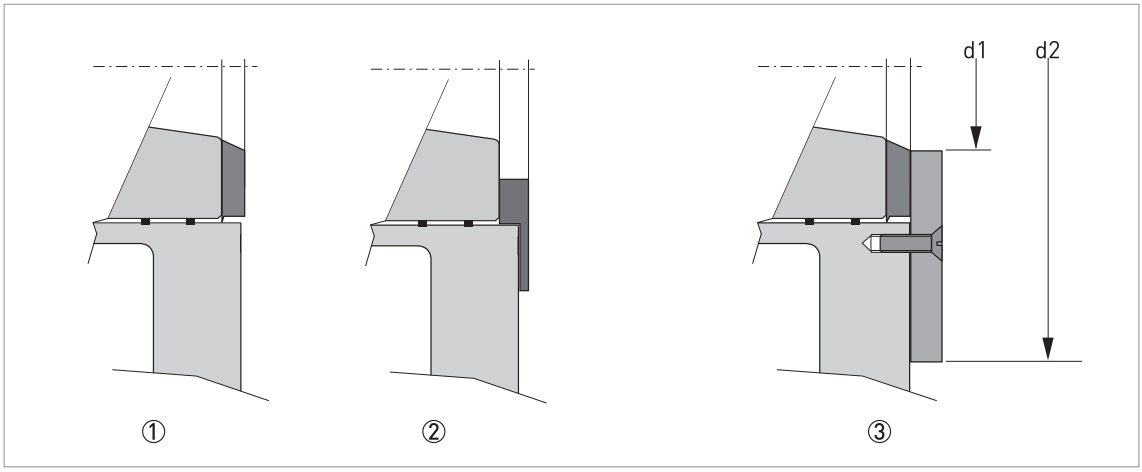


Figure 6-4: Details of gasket options

① Sealing ring: PTFE (white)
Optional: conductive PTFE (grey) / Gylon 3504 (blue)
② Sealing ring for rounded counter flanges: filled PTFE (blue)
③ DN25...100 / 1...4"; optional spacer ring with gasket

EN 1092-1

Nominal size	Dimensions [mm]					Approx. weight [kg]
DN	L	H	W	D	Ød1	
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
1 1/2"	5.91	6.18	5.00	1.18	1.54	13.2
2"	7.87	6.89	6.00	1.57	2.01	19.8
3"	7.87	8.39	7.50	2.36	3.15	33.1
4"	9.84	9.65	9.00	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

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