



## **WATERFLUX 3000** Quick Start

Electromagnetic flow sensor

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

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### Warnings and symbols used



#### **DANGER!**

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



#### **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.*



#### **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.

### Safety instructions for the operator



#### **CAUTION!**

*Installation, assembly, start-up and maintenance may only be performed by appropriately trained personnel. The regional occupational health and safety directives must always be observed.*



#### **LEGAL NOTICE!**

*The responsibility as to the suitability and intended use of this device rests solely with the user. The supplier assumes no responsibility in the event of improper use by the customer. Improper installation and operation may lead to loss of warranty. In addition, the "Terms and Conditions of Sale" apply which form the basis of the purchase contract.*



#### **INFORMATION!**

- Further information can be found on the supplied CD-ROM in the manual, on the data sheet, in special manuals, certificates and on the manufacturer's website.
- If you need to return the device to the manufacturer or supplier, please fill out the form contained on the CD-ROM and send it with the device. Unfortunately, the manufacturer cannot repair or inspect the device without the completed form.

## 2.1 Scope of delivery



**INFORMATION!**

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



**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!**

The remote version will arrive in two cartons. One carton contains the converter and one carton contains the sensor.

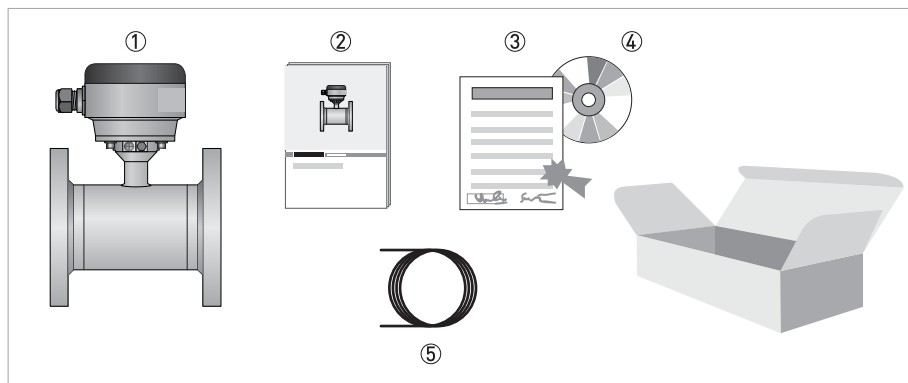


Figure 2-1: Scope of delivery

- ① Ordered flowmeter
- ② Product documentation
- ③ Factory calibration report
- ④ CD-ROM with product documentation in available languages
- ⑤ Signal cable (remote versions only)



**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.



### INFORMATION!

Product specific information and extensive product specification is available using PICK, the Product Information Center KROHNE web-tool.

PICK can be found via the service menu button on the KROHNE.com website.



### The following versions are available:

- Compact version (the signal converter is mounted directly on the measuring sensor)
- Remote version (measuring sensor with connection box and a signal converter in a remote (field) housing)

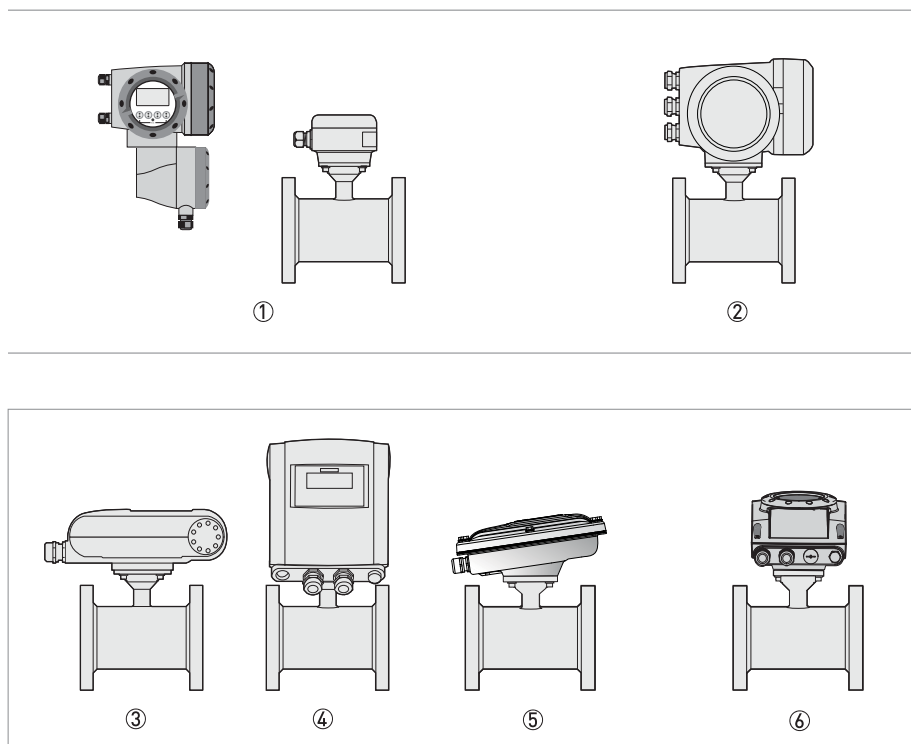


Figure 2-2: Device versions

- ① Remote version
- ② Compact version with signal converter IFC 300
- ③ Compact version with signal converter IFC 100 (0°)
- ④ Compact version with signal converter IFC 100 (45°)
- ⑤ Compact version with signal converter IFC 100 (10°) Stainless steel
- ⑥ Compact version with signal converter IFC 050 (10°)

## 2.3 Nameplate (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.

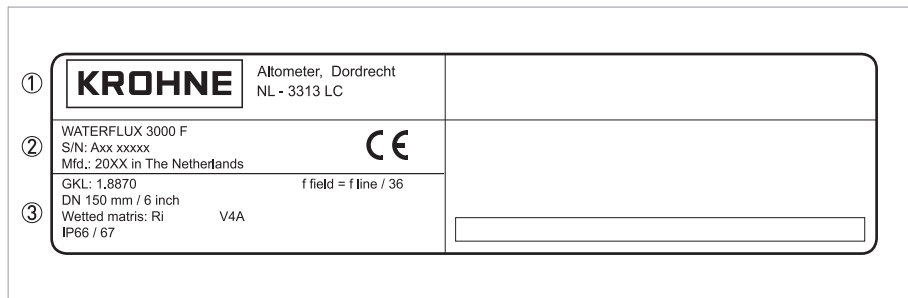


Figure 2-3: Example of nameplate

- ① Name and address of manufacturer
- ② Type designation of the flowmeter and CE sign with number(s) of notified body / bodies
- ③ Meter constant, diameter, wetted materials, protection class

## 2.4 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

## 2.5 Transport

### Signal converter

- No special requirements.

### Compact version

- Do not lift the device by the signal converter housing.
- Do not use lifting chains.
- To transport flange devices, use lifting straps. Wrap these around both process connections.

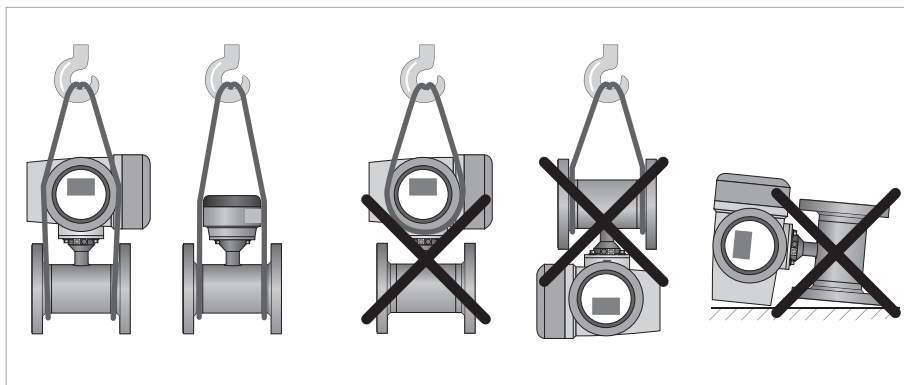


Figure 2-4: Transport

## 2.6 Pre-installation requirements

### Make sure that you have all necessary tools available:

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

## 2.7 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 vibration. The flowmeters are tested for a vibration level in accordance with IEC 68-2-64.

### 2.7.1 Vibrations

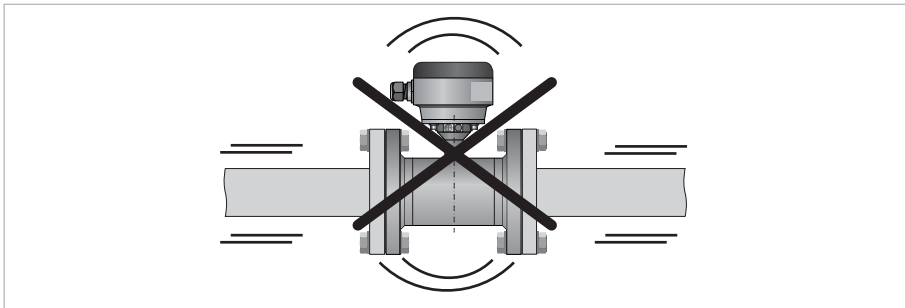


Figure 2-5: Avoid vibrations

### 2.7.2 Magnetic field

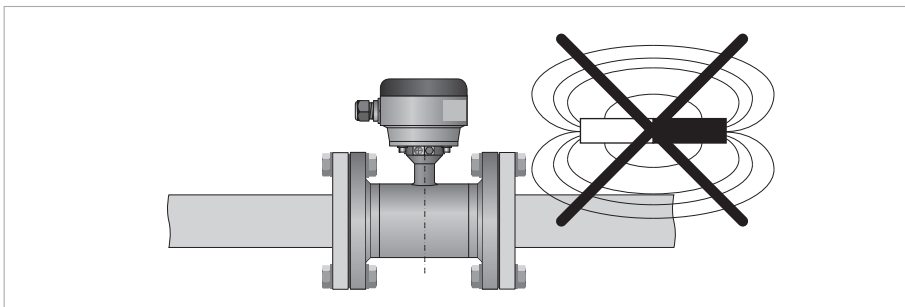


Figure 2-6: Avoid magnetic field



## 2.8 Installation conditions



### CAUTION!

To prevent damage to the Rilsan® coating, the WATERFLUX 3000 sensor must be installed carefully. Take precautions during transport and installation to protect the in- and outlet of the sensor.

### 2.8.1 Inlet and outlet

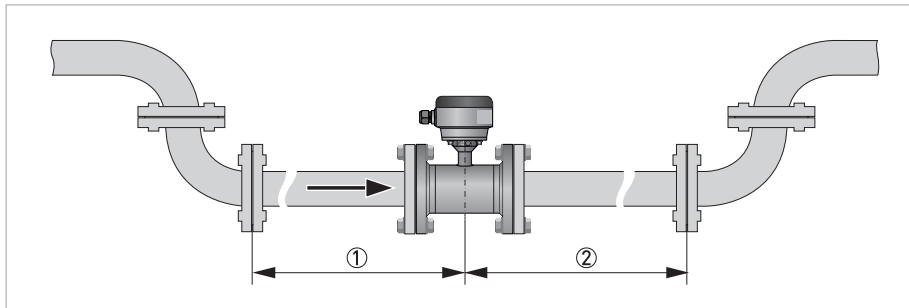


Figure 2-7: Minimal inlet and outlet

- ① Inlet:  $\geq 0$  DN
- ② Outlet:  $\geq 0$  DN

### 2.8.2 T-section

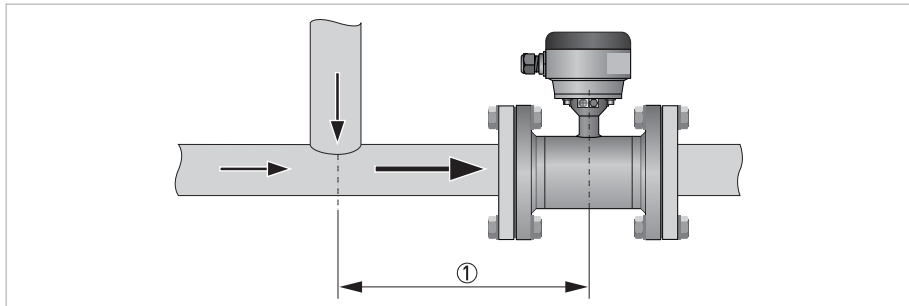


Figure 2-8: Distance behind a T-section

- ①  $\geq 0$  DN

## 2.9 Open discharge

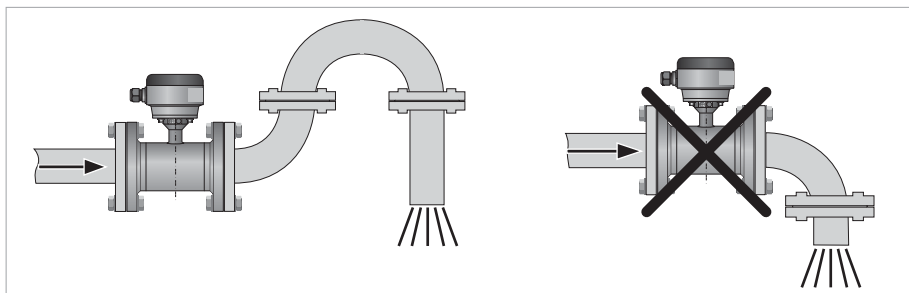


Figure 2-9: Installation in front of an open discharge

2.9.1 Bends

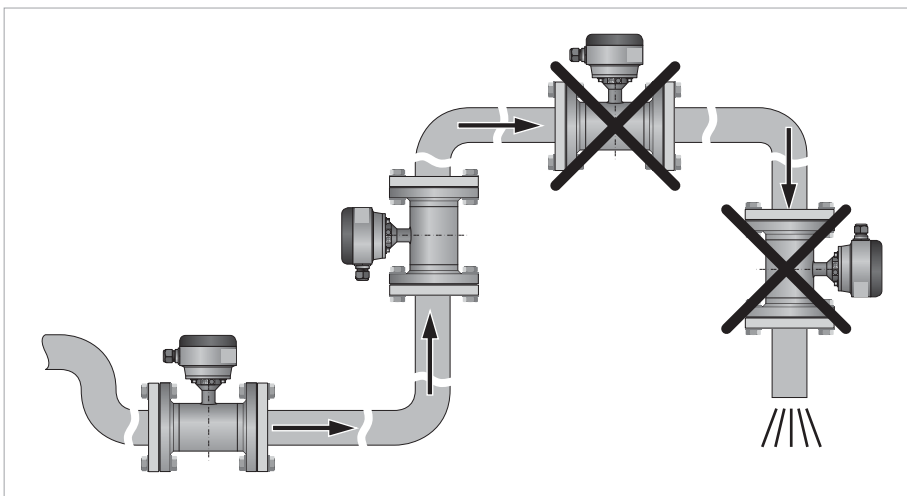


Figure 2-10: Installation in bending pipes

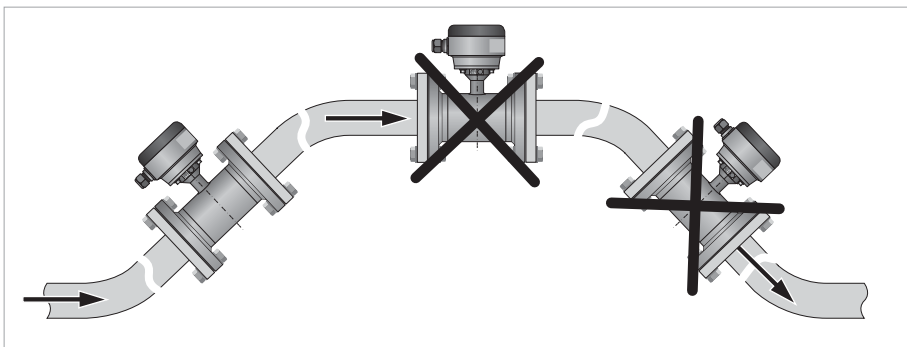


Figure 2-11: Installation in bending pipes

2.10 Pump

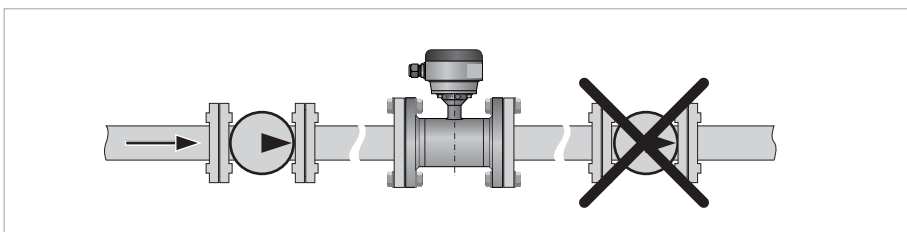


Figure 2-12: Installation behind a pump

## 2.11 Control valve

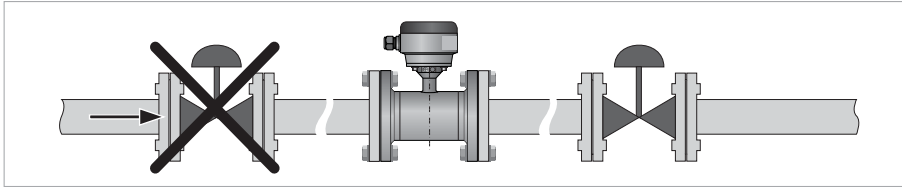


Figure 2-13: Installation in front of a control valve

## 2.12 Air venting and vacuum forces

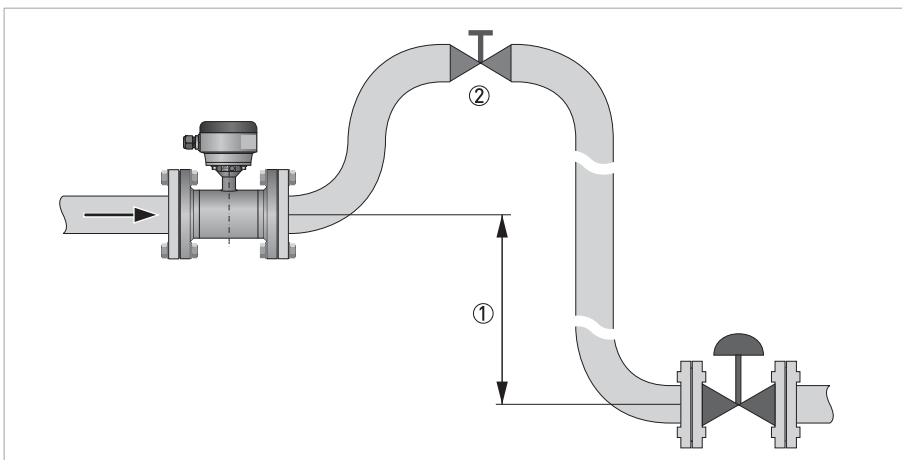


Figure 2-14: Air venting

- ①  $\geq 5$  m
- ② Air ventilation point

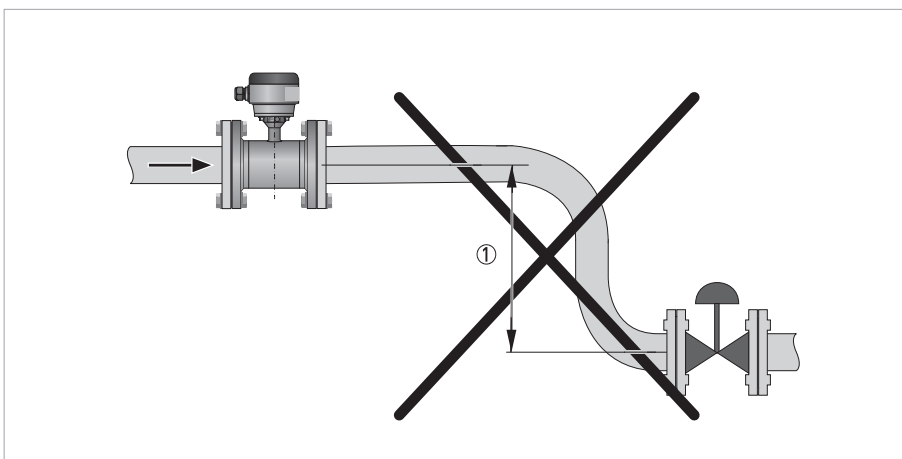


Figure 2-15: Vacuum

- ①  $\geq 5$  m

## 2.13 Flange deviation



### CAUTION!

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

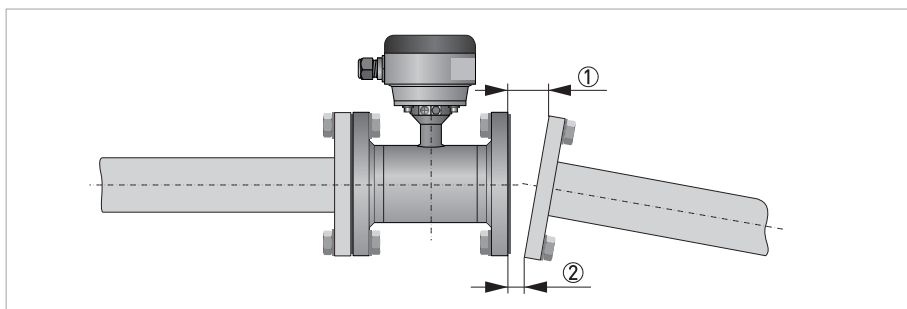


Figure 2-16: Flange deviation

- ①  $L_{max}$
- ②  $L_{min}$

## 2.14 Mounting position

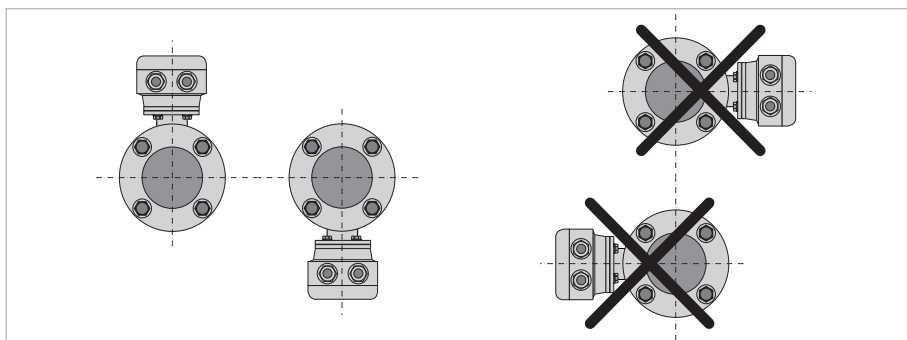
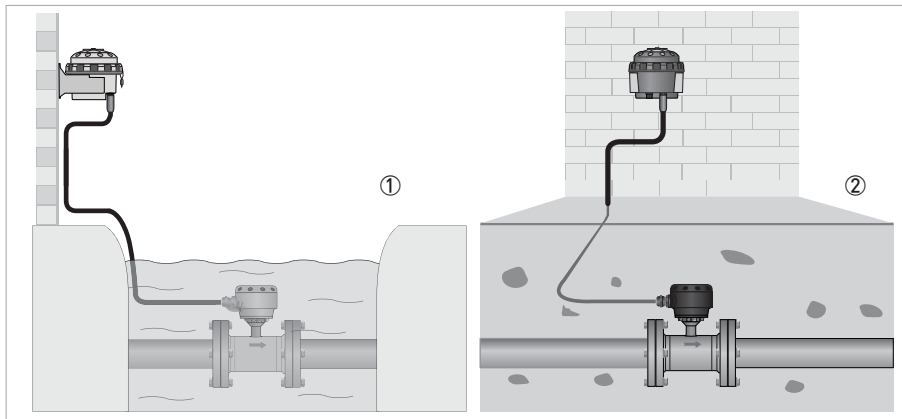


Figure 2-17: Mounting position

- Install flow sensor in line with the pipe axis.
- Pipe flange faces must be parallel to each other.

## 2.15 IP 68

The WATERFLUX 3000 flow sensor is rated IP68 (NEMA 4X/6P). It is suitable for submersion in flooded measurement chambers and for subsurface installation.



- ① Submersible
- ② Buried

## 2.16 Mounting

### 2.16.1 Torques and pressures

The maximum pressure and torque values for the flowmeter are theoretical and calculated for optimum conditions and use with carbon steel flanges.

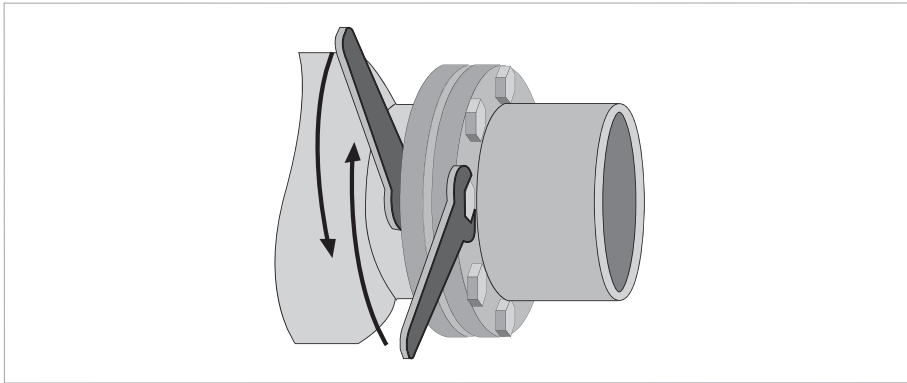


Figure 2-18: Tightening of bolts



#### Tightening of bolts

- Always tighten the bolts uniformly and in diagonally opposite sequence.
- Do not exceed the maximum torque value.
- Step 1: Apply approx. 50% of max. torque given in table.
- Step 2: Apply approx. 80% of max. torque given in table.
- Step 3: Apply 100% of max. torque given in table.

Nominal size DN [mm]	Pressure rating	Bolts	Max. torque [Nm] <sup>①</sup>
25	PN 16	4 x M 12	12
40	PN 16	4 x M 16	30
50	PN 16	4 x M 16	36
65	PN 16	8 x M 16	50
80	PN 16	8 x M 16	30
100	PN 16	8 x M 16	32
125	PN 16	8 x M 16	40
150	PN 10	8 x M 20	55
150	PN 16	8 x M 20	55
200	PN 10	8 x M 20	85
200	PN 16	12 x M 20	57
250	PN 10	12 x M 20	80
250	PN 16	12 x M 24	100
300	PN 10	12 x M 20	95
300	PN 16	12 x M 24	136
350	PN 10	16 x M 20	96
400	PN 10	16 x M 24	130
450	PN 10	20 x M 24	116
500	PN 10	20 x M 24	134
600	PN 10	20 x M 27	173

① The torque values also depend on variables (temperature, bolt material, gasket material, lubricants, etc.) outside the control of the manufacturer. Therefore these values should be regarded as indicative only.

Nominal size [inch]	Flange class [lb]	Bolts	Max. torque [lbs.ft] <sup>①</sup>
1	150	4 x 1/2"	4
1½	150	4 x 1/2"	11
2	150	4 x 5/8"	18
2.5	150	8 x 5/8"	27
3	150	4 x 5/8"	33
4	150	8 x 5/8"	22
5	150	8 x 3/4"	33
6	150	8 x 3/4"	48
8	150	8 x 3/4"	66
10	150	12 x 7/8"	74
12	150	12 x 7/8"	106
14	150 ②	12 x 1"	87
16	150 ②	16 x 1"	84
18	150 ②	16 x 1 1/8"	131
20	150 ②	20 x 1 1/8"	118
24	150 ②	20 x 1 1/4"	166

① The torque values also depend on variables (temperature, bolt material, gasket material, lubricants, etc.) outside the control of the manufacturer. Therefore these values should be regarded as indicative only.

② No full rating (max. 150 psi / 10 bar).



### 3.1 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!



**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.

### 3.2 Grounding



**DANGER!**

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

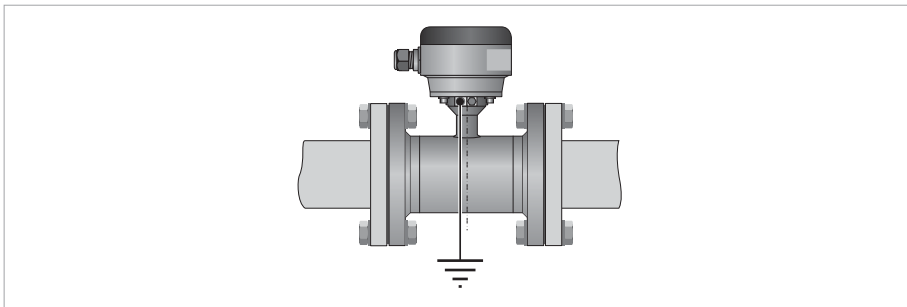


Figure 3-1: Grounding



**INFORMATION!**

Grounding without grounding rings. The flow sensor is equipped with a reference electrode.

### 3.3 Connection diagrams



**INFORMATION!**

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

## 4.1 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.

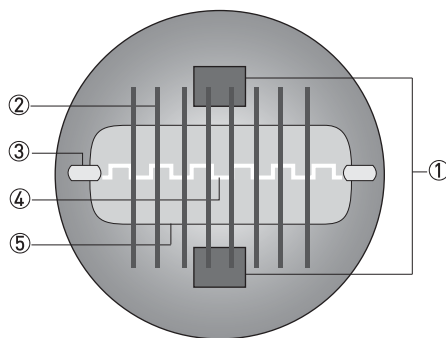


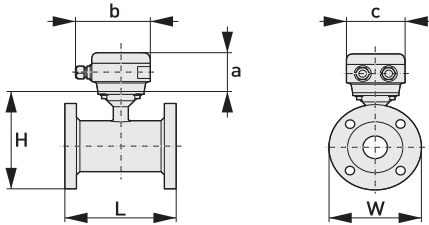
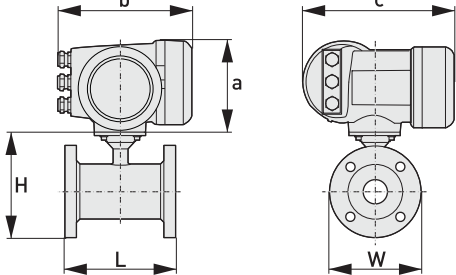
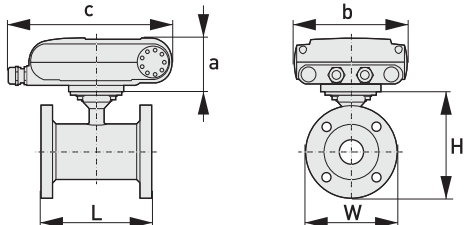
Figure 4-1: Measuring principle

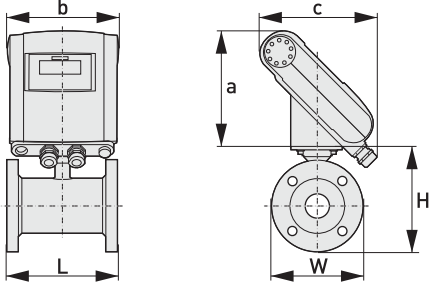
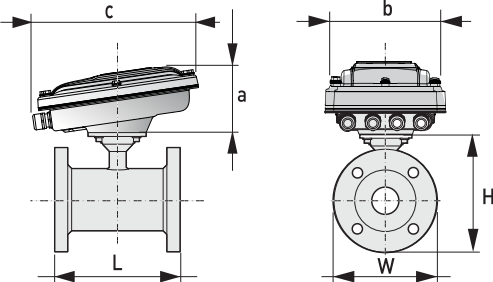
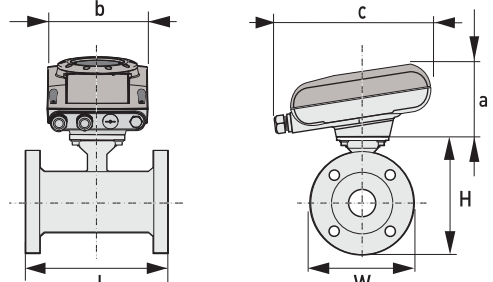
- ① Field coils
- ② Magnetic field
- ③ Electrodes
- ④ Induced voltage (proportional to flow velocity)
- ⑤ Rectangular cross section

### Rectangular cross section

The minimal height of the measuring tube decreases the distance between the field coils (1), resulting in a stronger and more homogeneous magnetic field (2). In addition, the mean flow velocity  $v$  increases due to the rectangular and reduced cross section. The large electrode spacing ( $D$ ) and the increased flow velocity results in a higher magnetic signal voltage, also in the presence of a low flow rate.

### 4.2 Dimensions and weights

<p>Remote version</p>		<p>a = 88 mm / 3.5"</p> <p>b = 139 mm / 5.5" ①</p> <p>c = 106 mm / 4.2"</p> <p>Total height = H + a</p>
<p>Compact version with : IFC 300</p>		<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>
<p>Compact version with: IFC 100 (0°)</p>		<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>

<p>Compact version with: IFC 100 (45°)</p>		<p>a = 186 mm / 7.3" b = 161 mm / 6.3" c = 184 mm / 2.7" ① Total height = H + a</p>
<p>Compact version with: stainless steel IFC 100 (10°)</p>		<p>a = 100 mm / 4" b = 187 mm / 7.36" ① c = 270 mm / 10.63" Total height = H + a</p>
<p>Compact version with: IFC 050 (10°)</p>		<p>a = 101 mm / 3.98" b = 157 mm / 6.18" c = 260 mm / 10.24" ① 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 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.

**EN 1092-1**

Nominal size DN [mm]	Dimensions [mm]			Approx. weight [kg]
	L	H	W	
25	150	151	115	5
40	150	166	150	6
50	200	186	165	13
65	200	200	185	11
80	200	209	200	17
100	250	237	220	17
125	250	266	250	21
150	300	300	285	29
200	350	361	340	36
250	400	408	395	50
300	500	458	445	60
350	500	510	505	85
400	600	568	565	110
450	600	618	615	125
500	600	671	670	120
600	600	781	780	180

## ASME B16.5 / 150 lb

Nominal size [inches]	Dimensions [inches]			Approx. weight [lb]
	L	H	W	
1	5.91	5.83	4.3	18
1½	5.91	6	4.9	21
2	7.87	7.05	5.9	34
3	7.87	8.03	7.5	42
4	9.84	9.49	9.0	56
5	9.84	10.55	10.0	65
6	11.81	11.69	11.0	80
8	13.78	14.25	13.5	100
10	15.75	16.3	16.0	148
12	19.7	18.8	19.0	210
14	27.6	20.7	21	290
16	31.5	22.9	23.5	370
18	31.5	24.7	25	420
20	31.5	27	27.5	500
24	31.5	31.4	32	680





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