



# WATERFLUX 3000

## Quick Start

Electromagnetic flowmeter

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!**

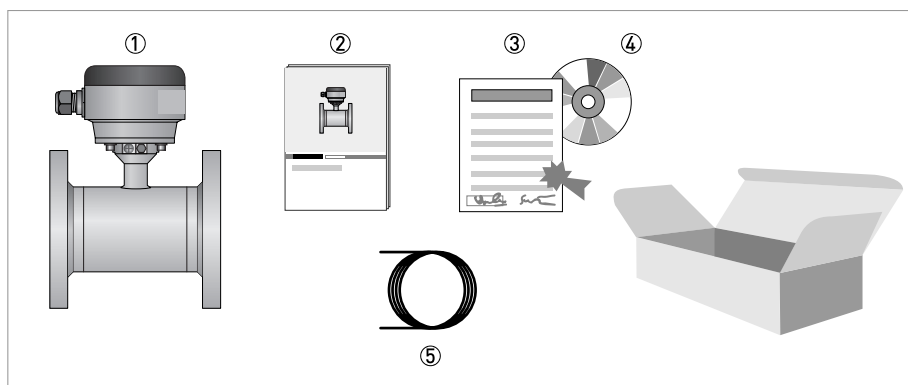
*Do a check of the packing list to make sure that you have all the elements given in the order.*

**INFORMATION!**

*Inspect the cartons 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!**

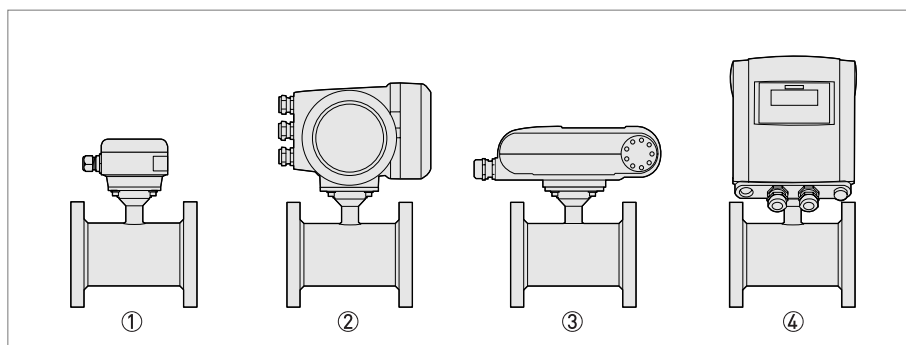
*Assembly materials and tools are not part of the delivery. Use the assembly materials and tools in compliance with the applicable occupational health and safety directives.*

## 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.

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)



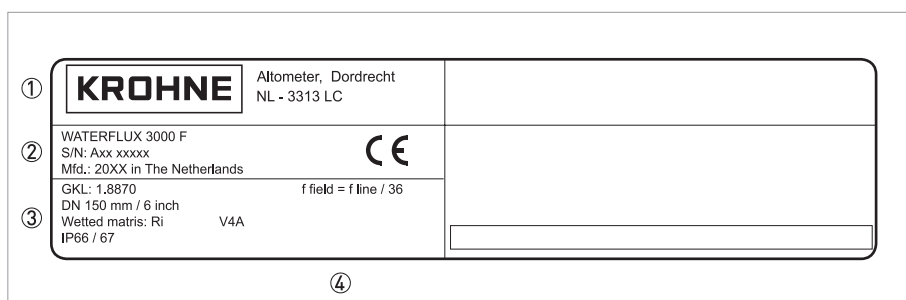
- ① Remote version  
 ② Compact version with IFC 300 signal converter  
 ③ Compact version with IFC 100 (0°) signal converter  
 ④ Compact version with IFC 100 (45°) signal converter

## 2.3 Nameplate



### 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 manufacturer  
 ② Type designation of the flowmeter and CE sign with number(s) of notified body / bodies  
 ③ Calibration data  
 ④ PED data

## 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

- 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.

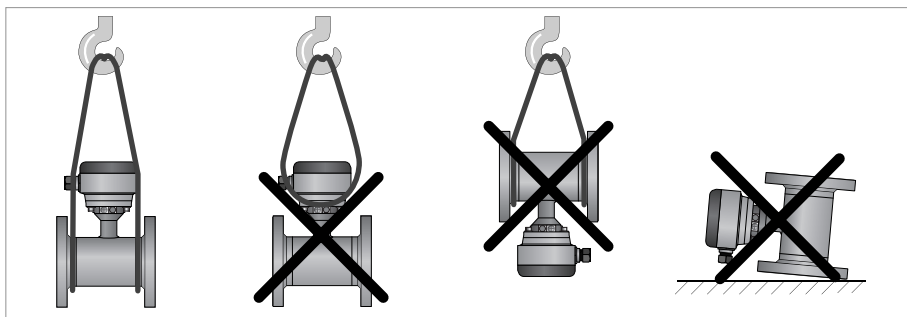


Figure 2-2: Transport

## 2.6 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

## 2.7 Installation conditions

### 2.7.1 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.*

### 2.7.2 Inlet and outlet

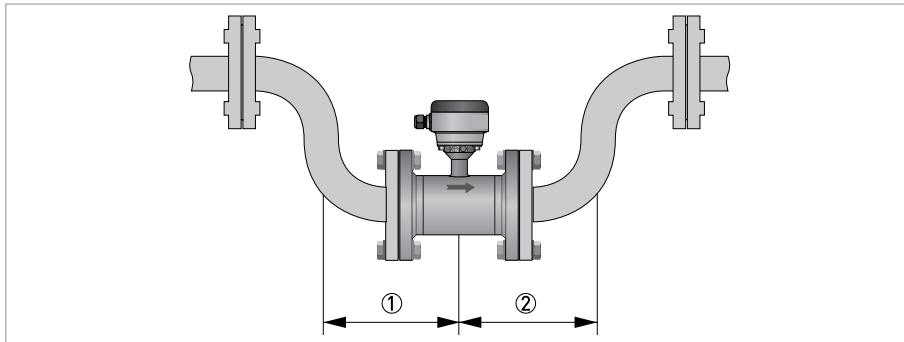


Figure 2-3: Recommended inlet and outlet

- ①  $\geq 0 \text{ DN}$
- ②  $\geq 0 \text{ DN}$

### 2.7.3 Mounting position

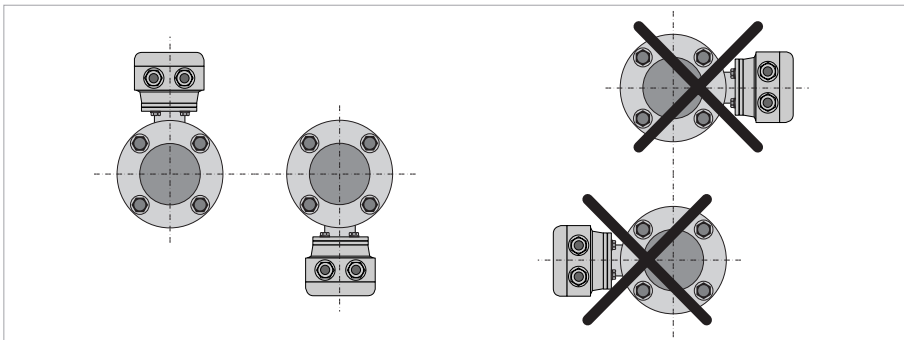


Figure 2-4: Mounting position

### 2.7.4 Flange deviation



**CAUTION!**

Max. permissible deviation of pipe flange faces:

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

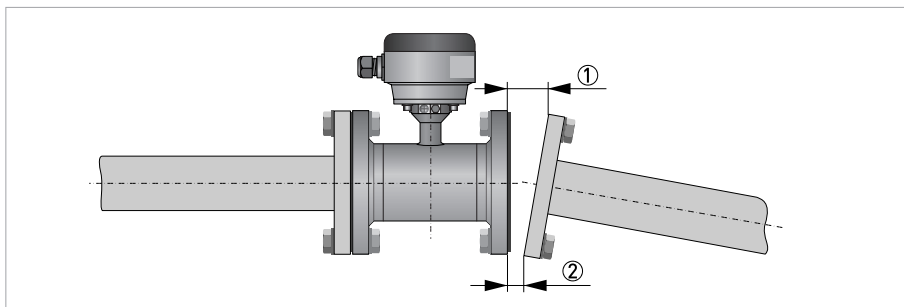


Figure 2-5: Flange deviation

- ①  $L_{\max}$
- ②  $L_{\min}$

### 2.7.5 T-section

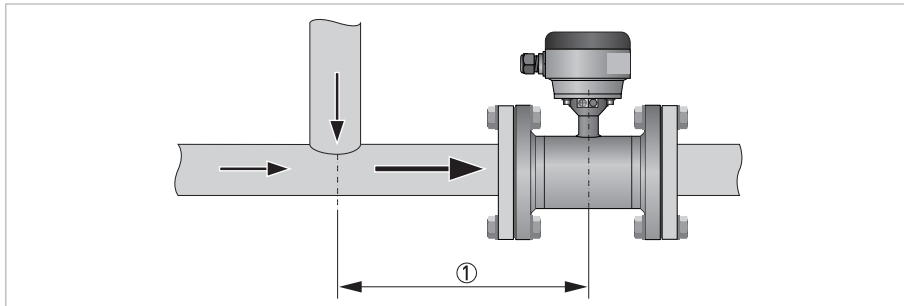


Figure 2-6: Distance behind a T-section

① 0 DN

### 2.7.6 Vibration

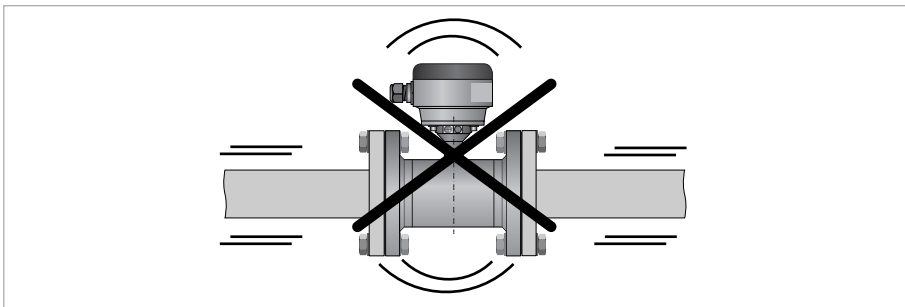


Figure 2-7: Avoid vibrations

### 2.7.7 Magnetic field

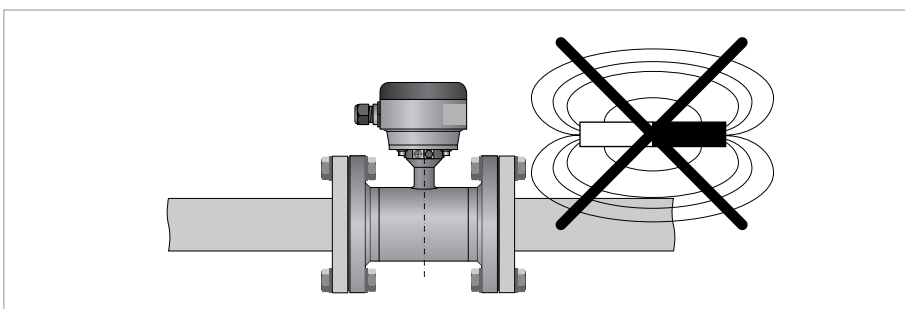


Figure 2-8: Avoid magnetic fields



### 2.7.8 Bends

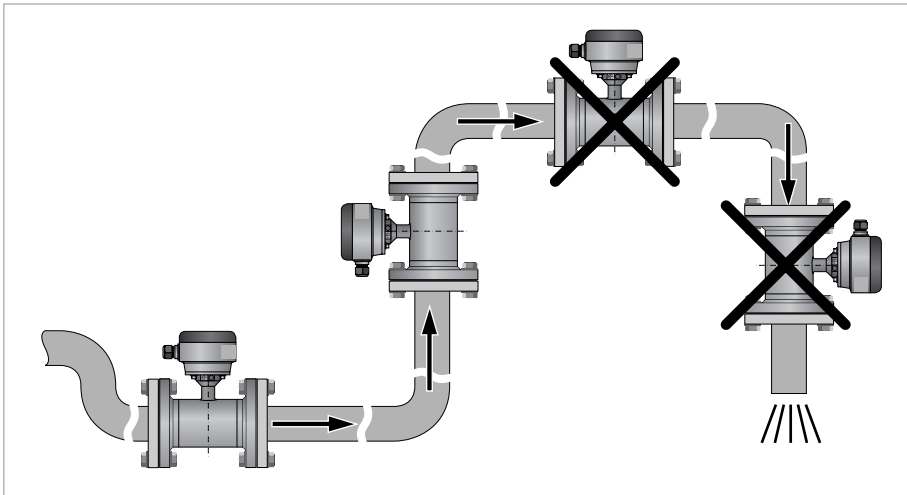


Figure 2-9: Installation in bending pipes

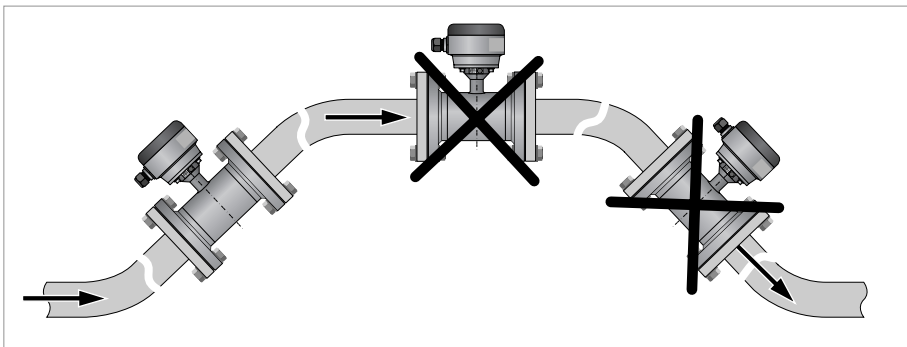


Figure 2-10: Installation in bending pipes

### 2.7.9 Open discharge

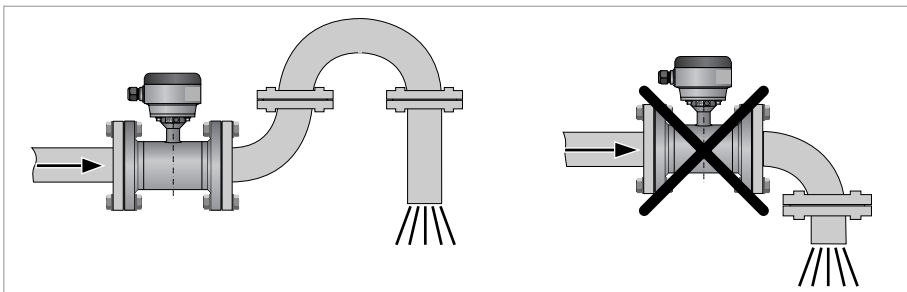


Figure 2-11: Installation in front of an open discharge

## 2.7.10 Control valve

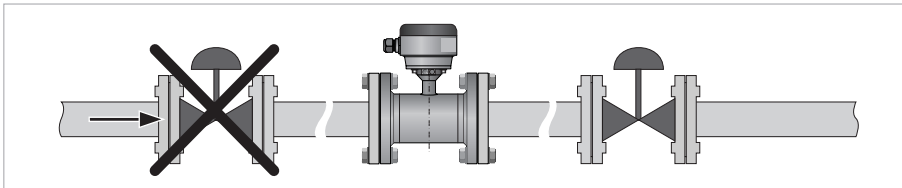


Figure 2-12: Installation in front of a control valve

## 2.7.11 Air venting

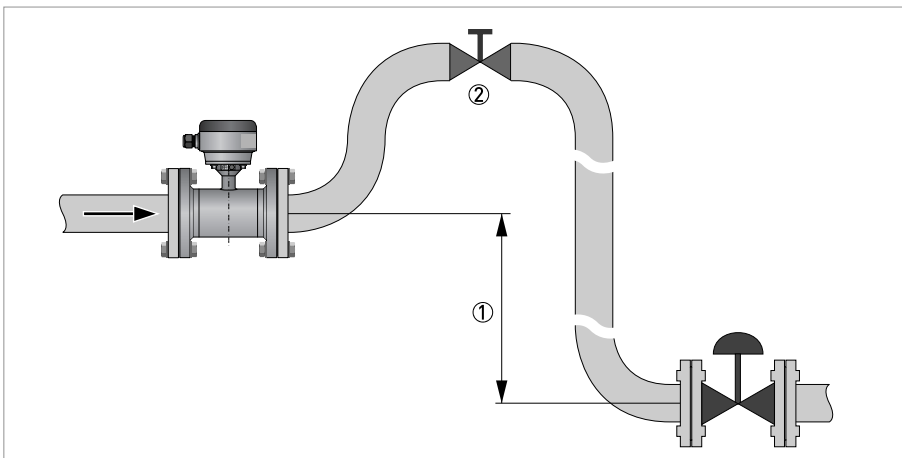


Figure 2-13: Air venting

①  $\geq 5$  m

② Air ventilation point

## 2.7.12 Pump

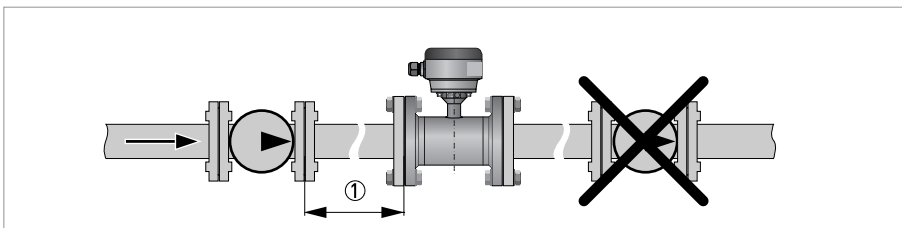


Figure 2-14: Installation behind a pump

①  $\geq 3$  DN

## 2.8 Mounting

### 2.8.1 Torques and pressures

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

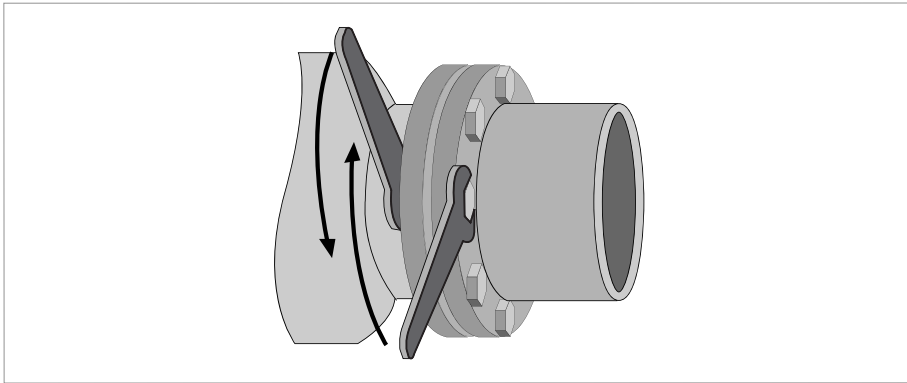


Figure 2-15: Tightening of bolts



#### 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	4 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	PN10	8 x M20	55
150	PN 16	8 x M 20	55
200	PN 10	8 x M 20	85
200	PN 16	12 x M20	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

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 [inches]	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	4 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

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.

### 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.*

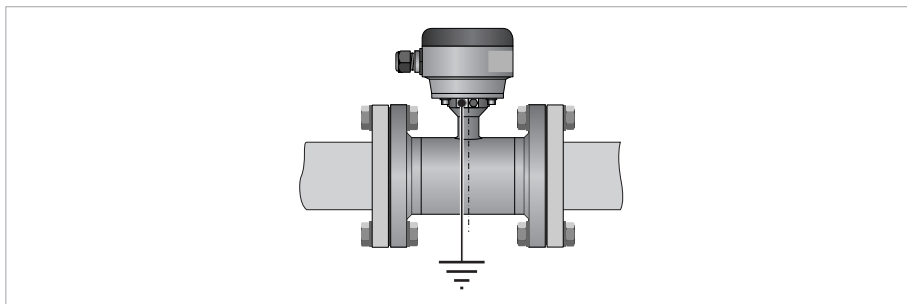


Figure 3-1: Grounding

**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 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:

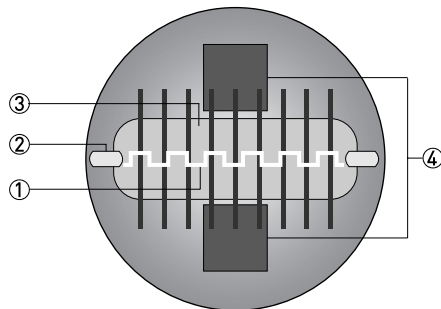
$v$  = mean flow velocity

$k$  = factor correcting for geometry

$B$  = magnetic field strength

$D$  = inner diameter of flow meter

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

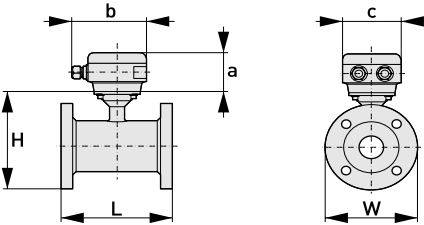
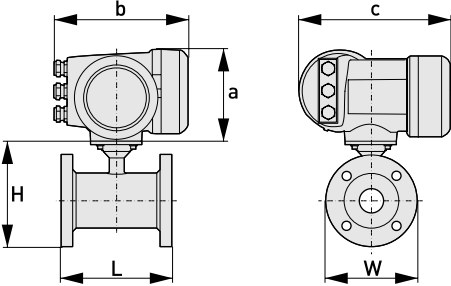
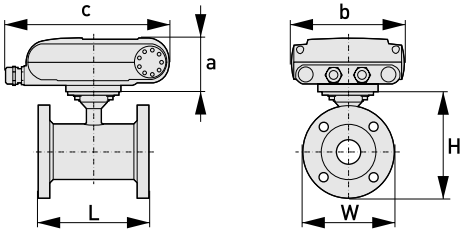
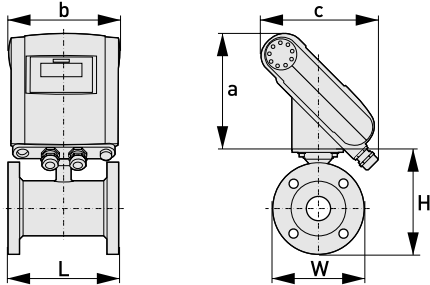


- ① Induced voltage (proportional to flow velocity)
- ② Electrodes
- ③ Magnetic field
- ④ Field coils

### Rectangular cross section

The minimal height of the measuring tube decreases the distance between the field coils (4), resulting in a stronger and more homogeneous magnetic field (3). 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

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

① The value may vary depending on the used cable glands

**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.

**EN 1092-1**

Nominal size DN [mm]	Dimensions [mm]			Approx. weight [kg]
	L	H	W	
25	150	150.5	115	5
40	150	165.5	150	5.7
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

**ASME B16.5 / 150 lb**

Nominal size [inches]	Dimensions [inches]			Approx. weight [lb]
	L	H	W	
1	5.91	5.83	4.33	18
1½	5.91	6	4.92	21
2	7.87	7.05	5.98	34
3	7.87	8.03	7.50	42
4	9.84	9.49	9.00	56
5	9.84	10.55	10.00	65
6	11.81	11.69	11.00	80
8	13.78	14.25	13.50	100
10	15.75	16.30	16.00	148
12	19.69	18.78	19.00	212











### KROHNE product overview

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

Head Office KROHNE Messtechnik GmbH  
Ludwig-Krohne-Str. 5  
47058 Duisburg (Germany)  
Tel.: +49 (0)203 301 0  
Fax: +49 (0)203 301 10389  
info@krohne.de

The current list of all KROHNE contacts and addresses can be found at:  
[www.krohne.com](http://www.krohne.com)

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