



## **WATERFLUX 3000** Handbook

Electromagnetic flow sensor

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

All rights reserved. It is prohibited to reproduce this documentation, or any part thereof, without the prior written authorisation of KROHNE Messtechnik GmbH.

Subject to change without notice.

Copyright 2018 by  
KROHNE Messtechnik GmbH - Ludwig-Krohne-Str. 5 - 47058 Duisburg (Germany)

1	Safety instructions	5
1.1	Intended use	5
1.2	Certification	5
1.3	Safety instructions from the manufacturer	6
1.3.1	Copyright and data protection	6
1.3.2	Disclaimer	6
1.3.3	Product liability and warranty	7
1.3.4	Information concerning the documentation	7
1.3.5	Warnings and symbols used	8
1.4	Safety instructions for the operator	8
2	Device description	9
2.1	Scope of delivery	9
2.2	Device description	10
2.3	Nameplate (example)	11
3	Installation	12
3.1	General notes on installation	12
3.2	Storage	12
3.3	Transport	12
3.4	Pre-installation requirements	13
3.5	General requirements	13
3.5.1	Vibrations	13
3.5.2	Magnetic field	13
3.6	Installation conditions	14
3.6.1	Inlet and outlet	14
3.6.2	T-section	14
3.6.3	Open discharge	14
3.6.4	Bends	15
3.6.5	Pump	15
3.6.6	Control valve	16
3.6.7	Air venting and vacuum forces	16
3.6.8	Mounting position	17
3.6.9	Flange deviation	17
3.7	IP 68	18
3.8	Mounting	19
3.8.1	Torques and pressures	19

4	Electrical connections	22
<hr/>		
4.1	Safety instructions.....	22
4.2	Grounding .....	22
4.3	Connection diagrams .....	22
5	Service	23
<hr/>		
5.1	Spare parts availability .....	23
5.2	Availability of services .....	23
5.3	Returning the device to the manufacturer.....	23
5.3.1	General information.....	23
5.3.2	Form (for copying) to accompany a returned device.....	24
5.4	Disposal .....	24
6	Technical data	25
<hr/>		
6.1	Measuring principle.....	25
6.2	Technical data.....	26
6.3	Legal metrology.....	31
6.3.1	MID Annex III (MI-001).....	31
6.3.2	Verification to MI-001 .....	33
6.4	Measurement accuracy .....	34
6.4.1	WATERFLUX 3050, 3100 and 3300 without straight inlet and outlet sections .....	35
6.5	Dimensions and weights .....	36
6.6	Pressure loss.....	40
7	Notes	41
<hr/>		

## 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.

This electromagnetic flowmeter is designed exclusively to measure the flow of drinking water, raw water and irrigation water.

**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

CE marking



The manufacturer certifies successful testing of the product by applying the CE marking.

**This device fulfils the statutory requirements of the relevant EU directives.**

For full information of the EU directives and standards and the approved certifications, please refer to the EU Declaration of Conformity or the website of the manufacturer.

### Other approvals and standards

- Measuring Instruments Directive 2014/32/EU, Annex III (MI-001), Annex VI (MI-004)
- NAMUR NE 21/04

For more information, please refer to the dedicated documentation.

## 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.

The collection of personal data (such as names, street addresses or e-mail addresses) in the manufacturer's documents is always on a voluntary basis whenever possible. Whenever feasible, it is always possible to make use of the offerings and services without providing any personal data.

We draw your attention to the fact that data transmission over the Internet (e.g. when communicating by e-mail) may involve gaps in security. It is not possible to protect such data completely against access by third parties.

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 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 icons as shown below.

### 1.3.5 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!**

*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.*



**CAUTION!**

The WATERFLUX 3000 can be combined with the mains powered IFC 050, IFC 100 and IFC 300 signal converter and with the battery powered IFC 070 signal converter.

This handbook only describes the combination with the IFC 050, IFC 100 and IFC 300 signal converter.

## 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.

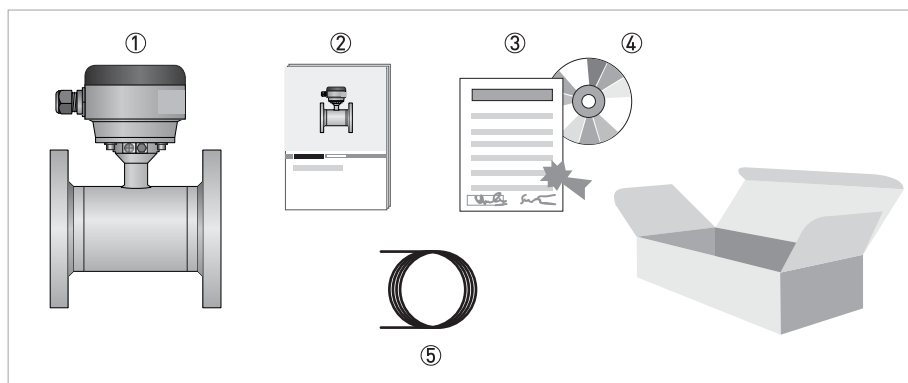


Figure 2-1: Scope of delivery

- 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

Electromagnetic flowmeters are designed exclusively to measure the flow and conductivity of electrically conductive, liquid media.

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!**

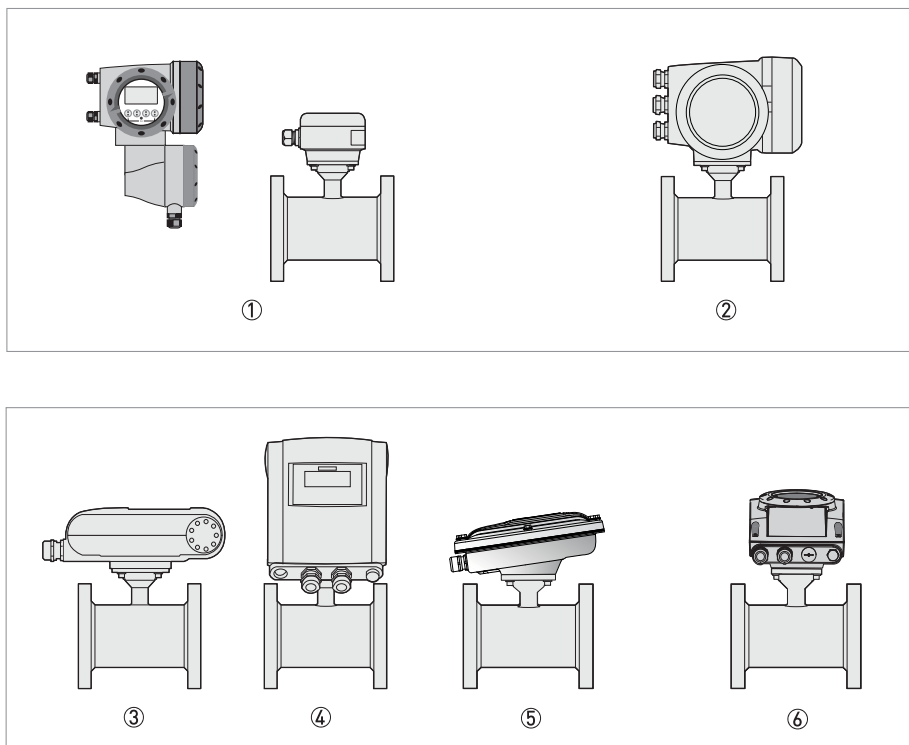
Product specific information and extensive product specification is available using PICK, the Product Information Center KROHNE web-tool.

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**

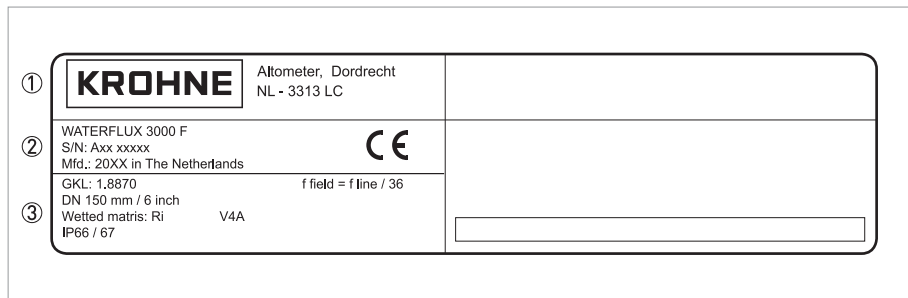
- ① Remote version
- ② Compact version with signal converter IFC 300
- ③ Compact version with signal converter IFC 100 (0°)
- ④ Compact version with signal converter IFC 100 (45°)
- ⑤ Compact version with signal converter IFC 100 (10°) Stainless steel
- ⑥ Compact version with signal converter IFC 050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

### 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, dust-free location.
- Avoid continuous direct sunlight.
- Store the device in its original packaging.
- Storage temperature: -50...+70°C / -58...+158°F

### 3.3 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.

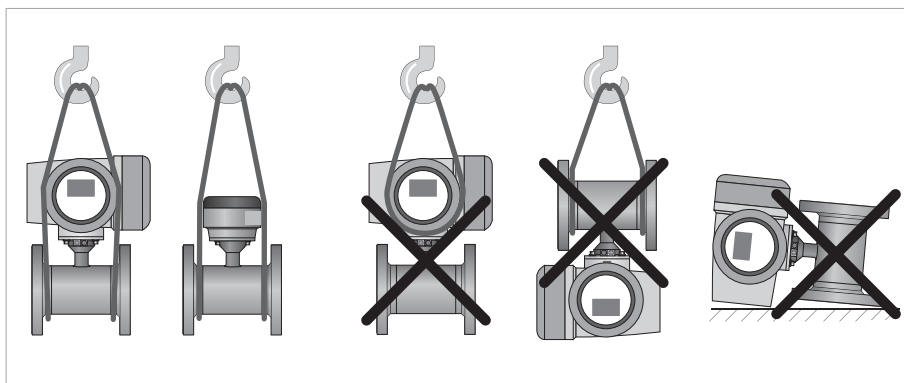


Figure 3-1: Transport

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

#### 3.5.1 Vibrations

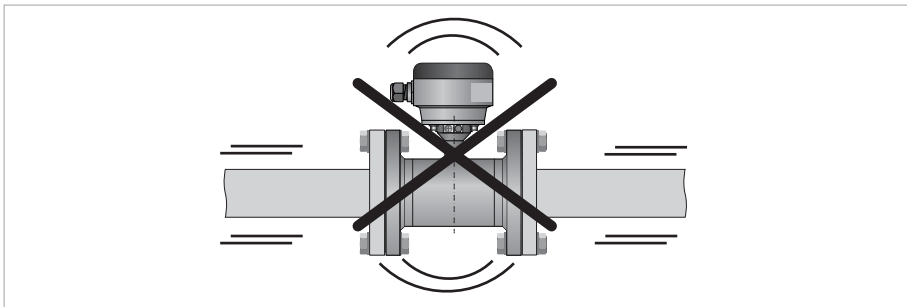


Figure 3-2: Avoid vibrations

#### 3.5.2 Magnetic field

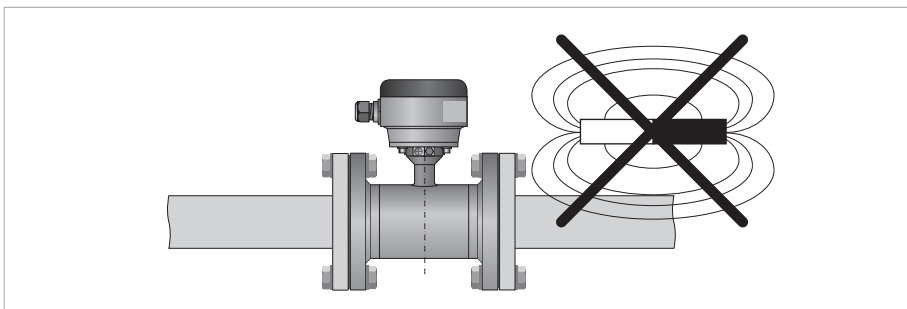


Figure 3-3: Avoid magnetic field

### 3.6 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.

#### 3.6.1 Inlet and outlet

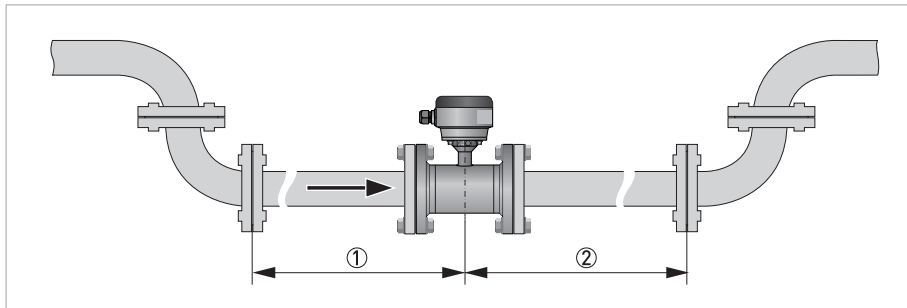


Figure 3-4: Minimal inlet and outlet

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

#### 3.6.2 T-section

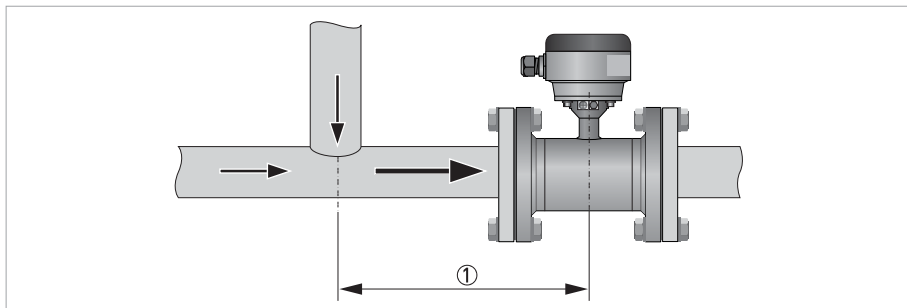


Figure 3-5: Distance behind a T-section

- ①  $\geq 0$  DN

#### 3.6.3 Open discharge

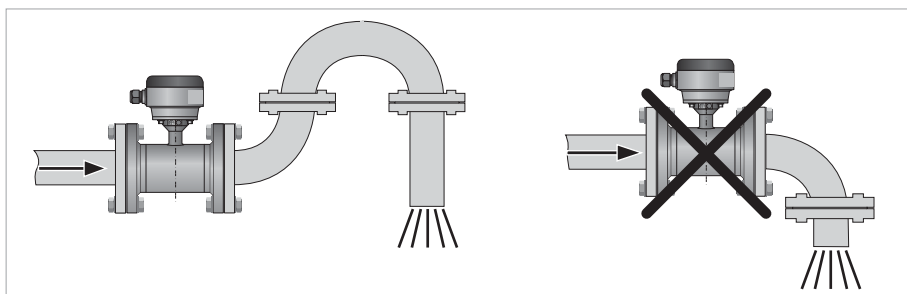


Figure 3-6: Installation in front of an open discharge

### 3.6.4 Bends

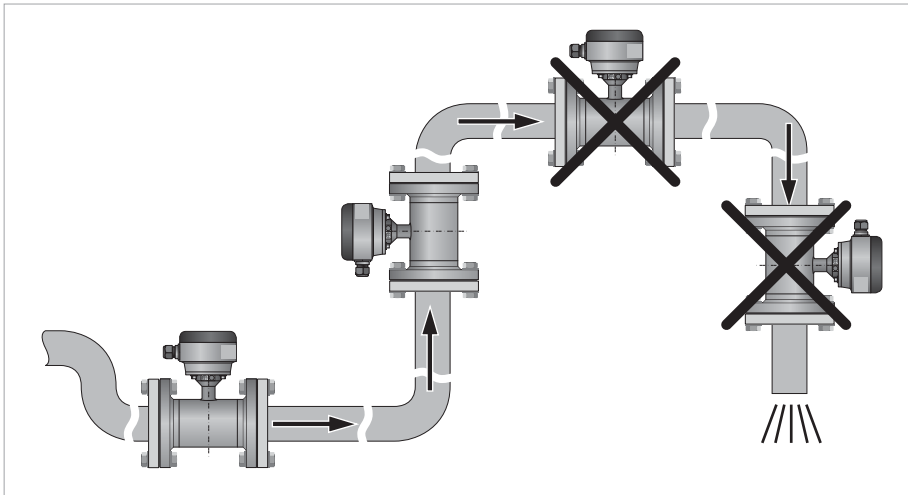


Figure 3-7: Installation in bending pipes

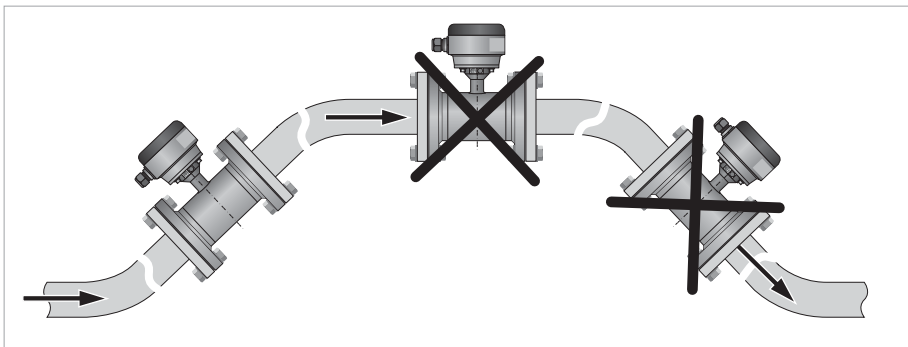


Figure 3-8: Installation in bending pipes

### 3.6.5 Pump

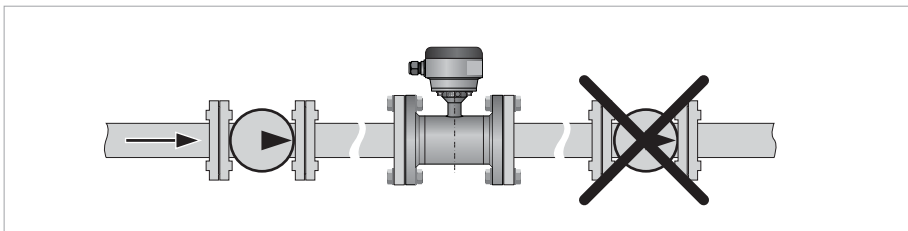


Figure 3-9: Installation behind a pump

3.6.6 Control valve

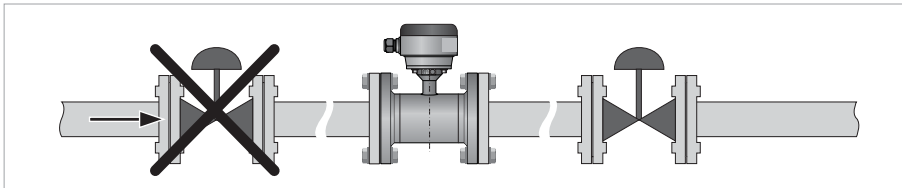


Figure 3-10: Installation in front of a control valve

3.6.7 Air venting and vacuum forces

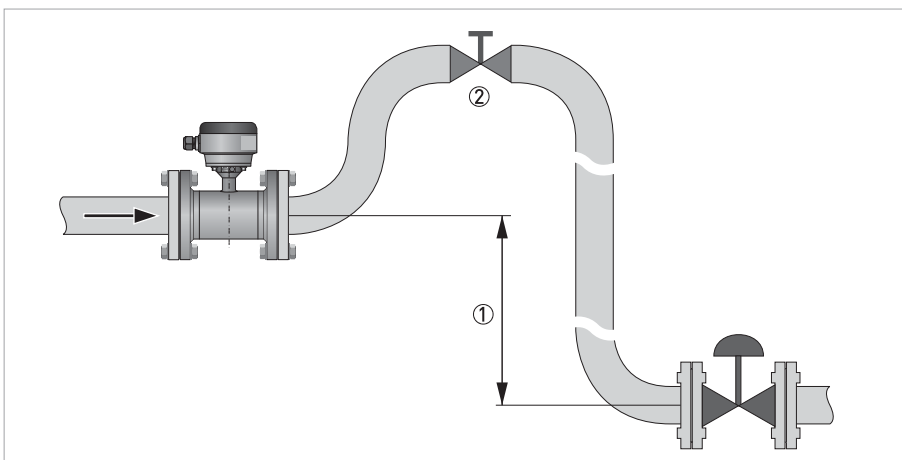


Figure 3-11: Air venting

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

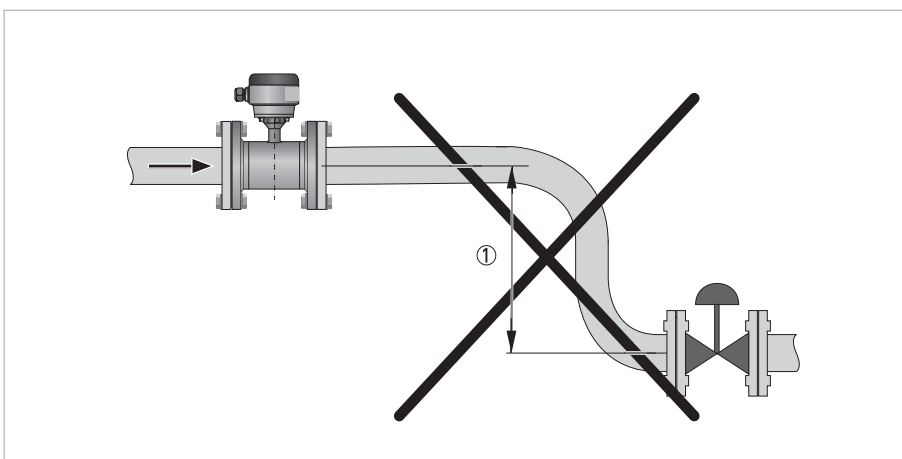


Figure 3-12: Vacuum

- ①  $\geq 5$  m



### 3.6.8 Mounting position

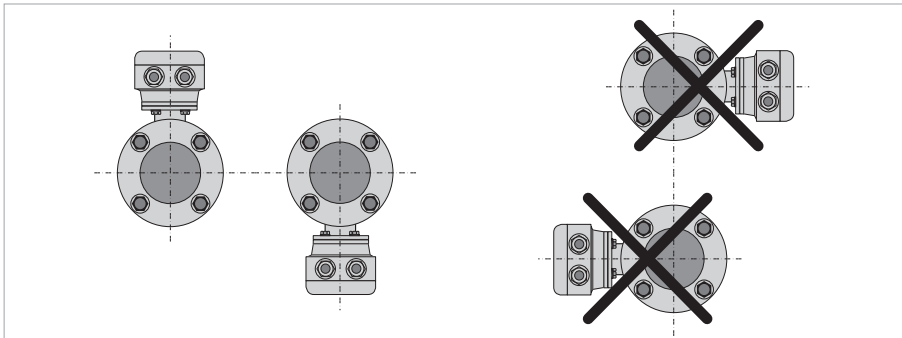


Figure 3-13: Mounting position

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

### 3.6.9 Flange deviation



**CAUTION!**

Max. permissible deviation of pipe flange faces:

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

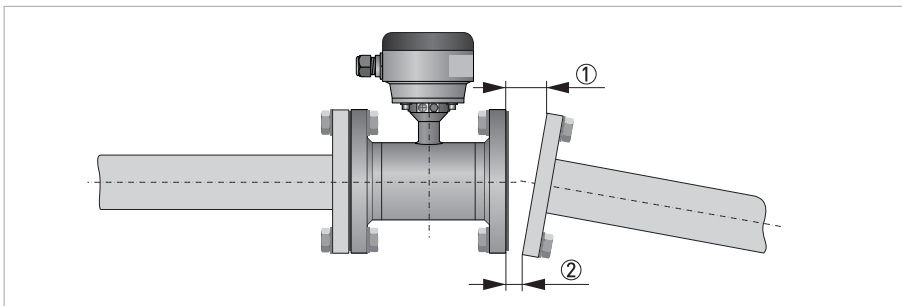


Figure 3-14: Flange deviation

- ①  $L_{max}$
- ②  $L_{min}$

### 3.7 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.

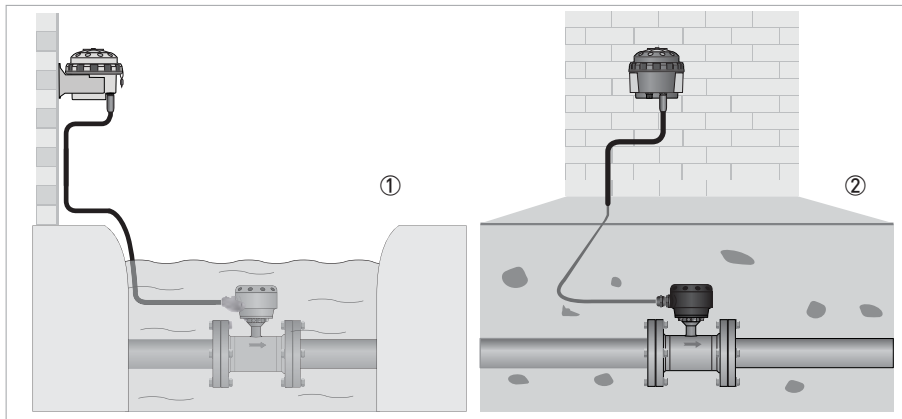


Figure 3-15: IP68 versions

- ① Submersible
- ② Buried

## 3.8 Mounting

### 3.8.1 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.

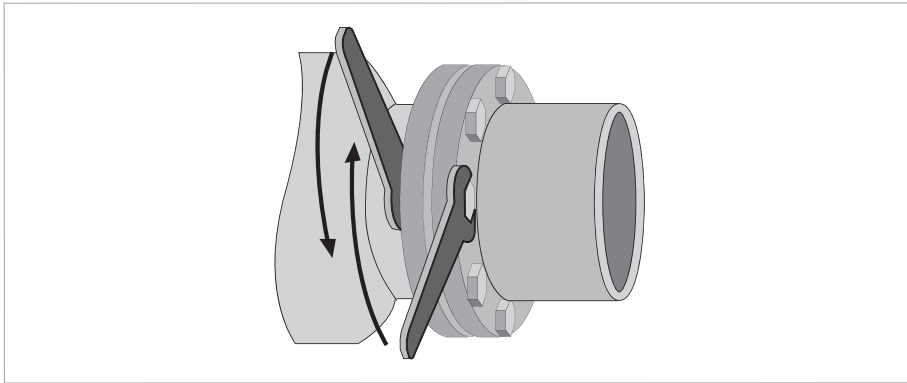


Figure 3-16: Tightening of bolts



#### 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).

## 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!

**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.

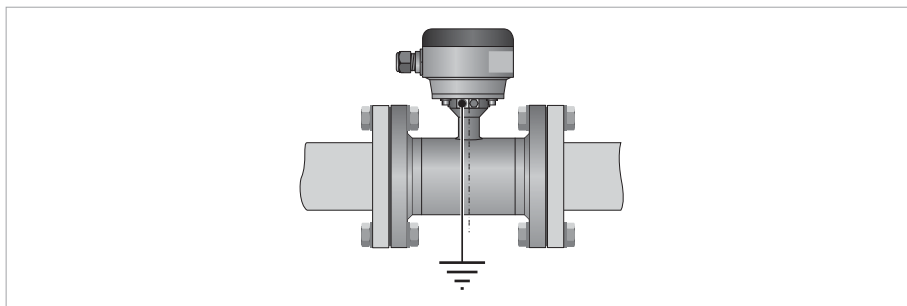


Figure 4-1: Grounding

**INFORMATION!**

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

## 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:	
Tel. no.:		Fax no. and/or Email address:	
Manufacturer's order no. or serial no.:			
The device has been operated with the following medium:			
This medium is:	<input type="checkbox"/>	radioactive	
	<input type="checkbox"/>	water-hazardous	
	<input type="checkbox"/>	toxic	
	<input type="checkbox"/>	caustic	
	<input type="checkbox"/>	flammable	
	<input type="checkbox"/>	We checked that all cavities in the device are free from such substances.	
<input type="checkbox"/>	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



**LEGAL NOTICE!**

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

**Separate collection of WEEE (Waste Electrical and Electronic Equipment) in the European Union:**



According to the directive 2012/19/EU, 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.



## 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.

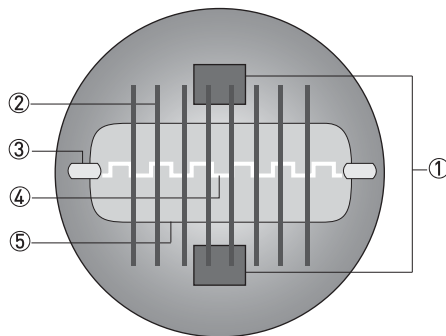


Figure 6-1: Measuring principle

- ① Field coils
- ② Magnetic field
- ③ Electrodes
- 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.

## 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 (Downloadcenter).

### Measuring system

Measuring principle	Faraday's law of induction
Application range	Electrically conductive fluids
<b>Measured value</b>	
Primary measured value	Flow velocity
Secondary measured value	Volume flow

### Design

Features	Unique rectangular flow tube design providing improved flow profile and signal to noise ratio resulting in highest accuracy and large turndown ratio
	Rilsan® polymer coated flow tube approved for drinking water
	No internal or moving parts
	Built-in reference electrode
Modular construction	The measurement system consists of a flow sensor and a signal converter. It is available as compact and as separate version. More information about the signal converter can be found in the relevant documentation.
Compact version	With IFC 050 converter: WATERFLUX 3050 C
	With IFC 100 converter: WATERFLUX 3100 C
	With IFC 300 converter: WATERFLUX 3300 C
Remote version	In wall (W)mount version with IFC 050 converter: WATERFLUX 3050 W
	In wall (W)mount version with IFC 100 converter: WATERFLUX 3100 W
	In field (F), wall (W) or rack ( R) mount version with IFC 300 converter: WATERFLUX 3300 F, W or R
Nominal diameter	DN25...600 / 1...24" ; Rectangular bore

### Measuring accuracy

Maximum measuring error	IFC 050: down to 0.5% of the measured value $\pm 1$ mm/s
	IFC 100: down to 0.3% of the measured value $\pm 1$ mm/s
	IFC 300: down to 0.2% of the measured value $\pm 1$ mm/s
	The maximum measuring error depends on the installation conditions.
	For detailed information refer to <i>Measurement accuracy</i> on page 34.
Repeatability	DN25...300 / 1...12" ; $\pm 0.1\%$ ( $v > 0.5$ m/s / 1.5 ft/s) DN350...600 / 14...24" ; $\pm 0.2\%$ ( $v > 0.5$ m/s / 1.5 ft/s)
Calibration / Verification	<b>Standard:</b>
	2 point calibration by a direct volume comparison.
	<b>Option (for DN25...600):</b>
	Verification to Measurement Instrument Directive (MID), Annex MI-001. Standard: Verification at Ratio (Q3/Q1) = 80, Q3 $\geq 2$ m/s / 6.6 ft/s Optional: Verification at Ratio (Q3/Q1) > 80
MID Annex MI-001 (Directive 2014/32/EU)	Only in combination with the IFC 300 signal converter
	<b>EC-Type examination certificate to MID Annex MI-001</b>
	Only in combination with the IFC 300 signal converter
	Diameter range: DN25...600 / 1...24"
	Minimum straight inlet flow: 0 DN
	Minimum straight outlet flow: 0 DN
	Forward and reverse (bi-directional) flow
	Orientation: any
	Ratio (Q3/Q1) up to 640
	Liquid temperature range: $+0.1^{\circ}\text{C}$ / $50^{\circ}\text{C}$
	Maximum operating pressure: $\leq$ DN200 / 8" : 16 bar / 232 psi, $\geq$ DN250 / 10" : 10 bar / 145 psi
	For detailed information refer to <i>Legal metrology</i> on page 31.

## Operating conditions

Temperature	
Process temperature	-5...+70°C / +23...+158°F
Ambient temperature	<p><b>Standard:</b> DN25...200: remote or compact version with aluminium converter housing and with stainless steel flanges: -40...+65°C / -40...+149°F compact version with stainless steel converter housing and with stainless steel flanges -40...+55°C / -40...+130°F</p> <p><b>Standard, DN250...600:</b> remote version with stainless steel converter housing and with carbon steel flanges: -20...+65°C / -4...+149°F compact version with stainless steel converter housing and with carbon steel flanges -20...+55°C / -4...+130°F</p> <p><b>Option, DN250...600 with low temperature carbon steel or stainless steel flanges :</b> -40...+65°C / -40...+130°F .</p>
Protect electronics against self-heating at ambient temperatures above 55°C / 131°F	
Storage temperature	-50...+70°C / -58...+158°F
<b>Measurement range</b>	-12...+12 m/s / -40...+40 ft/s
Pressure	
Operating pressure	Up to 16 bar / 232 psi for DN25...200 / 1...12" Up to 10 bar / 150 psi for DN250...600 / 14...24"
Vacuum load	0 mbar / 0 psi absolute
Pressure loss	For detailed information refer <i>Pressure loss</i> to on page 40.
Chemical properties	
Physical condition	Water: drinking water, raw water, irrigation water. For salt water please contact the factory.
Electrical conductivity	≥ 20 µS/cm

## Installation conditions

Installation	Assure that the flow sensor is always fully filled.
	For detailed information refer to <i>Installation</i> on page 12.
Flow direction	Forward and reverse
	Arrow on flow sensor indicates forward flow direction.
Inlet run	≥ 0 DN
	For detailed information refer to <i>Measurement accuracy</i> on page 34.
Outlet run	≥ 0 DN
	For detailed information refer to <i>Measurement accuracy</i> on page 34.
Dimensions and weights	For detailed information refer to <i>Dimensions and weights</i> on page 36.

## Materials

Sensor housing	Sheet steel
Measuring tube	DN25...200 / 1...8" : metallic alloy
	DN250...600 / 10...24" : stainless steel
Flanges	DN25...600 / 1...24" : steel 1.0460 / 1.0038 (RSt37-2) DN25...200 / 1...8" : ; stainless steel 3.04 (optionally 3.16)
Liner	Rilsan®
Protective coating	On exterior of the meter: flanges, housing, signal converter (compact version) and/or connection box (field version)
	Standard: polysiloxane
	Option: subsoil or offshore coating
Connection box	Only for remote versions
	Standard: stainless steel
Measuring electrodes	Standard: stainless steel 1.4301 / AISI 304
	Option: Hastelloy® C
Reference electrode	Standard: stainless steel 1.4301 / AISI 304
	Option: Hastelloy® C
Grounding rings	Grounding rings can be omitted when the reference electrode is used.

## Process connections

Flange	
EN 1092-1	<b>Standard:</b>
	DN25...200 / 1...8" : : PN 16
	DN250...600 / 10...24" : PN 10
	<b>Optional:</b>
	DN250...600 / 10...24" : PN16 (DN350...600 / 14...24" : 10 bar rated)
ASME	1" ...12" : 150 lb RF (232 psi / 16 bar rated) 14" ...24" : 150 lb (150 psi / 10 bar rated)
JIS	DN25...300 / 1" ...12" : 10 K DN350...600 / 14" ...24" : 7.5 K
AS 4087	DN25...600 / 1" ...24" : Class 16: on request (DN350...600 / 14" ...24" : 10 bar rated)
AS 2129	DN25...600 / 1" ...24" : Table D & E: on request (DN350...600 / 14" ...24" : 10 bar rated)
	For detailed information of nominal flange pressure and nominal diameter refer to <i>Dimensions and weights</i> on page 36.
Other connections	
Thread	DN25 / 1" : G1" thread connection on request
	DN40 / 1½" : G1.5" & G2" thread connection on request
Other	Weld-on, clamp, oval flanges: on request

## Electrical connections

	For detailed information refer to the documentation of the relevant signal converter.
<b>Signal cable</b> (remote versions only)	
Type A (DS)	<b>In combination with the IFC 050, IFC 100 and the IFC 300 signal converter</b> Standard cable, double shielded. Max. length: 600 m / 1950 ft (depends on electrical conductivity and measuring sensor). For detailed information refer to the documentation of the relevant signal converter.
Type B (BTS)	<b>Only in combination with the IFC 300 signal converter</b> Optional cable, triple shielded. Max. length: 600 m / 1950 ft (depends on electrical conductivity and measuring sensor). For detailed information refer to the documentation of the relevant signal converter.
I/O	For full details of I/O options, including data streams and protocols, see technical datasheet of the relevant converter.

## Approvals and certificates

<b>CE</b>	
This device fulfils the statutory requirements of the EU directives. The manufacturer certifies successful testing of the product by applying the CE mark	
	For full information of the EU directives & standards and the approved certifications, please refer to the EU Declaration of Conformity or the manufacturer website.
Custody transfer	Only in combination with the IFC 300 signal converter. Directive:2014/32/EU MID Annex III (MI-001) and MID Annex VI (MI-004) type examination certificate ( DN25...600 / 1...24") OIML R49 edition 2006 certificate of conformity ( DN25...600 / 1...24") Innerstaatliche Bauartzulassung als Kältezähler (For Germany, Switzerland and Austria)
<b>Other approvals and standards</b>	
Drinking water approvals	ACS, DVGW W270, NSF / ANSI Standard 61, TZW, KIWA (ATA), KTW, WRAS
Protection category acc. to IEC 60529	<b>Standard:</b> IP66 / 67 (NEMA 4/4X/6) <b>Option:</b> IP68 factory (NEMA 6P) IP68 field (NEMA 6P) IP68 is only available for separate design
Corrosion protection class acc. to ISO 12944-2	Standard: C3 medium Option: off-shore paint C5-I high - C5-M high
Shock test	IEC 68-2-27 30 g for 18 ms
Vibration test	IEC 68-2-64 f = 20...2000 Hz, rms = 4.5 g, t = 30 min

## 6.3 Legal metrology



### INFORMATION!

MID Annex MI-001 is **only** available in combination with the IFC 300 signal converter!

### 6.3.1 MID Annex III (MI-001)

All new designs of water meters that are to be used for legal purposes in Europe require certification under the Measurement Instrument Directive (MID) 2014/32/EU.

Annex III (MI-001) of the MID applies to water meters intended for the measurement of the volume of clean, cold or heated water in residential, commercial, and light industrial use. An EC-type examination certificate is valid in all countries of the European Union.

The WATERFLUX 3300 has an EC-type examination certificate and can be verified to the MID Annex III (MI-001) for water meters with diameter DN25...DN600. The conformity assessment procedure followed for the WATERFLUX 3300 is Module B (Type Examination) and Module D (Quality Assurance of the Production Process).

The maximum permissible error on volumes delivered between Q2 (transitional) flow rate and Q4 (overload) flow rate is  $\pm 2\%$ .

The maximum permissible error on volumes delivered between Q1 (minimum) flow rate and Q2 (transitional) flow rate is  $\pm 5\%$ .

$$Q1 = Q3 / R$$

$$Q2 = Q1 * 1.6$$

$$Q3 = Q1 * R$$

$$Q4 = Q3 * 1.25$$

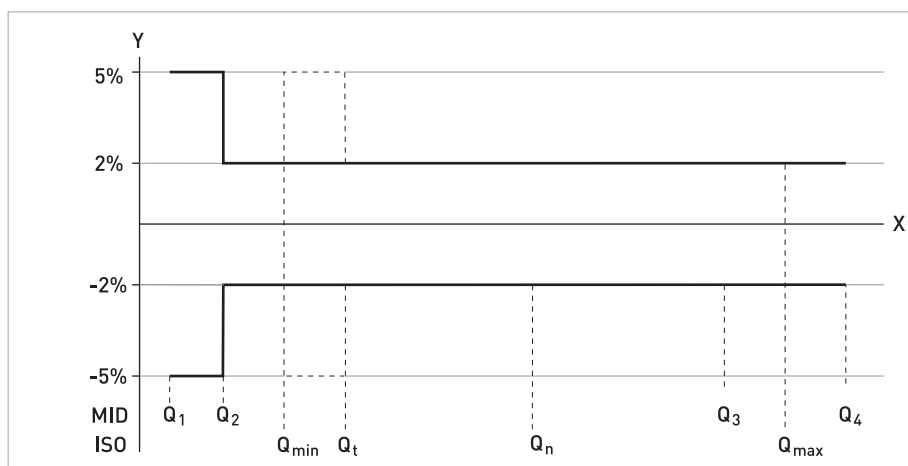


Figure 6-2: ISO flow rates added to figure as comparison towards MID

X: Flow rate

Y [%]: Maximum measuring error

## MI-001 certified flow characteristics

DN	Span (R) Q3 / Q1	Flow rate [m <sup>3</sup> /h]			
		Minimum Q1	Transitional Q2	Permanent Q3	Overload Q4
25	640	0.025	0.040	16	20.0
40	640	0.0625	0.100	40	50.0
50	630	0.100	0.160	63	78.75
65	635	0.1575	0.252	100	125.0
80	640	0.25	0.400	160	200.0
100	625	0.40	0.640	250	312.5
125	640	0.625	1.00	400	500.0
150	630	1.00	1.60	630	787.5
200	508	1.575	2.52	800	1000
250	400	2.50	4.00	1000	1250
300	400	4.00	6.40	1600	2000
350	160	15.625	25.0	2500	3125
400	160	25.00	40.0	4000	5000
450	160	25.00	40.0	4000	5000
500	160	39.375	63.0	6300	7875
600	100	63.00	100.8	6300	7875



### 6.3.2 Verification to MI-001



**INFORMATION!**

Verification to MI-001, standard at the following values for R, Q1, Q2 and Q3.  
Verification at other values for R and Q3 available on request.

#### Verification to MID Annex III (MI-001)

DN	Span (R)	Flow rate [m <sup>3</sup> /h]		
		Q1	Q2	Q3
25	80	0.050	0.08	4
40	80	0.125	0.20	10
50	80	0.200	0.32	16
65	80	0.313	0.50	25
80	80	0.500	0.80	40
100	80	0.788	1.26	63
125	80	1.250	2.00	100
150	80	2.000	3.20	160
200	80	3.125	5.00	250
250	80	5.000	8.00	400
300	80	7.875	12.60	630
350	80	20.00	32.0	1600
400	80	31.25	50.0	2500
450	80	31.25	50.0	2500
500	80	50.00	80.0	4000
600	80	78.75	126	6300

## 6.4 Measurement accuracy

Every electromagnetic flowmeter is calibrated by direct volume comparison. The wet calibration validates the performance of the flowmeter under reference conditions against accuracy limits.

The accuracy limits of electromagnetic flowmeters are typically the result of the combined effect of linearity, zero point stability and calibration uncertainty.

### Reference conditions

- Medium: water
- Temperature: +5...35°C / +41...95°F
- Operating pressure: 0.1...5 barg / 1.5...72.5 psig
- Inlet section:  $\geq 3$  DN
- Outlet section:  $\geq 1$  DN

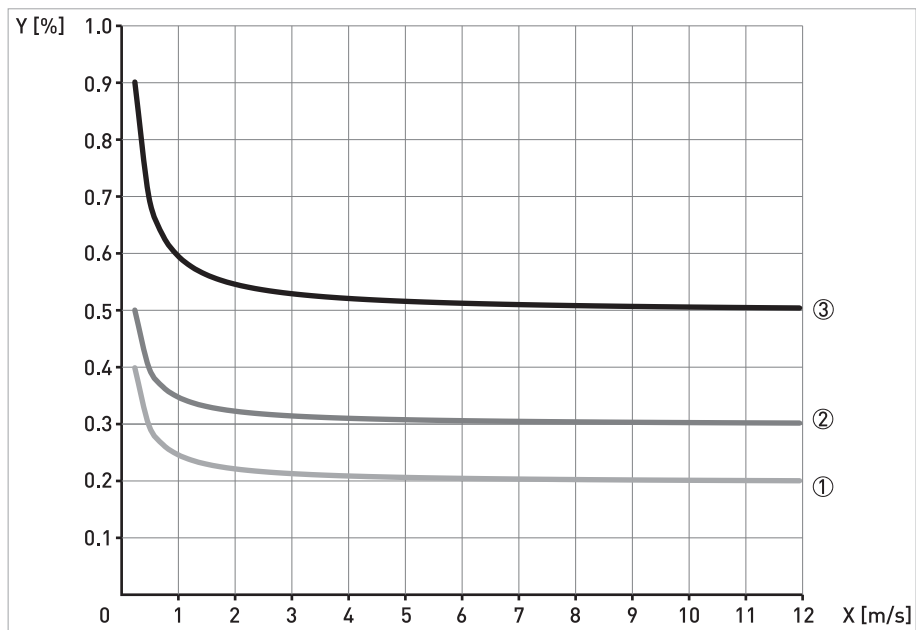


Figure 6-3: Flow velocity vs. accuracy

X [m/s]: flow velocity

Y [%]: deviation from the actual measured value

Converter type	Accuracy	Curve
IFC 050	0.5% of mv +1 mm/s	③
IFC 100	0.3% of mv +1 mm/s	②
IFC 300	0.2% of mv +1 mm/s	①

### 6.4.1 WATERFLUX 3050, 3100 and 3300 without straight inlet and outlet sections

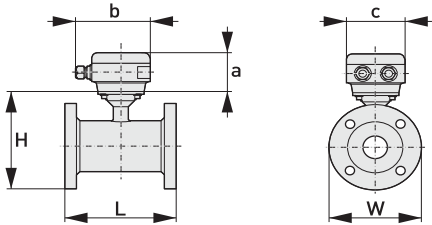
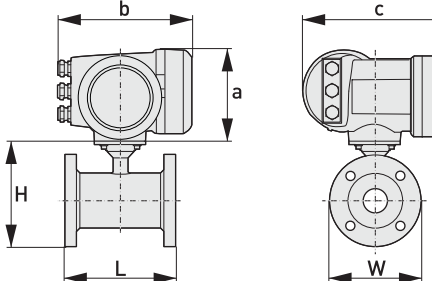
Disturbed flow profiles, such as those that occur behind elbows, tee pieces, reducers or valves installed in front of a flowmeter, affect the measuring performance. Therefore it is usually recommended to fit a straight inlet length in front of and straight outlet length behind a flowmeter.

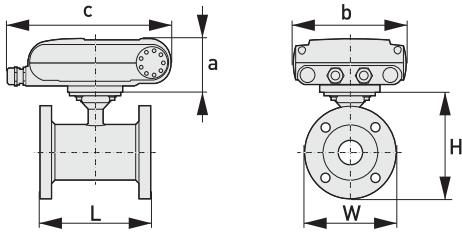
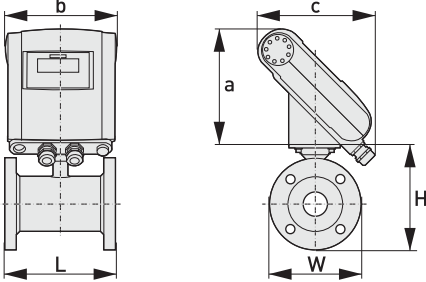
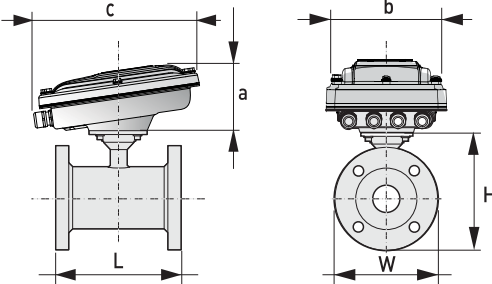
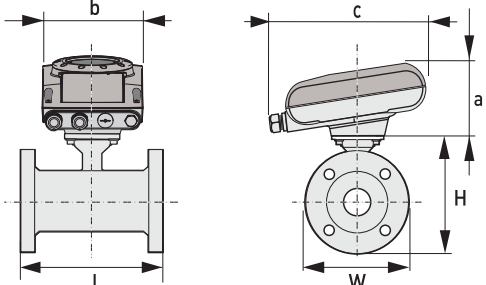
As a result of the unique WATERFLUX flow sensor design, whereby the mean flow velocity and flow profile are optimized within the rectangular and reduced cross section, the additional uncertainty for upstream disturbances are drastically reduced. Therefore the requirements for straight length and in front of and behind a meter are reduced.

#### **EC-type certificate according MID Annex III (MI-001)**

- In combination with the signal converter IFC 300
- Diameter range DN25...600
- Minimum straight inlet and outlet pipe length of 0 DN
- Bi-directional flow

### 6.5 Dimensions and weights

<p><b>Remote version</b></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><b>Compact version with : IFC 300</b></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"                      b = 161 mm / 6.3"                      c = 257 mm / 10.1" ①                      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

6.6 Pressure loss

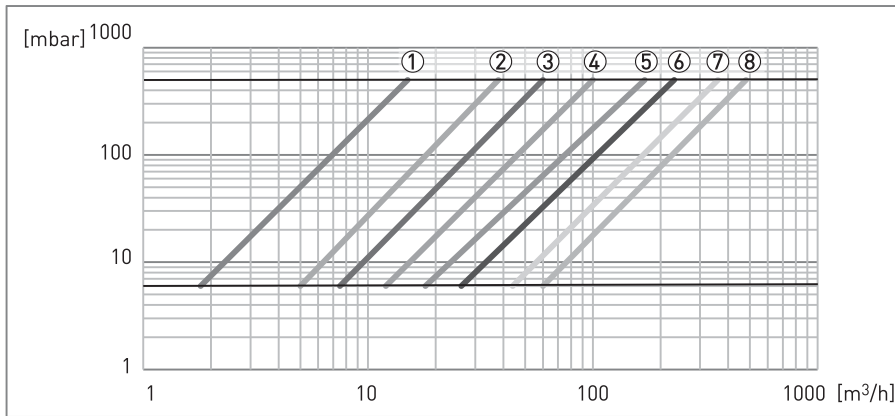


Figure 6-4: Pressure loss between 1...9 m/s / 3.3...30 ft/s for DN25...150 / 1...6"

- ① DN25 / 1"
- ② DN40 / 1½"
- ③ DN50 / 2"
- ④ DN65 / 2½"
- ⑤ DN80 / 3"
- ⑥ DN100 / 4"
- ⑦ DN125 / 5"
- ⑧ DN150 / 6"

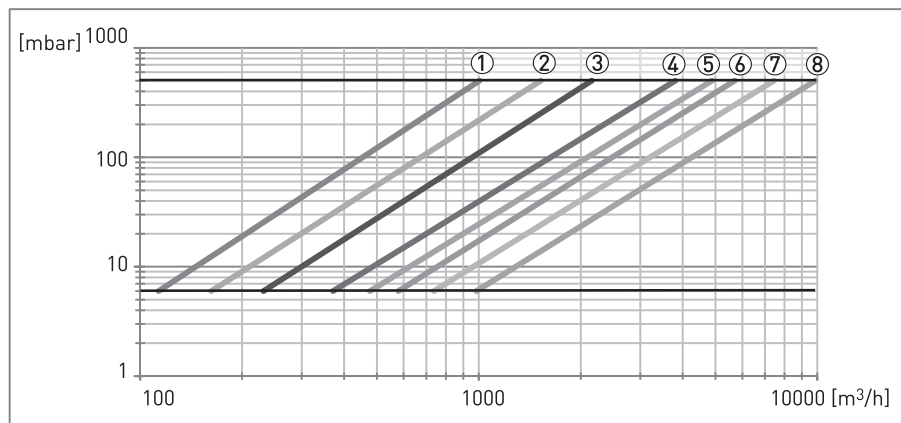


Figure 6-5: Pressure loss between 1...9 m/s / 3.3...30 ft/s for DN200...600 / 8...24"

- ① DN200 / 8"
- ② DN250 / 10"
- ③ DN300 / 12"
- ④ DN350 / 14"
- ⑤ DN400 / 16"
- ⑥ DN450 / 18"
- ⑦ DN500 / 20"
- ⑧ DN600 / 24"











## KROHNE – Process instrumentation and measurement solutions

- Flow
- Level
- Temperature
- Pressure
- Process Analysis
- Services

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

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

**KROHNE**