



# **WATERFLUX 3000**

Handbook

Electromagnetic flow sensor

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

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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.*

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

### Product marking



Figure 1-1: Examples 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.

**Other approvals and standards**

- Measuring Instruments Directive 2014/32/EU, Annex III (MI-001), Annex VI (MI-004) / and UK Measuring Instrument Regulation 2016 No. 1153.

For more information, please refer to the dedicated documentation.

**CAUTION!**

*For devices used in SIL applications, additional safety notes apply. For detailed information refer to the "OPTIFLUX x400 Safety manual".*

## **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.

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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 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, IFC 300 and IFC 400 signal converter and with the battery powered IFC 070 signal converter.

This handbook only describes the combination with the IFC 050, IFC 100, IFC 300 and IFC 400 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 signal converter and one carton contains the flow sensor.

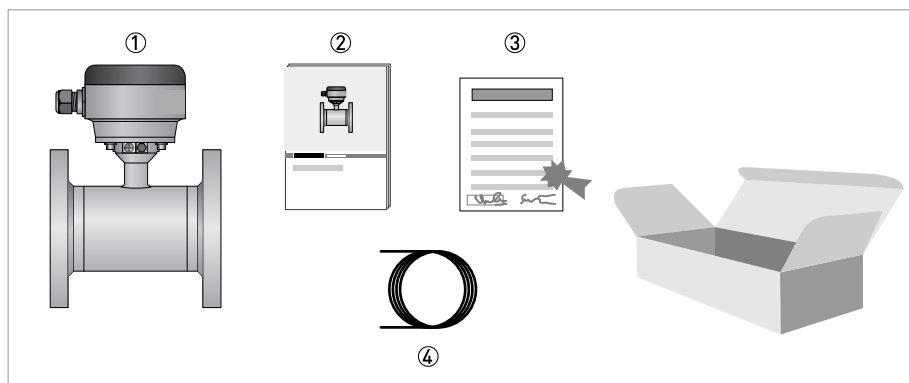


Figure 2-1: Scope of delivery

- ① Ordered flowmeter
- ② Product documentation
- ③ Factory calibration report
- ④ 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.

Scan the auto ID code (data matrix) on the device nameplate to download all product specific information.



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)

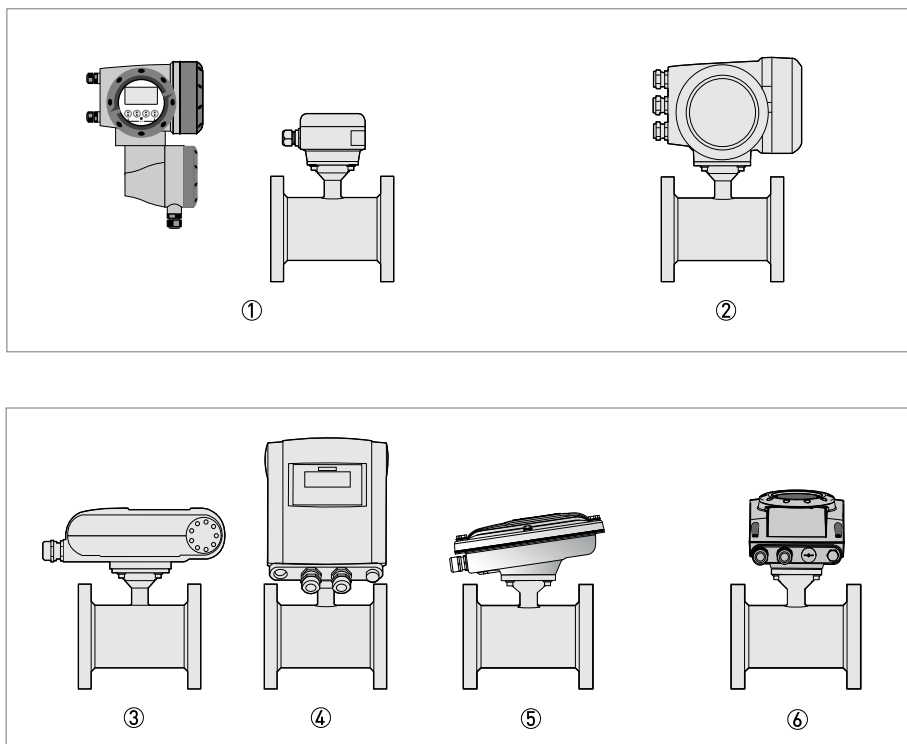


Figure 2-2: Device versions

- ① Remote version (example with IFC 300 / IFC 400 F remote converter)
- ② Compact version with signal converter IFC 300 / IFC 400
- ③ Compact version with signal converter IFC 100 (0°)
- ④ Compact version with signal converter IFC 100 (45°)
- ⑤ Compact version with stainless steel signal converter IFC 100 (10°)
- 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.

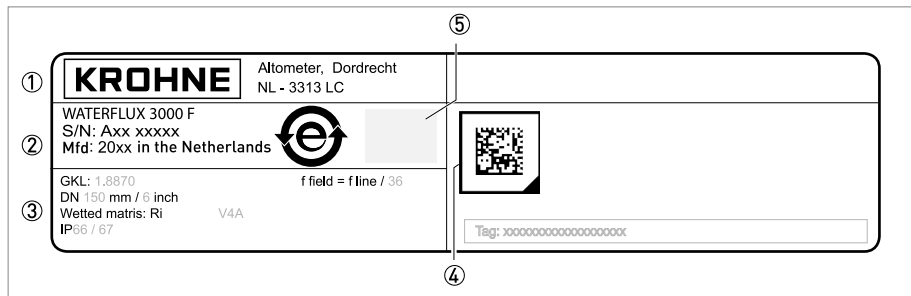


Figure 2-3: Example of nameplate

- ① Name and address of manufacturer
- ② Type designation of the flowmeter, serial number, manufacturing date and country of origin
- ③ Meter constant, diameter, wetted materials, protection class
- ④ Data matrix
- ⑤ Conformity mark (e.g. CE/UKCA) with number(s) of notified body/bodies and disposal logo

### 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

**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.

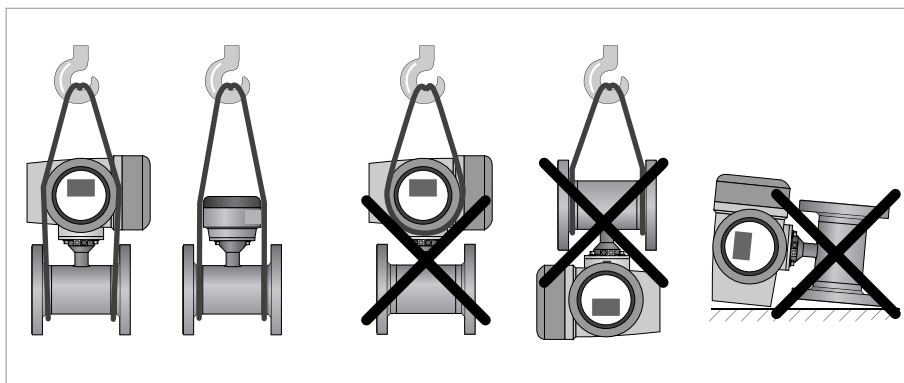


Figure 3-1: Transport

### 3.4 Pre-installation requirements

Make sure that you have all necessary tools available:

- Allen key (4 mm)
- Small screwdriver
- Wrench for cable glands (remote version only)
- 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

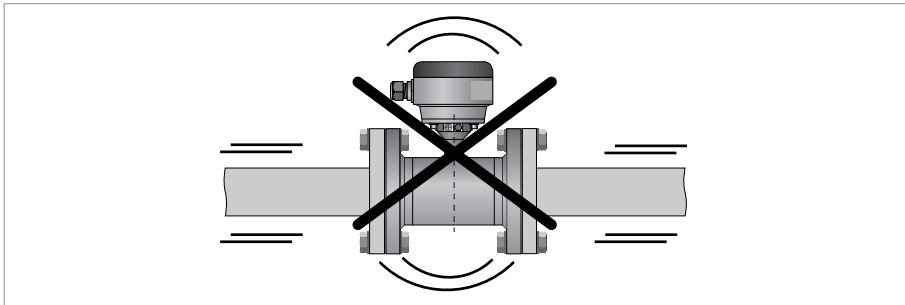


Figure 3-2: Avoid vibrations

#### 3.5.2 Magnetic field

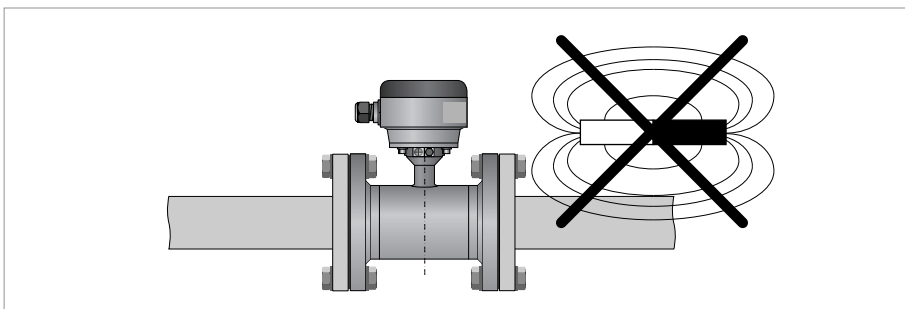


Figure 3-3: Avoid magnetic field

### 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).



#### CAUTION!

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

#### 3.6.1 Inlet and outlet section

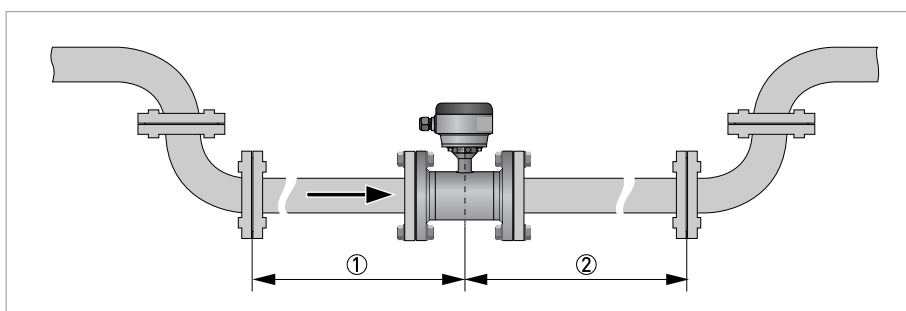


Figure 3-4: Minimal inlet and outlet section

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

#### 3.6.2 T-section

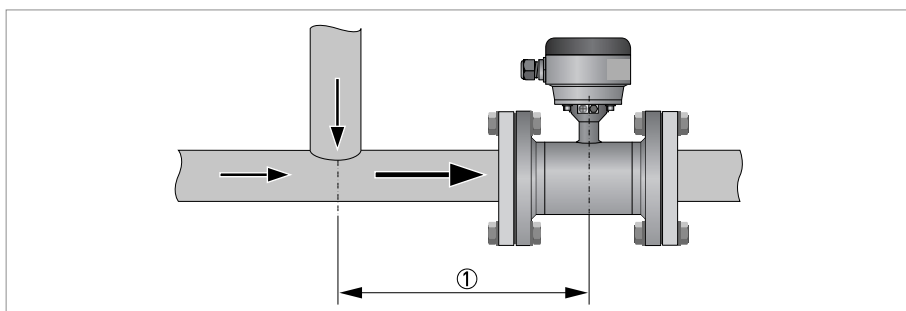


Figure 3-5: Distance behind a T-section

- ①  $\geq 0$  DN

#### 3.6.3 Open discharge

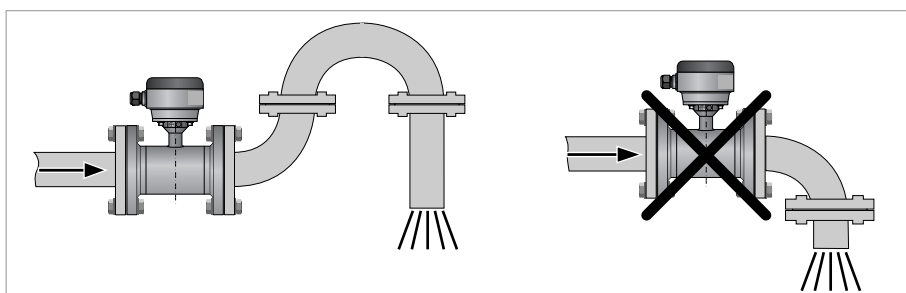


Figure 3-6: Installation in front of an open discharge

### 3.6.4 Bends

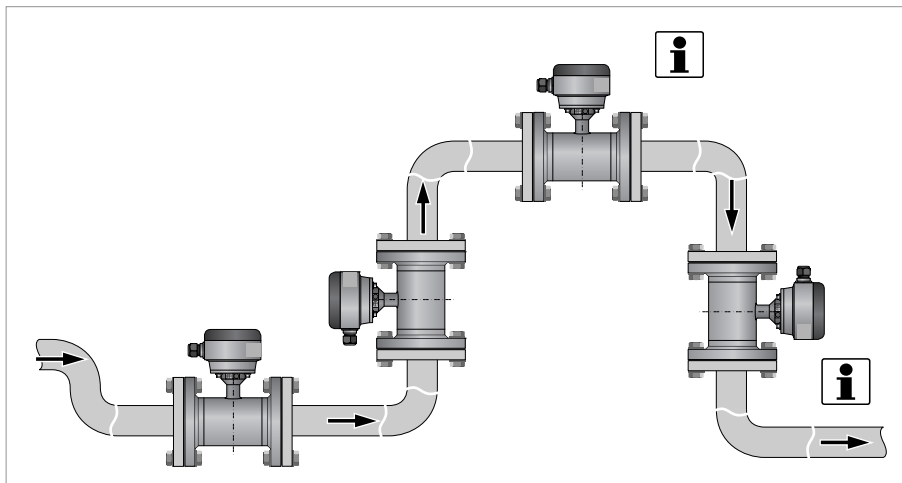


Figure 3-7: Installation in bending pipes (90°)



**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.*

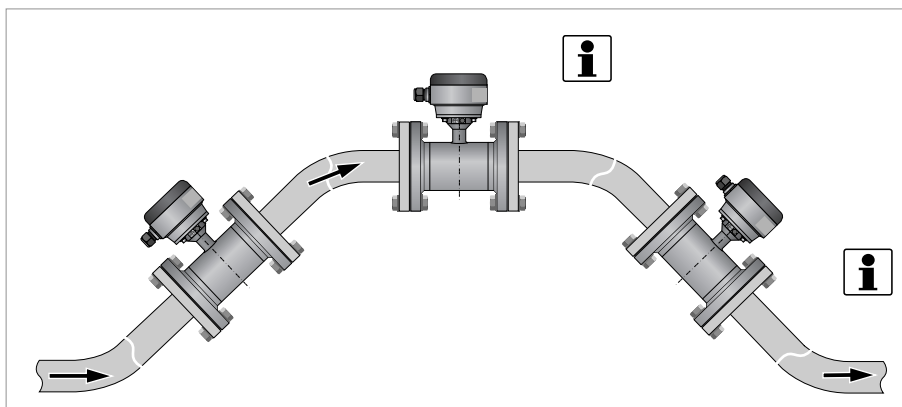


Figure 3-8: Installation in bending pipes (45°)



**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.*

### 3.6.5 Pump

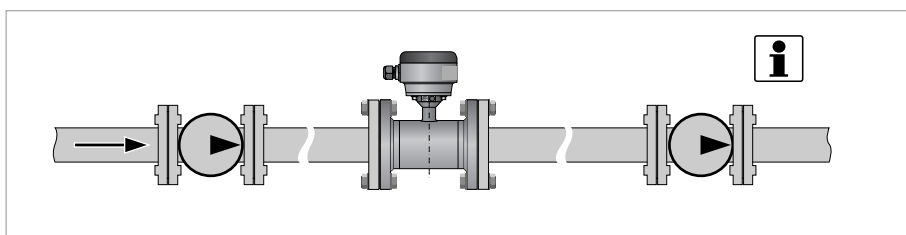


Figure 3-9: Installation behind a pump



#### **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.*

### 3.6.6 Control valve

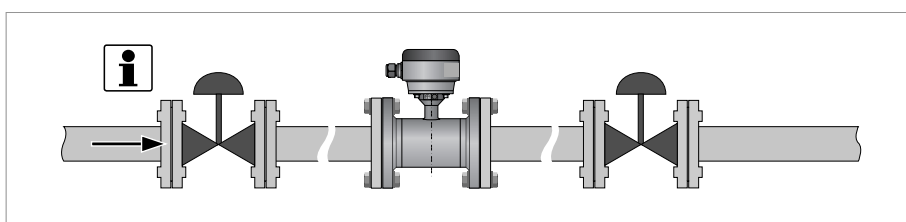


Figure 3-10: Installation in front of a control valve



#### **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).*

### 3.6.7 Air venting and vacuum forces

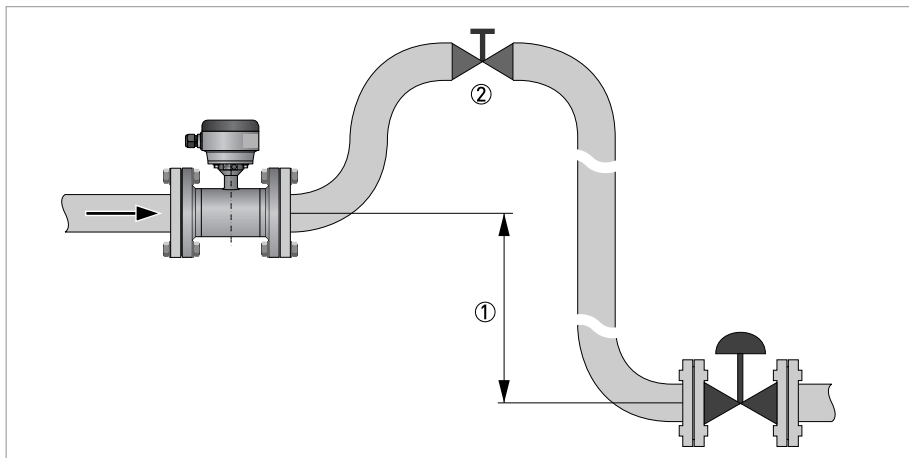


Figure 3-11: Air venting

- ①  $\geq 5 \text{ m} / 17 \text{ ft}$
- ② Air ventilation point

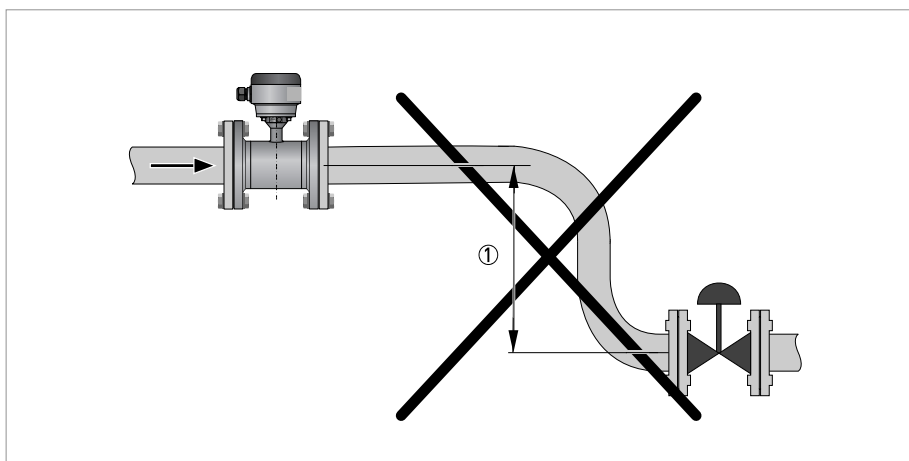


Figure 3-12: Vacuum

- ①  $\geq 5 \text{ m} / 17 \text{ ft}$

## 3.6.8 Flange deviation

**CAUTION!**

Max. permissible deviation of pipe flange faces:

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

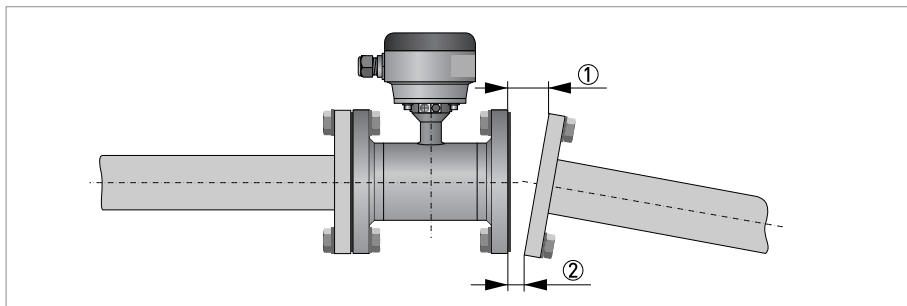


Figure 3-13: Flange deviation

①  $L_{max}$

②  $L_{min}$

## 3.6.9 Mounting position

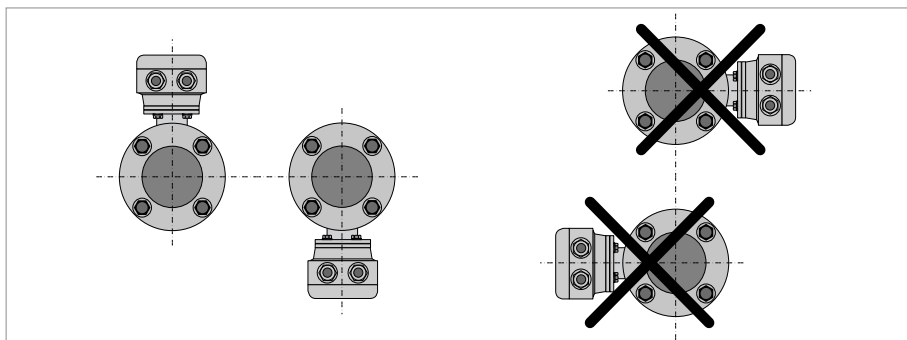


Figure 3-14: Mounting position

- Install the flow sensor with the signal converter aligned upwards or downwards.
- Install the flow sensor in line with the pipe axis.
- Pipe flange faces must be parallel to each other.

### 3.7 Installation in a metering pit and subsurface applications

The WATERFLUX 3000 flow sensor is rated IP68, NEMA 6P and is suitable for continuous submersion in flooded measurement chambers. The flow sensor can withstand a 10 meter water column and can be installed (buried) underground also (optional coating for subsurface application).

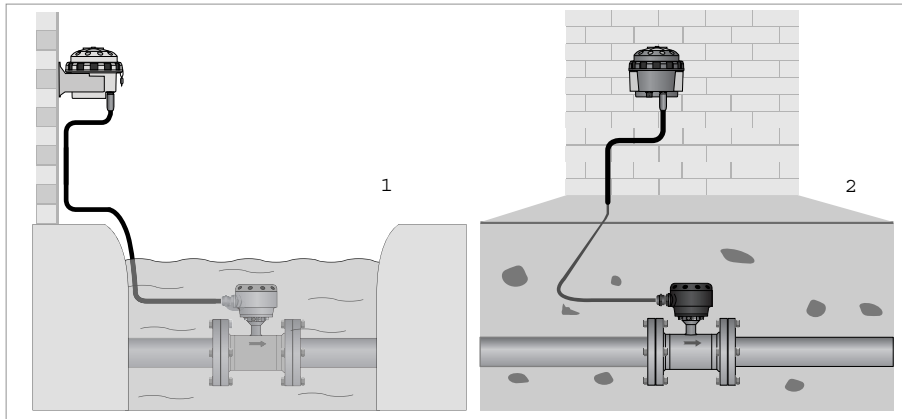


Figure 3-15: Examples of flooded and buried application

- ① Submersible
- ② Buried

The remote version of the IFC 050, IFC 100, IFC 300 and IFC 400 signal converters are IP66/67, NEMA 4/4X rated and can be installed in a dry area on the wall of the measuring pit for visual read out of the display.

#### Submersion applications

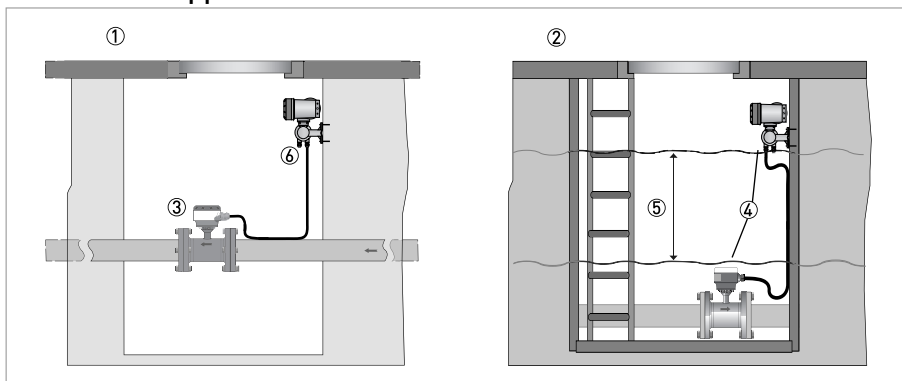


Figure 3-16: Examples of installation in measuring pit

- 1 Periodic submersion
- 2 Continuous submersion
- 3 Sensor (remote)
- 4 Remote version
- 5 Maximum water column 10 meter / 33 ft
- 6 Signal converter (remote)

## 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.

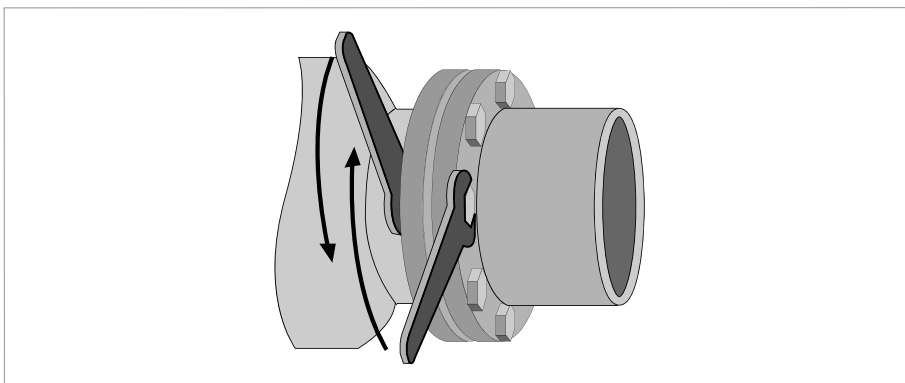


Figure 3-17: Tightening of bolts



#### 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<br>DN [mm] | Pressure<br>rating | Bolts     | Max. torque<br>[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 ②            | 12 x M 20 | 57                               |
| 250                     | PN 10              | 12 x M 20 | 80                               |
| 250                     | PN 16 ②            | 12 x M 24 | 100                              |
| 300                     | PN 10              | 12 x M 20 | 95                               |
| 300                     | PN 16 ②            | 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.

② No full rating (max. 10 bar)

| Nominal size<br>[inch] | Flange class<br>[lb] | Bolts       | Max. torque<br>[lbs.ft] <sup>①</sup> |
|------------------------|----------------------|-------------|--------------------------------------|
| 1                      | 150                  | 4 x 1/2"    | 4                                    |
| 1 1/2                  | 150                  | 4 x 1/2"    | 11                                   |
| 2                      | 150                  | 4 x 5/8"    | 18                                   |
| 2 1/2                  | 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.*

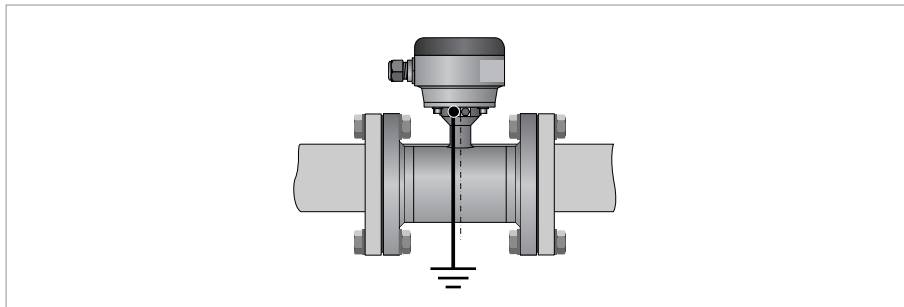


Figure 4-1: Grounding

**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:          |  |
| Telephone number:                                                                                                                                |                                                                           | Email address: |  |
| Fax number:                                                                                                                                      |                                                                           |                |  |
| 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:

$$U = v \cdot k \cdot B \cdot D$$

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.

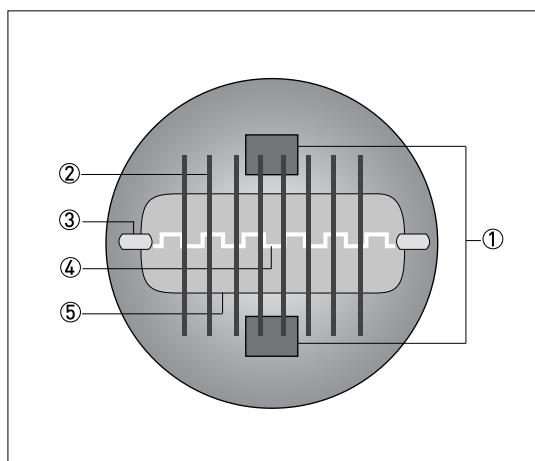


Figure 6-1: Measuring principle

- 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        | This electromagnetic flowmeter is designed exclusively to measure the flow of electrically conductive, liquid media. |
| <b>Measured value</b>    |                                                                                                                      |
| Primary measured value   | Flow velocity                                                                                                        |
| Secondary measured value | Volume flow                                                                                                          |

### Design

|                      |                                                                                                                                                                                                                      |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Features             | Unique rectangular flow sensor design providing improved flow profile and signal to noise ratio resulting in highest accuracy and large turndown ratio                                                               |
|                      | Rilsan® polymer coated flow sensor 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 signal converter IFC 050: WATERFLUX 3050 C                                                                                                                                                                      |
|                      | With signal converter IFC 100: WATERFLUX 3100 C                                                                                                                                                                      |
|                      | With signal converter IFC 300: WATERFLUX 3300 C                                                                                                                                                                      |
|                      | With signal converter IFC 400: WATERFLUX 3400 C                                                                                                                                                                      |
| Remote version       | In wall (W) mount version with IFC 050 signal converter: WATERFLUX 3050 W                                                                                                                                            |
|                      | In wall (W) mount version with IFC 100 signal converter: WATERFLUX 3100 W                                                                                                                                            |
|                      | In field (F), wall (W) or rack (R) mount version with signal converter IFC 300: WATERFLUX 3300 F, W or R                                                                                                             |
|                      | In field (F), wall (W) or rack (R) mount version with signal converter IFC 400: WATERFLUX 3400 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                                                                                                                                                    |
|                                                                                       | IFC 400: 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 35.                                                                                                                                   |
| Repeatability                                                                         | DN25...300 / 1...12": $\pm 0.1\%$ ( $v > 0.5$ m/s / 1.5 ft/s)<br>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 III.<br>Standard: Verification at Ratio ( $Q_3/Q_1$ ) = 80, $Q_3 \geq 2$ m/s / 6.6 ft/s<br>Optional: Verification at Ratio ( $Q_3/Q_1$ ) > 80 |
|                                                                                       | Only in combination with the IFC 300 signal converter.                                                                                                                                                      |
| MID Annex III (MI-001)<br>(Directive 2014/32/EU /<br>UK Regulations 2016 No.<br>1153) | <b>EC-Type examination certificate to MID Annex III</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 ( $Q_3/Q_1$ ) up to 640                                                                                                                                                                               |
|                                                                                       | Liquid temperature range: + 0.1°C / 50°C                                                                                                                                                                    |
|                                                                                       | Maximum operating pressure:<br>$\leq$ DN200 / 8": 16 bar / 232 psi, $\geq$ DN250 / 10": 10 bar / 145 psi                                                                                                    |
|                                                                                       | For detailed information refer to <i>Legal metrology</i> on page 32.                                                                                                                                        |

### Operating conditions

|                                                                                     |                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Temperature</b>                                                                  |                                                                                                                                                                                                                                                                              |
| Process temperature                                                                 | -5...+70°C / +23...+158°F                                                                                                                                                                                                                                                    |
| Ambient temperature                                                                 | <b>Standard:</b> DN25...200, remote or compact version with aluminium converter housing and with stainless steel flanges: -40...+65°C / -40...+149°F and compact version with stainless steel converter housing and with stainless steel flanges: -40...+55°C / -40...+130°F |
|                                                                                     | <b>Standard:</b> DN250...600, remote version with stainless steel converter housing and with carbon steel flanges: -20...+65°C / -4...+149°F and compact version with stainless steel converter housing and with carbon steel flanges: -20...+55°C / -4...+130°F             |
|                                                                                     | <b>Option:</b> DN250...600 with low temperature carbon steel or stainless steel flanges: -40...+65°C / -40...+130°F                                                                                                                                                          |
| 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                                                                                                                                                                                                                                               |
| <b>Pressure</b>                                                                     |                                                                                                                                                                                                                                                                              |
| Operating pressure                                                                  | Up to 16 bar / 232 psi for DN25...200 / 1...12"<br>Up to 10 bar / 150 psi for DN250...600 / 14...24"                                                                                                                                                                         |
| Vacuum load                                                                         | 0 mbar / 0 psi absolute                                                                                                                                                                                                                                                      |
| Pressure loss                                                                       | For detailed information refer to <i>Pressure loss</i> on page 41.                                                                                                                                                                                                           |
| <b>Chemical properties</b>                                                          |                                                                                                                                                                                                                                                                              |
| Physical condition                                                                  | Electrically conductive liquids<br>(For salt water please contact the factory).                                                                                                                                                                                              |
| Electrical conductivity                                                             | Standard measurement                                                                                                                                                                                                                                                         |
|                                                                                     | For detailed information refer to the relevant signal converter document.                                                                                                                                                                                                    |

### 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.                      |
| Straight inlet run     | ≥ 0 DN                                                                      |
|                        | For detailed information refer to <i>Measurement accuracy</i> on page 35.   |
| Straight outlet run    | ≥ 0 DN                                                                      |
|                        | For detailed information refer to <i>Measurement accuracy</i> on page 35.   |
| Dimensions and weights | For detailed information refer to <i>Dimensions and weights</i> on page 37. |

### Materials

|                      |                                                                                                                        |
|----------------------|------------------------------------------------------------------------------------------------------------------------|
| Sensor housing       | Sheet steel                                                                                                            |
| Measuring tube       | DN25...200 / 1...8": metallic alloy                                                                                    |
|                      | DN250...600 / 10...24": stainless steel                                                                                |
| Flanges              | DN250...600 / 10...24": steel 1.0460 / 1.0038 (RSt37-2)<br>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: standard coating                                                                                             |
|                      | 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": PN 16 (DN350...600 / 14...24": 10 bar rated)                                                        |
| ASME              | 1" ...12": 150 lb RF (232 psi / 16 bar rated)<br>14" ...24": 150 lb (150 psi / 10 bar rated)                                |
| JIS               | DN25...300 / 1" ...12": 10 K<br>DN350...600 / 14" ...24": 7.5 K                                                             |
| AS 4087           | DN25...600 / 1" ...24": Class 16: on request<br>(DN350...600 / 14" ...24": 10 bar rated)                                    |
| AS 2129           | DN25...600 / 1" ...24": Table D & E: on request<br>(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 37. |
| Other connections |                                                                                                                             |
| Thread            | DN25 / 1": G1" thread connection on request                                                                                 |
|                   | DN40 / 1 1/2": 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, IFC 300 and the IFC 400 signal converter.</b><br>Standard cable, double shielded.<br>Max. length: 600 m / 1950 ft<br>(depends on electrical conductivity and measuring sensor).<br>For detailed information refer to the documentation of the relevant signal converter. |
| Type B (BTS)                               | <b>Only in combination with the IFC 300 and IFC 400 signal converter.</b><br>Optional cable, triple shielded.<br>Max. length: 600 m / 1950 ft<br>(depends on electrical conductivity and measuring sensor).<br>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 signal converter.                                                                                                                                                                                      |

### Approvals and certificates

|                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CE</b>                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                               |
| This device fulfills 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.                                                                                                    |
| Custody transfer                                                                                                                                                                        | Only in combination with the IFC 300 signal converter.<br>Directive: 2014/32/EU / UK Regulations 2016 No. 1153 MID Annex III (MI-001) and MID Annex VI (MI-004) type examination certificate (DN25...600 / 1...24")<br>Innerstaatliche Bauartzulassung als Kältezähler (For Germany, Switzerland and Austria) |
| <b>Other approvals and standards</b>                                                                                                                                                    |                                                                                                                                                                                                                                                                                                               |
| Drinking water approvals                                                                                                                                                                | ACS, DVGW W270, NSF / ANSI / CAN Standard 61, TZW, KIWA (ATA), KTW, WRAS                                                                                                                                                                                                                                      |
| Protection category acc. to IEC 60529                                                                                                                                                   | <b>Standard:</b><br>IP66/67, NEMA 4/4X/6<br><b>Option:</b><br>IP68 factory, NEMA 6P<br>IP68 field, NEMA 6P<br>IP68 is only available for separate design                                                                                                                                                      |
| Corrosion protection class acc. to ISO 12944-2                                                                                                                                          | Standard: C3 medium<br>Option: off-shore paint C5-I high - C5-M high                                                                                                                                                                                                                                          |
| Shock test                                                                                                                                                                              | IEC 60068-2-27<br>30 g for 18 ms                                                                                                                                                                                                                                                                              |
| Vibration test                                                                                                                                                                          | IEC 60068-2-64<br>f = 20...2000 Hz, rms = 4.5 g, t = 30 min                                                                                                                                                                                                                                                   |

## 6.3 Legal metrology



### INFORMATION!

MID Annex III (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 / UK Regulation 2016 No. 1153 Annex III (MI-001).

Annex MI-001 of the MID applies to water meters intended for the measurement of 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 3000 has a 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 WATERFLUX 3000 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  $\pm 5\%$ .

$$Q1 = Q3 / R$$

$$Q2 = Q1 * 1.6$$

$$Q3 = Q1 * R$$

$$Q4 = Q3 * 1.25$$

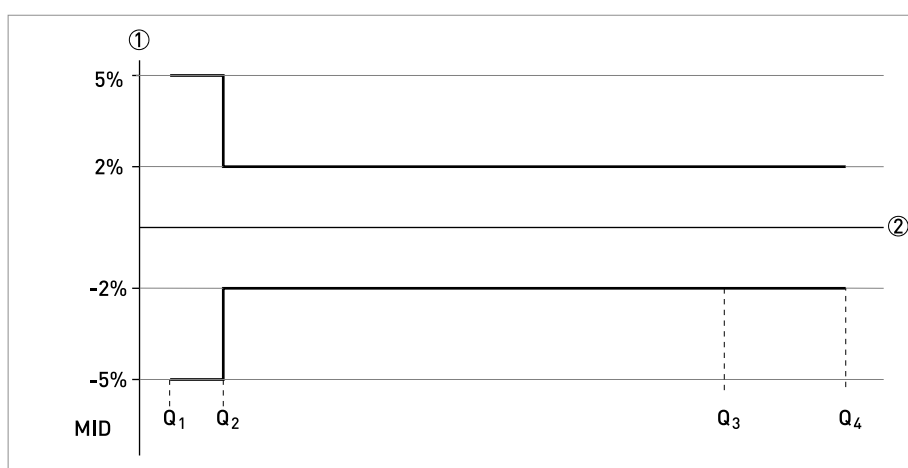


Figure 6-2: ISO flow rates added to figure as comparison towards MID

X: Flow rate

Y [%]: Maximum measuring error

## MI-001 certified flow characteristics

| DN  | Span (R)<br>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            | 630          | 787.5       |
| 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

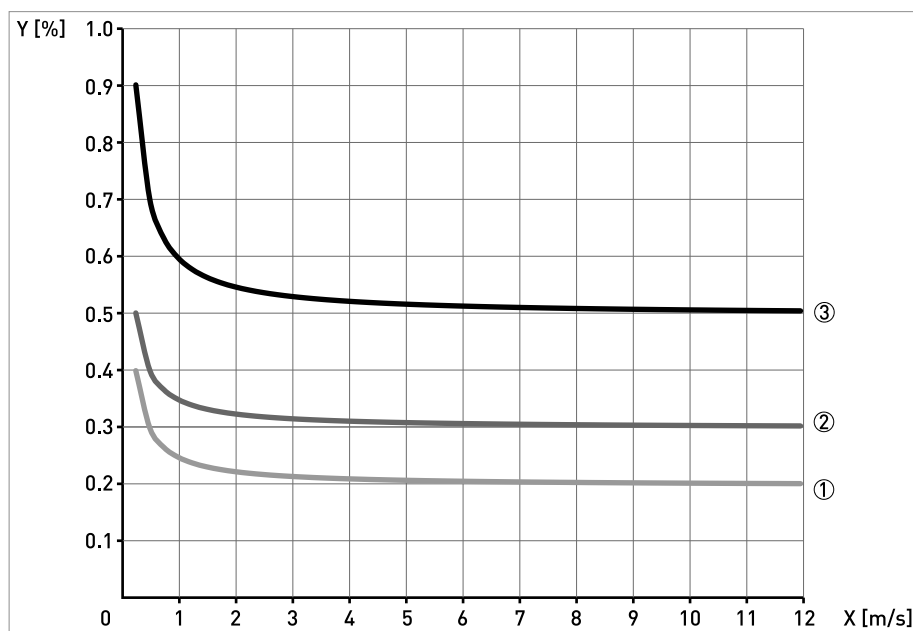


Figure 6-3: Flow velocity vs. accuracy

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     |
| IFC 400        | 0.2% of mv +1 mm/s | ①     |

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

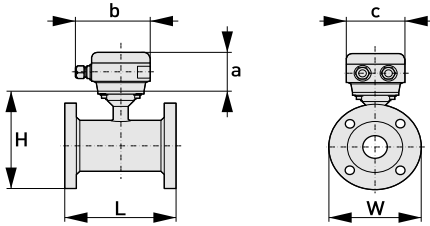
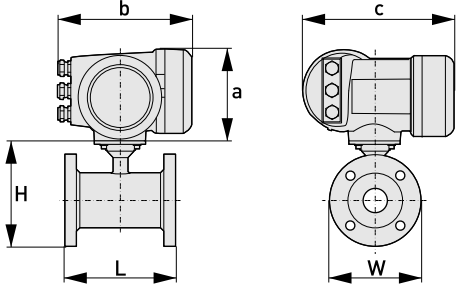
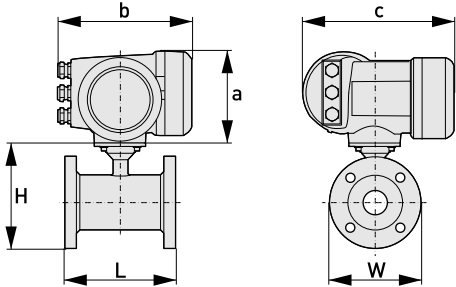
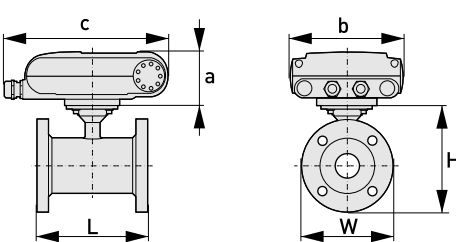
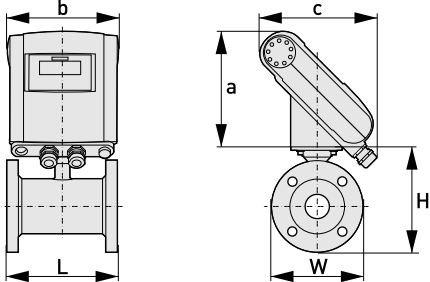
Disturbed flow profiles, such as those that occur behind elbows, tee pieces, reducers or valves installed in front of a flowmeter, affect the measuring performance. Therefore it is usually recommended to fit a straight inlet length in front of and straight outlet length behind a flowmeter.

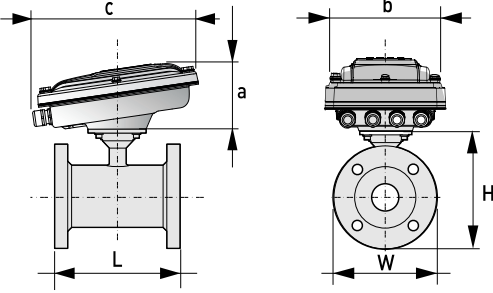
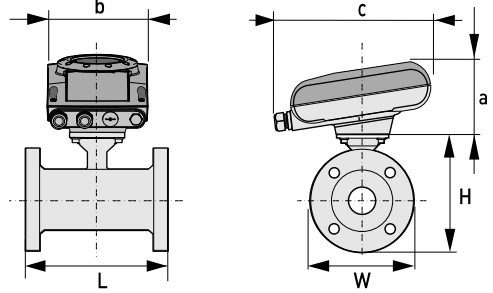
As a result of the unique WATERFLUX 3000 flow sensor design, whereby the mean flow velocity and flow profile are optimized within the rectangular and reduced cross section, the additional uncertainty for upstream disturbances are drastically reduced. Therefore the requirements for straight length and in front of and behind a meter are reduced.

##### Type certificate according MID Annex III (MI-001)

- In combination with the signal converter IFC 300
- Diameter range DN25...600 / 1...24"
- Minimum straight inlet and outlet pipe length of 0 DN
- Bi-directional flow

## 6.5 Dimensions and weights

|                                        |                                                                                      |                                                                                                           |
|----------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Remote version                         |     | <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>   |
| Compact version with:<br>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:<br>IFC 400       |   | <p>a = 160 mm / 6.3"</p> <p>b = 240 mm / 9.5" ①</p> <p>c = 260 mm / 10.2"</p> <p>Total height = H + a</p> |
| Compact version with:<br>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:<br>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>  |

|                                                        |                                                                                    |                                                                                                                                                                                             |
|--------------------------------------------------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Compact version with:<br>stainless steel IFC 100 (10°) |  | <p><math>a = 100 \text{ mm} / 4''</math></p> <p><math>b = 187 \text{ mm} / 7.36''</math> ①</p> <p><math>c = 270 \text{ mm} / 10.63''</math></p> <p>Total height = <math>H + a</math></p>    |
| Compact version with:<br>IFC 050 (10°)                 |  | <p><math>a = 101 \text{ mm} / 3.98''</math></p> <p><math>b = 157 \text{ mm} / 6.18''</math></p> <p><math>c = 260 \text{ mm} / 10.24''</math> ①</p> <p>Total height = <math>H + a</math></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<br>DN [mm] | Dimensions [mm] |     |     | Approx. weight<br>[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<br>[inch] | Dimensions [inch] |       |      | Approx. weight<br>[lb] |
|------------------------|-------------------|-------|------|------------------------|
|                        | L                 | H     | W    |                        |
| 1                      | 5.91              | 5.83  | 4.3  | 18                     |
| 1 1/2                  | 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

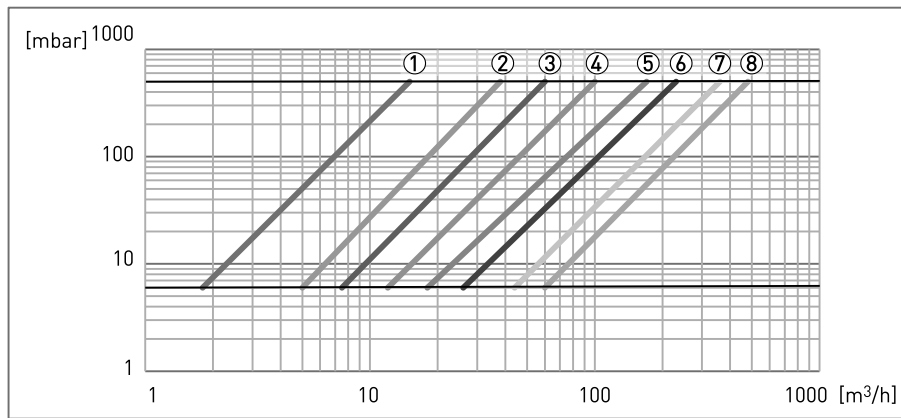


Figure 6-4: Pressure loss between 1...9 m/s / 3.3...30 ft/s for DN25...150 / 1...6"

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

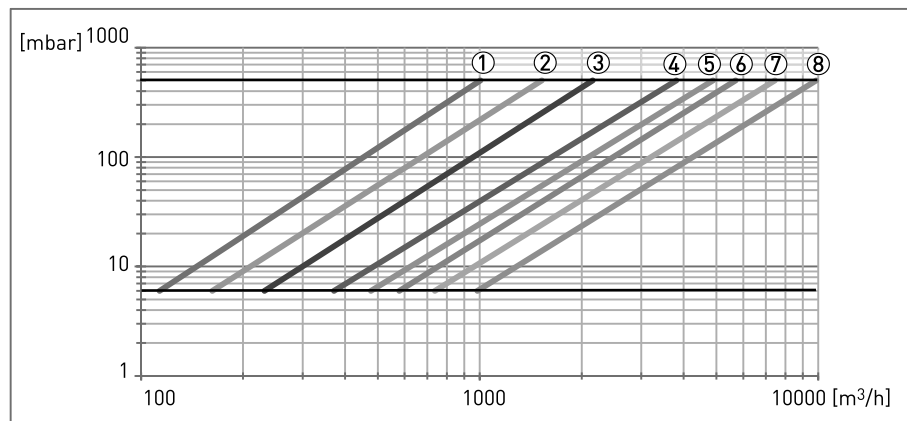
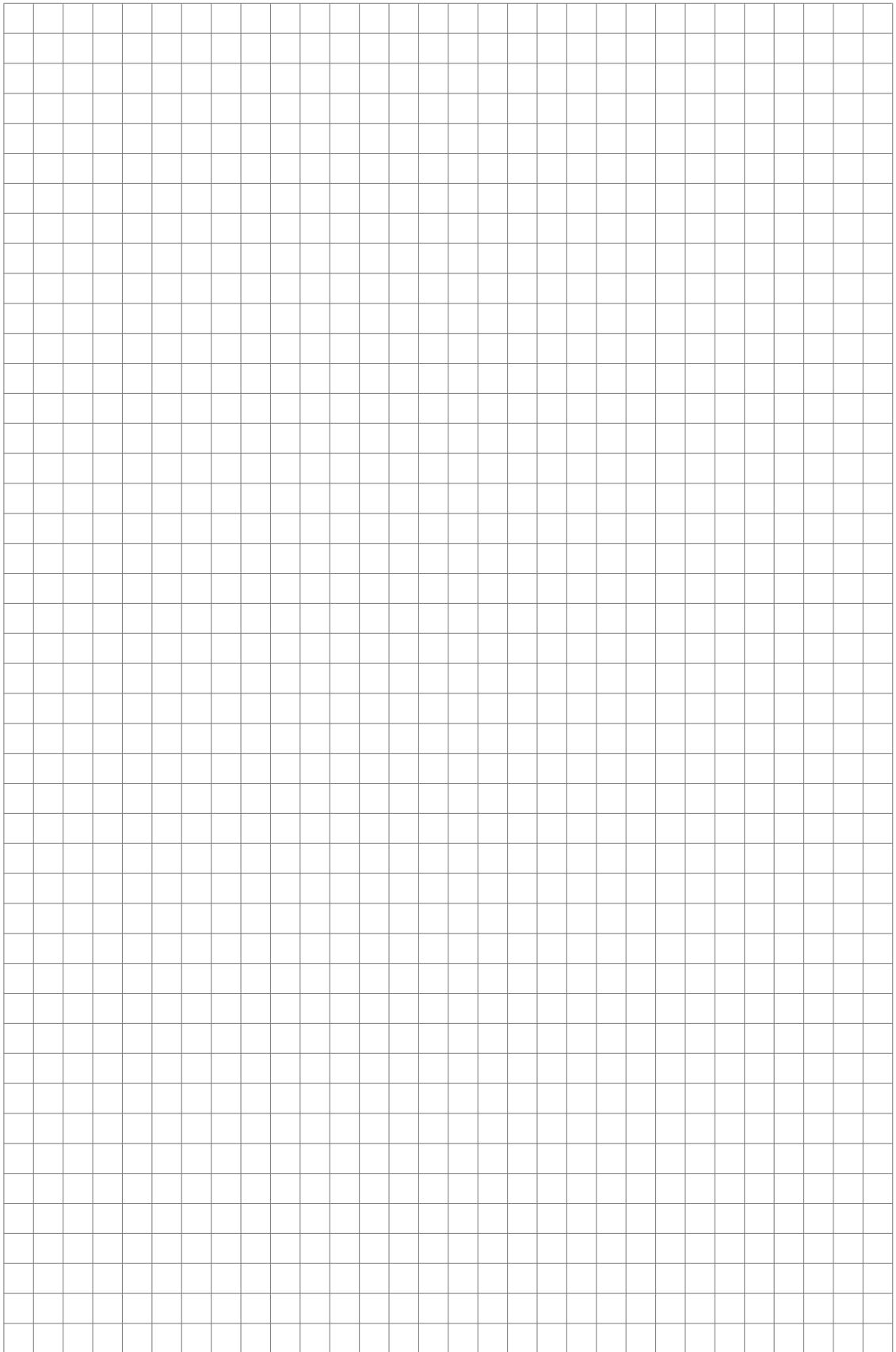


Figure 6-5: Pressure loss between 1...9 m/s / 3.3...30 ft/s for DN200...600 / 8...24"

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

[illegible]



## **KROHNE – Products, Solutions and Services**

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