



## **OPTIFLUX 5000** Handbook

Electromagnetic flowmeter in sandwich version

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.*

The **OPTIFLUX 5000** flowmeter measures the volumetric flow rate of electrically conductive liquids, acids, alkaline solutions, pastes and slurries, also with very high solid contents.

## 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.

**DANGER!**

*For devices used in hazardous areas, additional safety notes apply. Please refer to the Ex 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.

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 cannot accept responsibility for any damage or injury caused by misunderstanding of the information in this document.

This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device. Special considerations and precautions are also described in the document, which appear in the form of icons as shown below.

### 1.3.5 Warnings and symbols used

Safety warnings are indicated by the following symbols.



**DANGER!**

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



**DANGER!**

*This warning refers to the immediate danger of burns caused by heat or hot surfaces.*



**DANGER!**

*This warning refers to the immediate danger when using this device in a hazardous atmosphere.*



**DANGER!**

*These warnings must be observed without fail. Even partial disregard of this warning can lead to serious health problems and even death. There is also the risk of seriously damaging the device or parts of the operator's plant.*



**WARNING!**

*Disregarding this safety warning, even if only in part, poses the risk of serious health problems. There is also the risk of damaging the device or parts of the operator's plant.*



**CAUTION!**

*Disregarding these instructions can result in damage to the device or to parts of the operator's plant.*



**INFORMATION!**

*These instructions contain important information for the handling of the device.*



**LEGAL NOTICE!**

*This note contains information on statutory directives and standards.*



• **HANDLING**

This symbol designates all instructions for actions to be carried out by the operator in the specified sequence.

➡ **RESULT**

This symbol refers to all important consequences of the previous actions.

## 1.4 Safety instructions for the operator



**WARNING!**

*In general, devices from the manufacturer may only be installed, commissioned, operated and maintained by properly trained and authorized personnel.*

*This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device.*



## 2.1 Scope of delivery


**INFORMATION!**

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.

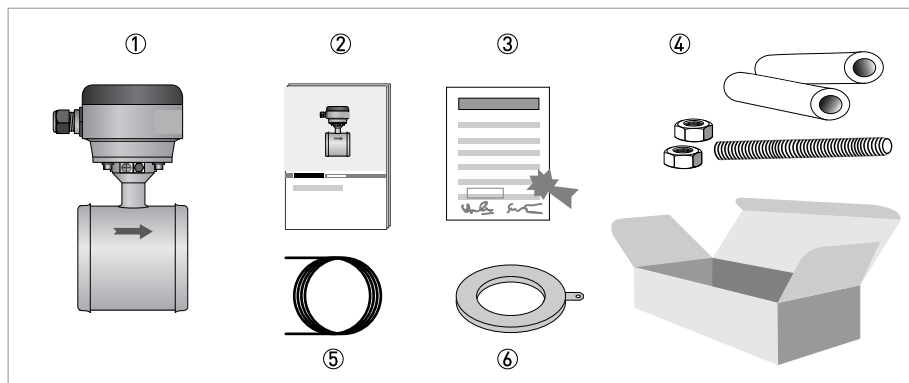


Figure 2-1: Scope of delivery

- ① Ordered flowmeter
- ② Product documentation
- ③ Factory calibration report
- ④ Mounting material (rubber sleeves). Optional; studs and bolts.
- ⑤ Signal cable (remote versions only)
- ⑥ Grounding rings (optional  $\geq$  DN 25/1")


**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 flow sensor)
- Remote version (a flow sensor with connection box and a separate signal converter)

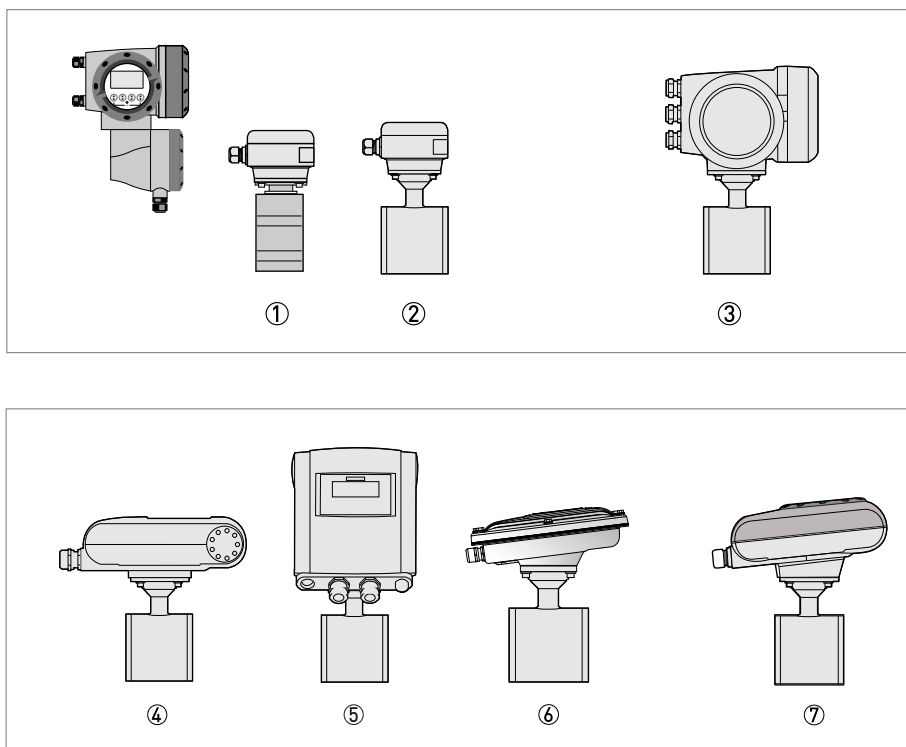


Figure 2-2: Device versions

- ① Remote version IFC 300/ IFC 400 (DN2.5...15)
- ② Remote version IFC 300/ IFC 400 (DN25...100)
- ③ Compact version with IFC 300/ IFC 400 signal converter
- ④ Compact version with IFC 100 (0°) signal converter
- ⑤ Compact version with IFC 100 (45°) signal converter
- ⑥ Compact version with IFC 100 (10°) stainless steel signal converter
- ⑦ Compact version with IFC 050 (10°) signal converter

## 2.3 Nameplates (examples)



### 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.

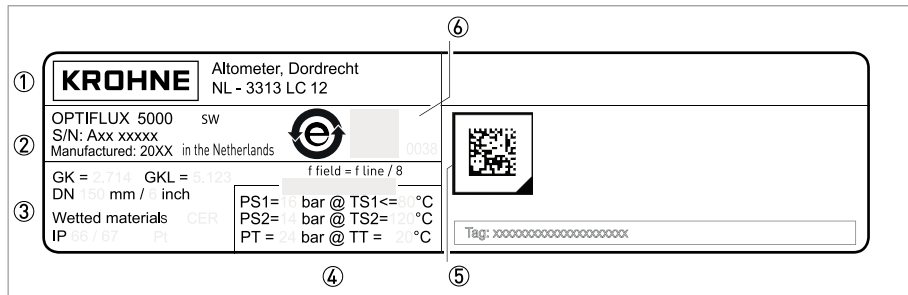


Figure 2-3: Example of the nameplate on the flow sensor

- ① Name and address of the manufacturer
- ② Type designation of the flowmeter, serial number and manufacturing date
- ③ Calibration data
- ④ PED data
- ⑤ Data matrix
- ⑥ Conformity marking (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 the device, use lifting straps.

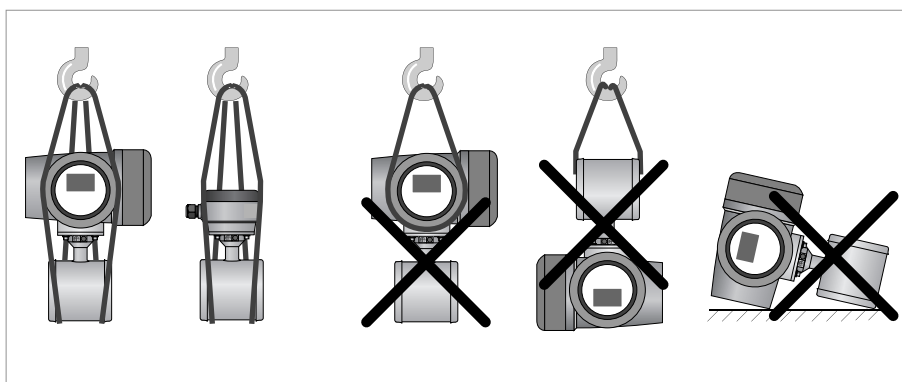


Figure 3-1: Transport

### 3.4 Pre-installation requirements

Make sure that you have all necessary tools available:

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

### 3.5 General requirements



**INFORMATION!**

*The following precautions must be taken to ensure reliable installation.*

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

#### 3.5.1 Vibrations

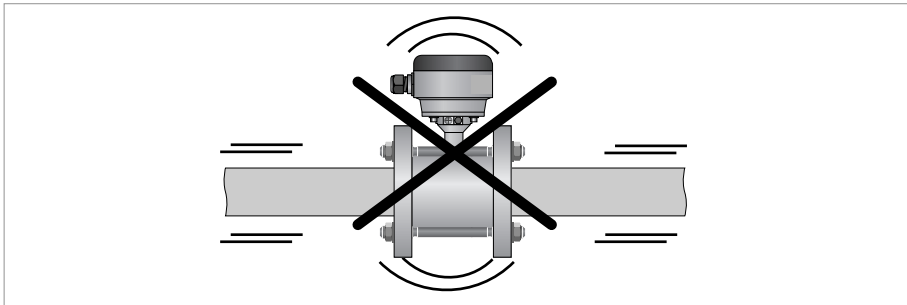


Figure 3-2: Avoid vibrations

#### 3.5.2 Magnetic field

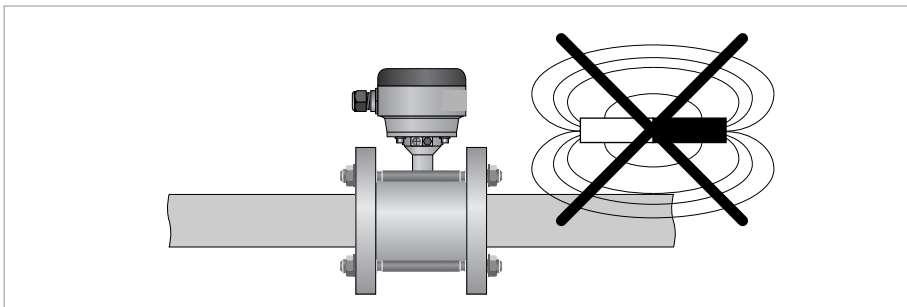


Figure 3-3: Avoid magnetic fields

### 3.6 Installation conditions

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

#### 3.6.1 Inlet and outlet

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

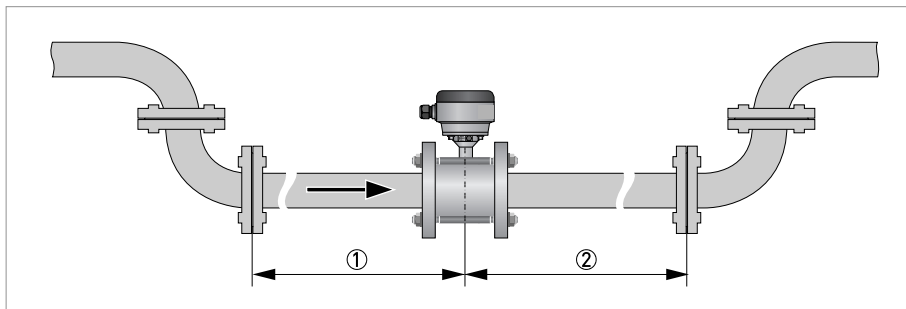


Figure 3-4: Recommended inlet and outlet section

- ① Refer to chapter "Bends in 2 or 3 dimensions"
- ②  $\geq 2 \text{ DN}$

#### 3.6.2 Bends in 2 or 3 dimensions

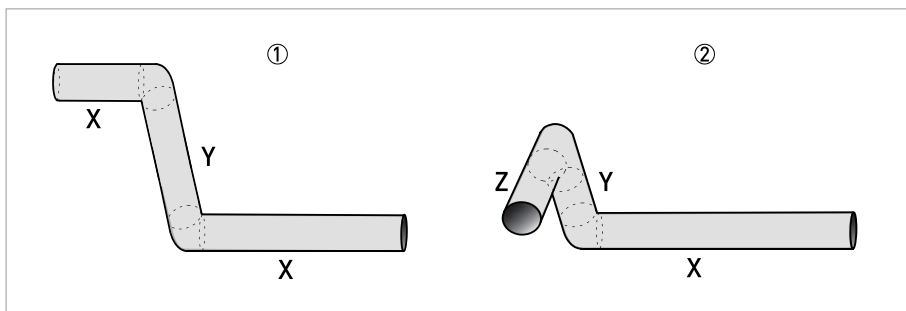


Figure 3-5: 2 and/or 3 dimensional bends upstream of the flowmeter

- ① 2 dimensions = X/Y
- ② 3 dimensions = X/Y/Z

Inlet length: using bends in 2 dimensions:  $\geq 5 \text{ DN}$ ; when having bends in 3 dimensions:  $\geq 10 \text{ DN}$



#### INFORMATION!

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

### 3.6.3 Bends

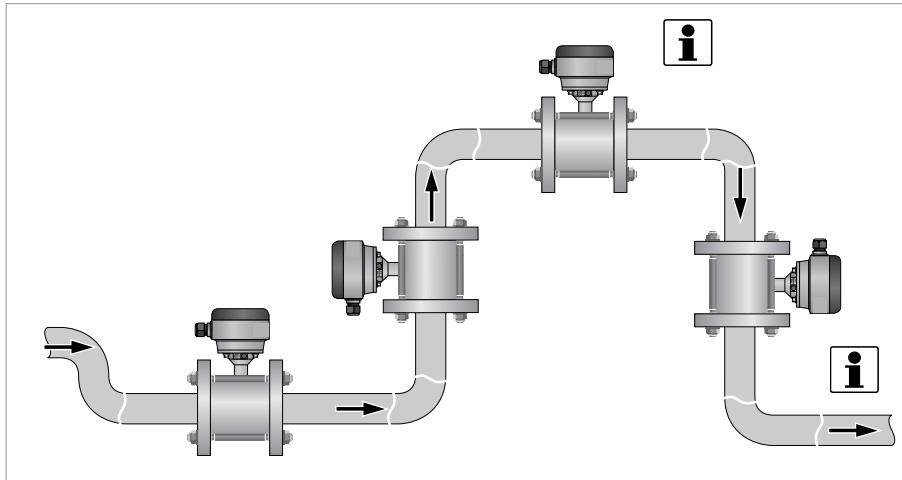


Figure 3-6: Installation in bending pipes (90°)



**INFORMATION!**

*Recommended installation positions are at a lowered or ascending section of the pipeline installation. Installation at the highest point will enlarge the risk of flowmeter malfunction, because of air/gas bubbles.*

*Vertical installation in combination with an open discharge has to be avoided.*

*Vertical installation with a controlled back-pressure is possible.*

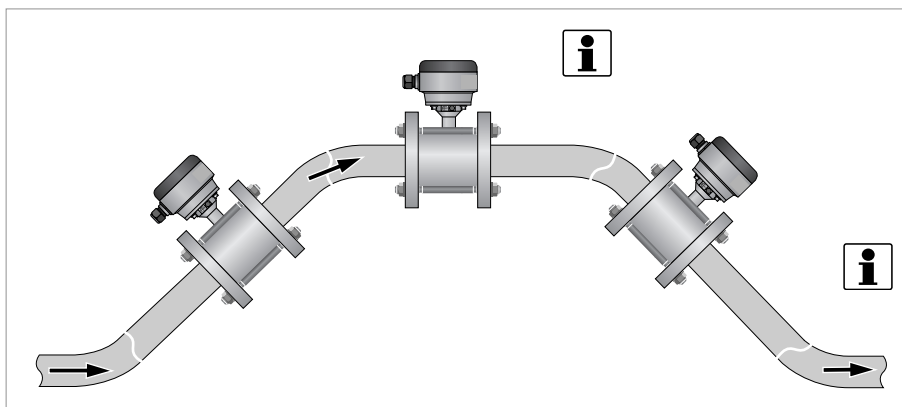


Figure 3-7: Installation in bending pipes (45°)



**CAUTION!**

*Avoid draining or partial filling of the flow sensor.*



**INFORMATION!**

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

### 3.7 T-section

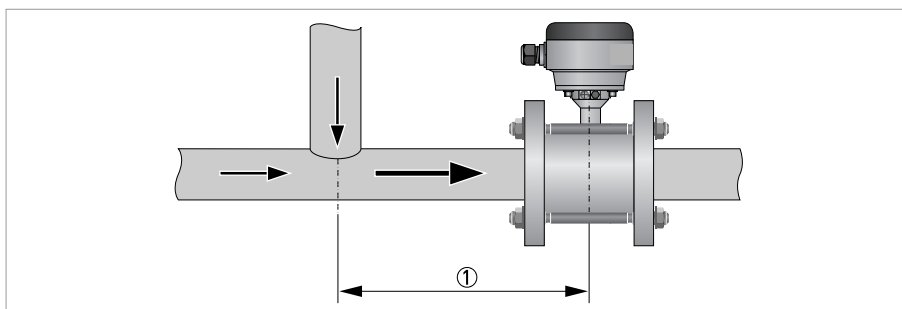


Figure 3-8: Distance behind a T-section

①  $\geq 10 \text{ DN}$

### 3.8 Open discharge

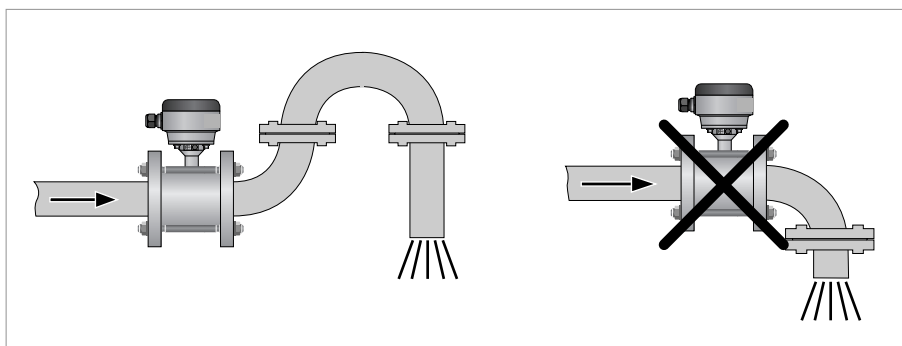


Figure 3-9: Installation in front of an open discharge



### 3.9 Control valve

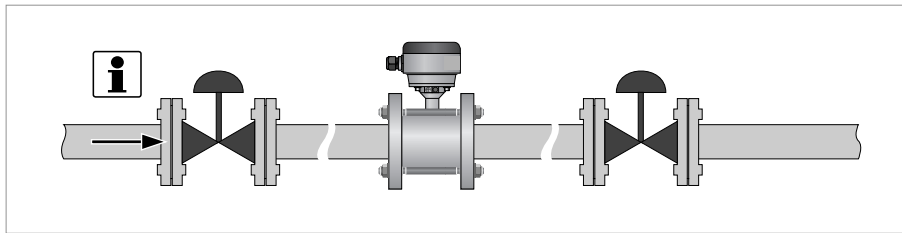


Figure 3-10: Installation in front of a control valve



**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).*

### 3.10 Pump

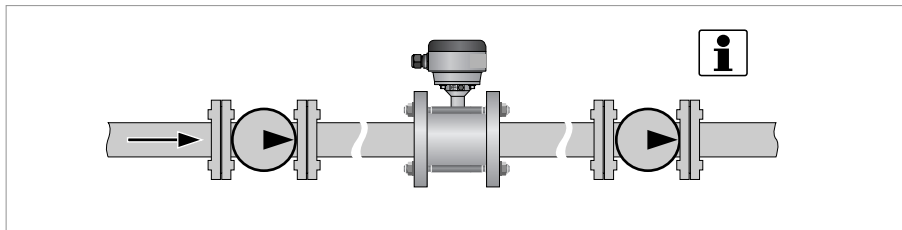


Figure 3-11: Installation behind a pump



**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.*

### 3.11 Air venting and vacuum forces

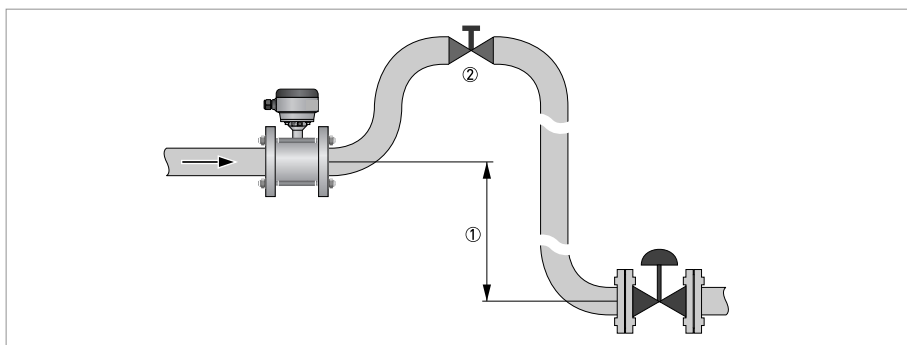


Figure 3-12: Air venting

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

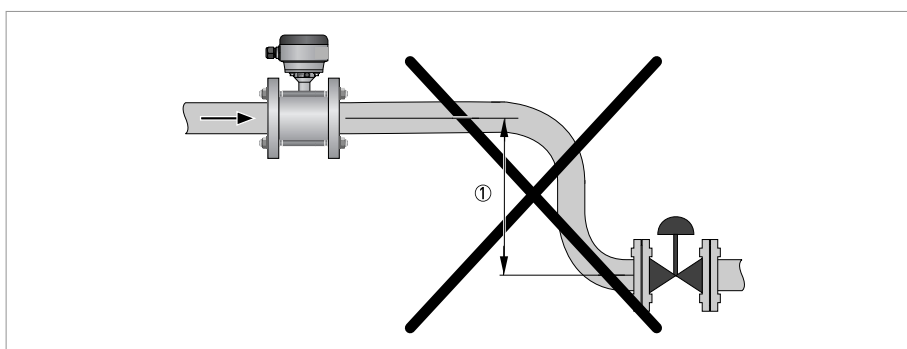


Figure 3-13: Vacuum

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

### 3.12 Flange deviation



**CAUTION!**

Max. permissible deviation of pipe flange faces:

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

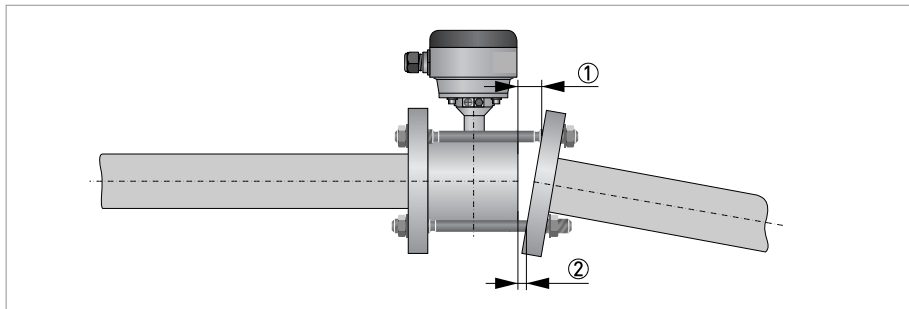


Figure 3-14: Flange deviation

- ①  $L_{max}$
- ②  $L_{min}$

### 3.13 Mounting position

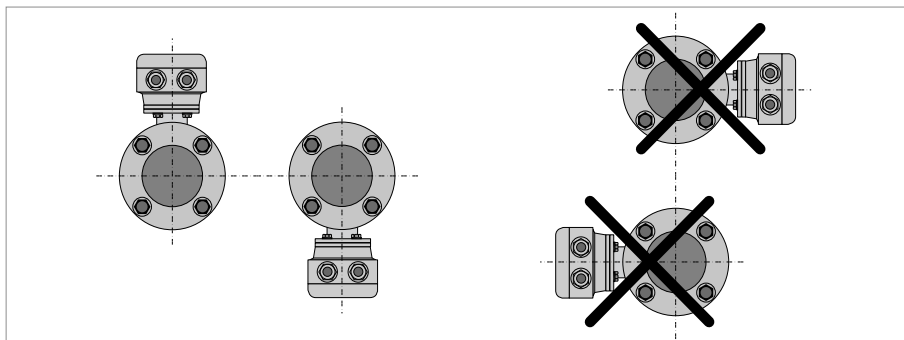


Figure 3-15: Mounting position

- Install the flow sensor with the signal converter aligned upwards or downwards.
- Install the flow sensor in line with the pipe axis.

## 3.14 Mounting

### 3.14.1 Torques and pressure


**WARNING!**

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

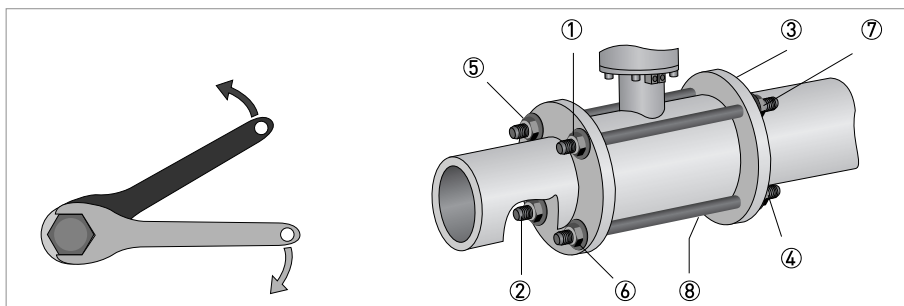


Figure 3-16: Tighten the bolts in fixed order, see picture.

**Max. torque:**

- Step 1: approx. 50% of max. torque
- Step 2: approx. 80% of max. torque
- Step 3: 100% of max. torque given in tables

**EN 1092-1**

| Nominal size<br>DN [mm] | Pressure rating | Max. allowable operating pressure<br>[bar] |
|-------------------------|-----------------|--|
| 2.5...80                | PN 40           | 40   |
| 100                     | PN 16           | 16   |
| 100                     | PN 25           | 25   |

**ASME B 16.5**

| Nominal size<br>[inch] | Pressure rating | Max. allowable operating pressure<br>[psig] |
|------------------------|-----------------|---|
| 1/10...4"              | 150 lb          | 230   |
| 1/10...3"              | 300 lb          | 580   |


**CAUTION!**

- Pressures at 20°C / 68°F.
- For higher temperatures, the pressure and temperature ratings are as per ASME B16.5.

**INFORMATION!**

The specified torque values are dependent on variables (temperature, bolt material, gasket material, lubricants, etc.) which are not within the control of the manufacturer. Therefore the values should be regarded as indicative only.

**EN 1092-1**

| Nominal size<br>DN [mm] | Counter flanges<br>& bolts |           | Max. allowable torque                   |       |                     |       |        |       |
|-------------------------|----------------------------|-----------|---|-------|---------------------|-------|--------|-------|
|                         |                            |           | Gasket:<br>Filled PTFE / PTFE /<br>PF29 |       | Gasket:<br>Graphite |       | O-ring |       |
|                         | Rating                     | Size      | Nm                                      | ft-lb | Nm                  | ft-lb | Nm     | ft-lb |
| 2.5...10                | PN 40                      | M12 x 141 | -                                       | -     | -                   | -     | 32     | 24    |
| 15                      | PN 40                      | M12 x 141 | -                                       | -     | -                   | -     | 36     | 27    |
| 25                      | PN 40                      | M12 x 141 | 22                                      | 16    | 32                  | 24    | -      | -     |
| 40                      | PN 40                      | M16 x 176 | 47                                      | 35    | 66                  | 49    | -      | -     |
| 50                      | PN 40                      | M16 x 203 | 58                                      | 43    | 82                  | 60    | -      | -     |
| 80                      | PN 40                      | M16 x 261 | 48                                      | 35    | 69                  | 51    | -      | -     |
| 100                     | PN 16                      | M16 x 303 | 75                                      | 55    | 106                 | 78    | -      | -     |
| 100                     | PN 25                      | M20 x 176 | 94                                      | 69    | 133                 | 98    | -      | -     |

**ASME B 16.5**

| Nominal size<br>[inch] | Counter flanges<br>& bolts |               | Max. allowable torque                   |       |                     |       |        |       |
|------------------------|----------------------------|---------------|---|-------|---------------------|-------|--------|-------|
|                        |                            |               | Gasket:<br>Filled PTFE /<br>PTFE / PF29 |       | Gasket:<br>Graphite |       | O-ring |       |
|                        | Rating                     | Size          | Nm                                      | ft-lb | Nm                  | ft-lb | Nm     | ft-lb |
| 1/10...3/8"            | 150 lb                     | 1/2"UNC x 142 | -                                       | -     | -                   | -     | 35     | 26    |
| 1/2"                   | 150 lb                     | 1/2"UNC x 142 | -                                       | -     | -                   | -     | 35     | 26    |
| 1"                     | 150 lb                     | 1/2"UNC x 142 | 24                                      | 18    | 33                  | 24    | -      | -     |
| 1 1/2"                 | 150 lb                     | 1/2"UNC x 174 | 38                                      | 28    | 54                  | 40    | -      | -     |
| 2"                     | 150 lb                     | 5/8"UNC x 215 | 58                                      | 43    | 83                  | 61    | -      | -     |
| 3"                     | 150 lb                     | 5/8"UNC x 268 | 98                                      | 72    | 138                 | 102   | -      | -     |
| 4"                     | 150 lb                     | 5/8"UNC x 318 | 75                                      | 55    | 108                 | 80    | -      | -     |

## 4.1 Safety instructions

**DANGER!**

*All work on the electrical connections may only be carried out with the power disconnected.  
Take note of the voltage data on the nameplate!*

**DANGER!**

*Observe the national regulations for electrical installations!*

**DANGER!**

*For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.*

**WARNING!**

*Observe without fail the local occupational health and safety regulations.  
Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.*

**INFORMATION!**

*Look at the device nameplate to ensure that the device is delivered according to your order.  
Check for the correct supply voltage printed on the nameplate.*

## 4.2 Grounding



### **DANGER!**

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

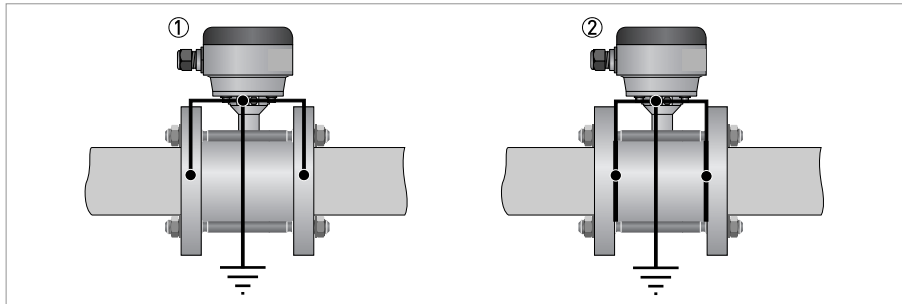


Figure 4-1: Grounding

- ① Metal pipelines, not internally coated. Grounding without grounding rings!
- ② Metal pipelines with internal coating and non-conductive pipelines. Grounding with grounding rings!



### **INFORMATION!**

*For diameter DN10 / 3/8" and DN15 / 1/2", grounding rings are integrated as standard in the flow sensor construction.*

### Grounding rings

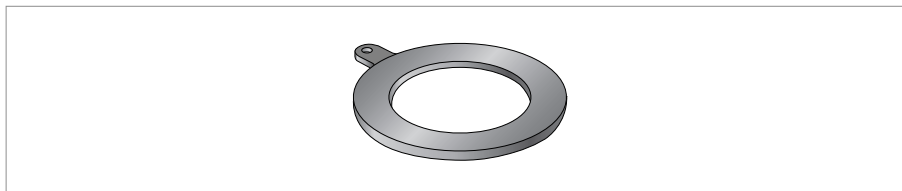


Figure 4-2: Grounding ring number 1

**Grounding ring number 1 (optional for DN25...150 / 1...6"):** Thickness: 3 mm / 0.1" (tantalum: 0.5 mm / 0.02")

### 4.3 Virtual reference option

**CAUTION!**

*Only in combination with the IFC 300 and IFC 400 signal converter (C, W and F version)*

**Benefits of virtual reference:**

- Grounding rings or grounding electrodes can be omitted.
- Safety increases by reducing the number of potential leakage points.
- The installation of the flowmeters is much easier.
- Compliant with OIML-R49 and MID MI-001 certification (IFC 300).

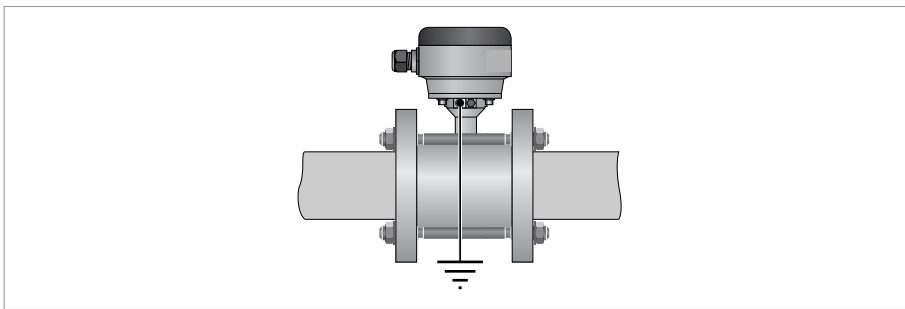


Figure 4-3: Virtual reference

**Minimum requirements:**

- Electrical conductivity:  $\geq 200 \mu\text{S/cm}$
- Signal cable: max. 50 m / 164 ft, type DS

**INFORMATION!**

*Virtual reference cannot be activated when the IFC 400 is in the SIL mode.*

### 4.4 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:

$$U = v * k * B * D$$

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.

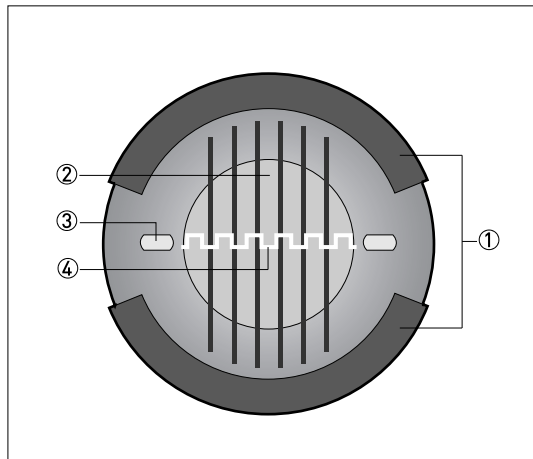


Figure 6-1: Measuring principle

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

## 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  |
| 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, mass flow, electrical conductivity, coil temperature  |

### Design

|                      |  |
|----------------------|--|
| Features             | Sandwich version with optimized flow sensor  |
| 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 documentation of the signal converter |
| Compact version      | With IFC 050 signal converter: OPTIFLUX 5050 C   |
|                      | With IFC 100 signal converter: OPTIFLUX 5100 C   |
|                      | With IFC 300 signal converter: OPTIFLUX 5300 C<br>DN2.5...15 / 1/10...1/2" is only available with aluminum signal converter housing  |
|                      | With IFC 400 signal converter: OPTIFLUX 5400 C<br>DN2.5...15 / 1/10...1/2" is only available with aluminum signal converter housing  |
| Remote version       | In wall (W) mount version with IFC 050 signal converter: OPTIFLUX 5050 W   |
|                      | In wall (W) mount version with IFC 100 signal converter: OPTIFLUX 5100 W   |
|                      | In field (F), wall (W) or rack (R) mount version with IFC 300 signal converter: OPTIFLUX 5300 F, W or R  |
|                      | In field (F), wall (W) or rack (R) mount version with IFC 400 signal converter: OPTIFLUX 5400 F, W or R  |
| Nominal diameter     | DN2.5...100 / 1/10...4"  |

### 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 and IFC 400: down to 0.15% of the measured value $\pm 1$ mm/s  |
|                         | <b>Optionally:</b> optimised accuracy for IFC 050 and IFC 100. For more details on optimised accuracy, see the concerning signal converter     |
|                         | The maximum measuring error depends on the installation conditions.<br>For detailed information refer to <i>Measuring accuracy</i> on page 12. |
| Repeatability           | $\pm 0.1\%$ of MV, minimum 1 mm/s  |
| Calibration             | <b>Standard:</b> 2 point calibration by direct volume comparison.<br><b>Optional:</b> special calibration on request.                          |

### Operating conditions

|   |  |
|---|--|
| <b>Temperature</b>                        |  |
| Process temperature                       | Compact version: -40...+140°C / -40... +284°F<br>Size DN 2.5...15 / 1/10...1/2": -20...+120°C / -4... +248°F       |
|   | Remote version: -40...+180°C / -40...+356°F<br>Size DN 2.5...15 / 1/10...1/2": -20...+180°C / -4... +356°F         |
|   | For Ex versions different temperature ranges are applicable. Please see the relevant Ex documentation for details. |
| Maximum temperature change (shock)        | DN2.5...25 / 1/10...1": < 3 K/s<br>DN40...100 / 1 1/2...4": < 0.2 K/s  |
| Ambient temperature                       | -40...+65°C / -40...+149°F<br>For IFC 100 stainless steel: -40...+60°C / -40...+140°F                              |
|   | For Ex versions different temperature ranges are applicable. Please see the relevant Ex documentation for details. |
| Storage temperature                       | -50...+70°C / -58...+158°F   |
| <b>Measurement range</b>                  | -12...+12 m/s / -40...+40 ft/s   |
| <b>Pressure</b>                           |  |
| Ambient                                   | Atmospheric  |
| <b>Nominal flange pressure</b>            |  |
| EN 1092-1                                 | <b>Standard:</b>   |
|   | DN100: PN 16   |
|   | DN2.5...80: PN 40  |
|   | <b>Option:</b>   |
|   | DN100: PN 25   |
| ASME B16.5                                | <b>Standard:</b>   |
|   | 1/10...4": 150 lb  |
|   | <b>Option:</b>   |
|   | 1/10...4": 300 lb  |
| Vacuum load                               | 0 mbar / 0 psi   |
| Pressure ranges for secondary containment | Pressure resistant up to 40 bar / 580 psi  |
|   | Burst pressure up to ± 160 bar / 2320 psi  |
| <b>Chemical properties</b>                |  |
| Physical condition                        | Electrically conductive liquids  |
| Electrical conductivity                   | Standard measurement   |
|   | For detailed information refer to the relevant signal converter document.  |
| Permissible gas content (volume)          | ≤ 5%   |
| Permissible solid content (volume)        | IFC 050: ≤ 10%   |
|   | IFC 100: ≤ 10%   |
|   | IFC 300 / IFC 400: ≤ 70%   |

### Installation conditions

|                        |   |
|------------------------|---|
| Installation           | Take care 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 the flow sensor indicates positive flow direction.                 |
| Inlet run              | ≥ 5 DN (without disturbing flow, after a single 90° bend)                   |
|                        | ≥ 10 DN (after a double bend = 2 x 90° )                                    |
| Outlet run             | ≥ 2 DN  |
| Dimensions and weights | For detailed information refer to <i>Dimensions and weights</i> on page 35. |

### Materials

|  |  |
|--|--|
| Flow sensor housing                      | DN2.5...15 / 1/10...1/2": stainless steel 1.4408 / 316   |
|  | DN25...100 / 1...4": stainless steel 1.4301 / 304  |
| Flow sensor                              | Ceramic  |
| Connection box<br>(remote versions only) | <b>Standard:</b>   |
|  | Polyurethane coated die-cast aluminum  |
|  | <b>Option:</b><br>Stainless steel  |
| Grounding rings                          | <b>Standard:</b>   |
|  | Stainless steel  |
|  | <b>Option:</b>   |
|  | Hastelloy® C, titanium, tantalum   |
|  | Other materials on request.  |
| Mounting materials                       | Grounding rings can be omitted with virtual reference option for the IFC 300 / IFC 400 signal converter.                       |
|  | <b>Standard:</b> rubber centering sleeves  |
| Gaskets                                  | <b>Option:</b> stud bolts and nuts in stainless steel or galvanized steel  |
|  | DN2.5...15 / 1/10...1/2"; O-rings: FKM, EPDM, FFKM   |
|  | DN25...100 / 1...4"; flat gaskets: filled PTFE, Graphite.<br>PTFE envelope: only in combination with tantalum grounding rings. |
| Measuring electrodes                     | Other materials on request.  |
|  | DN2.5...25 / 1/10...1": Cermet   |
|  | DN40...100 / 1 1/2...4": Platinum  |

### Process connections

|           |                        |
|-----------|------------------------|
| EN 1092-1 | <b>Standard:</b>       |
|           | DN100: PN 16           |
|           | DN2.5...80: PN 40      |
|           | <b>Option:</b>         |
|           | DN100: PN 25           |
| ASME      | <b>Standard:</b>       |
|           | 1/10...4": 150 lb      |
|           | <b>Option:</b>         |
|           | 1/10...4": 300 lb      |
| JIS       | DN2.5...100: 10...20 K |

### Electrical connections

|  |  |
|--|--|
| For more details; see the relevant documentation of the signal converter |  |
| Signal cable (remote versions only)                                      |  |
| Type A (DS)  | <b>In combination with the IFC 100, IFC 300 and IFC 400 signal converter</b><br>Standard cable, double shielded.<br>Max. length: 600 m / 1950 ft (depends on electrical conductivity and the flow sensor). |
| 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 (depends on electrical conductivity and the flow sensor).     |
| I/O  | For more details of I/O options, including data streams and protocols, see technical datasheet of the relevant signal converter.   |

## Approvals and certifications

|  |  |
|--|--|
| <b>CE</b>  |  |
| This device fulfils the statutory requirements of the relevant directives. The manufacturer certifies successful testing of the product by applying the conformity mark on the device. |  |
|  | For more information on the directives, standards and the approved certifications, please refer to the declaration of conformity supplied with the device or downloadable from the manufacturer's website. |
| <b>Hazardous areas</b>   |  |
| Non-Ex   | Standard   |
| ATEX   | KEMA 04 ATEX 2126 X  |
|  | ATEX II 2 GD EEx me ia IIC T6...T3   |
|  | ATEX II 2 GD EEx de ia IIC T6...T3   |
|  | For more details, see Ex documentation of the flow sensor and signal converter.  |
| FM   | Class I, Div 2, groups A, B, C and D   |
|  | Class II, Div 2, groups F and G  |
|  | Class III, Div 2, groups F and G   |
| CSA  | Class I, Div 2, groups A, B, C and D   |
|  | Class II, Div 2, groups F and G  |
| IECEX  | Pending  |
| NEPSI  | Sensor: GYJ20.1384X  |
|  | Ex e ia mb IIC T3...T6 Gb (DN2.5...15)   |
|  | Ex d e ia IIC T3...T6 Gb (DN25...100)  |
|  | Compact version: GYJ20.1383X   |
|  | Ex d e ia [ia] mb IIC T3...T6 Gb (DN2.5...15)  |
|  | Ex d ia [ia] IIC T3...T6 Gb (DN25...100)   |
|  | Ex d e ia [ia] IIC T3...T6 Gb (DN25...100)   |
| Protection category acc. to IEC 60529  | <b>Standard:</b>   |
|  | IP66/67, NEMA 4/4X/6   |
|  | <b>Option:</b>   |
|  | IP68, NEMA 6P  |
|  | IP68 is only available for remote designs and with a stainless steel connection box.   |
|  | IP67/69 with IFC 100 stainless steel signal converter  |
| Hygiene  | FDA approved materials.  |
| Shock test   | IEC 60068-2-27   |
|  | 30 g for 18 ms   |
| Vibration test   | IEC 60068-2-64   |
|  | f = 20...2000 Hz, rms = 4.5 g, t = 30 min.   |



## 6.3 Measuring 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:  $\geq 5$  DN
- Outlet section:  $\geq 2$  DN

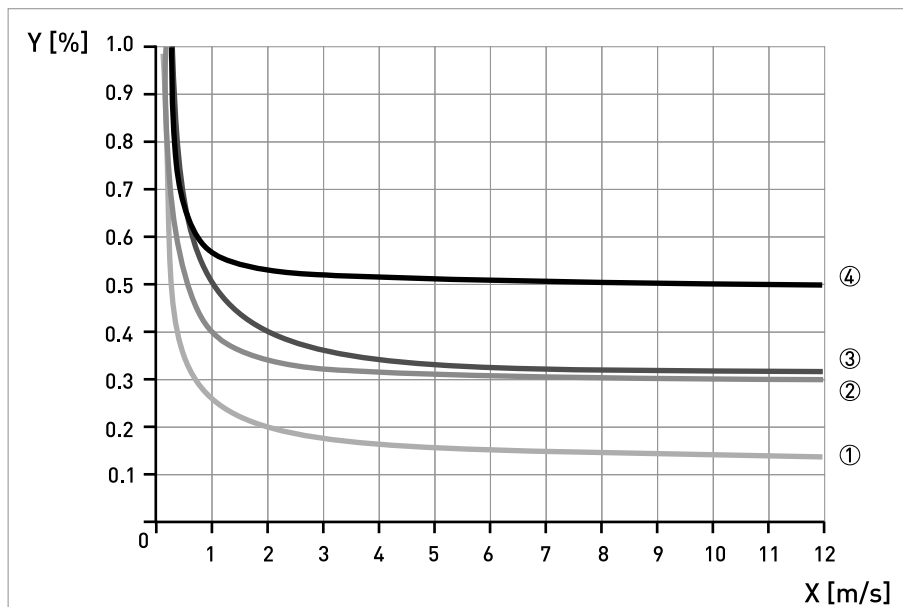


Figure 6-2:  
 X [m/s]: flow velocity  
 Y [%]: deviation from the actual measured value (mv)

**In combination with the IFC 300 / IFC 400**

|                         | Accuracy             | Curve |
|-------------------------|----------------------|-------|
| DN2.5...6 / 1/10...1/4" | 0.3% of mv + 2 mm/s  | ③     |
| DN10...100 / 3/8... 4"  | 0.15% of mv + 1 mm/s | ①     |

**In combination with the IFC 100**

|                         | Accuracy            | Curve       |
|-------------------------|---------------------|-------------|
| DN2.5...6 / 1/10...1/4" | 0.4% of mv + 1 mm/s | As ② + 0.1% |
| DN10...100 / 3/8...4"   | 0.3% of mv + 1 mm/s | ②           |

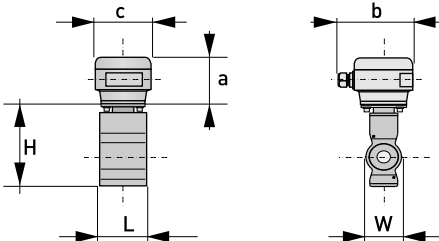
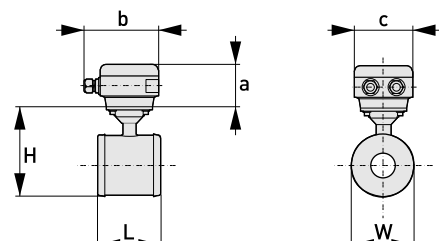
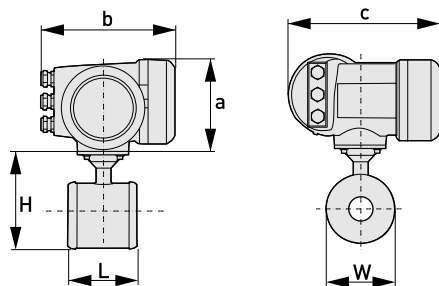
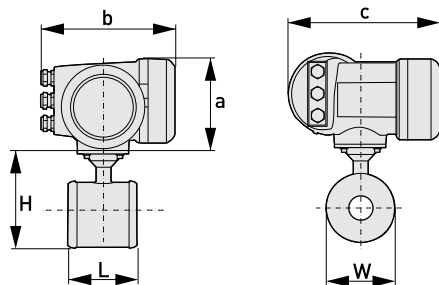
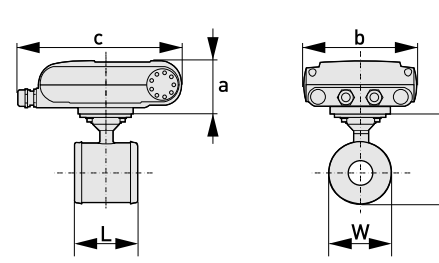
**In combination with the IFC 050**

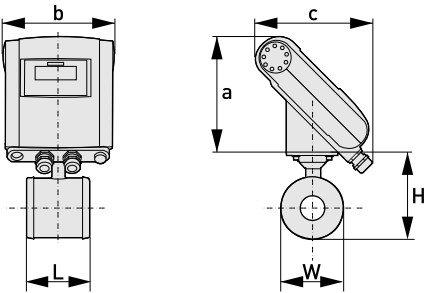
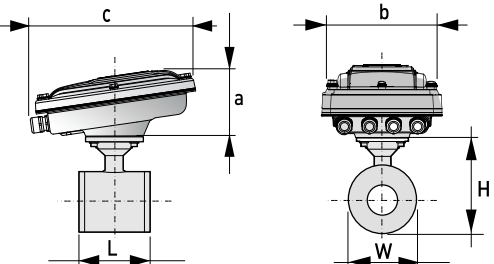
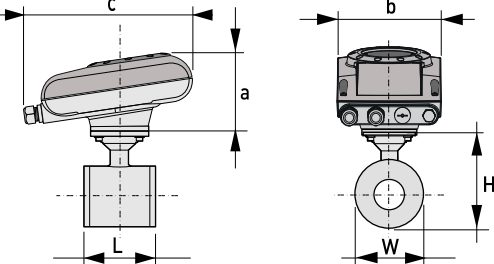
|                         | Accuracy            | Curve |
|-------------------------|---------------------|-------|
| DN2.5...6 / 1/10...1/4" | 0.5% of mv + 1 mm/s | ④     |
| DN10...100 / 3/8...4"   | 0.5% of mv + 1 mm/s |       |

**INFORMATION!**

*Optionally for IFC 050 and IFC 100; extended calibration at 2 points for optimised accuracy.  
For more details on optimised accuracy, see the concerning signal converter documentation.*

## 6.4 Dimensions and weights

|  |  |  |
|--|--|--|
| <b>Remote version:</b><br>DN2.5...15 / 1/10...1/2" |    | a = 88 mm / 3.5"<br>b = 139 mm / 5.5" ①<br>c = 106 mm / 4.2"<br>Total height = H + a   |
| <b>Remote version:</b><br>DN25...100 / 1...4"      |    | a = 88 mm / 3.5"<br>b = 139 mm / 5.5" ①<br>c = 106 mm / 4.2"<br>Total height = H + a   |
| <b>Compact version with IFC 300</b>                |   | a = 155 mm / 6.1"<br>b = 230 mm / 9.1" ①<br>c = 260 mm / 10.2"<br>Total height = H + a |
| <b>Compact version with IFC 400</b>                |  | a = 160 mm / 6.3"<br>b = 240 mm / 9.5" ①<br>c = 260 mm / 10.2"<br>Total height = H + a |
| <b>Compact version with IFC 100 (0°)</b>           |  | a = 82 mm / 3.2"<br>b = 161 mm / 6.3"<br>c = 257 mm / 10.1" ①<br>Total height = H + a  |

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

① The value may vary depending on the used cable glands.

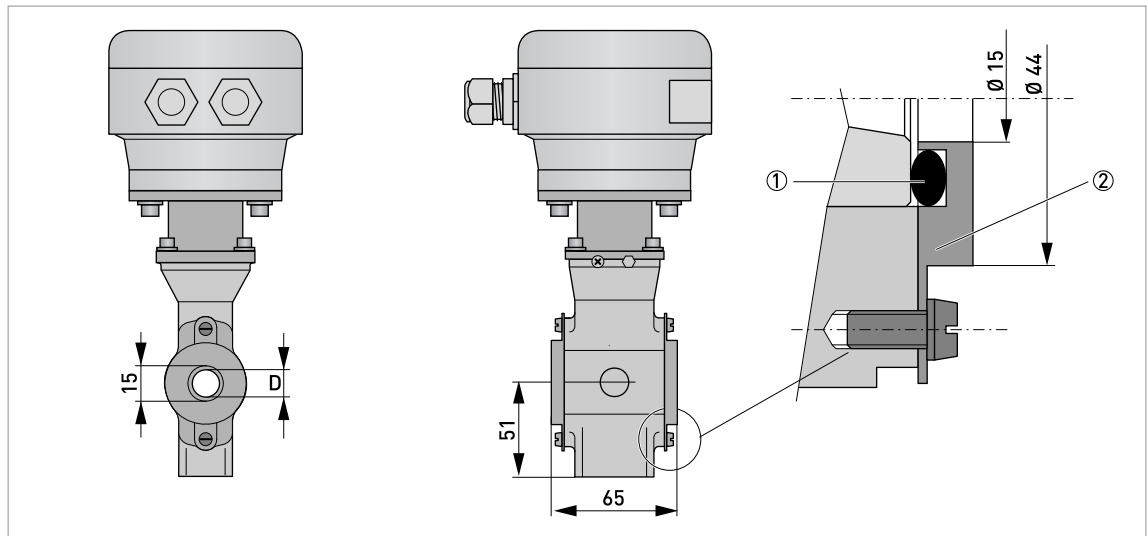


Figure 6-3: Construction details DN2.5...15 / 1/10...1/2"

- ① O-ring
- ② Grounding ring

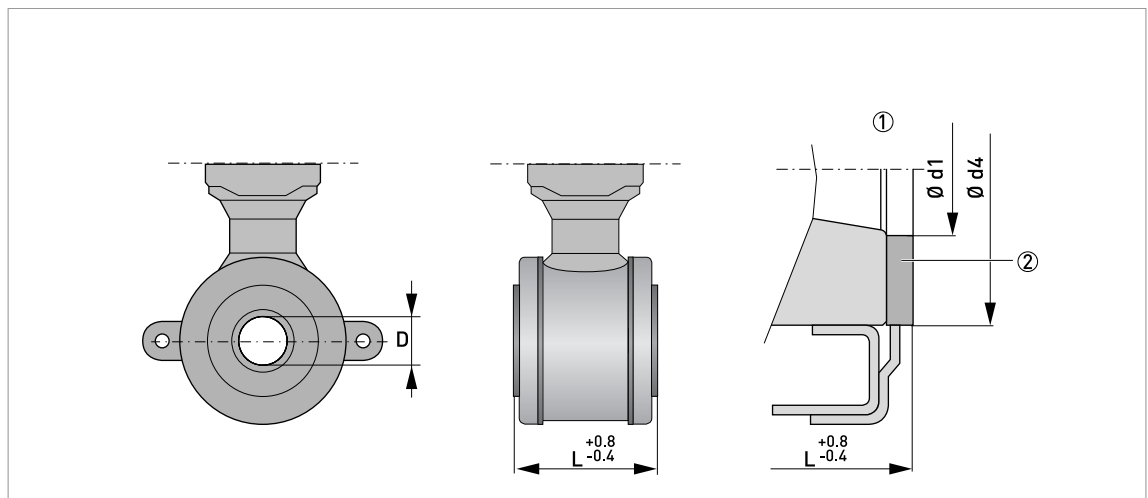


Figure 6-4: Construction details DN25...100 / 1...4"

- ① Situation without grounding rings
- ② Gasket

**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.

| Nominal size | Dimensions [mm] |     |     |     |     |     | Approx. weight [kg] |
|--------------|-----------------|-----|-----|-----|-----|-----|---------------------|
| DN           | L               | H   | W   | D   | Ød1 | Ød4 |                     |
| 2.5          | 65 ①            | 123 | 44  | 2   | 6   | -   | 1.6                 |
| 4            | 65 ①            | 123 | 44  | 3.2 | 7   | -   | 1.6                 |
| 6            | 65 ①            | 123 | 44  | 4.8 | 9   | -   | 1.6                 |
| 10           | 65 ①            | 123 | 44  | 7   | 12  | -   | 1.6                 |
| 15           | 65 ①            | 123 | 44  | 12  | 14  | -   | 1.6                 |
| 25           | 58 ②            | 116 | 68  | 20  | 26  | 46  | 1.6                 |
| 40           | 83 ②            | 131 | 83  | 30  | 39  | 62  | 2.4                 |
| 50           | 103 ②           | 149 | 101 | 40  | 51  | 74  | 2.9                 |
| 80           | 153 ②           | 181 | 133 | 60  | 80  | 106 | 6.4                 |
| 100          | 203 ②           | 206 | 158 | 80  | 101 | 133 | 8.8                 |

① Total fitting length of flowmeter with integrated rings: dimension L + 2 x gasket thickness.

② Total fitting length of flowmeter without rings: dimension L only.

| Nominal size | Dimensions [inches] |      |      |      |      |      | Approx. weight [lb] |
|--------------|---------------------|------|------|------|------|------|---------------------|
| ASME         | L                   | H    | W    | D    | Ød1  | Ød4  |                     |
| 1/10"        | 2.56 ①              | 4.84 | 1.73 | 0.08 | 0.24 | -    | 3.53                |
| 1/6"         | 2.56 ①              | 4.84 | 1.73 | 0.13 | 0.28 | -    | 3.53                |
| 1/4"         | 2.56 ①              | 4.84 | 1.73 | 0.19 | 0.35 | -    | 3.53                |
| 3/8"         | 2.56 ①              | 4.84 | 1.73 | 0.28 | 0.47 | -    | 3.53                |
| 1/2"         | 2.56 ①              | 4.84 | 1.73 | 0.47 | 0.55 | -    | 3.53                |
| 1"           | 2.28 ②              | 4.57 | 2.68 | 0.79 | 1.02 | 1.81 | 3.53                |
| 1 1/2"       | 3.27 ②              | 5.16 | 3.27 | 1.18 | 1.54 | 2.44 | 5.29                |
| 2"           | 4.06 ②              | 5.87 | 3.98 | 1.57 | 2.01 | 2.91 | 6.39                |
| 3"           | 6.02 ②              | 7.13 | 5.24 | 2.36 | 3.15 | 4.17 | 14.11               |
| 4"           | 7.99 ②              | 8.11 | 6.22 | 3.15 | 3.98 | 5.24 | 19.40               |

① Total fitting length of flowmeter with integrated rings: dimension L + 2 x gasket thickness.

② Total fitting length of flowmeter without rings: dimension L only.



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

- Process instrumentation for flow, level, temperature, pressure measurement and process analytics
- Flow metering, monitoring, wireless and remote metering solutions
- Engineering, commissioning, calibration, maintenance and training services

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