



## WATERFLUX 3070 Technical Datasheet

Battery powered electromagnetic water meter with optional KROHNE FlexPower

- Battery power or optional mains power & battery backup with the FlexPower
- Easy installation without straight inlet or outlet lengths
- Integrated pressure and temperature sensor



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## 1.1 The power of independence

In a world where water is becoming increasingly scarce, accurate flow measurements of a valuable resource like drinking water is essential for efficient water network management, reducing non-revenue water and for billing purposes. Throughout the history of the company, KROHNE has always been engaged in research into promising technologies for the future, in pursuit of improved measurement and further developments. WATERFLUX 3070, with its unique **rectangular sensor design** and efficient coil construction forms a good example of an innovation.

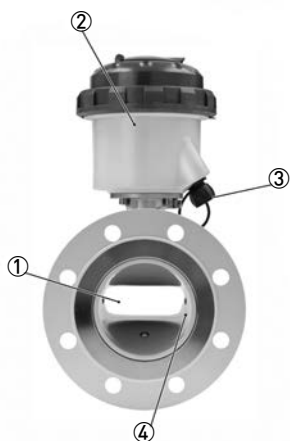
Flow profile disturbances are squeezed out by contraction and the mean flow velocity in the rectangular cross section is doubled. The coils provide a strong and homogeneous magnetic field, leading to an improved signal to noise ratio and stable measurements. The result is a very good low flow performance and a drastic reduction of the additional uncertainty for upstream disturbances. The WATERFLUX 3000 sensor has set a new standard in the market for simplifying installation with **zero inlet and zero outlet sections**. Another benefit of the rectangular bore is a very low power consumption and thus a longer battery lifetime.

The **battery powered** WATERFLUX 3070 is ideal for remote locations where **no mains power** is available. For locations where mains power is available, but water companies demand for a battery power back up to ensure continuous measurements, the WATERFLUX 3070 can be equipped with an external FlexPower unit.

Again KROHNE introduces an innovation with the introduction of the first all-in-one water meter that measures flow, pressure and temperature with just one instrument. For this the WATERFLUX sensor has an **integrated pressure and temperature sensor**.

To transfer all data, including counter values, pressure & temperature measurements and meter and status alarms, WATERFLUX 3070 can communicate by RS485 using the **Modbus RTU protocol**. The unique low (battery) powered Modbus option can be connected to a GPRS data logger unit for a complete remote solution.

When using the **FlexPower unit**, with the high power Modbus version all available data is transferred at a high frequency.



1. Rectangular bore for DN25 up to DN600
2. Multiple power concept
3. Pulse and Modbus communication
4. Integrated pressure and temperature sensor

## Highlights

Accurate and reliable performance

- Unique rectangular flow sensor design for sizes DN25...600
- Flow profile disturbances squeezed out by contraction
- Large turn down ratio for peak flows during the day and low flows during the night
- Standard in-house wet calibration for every meter
- Internal diagnostics and external verification with OPTICHECK tool

Approvals

- Certifications to OIML R49 and MID Annex III (MI-001) up to DN600
- Range of local custody transfer approvals based on OIML R49
- Drinking water approvals including ACS, DVGW, NSF, TZW and WRAS

Standard IP68 signal converter and sensor

- IP68 compact and field version for submersion in flooded chambers
- Compact housing with small footprint for installation in electrical cabinets
- Plug & play (IP68) connectors

Simplifies installation, minimises maintenance

- 0D inlet, 0D outlet for compact installation directly behind an elbow or reducer
- Special coating for immersed or subsoil sensor installation
- Standard reference electrode making grounding rings obsolete

Multiple power concept for any location

- Internal lithium batteries for battery lifetime up to 10 years
- External battery pack for longer lifetime
- AC mains supply and DC power (for green energy eg. solar or wind power) both with battery backup

Flow, pressure and temperature measurement

- Flow, pressure and temperature measurement integrated in one instrument
- Simple, cost efficient and tamper proof installation

Data communication and transfer

- RS485 Modbus RTU communication for disclosure of a wide range of data
- Special low power Modbus option for battery operation
- Preselected brands for GPRS/data logger for data transfer

## Industries

- Water distribution network management
- District metering (DMA)
- Revenue metering
- Water extraction
- Other; irrigation, dewatering

## Applications

- Measurement of clean potable water, raw water and irrigation water
- Monitoring of distribution networks
- Pressure and water quality control with integrated P&T sensor
- Pressure and pumping stations
- District Metering Areas (DMA) for leak detection
- Water consumption and billing
- Checking of water wells or pumps and maintaining water balance

## 1.2 Options



### Remote or compact signal converter

The WATERFLUX 3070 is available in a compact or a remote (field) version.

The remote signal converter comes with a practical wall holder for easy mounting to a wall of a measurement chamber or electrical cabinet. The functionality of the compact and the remote version is identical.



### Power: Internal or external battery pack

On locations where no power is available, the WATERFLUX 3070 is operated on batteries.

Standard the IFC 070 has an internal battery pack with lithium dual D-cell. For an extended battery lifetime an external battery pack with a lithium dual DD-cell can be connected to the converter. The KROHNE PowerBlock has a 1.5 meter cable.



### FlexPower for mains power with battery backup

The WATERFLUX 3070 can be powered by an external IP68 rated **Flexpower unit** on locations with a main supply (110 V...230 V AC), but where battery backup is required.

The integrated dual D-cell battery ensures a continuous measurement in cases where mains power supply is interrupted.

To save energy, the meter automatically switches to a low power battery backup mode. The FlexPower unit comes with a 10...30 V DC power cable for connection to green power supply sources such as wind or solar panels



#### Immersion in water (IP68)

Both sensor and signal converter are IP68 rated according IEC/EN 60529 suitable for immersing underwater during flooding (e.g. in periods of heavy rainfall).

The robust **WATERFLUX 3000** flow sensor is suitable for long duration immersion in flooded metering pits.

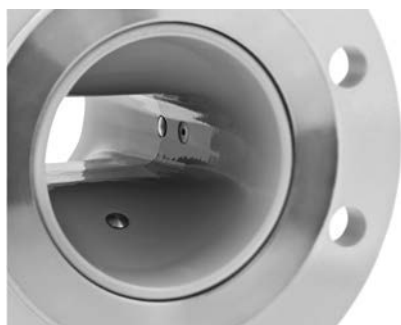
The compact and remote version of the IFC 070 signal converter, can be installed in chambers with periodic submersion.

The output cable has plug and play IP68 rated connectors. Immersion in water is possible down to a depth of 10 meters.



#### Underground installation

With its robust construction the flow sensor can also be buried underground. This can be a major cost saving as it eliminates the need for a measurement chamber. To protect the flow sensor a special coating can be ordered as an option. The remote sensor version has an IP68 stainless steel connection box.



#### Integrated Pressure & Temperature sensor

The **WATERFLUX 3070** is the first all-in-one water meter measuring flow, pressure and temperature with just one instrument.

For this the **WATERFLUX 3000** sensor is equipped with an integrated pressure and temperature sensor.

Flow, pressure and temperature values can be read on the display or via Modbus. When critical limits for pressure and temperature are exceeded an alarm can be generated via a status output or Modbus.

The integrated pressure and temperature sensor is available for sizes DN50 to DN200.





### Calibration to OIML R49 and MID MI-001

Every single flowmeter is wet calibrated before leaving the factory. For this KROHNE operates a large number of accurate calibration facilities including the world's most precise volumetric calibration rig for flowmeters.

The WATERFLUX 3070 is approved to MID Annex III (MI-001) and OIML R49. The certification applies for accuracy class 1 and 2, all sizes, and for OD inlet- OD outlet. Access to fiscal parameters can be blocked to prevent intervention of non-authorized persons.



### OPTICHECK | Tool for on-site verification

The OPTICHECK provides an inline health check of the meter under test. When the tool is connected on site, it gathers measuring data to ensure that the flowmeter is performing within 1% of its factory calibration. The baseline can be historic repair data from the factory or on-site test results after performing a full verification. A hard copy of the verification report can be printed for every flowmeter. The verification data are digitally stored. Contact KROHNE for more information or for an on-site service visit.

## Data communication options

Water companies are looking for more measurement data, smart data, and real time data from water meters located over a wide area. The display forms the main source of data for meters subject to custody transfer (OIML R49, MI-001). Measurement and meter status data can be given out either via 2 pulse and 2 status outputs or via MODBUS RTU. Via its outputs the WATERFLUX 3070 can be connected to a wide range of data logger and remote communication equipment from various brands supporting pulses and or Modbus. Contact KROHNE for a list with preselected brands that have already been tested on their compatibility.



### Modbus communication

The WATERFLUX 3070 offers two RS 485 Modbus RTU interface options. The low power (non-isolated) Modbus option can be used for data communication between a stand-alone battery operated WATERFLUX 3070 and data logger GPRS module. The high powered (isolated) Modbus option can be used for data transfer between a WATERFLUX 3070 using the FlexPower unit and process automation systems. Modbus offers a simple solution to disclose all available data including measurement data (sum, forward, reverse counters, flow rate), status data (battery lifetime, meter status) and actual values for pressure and temperature.

### 1.3 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.

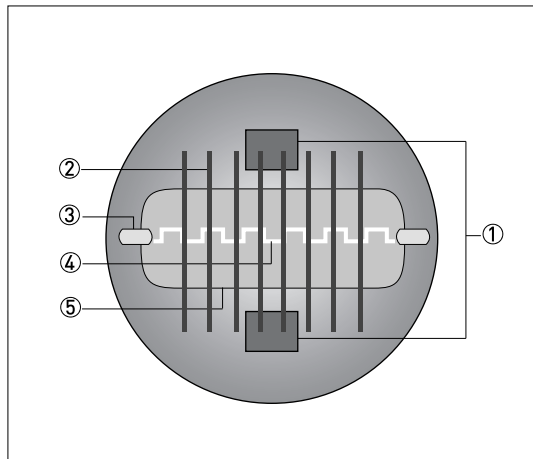


Figure 1-1: Measuring principle

- 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.

## 2.1 Technical data

- The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local sales office.
- Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Downloadcenter).

### Measuring system

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

### Design

|                      |                                                                                                                                                                                 |
|----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Features             | Unique rectangular flow sensor design providing improved flow profile and signal to noise ratio resulting in highest accuracy, low energy consumption and large turndown ratio. |
|                      | Rilsan® polymer coated flow sensor approved for drinking water                                                                                                                  |
|                      | No internal or moving parts                                                                                                                                                     |
|                      | Built-in reference electrode                                                                                                                                                    |
|                      | Optional; built-in P&T sensor (restricted to DN50...200 / 1...8"), refer to <i>Integrated P&amp;T sensor (optional)</i> on page 18.                                             |
|                      | Self-providing energy by batteries for up to 10 years                                                                                                                           |
| Modular construction | The measurement system consists of a flow sensor and a signal converter. It is available as a compact and as a remote version.                                                  |
| Compact version      | With IFC 070 signal converter: WATERFLUX 3070 C                                                                                                                                 |
| Remote version       | In field (F) version with IFC 070 signal converter: WATERFLUX 3070 F                                                                                                            |
|                      | Cable length up to 25 m / 70 ft, other lengths on request.                                                                                                                      |
| Nominal diameter     | DN25...600 / 1...24", rectangular bore.                                                                                                                                         |

| <b>Display and user interface</b> |                                                                                                                                                                                 |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Display                           | LCD display, 8 digits.                                                                                                                                                          |
| Operation                         | 2 Optical keys to navigate through the menu of the signal converter without opening the housing                                                                                 |
| Display information               | <b>Standard:</b>                                                                                                                                                                |
|                                   | Sum counter (default), forward counter, reverse counter or flow rate.                                                                                                           |
|                                   | Flow direction (forward or reverse), counter settings.                                                                                                                          |
|                                   | Measured value and measuring unit                                                                                                                                               |
|                                   | Battery lifetime indicator                                                                                                                                                      |
| Optional:                         | Operating pressure, operating temperature, empty pipe, self-test, display test, test mode, diameter, meter constant, software version, AMR mode, notification sign, multiplier. |
| Remote reading                    | Optional: external GSM / GPRS data logger for pulse or Modbus<br>For preselected data logger brands, please contact KROHNE.                                                     |

### Measurements

|                                |                                                                                                                                                  |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Measuring units                | <b>Volume</b>                                                                                                                                    |
|                                | Default setting: m <sup>3</sup>                                                                                                                  |
|                                | Selectable: litre, gallon, imperial gallons, cubic feet, acre inch, acre feet, mega litre, mega imp. gallon.                                     |
|                                | <b>Flow rate</b>                                                                                                                                 |
|                                | Default setting: m <sup>3</sup> / hr                                                                                                             |
|                                | Selectable: litre/sec, gallon/min, imperial gallon/min, cubic feet/hour, acre inch/day, acre feet/day, mega litre/day, mega imperial gallon/day. |
| Measurement interval           | Default setting: 15s                                                                                                                             |
| Battery power                  | Selectable: 5s, 10s, 15s, 20s.                                                                                                                   |
| Measurement interval FlexPower | Default setting: 5s                                                                                                                              |
| Empty pipe detection           | Optional: display shows - EP - in case of empty pipe detection                                                                                   |
| Low flow cut off               | Measurements below this value are neglected                                                                                                      |
|                                | Default setting: 10 mm/s                                                                                                                         |
|                                | Selectable: 0 mm/s, 5 mm/s, 10 mm/s                                                                                                              |

## Measuring accuracy

|                                                                                      |                                                                                                                                                                           |
|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Maximum measuring error                                                              | DN25...300 / 1...12"; down to 0.2% of the measured value $\pm 1$ mm/s<br>DN350...600 / 14...24"; down to 0.4% 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 27.                                                                                                 |
| 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><br>2 Point calibration by a direct volume comparison                                                                                                     |
|                                                                                      | <b>Optional:</b> for DN25...600 / 1...24"                                                                                                                                 |
|                                                                                      | Verification to Measurement Instrument Directive (MID) Annex III (MI-001)<br>Standard: Verification at Ratio (Q3/Q1) = 80<br>Optional: Verification at Ratio (Q3/Q1) > 80 |
| MID Annex III (MI-001)<br>(Directive 2014/32/EU /<br>UK Regulation<br>2016 No. 1153) | <b>EC-Type examination certificate to MID Annex III (MI-001)</b>                                                                                                          |
|                                                                                      | Diameter: DN25...600 / 1...24"                                                                                                                                            |
|                                                                                      | Minimum straight inlet flow: 0 DN                                                                                                                                         |
|                                                                                      | Minimum straight outlet flow: 0 DN                                                                                                                                        |
|                                                                                      | Forward and reverse (bi-directional) flow                                                                                                                                 |
|                                                                                      | Orientation: any                                                                                                                                                          |
|                                                                                      | Ratio (Q3/Q1): up to 630                                                                                                                                                  |
|                                                                                      | Liquid temperature range: +0.1...50°C / +32...122°F                                                                                                                       |
|                                                                                      | Maximum operating pressure: $\leq$ DN200 / 8": 16 bar / 232 psi,<br>$\geq$ DN250 / 10": 10 bar / 150 psi.                                                                 |
|                                                                                      | For detailed information refer to <i>Legal metrology</i> on page 21.                                                                                                      |
| OIML R49                                                                             | <b>Certificate of conformity to OIML R49 -1</b>                                                                                                                           |
|                                                                                      | Diameter: DN25...600 / 1...24"                                                                                                                                            |
|                                                                                      | Accuracy: Class 1 and 2                                                                                                                                                   |
|                                                                                      | Minimum straight inlet flow: 0 DN                                                                                                                                         |
|                                                                                      | Minimum straight outlet flow: 0 DN                                                                                                                                        |
|                                                                                      | Forward and reverse (bi-directional) flow                                                                                                                                 |
|                                                                                      | Orientation: any                                                                                                                                                          |
|                                                                                      | Ratio (Q3/Q1): up to 400                                                                                                                                                  |
|                                                                                      | Liquid temperature range: +0.1...50°C / +32...122°F                                                                                                                       |
|                                                                                      | Maximum operating pressure: $\leq$ DN200 / 8": 16 bar / 232 psi,<br>$\geq$ DN250 / 10": 10 bar / 150 psi.                                                                 |
| For detailed information refer to <i>Legal metrology</i> on page 21.                 |                                                                                                                                                                           |

### Operating conditions

| <b>Temperature</b>         |                                                                                                                                                                                                     |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Process temperature        | -5...+70°C / +23...+158°F                                                                                                                                                                           |
| Ambient temperature        | -25...+65°C / -13...+149°F                                                                                                                                                                          |
|                            | Ambient temperatures below -25°C / -13°F may affect the readability of the display                                                                                                                  |
|                            | It is recommended to protect the signal converter from external heat sources such as direct sunlight, because high temperatures reduce the life cycle of all electronic components and the battery. |
| Storage temperature        | -30...+70°C / -22...+158°F                                                                                                                                                                          |
| <b>Measurement range</b>   |                                                                                                                                                                                                     |
| Starting flow              | From 0 m/s / 0 ft/s onwards                                                                                                                                                                         |
| <b>Pressure</b>            |                                                                                                                                                                                                     |
| Operating pressure         | Up to 16 bar (232 psi) for DN25...200 / 1...8"<br>Up to 10 bar (150 psi) for DN250...600 / 10...24"                                                                                                 |
| Vacuum load                | 0 mbar / 0 psi absolute                                                                                                                                                                             |
| Pressure loss              | For detailed information refer to <i>Pressure loss</i> on page 32.                                                                                                                                  |
| <b>Chemical properties</b> |                                                                                                                                                                                                     |
| Physical conditions        | Water: drinking water, raw water, irrigation water.<br>For salt water, please contact the factory.                                                                                                  |
| Electrical conductivity    | ≥ 20 µS/cm                                                                                                                                                                                          |

### Installation conditions

|                        |                                                                             |
|------------------------|-----------------------------------------------------------------------------|
| Installation           | Assure that flow sensor is always fully filled.                             |
|                        | For detailed information refer to <i>Installation</i> on page 34.           |
| Flow direction         | Forward and reverse                                                         |
|                        | Arrow on flow sensor indicates forward flow direction                       |
| Inlet run              | ≥ 0 DN                                                                      |
|                        | For detailed information refer to <i>Measurement accuracy</i> on page 27.   |
| Outlet run             | ≥ 0 DN                                                                      |
|                        | For detailed information refer to <i>Measurement accuracy</i> on page 27.   |
| Dimensions and weights | For detailed information refer to <i>Dimensions and weights</i> on page 29. |

## Materials

|                                         |                                                                                                                                                                                                         |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sensor housing                          | Sheet steel                                                                                                                                                                                             |
| Measuring tube                          | DN25...200 / 1...8": metallic alloy                                                                                                                                                                     |
|                                         | DN250...600 / 10...24": stainless steel                                                                                                                                                                 |
| Flanges                                 | DN25...150 / 1...6": Stainless steel 1.4404 / 316L<br>DN200 / 8": Stainless steel 1.4301 / 304L<br>DN250...DN600 / 10...24": steel St37-C22 / A105<br>Optional: DN250...600 / 10...24": Stainless steel |
| Liner                                   | Rilsan®                                                                                                                                                                                                 |
| Protective coating                      | On exterior of the meter: flanges, housing and / or connection box (field version).                                                                                                                     |
|                                         | Standard: coating                                                                                                                                                                                       |
|                                         | Option: subsoil coating                                                                                                                                                                                 |
| Measuring electrodes                    | Standard: stainless steel 1.4301 / AISI 304                                                                                                                                                             |
|                                         | Optional: Hastelloy® C                                                                                                                                                                                  |
| Reference electrode                     | Standard: stainless steel 1.4301 / AISI 304                                                                                                                                                             |
|                                         | Optional: Hastelloy® C                                                                                                                                                                                  |
| Grounding rings                         | Grounding rings can be omitted when the reference electrode is used                                                                                                                                     |
| Signal converter housing                | Polycarbonate                                                                                                                                                                                           |
| Wall holder for remote signal converter | Polycarbonate                                                                                                                                                                                           |
| Connection box                          | Only for remote versions.                                                                                                                                                                               |
|                                         | Stainless steel                                                                                                                                                                                         |

## Process connections

|                                                                                                                             |                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 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: 10 bar rated)                               |
| ASME B16.5                                                                                                                  | 1...8": 150 lb RF (232 psi / 16 bar rated)<br>10...24": 150 lb (150 psi / 10 bar rated) |
| JIS B2220                                                                                                                   | 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 on nominal flange pressure and nominal diameter refer to <i>Dimensions and weights</i> on page 29. |                                                                                         |

| Other connections |                                           |
|-------------------|-------------------------------------------|
| Thread            | DN25: G1" thread connection               |
|                   | DN40: G1½" thread connection              |
| Other             | Weld-on, clamp, oval flanges: on request. |

### Electrical connections

| Cable connections                      |                                                                                                                                                                                    |                                                                               |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Cable entries                          | Compact and field version: <b>IFC 070 C and F</b>                                                                                                                                  |                                                                               |
|                                        | Connection with 1 or 2 snap-on connectors                                                                                                                                          |                                                                               |
| Output cable                           | <b>IFC 070 compact and field version</b>                                                                                                                                           |                                                                               |
|                                        | Standard: Pulse- or Modbus output cable                                                                                                                                            |                                                                               |
|                                        | Optional: Pulse output activated and connection to the KGA 42 data logger - GPRS module. Output cable with 2 plug and play - IP68 rated connectors                                 |                                                                               |
| Power supply                           |                                                                                                                                                                                    |                                                                               |
| Battery                                | <b>Standard:</b>                                                                                                                                                                   |                                                                               |
|                                        | Internal battery pack: Dual D-cell (Lithium, 3.6V, 38 Ah).                                                                                                                         |                                                                               |
|                                        | <b>Optional:</b>                                                                                                                                                                   |                                                                               |
|                                        | External IP67 PowerBlock: Dual DD-cell (Lithium, 3.6V, 70 Ah).<br>Cable length is 1.5 meter / 5 feet                                                                               |                                                                               |
| KROHNE FlexPower<br><b>Optional:</b>   | External IP68 rated AC/DC power supply (110...230V AC ± 10% / 10...30V DC / 50-60Hz) with battery backup Dual D-cell (Lithium, 3.6V, 38 Ah).<br>Cable length is 1.5 meter / 5 feet |                                                                               |
| Typical lifetime<br>(default settings) | With 2 internal batteries;                                                                                                                                                         | DN25...200 / 1...8": up to 10 years<br>DN250...600 / 10...24": up to 7 years  |
|                                        | With external KROHNE PowerBlock;                                                                                                                                                   | DN25...200 / 1...8": up to 16 years<br>DN250...600 / 10...24": up to 13 years |
|                                        | For detailed information refer to <i>Battery lifetime</i> on page 33                                                                                                               |                                                                               |
| Notifications                          | Pre-notification at < 10% of its original capacity                                                                                                                                 |                                                                               |
|                                        | Final notification at < 1% of its original capacity                                                                                                                                |                                                                               |
| Battery replacement                    | No loss of totalizer data                                                                                                                                                          |                                                                               |



|                                            |                                                                                                                                                                                                            |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sensor cable</b> (remote versions only) |                                                                                                                                                                                                            |
| Type                                       | KROHNE WSC2 standard cable, double shielded.                                                                                                                                                               |
| Length                                     | Standard: 5 meter / 16 feet                                                                                                                                                                                |
|                                            | Optional: 10 meter / 33 feet, 25 meter / 82 feet.                                                                                                                                                          |
|                                            | Other cable lengths on request (max. 30 meter)                                                                                                                                                             |
| <b>In- and output</b>                      |                                                                                                                                                                                                            |
| Pulse output                               | 2 Passive pulse outputs (maximum 3 outputs possible; see status output).                                                                                                                                   |
|                                            | $f \leq 100$ Hz; $I \leq 10$ mA; $U: 2.7...24$ VDC ( $P \leq 100$ mW).                                                                                                                                     |
|                                            | Volume / pulse is programmable                                                                                                                                                                             |
|                                            | Phase shift between pulse A and B (forward and reverse) selectable                                                                                                                                         |
|                                            | Pulse width is selectable:<br>5 ms (default), 10 ms, 20 ms, 50 ms, 100 ms, 200 ms.                                                                                                                         |
| Status output                              | 2 Passive status outputs (1 status output can be used as a third pulse output)                                                                                                                             |
|                                            | $I \leq 10$ mA; $U: 2.7...24$ VDC ( $P \leq 100$ mW)                                                                                                                                                       |
|                                            | Function (selectable): pressure limit maximum, pressure limit minimum, temperature limit maximum, temperature limit minimum, self-check, battery pre notification, battery final notification, empty pipe. |
| Communication                              | Internal & external batteries: Passive pulses or non-galvanic separated Modbus<br>KROHNE FlexPower: Passive pulses or galvanic separated Modbus                                                            |

### 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<br>Not valid for integrated temperature and pressure sensor                                                                                                            | Directive: 2014/32/EU / UK Regulation 2016 No. 1153 MID Annex III (MI-001) type examination certificate (DN25...600 / 1...24")                                                                             |
|                                                                                                                                                                                         | OIML R49 -1 certificate of conformity (DN25...600 / 1...24")                                                                                                                                               |
|                                                                                                                                                                                         | Innerstaatliche Bauartzulassung als Kaeltezaehler (For Germany, Switzerland and Austria)                                                                                                                   |
|                                                                                                                                                                                         | NMI M10 Certificate of approval for accuracy class 2.5 (Australia)                                                                                                                                         |
|                                                                                                                                                                                         | DN40...100; SANS 1529 (South Africa)                                                                                                                                                                       |
|                                                                                                                                                                                         | Contact Product Support KROHNE                                                                                                                                                                             |
| <b>Other approvals and standards</b>                                                                                                                                                    |                                                                                                                                                                                                            |
| Drinking water approvals                                                                                                                                                                | ACS, DVGW W270, NSF / ANSI Standard 61, UBA, WRAS, KIWA                                                                                                                                                    |
| Protection category according to IEC 60529                                                                                                                                              | Compact (C) and field (F) version in polycarbonate housing: IP68, NEMA 4X/6P and IP68 FlexPower unit / IP67 External battery pack (Test conditions; 1500 hours, 10 meters / 33 feet below surface)         |
| Shock test                                                                                                                                                                              | IEC 60068-2-27                                                                                                                                                                                             |
|                                                                                                                                                                                         | 30 g for 18 ms                                                                                                                                                                                             |
| Vibration test                                                                                                                                                                          | IEC 60068-2-64                                                                                                                                                                                             |
|                                                                                                                                                                                         | $f = 20...2000$ Hz, rms = 4.5g, t = 30 min.                                                                                                                                                                |

## 2.1.1 Integrated P&amp;T sensor (optional)

**Design**

|          |                                                                                                        |
|----------|--------------------------------------------------------------------------------------------------------|
| Features | Optional: integrated pressure and temperature sensor in the WATERFLUX 3000 flow sensor.                |
|          | In combination with:<br>IFC 070 (compact and remote)<br>WATERFLUX 3000 flow sensor DN50...200 / 2...8" |

**Measurements**

|                      |                                                                                         |
|----------------------|-----------------------------------------------------------------------------------------|
| Measuring range      | Pressure                                                                                |
|                      | -0.5...16 bar / -7.3...232 psi (relative)                                               |
|                      | Temperature                                                                             |
|                      | -5...+70°C / +23...158°F                                                                |
| Measuring units      |                                                                                         |
| Pressure             | Default setting: bar                                                                    |
|                      | Selectable: mbar, psi                                                                   |
| Temperature          | Default setting: °C                                                                     |
|                      | Selectable: °F                                                                          |
| Measurement interval | Default setting: 15 min.                                                                |
|                      | Selectable: 1 min., 5 min., 10 min., 15 min. or equal to the measurement flow interval. |

**Measuring accuracy**

|                            |                                                    |
|----------------------------|----------------------------------------------------|
| Maximum measuring accuracy | Pressure                                           |
|                            | ± 1% of full scale (0.5...16 bar / -7.3...232 psi) |
|                            | Temperature                                        |
|                            | ± 1.5°C for -5...+70°C / +23...158°F               |

**Materials**

|                                 |      |
|---------------------------------|------|
| Pressure and temperature sensor | 316L |
|---------------------------------|------|

## 2.1.2 KROHNE FlexPower (optional)

### Design

|          |                                                                                                                                                             |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Features | The WATERFLUX 3070 can be connected to an external FlexPower unit. The input power for the FlexPower can be realized by connection to a AC/DC supply source |
|          | Protection class; IP68                                                                                                                                      |
|          | Housing material; polypropylene                                                                                                                             |

### Operating range

|                                   |                                                            |
|-----------------------------------|------------------------------------------------------------|
| Input                             | 110...230 V AC $\pm$ 10%, 50-60 Hz, 9.5W                   |
|                                   | 10...30 V DC, 775-230 mA                                   |
| Output                            | 4.2 V DC, 5W                                               |
| Cable (Output)                    | Combined power and output (Y-cable) with snap-on connector |
| Power Cable                       | DC cable (green) and AC cable (grey)                       |
| Temperature                       |                                                            |
| Storage and transport temperature | -30...+70°C / -22...158°F                                  |
| Maximum operating temperature     | -25...+65°C / -13...149°F                                  |

### Approval

|                                            |                                                                                                        |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Transport                                  | Certificate under UN38.3 requirements (Transportation Tests for Lithium batteries)                     |
| <b>Other approval and standards</b>        |                                                                                                        |
| Protection category according to IEC 60529 | KROHNE FlexPower: IP68, NEMA 4X/6P<br>(Test conditions; 1500 hours, 10 meters / 33 feet below surface) |
| Shock test                                 | IEC 60068-2-27                                                                                         |
|                                            | 30 g for 18 ms                                                                                         |
| Vibration test                             | IEC 60068-2-64                                                                                         |
|                                            | f = 20...20000 Hz, rms = 4.5g, t = 30 min.                                                             |

### 2.1.3 Modbus protocol (option)

The Modbus option on the WATERFLUX 3070 is available in two versions:

- not isolated (battery powered) - for standard internal battery version
- galvanically isolated (mains powered) - for KROHNE FlexPower version

The WATERFLUX 3070 flow converter and FlexPower with Modbus has a RS485 interface to communicate with an external device (PC or other suitable computer system) using the Modbus protocol. This option allows data exchange between PC or computer and single or multiple devices. The bus configuration consists of one external device as a master and one or more signal converters as slaves.

For bus operation, the device address, parity, baud rate, stop bits, data format and transmission delay must be set in the signal converter. All devices connected to the bus, must have the same baud rate and settings, but different (unique) addresses.

*Please note that changing the baud rate will greatly affect the units battery life time. The baud rate equal to and below 9600 bps are considered energy efficient while baud rates greater than 9600 bps are not.*

*Do not use a bus termination for the non-isolated standard battery powered version (will effect the lifetime)!*

#### General technical data

|                             |                                                                                                                  |
|-----------------------------|------------------------------------------------------------------------------------------------------------------|
| Baud rate                   | 1200, 2400, 3600, 4800, 9600 (default), 19200, 38400, 57600 or 115200                                            |
| Protocol                    | Modbus RTU (documentation available on the Modbus Organisation website)                                          |
| Data encoding               | All Modbus data fields are encoded according to the IEC 61131-3 standard                                         |
| Maximum participants on bus | 32 per line, master included (may be extended by repeaters)                                                      |
| Coding                      | NRZ bit coding                                                                                                   |
| Address range               | Modbus: 1...247                                                                                                  |
| Transmission procedure      | Half duplex, asynchronous                                                                                        |
| Bus access                  | Master / slave                                                                                                   |
| Device role                 | Slave                                                                                                            |
| Cable                       | Shielded twisted pair for RS 485 applications                                                                    |
| Distances                   | Isolated: Maximum 1.2 km / 3937 ft without repeater (dependent on baud rate and cable specifications) multi-drop |
|                             | Non-isolated: Maximum 100 m, without termination (point to point)                                                |

*For more details refer to the Modbus supplementary manual.*

## 2.2 Legal metrology

### 2.2.1 OIML R49

The WATERFLUX 3070 has a certificate of conformity with the international recommendation OIML R49-1. The certificate has been issued by NMI (Dutch board of weight and measures).

The OIML R49 -1 concerns water meters intended for the metering of cold potable and hot water. The measuring range of the water meter is determined by  $Q_3$  (nominal flow rate) and  $R$  (ratio).

The WATERFLUX 3070 meets the requirements for water meters of accuracy class 1 and 2.

- For accuracy class 1, the maximum permissible error for water meters is  $\pm 1\%$  for the upper flow rate zone and  $\pm 3\%$  for the lower flow rate zones.
- For accuracy class 2, the maximum permissible error for water meters is  $\pm 2\%$  for the upper flow rate zone and  $\pm 5\%$  for the lower flow rate zones.

According to OIML R49, accuracy class 1 designation shall be applied only to water meter with  $Q_3 \geq 100 \text{ m}^3/\text{h}$ .

Refer to the technical datasheet of WATERFLUX 3070 for further details of the certification.

$$Q_1 = Q_3 / R$$

$$Q_2 = Q_1 * 1.6$$

$$Q_3 = Q_1 * R$$

$$Q_4 = Q_3 * 1.25$$

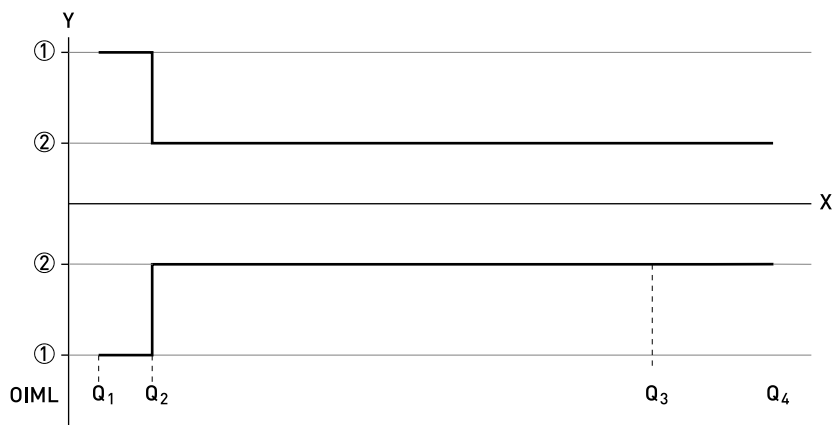


Figure 2-1: ISO flow rates added to figure as comparison towards OIML

**X:** Flow rate

**Y [%]:** Maximum measuring error

①  $\pm 3\%$  for class 1,  $\pm 5\%$  for class 2 devices

②  $\pm 1\%$  for class 1,  $\pm 2\%$  for class 2 devices

## OIML R49 Class 1; certified metrological flow characteristics

| DN  | Span (R)<br>Q3 / Q1 | Flow rate [m <sup>3</sup> /h] |                    |                 |                |
|-----|---------------------|-------------------------------|--------------------|-----------------|----------------|
|     |                     | Minimum<br>Q1                 | Transitional<br>Q2 | Permanent<br>Q3 | Overload<br>Q4 |
| 50  | 400                 | 0.10                          | 0.16               | 40              | 50             |
| 65  | 250                 | 0.400                         | 0.64               | 100             | 125            |
| 80  | 250                 | 0.640                         | 1.02               | 160             | 200            |
| 100 | 250                 | 1.00                          | 1.60               | 250             | 312.5          |
| 125 | 250                 | 1.60                          | 2.56               | 400             | 500            |
| 150 | 250                 | 2.52                          | 4.03               | 630             | 787.5          |
| 200 | 160                 | 3.9375                        | 6.30               | 630             | 787.5          |
| 250 | 160                 | 6.25                          | 10.00              | 1000            | 1250           |
| 300 | 160                 | 10.00                         | 16.00              | 1600            | 2000           |
| 350 | 160                 | 15.625                        | 25.00              | 2500            | 3125           |
| 400 | 160                 | 25                            | 40.00              | 4000            | 5000           |
| 450 | 160                 | 25                            | 40.00              | 4000            | 5000           |
| 500 | 160                 | 39.375                        | 63.00              | 6300            | 7875           |
| 600 | 100                 | 63                            | 100.80             | 6300            | 7875           |

## OIML R49 Class 2; certified metrological flow characteristics

| DN  | Span (R)<br>Q3/Q1 | Flow rate [m <sup>3</sup> /h] |                    |                 |                |
|-----|-------------------|-------------------------------|--------------------|-----------------|----------------|
|     |                   | Minimum<br>Q1                 | Transitional<br>Q2 | Permanent<br>Q3 | Overload<br>Q4 |
| 25  | 400               | 0.025                         | 0.040              | 10              | 12.5           |
| 25  | 400               | 0.040                         | 0.064              | 16              | 20.0           |
| 40  | 400               | 0.0625                        | 0.100              | 25              | 31.3           |
| 40  | 400               | 0.100                         | 0.160              | 40              | 50.0           |
| 50  | 400               | 0.100                         | 0.160              | 40              | 50.0           |
| 50  | 400               | 0.1575                        | 0.252              | 63              | 78.75          |
| 65  | 400               | 0.1575                        | 0.25               | 63              | 78.75          |
| 65  | 400               | 0.250                         | 0.40               | 100             | 125.0          |
| 80  | 400               | 0.250                         | 0.40               | 100             | 125.0          |
| 80  | 400               | 0.400                         | 0.64               | 160             | 200.0          |
| 100 | 400               | 0.400                         | 0.64               | 160             | 200.0          |
| 100 | 400               | 0.625                         | 1.00               | 250             | 312.5          |
| 125 | 400               | 0.625                         | 1.00               | 250             | 312.5          |
| 125 | 400               | 1.000                         | 1.60               | 400             | 500.0          |
| 150 | 400               | 1.000                         | 1.60               | 400             | 500.0          |
| 150 | 400               | 1.575                         | 2.52               | 630             | 787.5          |
| 200 | 400               | 1.575                         | 2.52               | 630             | 787.5          |
| 250 | 400               | 2.500                         | 4.00               | 1000            | 1250           |
| 300 | 400               | 4.000                         | 6.40               | 1600            | 2000           |
| 350 | 160               | 15.625                        | 25.0               | 2500            | 3125           |
| 400 | 160               | 25.000                        | 40.0               | 4000            | 5000           |
| 450 | 160               | 25.000                        | 40.0               | 4000            | 5000           |
| 500 | 160               | 39.375                        | 63.00              | 6300            | 7875           |
| 600 | 160               | 63.000                        | 100.80             | 6300            | 7875           |

### 2.2.2 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 3070 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 3070 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  $\pm 5\%$ .

$$Q1 = Q3 / R$$

$$Q2 = Q1 * 1.6$$

$$Q3 = Q1 * R$$

$$Q4 = Q3 * 1.25$$

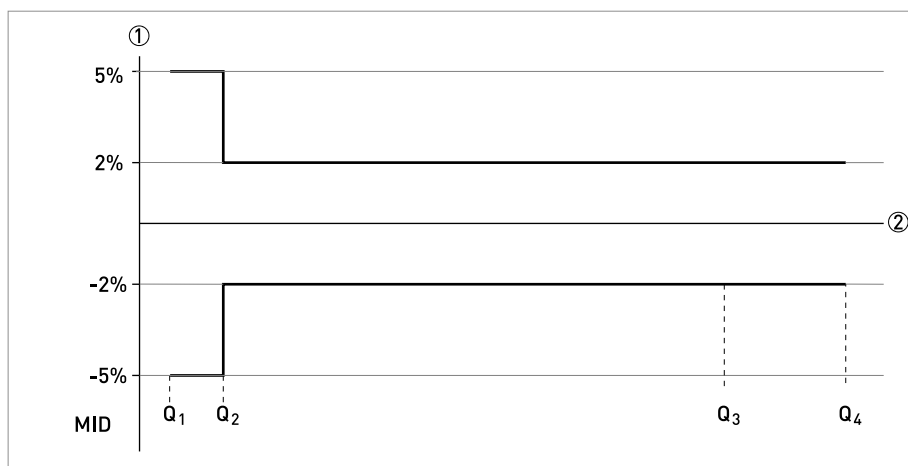


Figure 2-2: ISO flow rates added to figure as comparison towards MID

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        |

## 2.2.3 Verification to MID Annex III (MI-001) and OIML R49

Verification at other values for R and Q3 or to OIML R49 class 1 is 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 |

## 2.3 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

Note: the performance of the water meter is defined and documented in an individual water meter calibration certificate.

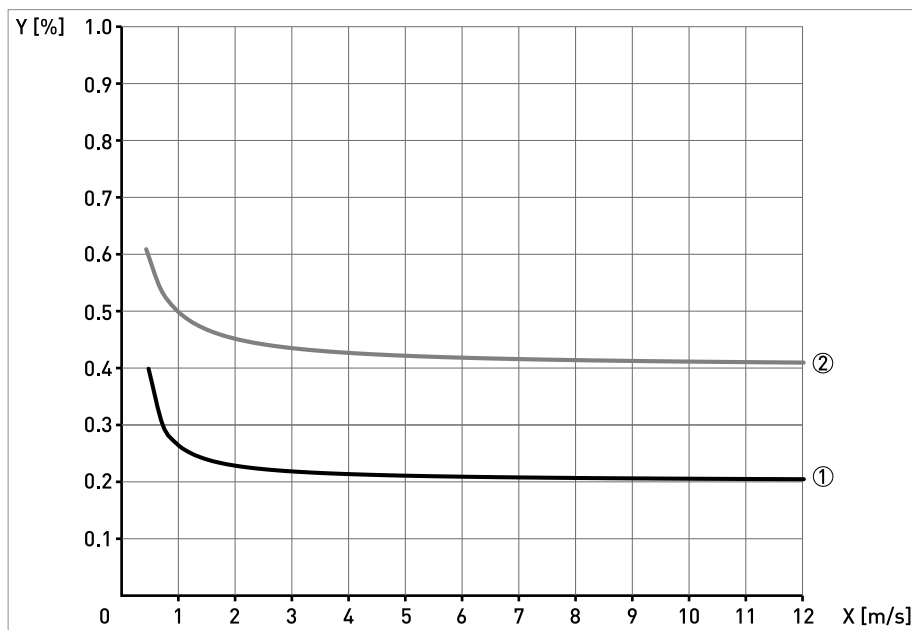


Figure 2-3: Measuring accuracy  
X [m/s]: Flow velocity; Y [%]: Maximum measuring error

### Accuracy with signal converter IFC 070

| Size                   | Accuracy                                | Curve |
|------------------------|-----------------------------------------|-------|
| DN25...300 / 1...12"   | 0.2% of the measured value $\pm 1$ mm/s | ①     |
| DN350...600 / 14...24" | 0.4% of the measured value $\pm 1$ mm/s | ②     |

### 2.3.1 WATERFLUX 3070 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 water meter, affect the measuring performance. Therefore it is usually recommended to fit a straight inlet length in front of and straight outlet length behind a water meter.

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.

The NMI has performed tests with various flow and swirl disturbers according to ISO 4064 and EN 14154. Based on these results the WATERFLUX 3070 has received the following certificates:

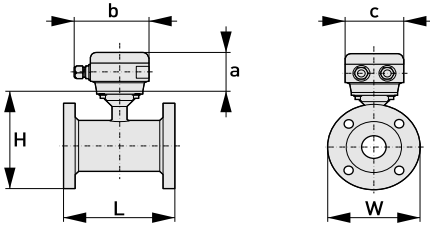
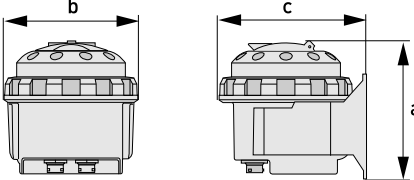
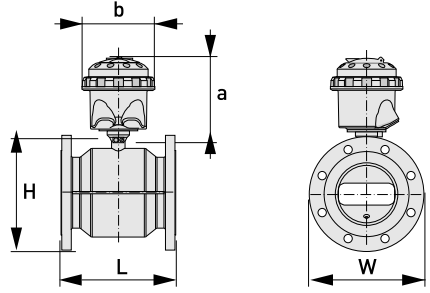
#### **OIML R49 certificate**

- In combination with the signal converter IFC 070
- Diameter range DN25...600 / 1...24"
- Accuracy class 1 and class 2
- Minimum straight inlet and outlet pipe length of 0 DN
- Bi-directional flow

#### **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

## 2.4 Dimensions and weights

|                                                                |                                                                                     |                                                                                                         |
|----------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| <p>Remote flow sensor</p>                                      |   | <p>a = 88 mm / 3.5"</p> <p>b = 139 mm / 5.5" ①</p> <p>c = 106 mm / 4.2"</p> <p>Total height = H + a</p> |
| <p>Remote signal converter in polycarbonate housing (IP68)</p> |   | <p>a = 171 mm / 6.7"</p> <p>b = 161 mm / 6.3"</p> <p>c = 177 mm / 7"</p>                                |
| <p>Compact version in polycarbonate housing (IP68)</p>         |  | <p>a = 159 mm / 6.3"</p> <p>b = 161 mm / 6.3"</p> <p>Total height = H + a</p>                           |

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

- 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                     |
| 1½                     | 5.91              | 6     | 4.9  | 21                     |
| 2                      | 7.87              | 7.05  | 5.9  | 34                     |
| 3                      | 7.87              | 8.03  | 7.5  | 42                     |
| 4                      | 9.84              | 9.49  | 9.0  | 56                     |
| 5                      | 9.84              | 10.55 | 10.0 | 65                     |
| 6                      | 11.81             | 11.69 | 11.0 | 80                     |
| 8                      | 13.78             | 14.25 | 13.5 | 100                    |
| 10                     | 15.75             | 16.3  | 16.0 | 148                    |
| 12                     | 19.7              | 18.8  | 19.0 | 210                    |
| 14                     | 27.6              | 20.7  | 21   | 290                    |
| 16                     | 31.5              | 22.9  | 23.5 | 370                    |
| 18                     | 31.5              | 24.7  | 25   | 420                    |
| 20                     | 31.5              | 27    | 27.5 | 500                    |
| 24                     | 31.5              | 31.4  | 32   | 680                    |

2.5 Pressure loss

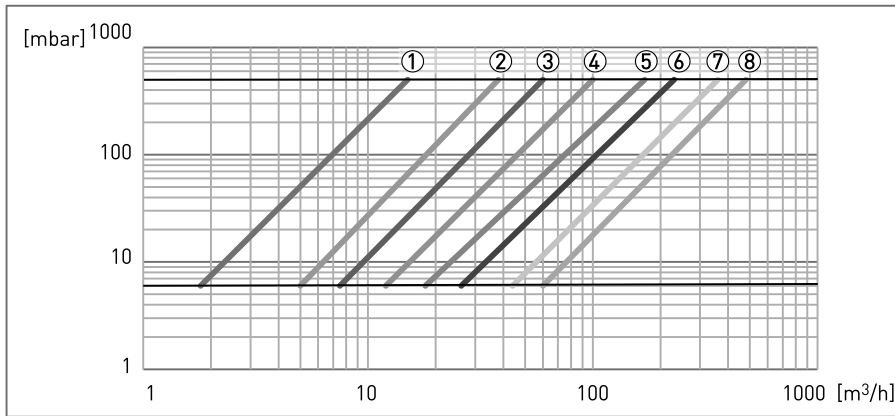


Figure 2-4: Pressure loss between 1...9 m/s / 3.3...30 ft/s for DN25...150 / 1...6"

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

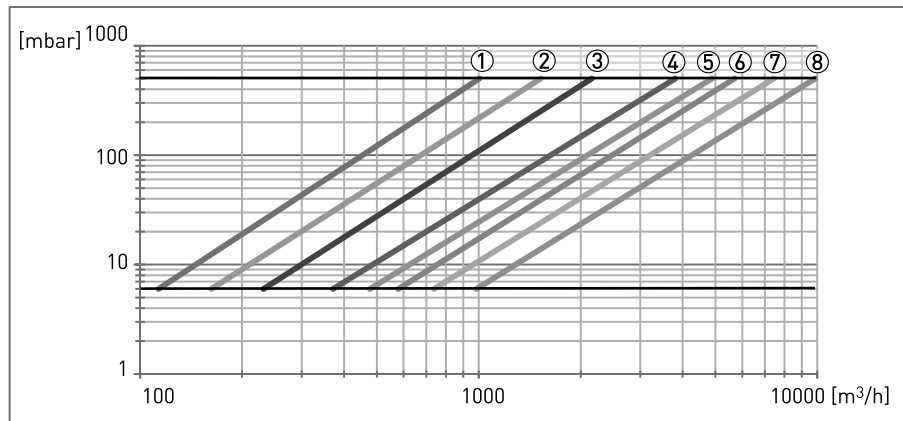


Figure 2-5: Pressure loss between 1...9 m/s / 3.3...30 ft/s for DN200...600 / 8...24"

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



## 2.6 Battery lifetime

The maximum battery lifetime depends on the choice of battery pack, the diameter and on the measurement interval. Other factors influencing the battery lifetime include the ambient temperature, the pulse output settings, the status output, the pulse width and the Modbus baud rate settings. The graphs show the battery lifetime for the different available battery types and measurement intervals.

### Conditions

The maximum battery lifetime is based on default menu and Modbus settings, an ambient temperature of 25°C / 77°F and a flow rate at 2 m/s. The effect of the optional pressure and temperature sensor decreases the battery lifetime by 5% (on average).

#### Maximum lifetime of batteries for: DN25...200 / 1...8"

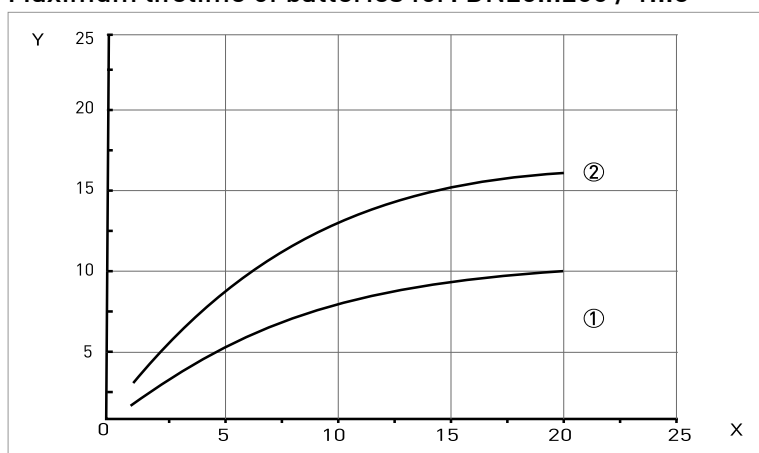


Figure 2-6: X = Measuring interval in seconds, Y = typical lifetime in years

#### Maximum lifetime of batteries for: DN250...600 / 10...24"

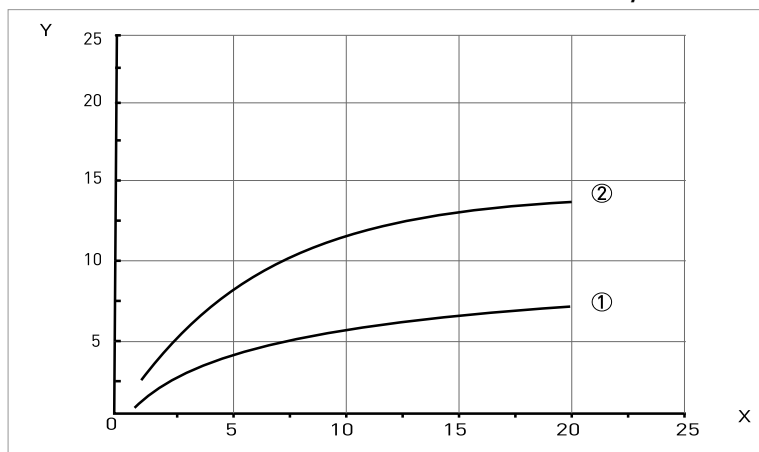


Figure 2-7: X = Measuring interval in seconds, Y = typical lifetime in years

- ① Internal Dual D-cell battery
- ② External KROHNE PowerBlock

### 3.1 General notes on installation

*Inspect the packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.*

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

*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 Intended use

*If the device is not used according to the operating conditions (refer to chapter Technical data), the intended protection could be affected.*

*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.*

*The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose.*

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

### 3.3 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

### 3.4 General requirements

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.

#### 3.4.1 Vibration

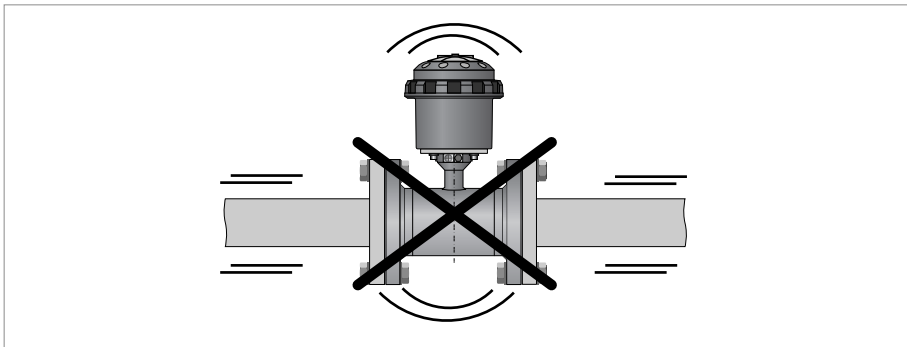


Figure 3-1: Avoid vibrations

#### 3.4.2 Magnetic field

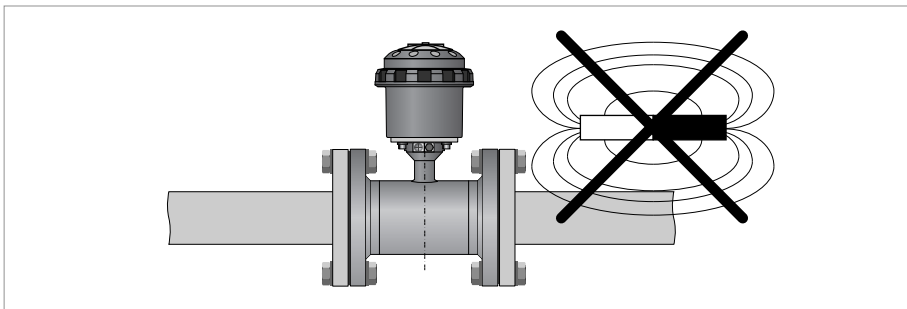


Figure 3-2: Avoid magnetic fields

### 3.5 Installation conditions

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.

3.5.1 Inlet and outlet

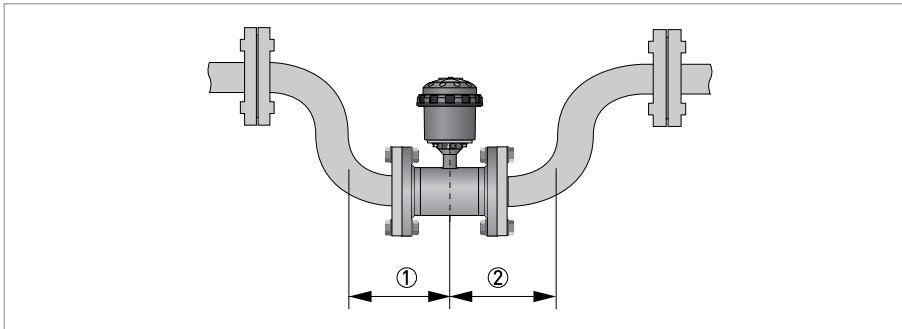


Figure 3-3: Minimal inlet and outlet

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

3.5.2 T-section

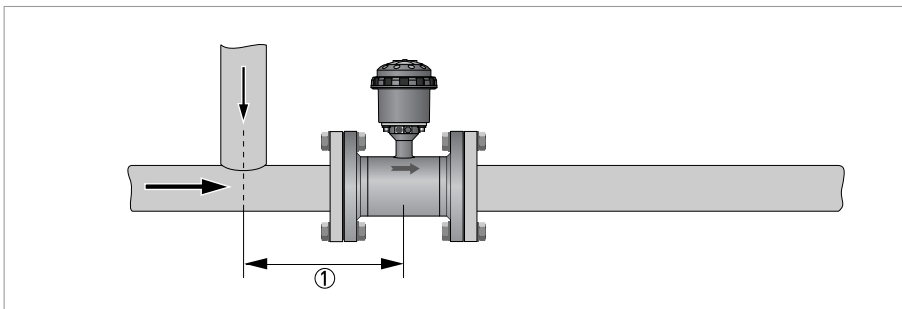


Figure 3-4: Distance behind a T-section

- ①  $\geq 0$  DN

3.5.3 Open feed or discharge

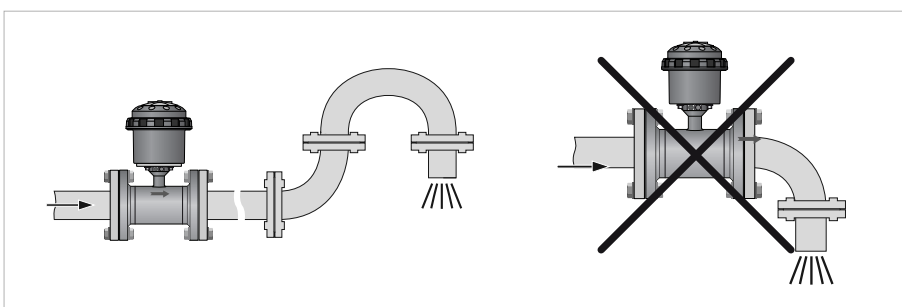


Figure 3-5: Installation in front of an open discharge

### 3.5.4 Bends

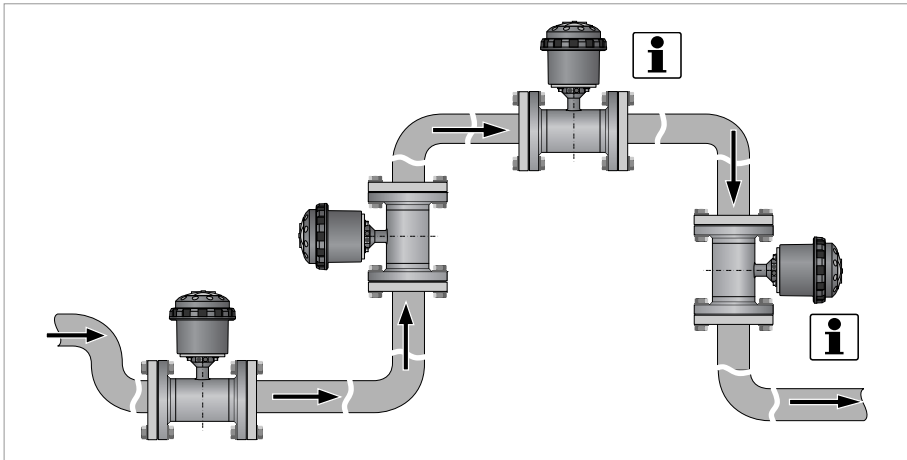


Figure 3-6: Installation in bending pipes (90°)

**NOTE!**

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.

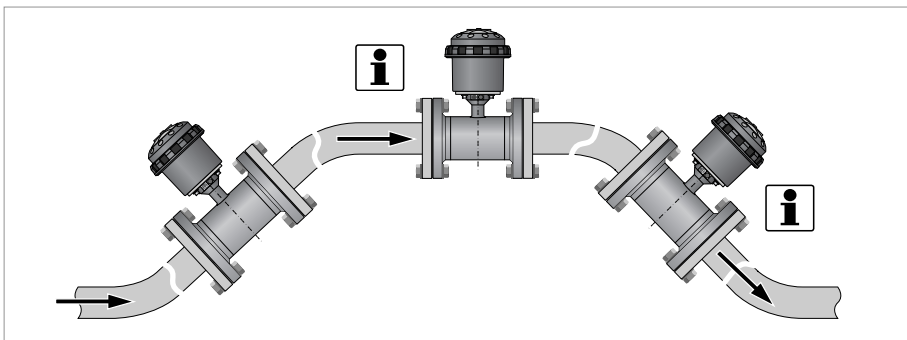


Figure 3-7: Installation in bending pipes (45°)

Avoid draining or partial filling of the flow sensor.

**NOTE!**

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

### 3.5.5 Pump

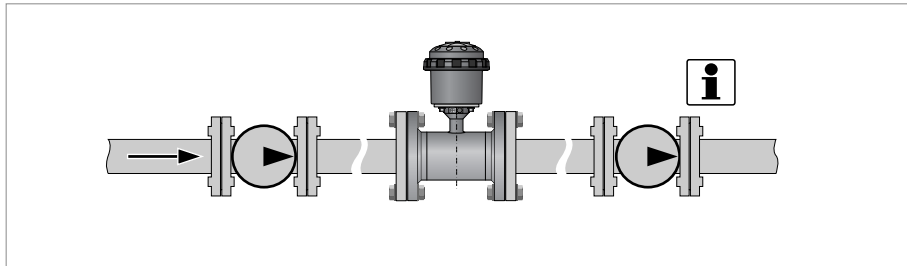


Figure 3-8: Recommended installation: behind a pump

**NOTE!**

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.

### 3.5.6 Control valve

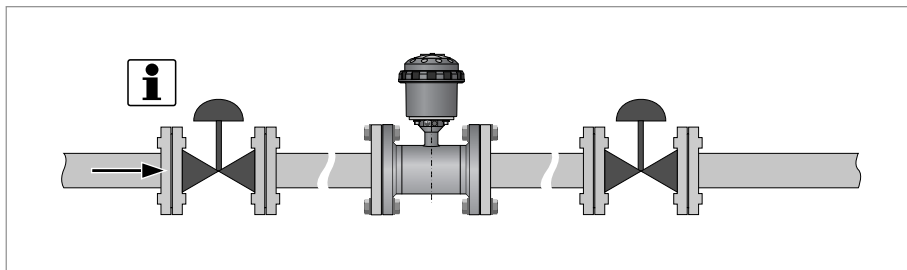


Figure 3-9: Recommended installation: in front of a control valve

**NOTE!**

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).

### 3.5.7 Air venting and vacuum forces

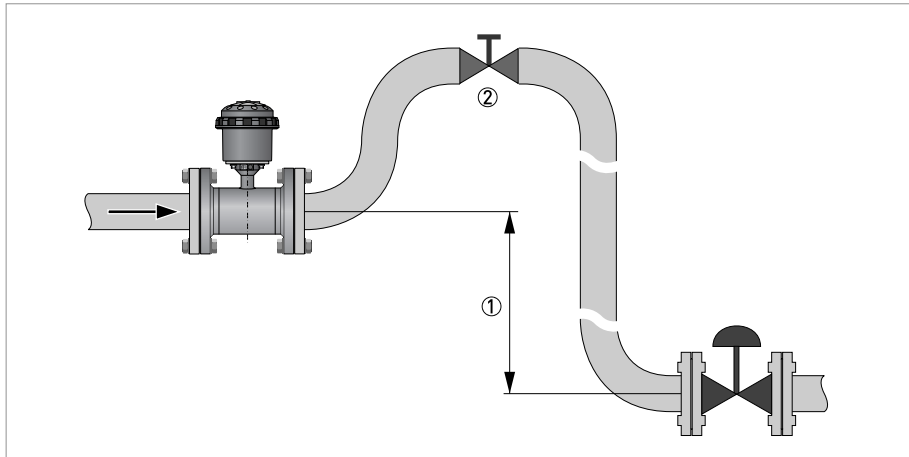


Figure 3-10: Air venting

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

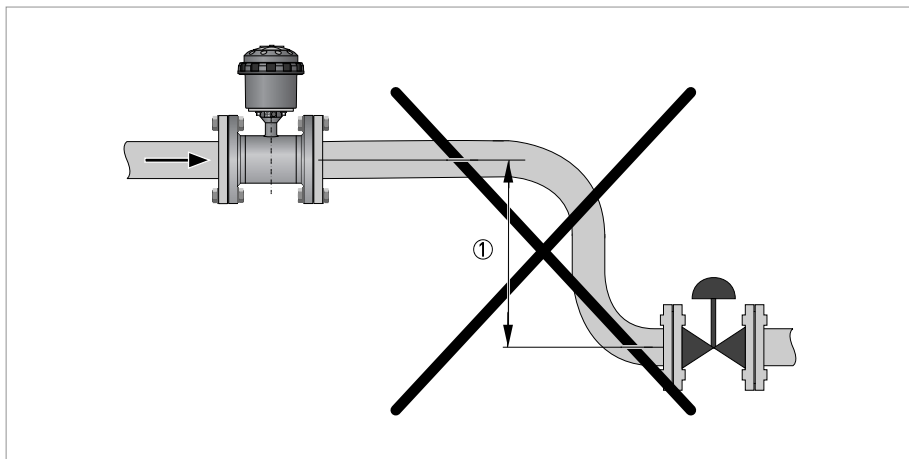


Figure 3-11: Vacuum

- ①  $\geq 5$  m

## 3.5.8 Flange Deviation

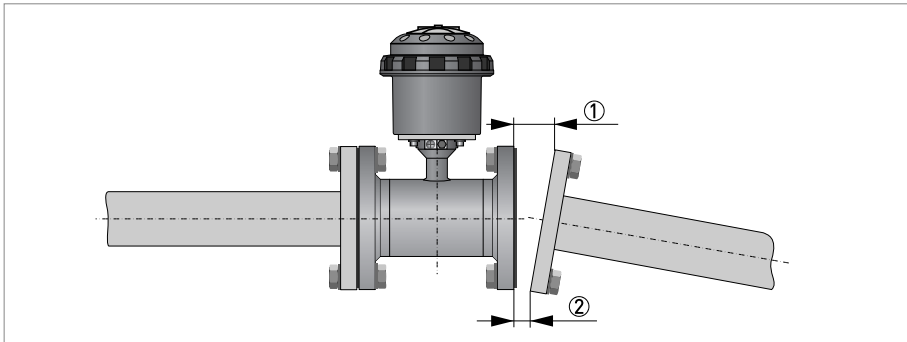


Figure 3-12: Flange deviation

- ①  $L_{max}$
- ②  $L_{min}$

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

Use the proper tools to ensure the integrity of the meter and prevent damage to the Rilsan<sup>®</sup> coating.

## 3.5.9 Mounting position

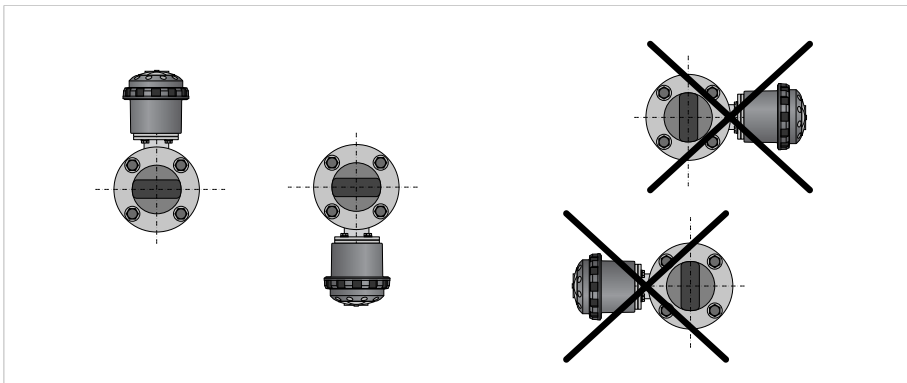


Figure 3-13: Mounting position

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



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

The WATERFLUX 3000 flow sensor is IP68 rated / NEMA 4X/6P to IEC/EN 60529. It is suitable for continuous submersion in flooded measurement chambers and can withstand a 10 meter / 33 ft water column.

The compact and remote version of the IFC 070 signal converter is IP68 rated / NEMA 4/4X/6 and suitable for periodic submersion in flooded measurement chambers.

The signal converters have a polycarbonate housing and IP68 rated (military) plug and play connectors. Submersion under water is possible down to a depth of 10 meter / 33 ft. In applications with prolonged or continuous submersion, it is advised to use the WATERFLUX 3070 remote version. The remote IFC 070 signal converter and GPRS data logger unit can be installed on the wall of the measuring pit near the lid for visual read out of the display.

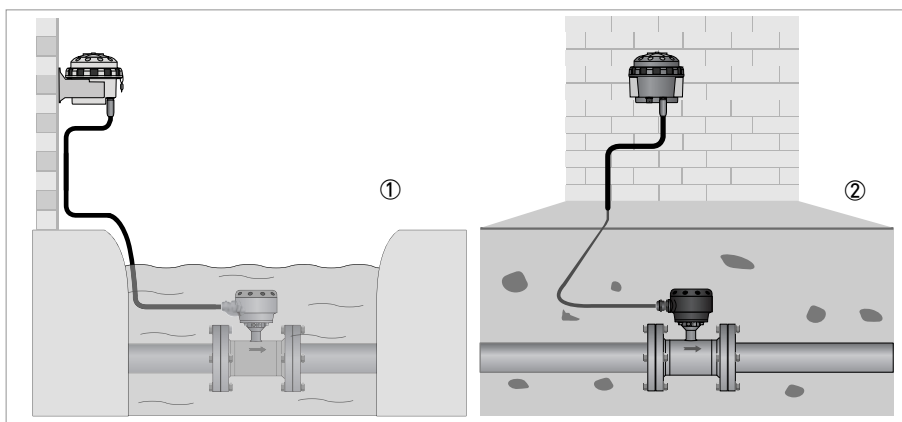


Figure 3-14: Examples of flooded and buried application

- ① Submersible
- ② Buried

#### Submersion applications

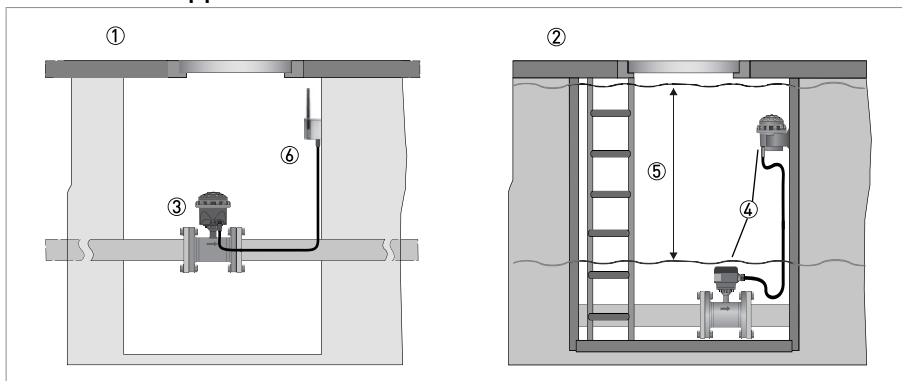


Figure 3-15: Examples of installation in measuring pit

- ① Periodic submersion
- ② Continuous submersion
- ③ Compact version
- ④ Remote version
- ⑤ Maximum water column 10 meter / 33 ft
- ⑥ GPRS / data logger unit (location)

*When installing flowmeter and GPRS/GSM module, follow supplier instructions.*

## 3.6 Mounting

### 3.6.1 Torques and pressures

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

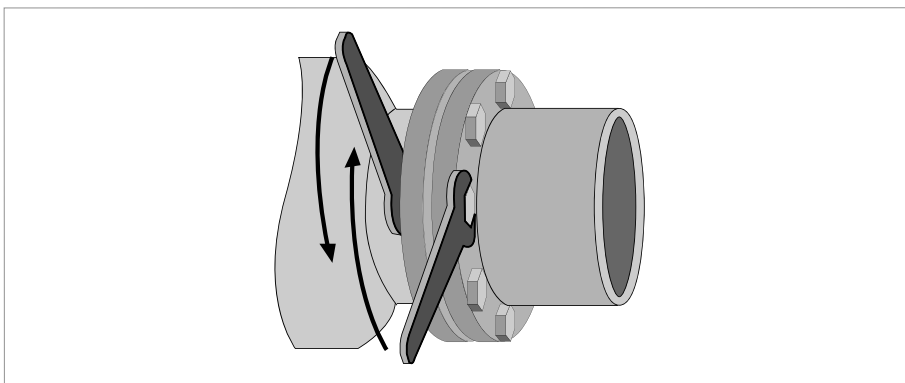


Figure 3-16: Tightening of bolts

#### Tightening of bolts

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

| Nominal size<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 <sup>②</sup> | 12 x M 20 | 57                               |
| 250                     | PN 10              | 12 x M 20 | 80                               |
| 250                     | PN 16 <sup>②</sup> | 12 x M 24 | 100                              |
| 300                     | PN 10              | 12 x M 20 | 95                               |
| 300                     | PN 16              | 12 x M 24 | 136                              |
| 350                     | PN 10              | 16 x M 20 | 96                               |
| 400                     | PN 10              | 16 x M 24 | 130                              |
| 450                     | PN 10              | 20 x M 24 | 116                              |
| 500                     | PN 10              | 20 x M 24 | 134                              |
| 600                     | PN 10              | 20 x M 27 | 173                              |

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

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                                    |
| 1½                     | 150                  | 4 x 1/2"    | 11                                   |
| 2                      | 150                  | 4 x 5/8"    | 18                                   |
| 2.5                    | 150                  | 8 x 5/8"    | 27                                   |
| 3                      | 150                  | 4 x 5/8"    | 33                                   |
| 4                      | 150                  | 8 x 5/8"    | 22                                   |
| 5                      | 150                  | 8 x 3/4"    | 33                                   |
| 6                      | 150                  | 8 x 3/4"    | 48                                   |
| 8                      | 150                  | 8 x 3/4"    | 66                                   |
| 10                     | 150                  | 12 x 7/8"   | 74                                   |
| 12                     | 150                  | 12 x 7/8"   | 106                                  |
| 14                     | 150 ②                | 12 x 1"     | 87                                   |
| 16                     | 150 ②                | 16 x 1"     | 84                                   |
| 18                     | 150 ②                | 16 x 1 1/8" | 131                                  |
| 20                     | 150 ②                | 20 x 1 1/8" | 118                                  |
| 24                     | 150 ②                | 20 x 1 1/4" | 166                                  |

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

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

### 3.7 Mounting of the signal converter

*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.*

#### 3.7.1 Remote signal converter housing

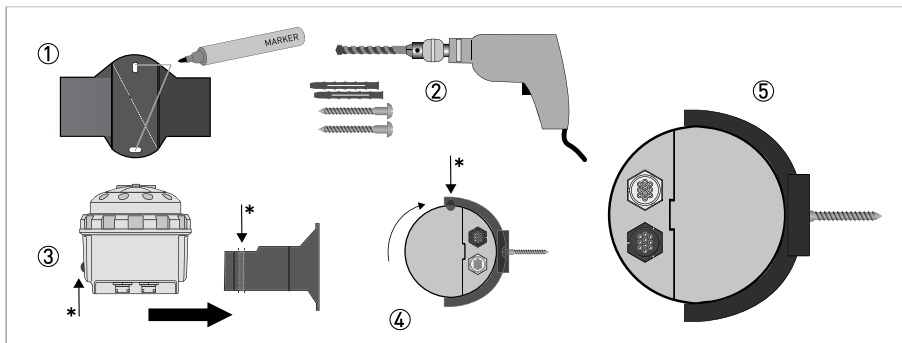


Figure 3-17: Mounting of the wall holder

- ① Mark the fixation points.
- ② Drill the holes and mount the holder with the right screws (e.g. M6 x 50 with washer) and plugs. Do not exceed a tightening torque of 2 Nm / 1.5 lb-ft when fastening the screws. This can damage the wall holder.
- ③ Slide the IP68 remote version housing into the holder as shown. Make sure that the positioning cam \* is placed in the guiding provided for that purpose (power and data connectors positioned on the backside).
- ④ Turn the housing 180° counter clockwise (until the power and data connectors are on the front side). Make sure that the holder snaps into the lock of the wall holder.
- ⑤ Bottom view of the IP68 remote version in to the wall holder.

#### 3.7.2 Closing of the signal converter housing

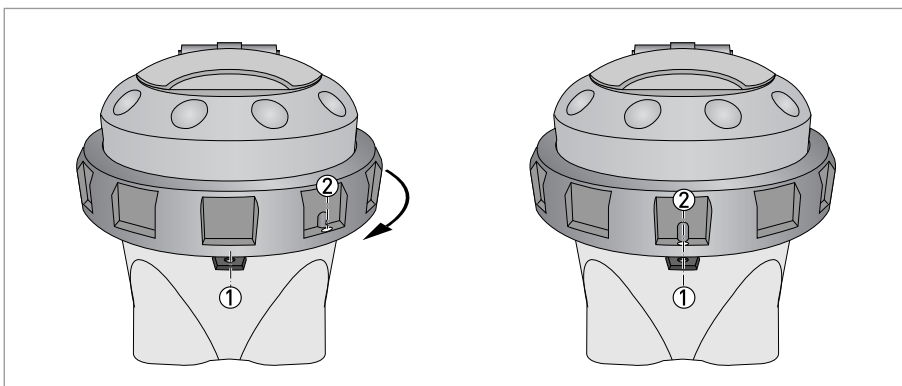


Figure 3-18: Closing of the signal converter housing

- Before closing the case of the signal converter, ensure that all surfaces in contact with the seals are clean.
- Position the upper part of the case and tighten the lock ring, up until the positions of points ① and ② are in line (do not tighten the ring any further).
- Use the special wrench to tighten the ring as advised above.
- If applicable, place a new utility seal (see section Utility Seal).

## 4.1 Safety instructions

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

*Observe the national regulations for electrical installations!*

*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.*

*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

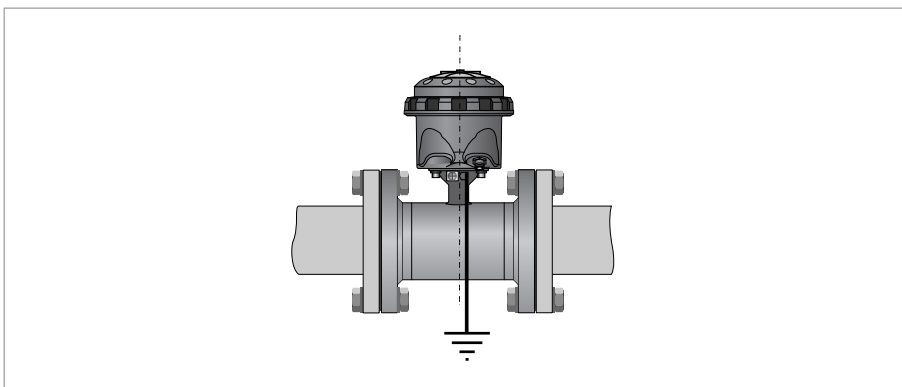


Figure 4-1: Grounding

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

### 4.3 Cable overview

The following overview describes the different cables available for the compact and remote version.

The flow sensor cable for the IP68 remote (field) version has an 8 pin male connector. The I/O cable (pulse /modbus) is available in a KROHNE FlexPower version and has an additional power cable connection.

Overview I/O cables, with or without a power cable, with female connector:

#### IP68 Cable versions

| I/O version  | KROHNE FlexPower cable | PIN |
|--------------|------------------------|-----|
| Modbus cable | N                      | 4   |
| Pulse cable  | N                      | 8   |
| KGA 42       | N                      | 8   |
| Modbus cable | Y                      | 10  |
| Pulse cable  | Y                      | 8   |
| KGA 42       | Y                      | 8   |

#### Electrical values

- **Pulse output**  
**2x Pulse output passive - (maximum 3 outputs possible, see status output):**  
 $f \leq 100 \text{ Hz}$ ;  $I \leq 10 \text{ mA}$ ;  $U: 2.7...24 \text{ VDC}$  ( $P \leq 100 \text{ mW}$ )
- **Status output**  
**2x Status output passive - (1 status output can be used as a third pulse output):**  
 $I \leq 10 \text{ mA}$ ;  $U: 2.7...24 \text{ VDC}$  ( $P \leq 100 \text{ mW}$ )
- **Communication**  
 Modbus RTU output - (detailed information available in Supplementary Manual)
- **Optional:**  
 KGA external data logger / GSM module - (see the KGA 42 Supplementary Manual)

## 4.4 Connection of the flow sensor cable

*Make sure the device functions properly, always use the signal cables included in the delivery*

The compact version of the WATERFLUX 3070 is already internally connected to the flow sensor and has different options to connect pulse, Modbus and/or external supply cables. See the following sections for the different options and available cables.

For the WATERFLUX 3070 remote version, a standard cable is delivered with the device. On the flow sensor side the cable is as standard potted at the factory. The flow sensor cable has a IP68 rated stainless steel snap-on connection to connect the flow sensor with the IP68 field signal converter the cables have the following colour coded leads:

### Standard flow sensor cable

| Wire colour | Terminal | Function                  |
|-------------|----------|---------------------------|
| Brown       | 1        | Reference electrode       |
| White       | 2        | Standard electrode signal |
| Violet      | 3        | Standard electrode signal |
| Blue        | 7        | Field current             |
| Green       | 8        | Field current             |
| Yellow      | 9        | No function               |
| Drain wires | Screws   | Shielding                 |

*The standard WSC2 flow sensor cable (double shielded), includes both electrode and field current leads and has a maximum length of 25 m / 82 ft. (other lengths on request).*

### Flow sensor cable with integrated P&T option

| Wire colour | Contact on connector | Terminal | Function                         |
|-------------|----------------------|----------|----------------------------------|
| Brown       | H                    | 1        | Reference electrode / P&T sensor |
| White       | D                    | 4        | P&T sensor                       |
| Grey        | F                    | 5        | P&T sensor                       |
| Pink        | B                    | 6        | P&T sensor                       |
| Blue        | A                    | 7        | Field current                    |
| Green       | G                    | 8        | Field current                    |
| White/White | C                    | 2        | Standard electrode signal        |
| White/Red   | E                    | 3        | Standard electrode signal        |
| Drain wires | Housing              | Screws   | Shielding                        |



## 4.5 Connection of the signal cable

### 4.5.1 IP68 housing (compact version)

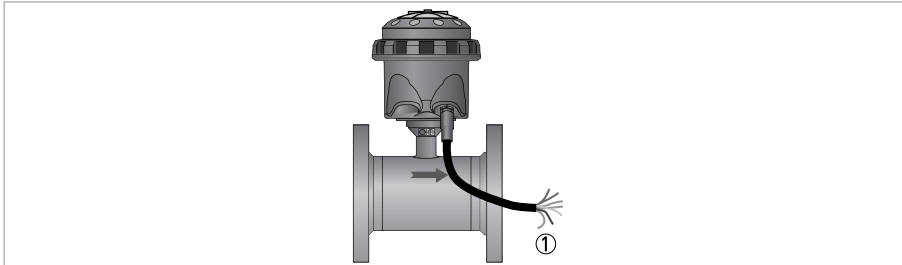


Figure 4-2: Output cable at IP68 compact version

① Color coded leads of the output cable

If an output is activated, the output cable with the IP68 rated connector has the following color coded leads:

#### Pulse output cable

| Wire color | Contact on connector | Function                                                  |
|------------|----------------------|-----------------------------------------------------------|
| Yellow     | A                    | Status output 1 or threshold for P or T or pulse output C |
| White      | G                    | Status output 2 or threshold for P or T                   |
| Blue       | H                    | Ground                                                    |
| Brown      | B                    | Pulse output A                                            |
| Green      | F                    | Pulse output B                                            |
| Pink       | C                    | External battery +                                        |
| Grey       | E                    | External battery -                                        |

Note; with or without shielding

#### Modbus cable

| Wire color | Contact on connector | Function                         |
|------------|----------------------|----------------------------------|
| Yellow     | 1                    | Down link wire B Sign. B (D1+) ← |
| Grey       | 1                    | Up link wire B Sign. B (D1+) →   |
| Pink       | 2                    | Up link wire A Sign. A (D0-) →   |
| Green      | 2                    | Down link wire A (D0-) ←         |
| White      | 3                    | Ground                           |
| Brown      | -                    | -                                |
| Shield     | Earth                |                                  |

Note: see the next chapter for the combined power and modbus / pulse cable options.

## 4.5.2 IP68 housing (remote version)

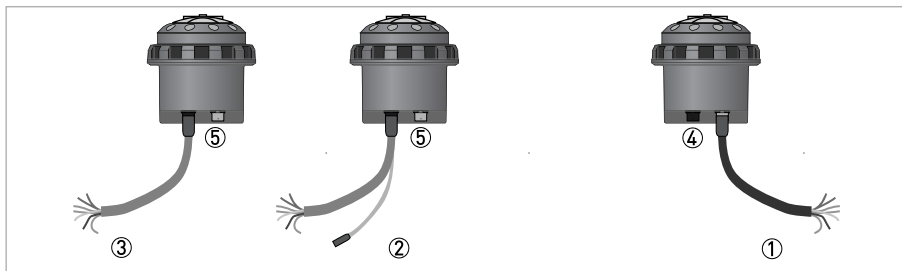


Figure 4-3: Different output cable, IP68 remote version

- ① Color coded leads of flow sensor cable
- ② Y - cable with additional power cable
- ③ I/O cable (pulse, modbus)
- ④ I/O connection
- ⑤ Stainless steel flow sensor cable connection

**Flow sensor cable:**

For more information; refer to *Connection of the flow sensor cable* on page 48 for the available connection options.

For connection of I/O (modbus, pulse output signals) with or without additional power supply cable connection, several cable connection options are available. The cables have the following color code leads.

**Output pulse cable**

| Wire color | Contact on connector | Function                                                  |
|------------|----------------------|-----------------------------------------------------------|
| Yellow     | A                    | Status output 1 or threshold for P or T or pulse output C |
| White      | G                    | Status output 2 or threshold for P or T                   |
| Blue       | H                    | Ground                                                    |
| Brown      | B                    | Pulse output A                                            |
| Green      | F                    | Pulse output B                                            |
| Pink       | C                    | External battery +                                        |
| Grey       | E                    | External battery -                                        |

**Modbus cable**

| Wire color | Contact on connector | Function                         |
|------------|----------------------|----------------------------------|
| Yellow     | 1                    | Down link wire B Sign. B (D1+) ← |
| Grey       | 1                    | Up link wire B Sign. B (D1+) →   |
| Pink       | 2                    | Up link wire A Sign. A (D0-) →   |
| Green      | 2                    | Down link wire A Sign. A (D0-) ← |
| White      | 3                    | Ground                           |
| Brown      | -                    | -                                |
| Shield     | Earth                |                                  |

**Combined power and pulse output cable (Y-cable)**

| Wire color | Contact on connector | Function                                                  |
|------------|----------------------|-----------------------------------------------------------|
| Yellow     | A                    | Status output 1 or threshold for P or T or pulse output C |
| White      | G                    | Status output 2 or threshold for P or T                   |
| Grey       | H                    | Ground                                                    |
| Brown      | B                    | Pulse output A                                            |
| Green      | F                    | Pulse output B                                            |
|            |                      |                                                           |
| Brown      | C                    | External power +3.6V                                      |
| White      | E                    | External power (Ground)                                   |
| Shield     | D                    | Shielding                                                 |

**Combined power and Modbus cable (Y-cable)**

| Wire color | Contact on connector | Function                         |
|------------|----------------------|----------------------------------|
| Shield     | C                    | Shielding                        |
| Brown      | B                    | -                                |
| White      | A                    | Ground                           |
| Green      | E                    | Down link wire A Sign. A (D0-) ← |
| Yellow     | K                    | Down link wire B Sign. B (D1+) ← |
| Pink       | H                    | Up link wire A Sign. A (D0-) →   |
| Grey       | J                    | Up link wire B Sign. B (D1+) →   |
|            |                      |                                  |
| Brown      | F                    | External power +3.6V             |
| White      | G                    | External power (Ground)          |
| Shield     | D                    | Shielding                        |

This cable has two pairs of wires, one for uplink and one for downlink. Both are connected within the connector. When disconnecting the cable on the flow sensor side, the two paired wires will stay connected so there is disconnection of the RS-485.

Because of this connection (switching link wire), it makes no difference where the up- and downlink are connected.

*For proper use and installation, it is recommended to follow the advised color coded wire connections in the table above. A 120 Ω line terminator is required when the WATERFLUX 3070 signal converter is the last device in line and/or is part of the bus connection.*

*Specific information is described in the supplementary Modbus manual, available on the manufacturer website.*

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

- Process instrumentation for flow, level, temperature, pressure measurement and process analytics
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