



WATERFLUX 3070 Handbook

Battery powered electromagnetic water meter

Electronic Revision ER 4.3.0_ up to ER 4.3.4_
(SW.REV 4.2.2_ up to 4.2.5_)

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1.1 Software history

The "Electronic Revision" (ER) is consulted to document the revision status of electronic equipment according to NE 53 for all GDC devices. It is easy to see from the ER whether troubleshooting or larger changes in the electronic equipment have taken place and how that has affected the compatibility.

Changes and effect on compatibility

1	Downwards compatible changes and fault repair with no effect on operation (e.g. spelling mistakes on display)	
3- P S X	Downwards compatible hardware and/or software change of inputs and outputs:	
	P	Pulse output
	S	Status output
	X	all inputs and outputs
4	Downwards compatible changes with new functions	
5	Incompatible changes, i.e. electronic equipment must be changed.	

Release date	Electronic revision	Changes and compatibility	Documentation
2009	ER 2.3.1_ (SW. REV. 2.3.1_)	Initial software version	MA IFC 070 R01
2009	ER 4.0.0_ (SW. REV. 4.0.4_)	1; 3-P; 3-S; 4	MA IFC 070 R02
2010	ER 4.0.0_ (SW. REV. 4.0.10_)	1; 3-P; 3-S; 4	MA IFC 070 R03
2011	ER 4.0.2_ & ER 4.0.3_ (SW. REV. 4.0.6_)	1; 3-P; 3-S; 4	MA IFC 070 R03
2011	ER 4.0.4_ (SW. REV. 4.0.11_)	1; 3-P; 3-S; 4	MA WATERFLUX 3070 R02
2012	ER 4.3.0_ (SW. REV. 4.2.2_)	5	MA WATERFLUX 3070 R03
2012	ER 4.3.2_ (SW. REV. 4.2.3_)	1	MA WATERFLUX 3070 R04
2012	ER 4.3.3_ (SW. REV. 4.2.4_)	1	MA WATERFLUX 3070 R04
2013	ER 4.3.4_ (SW. REV. 4.2.5_)	1	MA WATERFLUX 3070 R04
2013	ER 4.3.4_ (SW. REV. 4.2.5_)	1	MA WATERFLUX 3070 R05

1.2 Intended use

**CAUTION!**

Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.

**INFORMATION!**

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

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

**WARNING!**

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

1.3 Certification

CE marking



The device fulfils the statutory requirements of the following EC directives:

- EMC Directive 2004/108/EC in conjunction with EN 61010-1: 2001

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

1.4 Safety instructions from the manufacturer

1.4.1 Copyright and data protection

The contents of this document have been created with great care. Nevertheless, we provide no guarantee that the contents are correct, complete or up-to-date.

The contents and works in this document are subject to copyright. Contributions from third parties are identified as such. Reproduction, processing, dissemination and any type of use beyond what is permitted under copyright requires written authorisation from the respective author and/or the manufacturer.

The manufacturer tries always to observe the copyrights of others, and to draw on works created in-house or works in the public domain.

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

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

We hereby expressly prohibit the use of the contact data published as part of our duty to publish an imprint for the purpose of sending us any advertising or informational materials that we have not expressly requested.

1.4.2 Disclaimer

The manufacturer will not be liable for any damage of any kind by using its product, including, but not limited to direct, indirect or incidental and consequential damages.

This disclaimer does not apply in case the manufacturer has acted on purpose or with gross negligence. In the event any applicable law does not allow such limitations on implied warranties or the exclusion of limitation of certain damages, you may, if such law applies to you, not be subject to some or all of the above disclaimer, exclusions or limitations.

Any product purchased from the manufacturer is warranted in accordance with the relevant product documentation and our Terms and Conditions of Sale.

The manufacturer reserves the right to alter the content of its documents, including this disclaimer in any way, at any time, for any reason, without prior notification, and will not be liable in any way for possible consequences of such changes.

1.4.3 Product liability and warranty

The operator shall bear responsibility for the suitability of the device for the specific purpose. The manufacturer accepts no liability for the consequences of misuse by the operator. Improper installation and operation of the devices (systems) will cause the warranty to be void. The respective "Standard Terms and Conditions" which form the basis for the sales contract shall also apply.

1.4.4 Information concerning the documentation

To prevent any injury to the user or damage to the device it is essential that you read the information in this document and observe applicable national standards, safety requirements and accident prevention regulations.

If this document is not in your native language and if you have any problems understanding the text, we advise you to contact your local office for assistance. The manufacturer can not accept responsibility for any damage or injury caused by misunderstanding of the information in this document.

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

1.4.5 Warnings and symbols used

Safety warnings are indicated by the following symbols.



DANGER!

This information refers to the immediate danger when working with electricity.



DANGER!

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



DANGER!

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



WARNING!

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



CAUTION!

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



INFORMATION!

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



LEGAL NOTICE!

This note contains information on statutory directives and standards.



• **HANDLING**

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

➡ **RESULT**

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

1.5 Safety instructions for the operator



WARNING!

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

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

1.6 Instruction for transportation and handling of batteries

**WARNING!**

Lithium batteries are primary power sources with high energy content. If mistreated, they may present a potential risk.

**INFORMATION!**

The manufacturer assumes no liability for customer failure.

Please observe the following instructions:

- Transport only in special packaging with special labels and transportation documents.
- Do not short-circuit, recharge, overcharge or connect with false polarity.
- Do not expose to temperature beyond the specified temperature range or incinerate the battery.
- Do not crush, puncture or open cells or disassemble battery packs.
- Do not weld or solder to the body of the battery.
- Do not expose contents of battery to water.
- Remove the battery from device before returning to the manufacturer for service or warranty reasons.
- Dispose battery packs in accordance with local regulations; where possible, recycle used batteries.

2.1 Scope of delivery

**INFORMATION!**

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

**INFORMATION!**

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

**INFORMATION!**

The remote version will arrive in two cartons. One carton contains the converter and one carton contains the sensor.

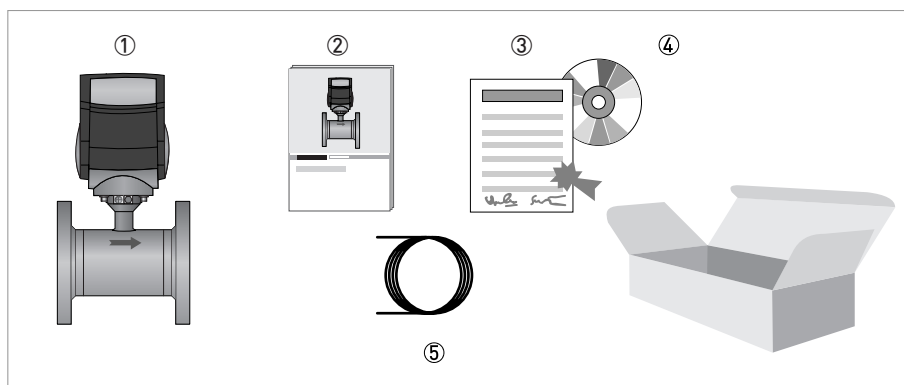


Figure 2-1: Scope of delivery

- ① Ordered water meter
- ② Product documentation
- ③ Factory calibration report
- ④ CD-ROM with product documentation in available languages
- ⑤ Signal cable (remote versions only)

**INFORMATION!**

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

2.2 Device description

Your measuring device is supplied ready for operation. The factory settings for the operating data have been made in accordance with your order specifications.

The following versions are available:

- Compact version (the signal converter is mounted directly on the measuring sensor) in aluminium (IP67) or polycarbonate (IP68) housing
- Remote version (measuring sensor with connection box and a signal converter in a remote (field) housing)

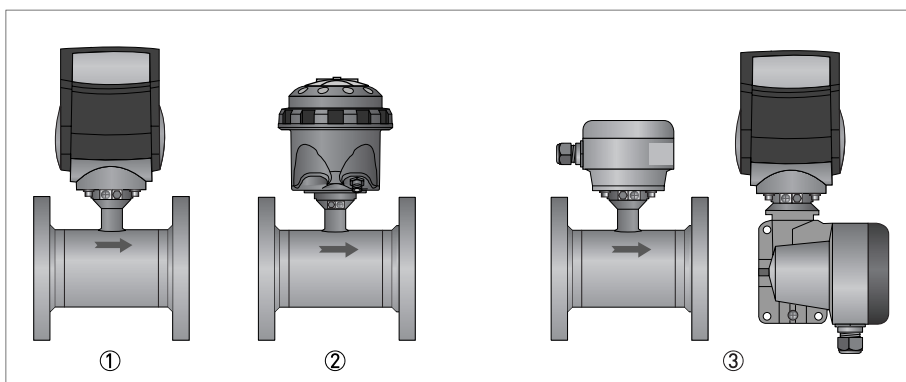


Figure 2-2: Device versions

- ① Compact version in aluminium (IP67) housing
- ② Compact version in polycarbonate (IP68) housing
- ③ Remote version

2.3 Nameplate



INFORMATION!

Check the device nameplate to ensure that the device is delivered according to your order.

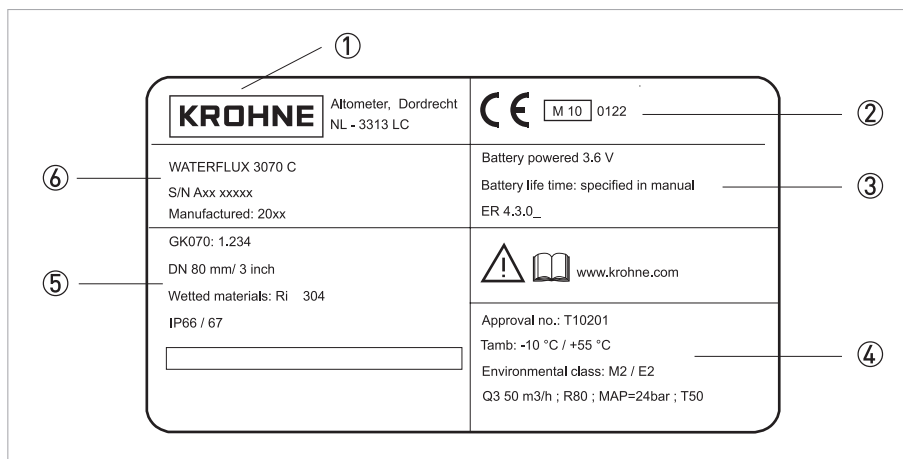


Figure 2-3: Example of nameplate

- ① Name and address of the manufacturer
- ② CE sign with number(s) of notified body / bodies
- ③ Battery voltage and Electronic Revision number
- ④ Optional (MI-001): Additional information including approval number, Q3, ratio
- ⑤ Meter constant, diameter, wetted materials, protection class
- ⑥ Type designation of the flowmeter, serial number, date of manufacturing

3.1 General notes on installation

**INFORMATION!**

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

**INFORMATION!**

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

**INFORMATION!**

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

3.2 Storage

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

3.3 Transport

Signal converter

- No special requirements.

Compact version

- Do not lift the device by the signal converter housing.
- Do not use lifting chains.
- To transport flange devices, use lifting straps. Wrap these around both process connections.

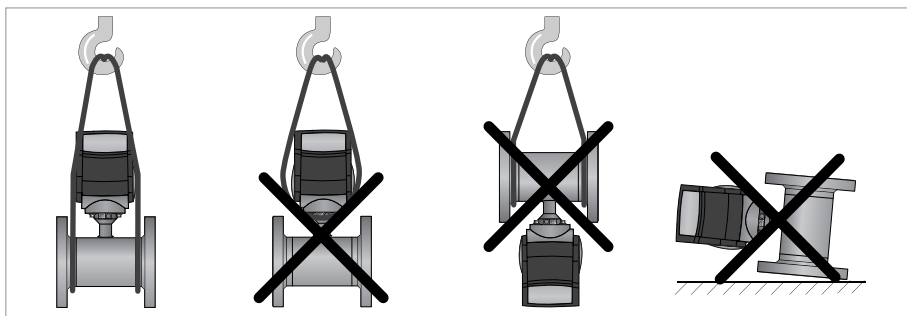


Figure 3-1: Transport

3.4 Pre-installation requirements

Make sure that you have all necessary tools available:

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

3.5 General requirements



INFORMATION!

The following precautions must be taken to ensure reliable installation.

- *Make sure that there is adequate space to the sides.*
- *Protect the signal converter from direct sunlight and install a sun shade if necessary.*
- *Signal converters installed in control cabinets require adequate cooling, e.g. by fan or heat exchanger.*
- *Do not expose the signal converter to intense vibration. The flowmeters are tested for a vibration level in accordance with IEC 68-2-64.*

3.5.1 Vibration

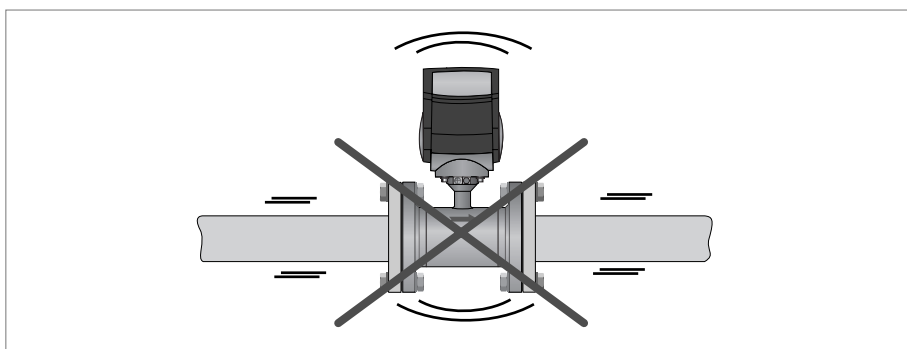


Figure 3-2: Avoid vibrations

3.5.2 Magnetic field

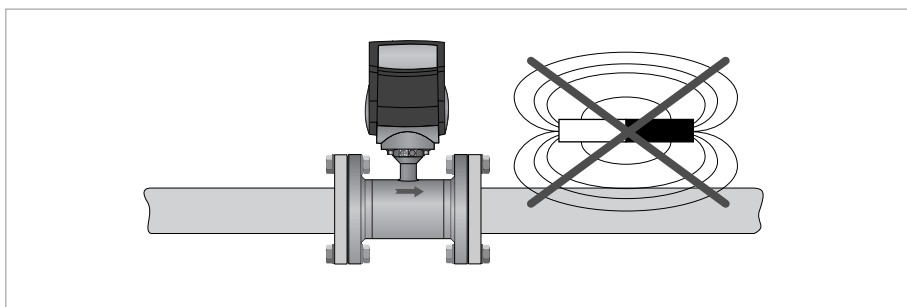


Figure 3-3: Avoid magnetic fields

3.6 Installation conditions

3.6.1 Inlet and outlet

DN25...300

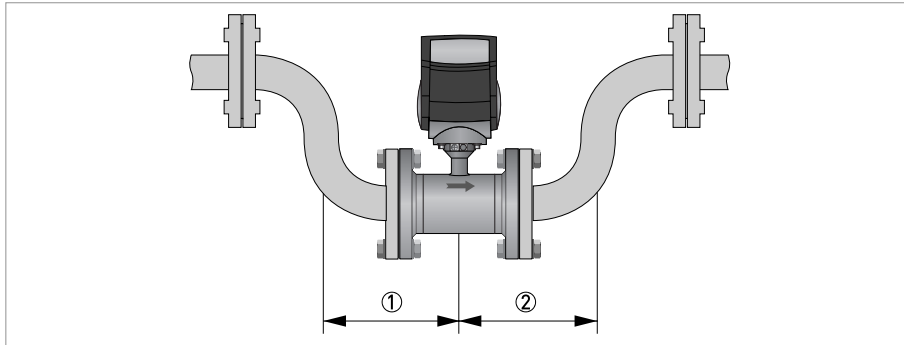


Figure 3-4: Minimal inlet and outlet

- ① Inlet: ≥ 0 DN
- ② Outlet: ≥ 0 DN

DN350...600

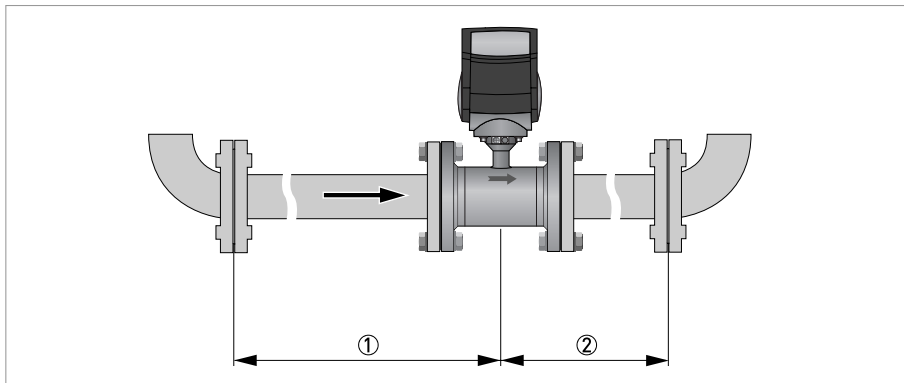


Figure 3-5: Minimal inlet and outlet

- ① Inlet: ≥ 3 DN
- ② Outlet: ≥ 1 DN

3.6.2 T-section

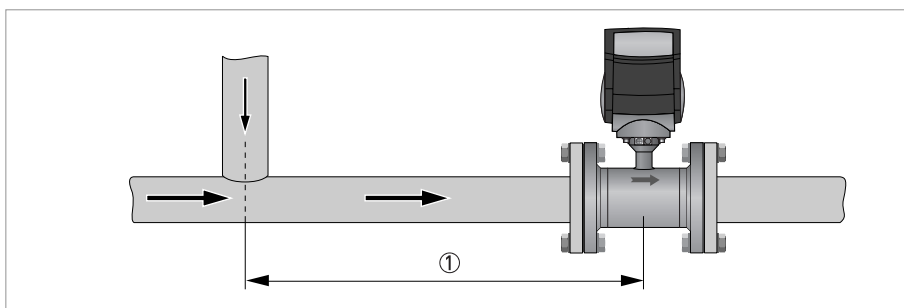


Figure 3-6: Distance behind a T-section

- ① DN 25...300: ≥ 0 DN & DN 350...600: ≥ 3 DN

3.6.3 Bends

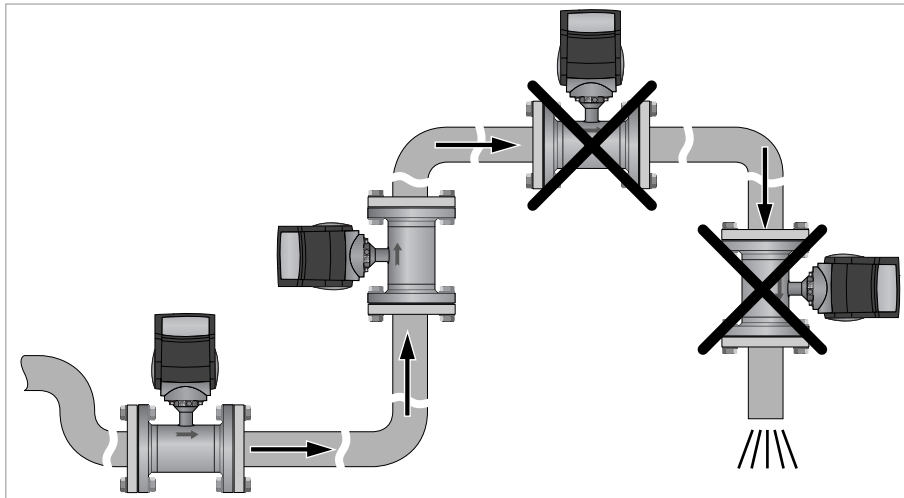


Figure 3-7: Installation in bending pipes

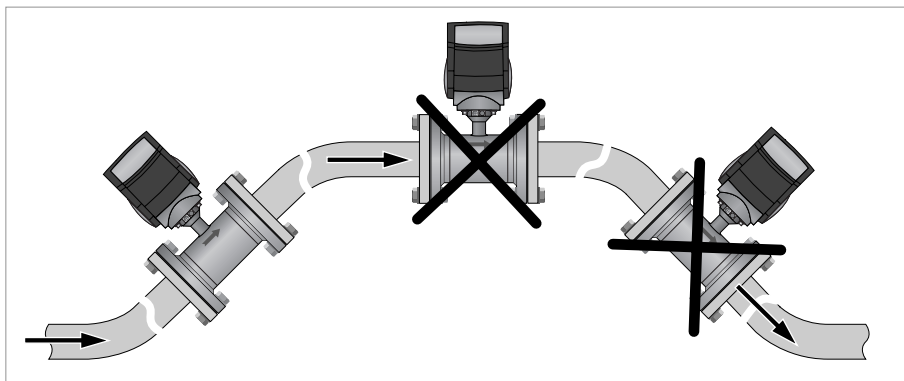


Figure 3-8: Installation in bending pipes



CAUTION!
Avoid draining or partial filling of the flow sensor

3.6.4 Open discharge

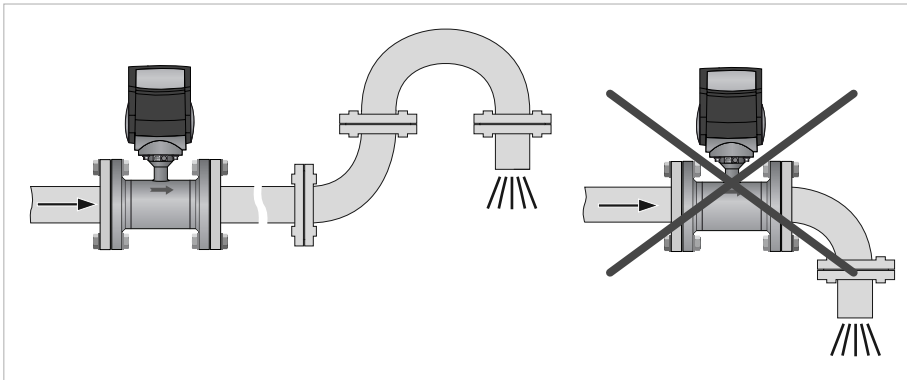


Figure 3-9: Installation in front of an open discharge

3.6.5 Pump

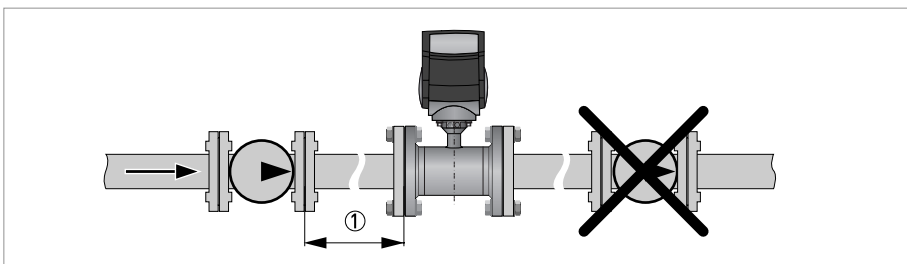


Figure 3-10: Recommended installation: behind a pump

① Inlet: ≥ 3 DN

3.6.6 Control valve

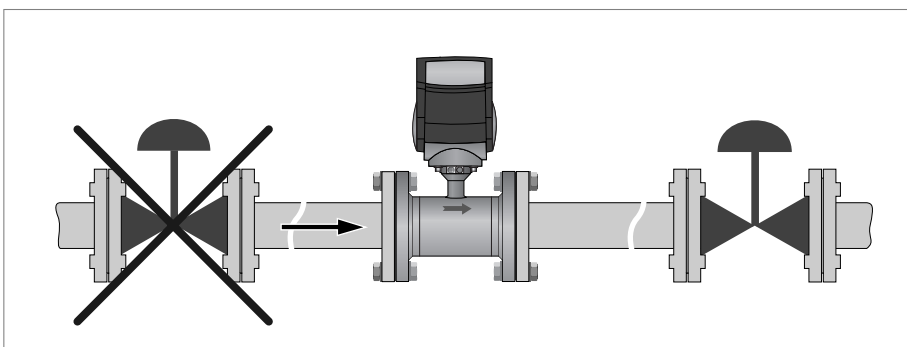


Figure 3-11: Recommended installation: in front of a control valve

3.6.7 Air venting and vacuum forces

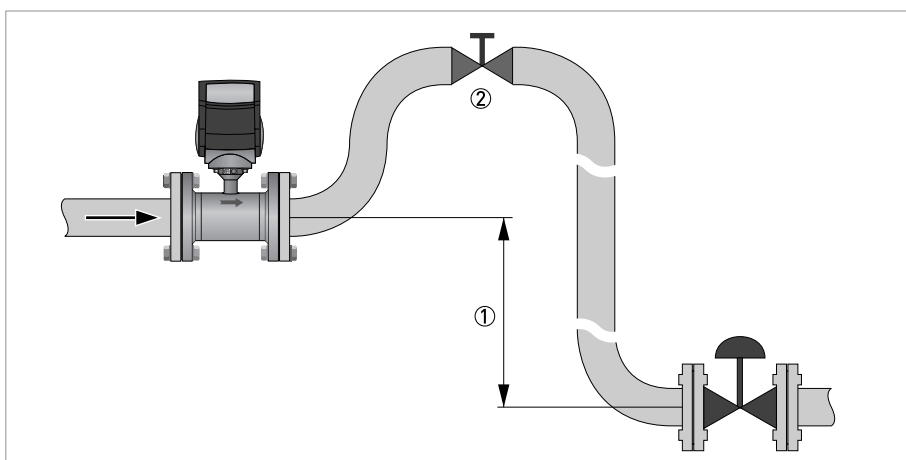


Figure 3-12: Air venting

① ≥ 5 m

② Air ventilation point

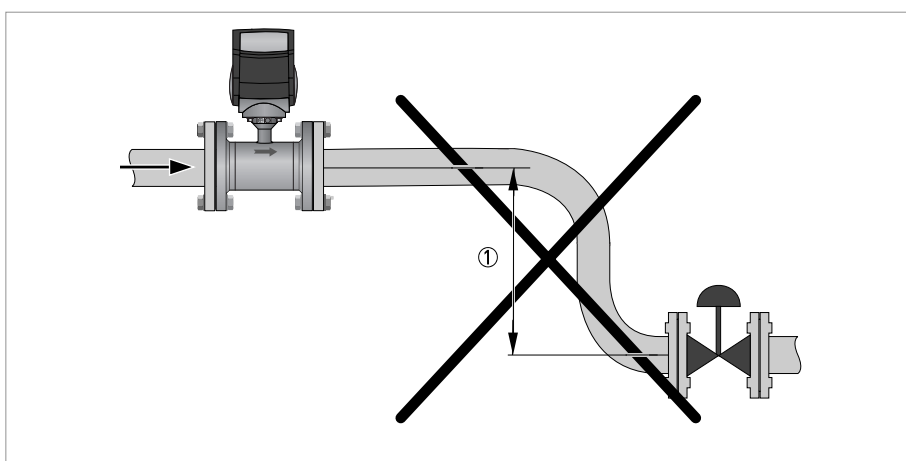


Figure 3-13: Vacuum

① ≥ 5 m

3.6.8 Mounting position and flange deviation

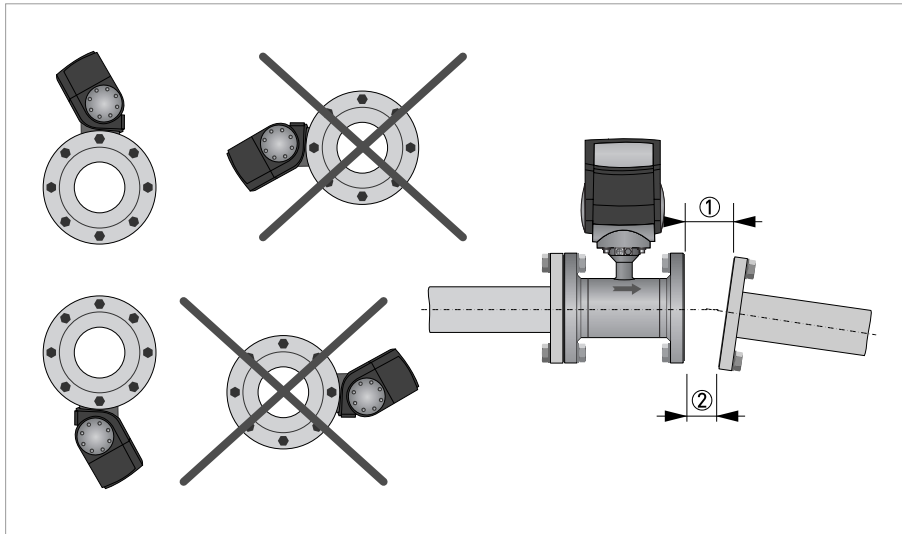


Figure 3-14: Mounting position and flange deviation

- ① L_{max}
- ② L_{min}

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



CAUTION!

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

3.6.9 IP68

The WATERFLUX 3000 flow sensor is rated IP68 (NEMA 4X/6P). It is suitable for submersion in flooded measurement chambers and for subsurface installation.

The compact IFC 070 signal converter is available in:

- an aluminium housing suitable for IP66/67, NEMA 4/4X/6
- a polycarbonate housing suitable for IP68, NEMA 4/4X/6.
This version is suitable for periodic submersion in flooded measurement chambers. The output cable has IP68 rated (military) connectors.
In case of continuous or long term submersion it is advised to select the field (remote) version (IP66/67). Submersion under water is possible down to a depth of 5 meters.

The remote IFC 070 signal converter is available in:

- an aluminium housing suitable for IP66/67, NEMA 4/4X/6.

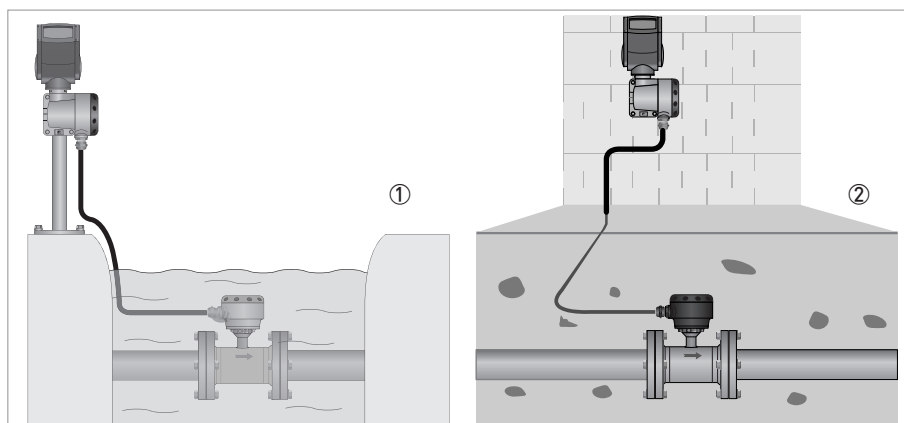


Figure 3-15: IP68 versions

- ① Submersible
- ② Buried

3.6.10 Mounting

3.6.11 Torques and pressures

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

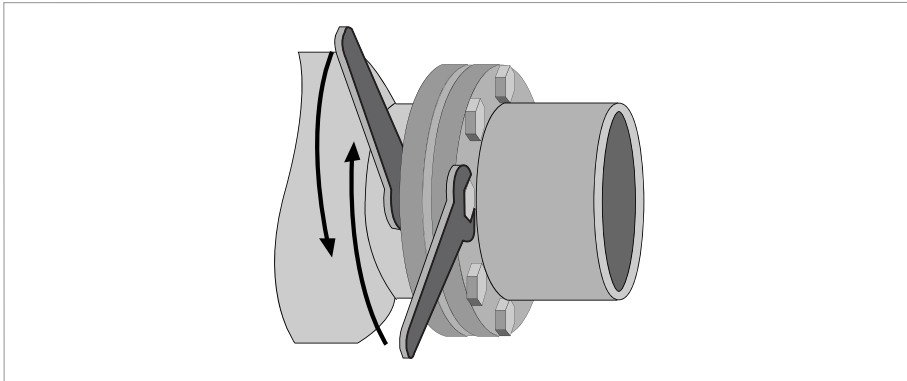


Figure 3-16: Tightening of bolts



Tightening of bolts

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

Nominal size DN [mm]	Pressure rating	Bolts	Max. torque [Nm] ^①
25	PN 16	4 x M 12	12
40	PN 16	4 x M 16	30
50	PN 16	4 x M 16	36
65	PN 16	8 x M 16	50
80	PN 16	8 x M 16	30
100	PN 16	8 x M 16	32
125	PN 16	8 x M 16	40
150	PN 10	8 x M 20	55
150	PN 16	8 x M 20	55
200	PN 10	8 x M 20	85
200	PN 16	12 x M 20	57
250	PN 10	12 x M 20	80
250	PN 16	12 x M 24	100
300	PN 10	12 x M 20	95
300	PN 16	12 x M 24	136
350	PN 10	16 x M 20	96
400	PN 10	16 x M 24	130
450	PN 10	20 x M 24	116
500	PN 10	20 x M 24	134
600	PN 10	20 x M 27	173

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

Nominal size [inches]	Flange class [lb]	Bolts	Max. torque [lbs.ft] ①
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. 145 psi).

3.7 Mounting of the signal converter



INFORMATION!

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

3.7.1 IP67 housing, remote version

Pipe mounting

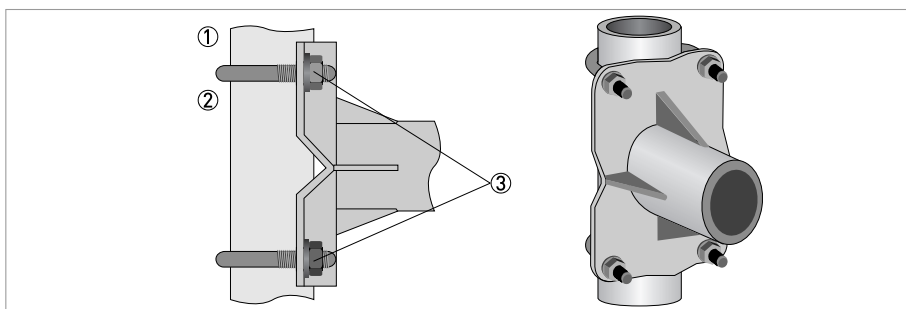


Figure 3-17: Pipe mounting of the field housing



- ① Fix the signal converter to the pipe.
- ② Fasten the signal converter using standard U-bolts and washers.
- ③ Tighten the nuts.

Wall mounting

No special requirements.

3.7.2 IP68 housing, compact version

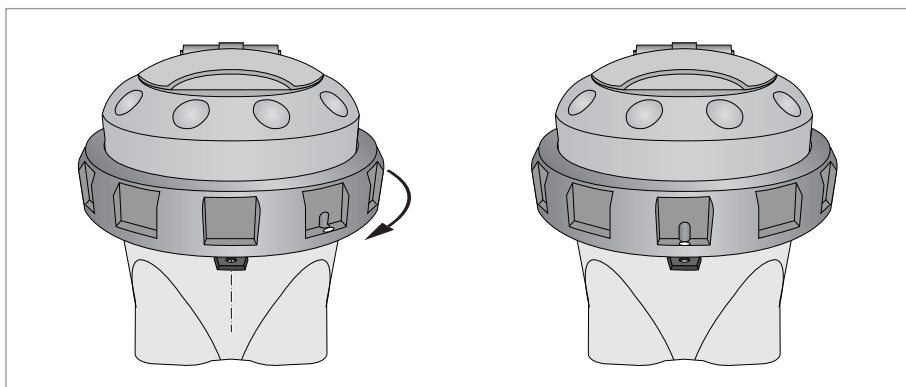


Figure 3-18: Closing of IP68 housing



- Before closing the case of the converter, ensure that all surfaces in contact with the seals are clean.
- Position the upper part of the case and tighten the lock ring.
- Use the wrench to tighten the ring as shown.

4.1 Safety instructions

**DANGER!**

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

**DANGER!**

Observe the national regulations for electrical installations!

**WARNING!**

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

**INFORMATION!**

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

4.2 Grounding

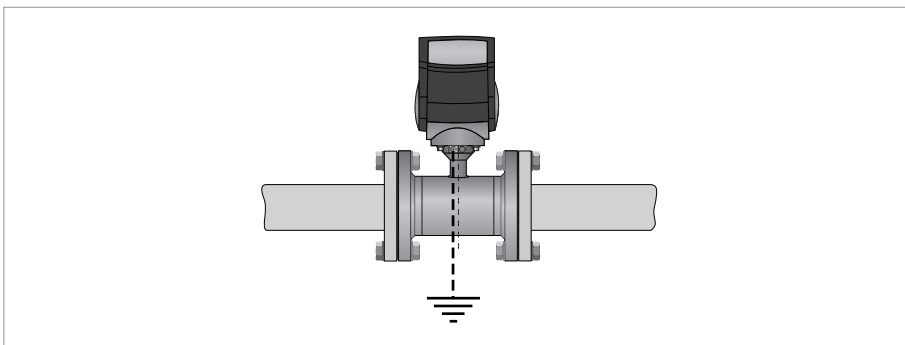


Figure 4-1: Grounding

**INFORMATION!**

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

4.3 Connection of the signal cable

4.3.1 IP 67 housing (field version)


CAUTION!

To ensure smooth functioning, always use the signal cables included in the delivery.


INFORMATION!

The signal cable is only used for remote versions. The standard WSC-cable includes both electrode and field current leads.

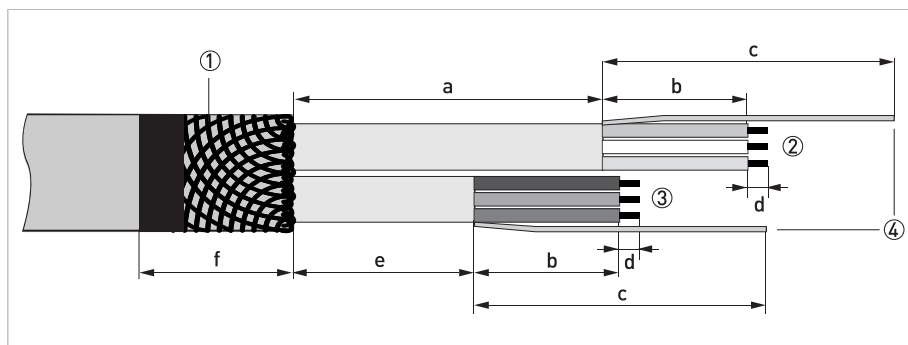


Figure 4-2: Preparation of standard cable (both sides)

- ① Shielding
- ② Blue + green + yellow cable, used for field current (terminals 7, 8, 9)
- ③ Brown + white + violet cable, used for electrode signals (terminals 1, 2, 3)
- ④ Drain wires

Dimensions of cable

	a	b	c	d	e	f
mm	75	35	70	5	45	30
inch	3.0	1.4	2.8	0.2	1.8	1.2

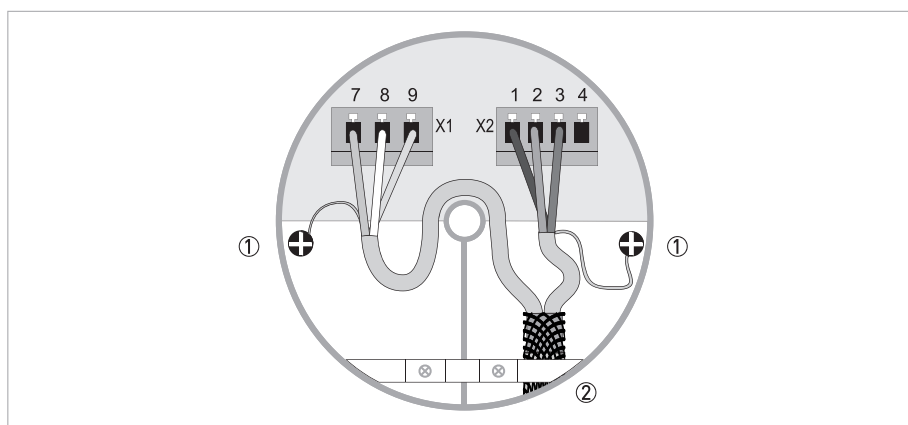


Figure 4-3: Cable connection at sensor side, standard cable

- ① Connect drain wires under screw
- ② Connect shielding under clamp

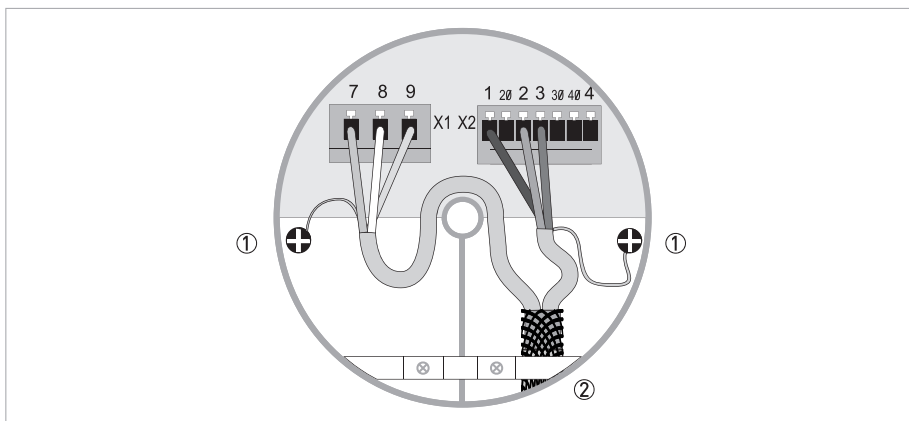


Figure 4-4: Cable connection at converter side, standard cable

- ① Connect drain wires under screw
- ② Connect shielding under clamp



- Prepare appropriate cable lengths as shown.
- Connect the wires as shown in the following table.

Wire color	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

4.4 Connection of the output cable

4.4.1 IP67 housing (compact and field version)

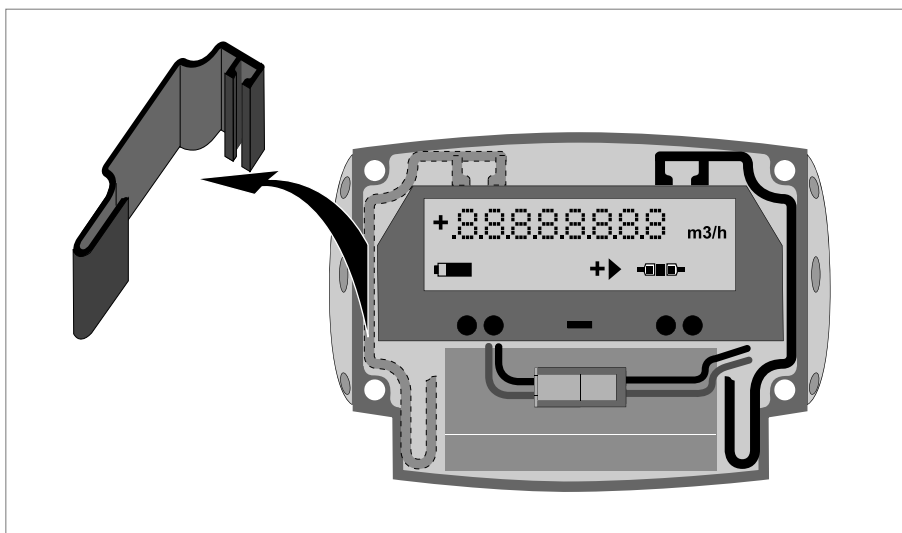


Figure 4-5: Removing side cap

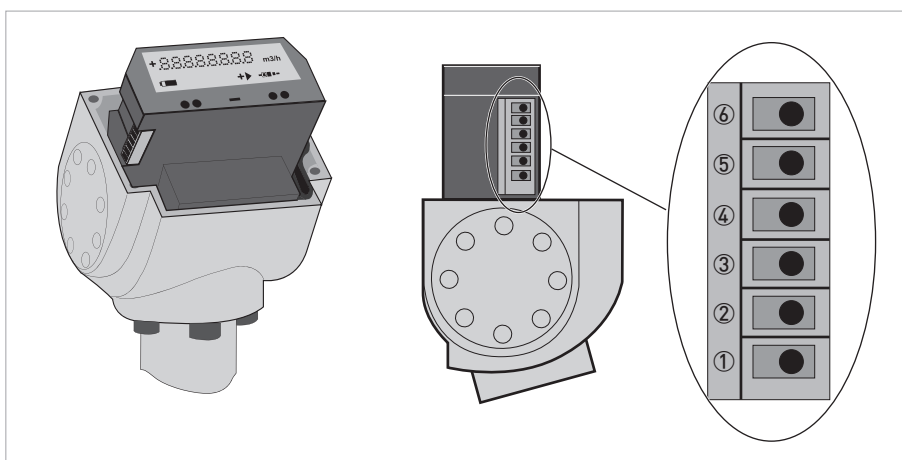


Figure 4-6: Terminal assignment

- ① Status output 1 or pulse output C
- ② Status output 2
- ③ Not used
- ④ Common ground
- ⑤ Pulse output A
- ⑥ Pulse output B

Electrical values

- **Pulse output passive:**
 $f \leq 100 \text{ Hz}$; $I \leq 10 \text{ mA}$; $U: 2.7 \dots 24 \text{ VDC}$ ($P \leq 100 \text{ mW}$)
- **Status output passive:**
 $I \leq 10 \text{ mA}$; $U: 2.7 \dots 24 \text{ VDC}$ ($P \leq 100 \text{ mW}$)

4.4.2 IP68 housing (compact version)

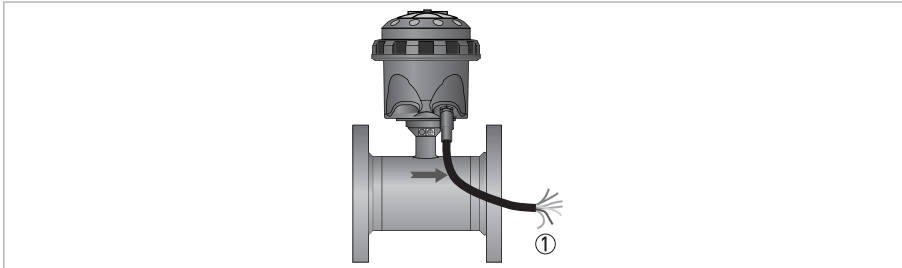


Figure 4-7: Output cable at IP68 compact version

① Color coded leads of output cable

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

Output cable with IP68 rated connectors with 5 color coded leads:

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

Electrical values

- **Pulse output passive:**
 $f \leq 100 \text{ Hz}$; $I \leq 10 \text{ mA}$; $U: 2.7 \dots 24 \text{ VDC}$ ($P \leq 100 \text{ mW}$)
- **Status output passive:**
 $I \leq 10 \text{ mA}$; $U: 2.7 \dots 24 \text{ VDC}$ ($P \leq 100 \text{ mW}$)

5.1 Connecting the internal battery



CAUTION!

Please connect the battery before first use. The signal converter is delivered with a disconnected battery. In case the meter is verified to MI-001, the batteries are already connected in the factory.

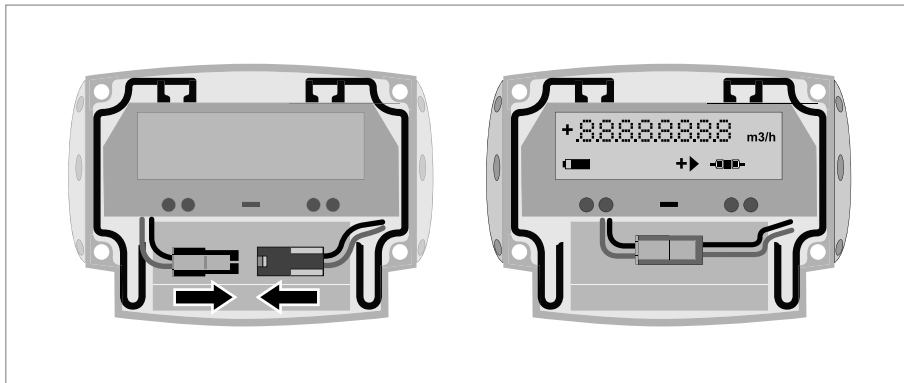


Figure 5-1: Connecting the battery



- Remove the protection cap and loosen the 4 Allen bolts (4mm) (IP67 housing).
- Remove the cover.
- Fasten the battery connector to the internal connector in the converter.
- Check if the display lights up.
- Put back the cover.



WARNING!

Make sure that the battery cable is not jammed by the cover.



- Tighten the 4 bolts and put back the protection cap (IP67 housing).
- For closing the case of the converter in the IP68 housing, please refer to *IP68 housing, compact version* on page 26.



INFORMATION!

The instrument now operates with default menu settings.
For configuration of these menu settings, please refer to *Battery* on page 53

5.2 Connecting the external battery

5.2.1 IP67 housing (compact and field version)



- Remove the protection cap and loosen the 4 Allen bolts (4mm).
- Remove the cover.
- Remove one of the blind cable glands in the bottom of the converter housing.
- Remove the metal strip at the bottom of the housing (2 screws).
- Lead the cable of the external battery through the gland opening and mount the attached cable gland loosely.
- Pull the cable to the top of the electronics.
- Fasten the battery connector to the internal connector in the converter.
- Check if the display lights up.
- Refit the metal strip at the bottom of the housing.
- Tighten the cable gland.
- Put back the cover.



WARNING!

Make sure that the battery cable is not jammed by the cover.



- Tighten the 4 bolts and put back the protection cap (IP67 housing).
- For closing the case of the converter in the IP68 housing, please refer to *IP68 housing, compact version* on page 26.



INFORMATION!

The instrument now operates with default menu settings.

*For configuration of these menu settings, please refer to *Battery* on page 53*

5.2.2 IP68 housing (compact version)

The output cable has two color coded leads for connecting the external battery. For detailed information, please refer to *IP68 housing (compact version)* on page 31.

6.1 Display and operating elements

The IFC 070 signal converter has a display and two optical keys. The optical keys can be used to cycle the display and to access the menu.

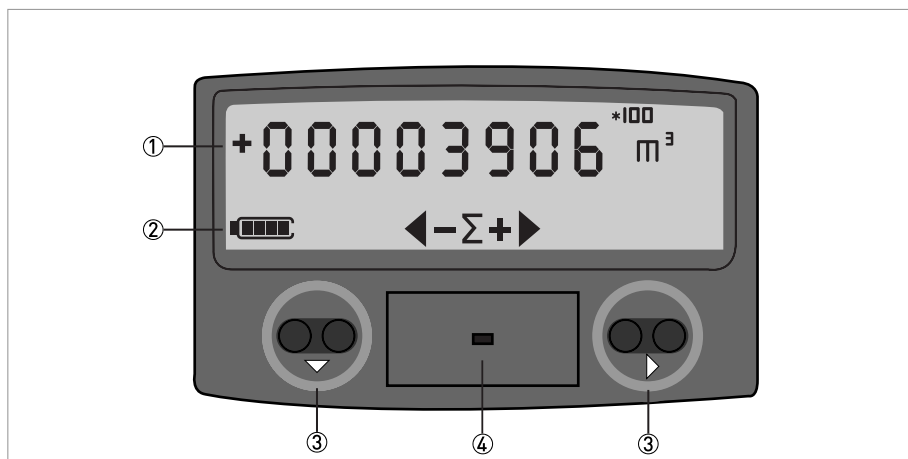


Figure 6-1: Display and operating elements

- ① Counter value or flow rate
- ② Status information including battery status, flow direction and counter settings
- ③ Optical keys ◀ and ▶ to navigate the menu and for display options
- ④ Reset button only accessible after removing the housing

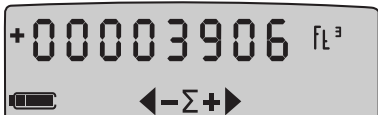
6.1.1 Show counters and flow rate on the display

Depending on the settings, the display shows the sum counter and optionally the forward and reverse counter and the flow rate. In addition, the display shows the unit of measurement, direction of the flow, and if selected, a decimal point or a multiplier value.



Set display to a different counter or to flow rate:

- Press the left optical key ▼ for 1 second to cycle to the next display.
- Leave the optical key untouched, to keep the current display.
- If the meter is set to AMR mode, the display will always switch back to the sum counter display.

Display	Description	Menu setting
	Sum counter (default)	Always available
	Forward counter	Available if menu number 13 is set to 1
	Reverse counter	Available if menu number 14 is set to 1
	Positive flow rate	Available if menu number 17 is set to 1

Display symbols for flow direction and counter settings

Flow direction is from left to right (default)	Flow direction is from right to left	Description
◀ - Σ + ▶	◀ + Σ - ▶	Sum counter (default)
Σ + ▶	◀ + Σ	Forward counter
◀ - Σ	Σ - ▶	Reverse counter
+ ▶	◀ +	Positive flow rate
◀ -	- ▶	Negative flow rate

6.1.2 Show software version, diameter, meter constant and display test on the display



To cycle through the displays:

- Press the right optical key ► for 1 second to cycle to the next display
- Leave the optical key untouched at any time to return to the main display.

Display	Description
	Example of the software version
	Example of the diameter (125) and the meter constant (4.160)
	Display test

6.1.3 Status information on the display

Display symbols	Description	Menu setting
	Battery status	Always available
AMR	AMR mode on	Available if menu number 2 is set to 1
	Automatic self-test	Automatically Please refer to <i>Automatic self-test</i> on page 54.
TEST	Test mode on	To activate Please refer to <i>Test mode</i> on page 54.

Warning and error messages

Display	Description	Actions
1year 1year 1year 1year 	At the current consumption rate, the battery will be empty within 1 year.	Plan battery replacement. This sign can also appear for a short period if the battery consumption is temporarily very high.
E-00	Battery voltage too low	Replace the battery
! (Flashing)	Warning	• Check all connections • If the exclamation mark does not disappear, contact the service department
E-X (X = 1...511)	Impaired software integrity	The meter has stored the last counter values and went to sleep mode. Contact the service department.
-EP-	Empty pipe	Available if menu number 83 is set to 1.

6.2 Access control

Access to the hardware and the software of the WATERFLUX 3070 can be limited or blocked to prevent intervention by non-authorised persons. The hardware can be blocked with metrology or utility seals. Menu access to the parameters relevant for fiscal metering can be blocked in the software.

6.2.1 Access levels to the menu

There are three levels of menu access:

Access levels to the menu	Menu settings
Full menu access	Menu number 1 is set to 0
Access to the service menu only	Menu number 1 is set to 1
	Use a jumper to gain access to the service menu
Menu access blocked	Menu number 1 is set to 1

6.2.2 Access to the service menu only

It can be necessary to access the menu for service purposes if the menu access is blocked. For this purpose, a service menu is available. The service menu becomes available after placing a jumper inside the converter housing. The service menu gives no access to items that are subject to legal metrology.



INFORMATION!

Be careful not to accidentally break the metrological seals while moving the jumper. Breaking the metrological seals could mean that the meter needs to be re-verified. For detailed information, please check your local regulations.

For an overview of menu items available in the service menu refer to *Menu overview* on page 43.



- ① No jumper, menu access blocked
- ② Jumper setting to gain access to the service menu
- ③ Storage location for the jumper. Menu access is blocked

6.2.3 Meters subject to metrology

After verification to MID Annex MI-001 or the OIML R49, hardware and software components that are critical for measurement characteristics and metrologically important parameters need to be protected against intervention such as accidental or intentional corruption during operation.

If the meter has been verified to MID Annex MI-001, access to the programming menu of the software containing the metrologically relevant parameters is blocked at the factory after the Module D verification procedure:

- Menu number 1 (access control) is set to 1
- Metrological seals are placed

Access to the service menu, without breaking the metrological seals is possible by placing the jumper. Parameters subject to fiscal metering are not available via the service menu.

The software version, diameter and meter constant are fiscal parameters. These values can be read on the display and checked with the values on the name plate without breaking the sealing. For more information please refer to *Show software version, diameter, meter constant and display test on the display* on page 36.

6.2.4 Metrological seals

After a meter is verified to MID Annex MI-001 or the OIML R49, the following metrological seals are applied on:

- The access hole to the reset switch that allows access to the parameter settings.
- The electronic units against removal from the outer housing of the water meter.
- The name plate and the housing of the meter to secure the nameplate against removal.



INFORMATION!

Breaking the metrological seals could mean that the meter needs to be re-verified. For detailed information, please check your local regulations.

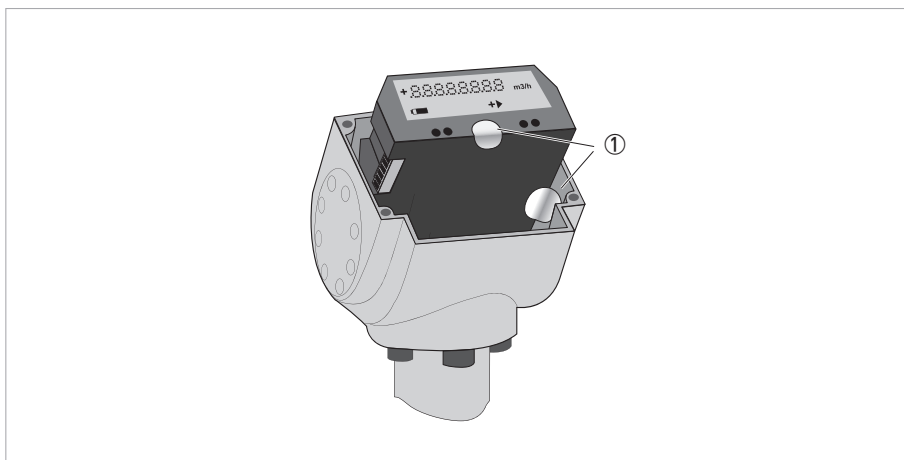


Figure 6-2: Metrological seals in IP67 housing

① Location of seals

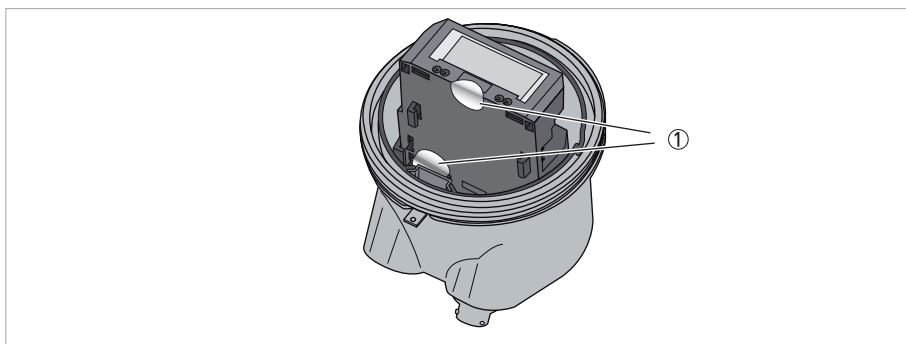


Figure 6-3: Metrological seals in IP68 housing

① Location of seals

6.2.5 Utility seals

To prevent intervention by non-authorised persons to the hardware and software, measures can be taken after installation and commissioning of the water meter in the field. For detailed information, please check your local regulations.

The following figures provide an example for additional utility seals. A utility seal on the outer housing of the converter and a utility seal on the measurement sensor can provide evidence of an intervention by a non-authorised person.

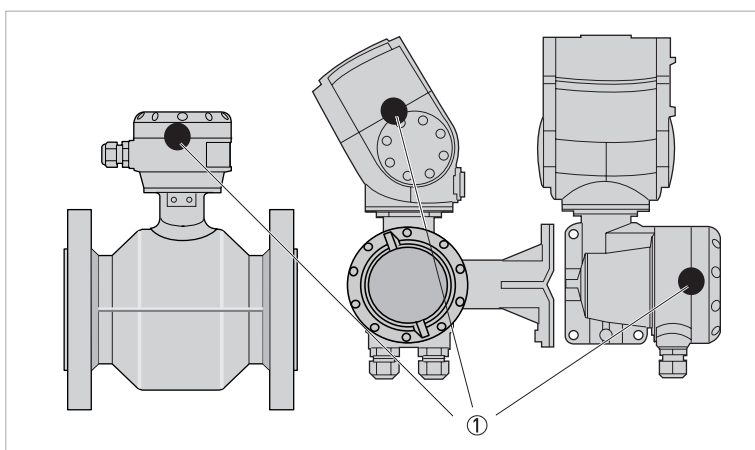


Figure 6-4: Examples of utility seals with the IP67 version

① Location of seals

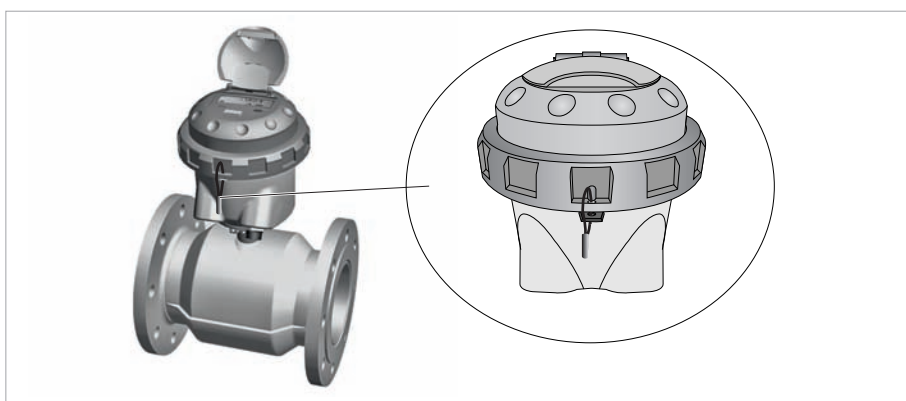


Figure 6-5: Example of an utility seals with the IP68 version

6.2.6 Reset full access to the menu



WARNING!

Do not break the metrological seals if the meter has been verified to MID Annex MI-001 or OIML R49 and has received metrological sealing. This can lead to the obligation to re-verify the meter. Please check your local regulations.

To enable access to the menu again, follow the next steps:



- Remove the protection cap and loosen the 4 Allen bolts (4mm) (IP67 housing).
- Remove the cover.
- Use a small screwdriver to press the reset button.
First press the reset button ① and then simultaneously press both the optical keys for 6 seconds ②.
- The display will automatically switch to menu number 1.
- To change the setting of menu number 1 from 1 to 0, please refer to *View or change menu settings* on page 42.

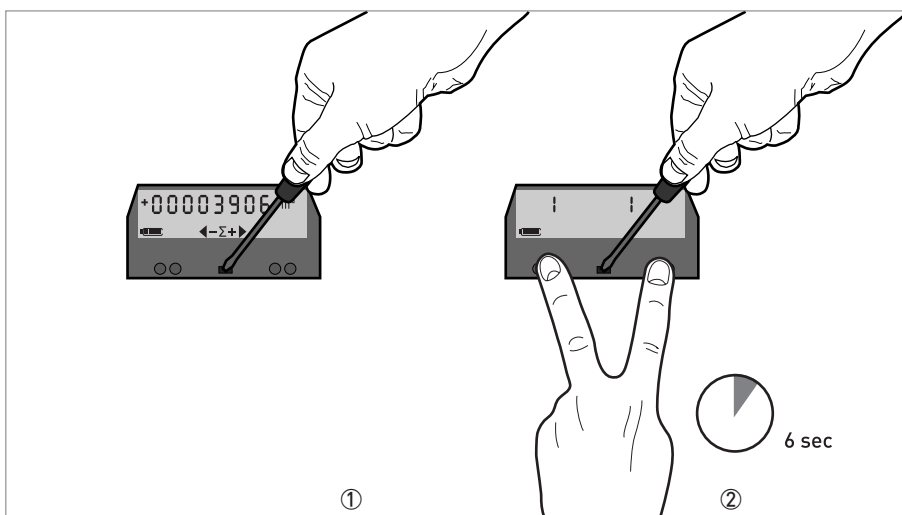


Figure 6-6: Change the settings of the access control.



WARNING!

Make sure that the battery cable is not jammed by the cover.



- Tighten the 4 bolts and put back the protection cap (IP67 housing).
- For closing the case of the converter in the IP68 housing, please refer to *IP68 housing, compact version* on page 26.

6.3 Menu

This chapter describes:

- How to view or change menu settings.
- A menu overview including menu access levels and default settings.
- Options for menu settings are explained in following subchapters.

6.3.1 View or change menu settings



CAUTION!

Access to the programming mode of the software is blocked if menu number 1 is set to 1. This is done at the factory after the Module D verification procedure when the meter is verified to MID Annex MI-001 or OIML R49.

To reset full access to the menu please refer to *Reset full access to the menu* on page 41.

To navigate or change menu settings follow the next steps:

Function	Keys	Display
To start the programming mode	Hold the ▼ and the ► key for 5 seconds.	The display flashes.
To enter the menu	Press the ► key within 3 seconds.	Left: menu number Right: menu setting
To navigate through the menu to the required menu number	Press the ▼ key.	
To change the menu setting	Press the ► key.	The menu setting starts to flash.
To select the menu setting	Press the ▼ key.	The new menu setting starts to flash.
To confirm the menu setting	Hold the ► key for 3 seconds.	The menu setting no longer flashes.
To leave the programming mode and to store the new value(s)	Hold the ▼ key for 3 seconds.	The display returns to the main screen.
To leave the programming mode without storing the new value(s)	Do not touch any key for 60 seconds.	The display returns to the main screen.

6.3.2 Menu overview

Access levels to the menu:

	Items only available with full menu access
	Items available in the service menu (and with full menu access)

Software version 4.2.2_ to 4.2.5_			
No.	Function	Default	Description
Access control			
1	Access control	0	Full menu access
AMR mode (Automatic Meter Reading)			
2	AMR mode	0	Off
3	AMR digits	8	Use all digits
Counter and flow rate			
10	Counter: unit of volume	01	m ³
11	Counter: number of decimals	99	Automatically
12	Counter: multiplier value	99	Automatically
13	Show forward counter	0	Off
14	Show reverse counter	0	Off
15	Flow rate: unit of volume / time	0102	m ³ /h
16	Flow rate: unit of time	99	Automatically
17	Show flow rate	0	Off
Pulse output			
20	Pulse output A	0	Off
21	Pulse output B	0	Off
22	Pulse output A and B: phase shift	0	90° offset
23	Pulse output A and B: pulse width	5	5 ms
24	Pulse output A and B: pulse value	00.100	Automatically
25	Pulse output A and B: pulse generation	99	Automatically
30	Pulse output C	0	Off
31	Pulse output C: unit of volume	01	m ³
32	Pulse output C: pulse width	5	5 ms
33	Pulse output C: pulse value	00.100	Automatically

Status output			
40	Status output 1: self-check	0	Off
41	Status output 1: battery pre warning	0	Off
42	Status output 1: battery final warning	0	Off
43	Status output 1: empty pipe	0	Off
50	Status output 2: self-check	0	Off
51	Status output 2: battery pre warning	0	Off
52	Status output 2: battery final warning	0	Off
53	Status output 2: empty pipe	0	Off
Measurement settings			
80	Flow direction	0	Forward
81	Measurement interval	15	15 sec
82	Low flow cut off	10	10 mm/s
83	Empty pipe detection (EP)	0	Off
Meter configuration			
90	Meter type	0	Factory setting
91	Meter size	100	Factory setting (example)
92	Meter constant	01.000	Factory setting (example)
93	Zero offset calibration	0	Off
94	Zero selection	0	Factory setting (calibration settings)
Service and test			
A0	Simulate outputs	0	Off
A1	Reset all counters	88888	Off
A2	Flow verification on site	0	Off
A3	Add-on communication	0	Factory setting
Battery			
B0	Battery type	1	Internal single battery
B1	Battery capacity	19.000	19 Ah
B2	Reset battery lifetime counter	0	Off

6.3.3 Access control

No.	Function	Options	Description
1	Access control	0 = Full menu access (default)	If set to 1, access to the programming mode is blocked. To reset access to the menu please refer to <i>Reset full access to the menu</i> on page 41.
		1 = Menu access blocked	

6.3.4 Automatic Meter Reading mode

In Automatic Meter Reading (AMR) mode the following settings apply:

- Menu number 10 (Counter: unit of volume) cannot be set to litre or acre-inch.
- Menu number 15 (Flow rate: unit of volume / time) cannot be set to litre per second or acre-inch per day.

No.	Function	Options	Description
2	AMR mode	0 = Off (default)	Automatic Meter Reading mode (AMR)
		1 = On	
3	AMR digits	8	Use all digits 87654321
		7 -	Use 7 most significant digits 8765432-
		- 7	Use 7 least significant digits -7654321
		6 - -	Use 6 most significant digits 876543--
		- 6 -	-765432-
		- - 6	--654321
		5 - - -	87654---
		- 5 - -	-76543--
		- - 5 -	--65432-
		- - - 5	---54321
		4 - - - -	8765----
		- 4 - - -	-7654---
		- - 4 - -	--6543--
		- - - 4 -	---5432-
		- - - - 4	----4321

6.3.5 Counters and flow rate

The following preferences are available:

- Unit of volume or time
- Accuracy of the counters
- Multiplier value
- Availability of forward and reverse counter and flow rate on the display

The counter values can be programmed to display a higher accuracy with a decimal dot (menu number 11).

The multiplier value enables the display of volumes with more than 8 digits (menu number 12).

If a multiplier is selected, the multiplier value is shown in the top right corner of the display.

The value on the display must be multiplied with a factor 10, 100 or 1000 to get the actual counter value.

The decimal dot and multiplier value are not available for the flow rate.

The default setting for decimals and the multiplier value is 99. The number of decimals and multiplier are set automatically by the software, based on the following criteria:

- The meter size and the measurement unit.
- The elapsed time to display overflow is minimal 6 years at a flow velocity of 3 m/s.
- The number of decimals is as high as possible.
- The multiplier (*10, *100, or *1000) can be used only if the number of decimals is zero.

No.	Function	Options	Description
10	Counter: unit of volume	00 = Litre (l)	00 and 06 are not shown if menu number 2 (AMR) mode is set to 1 (On).
		01 = Cubic meter (m ³) (default)	
		02 = Gallon (gal)	
		03 = Imperial gallon (i.gal)	
		04 = Cubic feet (ft ³)	
		05 = Acre feet (a-ft)	
		06 = Acre inch (a-in)	
11	Counter: number of decimals	99 = Automatically (default)	Places a decimal dot. 99 = The number of decimals is set automatically.
		0...7 = Number of decimals	
12	Counter: multiplier value	99 = Automatically (default)	Shows counter value divided by the multiplier value entered. 99 = The multiplier value is set automatically.
		1 = x 1	
		10 = x 10	
		100 = x 100	
		1000 = x 1000	
13	Show forward counter	0 = Off (default)	Makes the item available on the display.
		1 = On	
14	Show reverse counter	0 = Off (default)	Makes the item available on the display.
		1 = On	

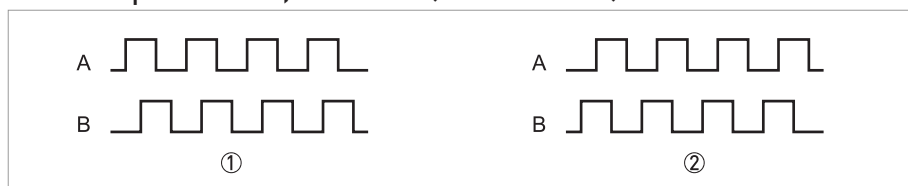
No.	Function	Options	Description
15	Flow rate: unit of volume / time	0000 = Litre per second (l/s)	0000 and 0603 are not shown if menu number 2 (AMR) mode is set to 1 (On). In the representation of the flow rate on the display, the unit of time is automatically chosen. The default unit of time can be overruled using menu number 16.
		0102 = Cubic meter per hour (m ³ /h) (default)	
		0201 = Gallon per minute (gal/min)	
		0301 = Imperial gallon per minute (i.gal/min)	
		0402 = Cubic feet per hour (ft ³ /h)	
		0503 = Acre feet per day (a-ft/d)	
		0603 = Acre inch per day (a-in/d)	
16	Flow rate: unit of time	99 (default)	99 = Value is based on menu number 15 (flow rate) and diameter.
		00 = per second	
		01 = per minute	
		02 = per hour	
		03 = per day	
17	Show flow rate	0 = Off (default)	Makes the item available on the display.
		1 = On	

6.3.6 Pulse output

By default two pulse outputs A and B are available. Optionally, status output 1 is available as a third pulse output C. Pulse output A and B are fiscal parameters, pulse output C is not a fiscal parameter.

The relation between pulse output A and B can be set in menu number 22 to the following pre-sets:

Pulse output A and B; 90° offset (default value)

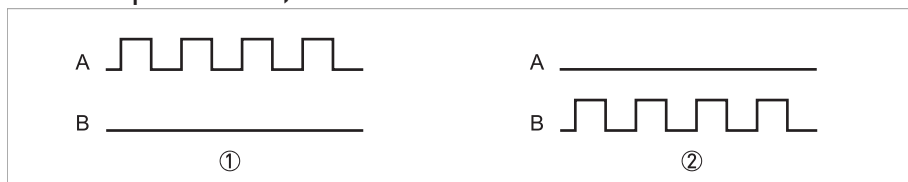


- ① Forward flow
- ② Reverse flow

There is a phase shift of 90° offset between pulse output A and B. Pulse output A and B give the same number of pulses, but pulse output B is shifted half a pulse width in time. In case of forward flow, pulse output B runs behind pulse output A. In case of reverse flow, pulse output A runs behind pulse output B.

If after a phase shift (90°) pulse output A runs behind pulse output B, the number of pulses need to be subtracted from the total, to get the net volume, equal to the sum counter on the display.

Pulse output A and B; Forward - Reverse



- ① Forward flow
- ② Reverse flow

Pulse output A gives the forward volume and pulse output B gives the reverse volume passing through the meter.

For a net volume, equal to the sum counter on the display, the pulses provided by pulse output B need to be subtracted from the pulses provided by pulse output A.

Pulse output A and B; Net forward volume

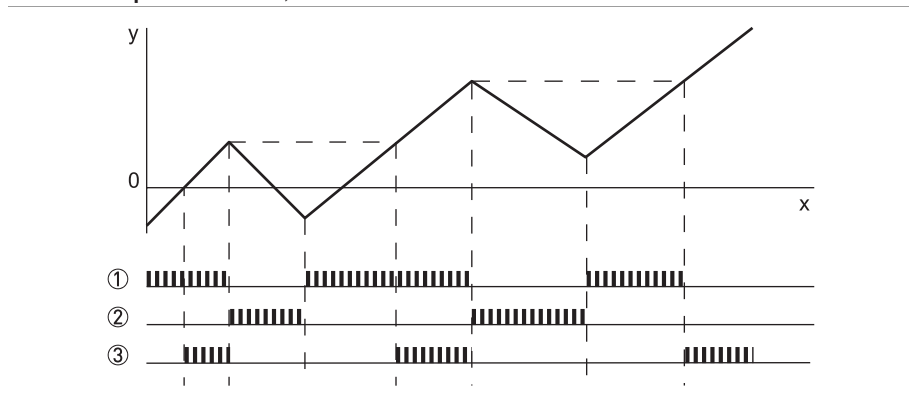


Figure 6-7: Y: Sum counter value; X: Time

- ① Forward flow
- ② Reverse flow
- ③ Net forward volume

Pulse output A and B give the same number of pulses, but pulse output B is shifted half a pulse width in time. Pulse output B always runs behind pulse output A.

In case of a forward flow, pulse output A and B give the forward volume passing through the meter.

In case of a reverse flow, pulse output A and B only start to give pulses again after the sum counter has reached the previous maximum net volume.

**INFORMATION!**

In case of net forward volume the sum counter on the display can temporarily be different from the net volume provided by pulse output A and B.

No.	Function	Options	Description
20	Pulse output A	0 = Off (default)	Pulse output A
		1 = On	
21	Pulse output B	0 = Off (default)	Pulse output B
		1 = On	
22	Pulse output A and B: phase shift	0 = 90° offset (default)	Sets the relation between pulse output A and B. Menu no. 20 and 21 must be set to 1 = on.
		1 = Forward - reverse	
		2 = Net forward volume	
23	Pulse output A and B: pulse width	5 = 5 ms (default)	The pulse width is always the same for pulse output A and B. A small pulse width means a lower energy consumption of the battery.
		10 = 10 ms	
		20 = 20 ms	
		50 = 50 ms	
		100 = 100 ms	
		200 = 200 ms	

No.	Function	Options	Description
24	Pulse output A and B: pulse value	00100 = litre	Unit and format are automatically set based on the selection made in menu number 10.
		00.100 = m ³ /pulse	
		0010.0 = gallon	
		0010.0 = imp. gallon	
		001.00 = ft ³	
		.00100 = a-inch	
		.00100 = a-ft	
25	Pulse output A and B: pulse generation	99 = Automatically set (default)	Pulse output reacts as set in menu number 24
		1	*****1 (A pulse is generated if the least significant digit changes)
		2	*****2*
		3	*****3**
		4	*****4***
		5	*****5****
		6	*****6*****
		7	*****7*****
		8	8***** (A pulse generated if the most significant digit changes)
30	Pulse output C	0 = Status output (default)	Sets status output 1 as status output (select 0) or as pulse output (select 1, 2 or 3).
		1 = Forward counter	
		2 = Reverse counter	
		3 = Net forward volume	
31	Pulse output C: unit of volume	00 = Litre (l)	
		01 = Cubic meter (m ³) (default)	
		02 = Gallon (gal)	
		03 = Imperial gallon (i.gal)	
		04 = Cubic feet (ft ³)	
		05 = Acre feet (a-ft)	
		06 = Acre inch (a-in)	
32	Pulse output C: pulse width	5 = 5 ms (default)	A small pulse width means a lower energy consumption of the battery.
		10 = 10 ms	
		20 = 20 ms	
		50 = 50 ms	
		100 = 100 ms	
		200 = 200 ms	
33	Pulse output C: pulse value	00100 = litre	Unit and format are automatically set based on the selection made in menu number 10.
		00.100 (default) = m ³ / pulse	
		0010.0 = gallon	
		0010.0 = imp. gallon	
		001.00 = ft ³	
		.00100 = a-inch	
		.00100 = a-ft	

6.3.7 Status output

No.	Function	Options	Description
40	Status output 1: Self check	0 = Off (default)	
		1 = On	
41	Status output 1: Battery pre warning	0 = Off (default)	Active in case of low battery (remaining capacity < 10%).
		1 = On	
42	Status output 1: Battery final warning	0 = Off (default)	Active in case of very low battery (remaining capacity < 1%).
		1 = On	
43	Status output 1: Empty pipe	0 = Off (default)	Active in case of empty pipe detection.
		1 = On	
50	Status output 2: Self check	0 = Off (default)	
		1 = On	
51	Status output 2: Battery pre warning	0 = Off (default)	Active in case of low battery (remaining capacity < 10%).
		1 = On	
52	Status output 2: Battery final warning	0 = Off (default)	Active in case of very low battery (remaining capacity < 1%).
		1 = On	
53	Status output 2: Empty pipe	0 = Off (default)	Active in case of empty pipe detection.
		1 = On	

6.3.8 Measurement settings

By default the forward flow direction is set from left to right. The red arrow on the measurement sensor indicates the same direction. The flow direction can be set from right to left in menu number 80.

No.	Function	Options	Description
80	Flow direction	0 = Forward (default)	Sets the flow direction.
		1 = Reverse	
81	Measurement interval	1 = 1 sec	Sets the interval time between two measurements. The default value of 15 sec is chosen for an optimal energy consumption of the battery. The 1 sec option is for test puposes only
		5 = 5 sec	
		10 = 10 sec	
		15 = 15 sec (default)	
		20 = 20 sec	
82	Low flow cut off	0 = 0 mm/s	Low flow cut off in mm/s. Measurements below this value are neglected.
		5 = 5 mm/s	
		10 = 10 mm/s (default)	
83	Empty pipe detection (EP)	0 = Off (default)	If switched to 1 (=on), the display shows "- EP -" in case of empty pipe and the measurement is stopped. In case of verification to MID Annex MI-001, the EP is set to on.
		1 = On	

6.3.9 Meter configuration settings


INFORMATION!

The meter constant (menu 92), zero offset calibration (menu 93) and zero selection (menu 94) are for service purposes only.

No.	Function	Options	Description
90	Meter type	0 = Rectangular (default)	Factory setting
		1 = Not used	
91	Meter size	Factory setting (xxx in mm)	By default the meter size is shown in mm. If menu number 10 (unit of volume for the counter) is set to 02, 03, 04, 05 or 06 the meter size is shown in inches. The meter size is also shown on the name plate and on the display.
92	Meter constant	Factory setting (xx.xxx)	The meter constant is also shown on the nameplate and on the display.
93	Zero offset calibration	0 = Off (default)	After a countdown the meter automatically switches back to the measuring mode and to the main display. The setting goes back to zero. Menu number 94 is automatically set to 1.
		1 = In situ determination of zero point	
94	Zero selection	0 = Factory setting (default)	Factory setting based on factory calibration
		1 = Measured value	The measured value is determined in situ if menu number 93 is set to 1.

6.3.10 Service and test


CAUTION!

Menu number A0 Simulate outputs is for service purposes only.


WARNING!

Activating a reset of all counters, means that previous values will be lost and cannot be re-covered.


WARNING!

Activating the verification mode affects the measurements and the counter value during the test procedure


INFORMATION!

Activation of add-on communication should be ordered with the meter. To use add-on communication for an existing installation please contact the service department

No.	Function	Options	Description
A0	Simulate outputs	0 = Off (default)	If set to 1 (=On) the pulse and status output automatically generate 1 pulse per second. Set back to 0 to stop the simulation.
		1 = On	
A1	Reset all counters	88888 = Off (default)	Set to 00000 to reset all counters. The value of A1 will automatically switch back to 88888 after the reset.
		00000 = Reset	
A2	Verification mode	0 = Off (default)	The display indicates Pxxxxxxx, the decimal separator position varies per diameter. Please refer to <i>Verification mode</i> on page 54, for more details.
		1 = On	
A3	Add-on communication	0 = Off (default)	Factory setting
		1 = On	

6.3.11 Battery

After a change of battery:

- Reset the battery lifetime counter (Menu number B2)
- Select the battery type, if a different type of battery is used. (Menu number B0)
- Change the total battery capacity, if a different type of battery is used. (Menu number B1)

No.	Function	Options	Description
B0	Battery type	0 = No battery	A wrong setting influences the battery lifetime calculation.
		1 = One internal battery (default)	
		2 = Two internal batteries	
		3 = External battery pack	
B1	Total battery capacity	xx.xxx = xx.xxx Ah (19.000 Ah Default)	Total of all batteries in Ah. After a change to a different battery type, change the setting (19 one battery, 38 two batteries, or 78 external battery)
B2	Reset battery lifetime counter	0 = Off (default)	Set the value to 1 to reset the battery lifetime counter. After a reset, the menu setting automatically goes back to 0.
		1 = Reset	

6.4 Tests

6.4.1 Automatic self-test

On regular basis the WATERFLUX 3070 performs automatic self-tests. Tests done include an integrity check of the hardware and the software including a memory self-test, a calculation of the remaining battery lifetime, the battery current and checking of the coils current.

6.4.2 Verification mode



WARNING!

Activating the verification mode, affects the measurement and the counter values during the test procedure.

The WATERFLUX 3070 complies with the requirements of OIML R49 and EN14154 that the device shall provide means (i.e. display reading) for visual and unambiguous verification testing and calibration. In order to run a test, for example a comparison with a known volume, the meter can be set in a verification mode (menu number A2 should be set to 1).

In verification mode, menu settings are automatically adjusted in order to fulfil the requirements. Firstly, the counters are shown with a modified number of decimals for a higher resolution on the display. The number of decimals depends on the size of the meter. The display indicates Pxxxxxxx. Secondly, the measurement interval is automatically set to 1 measurement per second. Thirdly, the unit of volume is set to m³. The meter will automatically return to its normal measuring mode.

6.4.3 Test mode

A test mode is available, with which a second sum counter is activated. The second sum counter can be activated without breaking the metrological seals. Activating the second sum counter has no effect on the measurement and does not affect the counter values.

The second sum counter starts counting from 0. The resolution of the second sum counter is 100 times larger for a more detailed reading. If, for example, the counter shows 11m³, the second sum counter will indicate 11,xx m³.

The maximum duration of the test is 3 hours. After 3 hours the meter will automatically return to its normal measuring mode.

Function	Keys	Display
To start the programming mode	Hold the ▼ and the ► key for 5 seconds	The display flashes
To enter the test mode	Press the ▼ key within 3 seconds	The display shows: - TEST - a second sum counter
To start the test (and to start the second counter)	Press the ▼ key	The test symbol starts to flash. The second counter starts at 0.
To reset the second counter	Press the ▼ key	The second counter starts at 0.
To stop the test / the second counter	Press the ► key	The TEST symbol stops flashing
To leave the test mode	Hold the ▼ and the ► key for 5 seconds	The display flashes.
	Press the ▼ key within 3 seconds	The second counter and the test symbol will disappear. The display returns to its normal measuring mode.

7.1 Replacement of battery

Three types of batteries with different capacities are available. They can be exchanged by one of the other two types.

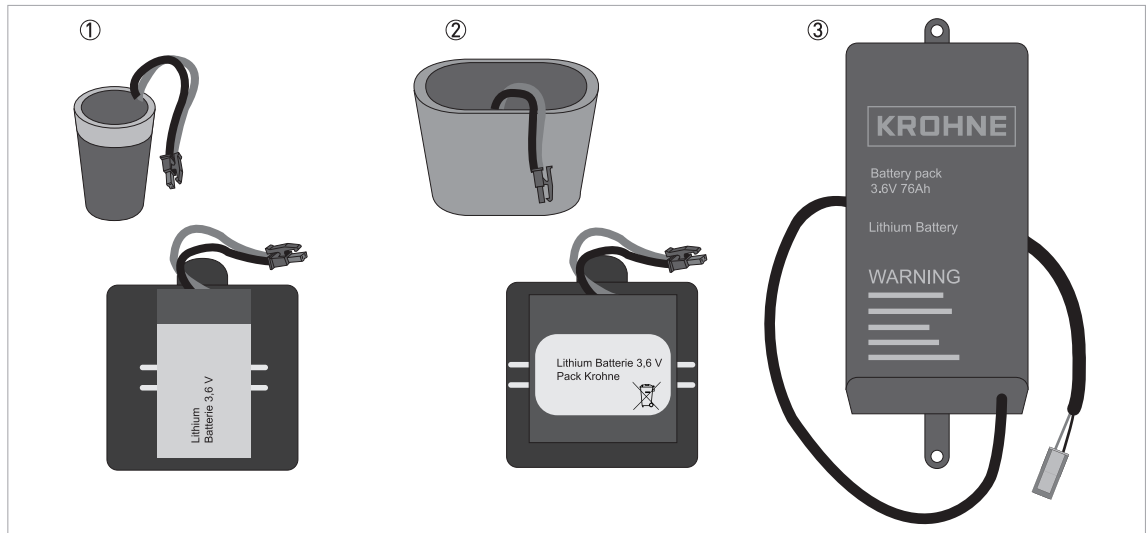


Figure 7-1: Batteries and battery holders

- ① Internal single D-cell battery (without / in holder)
- ② Internal dual D-cell battery (without / in holder)
- ③ External dual DD-cell battery pack

7.1.1 Replacement of internal battery

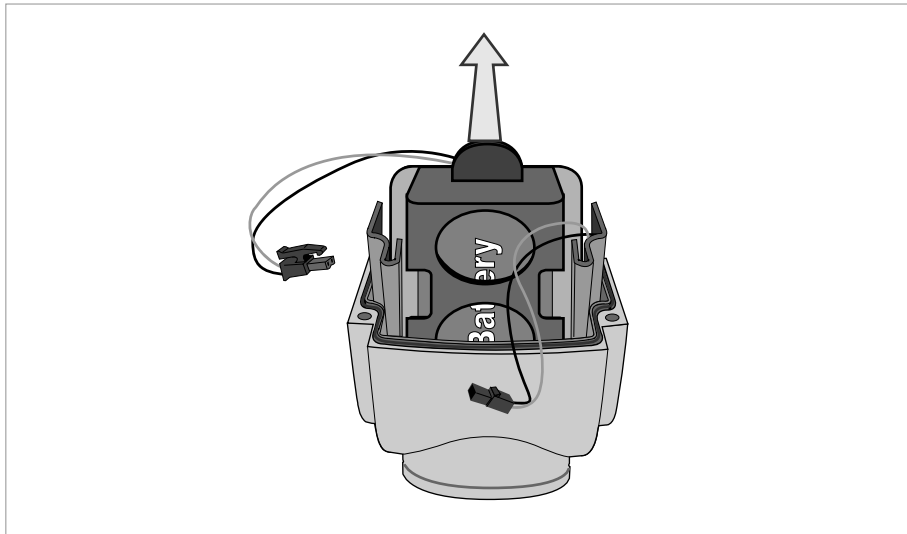


Figure 7-2: Removing the battery holder



- Remove the protection cap and loosen the 4 Allen bolts (4mm) (IP67 housing).
- Remove the cover.
- Disconnect the connector of the battery.
- Remove the battery holder by pulling it upwards.
- Remove the battery from the holder.
- Insert the new battery in the holder.
- Replace the holder.
- Fasten the battery connector to the internal connector in the converter.
- Check if the display lights up.
- Put back the cover.



WARNING!

Make sure that the battery cable is not jammed by the cover.



- Tighten the 4 bolts and put back the protection cap (IP67 housing).
- For closing the case of the converter in the IP68 housing, please refer to *IP68 housing, compact version* on page 26.



INFORMATION!

*After a change of batteries, reset the battery lifetime counter. For changing the menu settings of the battery, please refer to *Battery* on page 53.*

7.1.2 Replacement of external battery

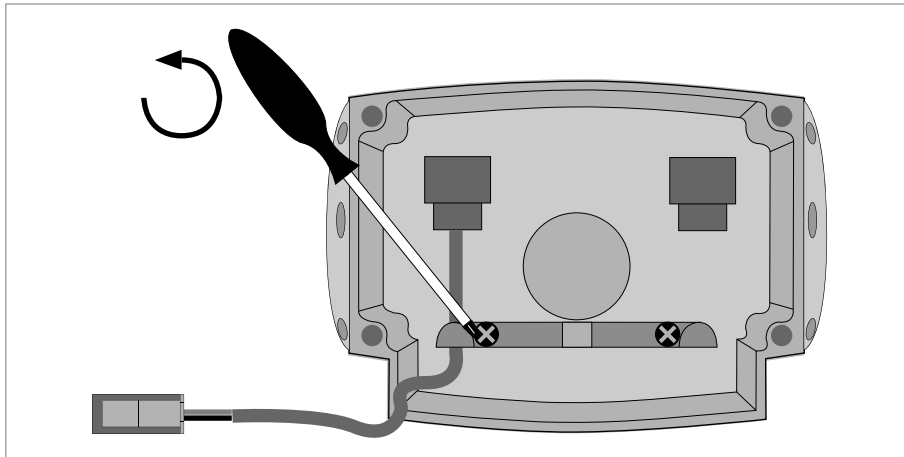


Figure 7-3: Removing the metal strip



- Remove the protection cap and loosen the 4 Allen bolts (4mm) (IP67 housing).
- Remove the cover.
- Loosen the used cable gland in the bottom of the converter housing.
- Remove the metal strip at the bottom of the housing (2 screws).
- Disconnect the connector of the battery.
- Remove the cable of the old battery.
- Lead the cable of the new external battery through the gland opening and mount the attached cable gland loosely.
- Pull the cable to the top of the electronics.
- Fasten the battery connector to the internal connector in the converter.
- Check if the display lights up.
- Refit the metal strip at the bottom of the housing.
- Tighten the cable gland.
- Put back the cover.



WARNING!

Make sure that the battery cable is not jammed by the cover.



- Tighten the 4 bolts and put back the protection cap (IP67 housing).
- For closing the case of the converter in the IP68 housing, please refer to *IP68 housing, compact version* on page 26.



INFORMATION!

*After a change of batteries, reset the battery lifetime counter. For changing the menu settings of the battery, please refer to *Battery* on page 53.*

7.2 Spare parts availability

The manufacturer adheres to the basic principle that functionally adequate spare parts for each device or each important accessory part will be kept available for a period of 3 years after delivery of the last production run for the device.

This regulation only applies to spare parts which are subject to wear and tear under normal operating conditions.

7.3 Availability of services

The manufacturer offers a range of services to support the customer after expiration of the warranty. These include repair, maintenance, technical support and training.



INFORMATION!

For more precise information, please contact your local sales office.

7.4 Returning the device to the manufacturer

7.4.1 General information

This device has been carefully manufactured and tested. If installed and operated in accordance with these operating instructions, it will rarely present any problems.



CAUTION!

Should you nevertheless need to return a device for inspection or repair, please pay strict attention to the following points:

- *Due to statutory regulations on environmental protection and safeguarding the health and safety of our personnel, manufacturer may only handle, test and repair returned devices that have been in contact with products without risk to personnel and environment.*
- *This means that the manufacturer can only service this device if it is accompanied by the following certificate (see next section) confirming that the device is safe to handle.*



CAUTION!

If the device has been operated with toxic, caustic, flammable or water-endangering products, you are kindly requested:

- *to check and ensure, if necessary by rinsing or neutralising, that all cavities are free from such dangerous substances,*
- *to enclose a certificate with the device confirming that is safe to handle and stating the product used.*

7.4.2 Form (for copying) to accompany a returned device

Company:		Address:	
Department:		Name:	
Tel. no.:		Fax no.:	
Manufacturer's order no. or serial no.:			
The device has been operated with the following medium:			
This medium is:	water-hazardous		
	toxic		
	caustic		
	flammable		
	We checked that all cavities in the device are free from such substances.		
	We have flushed out and neutralized all cavities in the device.		
We hereby confirm that there is no risk to persons or the environment through any residual media contained in the device when it is returned.			
Date:		Signature:	
Stamp:			

7.5 Disposal



CAUTION!

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

8.1 Measuring principle

An electrically conductive fluid flows inside an electrically insulated pipe through a magnetic field. This magnetic field is generated by a current, flowing through a pair of field coils. Inside of the fluid, a voltage U is generated:

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

in which:

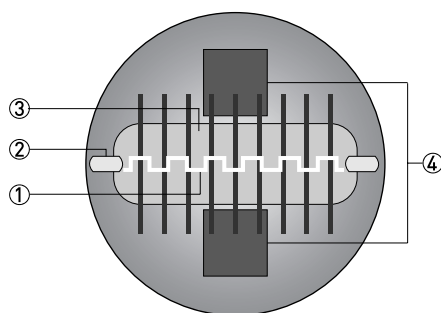
v = mean flow velocity

k = factor correcting for geometry

B = magnetic field strength

D = inner diameter of flow meter

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



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

Rectangular cross section

The minimal height of the measuring tube decreases the distance between the field coils (4), resulting in a stronger and more homogeneous magnetic field (3). In addition, the mean flow velocity v increases due to the rectangular and reduced cross section. The large electrode spacing (D) and the increased flow velocity results in a higher magnetic signal voltage, also in the presence of a low flow rate.

8.2 Technical data



INFORMATION!

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

Measuring system

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

Design

Features	Unique rectangular flow tube design providing improved flow profile and signal to noise ratio resulting in highest accuracy, low energy consumption and large turndown ratio
	Rilsan® polymer coated flow tube approved for drinking water
	No internal or moving parts
	Built-in reference electrode
	Self providing energy by batteries for up to 15 years
Modular construction	The measurement system consists of a flow sensor and a signal converter. It is available as compact and as separate version.
Compact version	With IFC 070 converter: WATERFLUX 3070 C
Remote version	In field (F) version with IFC 070 converter: WATERFLUX 3070 F
	Cable length up to 25 m / 75 ft
Nominal diameter	DN25...600 / 1...24", Rectangular bore
Display and user interface	
Display	LCD display, 8 digits
Operation	2 optical keys to navigate through the menu of the signal converter without opening the housing.
Display information	Standard:
	Sum counter (default), forward counter, reverse counter or flow rate
	Flow direction (forward or reverse), counter settings
	Measured value
	Measuring unit
	Battery lifetime indicator
	Optional:
	Empty pipe, self test, display test, test mode, diameter, meter constant, software version, AMR mode, warning sign, multiplier
Remote reading	Optional: KGA 42 external data logger / GSM module

Measurements

Measuring units	Volume
	Default setting: m ³
	Selectable: litre, gallon, imperial gallons, cubic feet, acre inch, acre feet
	Flow rate
	Default setting: m ³ / hr
	Selectable: litre/sec, gallon/min, imperial gallon/min, cubic feet/hour, acre inch/day, acre feet/day
Measurement interval	Default setting: 15s
	Selectable: 1s, 5s, 10s, 15s, 20s
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

Reference conditions	Medium: water
	Temperature: +10...30°C / +50...86°F
	Operating pressure: 1 bar / 14,5 psi
	Inlet section: 3 DN / Outlet section: 1 DN
	Electrical conductivity: > 300 µS/cm
Maximum measuring error	DN25...300; down to 0.2% of the measured value ± 0.5 mm/s
	DN350...600; down to 0.4% of the measured value ± 1 mm/s
	The maximum measuring error depends on the installation conditions. For detailed information refer to <i>Measurement accuracy</i> on page 72.
Repeatability	DN 25...300; ±0.1% (v > 0.5 m/s / 1.5 ft/s) DN350...600; ±0.2% (v > 0.5 m/s / 1.5 ft/s)
Calibration / Verification	Standard:
	2 Point calibration by a direct volume comparison.
	Optional: for DN25...300
	Verification to Measurement Instrument Directive (MID), Annex MI-001. Standard: Verification at Ratio (Q3/Q1) = 80 Optional: Verification at Ratio (Q3/Q1) > 80
MID MI-001 (Directive 2004/22/EC)	EC-Type examination certificate to MID Annex MI-001
	Diameter: DN25...300
	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°C / 50°C
	Maximum operating pressure: ≤ DN200: 16 bar, ≥ DN250: 10 bar
	For detailed information refer to <i>Legal metrology</i> on page 67.

OIML R49	Certificate of conformity to OIML R49
	Diameter: DN25...300
	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°C / 50°C
	Maximum operating pressure: ≤ DN200: 16 bar, ≥ DN250: 10 bar
	For detailed information refer to <i>Legal metrology</i> on page 67.

Operating conditions

Temperature	
Process temperature	-5...+70°C / +23...+158°F
Ambient temperature	-40...+65°C / -40...+149°F
	Ambient temperatures below -25°C / -13°F may affect the readability of the display.
	It is recommended to protect the converter from external heat sources such as direct sunlight because high temperatures reduce the lifecycle of all electronic components.
Storage temperature	-50...+70°C / -58...+158°F
Measurement range	-12...12 m/s / -40...40 ft/s
Starting flow	From 0 m/s / 0 ft/s onwards
Pressure	
Operating pressure	Up to 16 bar (232 psi) for DN25...300 Up to 10 bar (145 psi) for DN350...600
Vacuum load	0 mbar / 0 psi absolute
Pressure loss	For detailed information refer to <i>Pressure loss</i> on page 76.
Chemical properties	
Physical conditions	Water: drinking water, raw water, irrigation water. 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 15.
Flow direction	Forward and reverse
	Arrow on flow sensor indicates forward flow direction.
Inlet run	DN25...300 ≥ 0 DN DN350...600 ≥ 3 DN
	For detailed information refer to <i>Measurement accuracy</i> on page 72.
Outlet run	DN25...300 ≥ 0 DN DN350...600 ≥ 1 DN
	For detailed information refer to <i>Measurement accuracy</i> on page 72.
Dimensions and weights	For detailed information refer to <i>Dimensions and weights</i> on page 74.

Materials

Sensor housing	Sheet steel
Measuring tube	DN25...200: metallic alloy
	DN250...600: stainless steel
Flanges	Steel 1.0460 / 1.0038 (RSt37-2) DN25...DN200; Wetted parts nickel plated
Liner	Rilsan®
Protective coating	On exterior of the meter: flanges, housing, signal converter (compact version) and / or connection box (field version)
	Standard: polyurethane 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	Standard:
	Aluminium with a polyester topcoat
	Optional:
Connection box	Polycarbonate (IP68)
	Only for remote versions.
	Stainless steel (IP68)

Process connections

EN 1092-1	Standard:
	DN25...200: PN 16
	DN250...600 : PN 10
	Optional:
	DN250...600: PN16 (DN350...600: 10 bar rated)
ASME	1...12": 150 lb RF (232 psi / 16 bar rated)
	14...24": 150 lb (145 psi / 10 bar rated)

JIS	DN25...300 / 1"...12": 10 K DN350...600 / 14"...24": 7,5 K
AS 4087	DN25...600 / 1"...24": Class 16 on request (DN350...600 / 14"...24": 10 bar rated)
AS 2129	DN25...600 / 1"...24": Table D, E on request (DN350...600 / 14"...24": 10 bar rated)
	For detailed information on nominal flange pressure and nominal diameter refer to <i>Dimensions and weights</i> on page 74.
Other connections	
Thread	DN25: G1" thread connection on request
	DN40: G1.5" & G2" thread connection on request
Other	Weld-on, clamp, oval flanges: on request

Electrical connections

Cable connections	
Cable entries	IFC 070 C and F in aluminium housing (IP67)
	Standard: 2 x M20 x 1.45
	Optional: 1/2" NPT, PF1/2
Output cable	IFC 070 C in polycarbonate housing (IP68)
	Standard: No output connector. Pulse output not available. Note: output connector can not be added afterwards.
	Optional: Pulse output activated. Output cable with plug and play - IP68 rated connector
Power supply	
Battery	Standard:
	Internal battery pack: Single D-cell (Lithium, 3.6V, 19 Ah)
	Optional:
	Internal battery pack: Dual D-cell (Lithium, 3.6V, 38 Ah)
Typical lifetime (default settings)	External battery pack: Dual DD-cell (Lithium, 3.6V, 76 Ah), IP68 rated. Cable length is 1.5 m
	With 1 internal battery; DN25...200 : up to 8 years DN250...600 : up to 4 years
	With 2 internal batteries; DN25...200 : up to 15 years DN250...600 : up to 8 years
	With external battery pack; DN25...200 : up to 20 years DN250...600 : up to 15 years
	For detailed information refer to <i>Battery lifetime</i> on page 77.
Alarms	Pre-alarm at < 10% of its original capacity
	Final alarm at < 1% of its original capacity
Battery replacement	No loss of totalizer data

Signal cable (remote versions only)	
Type	KROHNE WSC cable
Length	Standard: 5m
	Optional: 10m, 15m, 20m, 25m
In- and output	
Pulse output	2 Passive pulse outputs (maximum 3 outputs possible; see status output)
	$f \leq 100 \text{ Hz}$; $I \leq 10 \text{ mA}$; $U: 2.7 \dots 24 \text{ VDC}$ ($P \leq 100 \text{ mW}$)
	Volume / pulse is programmable
	Phase shift between pulse A and B (forward and reverse) selectable
	Pulse width is selectable: 5 ms (default), 10 ms, 20 ms, 50 ms, 100ms, 200 ms
Status output	2 Passive status outputs (1 status output can be used as a third pulse output)
	$I \leq 10 \text{ mA}$; $U: 2.7 \dots 24 \text{ VDC}$ ($P \leq 100 \text{ mW}$)
	Function (selectable): self check, battery pre warning, battery final warning, empty pipe
Communication	Optional: KGA 42 external datalogger / GSM module
	For detailed information refer to the KGA 42 documentation.

Approvals and certificates

CE	
	This device fulfils the statutory requirements of the EC directives. The manufacturer certifies successful testing of the product by applying the CE mark.
Electromagnetic compatibility	Directive: 2004/108/EC
	Harmonized standard: EN 61326-1: 2006
Pressure Equipment Directive	Not applicable: networks for the supply, distribution and discharge of water and associated equipment are excluded from the scope of this directive.
Other approvals and standards	
Custody transfer (DN25...300)	MID Annex MI-001 type examination certificate
	OIML R49 certificate of conformity
	Conformity with ISO 4064 and EN 14541
	Innerstaatliche Bauartzulassung als Kaeltezaehler (For Germany, Switzerland and Austria).
	DN40...100; SANS 1529 (South Africa)
Drinking water approvals	ACS, DVGW W270, NSF / ANSI Standard 61, TZW, WRAS
Protection category acc. to IEC 529 / EN 60529	Compact version (C) in polycarbonate housing: IP68 (NEMA 4X/6P) [Test conditions; 1500 hours, 10 meters below surface]
	Compact version (C) in aluminium housing: IP66/67 (NEMA 4/4X/6)
	Field version (F) in aluminium housing: IP66/67 (NEMA 4/4X/6)
Shock test	IEC 68-2-27
	30 g for 18 ms
Vibration test	IEC 68-2-64
	$f = 20 - 20000 \text{ Hz}$, $rms = 4.5g$, $t = 30 \text{ min.}$

8.3 Legal metrology

8.3.1 OIML R49

The WATERFLUX 3070 has a certificate of conformity with the international recommendation OIML R49. The certificate has been issued by NMI.

The OIML R49 recommendation (2006) 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 meters with $Q_3 \geq 100 \text{ m}^3/\text{h}$.

$$Q_1 = Q_3 / R$$

$$Q_2 = Q_1 * 1.6$$

$$Q_3 = Q_1 * R$$

$$Q_4 = Q_3 * 1.25$$

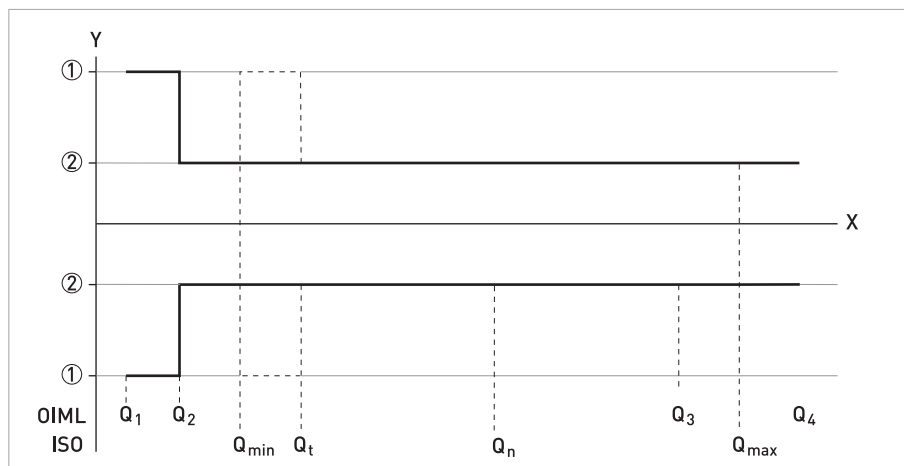


Figure 8-1: ISO flow rates added to figure as comparison towards OIML

X: Flow rate; Y [%]: Maximum measuring error

- ① Upper flow rate zone: $\pm 3\%$ (class 1), $\pm 5\%$ (class 2)
- ② Lower flow rate zone: $\pm 1\%$ (class 1), $\pm 2\%$ (class 2)

OIML R49 Class 1; certified metrological characteristics

DN	Span (R) Q3 / Q1	Flow rate [m ³ /h]			
		Minimum Q1	Transitional Q2	Permanent Q3	Overload Q4
65	250	0.400	0.640	100	125.0
80	160	0.625	1.000	100	125.0
80	250	0.640	1.024	160	200.0
100	160	1.000	1.600	160	200.0
100	250	1.000	1.600	250	312.5
125	160	1.563	2.500	250	312.5
125	250	1.600	2.560	400	500.0
150	160	2.500	4.000	400	500.0
150	250	2.520	4.032	630	787.5
200	160	3.938	6.300	630	787.5
200	200	4.000	6.400	800	1000.0
250	160	6.250	10.000	1000	1250.0
300	160	10.000	16.000	1600	2000.0

OIML R49 Class 2; certified metrological characteristics

DN	Span (R) Q3 / Q1	Flow rate [m ³ /h]			
		Minimum Q1	Transitional Q2	Permanent Q3	Overload Q4
25	400	0.025	0.040	10	12.5
25	400	0.040	0.064	16	20.0
40	400	0.063	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	0.160	0.252	63	78.8
65	400	0.160	0.250	63	78.8
65	400	0.250	0.400	100	125.0
80	400	0.250	0.400	100	125.0
80	400	0.400	0.640	160	200.0
100	400	0.400	0.640	160	200.0
100	400	0.625	1.000	250	312.5
125	400	0.625	1.000	250	312.5
125	400	1.000	1.600	400	500.0
150	400	1.000	1.600	400	500.0
150	400	1.575	2.520	630	787.5
200	400	1.575	2.520	630	787.5
250	400	2.500	4.000	1000	1250.0
300	400	4.000	6.400	1600	2000.0

8.3.2 MID Annex 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) 2004/22/EC.

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 an EC-type examination certificate and can be verified to the MID Annex MI-001 for water meters with diameter DN25...DN300. The conformity assessment procedure followed for the 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 $\pm 5\%$.

$$Q_1 = Q_3 / R$$

$$Q_2 = Q_1 * 1.6$$

$$Q_3 = Q_1 * R$$

$$Q_4 = Q_3 * 1.25$$

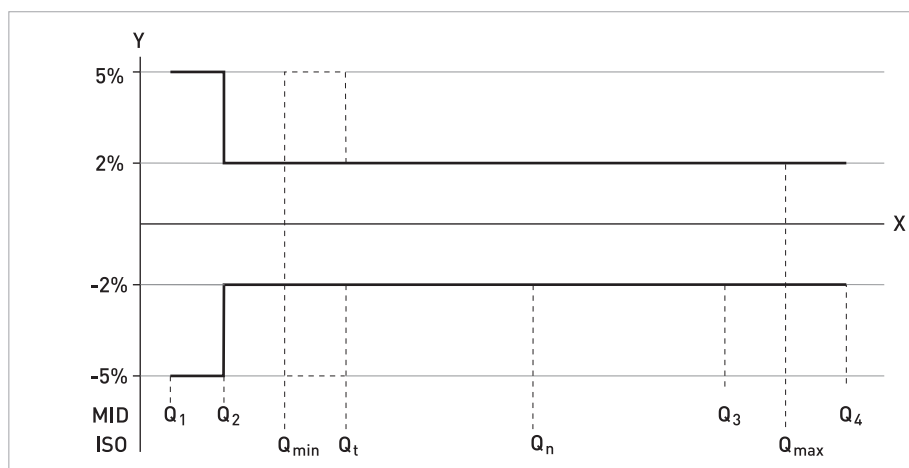


Figure 8-2: ISO flow rates added to figure as comparison towards MID

X: Flow rate

Y [%]: Maximum measuring error

MI-001 certified flow characteristics

DN	Span (R) Q3 / Q1	Flow rate [m ³ /h]			
		Minimum Q1	Transitional Q2	Permanent Q3	Overload Q4
25	400	0.025	0.040	10	12.5
25	400	0.040	0.064	16	20.0
40	400	0.063	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	0.158	0.252	63	78.8
65	400	0.158	0.252	63	78.8
65	400	0.250	0.400	100	125.0
80	400	0.250	0.400	100	125.0
80	400	0.400	0.640	160	200.0
100	400	0.400	0.640	160	200.0
100	400	0.625	1.000	250	312.5
125	400	0.625	1.000	250	312.5
125	400	1.000	1.600	400	500.0
150	400	1.000	1.600	400	500.0
150	400	1.575	2.520	630	787.5
200	400	1.575	2.520	630	787.5
200	315	2.540	4.060	800	1000.0
250	400	2.500	4.000	1000	1250.0
300	400	4.000	6.400	1600	2000.0

8.3.3 Verification to MI-001 & OIML R49


INFORMATION!

Verification to MI-001 and OIML R49, standard at the following values for R, Q1, Q2 and Q3.
Verification at other values for R and Q3 available on request.

Verification to MI-001

DN	Span (R)	Flow rate [m ³ /h]		
		Q1	Q2	Q3
25	80	0.050	0.080	4
32	80	0.125	0.200	10
40	80	0.125	0.200	10
50	80	0.200	0.320	16
65	80	0.313	0.500	25
80	80	0.500	0.800	40
100	80	0.788	1.260	63
125	80	1.250	2.000	100
150	80	2.000	3.200	160
200	80	3.125	5.000	250
250	80	5.000	8.000	400
300	80	7.875	12.600	630

8.4 Measurement accuracy

Each water meter is standard wet calibrated under reference conditions by direct volume comparison. The performance of the water meter is defined and documented in an individual water meter calibration certificate.

Reference conditions

- Medium: water
- Temperature: +10...30°C / +50...86°F
- Pressure: 1 bar / 14.5 psi
- Inlet section: ≥ 3 DN
- Outlet section: ≥ 1 DN
- Electrical conductivity: $\geq 300 \mu\text{S/cm}$

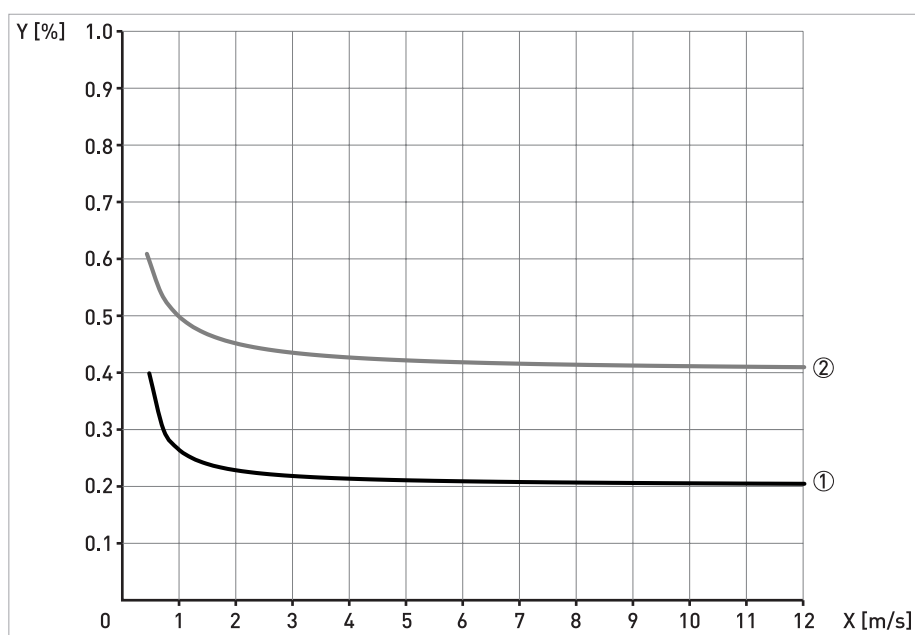


Figure 8-3: Measuring accuracy
X [m/s]: Flow velocity; Y [%]: Maximum measuring error

Accuracy with IFC 070 converter

	Inlet	Outlet	Accuracy	Curve
DN25...300 / 1...12"	3 DN	1 DN	0.2% + 0.5 mm/s	①
DN350...600 / 14...24"	3 DN	1 DN	0.4% + 1 mm/s	②

8.4.1 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 flow sensor design, whereby the mean flow velocity and flow profile are optimised 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 a

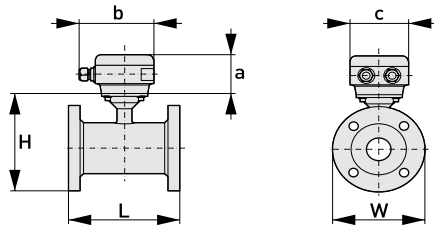
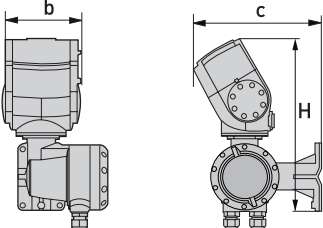
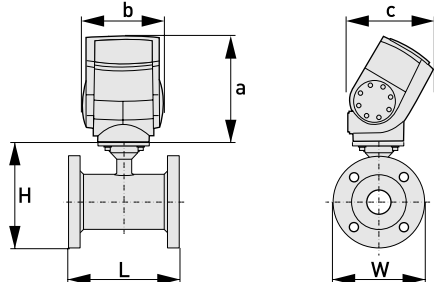
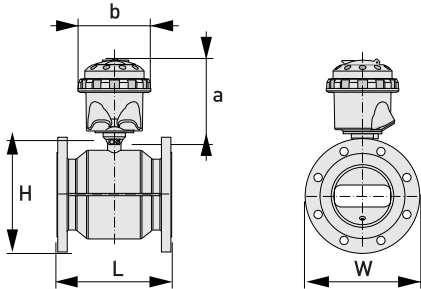
OIML R49 certificate

- Diameter range DN25...300
- Accuracy class 1 and class 2
- Minimum straight inlet and outlet pipe length of 0 DN
- Bi-directional flow

EC-type certificate according MID Annex MI-001

- Diameter range DN25...300
- Minimum straight inlet and outlet pipe length of 0 DN
- Bi-directional flow

8.5 Dimensions and weights

Remote flow sensor		a = 88 mm / 3.5" b = 139 mm / 5.5" ① c = 106 mm / 4.2" Total height = H + a
Remote version in aluminium housing (IP67)		b = 132 mm / 5.2" c = 235 mm / 9.3" H = 310 mm / 12.2" Weight = 3.3 kg / 7.3 lb
Compact version in aluminium housing (IP67)		a = 170 mm / 6.7" b = 132 mm / 5.2" c = 140 mm / 5.5" Total height = H + a
Compact version in polycarbonate housing (IP68)		a = 159 mm / 6.3" b = 161 mm / 6.3" Total height = H + a

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

**INFORMATION!**

- All data given in the following tables are based on standard versions of the flow sensor only.
- Especially for smaller nominal sizes of the flow sensor, the signal converter can be bigger than the flow sensor.
- Note that for other pressure ratings than mentioned, the dimensions may be different.
- For full information on signal converter dimensions see relevant documentation.

EN 1092-1

Nominal size DN [mm]	Dimensions [mm]			Approx. weight [kg]
	L	H	W	
25	150	151	115	5
40	150	166	150	6
50	200	186	165	13
65	200	200	185	11
80	200	209	200	17
100	250	237	220	17
125	250	266	250	21
150	300	300	285	29
200	350	361	340	36
250	400	408	395	50
300	500	458	445	60
350	500	510	505	85
400	600	568	565	110
450	600	618	615	125
500	600	671	670	120
600	600	781	780	180

ASME B16.5 / 150 lb

Nominal size [inches]	Dimensions [inches]			Approx. weight [lb]
	L	H	W	
1	5.91	5.83	4.3	18
1½	5.91	6	4.9	21
2	7.87	7.05	5.9	34
3	7.87	8.03	7.5	42
4	9.84	9.49	9.0	56
5	9.84	10.55	10.0	65
6	11.81	11.69	11.0	80
8	13.78	14.25	13.5	100
10	15.75	16.3	16.0	148
12	19.7	18.8	19.0	210
14	27.6	20.7	21	290
16	31.5	22.9	23.5	370
18	31.5	24.7	25	420
20	31.5	27	27.5	500
24	31.5	31.4	32	680

8.6 Pressure loss

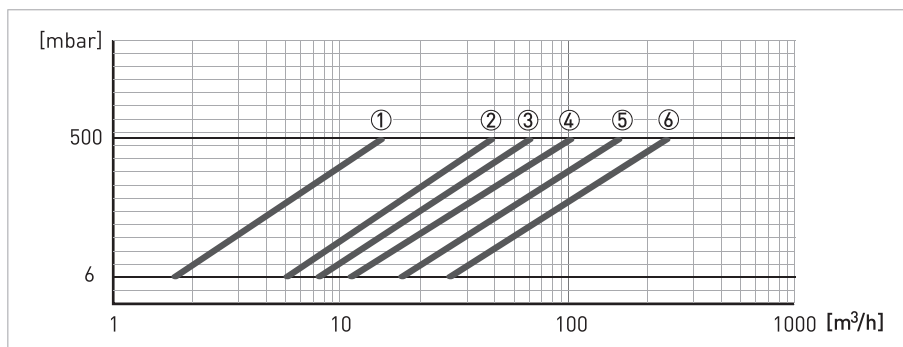


Figure 8-4: Pressure loss between 1 m/s and 9 m/s for DN25...100

- ① DN25
- ② DN40
- ③ DN50
- ④ DN65
- ⑤ DN80
- ⑥ DN100

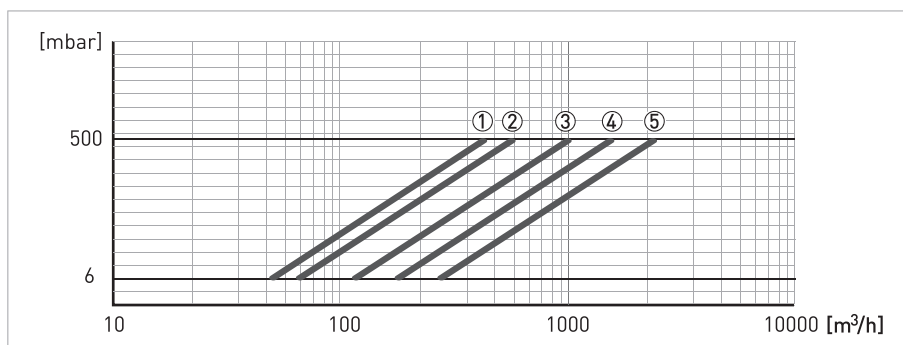


Figure 8-5: Pressure loss between 1 m/s and 9 m/s for DN125...300

- ① DN125
- ② DN150
- ③ DN200
- ④ DN250
- ⑤ DN300

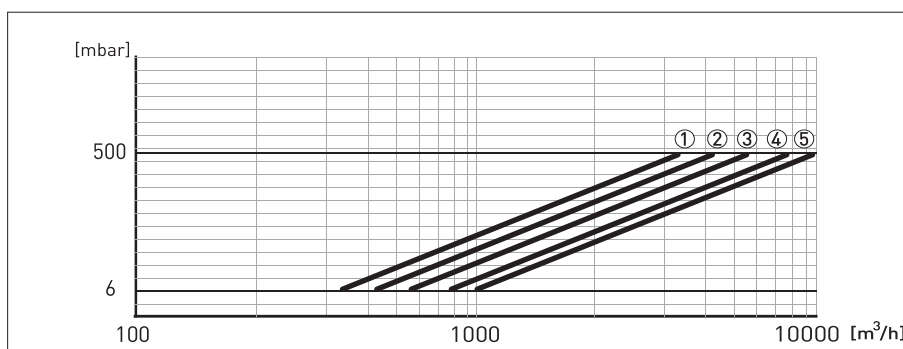


Figure 8-6: Pressure loss between 1 m/s and 9 m/s for DN350...600

- ① DN350
- ② DN400
- ③ DN450
- ④ DN500
- ⑤ DN600

8.7 Battery lifetime

The maximum battery lifetime depends on the choice of battery pack, the diameter and the measurement interval.

Other factors influencing the battery lifetime include the ambient temperature, the pulse output settings, the status output, and the pulse width. 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 settings, an ambient temperature of 25°C / 77°F and a flow rate at 2 m/s.

Maximum lifetime of batteries for: DN25...200

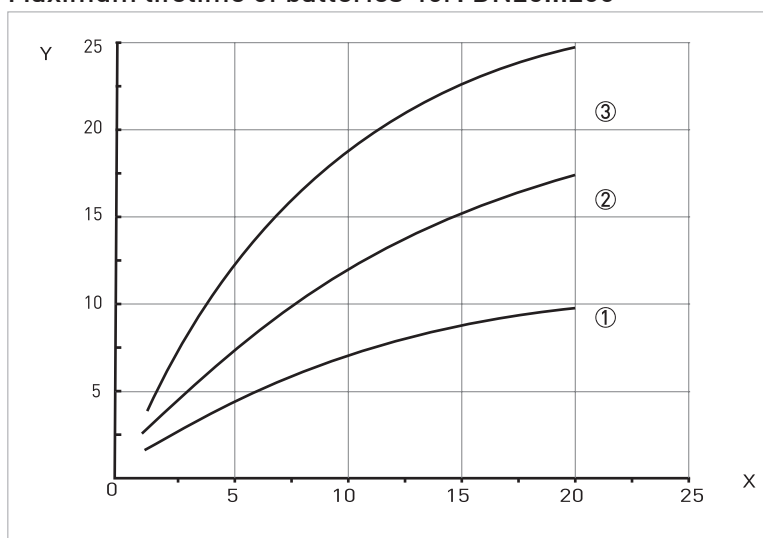


Figure 8-7: X = Measuring interval in seconds, Y = typical lifetime in years

Maximum lifetime of batteries for: DN250...600

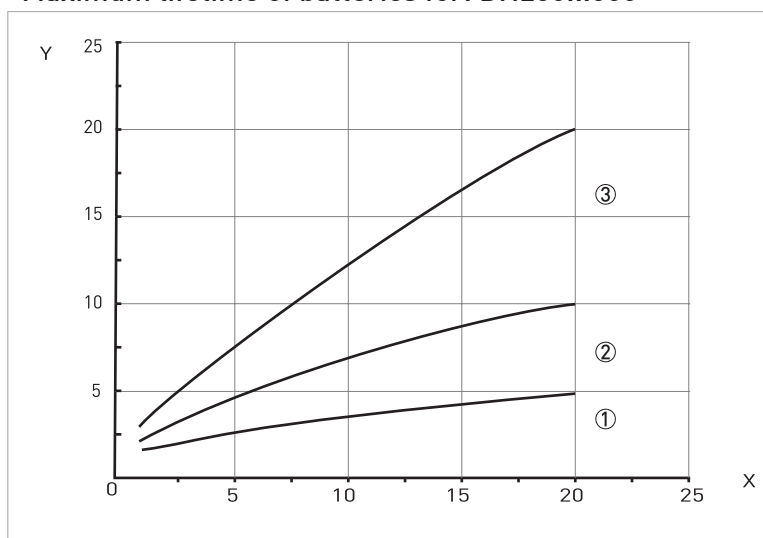


Figure 8-8: X = Measuring interval in seconds, Y = typical lifetime in years

- ① Single D-cell battery
- ② Dual D-cell battery
- ③ External battery







KROHNE product overview

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

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

The current list of all KROHNE contacts and addresses can be found at:
www.krohne.com

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