

Instruction

MI 021-547 en

AUGUST 2019

**6500W + IMT65W Battery Powered Electromagnetic
Water Meter**

Master Instruction

Electronic Revision 5.0.5_ (SW.REV.5.0.2_)

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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- _ | 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 | CCRC code | Documentation |
|--------------|-------------------------------|---------------------------|-----------|--------------------------|
| 2019 | ER 5.0.6 (SW. REV. 5.0.6_) | | | MI 6500W + IMT65W-R02 |

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.

**NOTICE!**

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.

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

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

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

Other approvals and standards

- Measuring Instruments Directive 2014/32/EU; Annex III (MI-001)

For more information, please refer to the dedicated documentation.

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.

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

1.4.2 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 or operation of the devices (systems) will cause the warranty to be void. The respective "Standard Terms and Conditions" which form the basis for the sales contract shall also apply.

1.4.4 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 icons as shown below.

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.

**NOTICE!**

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.

**NOTICE!**

*The lithium batteries supplied, are **non-rechargeable**. Do NOT recharge the empty lithium batteries. Dispose of them according the local legislation in your country.*

**NOTICE!**

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

**NOTICE!**

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

**NOTICE!**

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

**NOTICE!**

The remote version will arrive in two cartons. One carton contains the signal transmitter and one carton contains the flow tube.

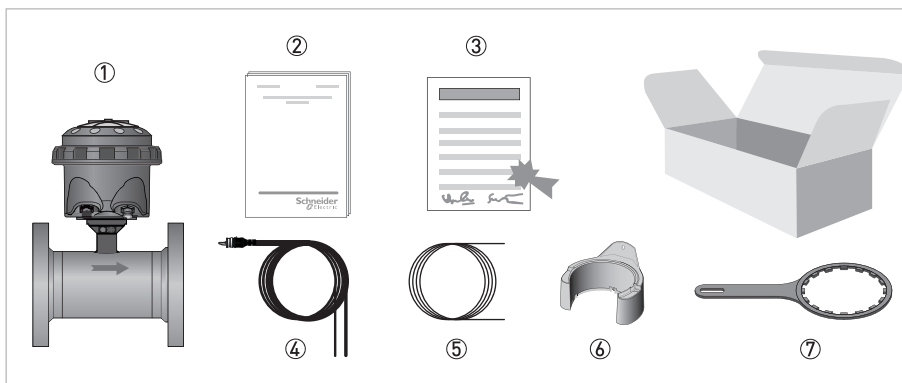


Figure 2-1: Scope of delivery

- ① Ordered water meter (compact or remote version)
- ② Product documentation
- ③ Combined signal/power cable (delivered according order)
- ④ Wall holder (remote version)
- ⑤ Special wrench for loosening the locking ring of the cover

**NOTICE!**

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.

**NOTICE!**

Special cable and/or cable assemblies are delivered according to the ordered signal transmitter type.

**CAUTION!**

The signal transmitter housing is delivered with attached IP67 dust caps to protect the connections of the signal transmitter. After removing the caps and connecting the signal- and tube cables, the signal transmitter housing and connections are IP68 rated.

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 transmitter is mounted directly on the measuring tube) in polycarbonate (IP68) housing
- Remote version (measuring tube with a stainless steel connection box and a signal transmitter) in a remote, polycarbonate housing

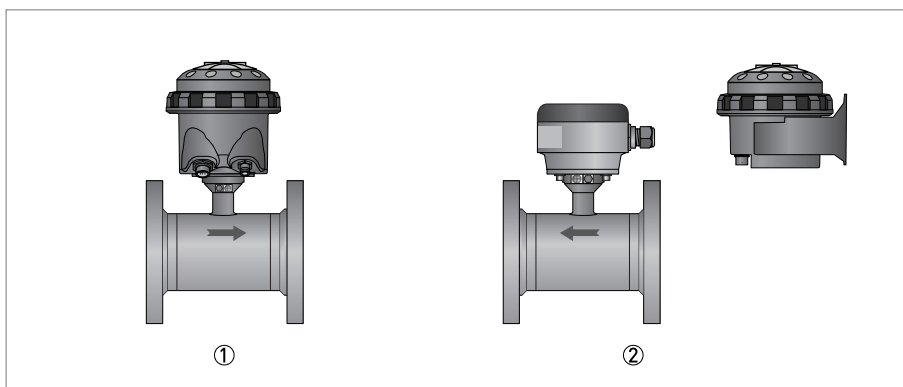


Figure 2-2: Device versions

- ① Compact version
- ② Remote version

Both versions are available with an optional integrated P&T sensor.

2.3 Nameplate (example)

**NOTICE!**

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

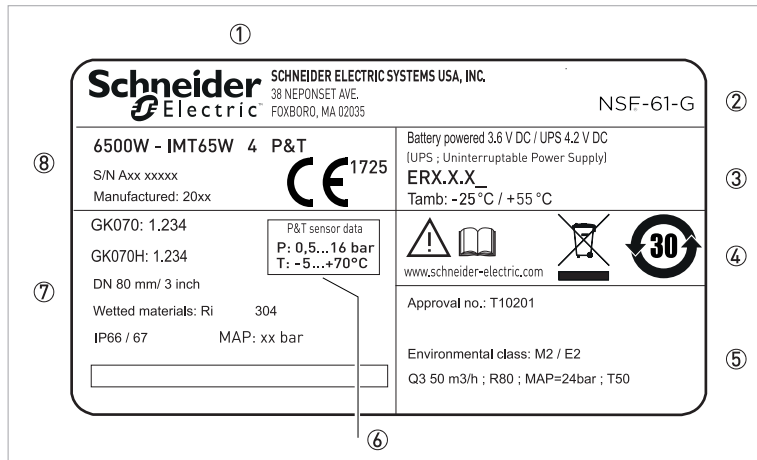


Figure 2-3: Example of nameplate

- ① Name and address of the manufacturer
- ② Additional logo and/or certifications
- ③ Battery voltage UPS and Electronic Revision number
- ④ Disposal logo and supplier website
- ⑤ Optional (MI-001): Additional information including approval number, Q3, ratio
- ⑥ Specific pressure and temperature data
- ⑦ Meter constant, diameter, wetted materials, protection class
- ⑧ Type designation of the flowmeter, serial number, date of manufacturing and CE sign with number of notified body (option: text P&T only for versions with integrated pressure and temperature sensor)

3.1 General notes on installation



NOTICE!

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



NOTICE!

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



NOTICE!

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: -30...+70°C / -22...+158°F

3.3 Transport

Signal transmitter

- No special requirements.

Compact version

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

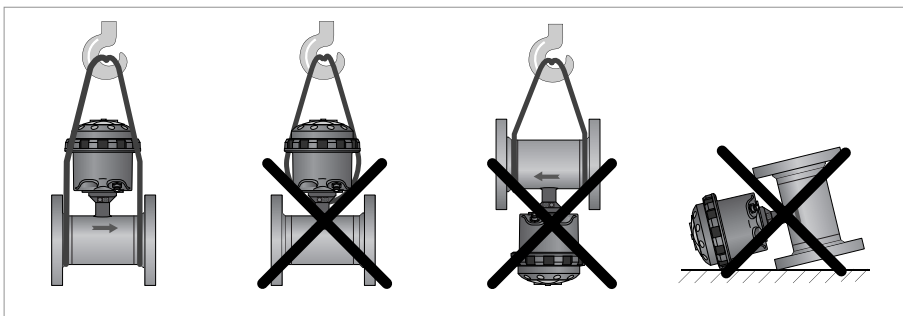


Figure 3-1: Transport

3.4 Pre-installation requirements

Make sure that you have all necessary tools available:

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

3.5 General requirements



NOTICE!

The following precautions must be taken to ensure reliable installation.

- *Make sure that there is adequate space to the sides.*
- *Protect the signal transmitter from direct sunlight and install a sun shade if necessary.*
- *Signal transmitters installed in control cabinets require adequate cooling, e.g. by fan or heat exchanger.*
- *Do not expose the signal transmitter to intense vibration. The flowmeters are tested for a vibration level in accordance with IEC 60068-2-64.*

3.5.1 Vibration

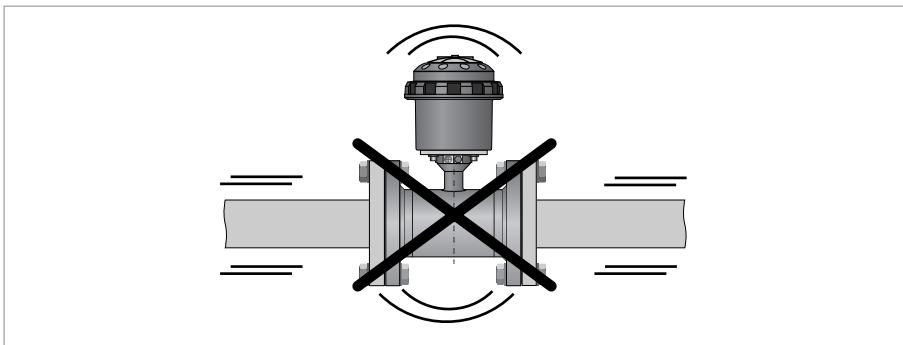


Figure 3-2: Avoid vibrations

3.5.2 Magnetic field

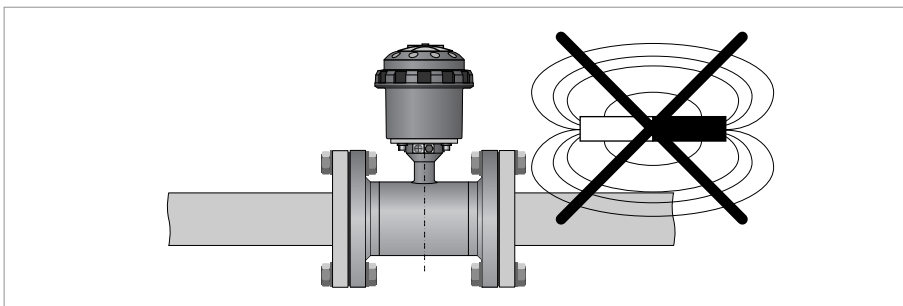


Figure 3-3: Avoid magnetic fields

3.6 Installation conditions



CAUTION!

To prevent damage to the Rilsan® coating, the 6500W tube must be installed carefully. Take precautions during transport and installation to protect the in- and outlet of the tube.

3.6.1 Inlet and outlet

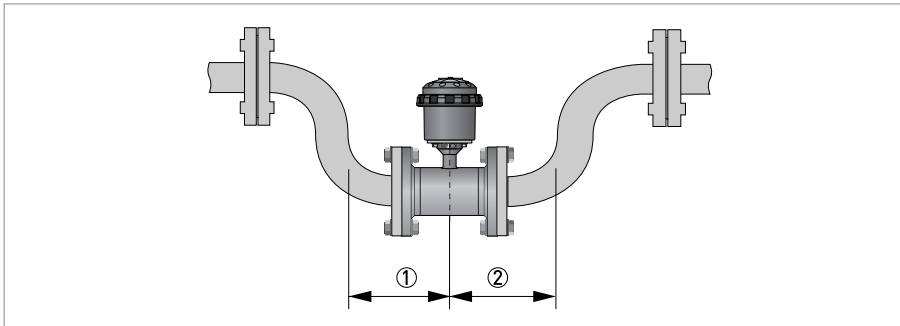


Figure 3-4: Minimal inlet and outlet

- ① Inlet: ≥ 0 DN
- ② Outlet: ≥ 0 DN

3.6.2 T-section

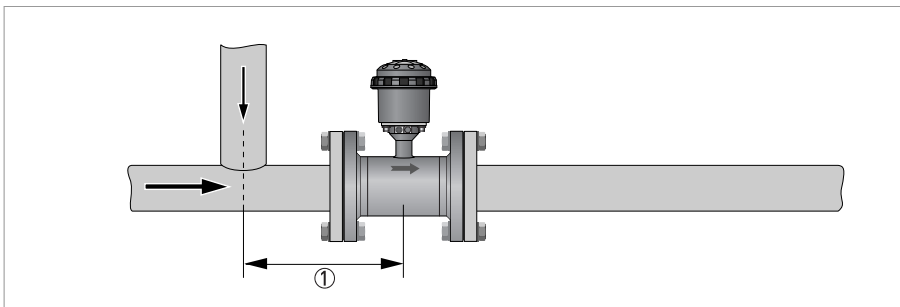


Figure 3-5: Distance behind a T-section

- ① ≥ 0 DN

3.6.3 Open feed or discharge

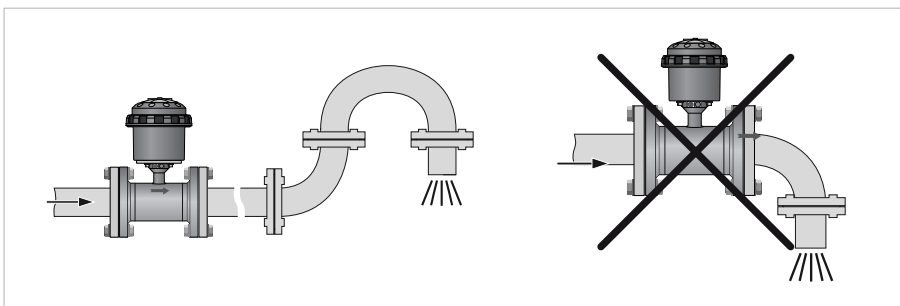


Figure 3-6: Installation in front of an open discharge

3.6.4 Bends

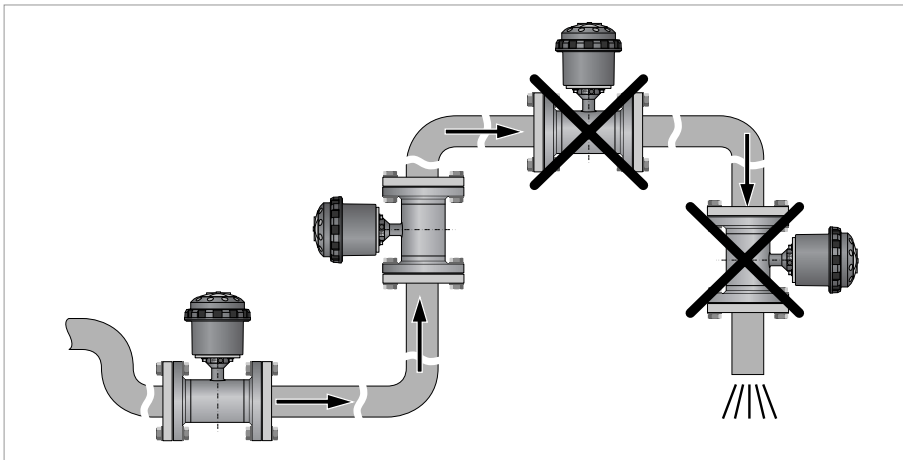


Figure 3-7: Installation in bending pipes (90°)

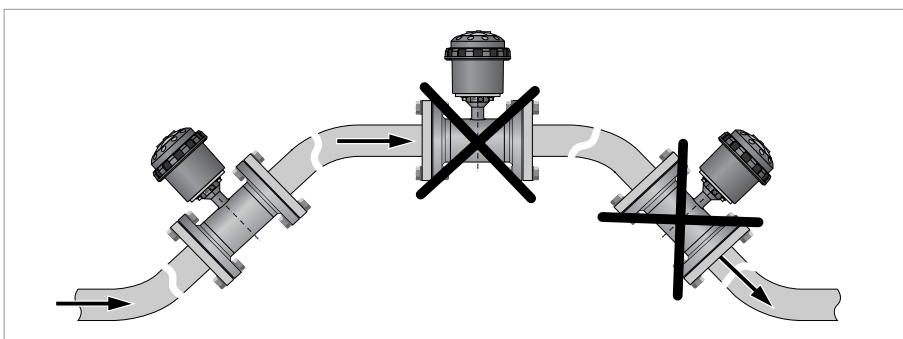


Figure 3-8: Installation in bending pipes (45°)



CAUTION!
Avoid draining or partial filling of the flow tube

3.6.5 Pump

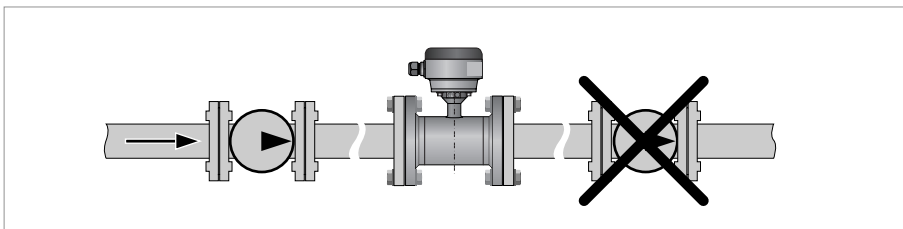


Figure 3-9: Recommended installation: behind a pump

3.6.6 Control valve

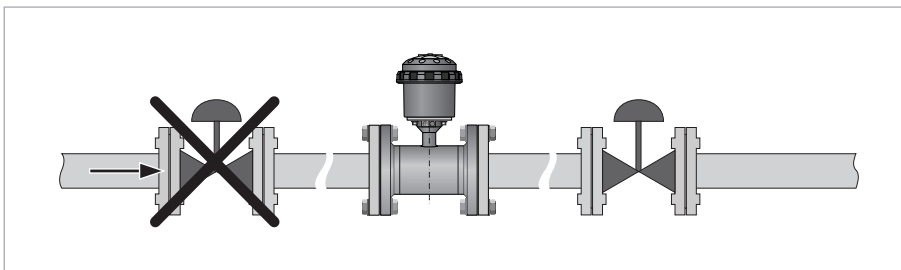


Figure 3-10: Recommended installation: in front of a control valve

3.6.7 Air venting and vacuum forces

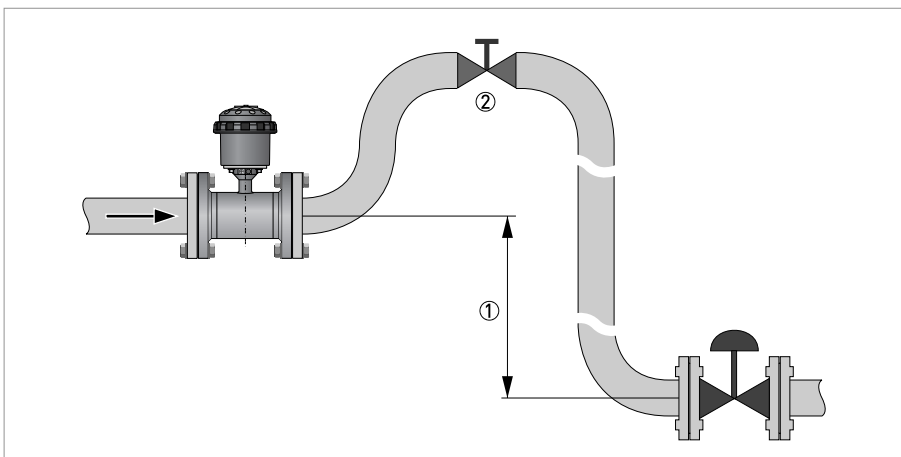


Figure 3-11: Air venting

- ① ≥ 5 m
- ② Air ventilation point

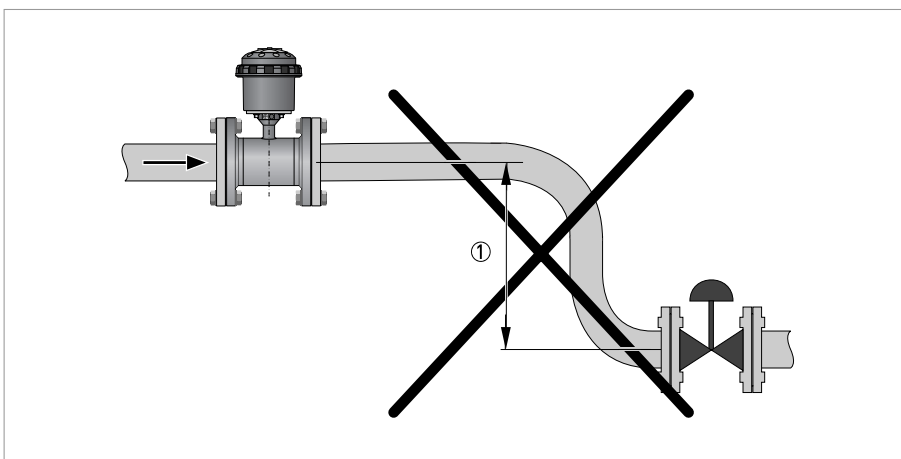


Figure 3-12: Vacuum

- ① ≥ 5 m

3.6.8 Installation in a metering pit and subsurface applications

The 6500W flow tube 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 IMT65W signal transmitter is IP68 rated (NEMA 4/4X/6) and suitable for periodic submersion in flooded measurement chambers.

The signal transmitters 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 6500W + IMT65W remote version. The remote IMT65W signal transmitter 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.

Submersion applications

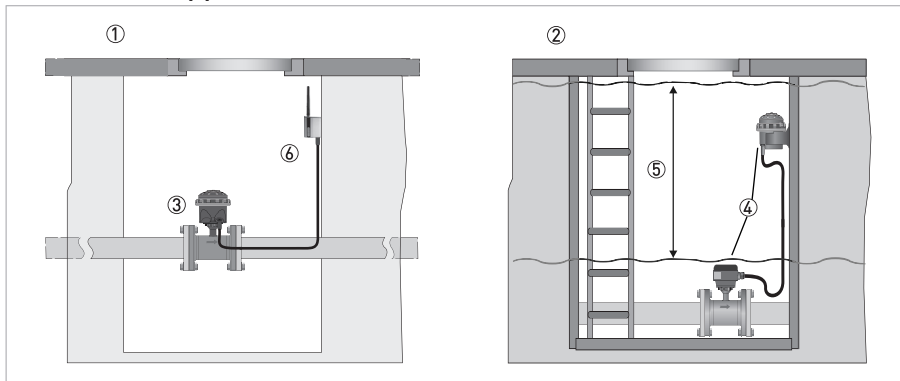


Figure 3-13: Examples of installation in measuring pit

- 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)



CAUTION!

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

Subsurface application

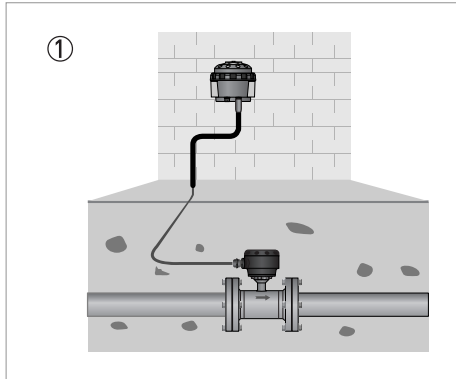


Figure 3-14: Application with buried (subsoil) tube and a field version transmitter

① 6500W + IMT65W remote version

Note: figure shows a cable ≤ 25 m / 82 ft

3.6.9 Mounting position and flange deviation

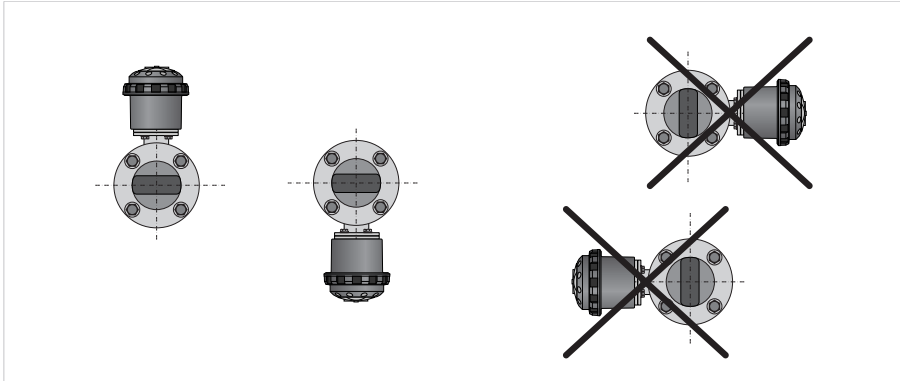


Figure 3-15: Mounting position

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

3.6.10 Flange Deviation

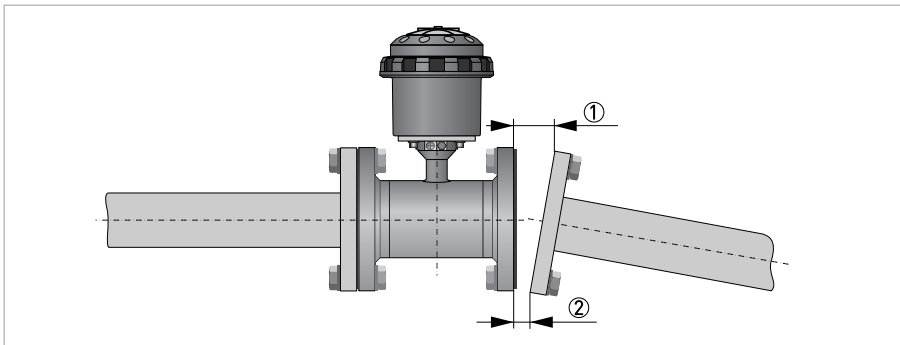


Figure 3-16: Flange deviation

- ① L_{max}
- ② L_{min}



CAUTION!

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



CAUTION!

Use the proper tools to ensure the integrity of the meter and prevent damage to the Rilsan[®] coating.

3.7 Mounting

3.7.1 Torques and pressures

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

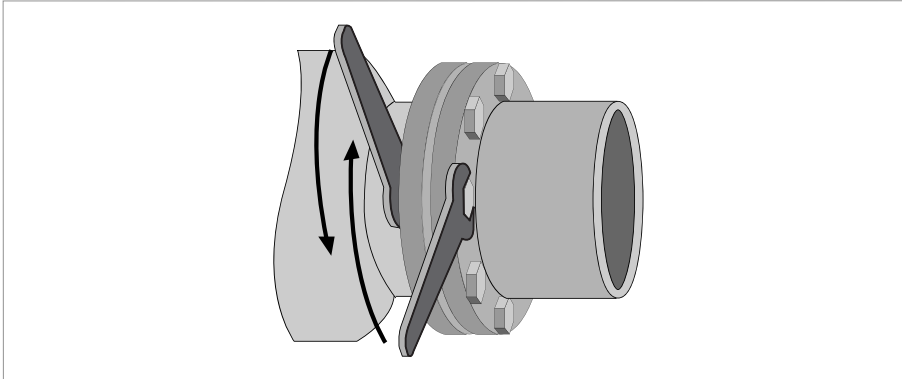


Figure 3-17: Tightening of bolts



Tightening of bolts

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

| Nominal size 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 [inch] | 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. 150 psi / 10 bar).

3.8 Mounting of the signal transmitter


NOTICE!

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.

3.8.1 Remote signal transmitter housing

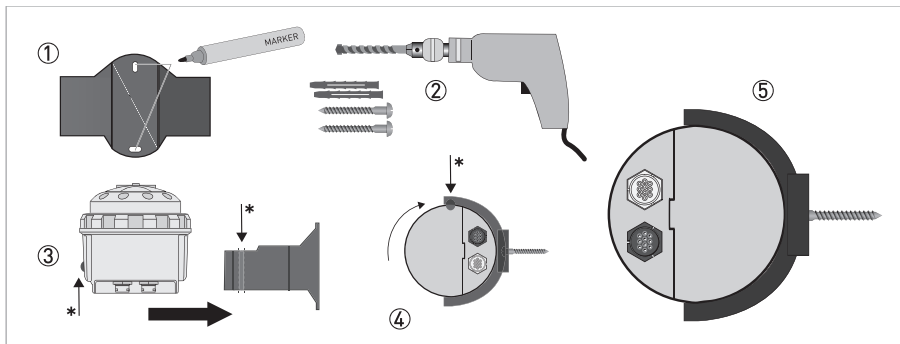


Figure 3-18: Mounting of the wall holder

- 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.

3.8.2 Closing of the signal transmitter housing

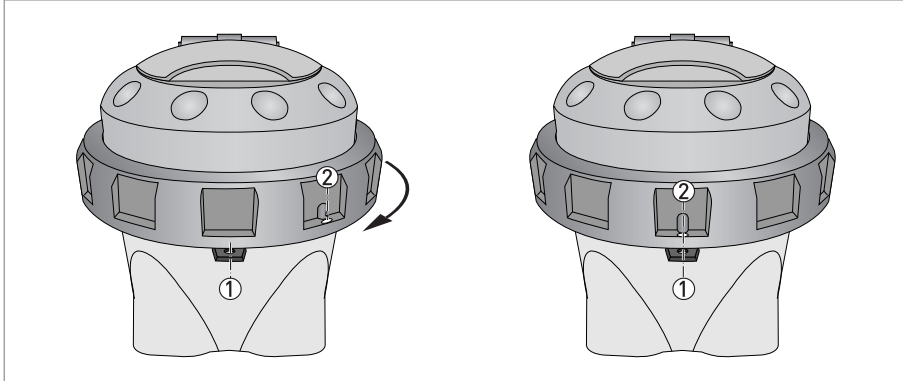


Figure 3-19: Closing of the signal transmitter housing



- Before closing the case of the signal transmitter, 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 inline (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).

3.8.3 Mounting of the Multi-Power unit

The mounting of the Multi-Power unit is possible in the following options:

- Surface mounting with 2 screws on a wall or other sufficient hard surface
- On-pipe mounting with 2 Tie-Wraps

For mounting on a horizontal or vertical surface, always use the proper tools and mounting materials (e.g. drill, plug and screws). The distance between the two mounting holes is 184 mm / 7.2". Always mount the Multi-Power unit on the intended location before connecting to the tube and/or switching on the main power. When attaching the wall holder unit to the wall, do not exceed a tightening torque of 1 Nm / 0.74 lb-ft when fastening the screws. This can damage the mounting eyelets.

Mounting on the pipe line construction can easily be done by using 2 Tie-Wraps. The bottom of the housing of the Multi-Power unit is designed for mounting on a pipe line. Choose the correct size and properties of the Tie-Wraps (specifications according ambient temperature and other conditions, size, width max. 14 mm / ½"). Consider releasable types of Tie-Wraps when mobility and/or replacing of mounting is expected.

The Multi-Power unit is IP68 rated.



CAUTION!

Prevent water ingress to the AC or DC cable when not connected.

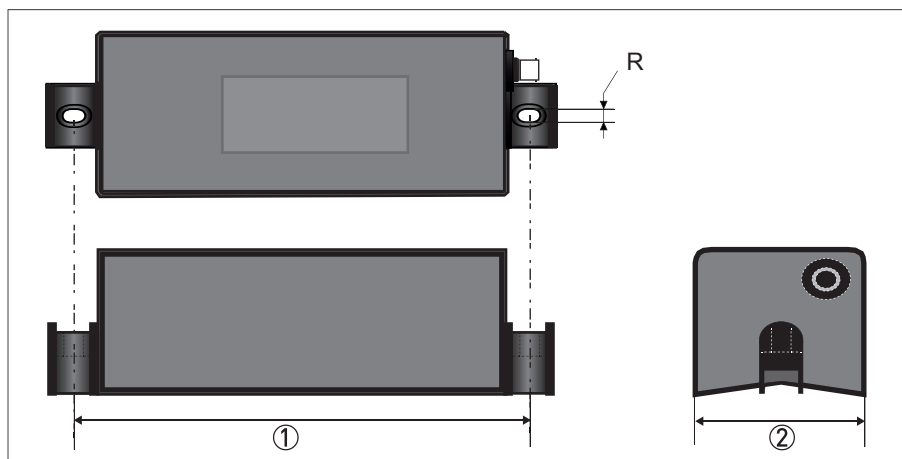


Figure 3-20: Dimensions Multi-Power

① distance = 184 mm / 7.2"

② width of unit = 74 mm / 2.9"

R = size of mounting hole ; 6 mm / ¼"

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.



NOTICE!

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 Important notes on electrical connection



DANGER!

Electrical connection is carried out in conformity with the VDE 0100 directive "Regulations for electrical power installations with line voltages up to 1000 V" or equivalent national regulations.



CAUTION!

- *Use suitable cable entries for the various electrical cables.*
- *The measuring tube and signal transmitter have been configured together at the factory. For this reason, please connect the devices in pairs. Ensure that the measuring tube constant GK/GKL (see nameplates) are identically set.*
- *If delivered separately or when installing devices that were not configured together, set the signal transmitter to the DN size and GK/GKL of the tube, refer to the chapter; **Function tables** of the concerning signal transmitter.*



DANGER!

Cables may only be connected when the power is switched off.

4.3 Grounding

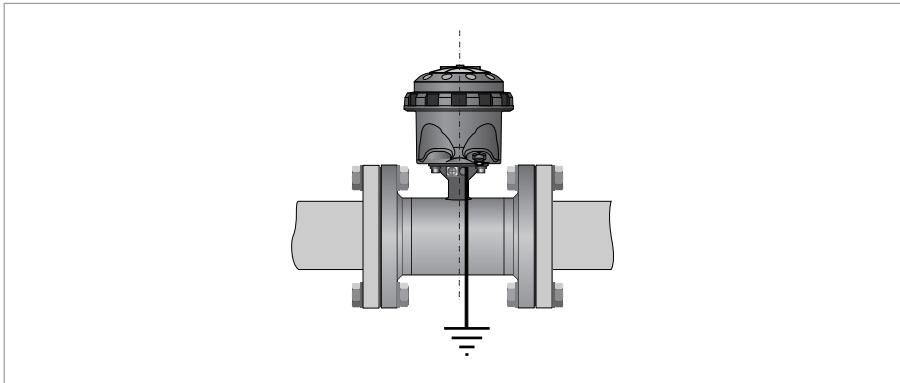


Figure 4-1: Grounding



NOTICE!

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

4.4 Cable overview

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

The tube cable for the IP68 remote (field) version has an 8 pin male connector.
The I/O cable (pulse /modbus) is available in a Multi-Power version and has an additional power cable connection.

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

IP 68 Cable versions

| I/O version | Multi-Power cable | PIN |
|--------------|-------------------|-----|
| Modbus cable | N | 4 |
| Pulse cable | N | 8 |
| Data logger | N | 8 |
| Modbus cable | Y | 10 |
| Pulse cable | Y | 8 |
| Data logger | Y | 8 |

Electrical values

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

4.5 Connection of the tube cable

The compact version of the 6500W + IMT65W is already internally connected to the tube 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 6500W + IMT65W remote version, a standard cable is delivered with the device. On the tube side the cable is as standard potted at the factory. The tube cable has a IP68 rated RVS snap-on connection to connect the tube with the IP68 field signal transmitter. The cables have the following colour coded leads:

Standard tube 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 |



NOTICE!

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

Tube 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 |



CAUTION!

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

4.6 Connection of the signal cable

4.6.1 IP68 housing (compact version)

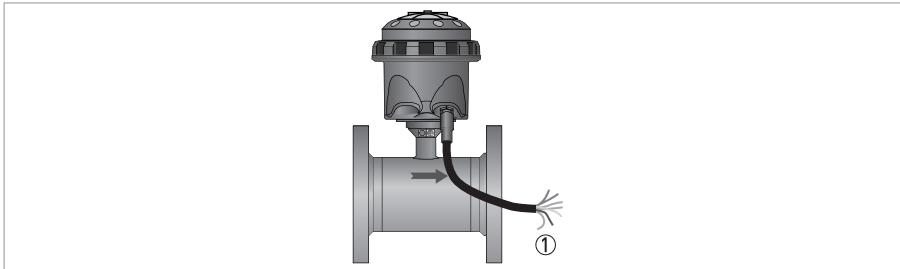


Figure 4-2: Output cable at IP68 compact version

① Color coded leads of the output cable

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

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

4.6.2 IP68 housing (remote version)

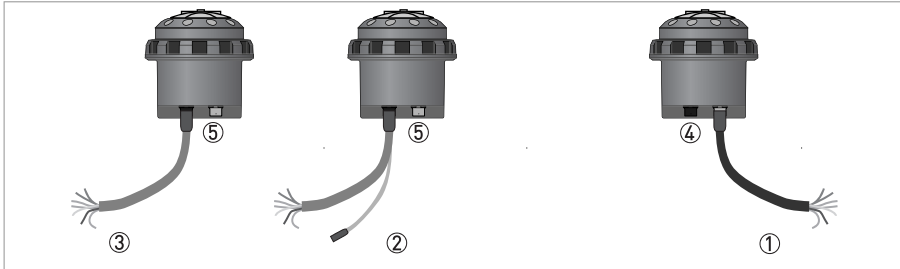


Figure 4-3: Different output cable, IP68 remote version

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

Tube cable:

For more information; refer to *Connection of the tube cable* on page 32 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 - |

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← |
| Yellow | K | Down link wire B← |
| Pink | H | Up link wire A→ |
| Grey | J | Up link wire B→ |
| | | |
| 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 tube 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.

**NOTICE!**

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 6500W + IMT65W signal transmitter 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.

5.1 Connecting the internal battery



CAUTION!

Please connect the battery before first use. The signal transmitter is delivered with a disconnected battery.



NOTICE!

For transport purposes, signal transmitters which are verified to MI-001 or OIML R49 have also disconnected batteries. Please connect battery before placing the local utility seal.

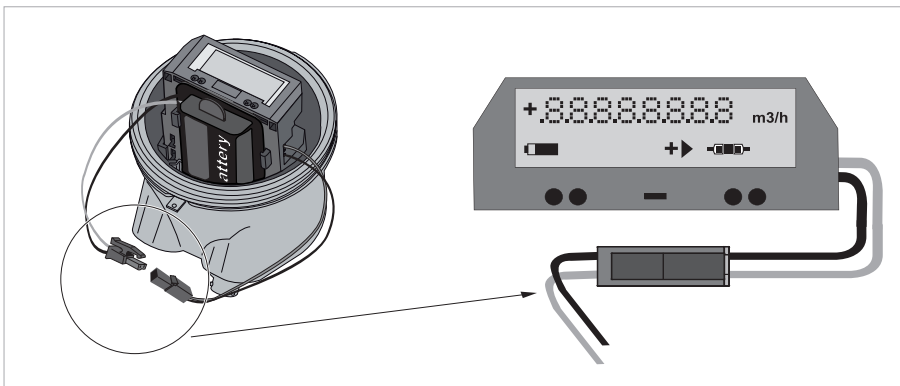


Figure 5-1: Connecting the battery



- Remove the cover.
- Fasten the battery connector of the power cable to the internal connector in the signal transmitter.
- Check if the display lights up.
- Put back the cover.



WARNING!

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



- For closing the case of the device in the IP68 housing refer to *Closing of the signal transmitter housing* on page 27.

For information on the different battery types refer to *Types of batteries* on page 70



NOTICE!

The device now operates with default menu settings. refer to *Battery settings* on page 66 for configuration of these menu settings.

5.2 Power supply - battery

The standard version of the 6500W + IMT65W has an internal battery pack with a Lithium double D cell (3.6V-38 Ah). There is no loss of totalizer data when exchanging and/or replacing the battery/power supply

More information regarding the exchange / replacing of battery, refer to *Types of batteries* on page 70 or refer to *Battery lifetime* on page 99 for typical lifetimes of batteries

5.3 Power supply - Multi-Power

Beside regular battery power supplies, the 6500W + IMT65W can also be connected to an external Multi-Power unit.

The external Multi-Power unit has an internal Lithium battery pack (3.6 V -38 Ah) and can be connected with a combined power and output cable (Y-cable) for power input. The unit is delivered with a special power cable for connection to a 10...30 V DC supply (a.o. through wind- and/or solar energy supplies) and a cable for connecting to mains supply (110...230 V AC / 50 - 60 Hz)

The Multi-Power unit has two, not rechargeable internal batteries (3.6 V -38 Ah) for battery backup mode. There is no loss of totalizer data when connecting / disconnecting the Multi-Power unit.

**WARNING!**

Fire, explosion and severe burn hazard. Do not recharge, disassemble, or heat above 70 °C / 158 °F. Do NOT incinerate or expose contents to water

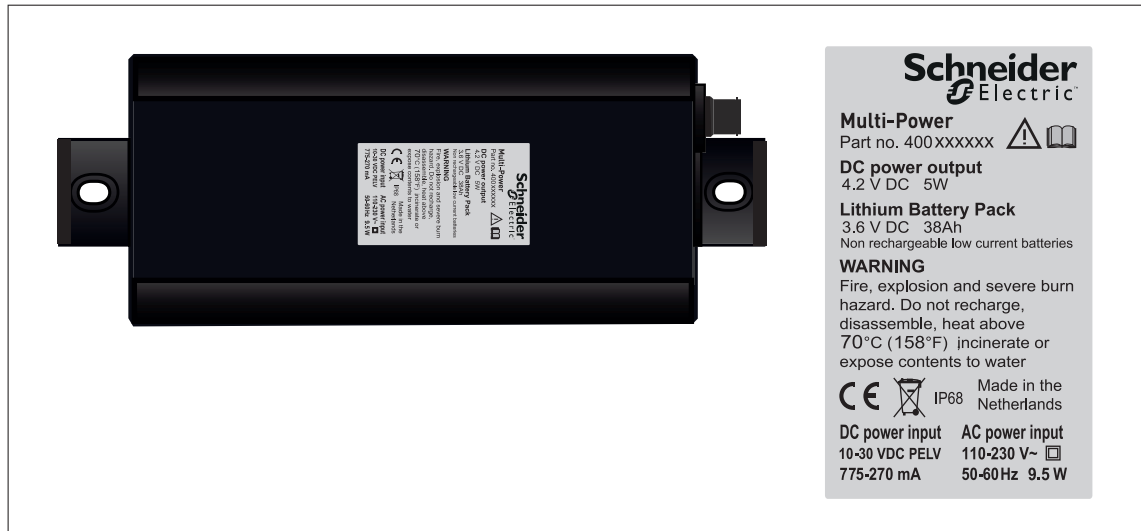


Figure 5-2: Multi-Power supply

Dimensions: L x W x H = 203 x 75 x 78 mm

* The information in the illustration, can deviate from the actual marking!

5.3.1 Connection of the Multi-Power unit

Optionally, beside an internal or external battery, the 6500W + IMT65W can be connected to an external Multi-Power unit for mains power and/or DC power operation with battery back-up.

The input power for the Multi-Power can be realized by connection to an AC/DC supply source

- AC mains supply source : 110...230 V AC - 50/60 Hz
- DC supply source : 10...30 V DC

Automatically a start-up routine is followed, when the 6500W + IMT65W with the Multi-Power is connected properly to a live AC and/or DC supply. First the DC input is checked and if present and AC/DC converter active, the power source is DC. When AC power is present and AC/DC converter active, the power source is AC/DC. If both are not available (interrupted) the internal dual D-cell battery pack (3.6V - 38 Ah) automatically takes over the power supply.

To save energy, the 6500W + IMT65W will automatically switch to the low power consuming battery backup mode and will continue to totalize volumes but temporarily stop to transfer the data.

The Multi-Power unit is IP68 rated and totally sealed and potted to prevent ingress of water. Therefore the integrated batteries cannot be changed.

Power input / output

The 3.6V **DC power output** of the Multi-Power can easily be connected with the cable assembly that is delivered with the Multi-Power unit. The UTS snap-on connector of the cable fits in only one way to the female connector on the Multi-Power unit.

As described, **the power input** of the Multi-Power can either be chosen an AC and/or DC input. To prevent water ingress and/or shock hazard, both cable ends are IP68 sealed. If possible, it is advised to connect both AC and DC inputs on the main power source.

When one of the input cables remain disconnected, make sure that this cable is correctly installed to prevent damage to the IP68 sealed end.

DC power cable (green cable)

| Wire color | Connection |
|--------------|-----------------------|
| Red | DC (+) |
| Blue | DC (+) |
| Yellow/Green | FE (functional earth) |

AC power cable (grey cable)

| Wire color | Connection |
|--------------|-----------------------|
| Black 1 | AC (-) |
| Black 2 | AC (-) |
| Green/Yellow | PE (protective earth) |

Cable $\varnothing = 0.75 \text{ mm}^2$



DANGER!

Observe the notes as described in this section with respect to the installation and connection of the AC and/or DC supply !



CAUTION!

*Rout non connected cables back to the power distribution box. Install cables correctly even when no power is to be connected!
Take measures to prevent water ingress and shock hazard on AC and/or DC cables when not connected.*

5.4 Starting the signal transmitter

The measuring device consist of a flow tube and a signal transmitter and is ready for operation. When the power is switched on (battery or Multi-powerunit is connected), a self-test is carried out and after that the meter starts to operate.

6.1 Display and operating elements

The IMT65W signal transmitter has a display and two optical keys. The optical keys can be used to cycle the display and to access the menu.

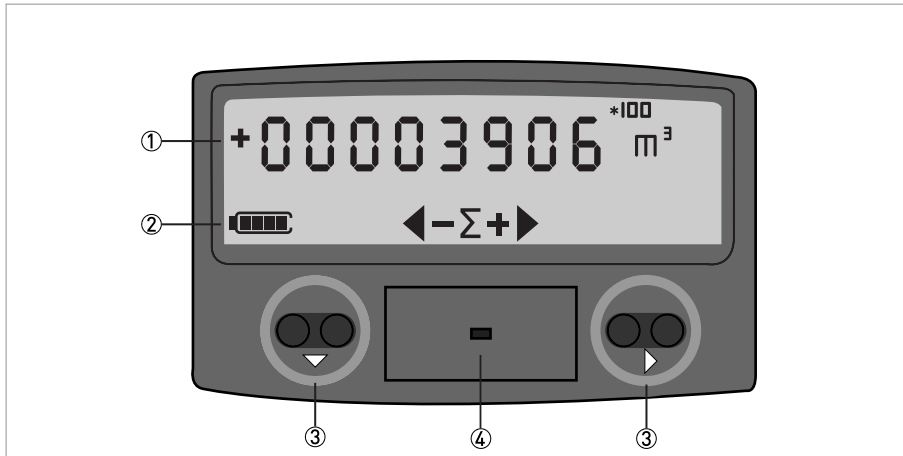
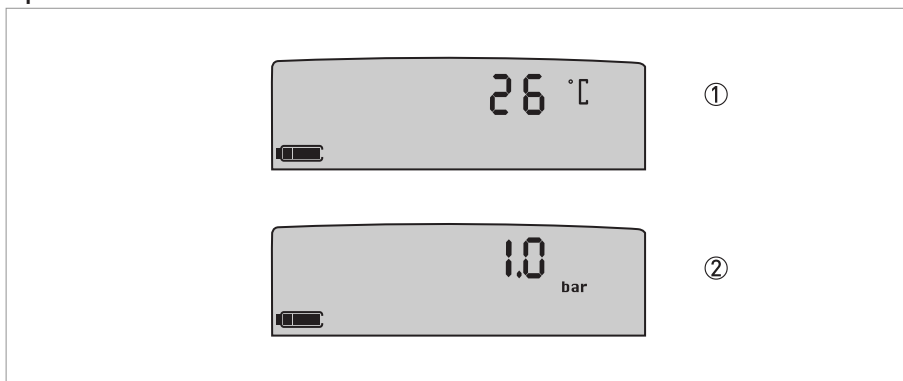


Figure 6-1: Display and operating elements

- 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

Optional P&T sensor



- ① Display showing temperature value
- ② Display showing pressure value

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 \blacktriangledown 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 instrument serial number |
|  | Example of the software version |
|  | CrC (cyclic redundancy check) integrity test of the memory and software. Example; CrC CFF7 is SWR 5.0.3_ |
|  | Example of the diameter (125) and the meter constant (4.160) |
|  | Example of the add-on software version |
|  | Example Modbus version |
|  | 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 68. |
| TEST | Test mode on | To activate Please refer to <i>Test mode</i> on page 69. |

Error and notification messages

| Display | Description | Actions |
|---|---|---|
| 1year  1year  1year  1year  | At the current consumption rate, the battery will be empty within 1 year. | Plan battery replacement. Note: this sign can also appear for a short period if the battery consumption is temporarily very high. |
|  | Battery nearly empty | Replace the battery |
| E-00 | Battery empty: voltage too low | |
| ! (Flashing) | Notification ! | <ul style="list-style-type: none"> • Check all connections • If the exclamation mark does not disappear, contact the service department |
| E-X (X = 1...127) | 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. |
| °C or bar | When the pressure/temperature is above or below max/min of the specified threshold values, the display will show the applicable max/min calibrated value, blinking ON/OFF | Check system and make sure not to exceed P/T range. (0.5...16 bar/ -5...+70°C) |
| - - - | When pressure/temperature is not read out correctly (or not read out yet from the P&T sensor) the display will show some dashes to indicate there is no valid data available | <ul style="list-style-type: none"> • Check all connections • If the exclamation mark does not disappear, contact the service department |

6.2 Access control

Access to the hardware and the software of the 6500W + IMT65W can be limited or blocked to prevent intervention by non-authorized 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 signal transmitter housing. The service menu gives no access to items that are subject to legal metrology.



NOTICE!

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 51.



- 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 III (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 III (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 42.

6.2.4 Metrological seals

After a meter is verified to MID Annex III (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.

**NOTICE!**

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

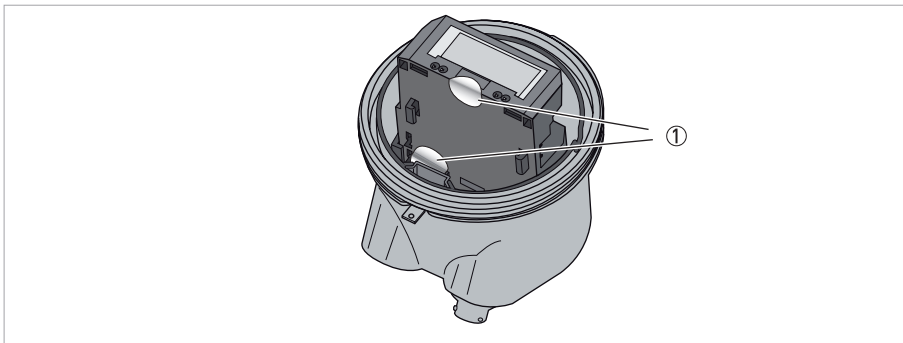


Figure 6-2: Metrological seals in signal transmitter housing

① Location of seals

6.2.5 Utility seals

To prevent intervention by non-authorized 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 signal transmitter and a utility seal on the measurement tube can provide evidence of an intervention by a non-authorized person.

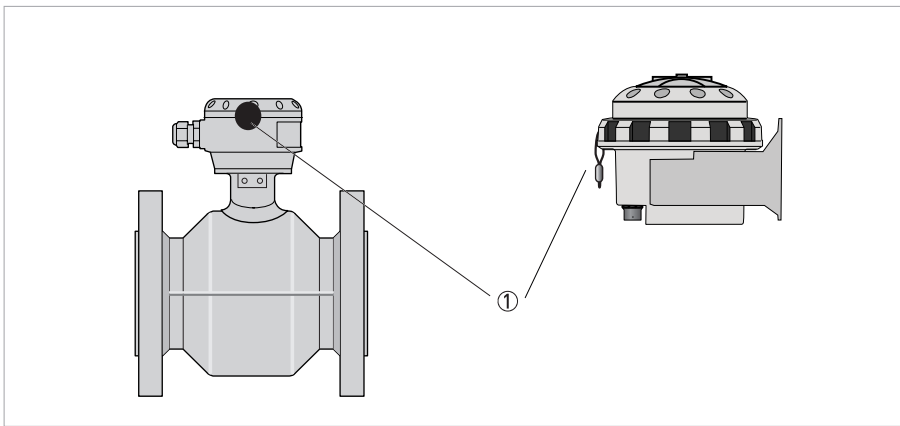


Figure 6-3: Examples of a utility seal with the remote version

① Location of seals

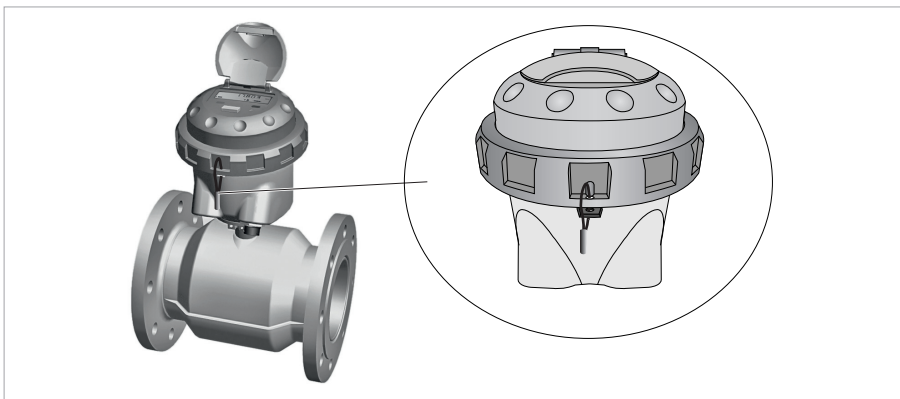


Figure 6-4: Example of a utility seal

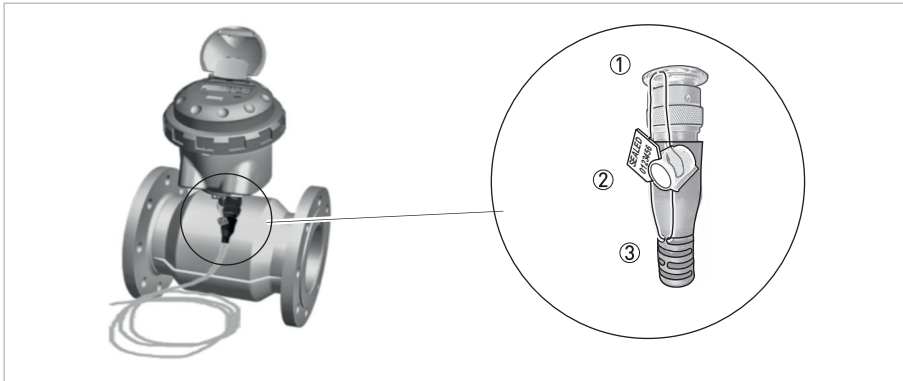


Figure 6-5: Utility seal on snap-on plug connection

- ① Steel sealing wire through housing connector
- ② Twister security meter seal
- ③ Steel sealing wire through strain relief of connector

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 III (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 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 50.

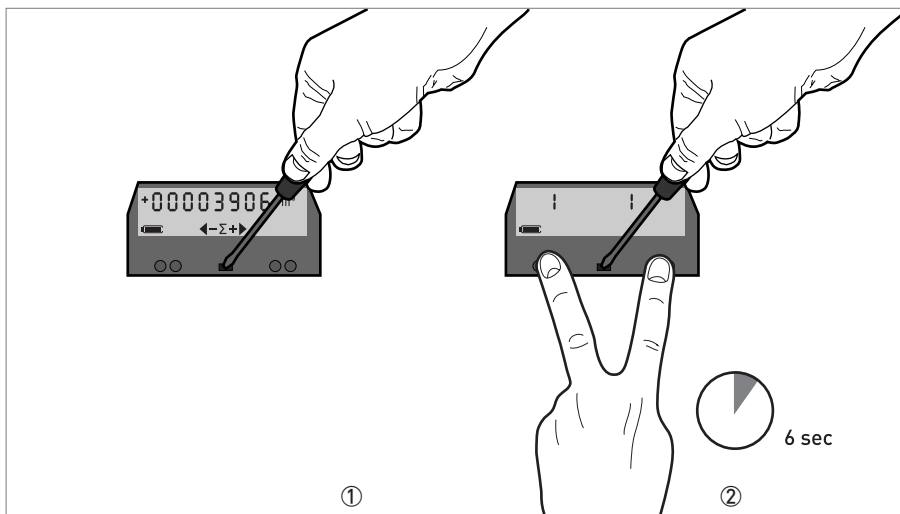


Figure 6-6: Change the settings of the access control.



WARNING!

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



- For closing the case of the signal transmitter in the IP68 housing, please refer to *Closing of the signal transmitter housing* on page 27.

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 III (MI-001) or OIML R49.

To reset full access to the menu please refer to *Reset full access to the menu* on page 49.

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 5.0.6_ | | | |
|---|---|---------|-------------------|
| 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 |
| Counters 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 notification | 0 | Off |
| 42 | Status output 1: battery final notification | 0 | Off |
| 43 | Status output 1: empty pipe | 0 | Off |
| 44 | Status output 1: P&T notification | 0 | Off |
| 50 | Status output 2: self-check | 0 | Off |
| 51 | Status output 2: battery pre notification | 0 | Off |
| 52 | Status output 2: battery final notification | 0 | Off |
| 53 | Status output 2: empty pipe | 0 | Off |
| 54 | Status output 2: P&T notification | 0 | Off |
| Pressure and temperature (optional) | | | |
| 60 | Pressure sensor | 0 | Off |
| 61 | Pressure unit | 00 | bar / psi (1 decimal) |
| 62 | Pressure limit, Maximum | xx.x / xxx | 16.0 bar / 232 psi |
| 63 | Pressure limit, Minimum | | -0.5 bar / -7.3 |
| 64 | Show pressure | 0 | Off |
| 65 | Temperature sensor | 0 | Off |
| 66 | Temperature unit | 00 | °C / °F |
| 67 | Temperature limit, Maximum | xxx | 70°C / 158°F |
| 68 | Temperature limit, Minimum | xxx | -5°C / 23°F |
| 69 | Show temperature | 0 | Off |
| 70 | P&T measuring rate | 15 | 15 minutes |
| 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 | | | |
| 91 | Meter size | xxx | Factory setting |
| 92 | Meter constant | xx.xxx | Factory setting |
| 93 | Zero offset calibration | 0 | Confirm |
| 94 | Zero selection | 0 | Factory setting (calibration settings) |

| Service and test | | | |
|------------------|-----------------------------------|--------|---------------------------|
| A0 | Simulate outputs | 0 | Off |
| A1 | Reset all counters | 88888 | Confirm |
| A2 | Flow verification on site | 0 | Off |
| A3 | Add-on communication | 0 | Off |
| Battery | | | |
| B0 | Battery type | 2 | Internal single batteries |
| B1 | Battery capacity | 038.00 | 38 Ah |
| B2 | Reset battery lifetime counter | 0 | Confirm |
| B3 | Modbus operation at power failure | 0 | Off |

| Modbus RS485 | | | |
|--------------|-----------------------|-------|-----------------------------------|
| C0 | Modbus slave adress | 001 | Value to be programmed (1 to 247) |
| C1 | Baud rate | 9.6 | 9600 baud |
| C2 | Parity rate | 0 | Even |
| C3 | Register format | 1 | Big endian |
| C4 | Transmission delay | 50 | 50 ms |
| C5 | Stop bits | 1 | 1 Stop bit |
| C6 | User application name | 00000 | To be set |
| C7 | RS485 bus termination | 0 | No RS485 termination |
| C8 | Reception interval | 0 | Set (0-3600 sec) |

6.3.3 Access control

| No. | Function | Options | Description |
|-----|----------------|---|--|
| 1 | Access control | 0 = Full menu access (default) 1 = Menu access blocked Fiscal metering / Custody transfer | 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 49. |

6.3.4 Automatic Meter Reading mode (AMR)

The AMR mode provides an option to read the display as base for the pulse output (e.g. use certain digits of the counter value).

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 number of 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) 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) 07 = Mega litre (Ml) 08 = Mega imperial gallon (M i. gal) | 00 and 06 are not shown if menu number 2 (AMR) mode is set to 1 (On). Note: the representation of the values (number of decimals) and the multiplier are automatically set. This can be adjusted using menu items 11 and 12. |
| 11 | Counter: number of decimals | 99 = Automatically (default) 0...7 = Number of decimals | Places a decimal dot. 99 = The number of decimals is set automatically. |
| 12 | Counter: multiplier value | 99 = Automatically (default) 1 = x 1 10 = x 10 100 = x 100 1000 = x 1000 | Shows counter value divided by the multiplier value entered. 99 = The multiplier value is set automatically. |

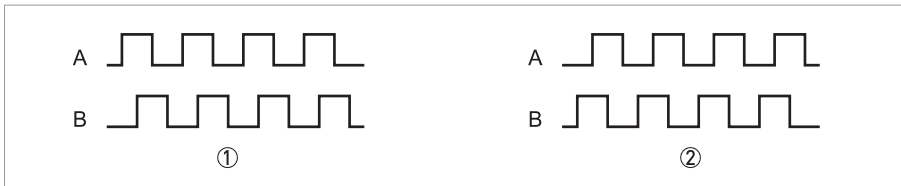
| No. | Function | Options | Description |
|--|-------------------------------------|---|--|
| 13 | Show forward counter | 0 = Off (default) | Makes the item available on the display. |
| | | 1 = On | |
| 14 | Show reverse counter | 0 = Off (default) | Makes the item available on the display. |
| | | 1 = On | |
| 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). Note: 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. The number of decimals is fixed and cannot be changed. |
| | | 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) | |
| | | 0703 = Mega litre per day (ML/d) | |
| 0803 = Mega imperial gallon per day (Mi.gal/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.

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)

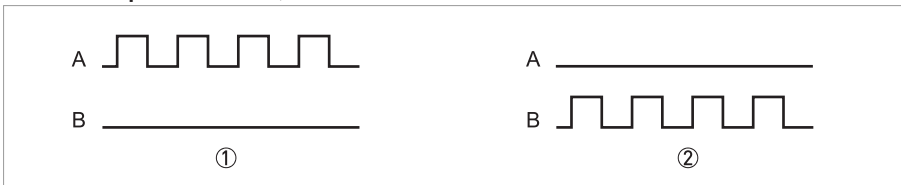


- ① Forward flow
- ② Reverse flow

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

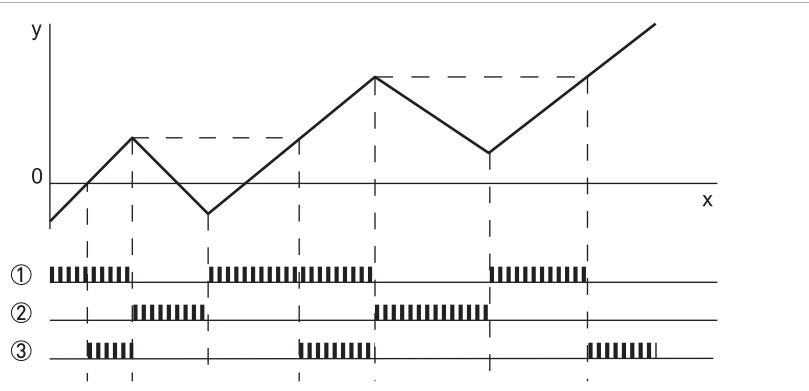


Figure 6-7: Y: Sum counter value; X: Time

- 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.



NOTICE!

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 | |

| No. | Function | Options | Description |
|--------------------------------|---|----------------------------------|--|
| 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 | |
| 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 | |
| | | .00100 = megalitre | |
| | | 00100 = mega imperial gallon | |
| 0.1000 = m ³ /pulse | When menu item A2 is set on 1 | | |
| 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 | |

| No. | Function | Options | Description |
|-----|-----------------------------------|--|---|
| 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) | |
| | | 07 = Megalitre | |
| | | 08 = Mega imperial gallon | |
| 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 | Value to set in unit of volume per pulse. Unit and format are determined by setting menu item 31 |
| | | 00.100 (default) = m ³ / pulse | |
| | | 0010.0 = gallon | |
| | | 0010.0 = imp. gallon | |
| | | 001.00 = ft ³ | |
| | | .00100 = a-inch | |
| | | .00100 = a-ft | |
| | | .00100 = megalitre | |
| | | .00100 = M.imp.gal. | |
| | | 0.1000 = m ³ / pulse | When menu item A2 is set on 1 |

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 notification | 0 = Off (default) | Active in case of low battery (remaining capacity < 10%). |
| | | 1 = On | |
| 42 | Status output 1: Battery final notification | 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 | |
| 44 | Status output 1: P/T notification | 0 (default) | Off |
| | | 1 | Pressure limit max. [menu item 62] |
| | | 2 | Pressure limit min. [menu item 63] |
| | | 3 | Temperature limit max. [menu item 67] |
| | | 4 | Temperature limit min. [menu item 68] |
| 50 | Status output 2: Self check | 0 Off (default) | |
| | | 1 = On | |
| 51 | Status output 2: Battery pre notification | 0 = Off (default) | Active in case of low battery (remaining capacity < 10%). |
| | | 1 = On | |
| 52 | Status output 2: Battery final notification | 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 | |
| 54 | Status output 2 P/T notification | 0=[default] | Off |
| | | 1 | Pressure limit max. [menu item 62] |
| | | 2 | Pressure limit min. [menu item 63] |
| | | 3 | Temperature limit max. [menu item 67] |
| | | 4 | Temperature limit min. [menu item 68] |



WARNING!

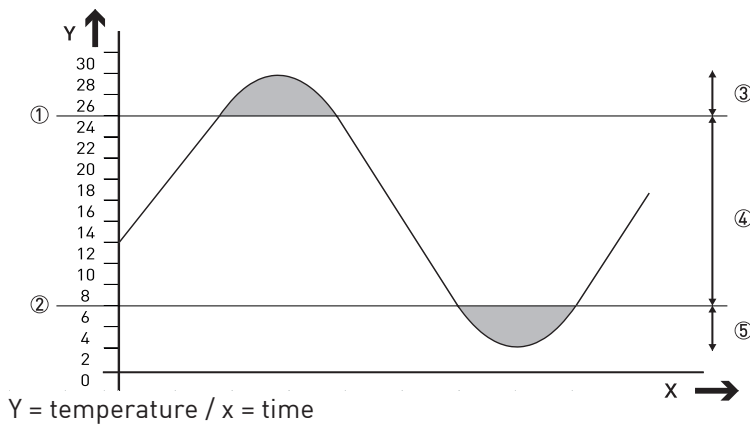
When setting the values of the temperature and / or pressure, the minimum value should not exceed the maximum value

6.3.8 Pressure and temperature settings

The following example of temperature warning setting, describes how to set the alarms (on upper or lower boundary) of the P&T sensor with the .

- Tmax. = 25°C (menu number: 67)
- Tmin. = 7°C (menu number: 68)
- Tmax. limit (menu number 44, setting [3])
- Tmin. limit (menu number 54, setting [4])

Once the measured temperature reaches Tmax. [25°C], the status output 1 gives an alarm and sends out pulses. When the measured temperature decreases and reach Tmin. [7°C], the status output 2 gives an alarm (similar to status output 1). When the temperature stays within Tmax. - Tmin. limit settings, [7...25°C) no alarm will be set. See the illustration below;



- ① Tmax
- ② Tmin
- ③ Status output 1; alarm
- ④ Status output 1 & 2 ; no alarm
- ⑤ Status output 2; alarm

Pressure and temperature sensor settings

| No. | Function | Options | Description |
|-----|----------------------------|------------------|---|
| 60 | Pressure sensor | 0= Off [default] | Disabled |
| | | 1 = On | Enabled |
| 61 | Pressure unit | 00 [default] | bar (1 decimal) |
| | | 01 | mbar (0 decimals) |
| | | 02 | psi (0 decimals) |
| | | 03 | mH ₂ O (0 decimals) |
| 62 | Pressure limit, maximum | 16.0 | Range 0...16 bar (Default); xx.x |
| | | 16000 | Range 0...16000 mbar; xxxxx |
| | | 232 | Range 0...232 psi; xxx |
| | | 163 | Range 0...163 mH ₂ O; xxx |
| 63 | Pressure limit, minimum | -0.5 | Range -0.5...16 bar; xx.x |
| | | -0500 | Range -500...16000 mbar; xxxxx |
| | | -07 | Range -7...232 psi; xxx |
| | | -05 | Range: -5...163 mH ₂ O; xxx |
| 64 | Show pressure | 0= Off [default] | Not visible in display |
| | | 1 = On | Visible in display |
| 65 | Temperature sensor | 0= Off [default] | Disabled |
| | | 1 = On | Enabled |
| 66 | Temperature unit | 00 [default] | °C |
| | | 01 | °F |
| 67 | Temperature limit, maximum | 070 | Range 0...+70°C xxx |
| | | 158 | Range 23...158°F xxx |
| 68 | Temperature limit, minimum | -05 | Range -5...+70°C xxx |
| | | 23 | Range 23...158°F xxx |
| 69 | Show temperature | 0= Off | Not visible in display |
| | | 1 = On | Visible in display |

| No. | Function | Options | Description |
|-----|------------------------|--------------|--|
| 70 | P&T measuring interval | 0 | P&T measurement is the same as flow measurement. ① |
| | | 1 | 1 minute |
| | | 5 | 5 minutes |
| | | 10 | 10 minutes |
| | | 15 (default) | 15 minutes |

Pressure and temperature settings are optional for DN50...200 / 2...8"

① depending on measurement interval of menu setting 81

6.3.9 Measurement settings

By default the forward flow direction is set from left to right. The red arrow on the measurement tube 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 | 5 = 5 sec | Sets the interval time between two measurements. The default value of 15 sec is chosen for an optimal energy consumption of the battery. |
| | | 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 = On (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 = Off | |

6.3.10 Meter configuration settings



NOTICE!

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

| No. | Function | Options | Description |
|-----|-------------------------|---|--|
| 91 | Meter size | Factory setting (xxx in mm) | By default the meter size is shown in mm. If menu nr. 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. |

6.3.11 Service and test settings



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



NOTICE!

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 | 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 | 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 | The display indicates Pxxxxxx, the decimal separator position varies per diameter. Please refer to <i>Verification mode</i> on page 68, for more details. |
| | | 1 = On | |
| A3 | Add-on communication | 0 = Off | Factory setting |
| | | 1 = On | |

6.3.12 Battery settings

After changing the batteries:

- 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. |
| | | 2 = Two internal batteries | |
| | | 4 = Multi-Power (2 batteries) | |
| B1 | Total battery capacity | xxx.xx = 019.00 (19.000 Ah) | Total of all batteries in Ah. After a change to a different battery type, change the setting (19 one battery, 38 two batteries) |
| B2 | Reset battery lifetime counter | 0 = Off | Set the value to 1 to reset the battery lifetime counter. After a reset, the menu setting automatically goes back to 0. |
| | | 1 = Reset | |
| B3 | Modbus operating in case of power supply failure | 0 = Off | Default = Off |
| | | 1 = On | |

6.3.13 Modbus settings

**CAUTION!**

*Changing the baudrate affects the battery lifetime.
For more details refer to the Modbus supplementary manual.*

| No. | Function | Options | Description |
|---------------------|-----------------------|-------------------------------|--|
| Modbus RS485 | | | |
| C0 | Modbus slave address | 001 | Value to be programmed (1 to 247) |
| C1 | Baud rate | Baud rate choice from table : | |
| | | 1.2 | 1200 baud |
| | | 2.4 | 2400 baud |
| | | 3.6 | 3600 baud |
| | | 4.8 | 4800 baud |
| | | 9.6 | 9600 baud (default) |
| | | 19.2 | 19200 baud |
| | | 38.4 | 38400 baud |
| | | 57.6 | 57600 baud |
| 115.2 | 115200 baud | | |
| C2 | Parity rate | 0 | Even (default) |
| | | 1 | Odd |
| | | 2 | No parity |
| C3 | Register format | 0 | Little endian |
| | | 1 | Big endian (default) |
| | | 2 | Mix endian, small words |
| | | 3 | Mix endian, large words |
| C4 | Transmission delay | 0 = 0ms | Transmission delay can be set by choice from table |
| | | 5 = 5ms | |
| | | 10 = 10ms | |
| | | 20 = 20ms | |
| | | 30 = 30ms | |
| | | 40 = 40ms | |
| | | 50 = 50ms (default) | |
| C5 | Stop bits | 1 | 1 Stop bit (default) |
| | | 2 | 2 Stop bits |
| C6 | User application name | 00000 | To be set by programmer |
| C7 | RS485 bus termination | 0 | No RS485 termination (default) |
| | | 1 | RS485 termination 2 x 120 Ω |
| C8 | Reception interval | 0 (default) | Set value for range 0-3600 sec. |

6.4 Tests

6.4.1 Automatic self-test

On a regular basis the 6500W + IMT65W 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. If required, warnings and error messages as a result of the self-test are available on the display of the signal transmitter and optionally via the status outputs.

6.4.2 Verification mode

**WARNING!**

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

The 6500W + IMT65W complies with the requirements of OIML R49 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. First, 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 Pxxxxxx. Second, the measurement interval is automatically set to 1 measurement every 2 seconds. Third, the unit of volume is set to m³. To go back to the standard mode menu number A2 should be set to 0.

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 Types of batteries

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

As standard the IMT65W signal transmitter is delivered with a lithium dual D cell (3.6V 38 Ah).

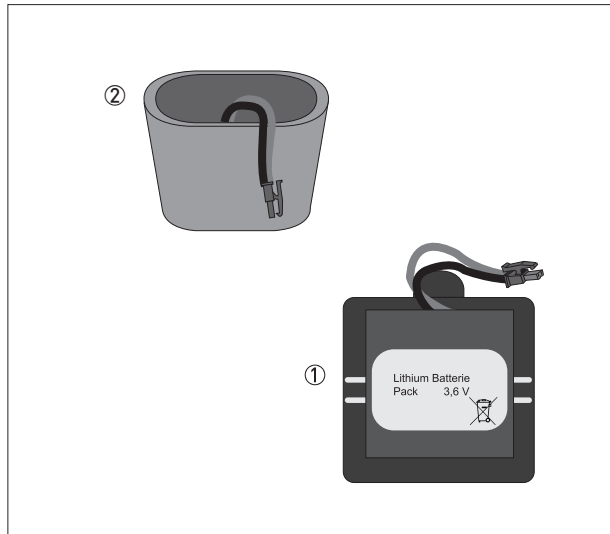


Figure 7-1: Batteries and battery holders

① Internal dual D-cell battery (without / in holder ②)

7.1.1 Replacement of internal battery

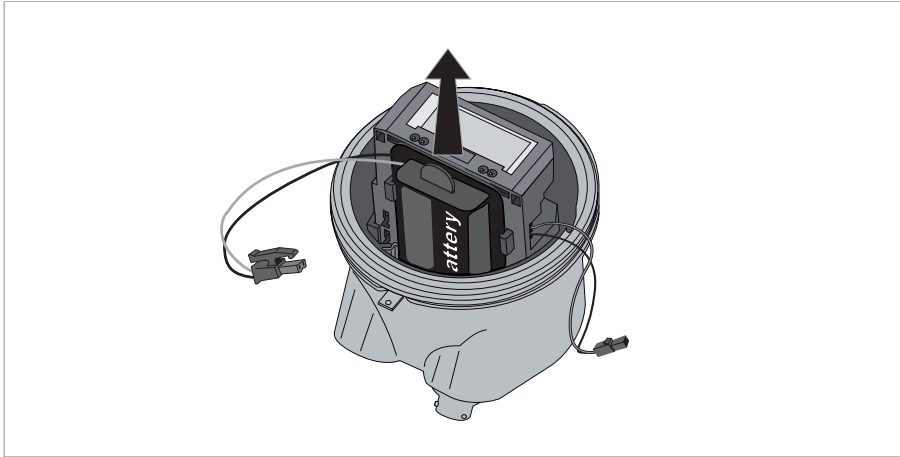


Figure 7-2: Removing the battery holder



- Loosen the locking ring with the special wrench
- 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 signal transmitter.
- Check if the display lights up.
- Put back the cover and locking ring. For closing the case of the device in the IP68 housing refer to *Closing of the signal transmitter housing* on page 27.



WARNING!

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



NOTICE!

*After a change of batteries, reset the battery lifetime counter.
refer to *Battery settings* on page 66 for configuration of these menu settings.*

7.1.2 Replacement of external battery

In case of exchanging a battery (or power source) using an external battery already, this will be done on the side of the actual power source (battery) and not on the signal transmitter side.

When switching from an internal battery supply to an external battery supply

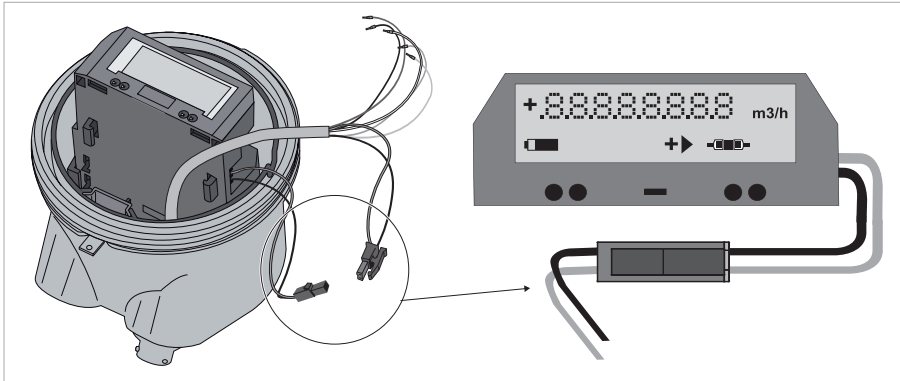


Figure 7-3: Connecting the external battery



- Loosen the locking ring with the special wrench
- Remove the cover.
- Disconnect the connector of the battery.
- Remove the old battery.
- Fasten the battery connector to the internal connector in the signal transmitter.
- Connect the external battery by the power connection cable and/or battery connection cable.
- Check if the display lights up.
- Put back the cover and lock, refer to *Closing of the signal transmitter housing* on page 27.



WARNING!

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



NOTICE!

*After a change of batteries, reset the battery lifetime counter. For changing the menu settings of the battery refer to *Battery settings* on page 66.*

7.2 Replacement of the Multi-Power unit

The 6500W + IMT65W can be used with an (optional) external, main supply power pack which is suitable for pulse output or isolated Modbus.

The Multi-Power provides the necessary power supply for the IMT65W signal transmitter.

An externally supplied voltage to the Multi-Power results in a 4.2 V DC output.

When a main power failure occurs, the internal dual D-cell battery will take over the power supply to the IMT65W signal transmitter as back up, with a voltage of 3.6 V DC

More information about battery lifetime can be found in refer to *Battery lifetime* on page 99

The input power for the Multi-Power can be realized by connecting :

- an AC mains supply source; range 110...230 VAC - 50/60 Hz
or
- a DC supply source; range 10...30 VDC

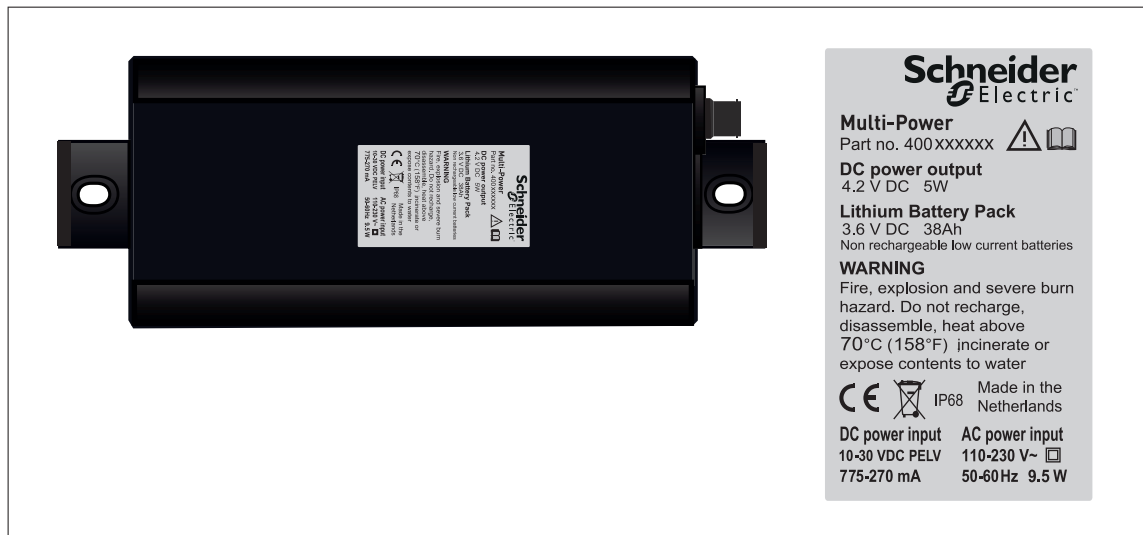


Figure 7-4: Multi-Power supply

Dimensions: L x W x H = 203 x 75 x 78 mm

* The information in the illustration, can deviate from the actual marking!

7.3 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.

7.4 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.



NOTICE!

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

7.5 Returning the device to the manufacturer

7.5.1 General information

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



WARNING!

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

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



WARNING!

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

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

7.6 Disposal

**LEGAL NOTICE!**

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

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

According to the directive 2012/19/EU, the monitoring and control instruments marked with the WEEE symbol and reaching their end-of-life **must not be disposed of with other waste.**

The user must dispose of the WEEE to a designated collection point for the recycling of WEEE or send them back to our local organisation or authorised representative.

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 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 transmitter is used to amplify the signal voltage, filter it and convert it into signals for totalizing, recording and output processing.

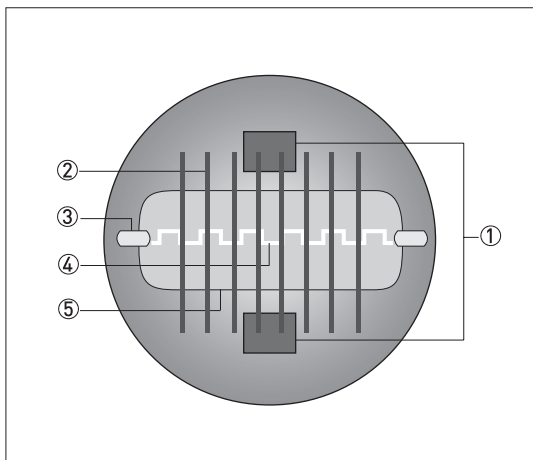


Figure 8-1: Measuring principle

- 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.

8.2 Technical data



NOTICE!

- *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.*

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 |
| Optional measured value | Pressure and temperature |

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 |
| | Optional; built-in P&T sensor (restricted to DN50...200 / 1...8"), refer to <i>Integrated P&T sensor (optional)</i> on page 84. |
| | Self-providing energy by batteries for up to 10 years |
| Modular construction | The measurement system consists of a flow tube and a signal transmitter. It is available as a compact and as a remote version. |
| Compact version | In compact version with IMT65W (C): Model 6500W + IMT65W C |
| Remote version | In field version with IMT65W (F): Model 6500W + IMT65W F |
| | Cable length up to 25 m / 70 ft, other lengths on request. |
| 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 transmitter 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 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 Please contact Customer Support for more information. |

Measurements

| | |
|----------------------------------|--|
| Measuring units | Volume |
| | Default setting: m ³ |
| | Selectable: litre, gallon, imperial gallons, cubic feet, acre inch, acre feet, mega litre, mega imp. gallon. |
| | Flow rate |
| | Default setting: m ³ / 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 Multi-Power | 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 | DN 25...300 / 1...12"; down to 0.2% of the measured value ± 1 mm/s DN350...600 / 14...24"; 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 93. |
| Repeatability | DN 25...300 / 1...12"; $\pm 0.1\%$ ($v > 0.5$ m/s / 1.5 ft/s) DN350...600 / 14...24"; $\pm 0.2\%$ ($v > 0.5$ m/s / 1.5 ft/s) |
| Calibration / Verification | Standard: 2 Point calibration by a direct volume comparison |
| | Optional: for DN25...600 / 1...24" |
| | Verification to Measurement Instrument Directive (MID) Annex MI-001 Standard: Verification at Ratio (Q3/Q1) = 80 Optional: Verification at Ratio (Q3/Q1) > 80 |
| MID Annex III (MI-001) (Directive 2014/32/EU) | EC-Type examination certificate to MID Annex III (MI-001) |
| | 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, \geq DN250 / 10": 10 bar / 150 psi. |
| | For detailed information refer to <i>Legal metrology</i> on page 87. |
| OIML R49 | Certificate of conformity to OIML R49 (edition 2006) |
| | 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, \geq DN250 / 10": 10 bar / 150 psi. |
| For detailed information refer to <i>Legal metrology</i> on page 87. | |

Operating conditions

| | |
|----------------------------|---|
| Temperature | |
| 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 transmitter 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 |
| 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...200 / 1...8" 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 98. |
| 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 tube is always fully filled. |
| | For detailed information refer to <i>Installation</i> on page 15. |
| Flow direction | Forward and reverse |
| | Arrow on flow tube indicates forward flow direction |
| Inlet run | ≥ 0 DN |
| | For detailed information refer to <i>Measurement accuracy</i> on page 93. |
| Outlet run | ≥ 0 DN |
| | For detailed information refer to <i>Measurement accuracy</i> on page 93. |
| Dimensions and weights | For detailed information refer to <i>Dimensions and weights</i> on page 95. |

Materials

| | |
|---|--|
| Tube 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 DN200 / 8" : Stainless steel 1.4301 / 304L DN250...DN600 / 10...24": steel St37-C22 / A105 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 transmitter housing | Polycarbonate |
| Wall holder for remote signal transmitter | Polycarbonate |
| Connection box | Only for remote versions. |
| | Stainless steel |

Process connections

| | |
|---|---|
| EN 1092-1 | Standard: |
| | DN25...200 / 1...8" : PN 16 |
| | DN250...600 / 10...24" : PN 10 |
| | Optional: |
| | DN250...600 / 10...24" : PN16 (DN350...600: 10 bar rated) |
| ASME B16.5 | 1...12": 150 lb RF (232 psi / 16 bar rated) 14...24": 150 lb (150 psi / 10 bar rated) |
| JIS B2220 | 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 95. | |

| Other connections | |
|-------------------|---|
| Thread | DN25: G1" thread connection |
| | DN40: G1.5" thread connection |
| Other | Weld-on, clamp, oval flanges: on request. |

Electrical connections

| Cable connections | |
|--|--|
| Cable entries | Compact and field version: IMT65W |
| | Connection with 1 or 2 snap-on connectors |
| Output cable | IMT65W compact and field version |
| | Standard: Pulse- or Modbus output cable |
| | Optional: Pulse output activated and connection to the data logger - GPRS module. Output cable with 2 plug and play - IP68 rated connectors |
| Power supply | |
| Battery | Standard: |
| | Internal battery pack: Dual D-cell (Lithium, 3.6V, 38 Ah). |
| Multi-Power Optional: | External IP68 rated AC/DC power supply (110...230V AC \pm 10% - 10..30V DC / 50-60Hz) with battery backup Dual D-cell (Lithium, 3.6V, 38 Ah). Cable length is 1.5 meter / 5 feet |
| Typical lifetime (default settings) | With 2 internal batteries; |
| | DN25...200 / 1...8" : up to 10 years DN250...600 / 10...24" : up to 7 years |
| | For detailed information refer to <i>Battery lifetime</i> on page 99 |
| Notifications | Pre-notification at < 10% of its original capacity |
| | Final notification at < 1% of its original capacity |
| Battery replacement | No loss of totalizer data |

| | |
|--|--|
| Tube cable (remote versions only) | |
| Type | 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) |
| In- and output | |
| 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: 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 Multi-Power: Passive pulses or galvanic separated Modbus |

Approvals and certificates

| | |
|--|--|
| CE | |
| This device fulfils the statutory requirements of the EU directives. The manufacturer certifies successful testing of the product by applying the CE mark. | |
| | For full information of the EU directives & standards and the approved certifications, please refer to the EU Declaration of Conformity or the manufacturer website. |
| Custody transfer Not valid for integrated temperature and pressure sensor | Directive: 2014/32/EU MID Annex III (MI-001) type examination certificate |
| | OIML R49 edition 2006 certificate of conformity |
| | * 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 |
| Other approvals and standards | |
| Drinking water approvals | ACS, DVGW W270, NSF / ANSI Standard 61, UBA, WRAS. |
| Protection category according to IEC 60529 | Compact and field version in polycarbonate housing: IP68 (NEMA 4X/6P) and IP68 Multi-Power unit (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. |

8.3 Integrated P&T sensor (optional)

Design

| | |
|----------|--|
| Features | Optional: integrated pressure and temperature sensor in the 6500W flow tube. |
| | In combination with: IMT65W (compact and remote) 6500W flow tube 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 |
|---------------------------------|------|

8.4 Multi-Power (optional)

Design

| | |
|----------|---|
| Features | The 6500W + IMT65W can be connected to an external Multi-Power unit. The input power for the Multi-Power 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) |
| Other approval and standards | |
| Protection category according to IEC 60529 | Multi-Power: IP68 (NEMA 4X/6P) (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. |

8.5 Modbus protocol (option)

The Modbus option on the 6500W + IMT65W is available in two versions:

- not isolated (battery powered) - for standard internal battery version
- galvanically isolated (mains powered) - for the Multi-Power version

The 6500W + IMT65W transmitter and Multi-Power 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 transmitters as slaves.

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



CAUTION!

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.



CAUTION!

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) |



NOTICE!

For more details refer to the Modbus supplementary manual.

8.6 Legal metrology

8.6.1 OIML R49

The 6500W + IMT65W has a certificate of conformity with the international recommendation OIML R49 (edition 2006). The certificate has been issued by NMI (Dutch board of weight and measures).

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 6500W + IMT65W 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 8-2: 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) Q3 / Q1 | Flow rate [m ³ /h] | | | |
|-----|---------------------|-------------------------------|--------------------|-----------------|----------------|
| | | Minimum Q1 | Transitional Q2 | Permanent Q3 | Overload Q4 |
| 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) 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 | 0.0625 | 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 |

8.6.2 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 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 6500W + IMT65W has an EC-type examination certificate and can be verified to the MID Annex III (MI-001) for water meters with diameter DN25...DN600.

The conformity assessment procedure followed for 6500W + IMT65W 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 $\pm 5\%$.

Refer to the technical datasheet of the 6500W for further details of the certification.

$$Q1 = Q3 / R$$

$$Q2 = Q1 * 1.6$$

$$Q3 = Q1 * R$$

$$Q4 = Q3 * 1.25$$

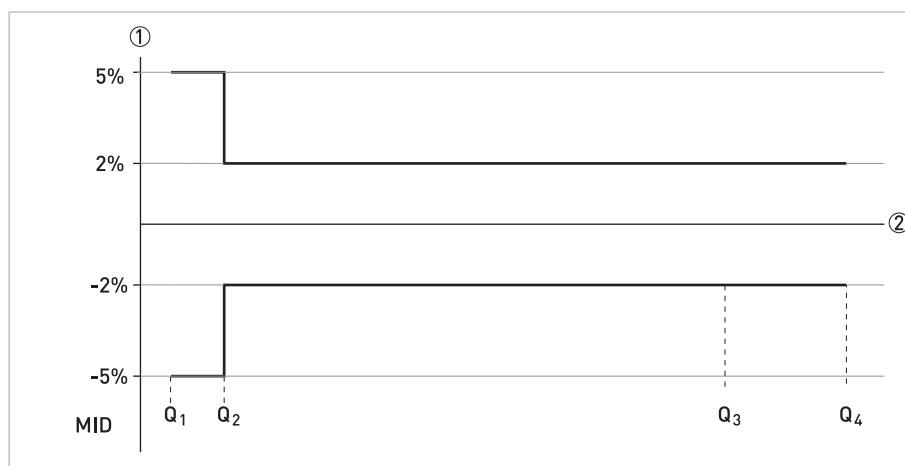


Figure 8-3: ISO flow rates added to figure as comparison towards MID

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 | 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 |

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

**NOTICE!**

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 ³ /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 |

8.7 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: ≥ 3 DN
- Outlet section: ≥ 1 DN

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

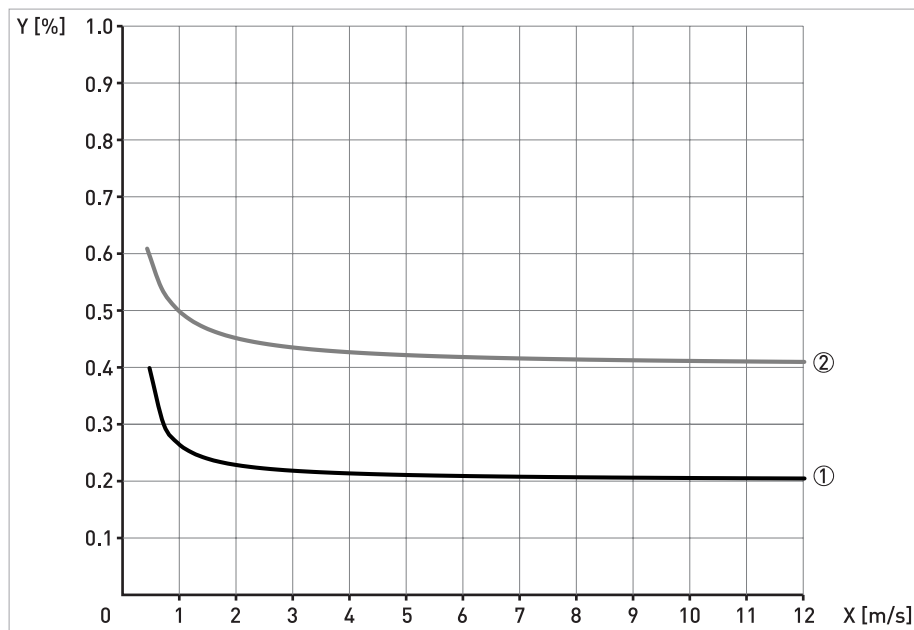


Figure 8-4: Measuring accuracy
X [m/s]: Flow velocity; Y [%]: Maximum measuring error

Accuracy with signal transmitter IMT65W

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

8.7.1 6500W + IMT65W 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 6500W flow tube 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 6500W + IMT65W has received the following certificates:

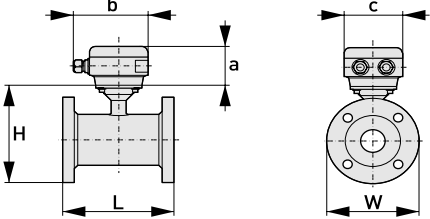
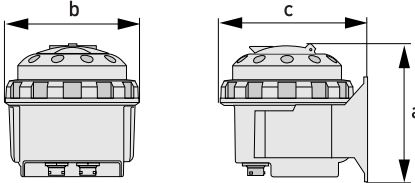
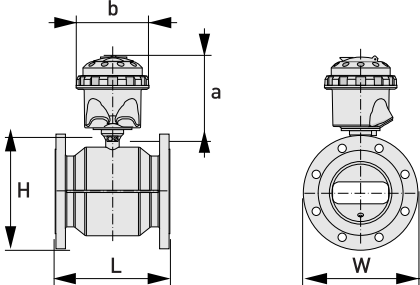
OIML R49 certificate

- 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

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

- Diameter range DN25...600 / 1...24"
- Minimum straight inlet and outlet pipe length of 0 DN
- Bi-directional flow

8.8 Dimensions and weights

| | | |
|---|---|---|
| Remote flow tube |  | <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> |
| Remote signal transmitter in polycarbonate housing (IP68) |  | <p>a = 171 mm / 6.7"</p> <p>b = 161 mm / 6.3"</p> <p>b = 177 mm / 7"</p> |
| Compact version in polycarbonate housing (IP68) |  | <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.

**NOTICE!**

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

8.9 Pressure loss

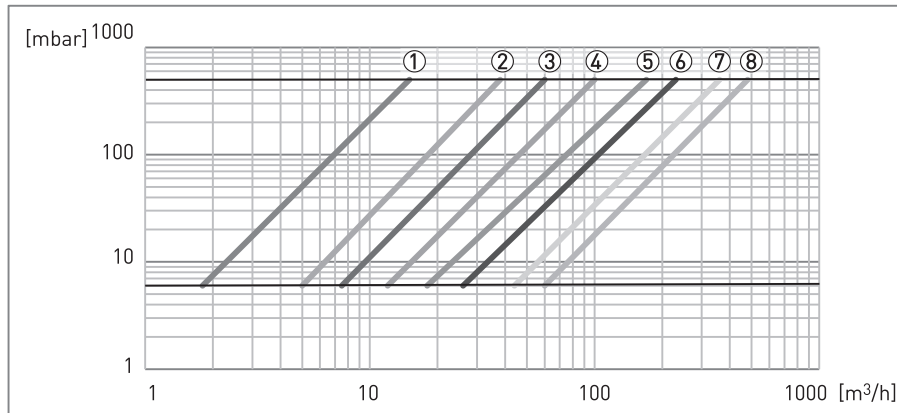


Figure 8-5: Pressure loss between 1...9 m/s / 3.3...30 ft/s for DN25...150 / 1...6"

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

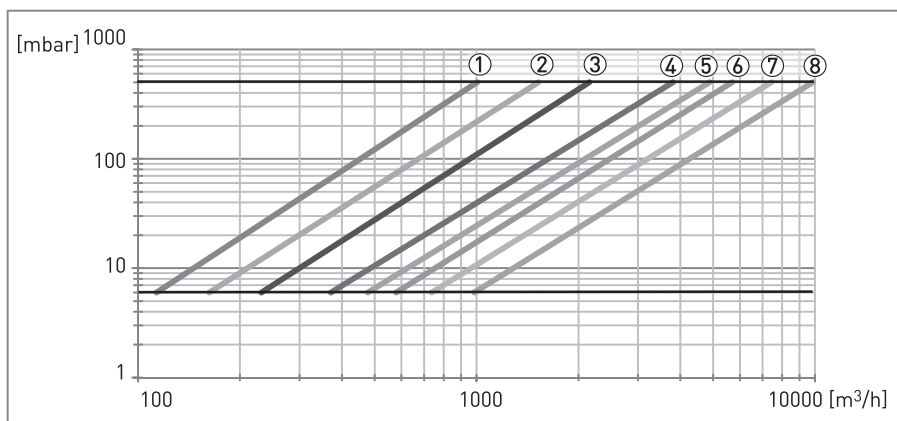


Figure 8-6: Pressure loss between 1...9 m/s / 3.3...30 ft/s for DN200...600 / 8...24"

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

8.10 Battery lifetime

The maximum battery lifetime depends on the choice of battery, 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"

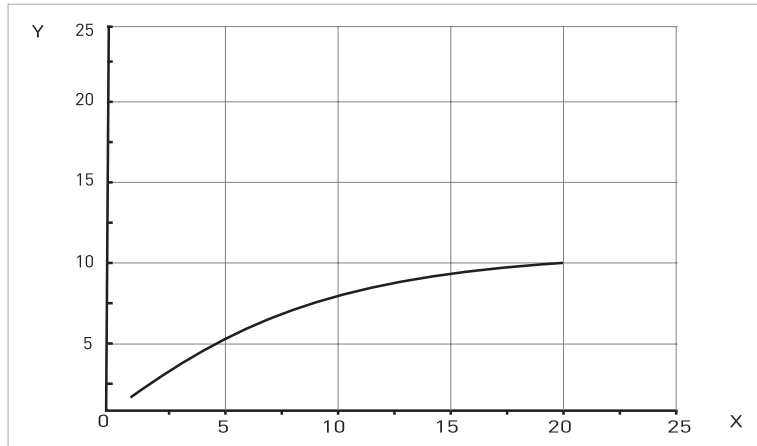


Figure 8-7: X = Measuring interval in seconds, Y = typical lifetime in years

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

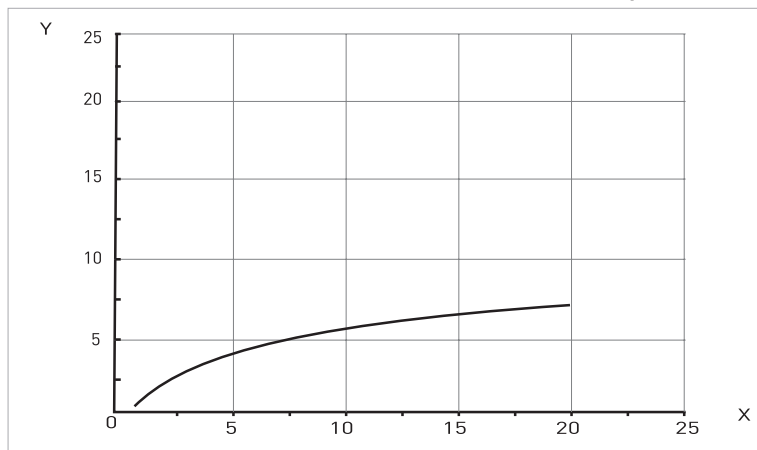


Figure 8-8: X = Measuring interval in seconds, Y = typical lifetime in years

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