ZENNER

Technical description

of the ultrasonic water meter series

Type IUW and type IUWS

As of: 22st of December 2025, Version 1.1

Contents

History of the document

Version	Content/Changes	Date
1.0	First initial version	10/2025
1.1	Additions, editorial changes	12/2025

1 General description

With the IUW and IUWS water meter series, ZENNER offers two series of static water meters based on the ultrasonic transit time difference method.

IUW stands for “Inline Ultrasonic Water Meter” and refers to the series of ultrasonic bulk water meters from DN 50 – DN 200 (DN 250 and DN 300 are in the MID approval process).

IUWS stands for “Inline Ultrasonic Water Meter Small” and includes domestic water meter sizes from DN 15 – DN 50. The development of the IUW and IUWS is based on our long-standing, proven thermal energy meter (heat meter) zelsius® C5 with its ultrasonic flow sensor IUF (= Inline Ultrasonic Flow).

For better readability, IUW B.One and IUWS B.One will be referred to as IUW and IUWS in the following. For detailed information on the B.One solution world, please visit the ZENNER website: https://zenner.de/b-one/.

The aim of developing the IUW/IUWS meter series was to meet market requirements for high-quality metering technology with low start-up values, interoperability and flexible communication interfaces. With state-of-the-art ultrasonic technology, the meters offer reliable, accurate measurements and enable individual consumption recording and billing. The IUW / IUWS water meter series is part of the digital B.One solution world.

Radio communication:
Water meters of the IUWS series include an integrated radio module. This module is factory-configured for data transmission, depending on customer requirements, either on wireless M-Bus (according to EN 13757-4) or LoRaWAN®. This ensures the highest possible flexibility. With the help of the B.One Device Manager Basic app, utilities have the option of changing the radio technology - depending on the requirements of their infrastructure or their operational processes.

The **parallel wireless technology** is a particular highlight, and enables the IUWS to send measurement data via wireless M-Bus and LoRaWAN® simultaneously. For certain markets, a variant of the IUWS with NB-IoT is also offered (currently not available in the European market).

Bulk water meters of type IUW must be connected to the external NDC radio module (NDC = NearfiedDataCapture Module) because they do not have an internal radio module. The NDC radio module can be connected to an IUW at any time without violating seals or user security.

Connecting an NDC module as an external radio module to IUWS is also optionally possible at any time in order to optimize the range during radio readout at challenging installation points such as meter shafts.

All materials used to produce IUW & IUWS for the drinking water sector comply with the latest standards, guidelines, the strict requirements of Germany’s regulation for drinking water, and the assessment principles of Germany’s Federal Environment Agency (UBA).

2 Target audience of this document

This technical description is aimed at the following target groups:

- Installation and service technicians
  The primary target group includes qualified and authorized personnel responsible for the installation, commissioning and operation of the ultrasonic water meter. These include installers in the drinking water industry as well as technical service employees from utility companies and service providers. These users require instructions on assembly, configuration and information on how to deal with warning and error messages.

- Utilities and system integrators
  Persons and organizations that integrate the transmitted consumption data into existing or new billing systems. This includes IT and technology managers who are responsible for setting up the wireless technologies (LoRaWAN® and wireless M-Bus) and their seamless integration.

- Facility managers and building operators
  This target group is responsible for managing and monitoring water consumption in multi-family or commercial buildings. You will use this technical description together with the dedicated user guide for integrators to interpret measurement data and to communicate with technicians in the event of any malfunctions.

- Environmental and Quality Manager
  Responsible persons in organizations who ensure that the measuring instruments comply with the applicable standards and regulations (e.g. Drinking Water Ordinance). You use the technical description to find out about materials, technical specifications and certifications (e.g. DVGW, OMS).

- End user (optional)
  In the case of retrofitting or direct use by private individuals, the technical description also serves as a guide for interpreting consumption data or displays and as an aid for basic questions about the device.

2.1 Objectives of the documentation

The technical description should ensure that each target group can find the information they need according to their respective experience level:

- Technicians, plumbers
  Step-by-step instructions for installation, configuration and commissioning.

- System integrators
  Details on radio configuration and data analysis.
  Note: ZENNER provides separate documents for system integrators on request for integration into the respective target systems (UserGuide for system integrators and LoRaWAN®-Packet description).

- Facility Manager
  Overview of smart functions such as leak warnings or battery status monitoring.

- End users:
  General explanations of the display of consumption data and warning/alarm messages.

The technical description contains the information necessary for the correct commissioning and use of the device in order to maintain the functional and qualitative characteristics of the device in the long term. It also contains descriptions, information and warnings for correct and safe use.

The technical description summarizes the relevant information about the device, but unlike the declaration of conformity and installation instructions, it is not part of the scope of delivery. System integrators are encouraged to request the separate technical documents available specifically for this specific user group.

3 Safety instructions

3.1 General information about the device:

- It is forbidden to make any modifications or repairs to the measuring device.
- The device is only intended for the designated use.
- Attention! Improper use may result in damage to the device.
- The device is filled with resin at the factory and is not designed to be opened.
- Caution! Opening of the device can lead to damage and possibly injury to hands.
- Water meters are precision devices. Protect against shock and vibration.
- Store in a frost-free, cool and dry location.
- Suitable measures must be taken to ensure that any contamination or damage is excluded during transport to the installation location.
- Attention! Unauthorized work on the device can no longer guarantee its safety and functionality.
- Caution! Loss of functionality and injuries can result from unauthorised work on the device. Make sure you familiarise yourself in advance with the required procedure.
- Attention! Make sure that the installation environment corresponds to the specified area of use. Adhere to specified temperature and limit values at all times.
- Caution! To avoid damaging the device or impairing its functionality, chemical cleaning agents should not be used. If cleaning is necessary, use a dry or slightly damp cloth.
- If this measuring device is used in an EU country, it is subject to a metrological test of the respective EU member state.

3.2 Safety instructions for the plumber

- The IUW & IUWS series has been approved with a flow sensitivity class U0/D0 (i.e. no inlet outlet section required). However, to achieve the best measurement results, we recommend observing national regulations and recognised rules of technology.
- For the IUW and IUWS series at least 3xDN are recommended as a straight inlet section. Ideally, at least 2xDN should be available as the outlet distance.
- The pipe cross-section should not be reduced or extended directly in front of or behind the measuring device.
- Connection seals must not protrude into the pipe cross-section.
- Valves or other flow regulators should be installed behind of the measuring device if possible.
- If necessary, the measuring device should be protected by a filter, so that no foreign particles, such as stones or sand, are flushed into the measuring device and cause damage.
- The measuring device must be protected against pressure surges in the pipe network.
- The measuring instrument may only be installed in a frost-proof location and the ambient temperature must not exceed +55 °C.
- The measuring device should be installed, where possible, at the deepest point of the pipe installation so that air bubbles are not able to form in the measuring device and the pipe is always completely filled.
- The water temperature must not exceed the permissible 50 °C (T50).
- When using lubricants / assembly pastes e.g. for the seals, it must be ensured that these are suitable for contact with drinking water.
- If there is a risk of frost, shut off the system and empty it completely (including the measuring device!), removing the measuring device if necessary.

3.3 Safety instructions for handling battery-operated devices

- Attention! The device is equipped with a permanently installed lithium battery, which must not be recharged. This type of battery is classified as dangerous goods (Hazardous goods class 9). The applicable transport regulations must be observed! Data sheets, safety data sheets and test reports of the batteries are available on request.
- Please also note the following general information on handling batteries.
- Warning! The device contains a non-rechargeable lithium battery. Attempting to charge the battery will damage the device and cause injury.
- Short-term storage (max. 1 week) down to -10 °C is safe as long as the device has **not** been activated. The storage temperature should not fall below or exceed 0 °C and + 26 °C over a longer period of time (ideally +15 °C). Long-term storage in extreme cold or heat outside this temperature range can damage the battery or greatly reduce its capacity.
- Attention! Under no circumstances may the device be disposed of with normal household waste.
- Please note our disposal regulations, which are stated separately in the assembly and installation instructions included with each device.

4 Declaration of conformity

The ultrasonic water meter IUWS or IUW was developed and tested in accordance with the applicable legal requirements and standards. This declaration of conformity confirms that the product meets the essential requirements of the relevant European directives and may be operated legally on the market.

4.1 Relevant directives

EU Directive 2014/53/EU – Radio Equipment Directive (RED)
The ultrasonic water meter meets the requirements of the RED Directive, in particular with regard to:

- - Security (Article 3.1a),
- Electromagnetic compatibility (article 3.1b),
- Efficient use of the radio spectrum (Article 3.2).

EU Directive 2014/32/EU – Measuring Instruments Directive (MID)
The IUW/IUWS complies with the requirements of the MID (Measuring Instruments Directive), ensuring the accuracy and reliability of consumption measurement in accordance with EU standards.

EU Directive 2011/65/EU (RoHS)
This directive guarantees that no hazardous substances such as lead, mercury or cadmium are used in unacceptable quantities in the manufacture of the IUW/IUWS.

Drinking Water Ordinance (TrinkwV)
All materials used in the IUW/IUWS that come into contact with drinking water meet the strict requirements of the Drinking Water Ordinance as well as the UBA assessment criteria for hygienic safety.

DIN-DVGW type examination certificate according to guideline W 406
The IUWS ultrasonic water meter is certified according to DVGW guideline W 406, which guarantees its suitability for use in drinking water systems.

Certificate of Conformity Hygiene System 1+
Confirmation of conformity according to System 1+ with external monitoring of the ultrasonic meters IUWS DN 15 to DN 50 available, IUW DN 50 to DN 300 in process.

Country-specific drinking water approvals
ACS (FR), WRAS (UK), Switzerland (SVGW);
Austria (ÖVGW) passed, official certification document still pending

OMS certification
The IUW with the external NDC radio module and the IUWS were developed according to the Open Metering System (OMS 4.0.2). Dedicated variants of the product range meet the requirements for connection to smart meter gateways according to BSI standards. Further information can be found on the OMS website: Certified Products - Open Metering System Group

LoRaWAN® certification

Both the IUW bulk water meter with the NDC radio module and the IUWS domestic water meter have been LoRaWAN® certified. Detailed information on the IUWS can be found here: https://lora-alliance.org/marketplace/zenner/iuws/; for the IUW with external NDC LoRa module here: https://lora-alliance.org/marketplace/zenner/iuw/ or https://lora-alliance.org/marketplace/zenner/ndc/

4.2 Technical tests and verifications

Compliance with the guidelines was ensured by the PTB (Physikalisch-Technische Bundesanstalt) as a notified body. The tests included:

- **Mechanical reliability:** Static compressive strength, temperature ranges, measured value display, overall length, connection size and connection type. IP68 protection class for flood protection and robust installation in different environments.
- **Mechanical reliability:** Nominal operating conditions, accuracy classes (ratio), installation positions, pressure loss classes, flow profile sensitivity, climatic and mechanical ambient conditions.

In addition, the following were also tested within the framework of the CE declaration:

- **Radio transmission quality:** Ensuring encryption, error detection (CRC) and efficient data transmission via LoRaWAN® and wireless M-Bus.
- **Longevity:** Battery status monitoring and an estimated battery life of up to 15 years.

4.3 CE marking

The IUW and the IUWS bear the CE marking, which confirms compliance with European regulations. The CE marking includes the following information:

- Product name: IUW & IUWS ultrasonic-water meter
- Manufacturer: ZENNER International GmbH & Co. KG
- Address: Heinrich-Barth-Straße 29, 66115 Saarbrücken, Germany
- EEC examination certificate numbers: IUW: DE-19-MI001-PTB001 / IUWS: DE-20-MI001-PTB011
- Applied standards and directives

4.3.1 Provision of declarations of conformity

The declarations of conformity were signed by ZENNER International GmbH & Co. KG and first issued on August 22, 2024. They are available along with further information on the manufacturer's website: KE_GWZ_IUWS.pdf / KE_GWZ_IUW.pdf

4.3.2 Responsible manufacturer

ZENNER International GmbH & Co. KG
Heinrich-Barth-Straße 29, 66115 Saarbrücken, Germany
Phone: +49 681 99 676-30; email: info@zenner.com

With certificate number 91124679 and 171124205, Dekra Certification GmbH confirms that ZENNER International GmbH & Co. KG has implemented and maintains a quality/environmental management system in accordance with ISO 9001:2015 and 14001:2015.

5 Intended use

5.1 General purpose

The IUW & IUWS ultrasonic water meters were specially developed for the precise consumption measurement of cold water up to a temperature of 50 °C. The IUW is used to record high and fluctuating flows in drinking water distribution and in industry, with a very low pressure loss at the same time. The IUWS is designed for use in residential and domestic installations and is suitable for both drinking water and clean service water. Variants of the IUWS for consumption recording of hot drinking water up to 90 °C (T90) are currently under development.

5.2 Applications IUW/IUWS

1. **Utilities / Water distribution network**
   IUW: For using to record high and fluctuating flows in drinking water distribution and in industry, with a very low pressure loss at the same time. IUWS: For the consumption measurement of cold and clean drinking water or service water up to 50 °C in the drinking water distribution network.
2. **Residential buildings**
   The meters are ideal for use in apartment buildings and single-family homes to enable accurate and transparent billing of individual water consumption.
3. **Commercial buildings**
   In office buildings, hotels or public facilities, the meters ensure precise consumption data recording and thus support the sustainable use of resources.
4. **Industrial plants**
   The meter series can also be used in industrial applications with comparable requirements for drinking water quality or process water.
5. **Smart Metering:** The series enables integration into modern billing systems thanks to LoRaWAN® or wireless M-Bus radio technology. Connectivity to smart meter gateways is possible with OMS-certified variants.

   IUWS variants with NB-IoT interface for the European market are planned for 2026.

5.3 Restrictions

- **Temperature limit:** The IUW / IUWS is designed exclusively for cold water with temperatures up to a maximum of 50 °C.
- **Medium:** It is only intended for use with clean drinking water or clean process water. Contaminated or chemically treated water can impair functionality.

- **Print area:** The IUW and IUWS are designed for an operating pressure of 0.3 to 16 bar.

5.4 Requirements for operation

- **Piping system**
  - The meter must be completely filled with water to ensure precise measurements.
  - The installation is carried out without tension in the pipework to avoid mechanical damage.

- **Environmental and climatic conditions**
  - Frost-free installation and protection against extreme temperatures (ambient temperature: according to MID 5 °C to 55 °C).
  - Protection against mechanical loads such as shocks or vibrations.
  - Short-term storage (max. 1 week) down to -10° C is safe as long as the device has not yet been activated. The storage temperature should not fall below or exceed 0° C and +26° C over a longer period of time (ideally +15° C). Long-term storage in extreme cold or heat outside this temperature range can damage the battery or greatly reduce its capacity.
  - Compliance with the specified electromagnetic and mechanical ambient conditions according to the rating plate of the respective measuring device.

5.5 Special technological features

- **Radio technologies:** The IUWS is factory-equipped with wireless M-Bus or LoRaWAN® radio technology, which enables convenient remote reading. The IUW becomes radio-capable using the external NDC module.
- **Permissible installation positions** The meter can be installed in any position (horizontal, vertical or overhead).
- **Longevity:** With a battery life of up to 15 years, the IUW / IUWS is designed for long-term, low-maintenance operation. The battery life depends on the selected transmission scenario, ambient conditions, transmission interval and the existing radio network coverage.

The IUW / IUWS is a modern and versatile measuring device that provides precise consumption data and meets the high demands - also with regard to digitalisation - of the housing industry, utility companies and facility management.

5.6 Intended use

The IUW ultrasonic bulk water meter is used to record high and fluctuating flow rates in drinking water distribution and in industry, with very low pressure loss. Using the external NDC radio module (wireless M-Bus or LoRaWAN®), the IUW can be integrated into remote readout systems and read out remotely.

The IUWS ultrasonic water meter is designed for precise consumption measurement of cold and clean drinking water or service water up to a temperature of 50 °C. The device is designed for use in residential and commercial buildings and is used to accurately record and transmit water consumption data. Thanks to the integrated radio technology (wireless M-Bus and/or LoRaWAN®), the IUWS enables simple remote reading that can be seamlessly integrated into modern billing systems.

The IUW/IUWS may only be used in accordance with the information in the enclosed instructions and in compliance with the applicable standards and regulations.

All variants of the IUW and IUWS series are not approved for measuring backflow.

5.7 Non-intended use

Any use other than that described in section 5.6 is considered improper use. These include in particular:

- The use of water with chemical or physical impurities that exceed the standards for drinking or process water.
- Operation with liquids above 50 °C.
- Use in applications with unauthorised operating pressures (outside the range 0.3 to 16 bar).
- Use in potentially explosive atmospheres or under conditions that do not comply with the specified ambient conditions.
- Storage for longer periods below 0 °C or above +26 °C
- Any manipulation, modification or improper installation of the appliance.

Improper use may result in damage to the appliance and invalidate the warranty and any liability claims against the manufacturer.

5.8 Performance characteristics

5.8.1 IUW/IUWS: General performance characteristics

- No moving parts, no wear and tear
- Long-term stable measuring results
- Insensitive to deposits and particles
- Low pressure loss
- State-of-the-art ultrasonic sensors
- Flow-optimised design for precise measurement results
- High dynamic range
    - IUWS R250 as standard, up to R800 possible in some cases
    - IUW with standard Q3 R500 and with high Q3 to R800 possible

5.8.2 IUW: Structure and features in detail

- Large, easy-to-read LC display
  - Volume display DN50-DN125, 6 digits before and 3 digits after the decimal point
    Volume display DN150-DN300, 7 digits before and 2 digits after the decimal point
- NFC interface
  - protected ex works with mounted NFC dummy;
    galvanically isolated from the meter electronics
- 2 pairs of ultrasonic sensors for high measurement stability
  - Redundancy in the event of a sensor pair failure
- Flow-optimised hydraulics
- Robust design thanks to metal head ring and counter cover
- 2 ultrasonic measuring sections
- Evacuated electronics ==> enables separation of materials by type
- Protection class IP68
- Can be retrofitted with external NDC radio module
  Radio options: wireless M-Bus or LoRaWAN®, in certain markets: NB-IoT
- Comprehensive data logger and event memory
- Smart functions (warnings and alarms)
- Calculated battery life of up to 15 years + 1 year reserve (depending on the selected transmission scenario and the ambient conditions at the measuring point)
- Temperature compensation
- Autostart after 10s flow rate
- Temperature range T50
- Operating pressure MAP 16
- Nominal size DN50, 65, 80, 100, 125, 150, 200, 250, 300
- All common standard lengths, WS lengths DN 50 to DN 150,
  ISO long lengths for export outside Europe
- Flange to DIN EN 1092-2 and ISO 7005-2 (BS10 and ANSI also possible on request)
- Mechanical environment class: M2
- Electromagnetic environment class: E2

5.8.3 IUWS: Structure and features in detail

- Large, easy-to-read, UV-resistant LC display, robust design without push-button or operating button
  - Volume display with 6 digits before and 3 digits after the decimal point
- NFC interface
  - protected ex works with mounted NFC dummy; galvanically isolated from the electronics
- All components in contact with water according to DVGW assessment basis or UBA lists
- Plastic housing with the option of equipping with C- or D-cell (standard ex works: D-cell)

- Evacuated electronics, protection class IP68
- Internal radio module, radio options switchable: wireless M-Bus or LoRaWAN®
- Parallel radio wM-Bus & LoRaWAN® possible from firmware version 1.8.5
- Transmission of the medium and ambient temperature in the wM-Bus radio protocol (depending on the selected radio scenario)
- NFC interface for external NDC radio module (e.g. for shaft application, integrated radio is then switched off)
- Comprehensive data logger and event memory
- Wide range of smart functions (wireless alerts)
- Calculated battery life of up to 15 years + 1 year reserve (depending on the selected transmission scenario and the ambient conditions at the measuring point)
- Temperature compensation
- Autostart after 10s flow rate
- Temperature range T50, T90 in development
- Operating pressure MAP 16
- Nominal size DN15 to DN50
- Intended for push-in non-return valves (from length 165mm)
- Mechanical environment class: M2
- Electromagnetic environment class: E1, E2 in development

5.9 Scope of delivery

The scope of delivery of the IUWS ultrasonic water meter includes:

- IUWS ultrasonic water meter with NFC and integrated radio interface (currently wireless M-Bus and/or LoRaWAN®)
- Installation and operating instructions (multilingual)

- Declaration of conformity

The scope of delivery of the IUW ultrasonic bulk water meter includes:

- IUW ultrasonic water meter with NFC-interface.
- Installation and operating instructions (multilingual)
- Declaration of conformity

Optionally available for IUW and IUWS:

- External NDC modules (wireless M-Bus or LoRaWAN®) for retrofitting.
- Accessories such as screw connections, seals, backflow preventers, filters, user safety devices.

The scope of delivery may vary depending on the model and configuration. Please observe the packaging instructions to ensure that all components are complete and undamaged.

6 Type overview

6.1 Residential water meters

- **Measuring section:** The IUWS is supplied with a brass flow meter as standard. The measuring part is available with screw connections or flange connections. All components in contact with water according to DVGW assessment basis or UBA brass list. Lead-free brass is available.
- A variant with DN15/20 composite housing is currently under development
- A T90-variant for hot water is also under development
- **Body/housing:** The potted housing, consisting of an upper and lower shell, is made of UV-resistant plastic and complies with protection class IP68.
- **Energy supply** Standard ex works: Lithium D cell (safety data sheet and test report available on request)
- **Integrated wireless interfaces:** wireless M-Bus, LoRaWAN®, NB-IoT (for certain markets)
- **Interface for configuration/readout:** NFC

6.2 Bulk water meter sonar IUW

- **Body/housing:** The IUW is available with a powder-coated grey cast iron housing. Variants with stainless steel housings are sold in some export markets.
- **Electronics:** The electronics integrated in the upper part of the housing are evacuated and comply with protection class IP68.
- **Flange versions:** Flange to DIN EN 1092 2 and ISO 7005 2; also BS10 and ANSI on request)
- **Energy supply:** Standard ex works: Lithium D cell (safety data sheet and test report available on request)
- **Radio interfaces:** The IUW does not have an integrated radio interface. The IUW can be retrofitted as a smart water meter using the external NDC radio module. The transmission scenario stored in the IUW determines the radio technology transmitted by the NDC. Wireless M-Bus and LoRaWAN® scenarios are currently implemented in the IUW. An NB-IoT NDC module is already being used in selected markets.
- **Interface for the configuration/readout/connection of a external radio module:** NFC

A detailed overview of all available nominal sizes and overall lengths can be found in chapter 17.

The ultrasonic measuring sections of the IUW meter series DN50-65 are arranged in a cross design. From DN 80, the construction has a parallel design, the two measuring sections are arranged one above the other:

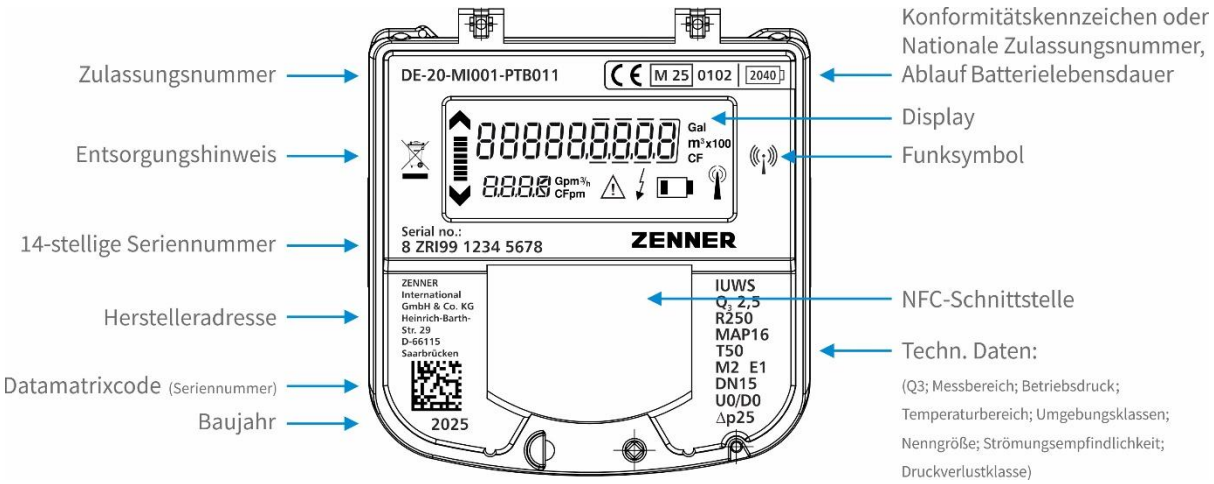
Cross design of the ultrasonic sensors
(DN50-65)

Parallel design of the ultrasonic sensors
(from DN80)

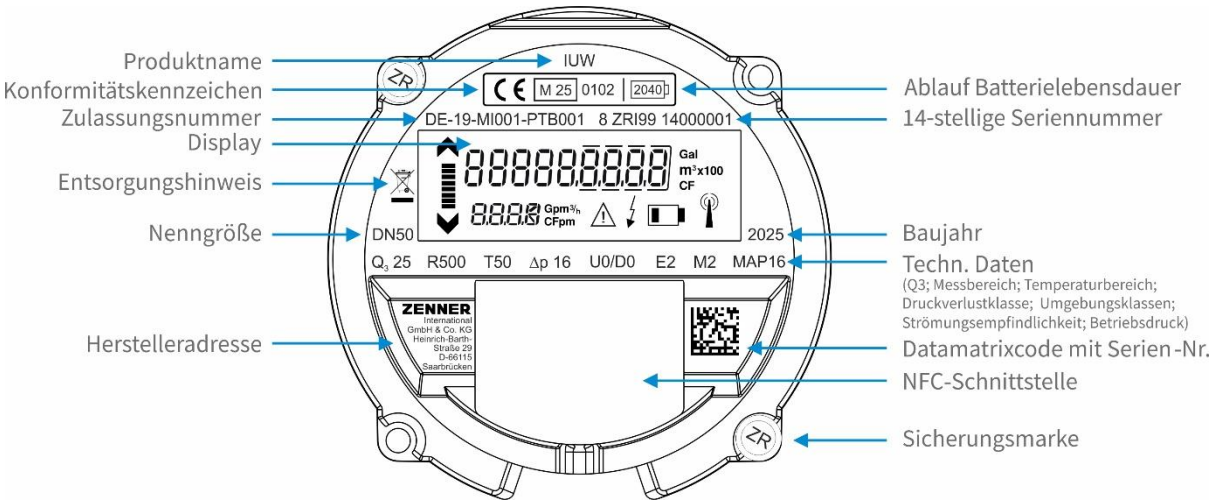
For certain markets (e.g. USA), the IUW is also available in a version with a stainless steel housing:

7 Front views

7.1 Illustration ‘display’ ultrasonic domestic water meter IUWS



7.2 Illustration "display" ultrasonic bulk meter IUW



The meters may also be marketed under the names of other companies, as requested by the customer. Other customer-specific information such as property numbers or a hotline number can alternatively be attached to the meter cover. A customer logo on the meter cover is also possible on request.

Exemplary:

8 Smart measurement technology:

8.1 General measuring principle

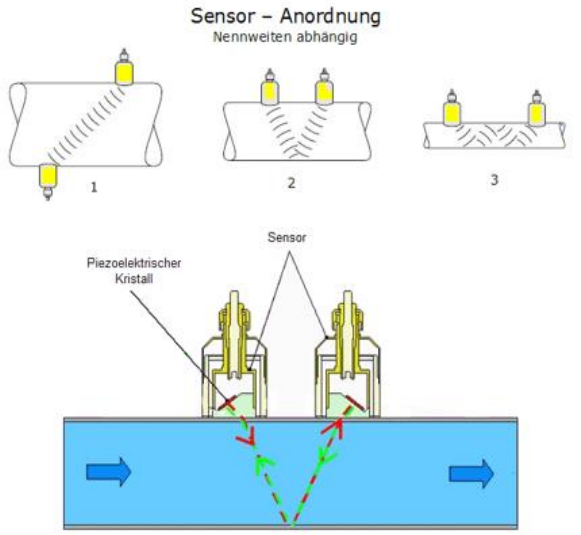
There are different types of ultrasonic measurement methods:

- Doppler method
- Stroboscopic method
- Drift method
- Time difference method etc.

The ‘transit time difference method’ has been established and proven for years for liquids and gases. Our IUW and IUWS ultrasonic water meters work with the transit time difference method.

This procedure is also known as the ‘transit time’ or ‘flight’ method. The standards for the calculation basis are ISO 6416, ISO 60041 and BS 8452.

Source : Wikipedia: Ultraschall-Durchflussmesser – Wikipedia



Common ultrasonic sensor arrangements

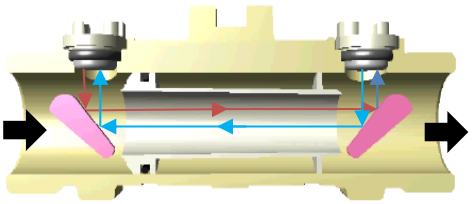
Implementation at ZENNER:

1= is used for IUW (2 measuring paths)

2= is used for IUWS

3= is not used at ZENNER

At least one pair of ultrasonic sensors is always required for this method. These work alternately as transmitter and receiver and form a so-called sound path.



Display of ultrasonic signal path

The transmission behaviour of the signals can also be experienced in everyday life, e.g. when you swim through a river and realise that you can swim much faster with the current than against it.

The signal that is sent in the direction of flow has a shorter transit time than the signal against the current. This time difference between the upstream and downstream signals can be used to calculate the flow velocity of the water, the so-called travel speed.

To enable more accurate measurements with unknown and disturbed flow profiles, it may be advisable to install several sound paths. For the IUW series, for example, ZENNER uses two paths.

The transit time difference method does not measure the mean flow velocity of a medium, as is often incorrectly conveyed, but the effective sound propagation velocity upstream (decelerated by the flow) and downstream (accelerated by the flow).

The mean flow velocity of the fluid (gases or, as in this case, liquid) is calculated from the temperature-dependent sound propagation velocity in a fluid at rest and the measured effective sound propagation velocities upstream and downstream.

The IUW/S series also has a temperature sensor for temperature correction of the measurement. This ensures and improves the measuring accuracy even if the temperature of the medium fluctuates.

8.2 Measuring intervals (consumption and temperature)

The flow rate determination is based on the principle of the ultrasonic transit time difference method. The ultrasonic transducers are used to measure the transit time of the sound signal alternately with and against the direction of flow. For this purpose, the ultrasonic transducers are used alternately as transmitters and receivers. The flow rate is then calculated by the microcontroller from the transit time difference and used for volume integration.

With IUWS, a measurement is carried out every 250 ms. After two seconds, a volume increment is generated from the eight values and the total volume is updated.

With the IUW, a US measurement is taken on both routes every 250 ms (time-delayed ~ 100 ms). After two seconds, a volume increment is generated from the values and the total volume is updated.

The display is refreshed every two seconds.

8.3 Maintenance / cleaning / repair

8.3.1 Maintenance

The devices themselves are maintenance-free. For this reason, regular adjustments and maintenance work on the device itself are not necessary.
Nevertheless, check the original installation condition of the appliance and the tightness of the connections at the installation location as part of normal maintenance intervals.

8.3.2 Cleaning

Regular cleaning of the appliance is not necessary.

However, if cleaning is necessary, please observe the following general instructions:

- Only with water, without chemicals
- Without print/high pressure
- Only when using a soft cloth
- Do not clean abrasively, scratch or scrub

8.3.3 Repair

The appliance must not be repaired, modified or tampered with. Always replace the device with a new one in the event of a calibration change or possible failure.

8.4 Activation / commissioning

8.4.1 IUWS:

The IUWS ultrasonic domestic water meter can be activated as follows: The display of the measuring device is in 'SLEEP mode' on delivery. The display is activated ten seconds after the measuring device has been filled with water. For this purpose, the pipeline or measuring device must be completely vented or filled with water.
Optional options for activation: Use of the MSS software (till firmwareversion 1.7.9) + MinoConnect Set USB NFC or by means of the B.One Device Manager Basic app. The app enables the meter to be activated via the NFC interface without having to use any other accessories. When the device is activated, radio transmission starts automatically according to the transmission scenario stored in the meter.

8.4.2 IUW:

The ultrasonic water meter IUW can be activated as follows: The display of the measuring device is in 'SLEEP mode' on delivery. The display is activated ten seconds after the measuring device has been filled with water. For this purpose, the pipeline or measuring device must be completely vented or filled with water.
Optional options for activation: Use of the MSS software (till firmwareversion 1.7.9) + MinoConnect Set USB NFC or by means of the B.One Device Manager Basic app. The app enables the meter to be activated via the NFC interface without having to use any other accessories. An external NDC radio module must be connected for radio transmission of the data from the IUW.

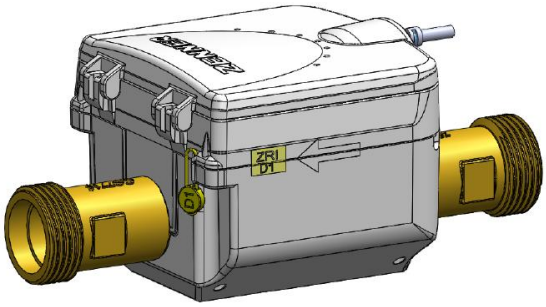
8.5 Certification for reverse water flow

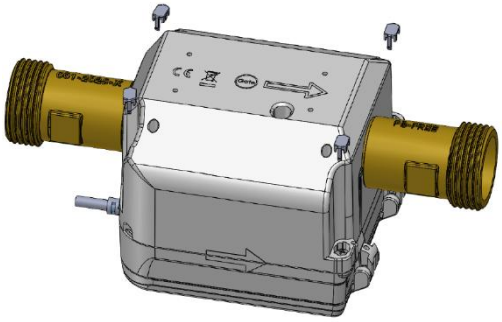
The IUW & IUWS series enables the detection of reverse flow, but this is not metrologically approved.

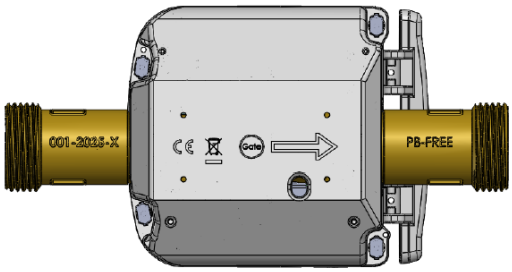
8.6 Security measures

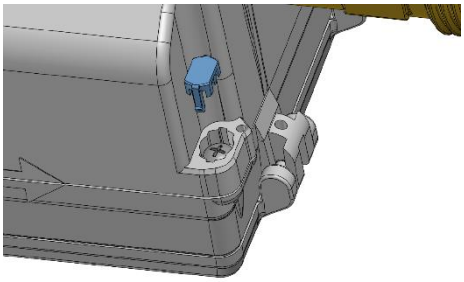
8.6.1 Mechanical seals

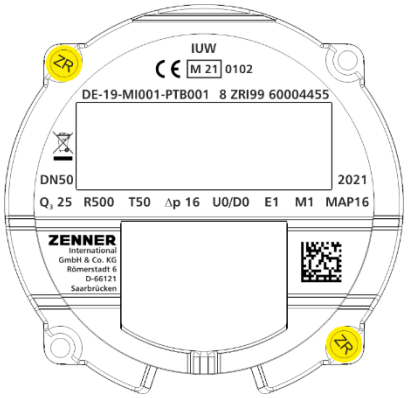
The measured value display must be connected to the meter housing in such a way that it can only be opened by force and with visible traces. The measuring mechanism is secured using a plug seal or adhesive label as shown in the following illustrations.









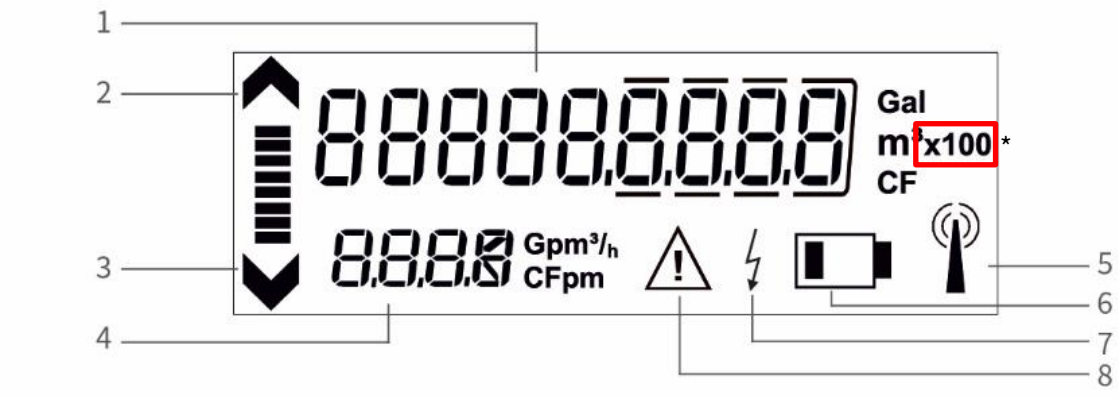


8.6.2 Electronic seals

Metrological data in the factory is read and written via the NFC interface. Access to this data is protected by software by setting write protection after verification. A watchdog monitors the software integrity.

9 Display description

9.1 Significance of the displays



1	Consumption with unit m³ (for nominal diameters DN15-DN50: 6 digits before/3 after the decimal point, for DN50 - DN125: 6 digits before/3 after the decimal point, for DN150-DN300: 7 digits before/2 after the decimal point)
2	Flow direction display in forward flow direction
3	Flow direction display in return flow direction
4	4-digit flow rate display, unit in m³/h; with automatic point shifting; the flow rate display is updated every 2 seconds
5	Data transfer display: Symbols for displaying the join status with LoRaWAN® or the wireless M-Bus radio status
6	Battery capacity display: Symbol is activated 15 months prior to fully discharged battery.
7	External power supply: Symbol is activated briefly once an NDC communication module is switched on via the NFC interface
8	Indication of alarm or error messages (those are saved in the data logger and can be read out via the NFC interface)
*****	Note x100: only visible with large water meters IUW from DN150

9.2 General information

9.2.1 4-digit current flow rate display

In addition to the standard consumption display, the second line shows the 4-digit current flow rate display in m^3/h. The flow rate display has a decimal shift. The flow rate display has a decimal point shift. The display starts with $0.000m^3/h$ and the decimal point jumps one place to the right as soon as the maximum value is reached.

9.2.2 Exceeding the measuring limit

If the upper measuring limit of an ultrasonic water meter is exceeded, the flow rate display is deactivated and FOR = Flow Out of Range (Flow outside the intended range) is displayed. While the flow rate is exceeded, the consumption progress is not registered. The last overload message is stored in the error memory as undersized detection.

9.2.3 Meter reading display

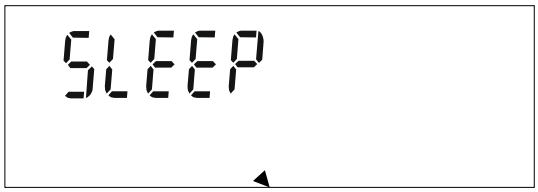
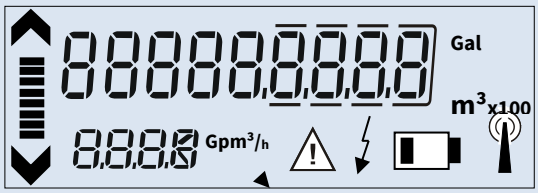
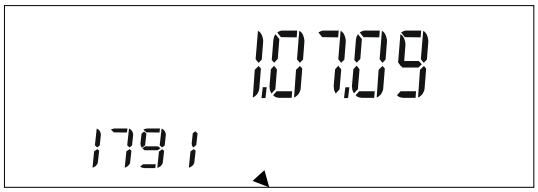
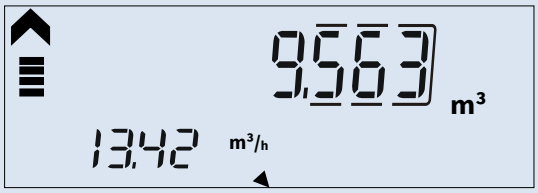
Leading zeros (digits before the decimal point) of the consumption display, as known from the mechanical meter, are not yet displayed during commissioning (display 0.000).
After a meter display "overflow", however, all leading zeros (00000.000) are displayed for reasons of traceability. The total consumption (consumption before overflow + consumption after overflow) can be read out with a smartphone via NFC interface.

9.2.4 Unit Consumption-Display in m^3

The display unit used for MID-compliant meters is m^3. Other country-specific units are available.

9.3 Display sequence

9.3.1 Display sequence during commissioning / activation

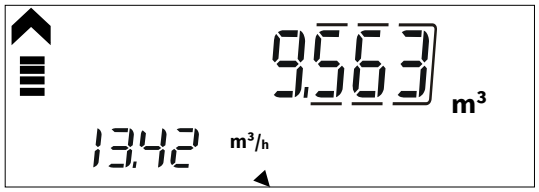
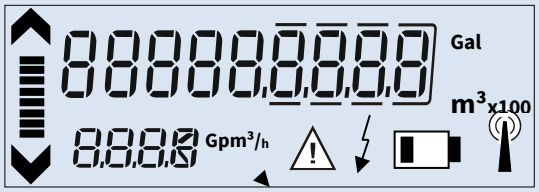
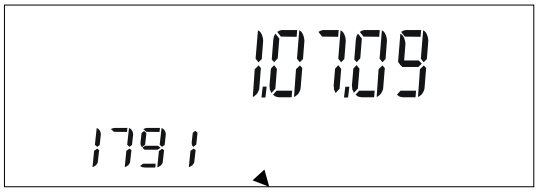
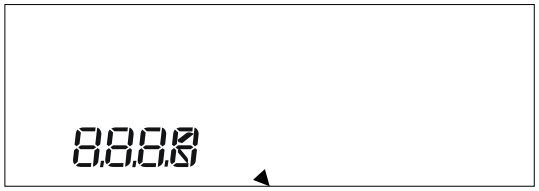
No.	LC-Display	Description	Duration of the display
1.		Reset to delivery „SLEEP-Mode“. The meter (display & radio) is activated automatically as soon as the unit is filled with water for >10s.	---
2.		After activation, the segment test appears first (flashing).	3 s
3.		Firmware version (1st line) Line) Firmware revision (2. Line)	3 s
4.		Main view: Consumption value (meter reading) 2. 2nd line: current flow rate in m³/h Possible country-specific displays: GAL= US Gallons CF = Cubic feet Gpm = Gallons per minute CFpm = Cubic feet per minute	5 min. then the segment test according to 2. appears again. 2.

9.3.2 Standard display

In normal operation, the main display as per point 4. of the above table is usually visible. In the LC menu, the respective status of the meter is also displayed if necessary. Further information on the status of the respective meter is also displayed in the LCD menu in the second line or with symbols or also in the "SystemInfo View" (section 9.3.4).

9.3.3 Display sequence in normal operation

The following views are displayed in an endless loop:

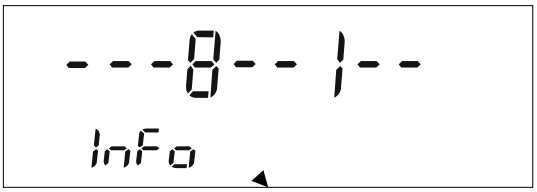
No.	LC-Display	Description	Duration of the display
1.		Main view consumption display Meter value (index) 2nd line: current flow rate + unit	5 minutes
2.		Segment test (flashing)	Appears every 5 minutes for 3 sec.
3.		1st Line: Firmware version 2nd Line: Firmware revision	every 5 minutes (is displayed directly after the segment test)
	Optional additional displays:		
4.		Normally, the second LCD line is used to display the current flow rate. If, however, the flow cannot be calculated due to a condition such as air in the pipe, the second line permanently displays this condition as text. The most recent event is displayed. (For details see chapter 9.6)	Event based, permanent and flashing
5.		1st Line: Accumulated volume in return flow direction. 2nd line: current flow rate in m³/h If the flow is in the reverse direction, the corresponding arrow symbol in the return flow direction also appears on the left side of the display.	Event based

9.3.4 SystemInfo View

The SystemInfo view provides a detailed status view of the meter. All unit states are visible in the SystemInfo view. The SystemInfo is a 32-bit status used for hardware and function diagnostics of the meter. It shows the exact internal problem, with the aim of providing appropriate support or understanding whether the unit can continue to be used or should be replaced.

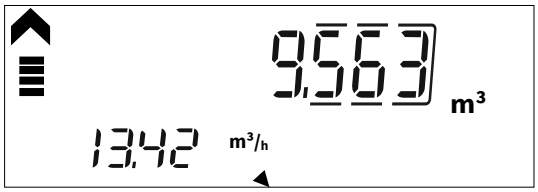
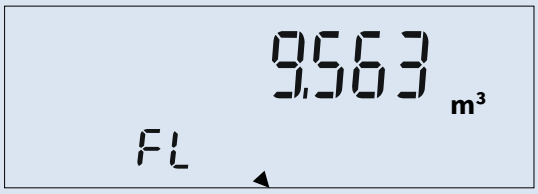
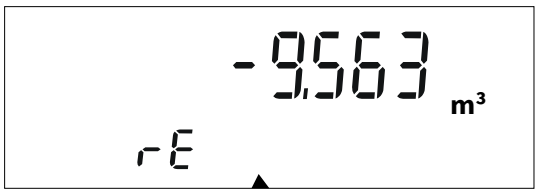
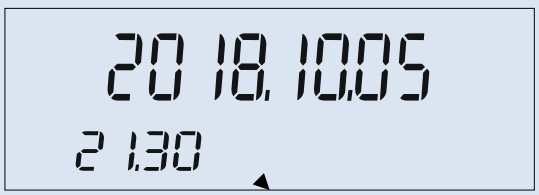
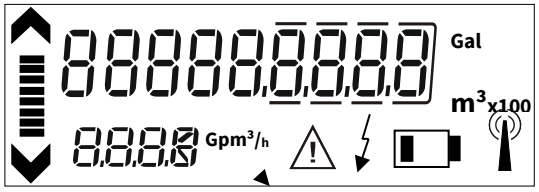
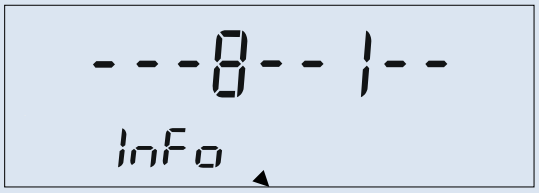
The system info view is not assigned to a specific sequence, but is triggered event-based.

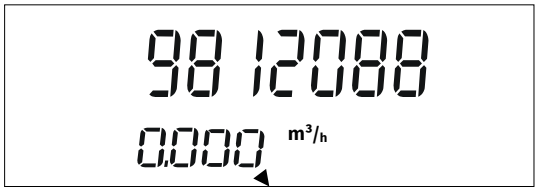
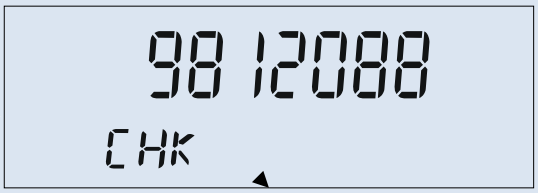
Example of a system info view:

LC-Display	Description	Duration of the display
	System-Info If an error is present, the corresponding error code (Info Code) is displayed. Further information on the error codes is available on request.	---

9.4 Readout options via NFC interface

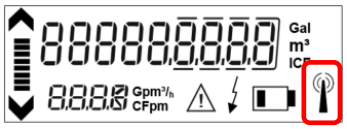
With an NFC-enabled device, the following (non-editable) menu displays can be called up and advanced. To do this, the NFC terminal must be brought close to the NFC interface of the meter and taken away again. With each new contact, the next display appears. After the last display, the display returns back to the main display at the next contact.

No.	LC-Display	Description	Duration of the display
1.		Main view consumption display Meter value (index) 2nd line: current flow rate	On contact (see above) with the NFC interface
2.		Forward flow volume	On contact (see above) with the NFC interface
3.		Return flow volume	On contact (see above) with the NFC interface
4.		1st Line: Current date 2nd Line: Current time (usually German winter time)	On contact (see above) with the NFC interface
5.		Segment test (flashing)	Appears every 5 minutes for 3 sec.
6.		System-Info If an error is present, the error code is displayed, otherwise the unit goes directly to the high-resolution test display	On contact (see above) with the NFC interface if available

7.	 	High resolution test display in ml 2nd Line: (flow rate / text "CHK" alternating)	On contact (see above) with the NFC interface

9.5 Data transfer display

This section explains the meaning of the ‘radio mast’ symbol (marked in red below).



Status of the radio symbol in the LCD-display	IUWS with integrated LoRaWAN® interface (Communication Scenario 2xx)	IUWS with integrated wM-Bus interface (Communication Scenario 3xx)	IUWS with attached external NDC radio module
no symbol	Radio off	The status of the symbol (visible or not visible) does not initially provide any information about the operating mode of the device	NDC module not yet discovered
	Radio on, but the device has not yet joined the LoRa network or the LoRa network join has failed.	<N/A>	(only in case of LoRa) radio on, but not yet joined to LoRa network or LoRa network join failed
	LoRa network join request was sent, accept not yet received	wM-Bus packet is being transmitted	<N/A>
	LoRa network joined	<N/A>	LoRa network joined

Note for parallel radio:

- *Join not yet complete, wM-Bus already active: Mast is visible, radio wave symbol flashes every x seconds (depending on wM-Bus transmission interval).*
- *Join successfull: Mast and wave symbol visible + wave symbol flashes every x seconds (depending on wM-Bus transmission interval).*

9.6 Permanent text visualisation in the main view

Normally, the second LCD line is used to display the current flow rate. If, however, the flow cannot be calculated due to a condition such as air in the pipe, the second line permanently displays this condition as Systeminfo text.

Possible text messages and their meanings:

- drY No water in the measuring tube
- AIR Air pockets (temporarily no ultrasonic measurement possible)
- Flow out of range Overload
- tOR= Temperature outside the specified range
- ErrX X = Error number
- ALXX XX = Alarm number
- IFXX XX = Info number
- SFXX XX = Smart function number
- nEXX XX = NDC module error

10 Communication interfaces

10.1 NFC interface for configuration purposes

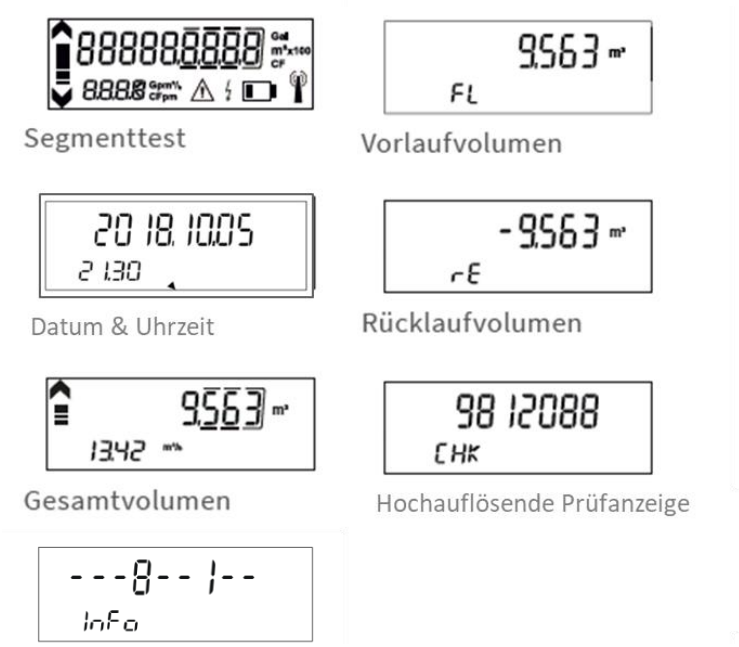
All ZENNER ultrasonic water meters in the IUW and IUWS series have an NFC interface that can be used for local device readout, device configuration and testing within production or for verification and calibration on customer test benches.

NFC: 'Near Field Communication is an international transmission standard based on RFID technology for the contactless exchange of data via electromagnetic induction' (source: Wikipedia).

The B.One Device Manager Basic Android app can be used to read or configure the meter at any time via the NFC interface. The app can be used, for example, to change transmission scenarios (switching between LoRaWAN® and wM-Bus) or to read out the various loggers. In addition, it is also possible to activate parallel radio, for example.

With any NFC-enabled smartphone, the following (non-editable) menu displays can be accessed and switched without the ZENNER app:

- To do this, bring the NFC device close to the NFC interface and then move it away again.
- The next display appears each time you make contact again.
- After the last display, the display jumps back to the main display when the next contact is made



System info (if an error is present, the corresponding error code is displayed)

The unit of the high-resolution test display is millilitres {ml}.

In addition to the functions described above, the NFC interface can also be used to connect an external communication module (NDC) to the meter. The following ZENNER NDC modules are available or used in the market (see Chapter 19):

- NDC wM-Bus (no longer in production)
- NDC LoRaWAN® (no longer in production)
- NDC LORA-WMBUS (combined successor device for NDC wM-Bus and NDC LoRaWAN®)

The NDC modules are available with cable lengths of 3 m or 10 m. The manufacturer does not recommend cutting the cable or using a cable extension.

10.2 IUWS radio interfaces

The IUWS meter series is equipped with an internal radio module ex works. This radio module can be used either as

- wireless M-Bus radio module or as
- LoRaWAN® radio module can be used.

The desired radio technology must be specified when placing the order. In addition, the customer should also specify the desired transmission scenario, i.e. the detailed telegram content. To assist in this decision, overviews are available that contain the respective telegram content, transmission intervals and further information (see Chapters 11 and 12).

IUWS with firmware version 1.8.5 (from 2024 onwards) and higher can also be operated in **parallel radio mode**. This means that the meters transmit using both LoRaWAN® radio and wireless M-Bus. The recommended combination here is a daily LoRaWAN® telegram (sent after midnight) and a drive-by wireless M-Bus telegram with a transmission interval of, for example, 20 seconds.

An IUWS variant with NB-IoT is available for export markets. In addition, a version with the so-called Sensus radio is also being marketed for the US market.

The IUWS can be retrofitted with an NDC module at any time. This is helpful, for example, in order to achieve a more stable radio connection at installation sites with limited radio connectivity (e.g. in meter shafts). The NDC module automatically 'recognises' the water meter connected to it (within a maximum of 24 hours) and starts the radio transmission. The internal radio module is deactivated here – except for parallel radio. In parallel radio transmission mode, both the external module and the internal radio module transmit. The exact behaviour of which radio is switched on or off depends on the default settings of the scenarios in the IUWS.

10.3 IUW radio interface

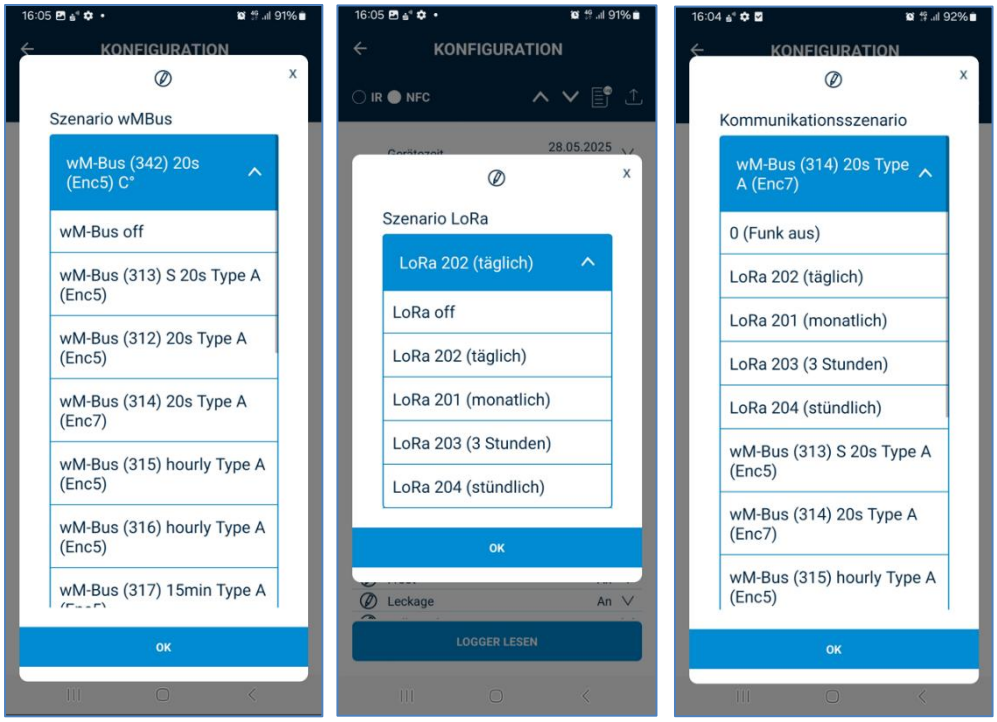
The IUW bulk water meter does not have an internal radio interface. For radio communication, an NDC radio module must always be retrofitted to the IUW. You will find suitable instructions for retrofitting in the installation instructions for the NDC module under MA_ST_NDC-Modul.pdf

Important note: ZENNER only recommends communication scenarios 312 and 313 for the combination IUW+NDC in the wireless M-Bus area. The daily value of 24:00 is transmitted by radio with each radio telegram. With these scenarios, the current meter reading is not transferred, but rather the daily value!

If the user selects other available transmission scenarios (using the B.One Device Manager Basic app), the battery life of the NDC module may be significantly reduced. An overview of available communication scenarios can be found here: Ultrasonic bulk water meter IUW.

10.4 Switch off radio interface

The radio can be deactivated if desired using the B.One Device Manager app. To do this, select either scenario 200 (= LoRaWAN® radio off) or 300 (= wM-Bus radio off). Depending on the firmware, scenario 0 (= radio off) may need to be clicked. Examples of screenshots from the configuration app are shown below.



Switching back on is done in the same way by selecting the desired transmission scenario and then pressing the ‘Write’ button.

11 Data relating to the radio interface

11.1 LoRaWAN® - Telegram contents, intervals and technical data

LoRaWAN® radio telegram	
Telegram content in general	**Interval**
Serial number (DevEUI)	once when logging into the LoRaWAN® network
Device-specific information (Firmware version, LoRaWAN version, device type)	six-monthly
Changes of status (manipulation, battery warning,...)	event-driven

Scenario 201 (monthly)	
Telegram content	**Interval**
Monthly value (previous month) [litre], status information, actual date and time	monthly (beginning)
Monthly value (previous month) [litre], mid-month value [litre], actual date and time	monthly (middle)
Key value and Key date [01.01.]	annually on the key date

Scenario 202 (daily)	
Telegram content	**Interval**
Daily value (previous day) [litre]	daily
Status information, actual date and time	monthly
Key value and Key date [01.01.]	annually on the key date

Scenario 203 (every 3 hours)	
Telegram content	**Interval**
3-hour values [litre]	8 x per day
Status information, actual date and time	monthly
Device-specific information (firmware version, LoRaWAN® version, device type)	six-monthly
Device-specific information (manufacturer, fabrication number, VIF/VIFE)	once at join

Scenario 204 (hourly)	
Telegram content	**Interval**
Hourly value [litre]	hourly
Status information, actual date and time	monthly
Device-specific information (firmware version, LoRaWAN® version, device type)	six-monthly
Device-specific information (manufacturer, fabrication number, VIF/VIFE)	once at join

Technical data LoRaWAN® radio interface	
Operating frequency	868 MHz
Maximum transmission power	approx. 14 dBm, 25 mW
Duration of transmission telegram	up to 1.5 s (depending on spreading factor)
Transmission interval	depending on the respective meter configuration, e.g. Every day; optional: monthly or 8 telegrams with three hourly values each
Data transmission procedure	LoRaWAN® class A (bi-directional communication)
Encryption of the Radio telegram	yes
Error detection	CRC
Battery status monitoring	yes
Calculated battery life	battery life up to 15 years (depending on configuration and environmental conditions)
CE conformity	according to directive 2014/53/EU (RED)
Activation of the radio interface	- automatically after the meter has been filled with water (> 10s); - via the NFC interface using the corresponding ZENNER NFC coupler, MinoConnectUSB and the MSS configuration software - via the NFC interface using the Android app ZENNER Device Manager Basic

11.2 Wireless M-Bus telegram contents and technical data

Depending on the selected transmission scenario, the following radio telegram information is available:

Possible telegram contents
current date
current date and time
current value
Date daily value
Daily value (00:00 h)
Key date
Key date value
Date of previous month's value
Previous month's value
Up to 15 previous month’s values
Status information
Temperature medium
Ambient temperature
current value forward volume
current value of return flow volume
Monthly value of previous month forward volume
Monthly value of previous month reverse volume
current flow
Operating time with warnings/errors
Operating time without warnings/errors

Technical data wireless M-Bus interface	
Operating frequency	868 MHz
Transmission power	approx. 14 dBm, 25 mW
Duration of transmission telegram	approx. 10-15 ms
Sending interval	depending on meter configuration
Data transmission procedure	wireless M-Bus (standard C1 mode)
Encryption of the radio data	depending on meter configuration; standard: Security Profile A, Encryption Mode 5; Security profile B, mode 7 on request
Error detection CRC	CRC
Battery status monitoring	yes
Calculated battery life	battery life up to 15 years (depending on configuration and environmental conditions)
CE conformity	according to directive 2014/53/EU (RED)
Activation of the radio interface	- automatically after the meter has been filled with water (> 10s); - via the NFC interface using the corresponding ZENNER NFC Coupler, MinoConnectUSB and the MSS configuration software - via the NFC interface using the Android app ZENNER Device Manager Basic

12 Transmission scenario lists

12.1 LoRaWAN®

LoRaWAN® Kommunikationszenarios für die ZENNER IUW & IUWS Zählerserie				
Kommunikationsszenario Nr.	**201**	**202**	**203**	**204**
Frequenz	EU-868	EU-868	EU-868	EU-868
Sendeintervall	monatlich	täglich	3 stündlich	stündlich
Funk aktiv	keine Funkpausen	keine Funkpausen	keine Funkpausen	keine Funkpausen
Telegramminhalte				
Tageswert (24:00 Uhr)		x		
Stichtagsdatum	x	x		
Stichtagswert	x	x		
Vormonatswert	x			
Stundenwert			x	x
Status (Alarme)	x	x	x	x
Berechnete Batterielaufzeit IUWS D-Zelle [Jahre]	> 15	> 15	> 15	> 15
Berechnete Batterielaufzeit NDC LoRa [Jahre]	10 + Reserve	10 + Reserve	10	4 + Reserve

Hinweis:
Für IUWS Ultraschallwasserzähler ab Firmware 1.8.5 sind Varianten für die parallele Nutzung von beiden Funktechnologien (wireless M-Bus und LoRaWAN®) verfügbar.

12.1.1 Summary of the radio telegrams included in each scenario

Communication scenarios	Radio telegram
201	SP2, SP3, SP4, SP9.1, SP9.2, SP9.3
202	SP1, SP4, SP4, SP9.1, SP9.2, SP9.3
203	SP12, SP4, SP4, SP9.1, SP9.2, SP9.3
204	SP12, SP4, SP4, SP9.1, SP9.2, SP9.3

The explanation of the radio telegrams can be found in the table in section 12.1.2.

SP = Synchronous packet (regular telegram)

AP = asynchronous packet (event-based telegram)

12.1.2 Telegram content of radio telegrams and associated transmission intervals

Tele-gram	Telegram content	Interval
SP 1	Daily value (previous day) [litre]	daily
SP 2	Monthly value (previous month) [litre] Status information, actual date and time	monthly (beginning)
SP 3	Monthly value (previous month) [litre] Mid-month value [liter], actual date and time	monthly (middle)
SP 4	Key value and Key date [01.01.]	annually on the key date
SP 9.1	Status information, actual date and time	monthly
SP 9.2	Meter ID (internal ZENNER number)	once at join
SP 9.2	Device-specific information (Firmware version, LoRaWAN version, device type)	six-monthly
SP 9.3	Device-specific information (manufacturer, fabrication number, VIF/VIFE)	once at join from time to time
SP12	Hourly value or 3 x hourly values [litres], number of the first hour	8 x per day
AP 1	Changes of status (z.B. Device error, Battery, …)	erratic (event based)

12.2 Wireless M-Bus

wM-Bus Kommunikationsszenarios für ZENNER IUW & IUWS Zähler													
Kommunikationsszenario Nr.	**312**	**313**	**314**	**315**	**317**	**318**	**319**	**320**	**321**	**322**	**324**	**329**	**342**
OMS zertifiziert							x				x	x	
Sendeintervall	120 s	20 s	20 s	stündlich	15 Min.	300 s	432 s	20s	20 s	16s	20s	20 s	20 s
Funk aktiv	immer	immer	immer	immer	immer	22:00 - 2:00	immer	immer	immer	immer	immer	immer	immer
Inbetriebnahme Szenario *(alle 30 s für eine Stunde)*	x	x	x	x	x	x	x	x	x	x	x	x	x
Telegrammminhalt													
Aktuelles Datum	x	x	x	x	x				x		x	x	x
Aktuelles Datum & Uhrzeit			x	x	x			x	x		x	x	x
Aktueller Wert			x	x	x	x	x	x	x	x	x	x	x
Tageswert (00:00 Uhr)	x	x		x	x								
Stichtagswert	x	x							x	x	x	x	x
Datum Vormonat	x							x				x	x
Vormonatswert	x	x		x	x			x	x	x	x	x	x
Vormonatswert -2 bis -12	x							x				x	x
Aktuelle Wasser- und Umgebungstemperatur													x
Statusinformation (Alarme)	x	x	x	x	x	x	x	x	x	x	x	x	x
Zeiten, Formate, Typen, Lebensdauer													
NDC Zykluszeit*	3600 s	3600 s	---	---	---	---	---	---	---	---	---	---	---
Betriebsmodus wM-Bus	C1	C1	C1	C1	C1	C1	C1	C1	C1	C1	C1	C1	C1
Encryption Mode	5	5	7	5	5	7	7	5	5	5	7	5	5
Szenario verwendbar für Zählertyp IUW + NDC	**x**	**x**	***nicht empfohlen***	***nicht empfohlen***	***nicht empfohlen***	**optional**	**optional**	***nicht empfohlen***	***nicht empfohlen***	***nicht empfohlen***	***nicht empfohlen***	***nicht empfohlen***	***nicht empfohlen***
Szenario verwendbar für Zählertyp IUWS	optional	optional	optional	optional	optional	optional	optional	optional	optional	optional	optional	optional	Standard ab Werk für IUWS mit D-Zelle**
Berechnete Batterielaufzeit IUW (Jahre)	> 15	> 15	---	---	---	---	---	---	---	---	---	---	---
Berechnete Batterielaufzeit NDC (Jahre)	12+Reserve	10	---	---	---	12+Reserve	5	---	---	---	---	---	---
Berechnete Batterielaufzeit IUWS D-Zelle (Jahre)	15+Reserve	15+Reserve	15+Reserve	15+Reserve	15+Reserve	15+Reserve	15+Reserve	15+Reserve	15+Reserve	15+Reserve	15+Reserve	15+Reserve	15+Reserve (202+342); *12+Reserve (203/204+342)*

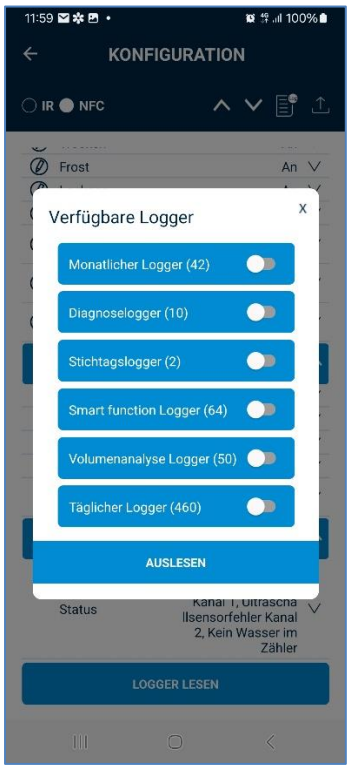
** NDC Modul ließt stündlich den Status des Zählers ab*

*** ab Q4-2024*

Hinweis: Für IUWS Ultraschallwasserzähler ab Firmware 1.8.5 sind Varianten für die parallele Nutzung von beiden Funktechnologien (wireless M-Bus und LoRaWAN®) verfügbar.

13 Data logger

The data memory (logger) is read using the Android app B.One Device Manager Basic via the meter's NFC interface. To ensure high user-friendliness and faster reading of logger data, the memory has been divided into seven areas:



App screenshot showing available logger areas

The loggers listed in the following table can be selected individually. Depending on the operating time of the meter and its installation situation, it is advisable not to read out all loggers at once, as this may result in unwanted interruptions of the NFC connection. Reading the individual loggers step by step usually results in fewer connection interruptions.

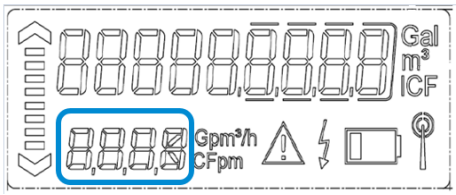
Name of the logger	Number of entries
Key date values	3
Monthly and half-monthly values	53
Daily values	460
Hourly values	1.440
Reverse flow	50
Volume analysis	50
Events	64
Short-term logger for the last 3 days (volume, water temperature, status) in quarter-hourly, hourly and 6-hourly values	12

When a memory area is full, the oldest entries are overwritten.

The event logger contains the following messages and warnings, which support efficient operation of the supply network:

Event (Smart function events)	Identification on the display
Leakage detection	SF01
Detection incorrect installation	SF02
Battery warning	SF03
Meter oversized	SF04
Meter undersized	SF05
Pipe burst warning	SF06
Meter Dry detection	SF07
Frost warning	SF08
Reverse water flow detection	SF09
Meter stop detection	SF10

These logger events are transmitted via LoRaWAN® radio and are displayed on the second line of the respective meter's display (blue border). The SFxx system info text is automatically deleted from the main view after 7 days. Even after reading the logger via NFC, the SFxx display disappears.



The logger data is stored on your smartphone with the ZENNER app installed. The data is available for later evaluation in successor systems as *.csv or PDF files.

14 Smart functions / Warnings

The IUW / IUWS meter series has smart functions. This means that the meter can detect certain conditions and display warnings or device status information. The following warnings and device status information can be shown on the display (see Chapter 13) or sent via radio (LoRaWAN®).

- Leakage detection
- Detection incorrect installation
- Battery warning
- Meter oversized
- Meter undersized
- Pipe burst warning
- Meter Dry detection
- Frost warning
- Reverse water flow detection
- Meter stop detection

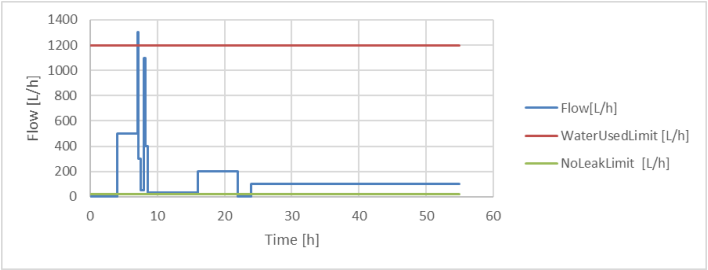
In the case of an active LoRaWAN® communication scenario, every time a smart meter function triggers a warning, a corresponding message is sent via LoRaWAN®.

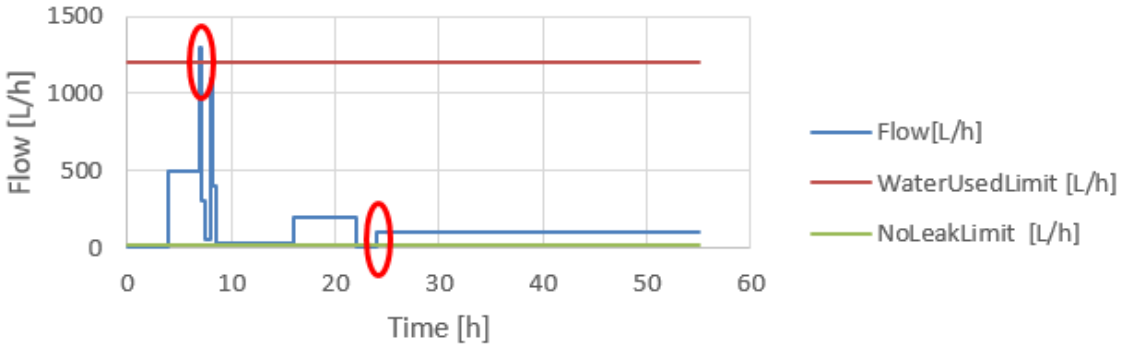
If the wM-Bus scenario is active, the device status information (e.g. device error, battery warning) is sent in the header of the radio telegram.

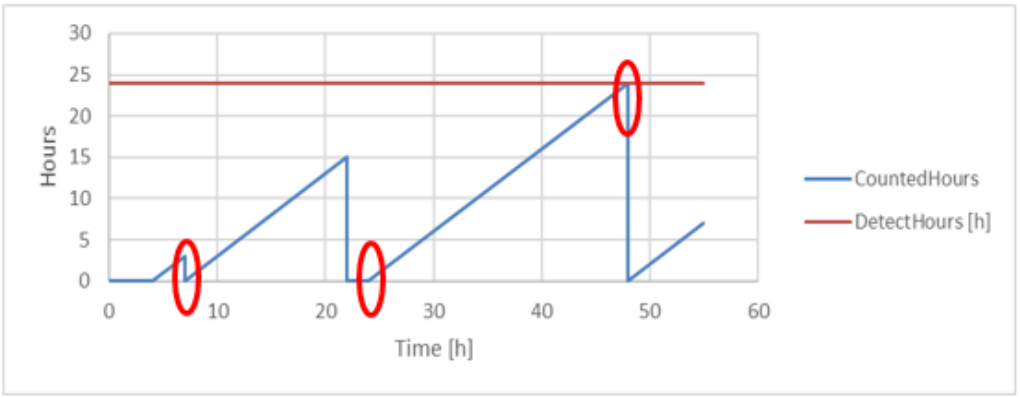
14.1 Leakage detection (SF01)

- **Goal:** Leak detection/warning, e.g. if the flow rate is never zero over a long period, then there is usually a leak
- **Parameters for detection:**
  - ***DetectHours:***
    After this period, a leak alarm is displayed if the flow rate never exceeded 'WaterUsedLimit' and never fell below 'NoLeakLimit' during this period. (Info: NoLeakLimit is >0)
    Default value: 24 h
  - ***WaterUsedLimit:***
    If the flow rate exceeds this limit, the installation is in active use and consumption is 'normal'.
    Default value: Q3/2 (with a Q3 = 4 meter, this would be 2 m^3/h)
  - ***NoLeakLimit:***
    If the system experiences a very small water loss at any point, this limit helps to suppress the leak alarm caused by this very small water loss.
    Default value: Q1 (with a Q3 = 4 counter R250, this would be 16 m^3/h)

- **Graphical example**:







The example shows that for the 24th hour a leak occurs. If this is scheduled for more than 24 hours, the alarm will be triggered after 48 hours.

14.2 Detection incorrect installation (SF02)

- **Goal:** Detection that the meter has been installed contrary to the intended flow direction. An incorrect installation is detected when the backflow volume is higher than the volume in the direction of flow.
- **Parameters for detection:**
  - ***DetectHours:***
    After this number of significant hours, an alarm is displayed if the backflow volume during each significant hour was higher than the volume in the direction of flow.
    Default value: 4 hours

- ***HourlyVolDiffLimit:***
  If the difference between the volume in the flow direction and the return flow volume per hour is below this threshold value, this hour is considered 'insignificant' and is not recorded.
  Default value: Q_2 / 30 (or Q2 for 2 minutes per hour)

- If, within one of the 4 hours (DetectHours), the volume in the direction of flow is greater than the return flow volume, the DetectHours are set to zero and the algorithm starts again.

- **Example of detecting incorrect meter installation: Meter Q3 = 4; Ratio 250 // Q2 = 25.60 l/h**
  - Period under review: 4 hours (the reflux volume must have been greater than the volume in the direction of flow in each hour)
  - HourlyVolDiffLimit:
    Q_2 / 30 = 25.60 l/h / 30 = 0.86 l/h
    or
    Q2 for 2 minutes per hour: 25.6 l/h 60 min/h = 0.43 l/min * 2 = 0.86 l/h
  - This means: If the return flow volume in each of the significant 4 hours is > than 0.86 l/h, then 'incorrect installation' is detected.

14.3 Battery warning (SF03)

- For IUW & IUWS, a battery warning is issued 15 months before the calculated end of battery life.
- The battery warning is shown on the display with the corresponding symbol.
- The battery life calculation starts when the device is activated.
- The battery end date can be displayed in the NFC tag via an NFC-enabled device (possible up to firmware version 1.7.9).

Battery warning symbol

14.4 Meter oversized (SF04)

- **Goal:** Recognition that the flow meter at the measuring point was oversized and therefore potentially provided poorer measurement results.
- **Parameters for detection:**
  - ***DetectHours:***
    After this time, an alarm is displayed if the flow rate has never exceeded 'Flow-Limit' during this period.
    Default value: 1,440 hours (approx. 2 months)

- ***FlowLimit:***
  If the flow rate falls below the 'FlowLimit' threshold value over the 'DetectHours' period, the alarm is triggered.
  Default value: Q_2

- **Example: for meter Q3 = 4 (R250):**
  Here, Q2 = 25.60 l/h; i.e. if the flow rate never exceeds 25.60 l/h for approx. 2 months

14.5 Detection Meter undersized (SF05)

- **Goal:** Recognition that the flow meter at the measuring point was undersized, that it is operating at its upper load limit and that this may result in higher measurement errors.
- **Parameters for detection:**
  - ***DetectHours:***
    After this time, an alarm is displayed if the average flow rate was higher than 'FlowLimit' during this period.
    Default value: 4 h
  - ***FlowLimit:***
    If the average flow rate over the 'DetectHours' period is higher than this threshold value, an alarm is displayed.
    Default value: $(Q_3 + Q_4) / 2$

- **Example: for meter Q_3 = 4 (R250):**
  Here, Q3 = 4 and Q4 = 5 m^3/h ➔ = 9/2 = 4.5 m^3/h;
  i.e. if the average flow rate over a period of 4 hours is continuously higher than 4.5 m^3/h, the message 'Meter undersized' is activated.

14.6 Pipe burst (SF06)

- **Goal:** Pipe burst detection: A relatively high flow rate over a longer period of time typically indicates a pipe burst. This detection is limited to one alarm per day.
- **Parameters for detection:**
  - ***DetectMinutes*:**
    After this time, a pipe burst alarm appears if the measured volume was higher than 'MaxVol' during this time. DetectMinutes therefore specifies the total length of the time intervals that must achieve a minimum flow rate of Q4 (default setting) in succession. The duration of a single time interval is always 10 minutes.
    Default value: 30 min. i.e. 3 time intervals

- ***MaxVol:***
  The volume difference is checked against this limit every 10 minutes. The meter therefore determines a volume difference for each time interval. If this volume difference is > MaxVol in all consecutive time intervals, a pipe burst is detected.
  Defaultvalue: Q_4 / 6

- The default setting detects a 'burst' after 30 minutes if the average flow rate at each of the three checks is higher than Q4/6. The default value of the volume difference MaxVol per time interval is derived from Q4. The flow rate Q4 in m^3/h corresponds to a volume in m^3 per hour. This is converted to the time interval used of 10 minutes (=1/6 h). I.e. default value MaxVol = Q4*(1/6 h).

  Example: for meter Q_3 = 4 (R250):
  Here, Q4 = 5 m^3/h➔ 5/6= 0.83 m^3/h ; i.e. if the limit value is exceeded within each of the 3 x 10-minute test windows, the pipe burst warning is triggered.

14.7 Meter Dry detection (SF07)

- **Goal:** Detection of whether the meter is filled with water. Normally, a water meter is always filled with water. In some markets, however, water is only available in the supply system at certain times (e.g. hourly). However, if a meter remains dry for a long period of time, this may indicate damage to the pipe system.
- **Parameters for detection:**
  DetectHours:
  After this time, an alarm will sound if the ultrasonic system does not detect any water during this period.
  Defaultvalue: 48 h

14.8 Frost warning (SF08)

- **Goal:** If the water temperature drops towards 0 °C, a frost warning is issued in order to prevent pipes and meters from freezing if possible.
- **Parameters for detection:**
  - ***DetectHours:***
    After this period, a frost alarm is triggered if the temperature during this period is consistently lower than 'MaxTemp'.
    Defaultvalue: 2 h
  - ***MaxTemp:***
    Defaultvalue: 3 °C

14.9 Reverse water flow detection (SF09)

- **Goal:** Detection of backflow or possible errors in the installation. If flows against the direction of flow occur frequently, this may indicate an error in the installation.
- **Parameters for detection:**
    - ***DetectHours:***
      After this time at the latest, a backflow alarm will be displayed if the relevant conditions occur.
      Defaultvalue: 24 h
    - ***ReversDetectFlow:***
      = Q2 of the meter
    - ***Reverse Volume Limit:***
      Only when the average volume per hour exceeds this limit is a reverse flow alarm displayed.
      Defaultvalue: Q2 * DetectHours

Caution: This function uses a recursive filter. The effects are:

- If the average flow rate is negative, no matter how small, an alarm will always be triggered.
- The time until triggering depends on the ratio of forward and reverse flow.
- In the event of a large, clearly recognisable reverse flow, the alarm is triggered within hours.
- In the event of a small to moderate reverse flow, at the level of Q2, the alarm is triggered after one day.
- If the average reverse flow is even smaller, the alarm will be triggered after a longer delay for safety reasons.

Examples of reverse flow detection

ReverseDetectFlow	25,6 l/h	= Q2
DetectHours	24	
ReversVolumeLimit	614,4 l/h	=25,6*24

a.) Wrong (pipe) installation: high reverse flow

Time	Flow	FilterVolume	Backflow Event
01.01.2000 00:00	-2000,0 l/h	0,0 l	0
01.01.2000 01:00	-2000,0 l/h	2000,0	1
01.01.2000 02:00	-2000,0 l/h	4000,0	1

b.) Wrong (pipe) installation: small reverse flow

Time	Flow	FilterVolume	Backflow Event
01.01.2000 00:00	-30,0 l/h	0,0 l	0
01.01.2000 01:00	-30,0 l/h	30,0	0
01.01.2000 02:00	-30,0 l/h	60,0	0
01.01.2000 03:00	-30,0 l/h	90,0	0
01.01.2000 04:00	-30,0 l/h	120,0	0
01.01.2000 05:00	-30,0 l/h	150,0	0
01.01.2000 06:00	-30,0 l/h	180,0	0
01.01.2000 07:00	-30,0 l/h	210,0	0
01.01.2000 08:00	-30,0 l/h	240,0	0
01.01.2000 09:00	-30,0 l/h	270,0	0
01.01.2000 10:00	-30,0 l/h	300,0	0
01.01.2000 11:00	-30,0 l/h	330,0	0
01.01.2000 12:00	-30,0 l/h	360,0	0
01.01.2000 13:00	-30,0 l/h	390,0	0
01.01.2000 14:00	-30,0 l/h	420,0	0
01.01.2000 15:00	-30,0 l/h	450,0	0
01.01.2000 16:00	-30,0 l/h	480,0	0
01.01.2000 17:00	-30,0 l/h	510,0	0
01.01.2000 18:00	-30,0 l/h	540,0	0
01.01.2000 19:00	-30,0 l/h	570,0	0
01.01.2000 20:00	-30,0 l/h	600,0	0
01.01.2000 21:00	-30,0 l/h	630,0	1
01.01.2000 22:00	-30,0 l/h	660,0	1
01.01.2000 23:00	-30,0 l/h	690,0	1

c.) Wrong (pipe) installation: constant reverse flow

Time	Flow	FilterVolume	Backflow Event
01.01.2000 00:00	-25,6 l/h	0,0 l	0
01.01.2000 01:00	-25,6 l/h	25,6	0
01.01.2000 02:00	-25,6 l/h	51,2	0
01.01.2000 03:00	-25,6 l/h	76,8	0
01.01.2000 04:00	-25,6 l/h	102,4	0
01.01.2000 05:00	-25,6 l/h	128,0	0
01.01.2000 06:00	-25,6 l/h	153,6	0
01.01.2000 07:00	-25,6 l/h	179,2	0
01.01.2000 08:00	-25,6 l/h	204,8	0
01.01.2000 09:00	-25,6 l/h	230,4	0
01.01.2000 10:00	-25,6 l/h	256,0	0
01.01.2000 11:00	-25,6 l/h	281,6	0
01.01.2000 12:00	-25,6 l/h	307,2	0
01.01.2000 13:00	-25,6 l/h	332,8	0
01.01.2000 14:00	-25,6 l/h	358,4	0
01.01.2000 15:00	-25,6 l/h	384,0	0
01.01.2000 16:00	-25,6 l/h	409,6	0
01.01.2000 17:00	-25,6 l/h	435,2	0
01.01.2000 18:00	-25,6 l/h	460,8	0
01.01.2000 19:00	-25,6 l/h	486,4	0
01.01.2000 20:00	-25,6 l/h	512,0	0
01.01.2000 21:00	-25,6 l/h	537,6	0
01.01.2000 22:00	-25,6 l/h	563,2	0
01.01.2000 23:00	-25,6 l/h	588,8	0
02.01.2000 00:00	-25,6 l/h	614,4	1

d.) Correct pipe installation: small back-flow parts

Time	Flow	FilterVolume	Backflow Event
01.01.2000 00:00	50,0 l/h	0,0 l	0
01.01.2000 01:00	50,0 l/h	-50,0	0
01.01.2000 02:00	50,0 l/h	-100,0	0
01.01.2000 03:00	-20,0 l/h	-80,0	0
01.01.2000 04:00	-20,0 l/h	-60,0	0
01.01.2000 05:00	500,0 l/h	-560,0	0
01.01.2000 06:00	500,0 l/h	-1060,0	0
01.01.2000 07:00	500,0 l/h	-1560,0	0
01.01.2000 08:00	500,0 l/h	-2060,0	0
01.01.2000 09:00	500,0 l/h	-2560,0	0
01.01.2000 10:00	500,0 l/h	-3060,0	0
01.01.2000 11:00	500,0 l/h	-3560,0	0
01.01.2000 12:00	-200,0 l/h	-3360,0	0
01.01.2000 13:00	-200,0 l/h	-3160,0	0
01.01.2000 14:00	-200,0 l/h	-2960,0	0
01.01.2000 15:00	600,0 l/h	-3560,0	0
01.01.2000 16:00	600,0 l/h	-4160,0	0
01.01.2000 17:00	600,0 l/h	-4760,0	0
01.01.2000 18:00	600,0 l/h	-5360,0	0
01.01.2000 19:00	600,0 l/h	-5960,0	0
01.01.2000 20:00	600,0 l/h	-6560,0	0
01.01.2000 21:00	-500,0 l/h	-6060,0	0
01.01.2000 22:00	1000,0 l/h	-7060,0	0
01.01.2000 23:00	1000,0 l/h	-8060,0	0
02.01.2000 00:00	1000,0 l/h	-9060,0	0
02.01.2000 01:00	1000,0 l/h	-10060,0	0
02.01.2000 02:00	1000,0 l/h	-11060,0	0
02.01.2000 03:00	1000,0 l/h	-12060,0	0
02.01.2000 04:00	1000,0 l/h	-13060,0	0
02.01.2000 05:00	1000,0 l/h	-14060,0	0

14.10 Meter stop detectionSF10

- **Goal:** Detection that the meter has not registered any flow for a prolonged period of time. No counting progress is made.
- **Parameters for detection:**
  - ***DetectDays:***
    After this time, an alarm will sound if no flow has been detected during this period.
    Defaultvalue: 30 days

14.11 Overview Smart functions and alarms

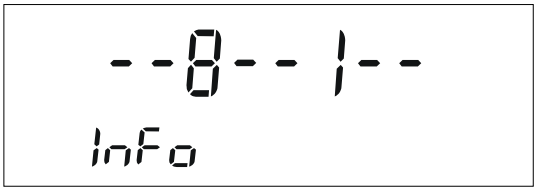
ALARME & WARNINGS	Transmis-sion via Lo-RaWAN®	Trans-mission via wM-Bus	Display on Display	Representation on the display
Leakage	X		X	SF01
Burst	X		X	SF06
Wrong installation	X		X	SF02
Reverse flow	X		X	SF09 or Info Code
Meter oversized	X		X	SF04
Meter undersized	X		X	SF05 or FOR
Meter blocked	X		X	SF10
Meter dry	X	X	X	SF07 oder dry or Info Code
Frost warning	X		X	SF08
Battery warning	X	X	X	SF03, Err7 or Info Code or battery symbol
Temperature outside the specified range	(X)*		X	tOR or Info Code | * monthly via radio as status summary
Overload	(X)*		X	FOR or Info Code | * monthly via radio as status summary
Device error	(X)*	X	X	ErrX or Info Code | * monthly via radio as status summary
air bubbles			X	In the 2nd line: 'AIR' or Info Code
Communication issue			X	Radio mast symbol without radio waves or nEXX
Manipulation, opening of de-vices	---	---	---	(yellow safety markings have been destroyed; warning triangle may appear)

15 Device status information

15.1 SystemInfo-View

Detailed information on the status of the meter is provided by the SystemInfo display.

Example of a SystemInfo view (see also section 9.3.4):



The SystemInfo view is used as a detailed status view. It displays all important status bits in detail. SystemInfo is a 32-bit status used for hardware and functional diagnostics of the meter. It shows the exact internal problem for ZENNER Support and is used to determine appropriate measures for troubleshooting.

By switching NFC fields with a smartphone with NFC enabled, you can always switch from the main view to additional LCD views such as the SystemInfo view (see also section 10.1).

Typically, a symbol in the second line of the main display provides basic information and can initiate a view of the SystemInfo view to determine the exact error situation. For example, the battery icon in the main view triggers a look at the system info view to understand whether it is a calculated warning about the end of battery life or a measurement under load. For example, if the warning triangle is active, the system info will show more details about it.

15.2 Overwriting and deleting the view

Only one SystemInfo text can be displayed in the second line of the main view. If several states are active, only the state with the highest priority is displayed. Any other conditions that may be present at the same time are then displayed in the System Info view.

A SystemInfo text is always overwritten by a newer SystemInfo text.

The SystemInfo text is immediately deleted when the measuring device is read via the standard NFC tag reading. The SystemInfo text is automatically deleted after seven days.

15.3 SystemInfo States

Possible functional states are described in the following table, and a recommended troubleshooting measure is listed.

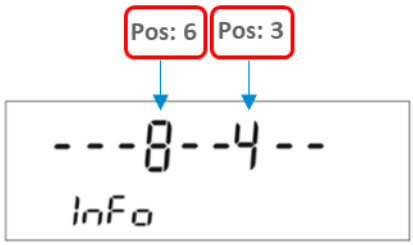
Possible functional states:

Bit	Name	Description	Reaction
0	BatteryOver	The calculated minimum battery life has been reached.	Next month the meter should be replaced
1	BatteryWarning	The measuring device detects voltage drops	The meter should promptly be replaced
2	BatteryError	The battery is almost empty	Meter should immediately be replaced
3	AccuracyUnsafe	The measuring device works, but accuracy is not guaranteed.	The meter should promptly be replaced
4	HardwareError	The hardware is defective or the measuring device has lost its configuration.	The meter should immediately be replaced
5	EmptyTube	This is usually the case when there is no water in the pipe.	Meter needs to be checked
6	FlowOutOfRange	Flow rate too high for this meter type	Replace the meter with a larger one.
7	Sleep	The device is not active	Please activate the measuring device. M-bus measuring instruments
8	NotProtected	Write access is fully permitted. Data is not secure.	Meter should be replaced immediately
9 -13	reserved		
14	NdcModule BatteryWarning	The battery of the NDC module is empty.	Please replace module
15	NdcModule ConnectionLost	The NDC module is disconnected from the meter.	Check the situation at the measuring point

The explanations for the SystemInfo view are described in a separate document in tabular form so that the respective cause of the error can be determined. The document is only available on request.

The error detection is illustrated below as an example:

The SystemInfo display shows:---8--4--



First, determine the position (coming from the right) at which an error message appears, i.e. here the ‘4’ at position 3 and the ‘8’ at position 6.

The meaning of the displayed digits or characters is then derived from the corresponding tables:

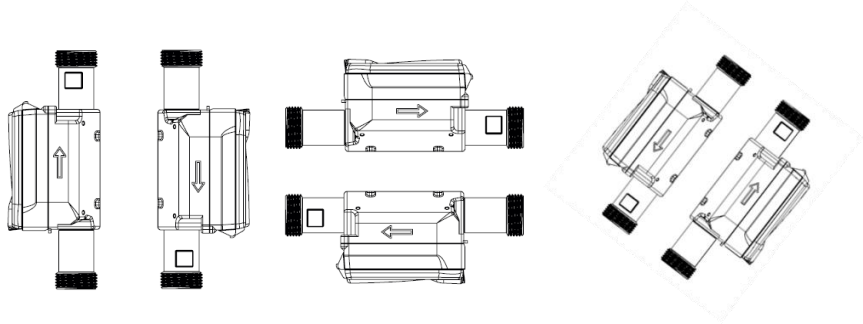
Pos. 3	Temperatursensor defekt Gefahrenzeichen wird aktiv	Ultraschall Kanal 2 defekt (bei IUW-S: diese Meldung kann auch durch ein leeres Rohr verursacht werden) Gefahrenzeichen wird aktiv
F	x	x
E	x	x
d	x	x
C	x	x
b	x	
A	x	
9	x	
8	x	
7		x
6		x
5		x
4		x
3		
2		
1		
--		

Pos. 6	kein Wasser im Rohr 2. Zeile zeigt trocken	Luftblasen im Wasser 2. Zeile zeigt AIR
F	x	x
E	x	x
d	x	x
C	x	x
b	x	
A	x	
9	x	
8	x	
7		x
6		x
5		x
4		x
3		
2		
1		
--		

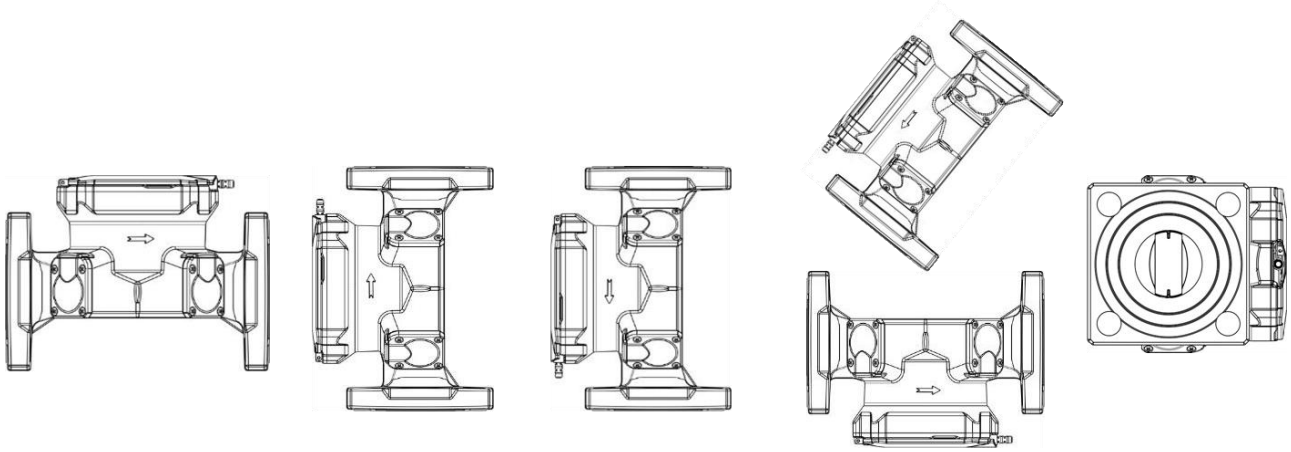
16 Installation instructions

The IUW & IUWS series are intended for "any" installation position (even overhead).
Possible installation situations are shown below. No inlet or outlet sections required (U0/D0)) Nevertheless, inlet and outlet sections are recommended in accordance with DVGW technical regulations.

16.1 Permissible installation positions



16.2 Permissible installation positions



16.3 Installation steps

- Prior to installing the measuring device, the pipe system is to be carefully flushed.
- Close the valves upstream and downstream of the measuring device and relieve the pressure at the installation point.
- Dismantle existing measuring device or adapter piece.
- Old seals must be removed immediately after dismantling the existing measuring device or adapter piece. The corresponding sealing surfaces must be cleaned and checked for damage.
- Check before starting installation:

  – that all sealing surfaces are plane and free of damages such as notches, grooves
  – all information on the dial/register cap/type plate are readable.
  – the measuring device in terms of design, size, temperature range and pressure rating fits to the installation location

- Only use new and flawless sealing material.
- It must be ensured that the flow direction of the measuring device matches that of the pipe.
- Screw on the swivel nuts by hand and tighten with a suitable tool. Make sure that the seals are seated correctly.
- It must be ensured that the meter is installed in a tensionless state in the pipe. In the case of an installation that is not tensionless, the housing of the measuring device can be damaged and water may escape.
- To prevent damage to the measuring instrument caused by pressure surges after installation, the pipe must be filled slowly after installation.
- The measuring instrument must be easily accessible at all times after installation to guarantee that the key data and the conformity/metrology mark can be read at all times.
- Check all sealing points for leaks after installation.
- We recommend securing the connection points against unauthorised disassembly with a user safeguard. It should not be possible to remove or loosen the guard without visibly damaging it.

16.3.1 Note on IUWS short overall lengths

- Use a screwdriver/metal rod (Ø max. 5.2mm) or similar tool to hold the short overall lengths (110mm – 145mm) when tightening the screw connections similar to the following illustration.

16.3.2 Activating of the measuring device

The activation of the meter is described in Chapter 8.4.in detail.

16.3.3 Retrofit options

The IUW & IUWS series measuring devices can be retrofitted with the following NDC modules (see also Chapter 19):

- NDC wM-Bus (no longer in production)
- NDC LoRaWAN® (no longer in production),
- NDC LORA-WMBUS (combined successor device for NDC wM-Bus and NDC LoRaWAN®)
- For certain markets on request: NDC NB-IoT
- Under development: NDC with M-bus interface and pulse output

17 Technical data

17.1 Technical data IUWS

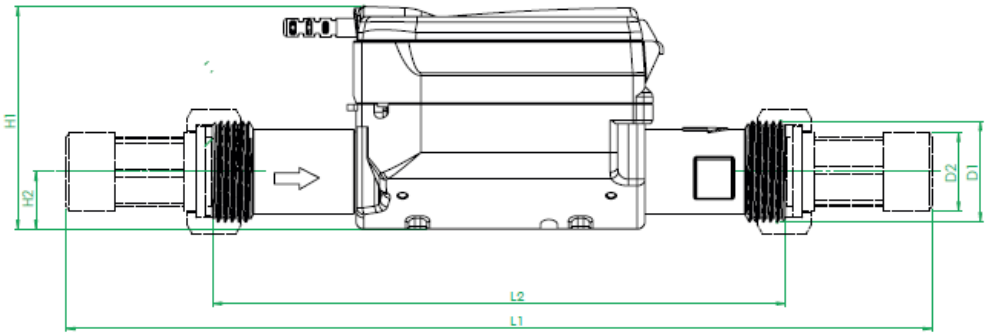
Technical data IUWS																
Permanent flowrate	Q3	m³/h	1,6	1,6	2,5	2,5	2,5	4	4	4	6,3	10	10	10	16	25
Attainable measuring range	Q3/Q1	R	315	315	500	500	315	400	500	315	500	800	800	800	500	800
Standard measuring range [1]	Q3/Q1	R	250	250	250	250	250	250	250	250	250	250	250	250	250	250
Overload Flowrate	Q4	m³/h	2,00	2,00	3,13	3,13	3,13	5,00	5,00	5,00	7,88	12,50	12,50	12,50	20,00	31,25
Minimum Flowrate [2]	Q1	l/h	6,40	6,40	10,00	10,00	10,00	16,00	16,00	16,00	25,20	40,00	40,00	40,00	64,00	100,00
Transitional Flowrate [2]	Q_2	l/h		10,24	16,00	16,00	16,00		25,60	25,60	40,32	64,00	64,00	64,00	102,40	160,00
Lower measuring limit	-	l/h	2,0	2,0	2,0	2,0	2,0	3,2	3,2	3,2	5,1	5,1	5,1	5,1	13,0	20,0
Upper measuring limit	-	m³/h	5,7	5,7	5,7	5,7	5,7	8,0	8,0	8,0	13,8	13,8	13,8	13,8	27,3	34,5
Display range	min.	l	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	max.	m³	999.999,999	999.999,999	999.999,999	999.999,999	999.999,999	999.999,999	999.999,999	999.999,999	999.999,999	999.999,999	999.999,999	999.999,999	999.999,999	999.999,999
Temperature range	-	°C	0.1 - 50	0.1 - 50	0.1 - 50	0.1 - 50	0.1 - 50	0.1 - 50	0.1 - 50	0.1 - 50	0.1 - 50	0.1 - 50	0.1 - 50	0.1 - 50	0.1 - 50	0.1 - 50
Operating pressure	MAP	bar	0.3 - 16	0.3 - 16	0.3 - 16	0.3 - 16	0.3 - 16	0.3 - 16	0.3 - 16	0.3 - 16	0.3 - 16	0.3 - 16	0.3 - 16	0.3 - 16	0.3 - 16	0.3 - 16
Pressure loss class at Q_3 (with straightener)	Δp	bar	0,16	0,16	0,25	0,25	0,16	0,40	0,25	0,10	0,16	0,40	0,40	0,40	0,25	0,25
Pressure loss class at Q_3 (with strainer)	Δp	bar	0,16	0,16	0,25	0,25	0,25	0,63	0,40	0,10	0,40	0,63	0,63	0,63	0,40	0,63
Mechanical environmental condition	-	-	M2	M2	M2	M2	M2	M2	M2	M2	M2	M2	M2	M2	M2	M2
Electromagnetic ambient condition	-	-	E1	E1	E1	E1	E1	E1	E1	E1	E1	E1	E1	E1	E1	E1
Climatic environmental condition [3]	-	°C	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55
Flow profile sensitivity	-	-	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0
Protection class (flood-proof)	-	-	IP68	IP68	IP68	IP68	IP68	IP68	IP68	IP68	IP68	IP68	IP68	IP68	IP68	IP68

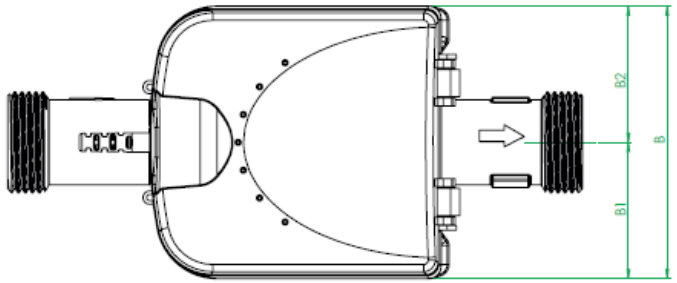
[1] Other measuring ranges and lengths available on request
[2] The data refer to the standard measuring range
[3] Condensation possible
[4] Flange according to ISO 7005-2
Attention: not all versions are available in all markets

17.2 Dimensions and measurement sketches IUWS

Dimensions and weights:																
Nominal diameter	DN	mm	15	15	15	15	20	20	20	25	25	25	25	32	40	50
		Inch	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"	1"	1"	1"	1"	1 1/4"	1 1/2"	2"
Overall length without screw connections [1]	L2	mm	110/115	145/165/ 170/190	110/115	145/165/ 170/190	130/160/ 165/190	105	130/160/ 165/190	175	160/260	175	260	160/260	300	300
Overall length with screw connection approx.	L1	mm	190/195	225/245/ 250/270	190/195	225/245/ 250/270	226/256/ 261/286	201	226/256/ 261/286	293	278/378	293	378	284/384	428	444
Thread at meter G x B	D1	Inch	3/4"	3/4"	3/4"	3/4"	1"	1"	1"	1 1/4"	1 1/4"	1 1/4"	1 1/4"	1 1/2"	2"	2 1/2"
Thread Connector R x	D2	Inch	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"	3/4"	1"	1"	1"	1"	1 1/4"	1 1/2"	2"
Width	B	mm	98,00	98,00	98,00	98,00	98,00	98,00	98,00	98,20	98,20	98,20	98,20	98,20	116,40	116,40
Width	B1	mm	53,00	53,00	53,00	53,00	53,00	53,00	53,00	56,00	56,00	56,00	56,00	56,00	63,80	63,80
Width	B2	mm	45,00	45,00	45,00	45,00	45,00	45,00	45,00	42,20	42,20	42,20	42,20	42,20	52,60	52,60
Height (overall)	H1	mm	80,00	80,00	80,00	80,00	80,00	80,00	80,00	80,00	80,00	80,00	80,00	81,20	93,20	101,00
Height	H2	mm	25,30	25,30	25,30	25,30	25,30	25,30	25,30	22,70	22,70	22,70	22,70	23,90	29,80	37,60
Weight approx.	-	kg	0,80/0,81	0,90/0,85/ 0,86/0,90	0,80/0,81	0,90/0,85/ 0,86/0,90	0,80/0,84 0,85/0,90	0,75	0,80/0,84/ 0,85/0,90	0,87	1,1/1,30	0,87	1,30	1,2/1,4	1,90	2,30

[1] Other measuring ranges and lengths available on request





17.3 Technical data IUW

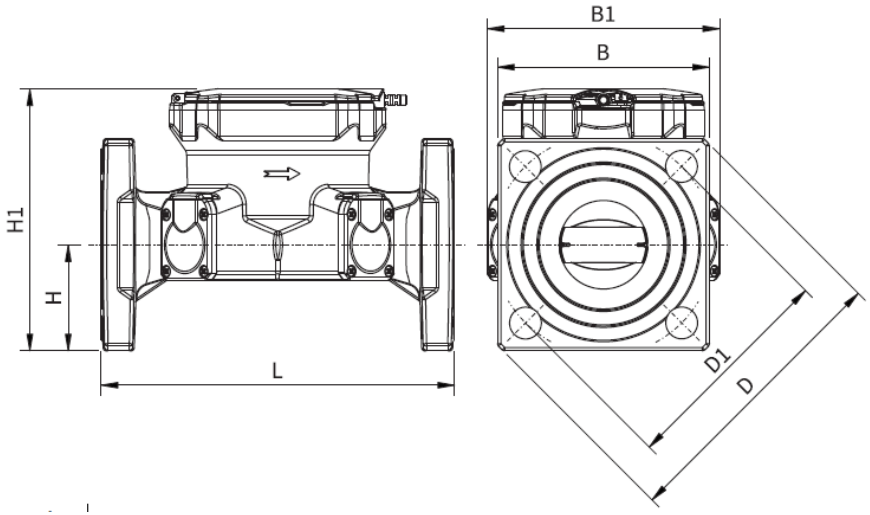
Nennweite	DN	mm	**50**	**50**	**65**	**65**	**80**	**80**	**100**	**100**	**125**	**125**	**150**	**150**	**200**	**200**
Dauerdurchfluss	Q_3	m³/h	25	40	40	63	63	100	100	160	160	250	250	400	400	630
Erreichbarer Messbereich	Q_3/Q_1	R	500	800	500	800	500	800	500	800	500	800	500	800	500	800
Standard Messbereich [1]	Q_3/Q_1	R	500	500	500	500	500	500	500	500	500	500	500	500	500	500
Überlastdurchfluss	Q_4	m³/h	31,25	50,00	50,00	78,75	78,75	125,00	125,00	200,00	200,00	312,50	312,50	500,00	500,00	787,5
Überlastdurchfluss max.	Q_{4M}	m³/h	55,00	55,00	87,00	87,00	138,00	138,00	220,00	220,00	344,00	344,00	550,00	550,00	865,00	865,00
Mindestdurchfluss [2]	Q_1	m³/h	0,05	0,08	0,08	0,13	0,13	0,20	0,20	0,32	0,32	0,50	0,50	0,80	0,80	1,26
Übergangsdurchfluss [2]	Q_2	m³/h	0,08	0,13	0,13	0,20	0,20	0,32	0,32	0,51	0,51	0,80	0,80	1,28	1,28	2,01
Untere Messgrenze	-	l/h	25	25	40	40	63	63	100	100	100	250	250	250	400	400
Anzeigebereich	min	l	1	1	1	1	1	1	1	1	1	1	10	10	10	10
	max	m³	999.999	999.999	999.999	999.999	999.999	999.999	999.999	999.999	999.999	999.999	9.999.999	9.999.999	9.999.999	9.999.999
Temperaturbereich	-	°C	0,1 - 50	0,1 - 50	0,1 - 50	0,1 - 50	0,1 - 50	0,1 - 50	0,1 - 50	0,1 - 50	0,1 - 50	0,1 - 50	0,1 - 50	0,1 - 50	0,1 - 50	0,1 - 50
Betriebsdruck	MAP	bar	0,3 - 16	0,3 - 16	0,3 - 16	0,3 - 16	0,3 - 16	0,3 - 16	0,3 - 16	0,3 - 16	0,3 - 16	0,3 - 16	0,3 - 16	0,3 - 16	0,3 - 16	0,3 - 16
Druckverlustklasse bei Q_3	Δp	bar	0,16	0,25	0,16	0,25	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10
Mechan. Umgebungsbedingung	-	-	M2	M2	M2	M2	M2	M2	M2	M2	M2	M2	M2	M2	M2	M2
Elektromagnetische Umgebungsklasse	-	-	E2	E2	E2	E2	E2	E2	E2	E2	E2	E2	E2	E2	E2	E2
Klimat. Umgebungsbedingung [3]	-	°C	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55	5 - 55
Strömungsprofilempfindlichkeit	-	-	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0	U0/D0

[1] Other measuring ranges and lengths available on request
[2] The data refer to the standard measuring range
[3] Condensation possible
[4] Flange according to ISO 7005-2
Attention: not all versions are available in all markets

17.4 Dimensions and measurement sketches IUW

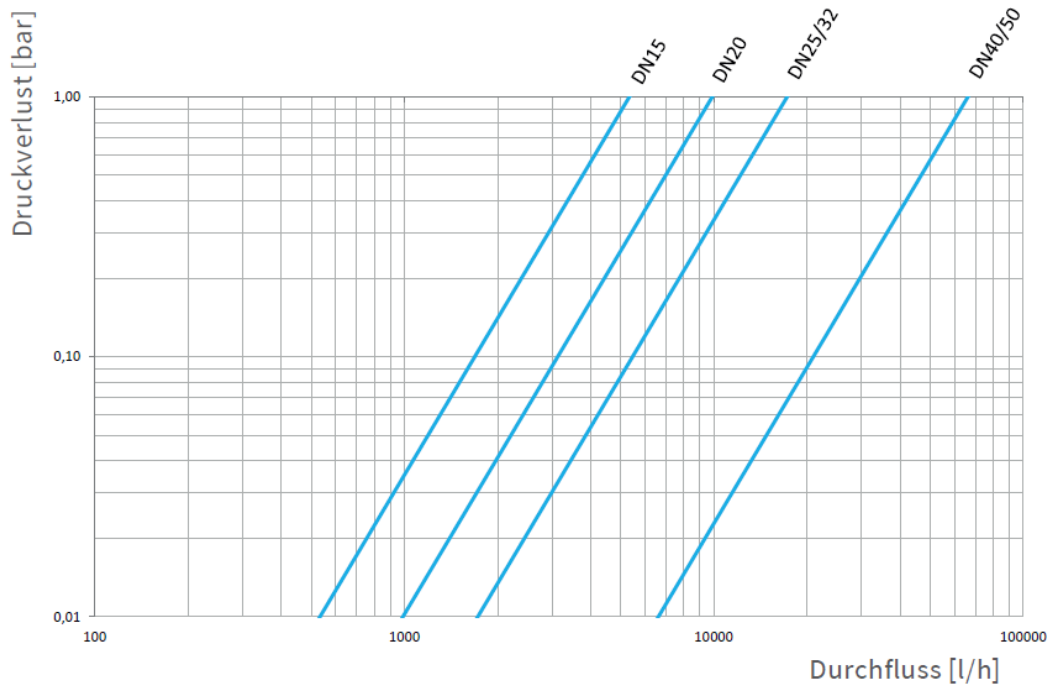
Nennweite	DN	mm	50	50	65	65	80	80	100	100	125	125	150	150	200	200
Baulänge	L	mm	200/270/300	200/270/300	200/300	200/300	200/225/ 300/350	200/225/ 300/350	250/350/360	250/350/360	250	250	300/500	300/500	350	350
Höhe	H	mm	60	60	73	73	94	94	104	104	117	117	135	135	162	162
Höhe	H1	mm	150	150	165	165	203	203	221	221	247	247	277	277	326	326
Breite	B	mm	120x120	120x120	145x145	145x145	= D	= D	= D	= D	= D	= D	= D	= D	= D	= D
Breite	B1	mm	135	135	150	150	< D	< D	< D	< D	< D	< D	< D	< D	< D	< D
Durchmesser Flansch	D	mm	165	165	185	185	200	200	220	220	250	250	285	285	340	340
Durchmesser Lockreis	D1	mm	125	125	145	145	160	160	180	180	210	210	240	240	295	295
Anzahl Schrauben	-	Stück	4	4	4	4	8	8	8	8	8	8	8	8	12	12
Schraubengröße	-	mm	M16	M16	M16	M16	M16	M16	M16	M16	M16	M16	M20	M20	M20	M20
Schraubenloch Durchmesser	-	mm	19	19	19	19	19	19	19	19	19	19	23	23	23	23
Gewicht ca.	-	kg	7,0/8,8/9,6	7,0/8,8/9,6	8,7/10,8	8,7/10,8	11,2/11,6/ 12,6/13,9	11,2/11,6/ 12,6/13,9	13,7/16,2/16,3	13,7/16,2/16,3	16,4	16,4	24,1/29,4	24,1/29,4	35,5	35,5

[1] Other measuring ranges on request
[2] The data refer to the standard measuring range
[3] Condensation possible
[4]During electromagnetic interference, data transmission between the NFC interface and the NDC module may be disrupted, resulting in a loss of radio transmission. However, this does not affect the counting progress on the measuring device itself.
Attention: not all versions are available in all markets

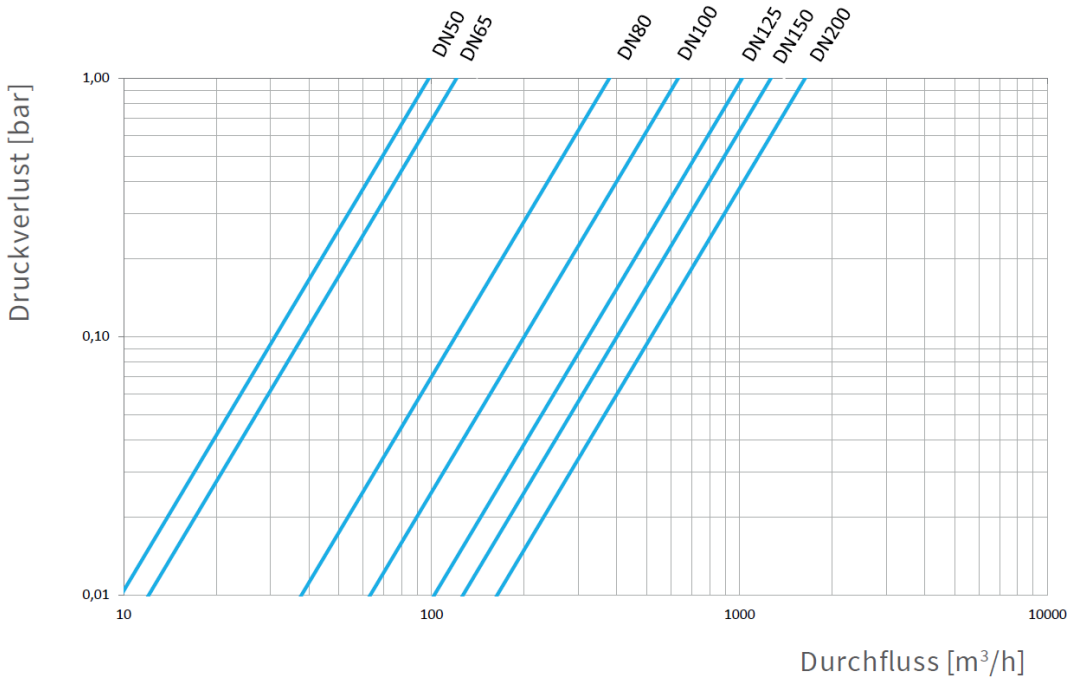


18 Pressure loss curves

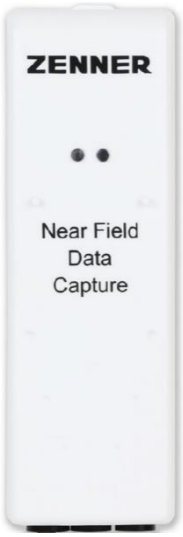
18.1 Pressure loss curve IUWS



18.2 Pressure loss curve IUW



19 NDC-communication module



The NDC communication module is required for remote radio reading of the IUW. The IUWS can be optionally equipped with an NDC to optimise the radio range in difficult installation locations such as meter shafts, for example.
The NDC does not replicate pulses; instead, the actual meter reading of the electronic meter is transmitted and can therefore be considered equivalent to encoders or heat meters with integrated radio modules.
The NDC module queries the consumption and status information of the connected meter via the NFC interface of the respective meter and transmits this information by radio.
The data is transferred unchanged by the NDC. The content of the data telegrams depends on the activated transmission scenario of the meter.
The NDC has a cable length of three or ten metres.

The following variants of the NDC communication module are in use:

NDC - Variant	Cable length	Article number	Short text
NDC radio module LoRaWAN®	3m	171620 (*)	NDC LoRa 3m:
NDC radio module wireless M-Bus	3m	171621 (*)	NDC LoRa 3m:
NDC radio module LORA-WMBUS	3m	178216	NDC LORA-WMBUS 868 OD IP68 A
NDC radio moduleLORA-WMBUS	10m	180653	NDC LORA-WMBUS 868 OD IP68 A 10M

* no longer in production

Performance characteristics of the NDC module:

- Easy installation on the meter
- Plug & Play – start-up mode
- Protection class IP68
- LoRa version LoRaWAN® certified:
  Can be used with various LoRaWAN® network providers
- wM-Bus version OMS certified (4.0.2)
- optical interface (IrDA)
- Supports both LoRaWAN® and wireless M-Bus and automatically adopts the settings of the connected water meter
- Calculated battery life:
  - LoRaWAN®: 10 years
  - wM-Bus: up to 12 years
- **Advantage of the external NDC module:**
  Particularly when installing in a shaft, positioning directly beneath the shaft cover is possible, thus achieving optimum radio wave radiation.
- If necessary, the NDC module can be flexibly moved from one meter to the next; the module automatically transfers the data from the last connected meter.

The installation, commissioning and radio activation of the NDC are described in detail in the accompanying installation instructions.

Note: ZENNER recommends communication scenarios 312 and 313 for the combination IUW+NDC in the wireless M-Bus area. The **daily value** of 24:00 is transmitted by radio with each radio telegram. The **current register reading** is not transferred with these scenarios! If the user selects other available transmission scenarios (using the B.One Device Manager Basic app), the battery life of the NDC module is significantly reduced. You can find an overview of available communication scenarios at zenner.com in the IUW product area.

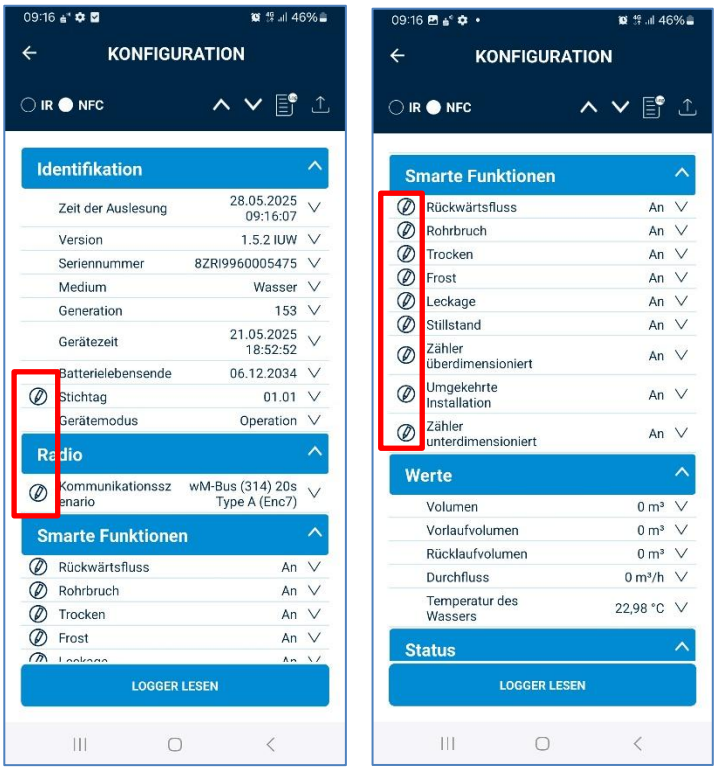
20 Configuration and readout software

The IUW and IUWS are configured and read out via the NFC interface. We recommend using the free B.One Device Manager Basic app. The app can be used to configure both the IUW and the IUWS in the same way without any separate accessories.

The following are examples of possible configuration settings:

- ✓ Set key date
- ✓ Activate the meter.
- ✓ Set radio communication scenario
- ✓ Activate parallel radio
- ✓ Select LoRaWAN activation mode
- ✓ Switch ADR on/off
- ✓ Switch smart functions on/off
- ✓ Read out logger

Selection of adjustable parameters



You can find the link to download the app from Google Play Store on the ZENNER website at the following link: https://zenner.com/products/zenner-device-manager-basic/.
Further documents relating to the app are also stored there (user manual, release notes, etc.).

21 Accessories (MinoConnectBluetooth, Strainer, Backflow preventer)

Accessories	DN	Article number	Short text	Image
MinoConnectBluetooth-Radio Radiotransceiver		186435	MinoConnect III BTLE Radio ZR	
MinoConnect Set USB NDC (required when using the Windows configuration software MSS from ZENNER)		175959	MINOCONNECT SET USB NDC	
NDC MiCon Modul (for customers who already use the MinoConnectSetUSB Opto)		158406	NDC MiCon Modul	
Brass screw connections with seal (2 pieces required per meter)	15	100252		
	20	100776		
	25	100777		
	32	100781		
	40	100782		
	50	100783		
Plug-in Backflow preventer * incl. seal **without seal	15	111382*		
	20	187968**		
	25	111386**		
	40	110391*		
2 seals				
Tamperproof clamp (2 half shells)				

22 Documentation

22.1 Weblinks

- Data sheet ultrasonic residential and domestic water meter IUWS
- Data sheet ultrasonic bulk water meter IUW
- Data sheet NDC communication module wM-Bus/LoRaWAN®

- Installation and operating instructions ultrasonic apartment and domestic water meter IUWS
- Installation and operating instructions ultrasonic bulk water meter IUW
- Installation and operating instructions NDC communication module wM-Bus / LoRaWAN®)
- Configuration ultrasonic water meter IUWS / IUW (+NDC) via ZENNER Device Manager Basic App
- Declaration of conformity ultrasonic apartment and domestic water meter IUWS
- Declaration of conformity ultrasonic bulk water meter IUW
- Declaration of conformity NDC communication module

- Display description for ultrasonic water meter IUW/IUWS
- Radio communication scenario list (wM-Bus / LoRaWAN®)
- Tender text ultrasonic apartment and domestic water meter IUWS (DE)
- Tender text ultrasonic bulk water meter IUW (DN50 bis DN200) DE
- Tender text NDC-communication module (DE)

- Flyer_ZRI_ZennerDeviceManagerBasic_220401_EN.pdf
- Infoblatt_ZennerDeviceManagerBasic_DE.pdf
- Userguide ZENNER Device Manager Basic
- Licence and Terms of Use ZENNER Device Manager Basic App
- Privacy Policy ZENNER Device Manager Basic App

- Datasheet MinoConnectBluetoothRadio
- Installation and operating instructions MinoConnectBluetoothRadio
- Declaration of conformity MinoConnectBluetoothRadio
- Tender text MinoConnectBluetoothRadio (DE)

22.2 Documents for system integrators

- User guide for system integrators IUW-IUWS (on request)
- LoRa radio packet definitions (upon request)
- Radio library user guide (on request)

22.3 Product videos (multilingual)

- 3D product video IUWS and Metering as a Service
- 3D product video IUW
- User videos on the functions of the ZENNER Device Manager Basic app

22.4 Explanation of ERP system short texts

Example heat meter: IUWS 4-190-3/4 R250 T50 DC202/342 RK ECO

Feature	Designation in ERP short text	Explanation
Meter type	IUWS	Inline Ultrasonic Water meter Small
Permanent Flowrate	Tel: +49 681 9 96 76 - 4	Q3 in m^3/h
Overall length without connectors	DN50, 170, 175, 260, 125, 150, 200, 250, 300	in mm
Nominal diameter	½; ¾; 6/4; 2	inch
Measuring range ratio	R250/R500	R=Q3/Q1
Temperature range	T50	in °C
Options	DC	D cell
	0711 94 91 -1152	LoRa radio scenarios
	312, 313, 318, 319, 321, 324, 329, 342	wM-Bus radio scenarios
	202/342	Parallel radio LoRaWAN® and wM-Bus
	RK	Device-specific AES key
	CC	C cell
	DC	D cell (standard ex works)
	ECO	Eco-Brass/Lead-free brass

Example IUW bulk water meter: IUW DN100-360 100-R500 PN16 T50 202

Feature	Designation in ERP short text	Explanation
Meter type	IUW	Inline Ultrasonic Water meter Small
Nominal diameter	DN50; DN65; DN80; DN100; DN125; DN150; DN200; DN250; DN300	in mm
Overall length without connectors	DN50, 200, 225, 250, 270, 300, 350, 360, 500	in mm
Permanent flowrate	DN50, 40, 63, 100, 160, 250, 400, 450, 500	Q3 in m^3/h
Standard measuring range	R500	R=Q3/Q1
Operating pressure	PN16	in bar
Temperature range	T50	in °C
Options	0711 94 91 -1152	LoRa radio scenarios
	312313	wM-Bus radio scenarios
	RK	Device-specific AES key

23 Disposal

Disposing of waste properly prevents harm to people and the environment and promotes the reuse of valuable raw materials. Please note that the regulations applicable in the country where the device is installed must be observed.

Do not dispose of the devices with domestic waste. In this way, you will help to protect natural resources and to promote the sustainable reuse of material resources. Illegal or improper disposal will result in penalties imposed in accordance with the regulations applicable in the country of installation.

23.1 Disposal by ZENNER

The devices contain non-removable and non-rechargeable lithium batteries. Batteries contain substances, which could harm the environment and might endanger human health if not disposed of properly.

To reduce the disposal quantity so as unavoidable pollutants from electrical and electronic equipment in waste, old equipment should be reused prior or materials recycled or reused as another form. This is only possible if old equipment, batteries, other accessories and packaging of the products are returned to the manufacturer or handed in at recycling centres.

Our business processes generally provide that we or the specialist companies we use take old devices including batteries, other accessories and packaging material back with us after they have been replaced or at the end of their useful life and dispose of them properly.

Insofar as no other contractual arrangement has been made in this respect, your local or municipal authority or the local waste disposal company can give you information relating the collection points for your used equipment. ZENNER will always ensure correct disposal.

23.2 Battery replacement

The replacement of batteries in the IUW / IUWS by our customers is not provided for in the European Economic Area. Replacement can only be carried out by ZENNER.

For reasons of sustainability, the IUWS is designed so that in countries where battery replacement is permitted, a sealed battery pack can be replaced in the field by the customer themselves.

23.3 Technical data of the battery

The data sheet, safety data sheet and the corresponding test report for the battery (item number 180217) are available on request.

23.4 RoHS material table

RoHS is Directive 2011/65/EU (Restriction of certain Hazardous Substances) on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

ZENNER hereby confirms that none of the substances listed below are added during the manufacture of our products. After checking with our direct suppliers, these substances are not used there either.

Substance name	CAS No.	Limit value
Lead (Pb) and all its connections		< 0.1% by weight
Mercury (Hg)	7439-97-6	< 0.1% by weight
Cadmium (Cd)	7440-43-9	< 0.01% by weight
Hexavalent chromium (Cr VI)	18540-29.9	< 0.1% by weight
Polybrominated biphenyls (PBB)	2052-07-5; 2113-57-7; 92-660; 36355-01-8	< 0.1% by weight
Polybrominated diphenyl ethers (PBDE)	32534-81-9	< 0.1% by weight
Di(2-ethylhexyl) phthalate (DEHP)	117-81-7	< 0.1% by weight
Butyl benzyl phthalate (BBP)	85-68-7	< 0.1% by weight
Dibutyl phthalate (DBP)	84-68-2	< 0.1% by weight
Diisobutyl phthalate (DIBP)	84-69-5	< 0.1% by weight

24 Support

You can reach our support team during normal business hours, preferably via the contact form on our website: https://zenner.com/contact/

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