Dynasonics®
Ultrasonic Flow Meters

UHC100

Ultrasonic Heat Meter / Cooling Energy Meter

Badger Meter

HYB-UM-03193-EN-02 (November 2020)

User Manual

CONTENTS

SCOPE OF THIS MANUAL

This manual is intended to help you get the UHC100 meter up and running quickly.
Read this manual carefully before attempting any installation or operation. Keep the manual accessible for future reference.

Typographic Conventions

- In step-by-step instructions, bold text indicates items on the screen you need to select or act upon.
  Example: Click the **Setup** menu.
- Names of parameters, options, boxes, columns and fields are italicized.
  Example: The value displays in the *Status* field.
- Messages and special markings are shown in quotation marks.
  Example: "Error" displays in the title bar.
- In most cases, software screen text appears in the manual as it does on the screen. For example, if a word is capitalized on the screen, it is capitalized when referred to in the manual.

UNPACKING AND INSPECTION

Upon opening the shipping container, visually inspect the product and applicable accessories for any physical damage such as scratches, loose or broken parts, or any other sign of damage that may have occurred during shipment.

NOTE: If damage is found, request an inspection by the carrier's agent within 48 hours of delivery and file a claim with the carrier. A claim for equipment damage in transit is the sole responsibility of the purchaser.

SAFETY

Terminology and Symbols

⚠ DANGER	Indicates a hazardous situation, which, if not avoided, *will* result in death or serious personal injury.
⚠ WARNING	Indicates a hazardous situation, which, if not avoided, *could* result in death or serious personal injury.
⚠ CAUTION	Indicates a hazardous situation, which, if not avoided, *could* result in minor or moderate personal injury or damage to property.

Safety Considerations

- The installation of the UHC100 meter must comply with all applicable federal, state, and local rules, regulations, and codes.
- Do not use sharp objects when operating the device (such as using a pen to press buttons on the keypad).

⚠ WARNING

NOT FOLLOWING INSTRUCTIONS PROPERLY MAY IMPAIR SAFETY OF EQUIPMENT AND/OR PERSONNEL.

⚠ WARNING

AFTER DE-ENERGIZING, DELAY 5 MINUTES BEFORE OPENING.

Basic Safety Recommendations

Before installing or using this product, please read this manual thoroughly. Only qualified personnel should install and/or repair this product. If a fault appears, contact your distributor.

Installation

- Do not place any unit on an unstable surface that may allow it to fall.
- Never place the units above a radiator or heating unit.
- Route all cabling away from potential hazards.
- Isolate from the mains before removing any covers.

Power Connection

- Use only the type of power source suitable for electronic equipment. If in doubt, contact your distributor. Check that any power cables are of a sufficiently high current rating.
- All units must be earthed to eliminate risk of electric shock.
- Failure to properly earth a unit may cause damage to that unit or data stored within it.

Protection Class

The device has protection class IP 65/67/68.

Setup and Operation

Adjust only those controls that are covered by the operating instructions. Improper adjustment of other controls may result in damage, incorrect operation or loss of data.

Cleaning

- Switch off all units and isolate from mains before cleaning.
- Clean using a damp cloth. Do not use liquid or aerosol cleaners.

Repairing Faults

Disconnect all units from power supply and have it repaired by a qualified service person if any of the following occurs:

- Power cord or plug is damaged or frayed.
- Unit does not operate normally when operating instructions are followed.
- Unit exposed to rain/water or if any liquid has been spilled into it.
- Unit has been dropped or damaged.
- Unit shows a change in performance, indicating a need for service.

⚠WARNING

FAILURE TO ADHERE TO THESE SAFETY INSTRUCTIONS MAY RESULT IN DAMAGE TO THE PRODUCT OR SERIOUS BODILY INJURY.

RoHs

Our products are RoHs compliant.

Battery Disposal

The batteries contained in our products need to be disposed of as per your local legislation acc. to EU directive 2006/66/EG.

APPLICATION FIELD

The Dynasonics® UHC100 ultrasonic heating and cooling energy meter (hereinafter referred to as "the meter") is designed to measure the consumption of heating and cooling energy and record data in two separate registers. It is used in individual or district heating facilities (for example, residential buildings, enterprises, organizations or supply facilities) for the commercial metering of consumed energy where water is the heat carrier.

This is a compact microprocessor meter for mounting optionally either at the supply or return heat exchange circulation system with permanently connected temperature sensors.

The meter complies with the requirements of Annex 1, Annex MI004 to the Technical Regulation on Measuring Instruments and harmonized standards LST EN 1434 – Heat meters (LST EN 1434-1:2016, LST EN 1434-2:2016, LST EN 1434-3:2016, LST EN 1434-4:2016, LST EN 1434-5:2016).

The meter meets the requirements of Environmental Class C according to LST EN1434-1:2016.

Climatic Environmental Conditions:	Temperature range:	41…131° F (5…55 °C)
	Humidity:	Condensing
	Location:	Closed
Mechanical Environment Class:	M1	
Electromagnetic Environment Class:	E2	

MEASUREMENT CANADA

The meter is approved by Measurement Canada in accordance with regulations and specifications established under the Weights and Measures Act as a thermal energy meter for heating type systems in residential, commercial, industrial and institutional usage.

Flow Sensory Accuracy:	Class 2
Heat Conveying Liquid:	Water
Ambient Temperature:	41…131° F (5…55 °C)
Relative Humidity:	<93%

OPERATING PRINCIPLE

The flow rate is measured on the basis of the ultrasonic measurement principle. The ultrasonic signal is sent along the flow sensor upstream and downstream between the ultrasonic sensors, which alternately perform transmitter and receiver functions. The flow rate is calculated on the basis of the measured propagation time difference (downstream and upstream).

The temperature differential between the supply and return flows is measured by resistive temperature sensors. The electronic unit calculates the amount of consumed heat energy by integrating over time the difference of the enthalpies of supply and return heat carrier and provides the data on the display.

Energy calculation formulas:

When the flow sensor is in the supply line: $Q = V * \rho_1 * (hT_1 - hT_2)$

When the flow sensor is in the return line: $Q = V * \rho_2 * (hT_1 - hT_2)$

Where:

$Q =$	Heat energy
$V =$	The volume of water passing through the meter, m^3
$\rho_1, \rho_2 =$	The water density corresponding to the supply and return heat carrier temperatures Θ1 and Θ2 measured by the supply and return water temperature sensors T_1 and T_2
$hT_1, hT_2 =$	The calculated specific enthalpy of the heat carrier for the temperatures Θ1 – Θ2

When the cooling energy tariff function is activated, in case of a negative temperature differential, energy will be accumulated in the additional tariff register $Q_{\text{☼}}$. In this case, energy values are calculated according to the following formulas:

When the flow sensor is in the supply line

when Θ1 > Θ2: $Q = V * \rho_1 * (hT_1 - hT_2)$, $Q_{\text{☼}} = 0$

when Θ1 < Θ2: $Q_{\text{☼}} = V * \rho_1 * (hT_2 - hT_1)$, $Q = 0$

When the flow sensor is in the return line

when Θ1 > Θ2: $Q = V * \rho_2 * (hT_1 - hT_2)$, $Q_{\text{☼}} = 0$

when Θ1< Θ2: $Q_{\text{☼}} = V * \rho_2 * (hT_2 - hT_1)$, $Q = 0$

The electronic unit of the heat meter performs all necessary measurement and data storage functions. The unit:

- Measures heat energy and determines overload characteristics;
- Calculates and stores maximum values;
- Stores data necessary for reports for a day set yearly and monthly;
- Measures the consumption under tariffs;
- Stores 36-month values, including the calculated energy, volume, and tariff register;
- Determines errors;
- Displays values, parameters (selectively) and error codes;
- Performs test and service functions.

INSTALLATION PROCEDURE

General Requirements

Prior to installing the meter:

- Check the complete set of the meter with that specified in the technical documentation;
- Check for any visible mechanical defects;
- Check the configuration of the meter and change it, if necessary.

The meters may only be installed by qualified specialists in accordance with the requirements of this document and the meter installation design.

DO NOT lay signal wires closer than 2 in. (5 cm) from power cables or cables of other devices.

Checking the Meter Configuration

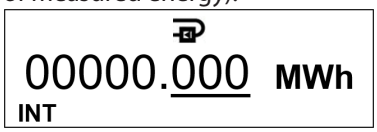
Prior to installing the meter, verify that its configuration complies with the requirements for the specific facility and change it, if necessary (if the meter is in the transport mode, the configuration can also be changed by the press-button or with HEAT3_service configuration software, without damaging the meter structure or seals). The following parameters are verified (the factory settings for the meter are their standard ones):

- Whether the meter is intended to be installed in a supply or return pipe;
- Whether the meter is intended to measure heat energy or heat and cooling energy;
- Energy measurement units;
- Displayed energy resolution (point position);
- Whether the tariff registers are activated and the functioning conditions of the tariff registers;
- Whether the pulse inputs are activated, their purpose, pulse values, initial values of their volume registers, and volume register resolution (point position);
- Whether the pulse outputs are activated, their purpose, pulse values, initial values of their volume registers, and volume register resolution (point position);
- The reporting year and month date;
- The subscriber number;
- The internal clock time;
- M-Bus interface addresses and communication speed.

NOTE: The transport mode will turn off automatically (the possibility to change configuration parameters will be turned off) when the meter starts operation and the volume integrator has accumulated more than 1 litre. For meters powered externally without a battery, the meter will remain in transport mode if the meter is not powered, but there is flow. The transport mode can also be turned off using the button (like turning on *Test Mode*) and with the HEAT3_service configuration software

Procedure for Checking the Meter Configuration

If the meter is in the transport mode, its display is off in the stand-by state. The display is turned on by pressing the button and, as long as the meter is in the transport mode, it will turn off after 5 minutes (in the normal operation mode, the display is constantly on and constantly shows the value of measured energy).



To review and change of the configuration, press and hold down the button until INF turns on at the bottom of the LCD. To select a parameter, press and release the button then change the parameter, if necessary.

NOTE: 1) The symbol ←→ shows that the meter is in the transport mode.
2) *The marked parameters are displayed only in the transport mode.
3) **The marked parameters can also be changed in the normal operation mode.

LCD Image	Parameter	Possibility to change
←→ 0.000 kW INF	Heat capacity	
←→ m³h 0.000 INF	Flow rate	
1 ←→ m³h 0 °C INF	Temperature T1	
2 ←→ m³h 0 °C INF	Temperature T2	
1-2 ←→ m³h 0.0 °C INF	Temperature differential T1-T2	
←→ SEt. 0.000 MWh INF	Installation place Heat or heat/cooling meter Energy measurement units and point position	Yes* Yes* Yes*
←→ b: 2027.03 INF	Battery service life end date	
←→ 2017.07.24 INF	Date (year.month.day)	Yes
←→ 15-07-32 INF	Time (hour-minute-second)	Yes
←→ --. 01. 32 INF	Reporting date of the year (month.day)	Yes
←→ --. --. 31 INF	Reporting day of the month	Yes

NOTE: 1) The symbol ←→ shows that the meter is in the transport mode.
2) *The marked parameters are displayed only in the transport mode.
3) **The marked parameters can also be changed in the normal operation mode.

LCD Image	Parameter	Possibility to change
1 L1 0.0 °C INF MAX	Parameter of the 1st tariff Parameter value Parameter condition	Yes
1 L2 0.0 °C INF MAX	Parameter of the 2nd tariff Parameter value Parameter condition	Yes
1 ←→ m³ In 0.001 INF	Mode of the 1st pulse input/output Pulse value	Yes
2 ←→ m³ In 0.001 INF	Mode of the 2nd pulse input/output Pulse value	Yes
1 ←→ m³h 00000.000 INF	Initial reading of the 1st pulse input Point position of the 1st pulse input	Yes*
2 ←→ m³h 00000.000 INF	Initial reading of the 2nd pulse input Point position of the 2nd pulse input	Yes*
1 ←→ buSA 1 INF	Initial address of M-bus protocol of the 1st wire interface	Yes*
1 ←→ 2400E bPS INF	Communication speed of the 1st wire interface, bits per second (E – parity Even)	Yes*
2 ←→ buSA 1 INF	Initial address of M-bus protocol of the 2nd wire interface	Yes*
2 ←→ 2400E bPS INF	Communication speed of the 2nd wire interface, bits per second (E – parity Even)	Yes*
←→ H: ---- INF	Heat carrier type (---- - water)	

NOTE: 1) The symbol ←→ shows that the meter is in the transport mode.
2) *The marked parameters are displayed only in the transport mode.
3) **The marked parameters can also be changed in the normal operation mode.

LCD Image	Parameter	Possibility to change
←→ C: 0000000 **INF**	Subscriber number	Yes
←→ SoFt 0.01 **INF**	Software version number	
←→ 0000000 **INF**	Meter factory (serial) number	
←→ 0000000.0 h **INF**	Error-free meter operation time	
←→ b:0000000 h **INF**	Total operation time of the meter	
←→ tESt on Wh **INF**	For activating the *Test Mode* and the output of energy pulses through the optical interface	Yes**
←→ tESt on **m³** **INF**	For activating the *Test Mode* and the output of volume pulses through the optical interface	Yes**
←→ InStALL **INF**	For activating the RF interface installation mode by the press-button (press and hold)	Yes**

Changing the Meter Configuration

The parameters marked in *"Procedure for Checking the Meter Configuration" on page 9* can be changed using the configuration program HEAT3_service (or with buttons, if the meter is in transport mode). If the transport mode is turned off in the meter, to change parameters (except type of energy measurement, measurement units and installation place), the slot SERVICE should be opened at the back of the electronic unit by breaking the partition and to short-circuit the contacts inside (TEST indication will turn on). By short-circuiting the contacts repeatedly, the configuring function will be turned off. After configuration, the slot must be sealed with a sticker seal.

Electrical Wiring

If the meter is to be powered from an external 230V AC or 24V AC/DC source, the cable of the meter intended for the purpose and respectively marked is connected to the respective source (see *"Transportation and Storage" on page 30*).

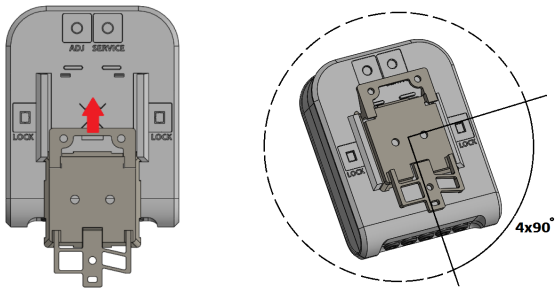
If the meter is completed with wire interfaces or the *Pulse Input/Output* function, the cables intended for the purpose and respectively marked are connected to the respective external appliance (see *"Transportation and Storage" on page 30*).

Mounting the Calculator

Mount the electronic unit (calculator) of the meter in a heated room. The temperature of the working environment should not be higher than 131° F (55° C). It may not be exposed to direct sunlight.

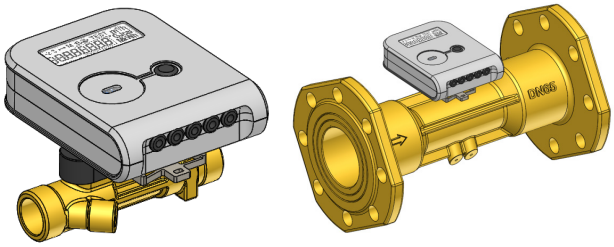
No special requirements are established for the free space around the meter. It is important that nearby installations or structures do not rest against the housing of the meter, do not hinder the laying of cables and reading of data on the display. Install the meter at a safe distance from other devices emitting heat or strong electromagnetic field (in order to prevent the disturbance of its working environment conditions).

The electronic unit is mounted on an auxiliary holder. It can be oriented in the required direction at an angle of each 90:

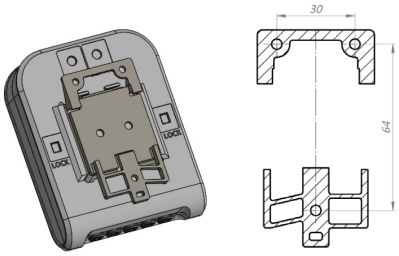


The possible ways of the mounting of the electronic unit (auxiliary holder):

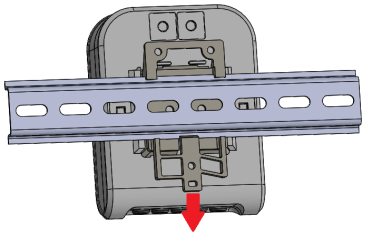
Direct mounting on the housing of the flow sensor, by turning each 90° only when the flow temperature does not exceed 194° F (90 °C):



On a wall:



In the electrical equipment cabinet, on a standard DIN rail:



IMPORTANT

DO NOT attach the electronic unit directly on the wall because there is a risk that moisture may condense on the walls of the room or the temperature of the surface of the wall may drop below 131° F (5 °C). Mount the unit to provide for an air space of at least 2 in. (5 cm) between the unit and the wall surface.

Mounting the Flow Sensors

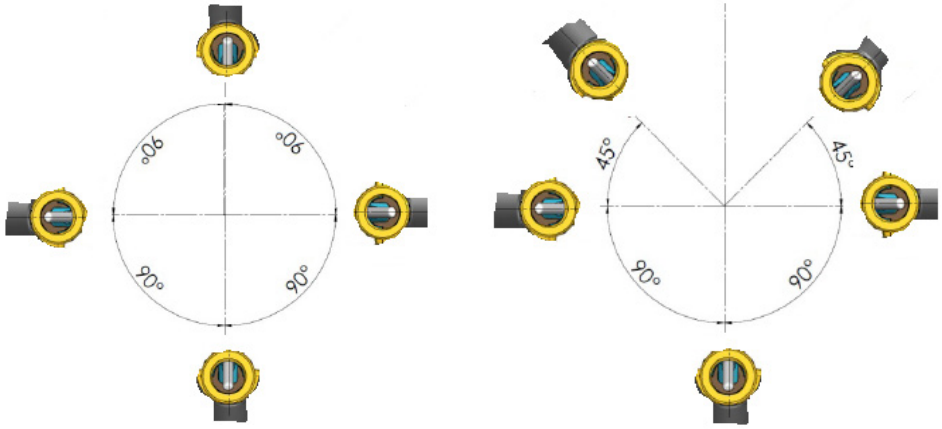
The installation and overall dimensions of the primary flow sensors are provided in *"Dimensions" on page 32*.

When installing in a pipeline, the following lengths of straight sections are required for sensors connected by flanges DN65, DN80, and DN100: upstream of the sensor, at least 5 pipe diameters; downstream of the sensor, at least 3 pipe diameters. No straight sections are required for flow sensors of other connection types either upstream or downstream of the meter.

Install flow sensors in pipelines as far as possible from pumps, partitions, and elbows.

Flow sensors may be installed horizontally, vertically, or in a slope. Mandatory condition: in the *Operating Mode*, the pipe must have a pressure of not less than 30 kPa and the pipe must be fully filled with water.

In respect of the longitudinal axis of the pipe, flow sensors with the connection type G3/4, G1, or DN20 may be mounted at any angle. See (a) in *Figure 1*; flow sensors of other connection types can be mounted in the positions specified in (b) in *Figure 1*; (it is not allowed when the flow sensor cover is oriented in a vertical position).



(a) (b)

Figure 1: Allowed installation positions of the flow sensor

The flow direction and the direction of the arrow on the flow sensor must coincide. The flow sensor can be installed either on the supply or return line, depending on the indication on the label of the meter. Prior to installing the sensor, the pipeline of the heating system must be flushed at the place of the installation of the sensor.

In order to avoid stresses in the pipelines, the distance between the flanges at the flow sensor installation place must correspond to the total length of the sensor with regard to the thickness of gaskets. Select the flow sensor installation place as far as possible from potential sources of vibration (for example, pumps). When installing the sensors, make sure the gaskets do not protrude inward the pipeline. Do not lay the wires of the flow sensor closer than 2 in. (5 cm) from power cables or cables of other devices.

Installing the Temperature Sensors

Install the temperature sensors with their placement heads upward, perpendicular to the pipe axis or at an angle of 45° to the fluid flow direction so that the sensing element is immersed in the medium being measured at least to the pipe centerline (see the figures in *"Sealing the Meter" on page 51*). When the meter is fitted with flow sensors with flanges G3/4, G1, and G1-1/4, one temperature sensor is installed in the housing of the flow sensor. DO NOT lay the wires of the temperature sensors closer than 2 in. (5 cm) from power cables or cables of other devices.

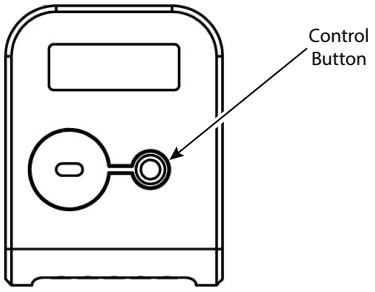
Checking Installation and Parameter Settings

If the meter (calculator, flow and temperature sensors) is installed correctly, when there is flow, the display of the meter represents the flow and temperature readings. If the readings of the measured channels are not displayed, check the installation of electrical circuits.

OPERATING PROCEDURE

Control Button

The representation of measured and information data on the display is selected by the control button located on the upper part of the electronic unit.



Representation of Data

Data are displayed on a liquid crystal, 8-digit display with special symbols for the representation of parameters, units of measurement, and *Operating Modes*:

When the flow is flowing in the right direction, it is represented by a right arrow →; when the flow flowing in the opposite direction, it is represented by a left arrow ←. When there is no flow, no arrow is displayed. The purpose of other symbols is described in *"Menu Structure" on page 16*.

This following information can be displayed:

- The values of the integral and instantaneous measured parameters when the symbol INT is displayed,
- The data of monthly archives and data of the reporting day when the symbol BIL is displayed,
- Information on the configuration of the device when the symbol INF is displayed.

The consumed heat energy is displayed constantly. Other data are represented on the display in a sequence with the use of the control button.

When the meter is configured for the installation in the supply line, the symbol is displayed; when the meter is configured for the installation in the return line, the symbol is displayed.

The symbol ⚠ is shown when there is a significant meter operation error (due to which the summing-up of energy or normal working time is suspended). For the error code, see the LCD menu item 1.12 in *"Menu Structure" on page 16*.

Menu Structure

The diagram of the review of readings of the electronic unit in the *Operating Mode* is shown in *Figure 2*. The main integral readings (1.2) or error (1.1) are shown if the button was not pressed for more than 60 seconds.

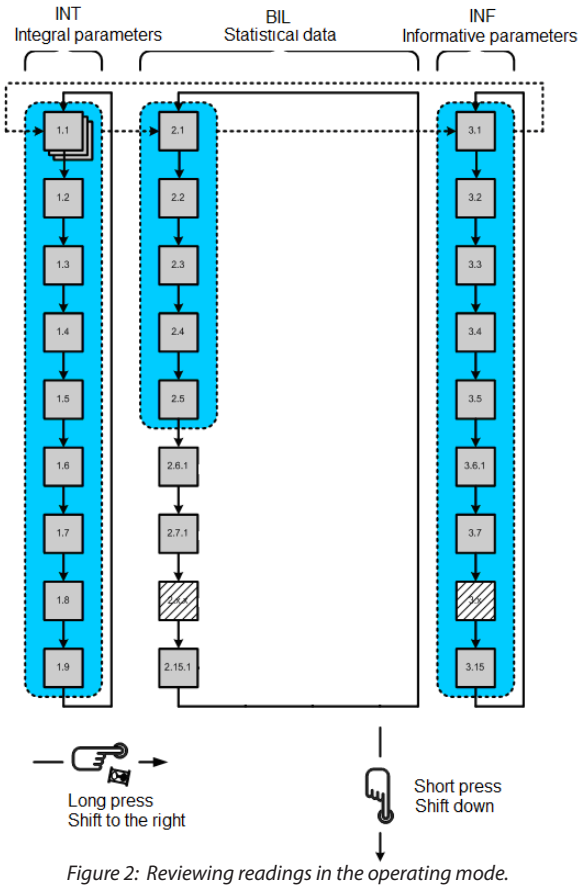
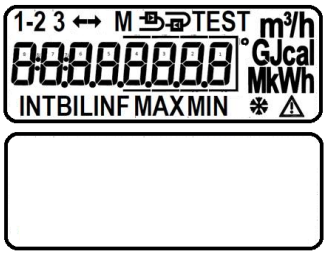


Figure 2: Reviewing readings in the operating mode.

Viewing the Readings in the Operating Mode (User Menu)

NOTE: This is a complete list of represented parameters. It can be shortened at a specific meter for the convenience of the user.

ID	Parameter	Value	Notes
1.1	Integral heating energy	00000.000 MWh INT	
1.2	Integral cooling energy	00000.000 MWh INT ☼	
1.3	Integral energy, Tariff 1	1 00000.000 MWh INT	In the case of a combined device, the "snowflake" shows that the tariff is linked with a cooling energy meter
1.4	Integral energy, Tariff 2	2 00000.000 MWh INT	In the case of a combined device, the "snowflake" shows that the tariff is linked with a cooling energy meter
1.5	Integral heat carrier volume	00000.000 m³ INT	
1.6	Integral volume of Pulse Input 1	1 00000.000 m³ INT	
1.7	Integral volume of Pulse Input 2	2 00000.000 m³ INT	
1.8	Segment test		Changes every second
1.9	No-energy operation calculation error time	00000.00 h INT	
1.10	User identification number	C:0000000 INT	Matches the secondary address of M-Bus interface

ID	Parameter	Value	Notes
1.11	Check number	0000 **INT**	
1.12	Error code and error beginning date	Er: 0001 **INT** 2017.01.01 **INT**	When there is no error, it only shows Er: 0000 When there is critical error, the images changes every second: error code and error beginning date The error code values are explained in *"Error Codes" on page 27*
2.1	Settlement day integral energy and date	00000.000 MWh **BIL** 2017.01.01 **BIL**	Changes every second
2.2	Settlement day integral cooling energy and date	00000.000 MWh **BIL** 2017.01.01 **BIL**	Changes every second
2.3	Settlement day integral Tariff 1 energy and date	**1** 00000.000 MWh **BIL** 2017.01.01 **BIL**	Changes every second
2.4	Settlement day integral Tariff 2 energy and date	**2** 00000.000 MWh **BIL** 2017.01.01 **BIL**	Changes every second

ID	Parameter	Value	Notes
2.5	Settlement day integral heat carrier volume and date	**m³** 00000.000 **BIL** 2017.01.01 **BIL**	Changes every second
2.6	Settlement day integral pulse input 1 value and date	**1** **m³** 00000.000 **BIL** 2017.01.01 **BIL**	Changes every second
2.7	Settlement day integral pulse input 2 value and date	**2** **m³** 00000.000 **BIL** 2017.01.01 **BIL**	Changes every second
2.8	Previous month integral energy and date	**M** 00000.000 MWh **BIL** 2017.01.01 **BIL**	Changes every second
2.9	Previous month integral energy and date	**M** 00000.000 MWh **BIL** ☼ 2017.01.01 **BIL**	Changes every second
2.10	Previous month integral Tariff 1 energy and date	**1** **M** 00000.000 MWh **BIL** 2017.01.01 **BIL**	Changes every second

ID	Parameter	Value	Notes
2.11	Previous month integral Tariff 2 energy and date	2 M 00000.000 MWh BIL 2017.01.01 BIL	Changes every second
2.12	Previous month integral heat carrier volume and date	M m^3 00000.000 BIL 2017.01.01 BIL	Changes every second
2.13	Previous month integral pulse input 1 value and date	1 M m^3 00000.000 BIL 2017.01.01 BIL	Changes every second
2.14	Previous month integral pulse input 2 value and date	2 M m^3 00000.000 BIL 2017.01.01 BIL	Changes every second
2.15	Previous month maximum power value and date	M 0.000 kW BIL MAX 2017.01.01 BIL	Changes every second
2.16	Previous month minimum (or maximum cooling) power value and date	M 0.000 kW BIL MIN 2017.01.01 BIL	Changes every second

ID	Parameter	Value	Notes
2.17	Previous month maximum flow-rate value and date	**M** **m^3/h** 0.000 **BIL** **MAX** 2017.01.01 **BIL**	Changes every second
2.18	Previous month supply heat carrier maximum temperature value and date	**1** **M** 0.0 °C **BIL** **MAX** 2017.01.01 **BIL**	Changes every second
2.19	Previous month return heat carrier maximum temperature value and date	**2** **M** 0.0 °C **BIL** **MAX** 2017.01.01 **BIL**	Changes every second
2.20	Previous month maximum recorded temperature differential	**1-2** **M** 0.0 °C **BIL** **MAX** 2017.01.01 **BIL**	Changes every second
2.21	Previous month supply heat carrier minimum temperature value and date	**1** **M** 0.0 °C **BIL** **MIN** 2017.01.01 **BIL**	Changes every second
2.22	Previous month return heat carrier minimum temperature value and date	**2** **M** 0.0 °C **BIL** **MIN** 2017.01.01 **BIL**	Changes every second

ID	Parameter	Value	Notes
2.23	Previous month minimum recorded temperature differential and date	**1-2** **M** 0.0 °C **BIL** **MIN** 2017.01.01 **BIL**	Changes every second
2.24	Recorded data and dates of previous months, similarly to 2.8 – 2.23 (up to 36 previous months)		When installing the meter, the selection can be set to the indication of the readings of only the last, two last, or all 36 months*
3.1	Thermal power	0.000 kW **INF**	
3.2	Heat carrier flow rate	**m^3/h** 0.000 **INF**	
3.3	Supply heat carrier temperature	**1** 0 °C **INF**	
3.4	Return heat carrier temperature	**2** 0 °C **INF**	
3.5	Temperature difference	**1-2** 0.0 °C **INF**	
3.6	Next battery replacement date	b: 2027.03 **INF**	
3.7	Device current date (real-time calendar)	2017.07.24 **INF**	
3.8	Device current time (real time)	15-07-32 **INF**	
3.9	Reporting date of the year	←→ --. 01. 31 **INF**	

ID	Parameter	Value	Notes
3.10	Reporting day of the month	←→ --. --. 31 **INF**	
3.11	Tariff 1 configuration	Example of Tariff 1, when T1-T2 is < 10.0 °C:	Possible setting: One of measured parameters, 1 or 2 pulse input (if it is configured as an input), one of the temperatures, or temperature differential.
		1-2 L1 10.0 °C **INF MAX**	
		when >10.0 °C:	
		1-2 L1 10.0 °C **INF MIN**	
		when within the range from 10.0 to 40.0°C (changes every 1 second):	
		1-2 L1 10.0 °C **INF MIN**	
		1-2 L1 40.0 °C **INF MAX**	
		when the time interval is set in hours (07-23 h):	
		1-2 L1 07-32 h **INF MAX**	
3.12	Tariff 2 configuration	Similarly to Tariff 1, only "L1" changes to "L2"	Similarly to tariff 1
3.14	2nd pulse input/output configuration	Similarly to the 1st pulse input/output, only "1" changes to "2"	Similarly to the 1st pulse input/output
3.15	Wire interface M-Bus 1 address	**1** buSA 1 **INF**	
3.16	Wire interface M-Bus 1 speed	**1** 2400E bPS **INF**	Bits per second. "E" – parity Even
3.17	Wire interface M-Bus 2 address	**2** buSA 1 **INF**	When a second wire interface is also included

ID	Parameter	Value	Notes
3.18	Wire interface M-Bus 2 speed	**2** 2400E bPS **INF**	When a second wire interface is also included Bits per second. "E" – parity Even
3.19	Heat carrier type	H: ---- **INF**	heat carrier type "----" – water
3.20	Heat carrier type	C: 0000000 **INF**	Transmitted in M-Bus telegrams
3.21	Device program version number	SoFT 0.01 **INF**	
3.22	Device factory number	00000000 **INF**	
3.23	No-energy operation calculation error time	0000000.0 h **INF**	
3.24	Battery working time	b:0000000 h **INF**	
3.25	For activating the *Test Mode* and the output of energy pulses through the optical interface	tESt on Wh **INF**	Protected by password (see *"Activating the Test Mode with the Control Button" on page 29*)
3.26	For activating the *Test Mode* and the output of volume pulses through the optical interface	**m^3** tESt on **INF**	Protected by password (see *"Activating the Test Mode with the Control Button" on page 29*)
3.27	For activating the RF interface installation mode by the press-button (press and hold)	InStALL **INF**	Protected by password (see *"Activating the Test Mode with the Control Button" on page 29*)

The indication of irrelevant parameters can be turned off. Also, parameters that are not relevant to the set meter configuration will not be indicated.

The indication of parameters can be turned on or off by means of the configuration programme HEAT3-SERVICE through the optical interface when installing the meter (if the meter is in the transport mode) or connecting the jumper SERVICE at any time.

Viewing Calculator Readings in Test Mode

The diagram of the review of calculator readings in the *Test Mode* is shown in *Figure 3*.

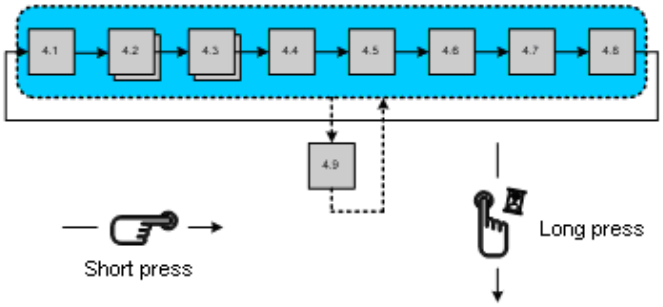


Figure 3: The diagram of the review of electronic unit readings in the Test Mode.

Display readings in the Test Mode

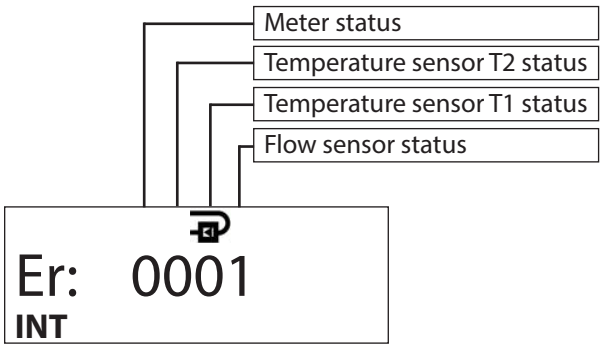
ID	Parameter	Value	Notes
4.1	High resolution energy	TEST 000000.00 Wh TEST PULSE Wh	Updated every second. Indicated as "Pulse Wh", if the energy test pulse output is activated ("Pulse m"3" – in the case of volume pulse output)
4.2	High resolution integrated volume	TEST m³ 00.000000 TEST PULSE Wh	Updated every second. Indicated as "Pulse Wh", if the energy test pulse output is activated ("Pulse m"3" – in the case of volume pulse output)
4.3	Supply heat carrier temperature value	1 TEST 0.0 °C	
4.4	Return heat carrier temperature value	2 TEST 0.0 °C	
4.5	Temperature difference	1-2 TEST 0.00 °C	
4.6	High resolution flow rate	1-2 TEST m³h 0.00 °C	

ID	Parameter	Value	Notes
4.7	To activate energy pulses output (when volume pulse output is active)	**TEST** tESt on Wh	Activated by pressing and holding the button
	To activate volume pulse output (when energy pulse output is active)	**TEST** **m^3** tESt on	Activated by pressing and holding the button
4.8	To deactivate the *Test Mode*	**TEST** tESt OFF	Deactivated by pressing and holding the button
4.9	SF" and the flow rate value are indicated if volume simulation has been started*	**TEST** **m^3h** SF 1.500	Changes every second by with selected parameter

* Volume pulse simulation is only possible when the *Test Mode* is activated by short-circuiting the contacts SERVICE. Flow simulation is started by pressing and holding the button. After its end (in 2.5 minutes), the values of the simulated flow quantity and energy corresponding to it are recorded.

Error Codes

Errors are encoded by a 4-digit code.



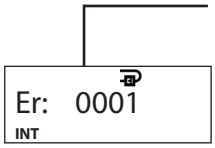
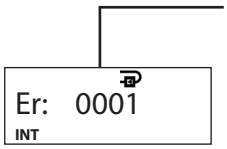
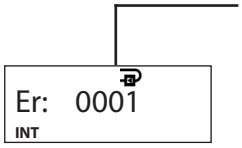
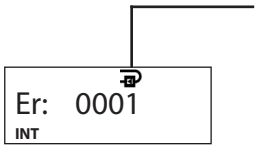
Code Name	Description
Status of calculator 	0 - normal operation 1 - battery service life has expired (or in the meter was not powered when meter is powering externally) 2 - temperature differential is higher than permissible limits 4 - temperature differential is lower than permissible limits 8 - electronic unit hardware failure *
Status of the return heat carrier temperature sensor (T2) 	0 - normal operation 4 - the sensor is short-circuited * 8 - the sensor is disconnected or short-circuited *
Status of the supply heat carrier temperature sensor (T1) 	0 - normal operation 4 - the sensor is short-circuited * 8 - the sensor is disconnected or short-circuited *
Status of the flow sensor 	0 - normal operation 1 – no signal; the flow sensor is not filled with water 2 – reverse flow 4 – the flow is greater than $1.2 \cdot q_s$ (indicated $q=1.2 \cdot q_s$) 8 – hardware failure *

Table 1: Error codes

* The summation of energy and normal working time will be stopped only in case of these serious errors; the error code will be displayed on the LCD first page; additionally the error date will be displayed.

Error codes sum up if there is more than one error. Then the summary indicated error code will be as follows:

3 – corresponds to error codes 2 + 1

5 – corresponds to error codes 4 + 1

7 – corresponds to error codes 4 + 2 + 1

9 – corresponds to error codes 8 + 1

A – corresponds to error codes 8 + 2

B – corresponds to error codes 8 + 2 + 1

C – corresponds to error codes 8 + 4

D – corresponds to error codes 8 + 4 + 1

E – corresponds to error codes 8 + 4 + 2

F – corresponds to error codes 8 + 4 + 2 + 1

If at least one digit value of an error code is ≥8, the summing-up of energy, water quantity, and trouble-free operation time is stopped.

In case of the flow sensor error 4, the time "when the flow q> 1.2·qs" is recorded additionally.

Test Mode Control

Test Mode Specifications

Test Mode (TEST) is intended for quick testing.

Test Mode can by activated by the control button, through optical interface or by the jumper.

In the *Test Mode*, the meter:

- indicates the increased resolution energy and flow values;
- forms energy or volume pulses through the optical interface;
- forms energy pulses at the 1st pulse output and volume pulses at the 2nd pulse output (when the meter is fitted with a pulse input/output cable);
- can simulate water volume for determining the energy measurement error tolerance (only when *Test Mode* is activated by the jumper).

The resolution of energy and flow rate indicators in the *Test Mode* (TEST) is presented in *Table 2*.

Selected energy measurement units	kWh, MWh	GJ	Gcal
Resolution of the energy indicator	000000.01 Wh	0000000.1 kJ	0000000.1 kcal
Resolution of volume indicator	00.000001 m^3		

Table 2: Resolution of energy and flow rate indicators in the Test Mode

The values of energy and volume test pulses (through the optical interface and at pulse outputs), depending on the permanent flow rate value, are presented in *Table 3*.

Permanent flow value, q_p, m^3/h	**Volume pulse value, l/pulse**	**Energy pulse value, when energy measurement units are selected as:**		
		kWh, MWh	**GJ**	**Gcal**
0.6	0.002	0.1 Wh/pulse	0.5 kJ/pulse	0.1 kcal/pulse
1.0	0.002	0.2 Wh/pulse	1 kJ/pulse	0.2 kcal/pulse
1.5	0.004	0.2 Wh/pulse	1 kJ/pulse	0.2 kcal/pulse
2.5	0.005	0.5 Wh/pulse	2 kJ/pulse	0.5 kcal/pulse
3.5	0.02	1 Wh/pulse	5 kJ/pulse	1 kcal/pulse
6.0	0.02	1 Wh/pulse	5 kJ/pulse	1 kcal/pulse
10.0	0.05	2 Wh/pulse	10 kJ/pulse	2 kcal/pulse
15.0	0.05	5 Wh/pulse	20 kJ/pulse	5 kcal/pulse
25	0.05	5 Wh/pulse	20 kJ/pulse	5 kcal/pulse
40	0.2	10 Wh/pulse	50 kJ/pulse	10 kcal/pulse
60	0.2	10 Wh/pulse	50 kJ/pulse	10 kcal/pulse

Table 3: The values of energy and volume test pulses (through the optical interface and at pulse outputs), depending on the permanent flow rate value

Activating the Test Mode with the Control Button

The *Test Mode* (TEST) can be activated by the button (or through the optical interface with the programme HEAT3-SERVICE). In this case, the water volume simulation feature is not available. Therefore, the *Test Mode* does not interfere with the normal *Operating Mode* (measured energy and volume are summed up at the operation mode registers).

The activation of the *Test Mode* requires the following:

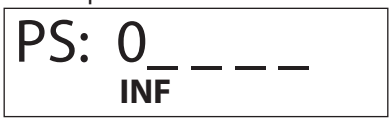
By pressing and holding the button, select the INF page on the display;

By short presses of the button, select "tESt On Wh" on the display (to activate energy pulses output through the optical interface) or "tESt On m^3" (to activate volume pulse output through the optical interface);

Press and hold the button, the security password entry window will turn on:

By pressing and holding the button*, activate the *Test Mode* (the indication "TEST" will appear at the top of the display)

NOTE: * The activation of the *Test Mode* by the button is additionally protected by a password. After pressing and holding the button, a four-digit password input window and the flashing first digit will appear first of all:



The first digit is selected by shortly pressing the button. The second digit position is caused to flash by pressing and holding the button, then the second digit is selected. In this way, all the four digit of the password are entered. If the input is correct, the indication PASS will appear for a short time after setting the fourth digit and pressing and holding the button, and the meter will switch to the *Test Mode*. If the input is incorrect, the indication FAIL will appear for a short time and the meter will return to the operation mode. The activation procedure will have to be repeated from the beginning. The preset password value: 0001.

Activating the Test/Service Mode with the Control Button and the Jumper

By short-circuiting the contacts SERVICE (by breaking the partition at the back side of the electronic unit of the meter or by removing the protective service seal if the partition was already broken before), the SERVICE mode will be activated and the symbol "<->" will be displayed. This mode allows changing the configuration parameters of the meter similarly to the transport mode (see *"Changing the Meter Configuration" on page 12*).

In this case, the *Test Mode* (TEST) is activated through the optical interface (with the program HEAT3-SERVICE) or by pressing the button:

- Press and release the button to select "tESt On Wh" on the display (to activate energy pulse output through the optical interface) or "tESt On m3" (to activate volume pulses output through the optical interface);
- Press and hold the button to activate the *Test Mode* (the indication "TEST" will appear at the top of the display after 150s).
- The possibility of service configuration.

The *Test Mode* functions specified in *"Activating the Test Mode with the Control Button"* will be activated (volume pulses output will turn on). Also, the possibility to turn on flow simulation will be activated (to determine the energy measurement error tolerance without using a real flow).

For determining the energy measurement error tolerance, automatic flow pulses simulation is designed: by pressing the button and holding it for more than 5 seconds when the meter is in the *Test Mode*, flow measurement is terminated and nominal flow pulse simulation is started (the indication "SF" periodically appears on the display). After 2.5 minutes, simulation ends, the indication "SF" disappears, the accumulated readings of flow volume and energy can be taken and used for determining the energy measurement error tolerance.

Deactivation of the Test (and Service) mode

The Test (and Service) mode can be deactivated through the optical interface (with the programme HEAT3-SERVICE) or by the press button:

- By short pressing of the button, select "tESt OFF" on the display;
- By pressing and holding the button, deactivate the *Test Mode* (the indication "TEST" will disappear on the display).

The Test (and Service) mode will also deactivate automatically 12 hours after its activation.

VERIFICATION

The metrological control of the parameters of the meter is performed according to LST EN1434-5.

TRANSPORTATION AND STORAGE

The packaged meters can be transported by any covered vehicles. During transportation, the meters must be reliably secured in order to prevent shocks or risk of movement inside the vehicle. Protect the meters against mechanical damage and shocks. The rooms where the meters are kept must be free from aggressive, corrosive materials.

Transportation and storage conditions:

- Temperature: -13…95° F (-25…35° C)
- Humidity: max. 60%.

CABLE CONNECTIONS

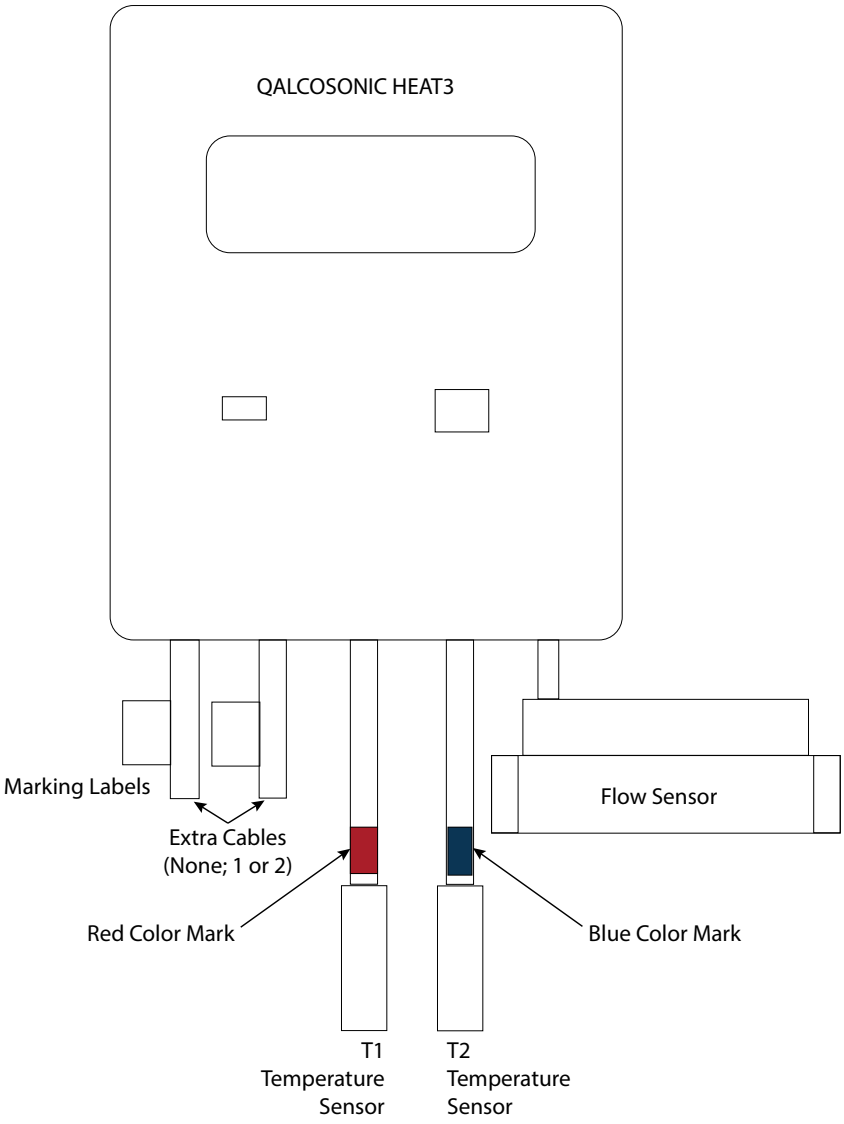


Figure 4: Meter connection diagram

Cable Destination	Cable Marking***	Wire Destination	Wire Color
M-Bus 1 interface	MBUS1	Line Line	brown white
M-Bus 2 interface	MBUS2	Line Line	brown white
M-Bus interfaces (two) *	MBUS	Mbus1 Line Mbus1 Line Mbus2 Line Mbus2 Line	brown white yellow green
1st pulse input/output	PULS1	Pulses (+) Common (-)	brown white
2nd pulse input/output	PULS2	Pulses (+) Common (-)	brown white
Pulse inputs/outputs (two) *	PULS	Pulses1 (+) Common1 (-) Pulses2 (+) Common2 (-)	yellow green brown white
ModBus® interface	MODBUS	Line A Line B 24V AC/DC** 24V AC/DC**	brown white yellow green
CL interface	CL	CL+ CL-	brown white
MiniBus interface	MINIBUS	Line+ Line-	brown white
For external power supply from 230V AC mains	230V AC	230V L 230V N	brown white
For external power supply from 24V AC/DC source	24V AC/DC	24V AC/DC 24V AC/DC	brown white

*The option for the case when two extra cables are included at a time.

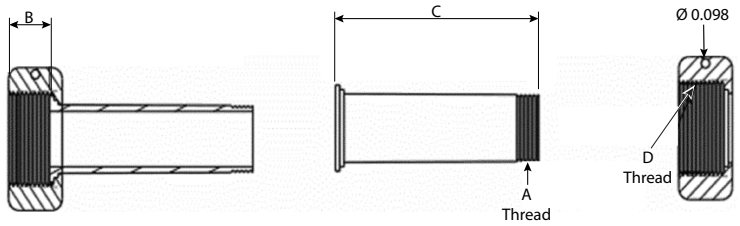
**Not used when the meter is powered from an external power supply source.

***When a second extra cable is not included, the M-Bus1 cable is not marked additionally.

Table 4: Destination and marking of the extra cables of the heat meter

DIMENSIONS

Coupling



				BSPP THREAD	
Part Number	**Description**	**B**	**C**	**D**	**A**
69234-004	Meter Coupling, 1-1/2 × 1-1/2 × 2.84 in.	0.77/0.85	2.78/2.84	G 2 in.	1-1/2 11-1/2 NPT
69234-003	Meter Coupling, 1 × 1 × 2.63 in.	0.46/0.54	2.60/2.64	G 1-1/4 in.	1-11 1/2 NPT
69234-002	Meter Coupling, 3/4 × 3/4 × 2.50 in.	0.43/0.51	2.48/2.52	G 1 in.	3/4-14 NPT
69234-001	Meter Coupling, 5/8 × 1/2 × 2.38 in.	0.47/0.55	2.36/2.40	G 3/4 in.	1/2-14 NPT

Electronic Unit

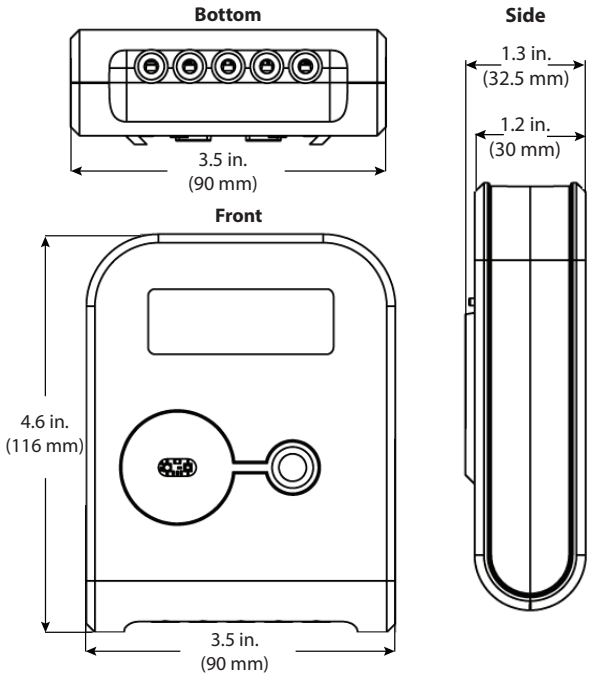


Figure 5: The overall dimensions of calculator of Dynasonics® UHC100 heat meter

IMPORTANT

The marking embossed on the meter is the end connection size, not the meter size.

Example: Flow sensor Q3 = 1.6/2.5 m^3/h, threaded end connections G3/4 in., mounting length L = 110 mm

Meter	**DN15 in. (mm)**	**DN20 in. (mm)**		**DN25 in. (mm)**		**DN32 in. (mm)**	**DN40 in. (mm)**		**DN50 in. (mm)**	**DN65 in. (mm)**	**DN80 in. (mm)**	**DN100 in. (mm)**
G - Thread DN - Flange	**G3/4 in.**	**G1**	**DN20**	**G1-1/4 G1-1/2**	**DN25**	**DN32**	**G2**	**DN40**	**DN50**	**DN65**	**DN80**	**DN100**
H	3.1 (80)	3.3 (84)	4.4 (112)	5.2 (131)	5.3 (134)	5.8 (147)	4.6 (118)	5.9 (150)	6.3 (159)	7.3 (185)	7.9 (200)	8.9 (225)
L	4.3 or 6.5 (110 or 165)	4.3 or 5.1 (130 or 190)		10.2 (260)			11.8 (300)		10.6 (270)	11.8 (300)	11.8 (300)	14.2 (360)

DN15 Threaded Connection G 3/4 in., Length = 110 mm or 165 mm

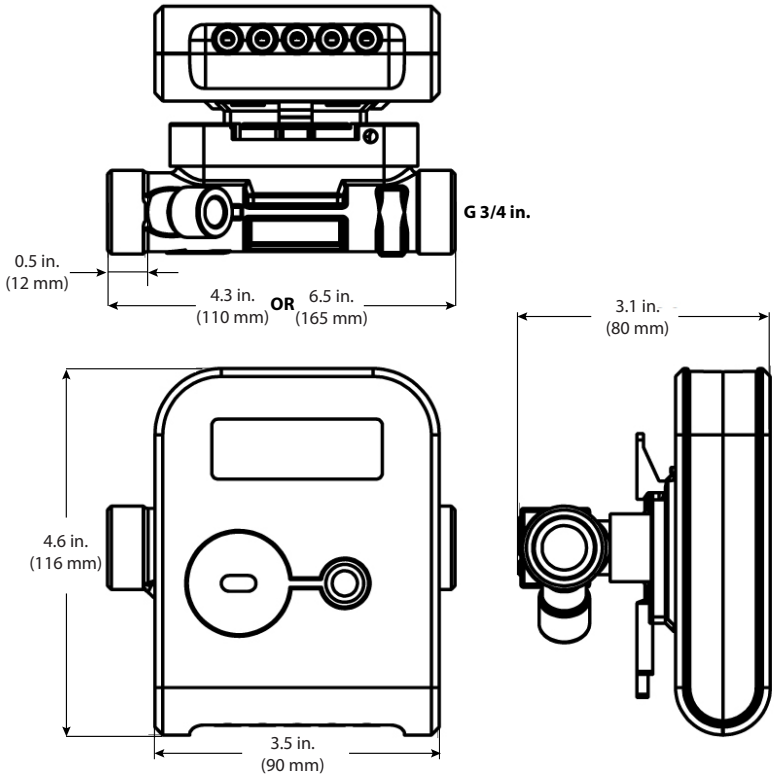


Figure 6: Flow sensor q_p= 0.6/1.0/1.5 m^3/h, Length L=110 mm (L=165 mm); connection type: thread G3/4 in.

DN20 Threaded Connection G 1 in., Length = 130 mm

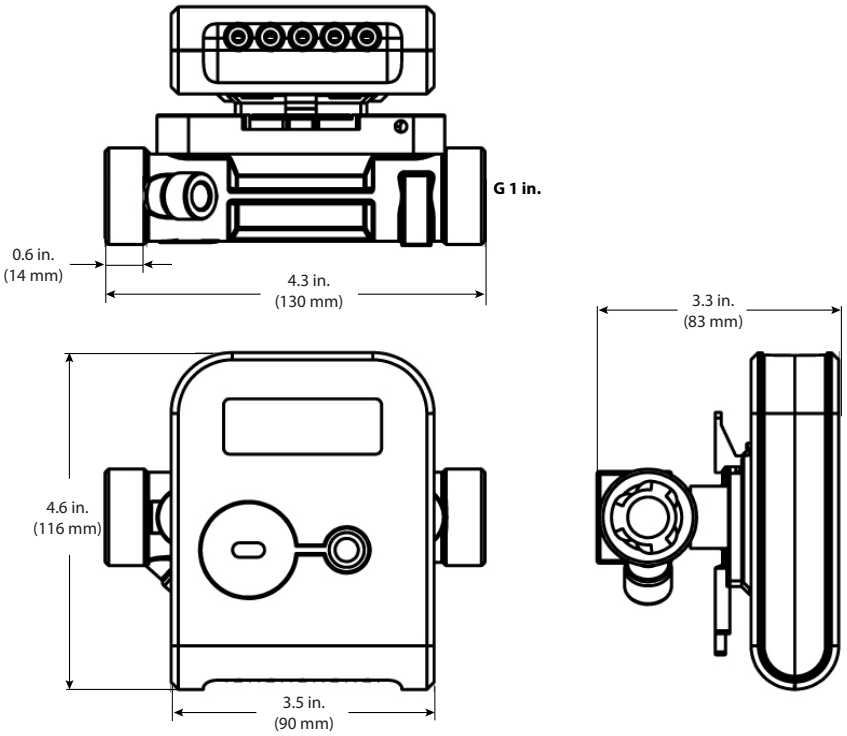


Figure 7: Flow sensor q_p = 2.5/1.5 m^3/h, Length L=130 mm; connection type: thread G1 in.

DN20 Threaded Connection G 1 in., Length = 190 mm

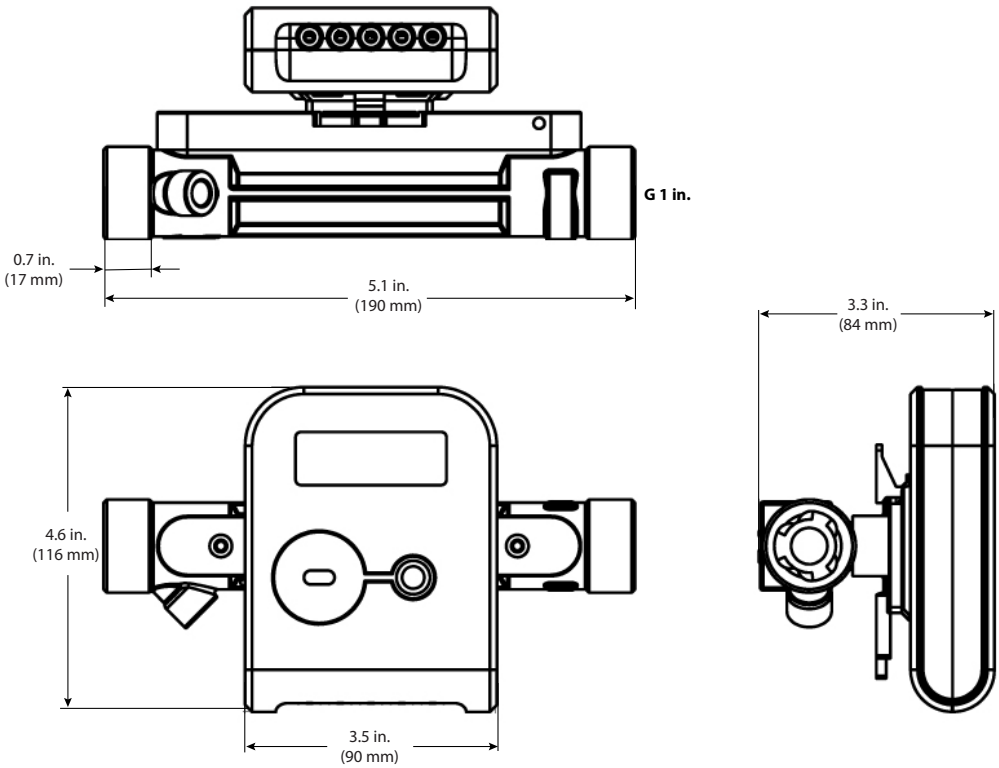


Figure 8: Flow sensor q_p = 0.6/1.0/1.5/2.5 m^3/h; L=190 mm; connection type: thread G1 in.

DN20 Flange Connection D20, Length = 190 mm

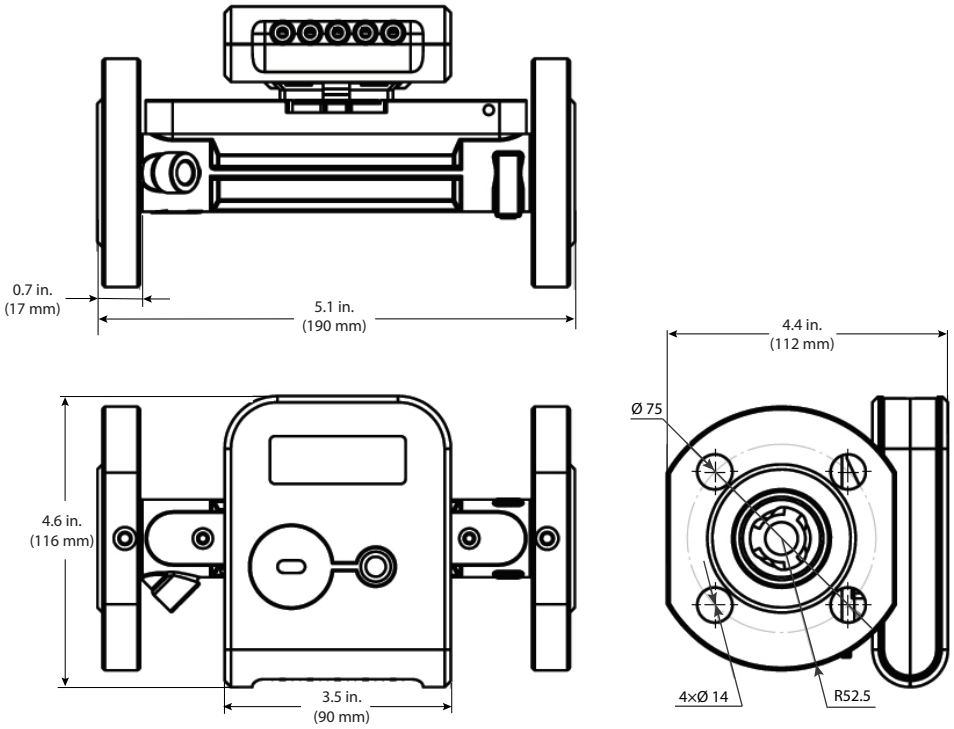


Figure 9: Flow sensor q_p = 0.6/1.0/1.5/2.5 m³/h; L=190 mm; connection type: flanges D20

DN25 Threaded Connection G 1-1/4 in. or G 1-1/2 in., Length = 260 mm

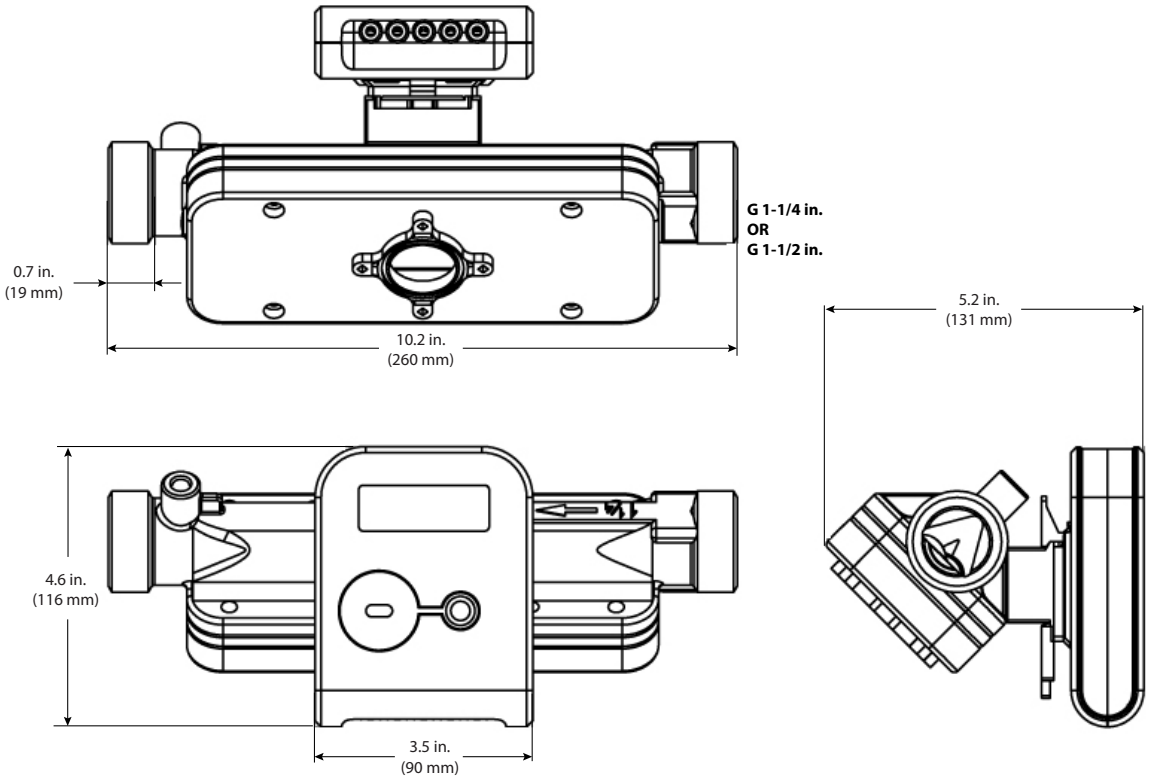


Figure 10: Flow sensor q_p = 3.5/6.0 m³/h; L=260 mm; connection type: thread G1-1/4 in. or G1-1/2 in.

DN25 Flange Connection DN25, Length = 260 mm

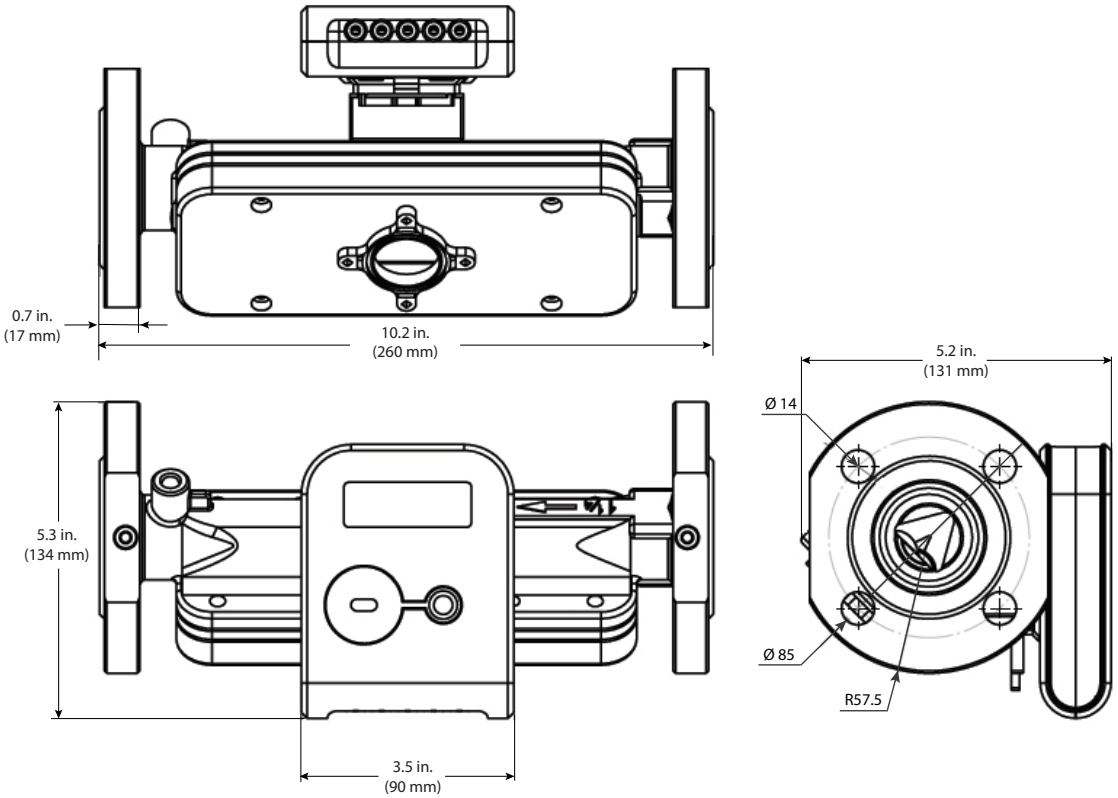


Figure 11: Flow sensor q_p = 3.5/6.0 m³/h; L=260 mm; connection type: flanges DN25

DN32 Flange Connection, Length = 260 mm

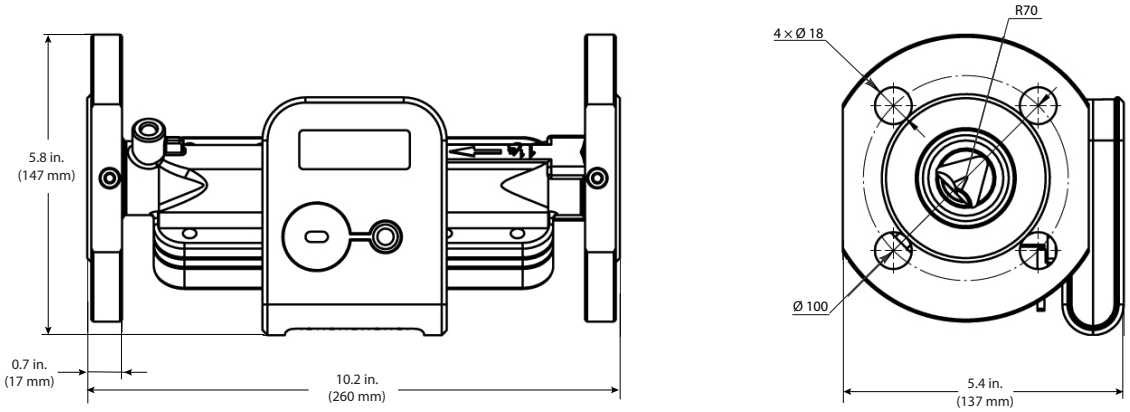


Figure 12: Flow sensor q_p = 3.5/6.0 m³/h; L=260 mm; connection type: flanges DN32

DN40 Threaded Connection G 2 in., Length = 300 mm

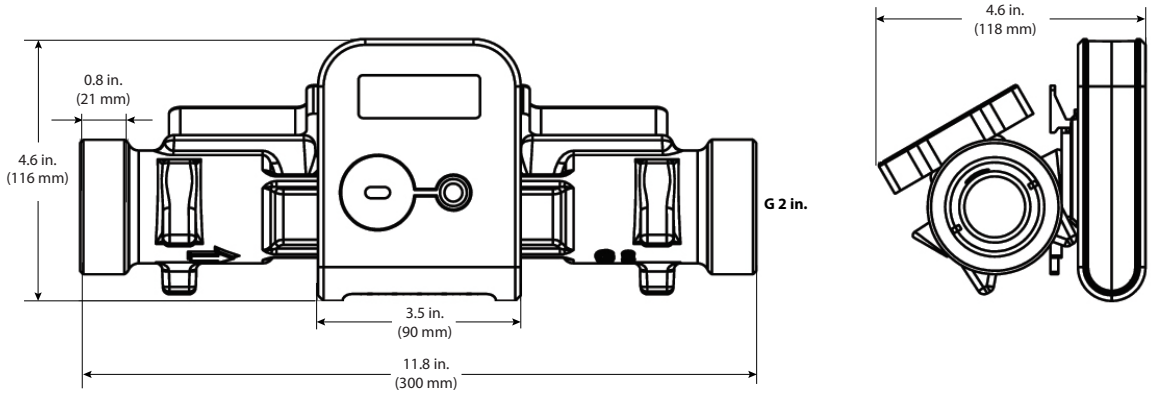


Figure 13: Flow sensor q_p= 10.0 m³/h; L=300 mm; connection type: thread G2 in.

DN40 Flange Connection DN40, Length = 300 mm

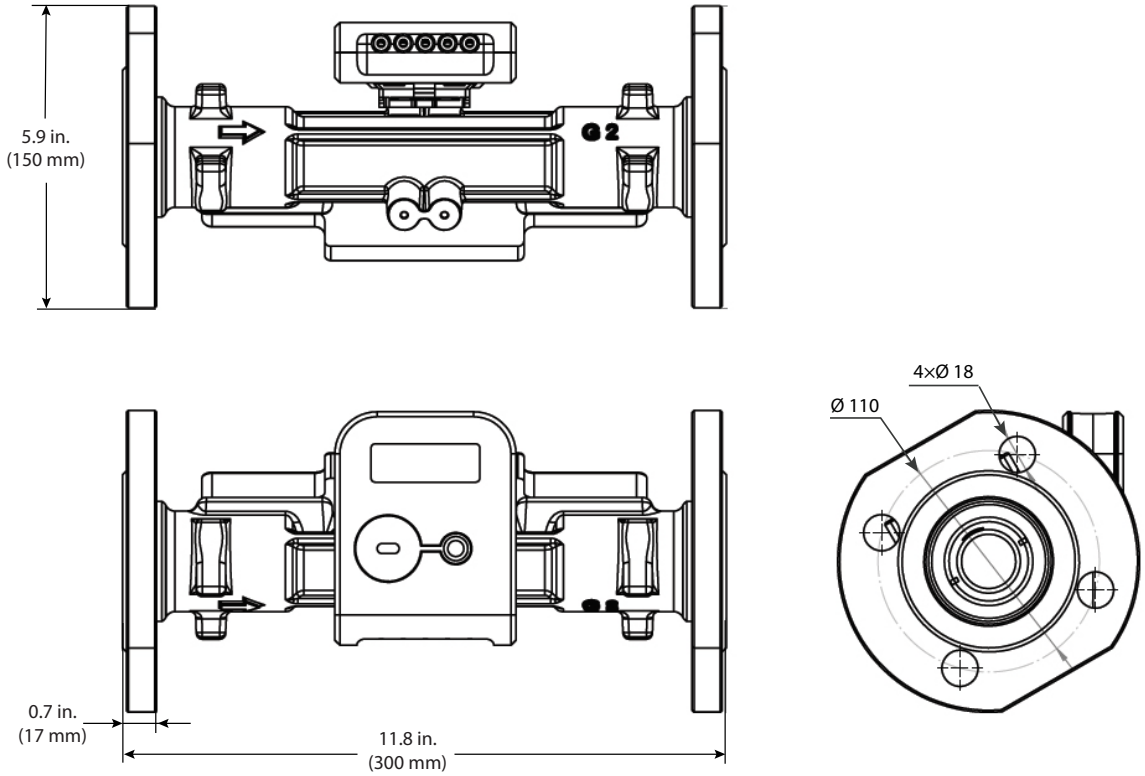


Figure 14: Flow sensor q_p= 10.0 m3/h; L=300 mm; connection type: flanges DN40

DN50 Flange Connection DN50 in., Length = 270 mm

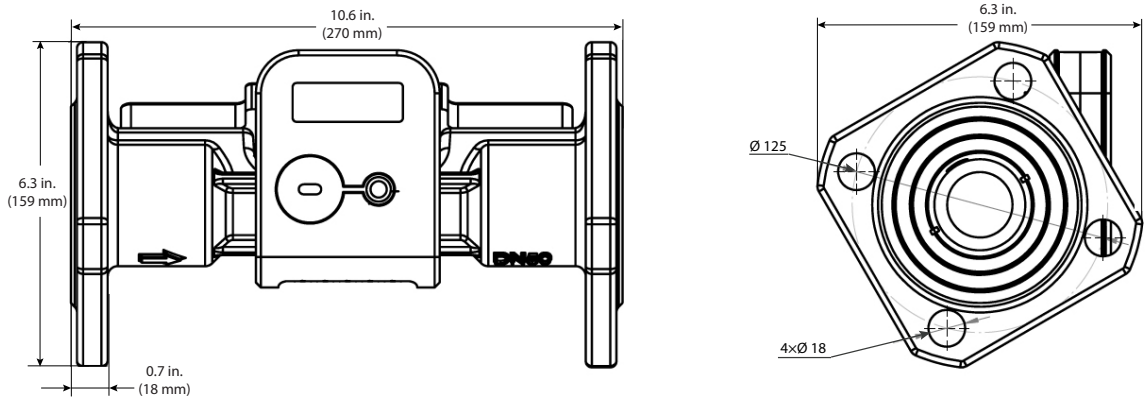


Figure 15: Flow sensor q_p = 15 m³/h; L=270 mm; connection type: flanges DN50

DN65 Flange Connection DN65 in., Length = 300 mm

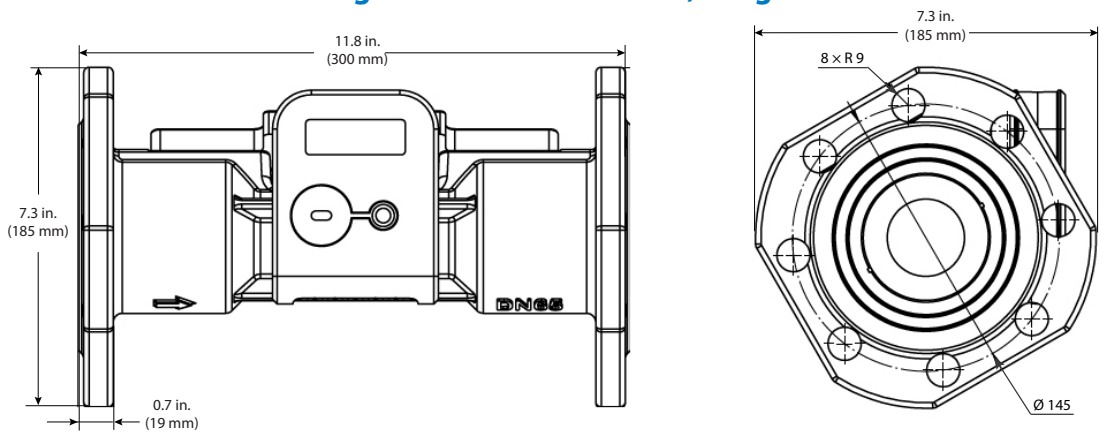


Figure 16: Flow sensor q_p = 25 m³/h; L=300 mm; connection type: flanges DN65

DN80 Flange Connection DN80 in., Length = 360 mm

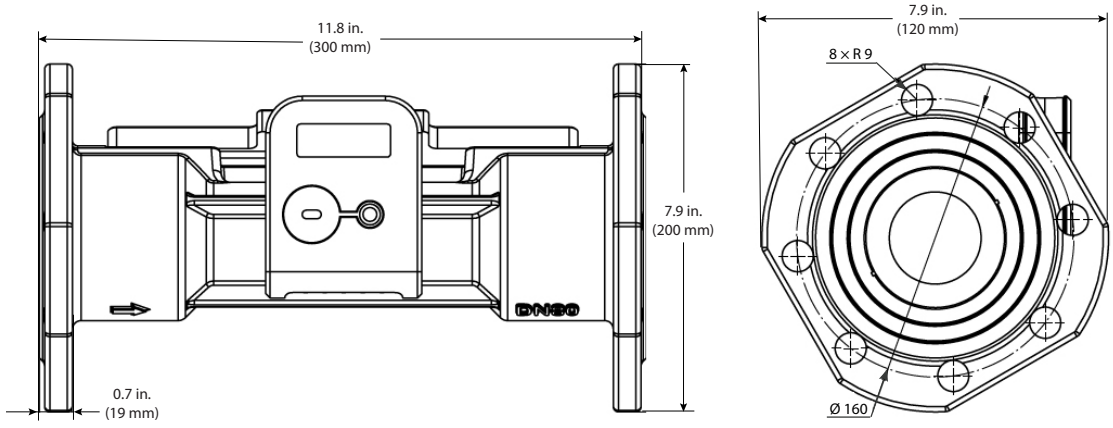


Figure 17: Flow sensor q_p = 40 m³/h; L=300 mm; connection type: flanges DN80

DN100 Flange Connection DN100 in., Length = 300 mm

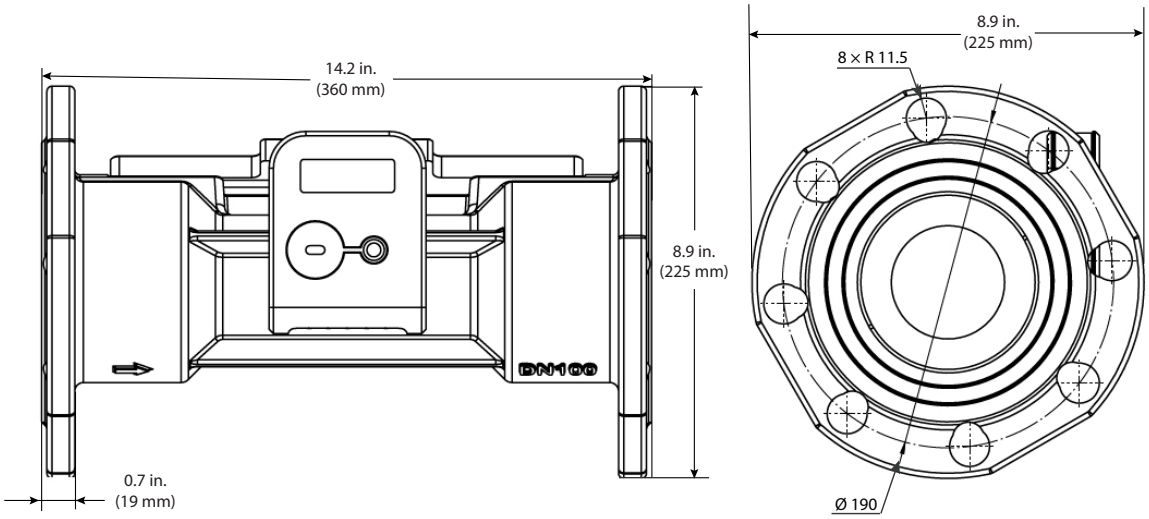


Figure 18: Flow sensor q_p = 60 m³/h; L=360 mm; connection type: flanges DN100

Overall Dimensions of Temperature Sensors

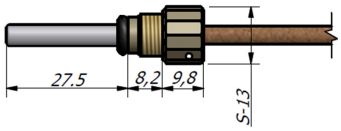


Figure 19: Overall dimensions of the DS type temperature sensor

Figure 20: PL type temperature sensor

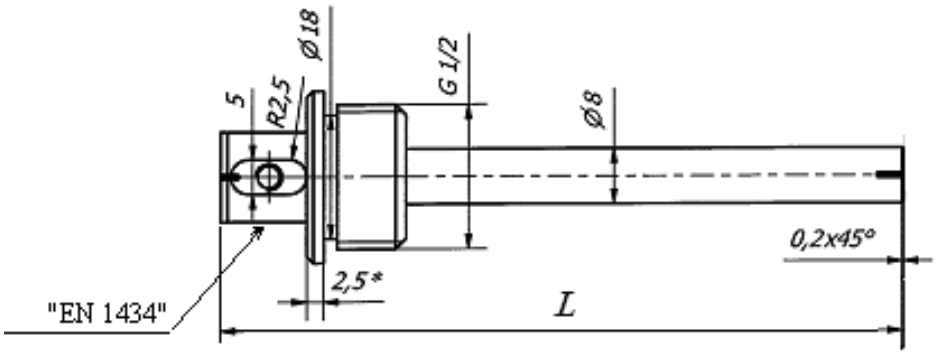


Figure 21: Overall dimensions of the PL type temperature sensor protective pocket

Nominal Pipe Diameter	Pocket Length in. (mm)
DN20 to DN100	4 (100)
DN125 to DN150	5.3 (135)
DN200	8.9 (225)

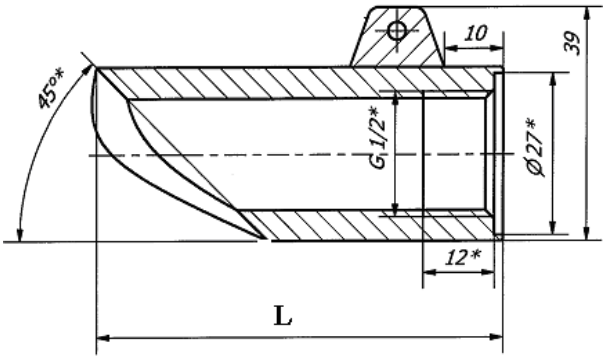


Figure 22: Dimensions of the fastening bushing when pipe DN < 65 mm

Nominal Pipe Diameter	Length in. (mm)
DN20	3.1 (79.3)
DN25	2.7 (69)
DN32, DN40	2.3 (59)
DN50	2 (49)

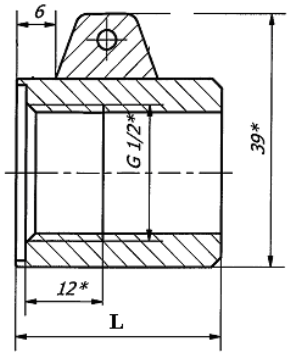


Figure 23: Dimensions of the fastening bushing when pipe DN ≥ 65 mm

Nominal Pipe Diameter	Length in. (mm)
DN65, DN80, DN125, DN150	1.3 (32)
DN100	0.7 (18)
DN200	3.5 (90)

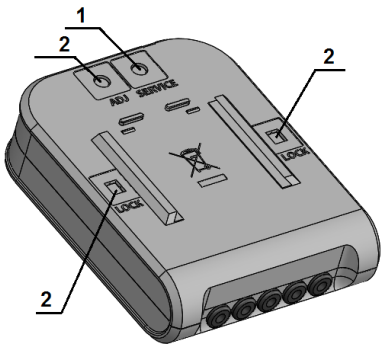


Figure 24: The sealing diagram of calculator (at the back side of the box): It shall be sealed additionally only if the breakable partitions are damaged (1 – the supplier's seal is attached after installation; 2 – verification seal stickers are attached)

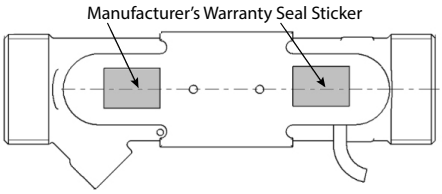


Figure 25: Flow sensor qp = 0.6/1.0/1.5/2.5 m³/h sealing

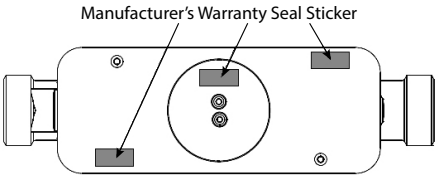


Figure 26: Flow sensor qp = 3.5/6.0 m³/h sealing

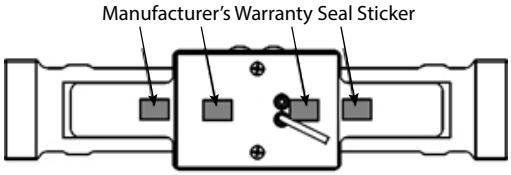


Figure 27: Flow sensor qp = 10.0 m³/h sealing

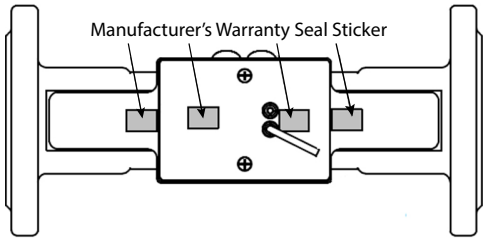


Figure 28: Flow sensor qp = 15.0 m³/h sealing

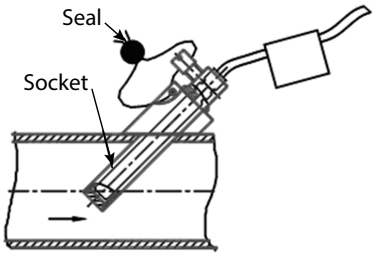


Figure 29: Seal installed at a 45° angle to the pipeline

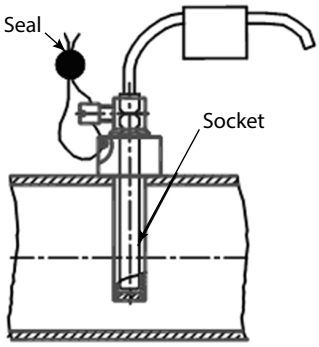


Figure 30: Seal installed perpendicular to the pipeline

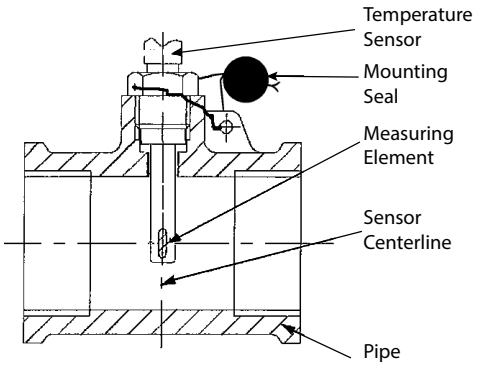


Figure 31: Sensor installed using a T-piece

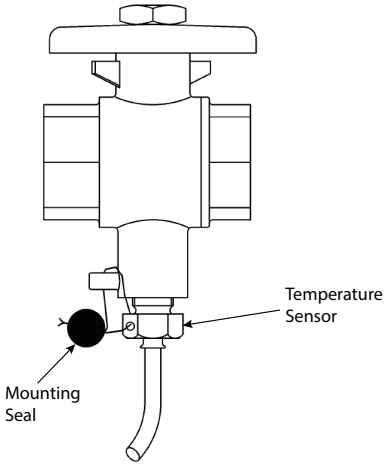


Figure 32: Sensor installed using a valve T-piece

METER ORDERING MATRIX

Meter Type **UHC100** E3-□-□-□□-□-□-□-□-□-□-□-□□-□-□-□-□-□

Purpose of the meter:	Flow sensor installation place:	Code
Heating energy meter	In supply pipe	1
	In return pipe	2
Heating and cooling energy meter	In supply pipe	3
	In return pipe (standard)	4

Ratio of the flow rates (q_p/q_i):	Min value of temperature difference:	Code
100	2 K	1
250*	2 K	2
100	3 K (standard)	3
250*	3 K	4

Flow sensor:

q_p, m³/h	L, mm	Connection	Code	q_p, m³/h	L, mm	Connection	Code
0.6	110	G ¾	11	3.5	260	G1-1/4	41
1.0	110	G ¾	12	3.5	260	G1-1/2	42
1.5	110	G ¾	13	3.5	260	DN25	43
1.5	165	G ¾	14	3.5	260	DN32	44
1.5	130	G1	21	6.0	260	G1-1/4	45
2.5	130	G1	22	6.0	260	G1-1/2	46
0.6	190	G1	31	6.0	260	DN25	47
0.6	190	DN20	32	6.0	260	DN32	48
1.0	190	G1	33	10.0	300	G2	51
1.0	190	DN20	34	10.0	300	DN40	52
1.5	190	G1	35	15.0	270	DN50	61
1.5	190	DN20	36	25.0	300	DN65	71
2.5	190	G1	37	40.0	300	DN80	81
2.5	190	DN20	38	60.0	360	DN100	92

Communication interface:	Code	Communication interface:	Code
Not included	0	RF 868 MHz	2
M-Bus	1	M-bus and RF 868 MHz	3

Power supply source type:	Code	Power supply source type:	Code
Internal battery (one)	1	Mains supply 230V AC	3
External 24V AC/DC voltage	2	Internal battery (two)	4

*only for meters with q_p=1.5 m³/h; 2.5 m³/h; 6.0 m³/h; 10 m³/h; 15 m³/h; 25 m³/h; 40 m³/h; 60 m³/h

Meter Ordering Matrix (continued) **UHC100** E3-□-□-□□-□-□-□-□-□-□-□-□□-□-□-□-□-□

Length of the flow sensor cable:	Code	Length of the flow sensor cable:	Code
1.2 m (standard)	1	5 m	3
2.5 m	2		

Extra communication interface:	Code
Not included	0

Protection class / Nominal pressure:	Code	Protection class / Nominal pressure:	Code
IP65 / PN16	1	IP65 / PN25	4
IP67 / PN16 (standard)	2	IP67 / PN25	5
IP68 / PN16	3	IP68 / PN25	6

Temperature range:	Extra inputs/outputs:	Code
0…90° C	No	1
	Yes	2
0…130° C (standard)	No	3
	Yes	4

Length of the temperature sensors cable:	Code	Length of the temperature sensors cable:	Code
1.5 m (standard)	1	3 m	4
2 m	2	5 m	5
2.5 m	3	10 m	6

Configuration profile:	Code
Standard	07
With turned off transport mode	08

Energy measurement units:	Code	Energy measurement units:	Code
0.001 MWh	1	0.001 Gcal	3
0.001 GJ	2	1 kWh	4

Heat carrier type:	Code
Water	1

Temperature sensors type:	Code	Temperature sensors type:	Code
DS with plastic nut (standard, up to DN25)	1	DS with metal nut (up to DN25)	5
PL (from DN32)	2		

UHC100 E3-□-□-□□-□-□-□-□-□-□-□-□□-□-□-□-□-□

Mounting set for temperature sensors:	Code	Mounting set for temperature sensors:	Code
Not included	0	Tee (for DS type sensors)	2
Valve (for DS type sensors)	1	Protective sockets (for PL type sensors)	3

Mounting set for flow sensor:	Code	Mounting set for flow sensor:	Code
Not included	0	Flanges with gaskets	3
Threaded with gaskets	1	Only gaskets	4
For welding with gaskets	2		

Meter kits that include G thread to NPT couplers have DHC- as the prefix to the part numbers.

TECHNICAL SPECIFICATIONS

Energy Measurement

Accuracy class: 2 according to LST EN1434-1:2016 ; Class 2 Measurement Canada

Energy measurement units: kWh; MWh; GJ; Gcal

Maximum value of thermal power: 5.28 MW

Flow Measurement

Ratio of the permanent flow rate to the lower limit of the flow-rate (selectable by the user):

$q_p/q_i = 100$, or $q_p/q_i = 250$ (only for sensors with q_p = 1.5 m^3/h; 2.5 m^3/h; 6.0 m^3/h; 15 m^3/h; 25 m^3/h; 40 m^3/h; 60 m^3/h)

The technical data of the flow sensor are provided in *Table 5*.

Permanent flow rate q_p, m^3/h	Upper flow-rate q_s, m^3/h	Lower flow-rate q_i, m^3/h	Threshold value of flow rate, m^3/h	Length of the flow sensor L, in. (mm)	Pressure losses at q_p, kPa	Joining to the pipeline (Thread - G, flange - DN)
0.6	1.2	0.006	0.003	4.33 (110)	7	G3/4 in.
0.6	1.2	0.006	0.003	7.48 (190)	0.9	G1 in. or DN20
1	2	0.01	0.005	4.33 (110)	11.3	G3/4 in.
1	2	0.01	0.005	7.48 (190)	2.5	G1 in. or DN20
1.5	3	0.006	0.003	4.33 (110); 4.5 (165)	17.1	G3/4 in.
1.5	3	0.006	0.003	7.48 (190)	5.8	G1 in. or DN20
1.5	3	0.015	0.003	4.33 (110); 4.5 (165)	17.1	G3/4 in.
1.5	3	0.015	0.003	7.48 (190)	5.8	G1 in. or DN20
1.5	3	0.015	0.005	5.9 (130)	7.2	G1 in.
2.5	5	0.01	0.005	5.9 (130)	19.8	G1 in.
2.5	5	0.01	0.005	7.48 (190)	9.4	G1 in. or DN20
2.5	5	0.025	0.005	5.9 (130)	19.8	G1 in.
2.5	5	0.025	0.005	7.48 (190)	9.4	G1 in. or DN20
3.5	7	0.035	0.017	10.24 (260)	4	G1-1/4 in., G1-1/2 in., DN25 or DN32
6	12	0.024	0.012	10.24 (260)	10	G1-1/4 in., G1-1/2 in., DN25 or DN32
6	12	0.06	0.012	10.24 (260)	10	G1-1/4 in., G1-1/2 in., DN25 or DN32
10	20	0.04	0.02	11.81 (300)	18	G2 in. or DN40
10	20	0.1	0.02	11.81 (300)	18	G2 in. or DN40
15	30	0.06	0.03	10.63 (270)	12	DN50
15	30	0.15	0.03	10.63 (270)	12	DN50
25	50	0.1	0.05	11.81 (300)	20	DN65
25	50	0.25	0.05	11.81 (300)	20	DN65
40	80	0.16	0.08	11.81 (300)	18	DN80
40	80	0.4	0.08	11.81 (300)	18	DN80
60	120	0.24	0.12	14.17 (360)	18	DN100
60	120	0.6	0.12	14.17 (360)	18	DN100

Table 5: Technical data

Temperature limits of heat conveying liquid:	32…194° F (0.1…90° C)
Custom-made, wall-mounted electronic unit:	32…266° F (0.1…130° C)
Length of the connecting cable between the flow sensor and electronic unit:	4 ft (1.2 m)
Custom-made:	8 ft or 16 ft (2.5 m or 5.0 m)
Maximum admissible working pressure (nominal pressure PN):	232 psi or 363 psi (16 bar or 25 bar)

If the flow rate exceeds the maximum value q_s:

- When the flow rate < $1.2 \cdot q_s$, the flow rate measurement and calculations are continued;
- When the flow rate > $1.2 \cdot q_s$, calculations are performed using flow-rate value $1.2 \cdot q_s$, the error "exceeded maximum flow rate" is recorded and the duration of that error is calculated.

Pulse Inputs (Additional)

- The number of pulse inputs: 2
- Indicated units: m^3
- Pulse value: programmable
- Input pulse types: IB according to LST EN1434-2
- Max. permissible frequency of input pulses: 3 Hz
- Max. permissible voltage of input pulses: 3.6V
- Condition of maintenance of high level: 3.6V through 3.3 MΩ resistor
- If the meter is ordered with the "pulse input-output" function, then a permanently connected 1.5 m long cable is fitted in the meter for connecting the inputs-outputs.

Temperature Measurement

Temperature measuring range:	32…194° F (0…90 °C)
Custom-made:	32…266° F (0…130 °C)
Temperature difference measuring range:	2…70 K or 3…70 K
Custom-made:	2…110 K or 3…110 K)

Temperature sensor design:

- DS type according to LST EN1434-2 (when the flow sensor connection type is G3/4, G1 or G1-1/4),
- PL type according to LST EN1434-2 (for other flow sensor connection types).

Connected cable length: Up to 33 ft (10 m)

Display

- A liquid crystal, 8-digit display for the representation of the values of the indicated parameter and for the representation of parameters, units of measurement, and *Operating Modes* with special symbols.
- Integral and instantaneous measured parameters as well as data read from the meter archive and configuration information specified in *"Operating Procedure" on page 15* are displayed.

Energy measurement units (user-selectable when installing):	kWh, MWh, Gcal or GJ
Resolution of energy indicators (user-selectable when installing):	0000000.1 kWh
	00000001 kWh
	00000.001 MWh (Gcal or GJ)
	000000.01 MWh (Gcal or GJ)
Resolution of flow-rate indicators:	00000.001 m^3

NOTE: If battery is discharged or disconnected, all integral readings and archive data are saved for at least 15 years and can be accessed by connecting a power battery in the *Operating Mode*.

Data Recording and Storage

In its memory, the meter accumulates an archive of hourly, daily, and monthly-measured parameters. Archive data can be read only by remote data reading means (see *"Representation of Data" on page 15*). The monthly data archive parameters that are also shown on the display are specified in *"Viewing the Readings in the Operating Mode (User Menu)" on page 17*.

The following parameters of each hour, day, and month are accumulated in the memory of the meter:

1	Integral energy
2	Integral cooling energy
3	Integral energy, Tariff 1
4	Integral energy, Tariff 2
5	Integral heat carrier volume
6	Integral value of Pulse Input 1
7	Integral value of Pulse Input 2
8	Value and date of the maximum power
9	Minimum (or maximum cooling) power value and date
10	Value and date of the maximum flow-rate
11	Supply heat carrier maximum temperature value and date
12	Return heat carrier maximum temperature value and date
13	Supply heat carrier minimum temperature value and date
14	Return heat carrier minimum temperature value and date
15	Minimum recorded temperature differential and date
16	Supply heat carrier average temperature value
17	Return heat carrier average temperature value
18	No-energy operation calculation error time
19	Summary error code
20	Time when flow-rate exceeded 1.2 q_s
21	Time when flow-rate was below q_i

Table 6: Accumulated parameters

Minimum Archive Capacity

Hours for archive records: 1480 hr

Days for archive records: 1130 days

Months for archive records: 36 months

Archive data storage time: at least 36 months

Time of storage of all measured integral data, also without power supply to the electronic unit: at least 15 years

External Communication Interfaces

Optical interface (always included, irrespective of the order)

Ordered interface (to be specified when ordering the meter; both options can be selected):

- M-Bus interface
- RF 868 MHz interface

The interfaces are intended for data reading and meter parametering. When the meter is configured for being powered only from the internal battery, the time of communication through the additional interfaces is automatically limited to save the battery—16 hours per month on an average. Unused communication limit is summed up. If the limit is used, the interface is locked and the summing-up of a new limit will start only after the change of the hour (80 times each hour).

For wired interfaces, a permanently connected 5 ft (1.5 m) length cable is included in the meter.

The optical interface is integrated in the front panel of the electronic unit and is intended for data reading in M-Bus protocol, meter parametering, and output of optical pulses in the *Test Mode*. It is activated by pressing the button (5 minutes after the end of communication, or is automatically disabled after pressing the button).

Pulse Outputs

Number of pulse outputs:	2 or none (to be specified when ordering)
Class:	OB in the *Operating Mode*
	OD in the *Test Mode*
Type:	Open collector
Permissible current:	Up to 20 mA
Voltage:	Up to 24 V
Pulse duration:	125 ms in the *Operating Mode*; 1.2 ms in the *Test Mode*

Pulse Value in the Operating Mode

When the output is configured for energy, the value of its pulses can be selected from the list (depending on the rated flow q_p and energy measurement units):

Permanent flow rate, q_p, m^3/h	**0.6…6**	**10…60**
Energy pulse value, when units are "kWh" or "MWh"	0.001; 0.01; 0.1; 1; 10 MWh/imp	0.01; 0.1; 1; 10 MWh/imp
Energy pulse value, when units are "GJ"	0.001; 0.01; 0.1; 1; 10 GJ/imp	0.01; 0.1; 1; 10 GJ/imp
Energy pulse value, when units are "Gcal"	0.001; 0.01; 0.1; 1; 10 Gcal/imp	0.01; 0.1; 1; 10 Gcal/imp

Table 7: Pulse value when output is configured for energy

When the output is configured for water quantity, the value of its pulses can be selected from the list (depending on the permanent flow q_p):

Permanent flow rate, q_p, m^3/h	**0.6…6**	**10…60**
Water volume pulse value, m^3/imp	0.001; 0.01; 0.1; 1; 10	0.01, 0.1, 1; 10

Table 8: Pulse value when output is configured for water quantity

If the meter is ordered with the *Pulse Input/Output* device, then a permanently connected 5 ft (1.5 m) length cable is fitted in the meter for connecting the inputs/outputs.

Meter Power Supply

One of the options, depending on the meter configuration:

- One or two internal AA-size 3.6 V lithium (Li-SOCl2) batteries with a service life of at least 15+1 years,
- Or an external 12…42V DC or 12…36V 50/60 Hz AC voltage; consumption current not more than 20 mA,
- Or an external 230V 10…15% 50/60 Hz AC voltage; consumption current not more than 5 mA.

Overall Dimensions

Electronic unit: maximum 115 mm x 30 mm x 90 mm

Flow sensors: See *"Dimensions" on page 32*

Meter Weight

Flow Sensor Connection Type (Length)	Meter Weight, max. in. (kg)
G3/4 in. (110 mm)	1.5 (0.7)
G3/4 in. (165 mm)	1.8 (0.8)
G1 in. (110 mm)	1.5 (0.7)
G1 in. (130 mm)	1.8 (0.8)
G1 in. (190 mm)	2 (0.9)
DN20 (190 mm)	5.5 (2.5)
G1-1/4 in.	7.1 (3.2)
G1-1/2 in.	7.3 (3.3)
DN25	12.3 (5.6)
DN32	13.2 (6.0)
G2 in.	8.2 (3.7)
DN40	15 (6.8)
DN50	18.8 (8.5)
DN65	28.7 (13)
DN80	33.1 (15)
DN100	40 (18)

Table 9: Meter weights

Operating Conditions

Electronic unit protection class:	IP65 (IP67 or IP68, custom-made)
Flow sensor protection class:	IP65 (IP67 or IP68, custom-made)
Temperature sensors protection class:	IP68
Ambient temperature:	5…55° C
Relative humidity:	Up to 93%
Atmospheric pressure:	86…106.7 kPa
Mechanical environment class:	M1
Electromagnetic environment class:	E2

MARKING AND SEALING THE METER

Marking the Meter

The following is indicated on the front panel of the electronic unit of the meter: The manufacturer's trademark, type and the type number of the meter, EU–type examination certificate number, factory number, year of manufacture, temperature measurement range, temperature difference measurement range, accuracy, environmental class according to LST EN1434-1, electromagnetic and mechanical environment class, flow measurement range (q_i, q_p, q_s), temperature range for the sensors, maximum allowable working pressure, types of communication interfaces (excluding optical ones), and supply voltage (in the case of external power supply).

The following is indicated on the housing of the flow sensor:

- The type of connection (thread or relative diameter)
- The flow direction

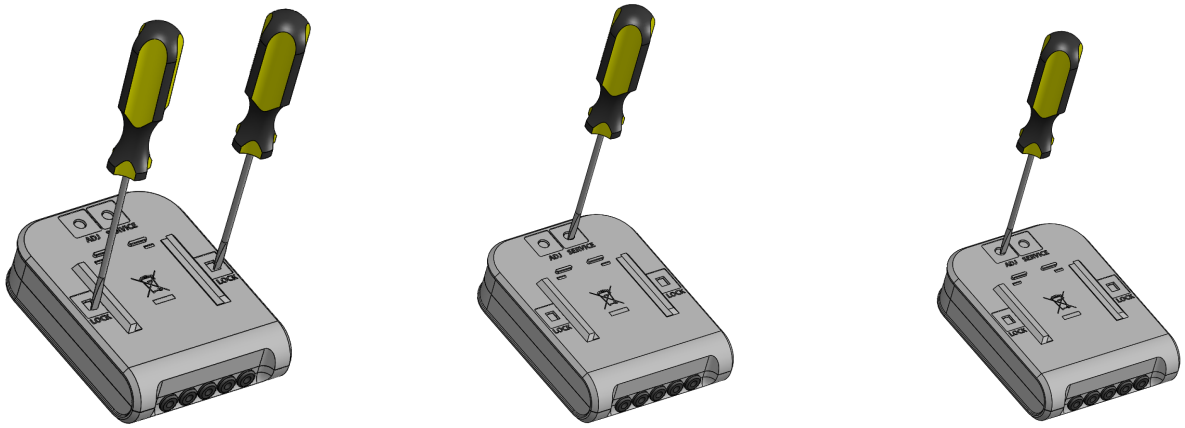
Destination of wire communication interfaces , additional inputs and outputs, and wires of external power cables is marked with the color of the cable wires and an additional label on the cable indicating the destination.

The temperature sensor intended for mounting in the higher temperature pipeline is marked with a red marking pipeline sign; that intended for mounting in the lower temperature pipeline is marked with a blue pipeline sign.

Sealing the Meter

Sealing the Heat Meter Calculator

No additional sealing applies to the electronic unit of a newly manufactured heat meter. Access to elements fixing the opening of the box, configuration change activation contacts, and adjustment data change activation contacts are protected by special easily breakable partitions (see *Figure 33*).



(a) (b) (c)

Figure 33: Access to elements fixing the opening of the box (a), configuration change activation contacts, and adjustment data change activation contacts (c) (partitions easily breakable with a tool)

After opening the box, changing the configuration, or adjusting the meter (when the special partitions were broken out for this purpose), you must seal the opened slots with sticker seals:

- The two slots marked LOCK for access to the elements fixing the opening of the box are sealed with test sticker seals. See (a) in *Figure 33*,
- The slot marked SERVICE for access to the configuration change activation contacts is sealed with the supplier's sticker seal. See (b) in *Figure 33*,
- The slot marked ADJ for access to the adjustment data change activation contacts is sealed with the supplier's sticker seal. See (c) in *Figure 33*.

Sealing the Heat Meter Flow Sensor

Attach the manufacturer's warranty sticker seal to seal the protective cap fastening screws.
See position 1 in *Figure 19 on page 40*.

After installation, seal the temperature sensor fastening screw with mounting seals. See *Figure 20 on page 40*.

RETURN OF GOODS FOR REPAIR

Please refer to our claims return form / harmlessness declaration at www.badgermeter.com.

Control. Manage. Optimize.

www.badgermeter.com