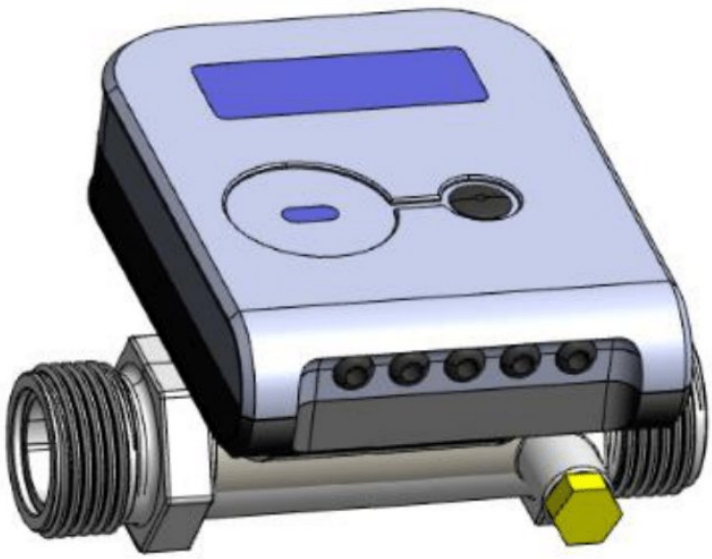
AXIOMA Metering UAB

ULTRASONIC HEATING AND COOLING ENERGY METER QALCOSONIC E4



TECHNICAL DESCRIPTION AND OPERATION GUIDE

PEE4V02

KAUNAS

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EU DECLARATION OF CONFORMITY

Axioma Metering UAB herewith declares, that heat meter (calculator and flow sensor) **QALCOSONIC E4** complies with the relevant requirements of the following directives:

2014/32/EU	Directive 2014/32/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the member states relating to the making available on the market of measuring instruments
2014/30/EU	Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility
2014/35/EU	Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits
2014/53/EU	Directive 2014/53/EU of the European Parliament and of the Council of 16 april 2014 on the harmonisation of the laws of the member states relating to the making available on the market of radio equipment and repealing directive 1999/5/EC
2011/65/EU	Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment
2006/66/EU	Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC
2012/19/EU	Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE)

Kaunas, 2021-02-15
Head of Innovation and Technology Division _____ Dr. Virgilijus Pamakštis
(signature)

EU – type examination certificate No: LT-1621-MI004-046
Quality system certificate No: KS-1621-MP-003.21

Notified body:
Lithuanian Energy Institute, Laboratory of heat equipment research and testing, Lithuania
Body No: **1621**

For EU Customers only - WEEE Marking

Marking of electrical and electronic equipment in accordance with Article 14 (2) of Directive 2012/19/EU



It is prohibited to dispose a meter marked with this sign into an unsorted municipal waste container together with other waste!

This symbol on the product indicates that it will not be treated as household waste. It must be handed over to the applicable take-back scheme for the recycling of electrical and electronic equipment. For more detailed information about the recycling of this product, please contact your local municipal office



SAFETY REQUIREMENTS

Before operating the meter, this Technical Description and the User Manual must be read and their instructions must be observed.

- When the meter is powered from a battery (3.6 V), the risk to safe operation is posed only by the heat carrier, which may have a pressure of up to 1.6 MPa and a temperature of up to 90 °C.

- When the meter is powered from the mains (230 V), an additional risk is posed by life-threatening alternating current. The meter must be installed and maintained in accordance with the requirements of the Safety Regulations related to the Operation of Electrical Installations.

- Meters can be installed and maintained only by specialists who have required qualifications (to work with electrical installations of up to 1000 V) and permits, are familiar with the technical documentation for the heat meter, and have received instruction briefing on work safety.

- No protective grounding is provided for because the housing of the electronic unit complies with the requirements of Protection Class II.

- Unauthorised dismantling or repair of the device is prohibited.

- Safety guarantees at installation and service of meter is:
  - Reliable insulation of electrical circuits,
  - Hermetic fitting of primary flow and temperature sensors into the pipeline,
  - Reliable fastening of sub-assemblies of heat meter at installation.

- The repair, replacement, connection, and disconnection of the sub-assemblies of the meter may only be possible **after disconnecting from the mains** (when the electronic unit is powered from 230 V mains) **and having made sure that there is neither pressure nor heat carrier in the pipeline**.

- **When the meter is powered from 230 V mains:**

  - Meter is connected to 230 V mains by a double-wire copper cable with a diameter of 2 × 0.25 mm^2 (a non-detachable cable is included in the supply package of the meter).
  - Meter should be connected to 230 V mains through a single-pole automatic 1A alternating current switch.
  - Automatic switch should be a part of the installation of the building. The automatic switch should be marked as a meter disconnecting device and should be installed near the meter in a position easily accessible by the meter servicing operator.

The meter and its parts should be installed so that not to hinder the use of the automatic switch.

It is recommended that the switches for disconnecting power supply be installed in the same cabinet and adapted to the power used by the device.

- Operating conditions:
  – ambient temperature — from +5 °C to +55 °C;
  – humidity — up to 93%.

<u>Caution</u>: If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired!

1 APPLICATION FIELD

The ultrasonic heating and cooling energy meter QALCOSINIC E4 (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 (residential buildings, enterprises, organisations or supply facilities, etc.) for the commercial metering of consumed energy where water is the heat carrier.

Microprocessor-based compact meter for installation in either the supply or return heat exchange circulating system, with replaceable (corresponding the requirements of the technical regulations for measuring instruments) temperature sensors.

This is microprocessor-based meter for optional mounting on either a supply or return heat exchange systems. The meter is available in two designs: with permanently connected temperature sensors or with changeable temperature sensors (complying with the requirements of the Measuring Instruments Regulations)

The meter complies with the requirements of Annex 1, Annex MI004 to the Technical Regulation on Measuring Instruments and harmonised standards LST EN 1434 – Heat meters (LST EN 1434-1:2015+A1:2019, LST EN 1434-2:2015 +A1:2019, LST EN 1434-3:2016, LST EN 1434-4: 2015+A1:2019, LST EN 1434-5: 2015+A1:2019). The meter meets the requirements of Environmental Class C according to LST EN 1434-1:2015+A1:2019.

Climatic environmental conditions: Temperature range: from 5 °C to 55 °C;
Humidity: condensing. Location: closed.
Mechanical environment class: M1
Electromagnetic environment class: E2

Meter type code structure:

QALCOSINIC E4 - □-□□-□-□-□-□-□-□-□-□□-□

Type

Accuracy class:	*Min value of temperature difference:*	*Ratio of the flow rates (qp/qi):*	*Code*
2	3 K	100 (standard)	3
		250*	4

* except sensors q_p=0,6 m³/h and q_p=3,5 m³/h with connection G1 ½

Flow sensor (permanent flow rate qp, mounting length L, connection type):

qp, m³/h	L, mm	Connection	Code
0,6	110	G ¾	11
1	110	G ¾	12
1,5	110	G ¾	13
1,5	130	G1	21
2,5	130	G1	22
3,5	260	G1 1/4	40
3,5	260	G1 1/2	42
6	260	G1 1/4	45
6	260	G1 1/2	46

Integrated communication interface type:	*Code*
Mbus (standard)	1
Mbus and RF 868 MHz	3
Mbus and RF 868 MHz (T1, AES)	7
Mbus and RF 868 MHz (T1, fixed key)	8
Mbus and RF 868 MHz (S1)	9

Power supply source type:	*Code*
Module 24V AC/DC	6
Module 24V AC/DC + mains unit 230 VAC	7
Internal battery (two.) (standard)	8

Length of the flow sensor cable:	*Code*
1,2 m (standard)	1

Extra communication interface:	*Code*	*Extra communication interface:*	*Code*
Not included (standard)	0	8	6
MODBUS (RS485)	2	LoRa 868 MHz RF 868 MHz (Nordic)	8
BACnet (RS485)	5		

Protection class:	*Code*
IP65 (standard)	1
IP68	3

Type code: **QALCOSINIC E4 -** □-□□-□-□-□-□-□-□-□-□-□□-□

Pulses inputs/outputs:	*Code*
No (IP65) (standard)	1
Yes (IP65)	2

Length of the temperature sensors cable	*Code*
1,5 m (standard)	1
3 m	4
5 m	5
10 m	6

Configuration profile:	*Code*
Transportation Mode (Standard)	02
Standard with turned off transport mode	05
Specific to the user	xx

Heat carrier type:	*Code*
Water	1

When ordering, in addition, the following is selected:

- meter initial configuration variant from the list:

Purpose of the meter:	*Flow sensor installation:*
Energy Meter for Heating	In supply pipe
	In return pipe
Energy Meter for Heating and Cooling	In supply pipe
	In return pipe

Energy measurement units and resolution:
0,001 MWh
0,001 GJ
0,001 Gcal
1 kWh (standard)

- meter assembly variant from the list:

Mountig kit for temperature sensors
None (standard)
Valve for DS type (DN15-25) or Pocket (DN32-100)

Mounting set for flow sensor
Only gaskets (standard)
Threaded fittings with gaskets

2 TECHNICAL SPECIFICATIONS

2.1. Energy measurement

Accuracy class: 2 according to LST EN 1434-1
Energy measurement units: kWh; MWh; GJ; Gcal
Maximum value of thermal power: 976 MW

2.2. 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 (standard) or q_p/q_i = 250 (except for q_p = 0.6 m^3/h and q_p 3.5 m^3/h with G 1 ½ end connection)

The technical data of the flow sensor are provided in Table 1.1.

1.1 Table

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, mm	Pressure losses at q_p, kPa	Joining to the pipeline (Thread – G, flange–DN)
0,6	1,2	0,006	0,003	110	1,7	G3/4“
1	2	0,004	0,003	110	4,2	G3/4“
1	2	0,01	0,003	110	4,2	G3/4“
1,5	3	0,006	0,003	110	8,8	G3/4“
1,5	3	0,015	0,003	110	8,8	G3/4“
1,5	3	0,006	0,005	130	4	G1“
1,5	3	0,015	0,005	130	4	G1“
2,5	5	0,01	0,005	130	10,4	G1“
2,5	5	0,025	0,005	130	10,4	G1“
3,5	7	0,014	0,007	260	6,8	G1 1/4“
3,5	7	0,035	0,007	260	6,8	G1 1/4“
6	12	0,024	0,012	260	18	G1 1/4“
6	12	0,06	0,012	260	18	G1 1/4“
3,5	7	0,035	0,012	260	2	G1 1/2“
6	12	0,024	0,012	260	5,8	G1 1/2“
6	12	0,06	0,012	260	5,8	G1 1/2“

Temperature limits of heat conveying liquid: 0.1 °C – 90 °C
Length of the connecting cable between the flow sensor and electronic unit: 1.2 m
Maximum admissible working pressure (nominal pressure PN): 16 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.

2.3. Pulse inputs (additional)

– the number of pulse inputs: 2
– indicated units: m^3
– pulse value programmable from list:
0,001; 0,002; 0,0025; 0,005; 0,01; 0,02; 0,025; 0,05; 0,1; 0,2; 0,25; 0,5; 1; 2; 2,5 ; 5; 10 m^3
– input pulse types: IB according to LST EN1434-2
– maximum permissible frequency of input pulses: 3 Hz
– maximum permissible voltage of input pulses: 3 V
– condition of maintenance of high level: 3 V through 2 MΩ resistor
– a connected 1.5 m cable is included in the meter for connecting the pulse inputs.

2.4. Temperature measurement

Temperature measuring range: 0 °C … 90 °C.
Temperature difference measuring range: 3 … 70 K
Temperature sensor design: DS type according to EN1434-2
Connected cable length: up to 10 m.

Platinum resistive temperature sensors Pt500 in accordance to EN60751 are used. Temperature sensors are paired according to EN1434 and MI004 requirements, the connection method is two-wire.

Note: The lower limit of temperature difference measurement of the pair of temperature sensors must correspond to the lower limit of temperature difference marked on the meter and the cable diameter must be within 4.0 ... 4.2 mm.

2.5. 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 Paragraph 6.3 are displayed.

Energy measurement units (selectable by the user when installing): kWh, MWh, Gcal, or GJ

Resolution of energy indicators (selectable by the user when installing):

000000,01 kWh (only for meters with q_p ≤1,5 m^3/h)
0000000,1 kWh
00000001 kWh,
00000,001* MWh (Gcal or GJ)
000000,01 MWh (Gcal or GJ)
0000000,1 MWh (Gcal or GJ) (only for meters with q_p ≥1,5 m^3/h)

*- manufacturer's standard setting.

Resolution of volume indicator: 00000,001 m^3

In the case of battery discharge or disconnection, all integral readings and archive data shall be saved for at least 16 years and can be accessed by connecting a power battery in the operating condition.

2.6. 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 Paragraph 6.5). The monthly data archive parameters which are also additionally showed on the display are specified in Paragraph 6.3.1.

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

Integral energy
Integral cooling energy
Integral energy, Tariff 1
Integral energy, Tariff 2
Integral heat carrier volume
Integral value of Pulse Input 1
Integral value of Pulse Input 2
Value and date of the maximum power
Minimum (or maximum cooling) power value and date
Value and date of the maximum flow-rate
Supply heat carrier maximum temperature value and date
Return heat carrier maximum temperature value and date
Supply heat carrier minimum temperature value and date
Return heat carrier minimum temperature value and date
Minimum recorded temperature differential and date
Supply heat carrier average temperature value
Return heat carrier average temperature value
No-energy operation calculation error time
Summary error code
Time when flow-rate exceeded 1.2 qs
Time when flow-rate was below qi

Archive capacity, minimum:

for hours archive records: 1480 h
for days archive records: 1130 days
for months and years 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 16 years

2.7. External communication interfaces

Interfaces are always included:

Optical interface
Mbus interface

Ordered interface:

wMbus RF 868MHz (S1 or T1)

Additional interface, depending on the order (only one option from the list is possible):

MODBUS (RS485)
BACnet (RS485)
LoRa RF 868 MHz

The interfaces are used for reading the metering data and configuring the meter. Wired interfaces are galvanically isolated from meter circuits. When the meter is powered by an internal battery, the number of readings per hour is limited to ensure 16 years of battery life. An unused reading reserve is accumulated. When the limit is used, the interface is stopped and only after the hour has changed, a new limit will be added.

Hourly limits for for standard-length telegrams for different interface combinations are given in the table:

	Maximum number of readings per hour (limited), depending on set of interfaces:			
Interface type	Mbus	Mbus + wMbus	Mbus + MODBUS/BACnet/LoRa	Mbus + wMbus + MODBUS/BACnet/LoRa
Mbus	600	60	60	200
wMbus	-	32	-	11
MODBUS/BACnet /LoRa	-	-	600 / (every 4 hours)*	200 / (every 12 hours)*

* - the limit of readings from meter to MODBUS or BACnet interfaces is given, with standard settings - is limitted to 6 times per hour. The reading of data from the module is not limited,
- the LoRa module standard periode of telegram transmitting in hours is given in brackets.

The table shows the number of Mbus readings for primary addressing method when the only one MBUS meter is in the network.
The table shows the number of Mbus and wMBUS readings with the standard list of parameters for transmitting. For a shorter list of parameters, a higher number of transmittings is possible.

For wired interfaces, a permanently connected 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 Mbus protocol, meter parametrization, and output of optical pulses in the test mode. It is activated by pressing the button (5 minutes after the end of communication or after pressing the button - is automatically disabled).

2.8. Pulse outputs

Number of pulse outputs: 2 or no (to be specified when ordering)
Class: OB – in the operating mode , OD – in the test mode
Type: open collector, 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:

Energy measurement units	Possible values for the energy pulse *
„kWh“ or „MWh“	0,00001; 0,0001; 0,001; 0,01; 0,1; 1; 10; 100; 1000; 10000 MWh/pulse
„GJ“	0,0001; 0,001; 0,01; 0,1; 1; 10; 100; 1000; 10000 GJ/ pulse
„Gcal“	0,0001; 0,001; 0,01; 0,1; 1; 10; 100; 1000 Gcal/imp
- lenth of values list depends of permanent flow rate and LCD energy value comma position	

– When the output is configured for water quantity, the value of its pulses can be selected from the list :
0,001; 0,01; 0,1; 1; 10 m^3/pulse

– a connected 1.5 m cable is included in the meter for connecting the output pulses .

2.9. Meter power supply

- two internal AA-size 3.6 V lithium (Li-$SOCl_2$) batteries with a service life of at least 15+1 years,
- or an external 12–42 V DC or 12–36 V 50/60 Hz AC voltage; consumption current not more than 20 mA. Mains unit 230 VAC can be added.

2.10. Overall dimensions:

electronic unit: max 115 mm x 90 mm x 30 mm,
flow sensors: according to Annex B

Weight of the meter:

Connection type (and length) of the flow sensor	Weight of the meter, maximum, kg
G3/4“	0,4
G1“	0,5
G1 ¼“	0,6
G1 ½ “	0,8

2.11. Operation conditions

Electronic unit and flow sensor protection class: IP65 (standard) or IP68
Temperature sensors protection class; IP68

Operating conditions:
– ambient temperature 5 °C to 55 °C;
– relative humidity up to 93 %,
– atmospheric pressure 86 kPa to 106.7 kPa
Mechanical environment class: M1
Electromagnetic environment class: E2.

3 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

$$Q = V \cdot \rho_1 \cdot (h_{T1} - h_{T2})$$

– when the flow sensor is in the return line

$$Q = V \cdot \rho_2 \cdot (h_{T1} - h_{T2})$$

Where: Q – heat energy;
V – the volume of water passing through the meter, m^3;
ρ_1, ρ_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 T1 and T2;
h_{T1}, h_{T2} – 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 $Q_☼$. In this case, energy values are calculated according to the following formulas:

– when the flow sensor is in the supply line

when Θ1 > Θ2: $Q = V \cdot \rho_1 \cdot (h_{T1} - h_{T2})$, $Q_☼ = 0$
when Θ1 < Θ2: $Q_☼ = V \cdot \rho_1 \cdot (h_{T2} - h_{T1})$, $Q = 0$

– when the flow sensor is in the return line

when Θ1 > Θ2: $Q = V \cdot \rho_2 \cdot (h_{T1} - h_{T2})$, $Q_☼ = 0$
when Θ1< Θ2: $Q_☼ = V \cdot \rho_2 \cdot (h_{T2} - h_{T1})$, $Q = 0$

The electronic unit of the heat meter performs all necessary measurement and data storage functions:
- measurement and collection of thermal energy consumption and heat transfer medium volume,
- accumulation of instantaneous, average, maximum and minimum values of heat flow and temperatures,
- measure and accumulation of volumes according to the received pulses at the two pulse inputs,
- generates energy and volume pulses at two pulse outputs,
- performs automatic diagnostics of the meter and accumulation of operating and measuring errors,
- displays measured and stored data and transmits via telemetry interfaces,
- store the values of thermal energy in separate registers,
- ensures accelerated detection of measurement errors in test and adjustment modes.

4 MARKING AND SEALING

4.1. Marking

The following is indicated on the front panel of the electronic unit of the meter: the manufacturer’s trade mark, type and the type code of the meter, EU – type examination certificate number, factory number,

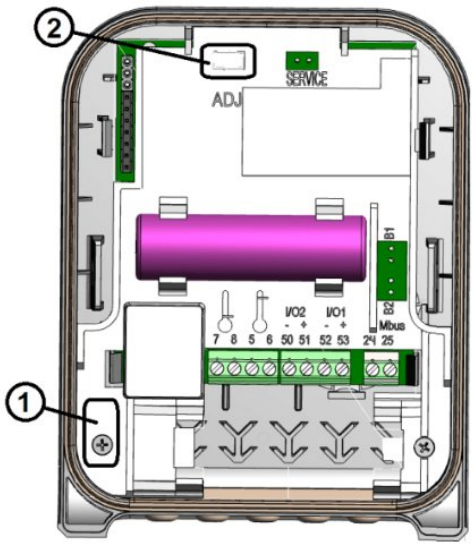


Fig. 4.2 . Sealing the cover of the calculator: the inspection seals /adhesive seals protect the acces to protective cap mounting bolt (1) and to adjustment data change activation contacts (2) , if breakable partition is broken out.

4.2.2. Sealing of the flow sensor of the heat meter.

The manufacturer's warranty sticker seal is attached – the protective cap fastening screws are sealed (Fig. C2, pos. 1).

4.2.3. After installation, the temperature sensor fastening screw is sealed with mounting seals (Fig. C3).

5 INSTALLATION PROCEDURE

5.1. General requirements

Prior to installing the meter, it is necessary:

- to check the complete set of the meter with that specified in the technical documentation;
- to check for any visible mechanical defects;
- to check the configuration of the meter and to 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.

It is prohibited to lay signal wires near (closer than 5 cm from) power cables or cables of other devices.

5.2. Check of the configuration of the meter

5.2.1. Prior to installing the meter, it must be verified whether its configuration complies with the requirements for the specific facility and it must be changed 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;
- Mbus 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. The transport mode can also be turned off using the button (as like turning on TEST mode) and with the HEAT3_service configuration software.

5.2.2. Procedure for the review of the configuration of the meter:

- 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):



- For the review and change of the configuration, press and hold down the button until INF turns on at the bottom of the LCD. The parameter is selected by shortly pressing the button (and is changed if necessary):

LCD image	Parameter	Possibility to change
↔ 0.000 kW INF	Heat power	
↔ m³h 0.000 INF	Flow-rate	
1 ↔ 0 °C INF	Temperature T1	
2 ↔ 0 °C INF	Temperature T2	
1-2 ↔ 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: 2037.03 INF	Battery service life end date	
↔ 2021.07.24 INF	Date (year.month.day)	Yes
↔ 15-07-32 INF	Time (hour-minute-second)	Yes
↔ ----. 01. 31 INF	Reporting date of the year (month.day)	Yes
↔ ----. --. 31 INF	Reporting day of the month	Yes
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)	
↔ C: 0000000 INF	Subscriber number	Yes
↔ SoFt 0.01 INF	Software version number	
↔ 00000000 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**
↔ m³ tESt on 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**

Notes.

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

5.2.3. Change of the configuration of the meter

The parameters marked in Paragraph 5.2.1 can be changed using the configuration programme HEAT3_service (or and by 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-circuit the contacts repetedly- the configuring function will be turned off. After configuration, the slot must be sealed with a sticker seal.

5.3. Electrical wiring

The meter is fully ready for installation, complete with the necessary cables for connection (usually no need to open the meter).

If the meter is equipped with wired interfaces or a pulse input / output function, appropriate and marked cables to connect the relevant external device are provided (see Annex A, Figure A1 and Table A1).

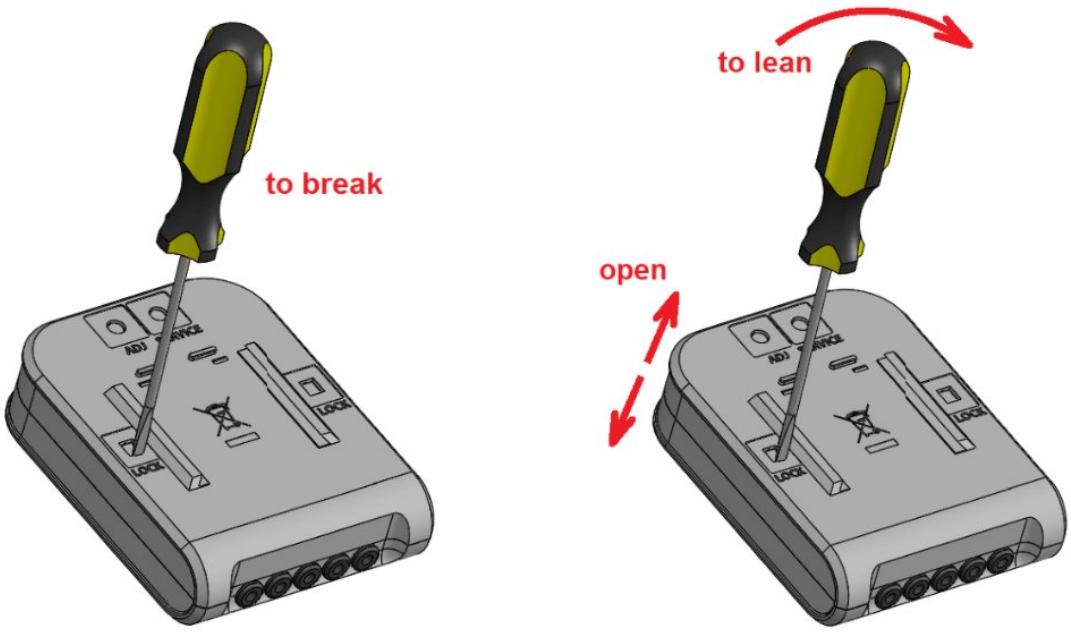
If the meter is intended to be powered by an external source of 230V AC, the dedicated and marked cable of the meter shall be connected to the appropriate source (see Annex A, Fig A1 and Table A1) or to the mains unit 230 VAC.

If it is necessary to install or replace the meter replaceable modules - open the electronic unit box.

Opening of electronic unit box

Open the electronic unit by help of universal tool (for example a universal flat screwdriver): by breaking two protective partitions marked LOCK - see Fig. 5.1., pos. a (or by removing sealing stickers, if the partitions have already been broken).

In the opened cavity, use a flat screwdriver to tilt the latch to the outside and open the box - see Fig'5.1, pos. b. Do this one after the other on both sides.



a) Break the protective LOCK outside and

b) Lean locking catches to the open the box

Fig. 5.1. Opening of electronic unit box

Connection of temperature sensors

Only platinum resistive temperature sensors Pt500 in accordance with EN60751, paired and labeled in accordance with LST EN1434 and MI004, are suitable for use with the meter and are connected by a two-core cable with an external diameter of 4.0 ... 4.2 mm and lenght up to 10 m.

Open the electronic unit box (Fig. 5.2).

If the meter is supplied with a second battery (located in the temperature sensor connection area), remove it from the socket, if needed (is allow to disconnect from the meter if necessary).

Install the wires of the temperature sensors through their respective holes, connect them to the marked terminals and fix the cable into the slots (see Annex A, Fig. A2 and A3). It is important that the temperature sensor for working in the higher temperature pipe (usually marked in red) is connected to terminals 5 and 6, the temperature sensor for working in the lower temperature pipe (usually marked in blue) is connected to terminals 7 and 8.

Install a second battery in to the slot (if any) and verify that it is plugged in (if disconnected).

The electronic unit box is closed by twisting it and squeezing it until it snaps into place. Check if it is locked firmly (by trying to open).

The LOCK holes has to be sealed with the supplier's seal-sticker.

Connecting additional interface modules

The meter has integrated wireless (RF) and cabled M-bus interfaces and two pulse inputs / outputs. Meter additionaly can be equipped with an optional interface modules.

Integrated Mbus interface and the pulse inputs / outputs cables is connected in the same order as when connecting the temperature sensors (see above), only the cable leads are connected to the dedicated terminals (see Annex A, Fig. A2, A3 and Table A2).

The optional interface module is connected in the following order:

-open the box and install additional/extra interface cable in the same order as when connecting the temperature sensors (see above),

- the additional interface cable is connected to the terminals of the interface module in accordance with Table A2,

- the module is inserted into the appropriate slot on the meter and the side-brackets, the module cable is firmly slipped into the meter and locked in place by finger-pinching it into the fixture (see Fig. A3),

- plug in and connect a second battery to connector B2,

- the electronic unit box is closed by twisting and squeezing it until it locks into place. Check for firm locking (when opening).

- the LOCK holes has to be sealed with the supplier's seal.

5.4 Installation

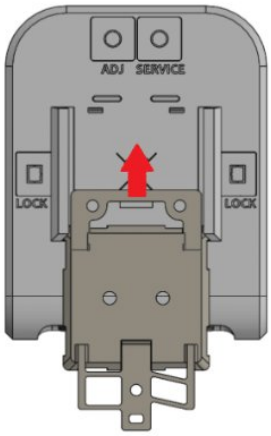
! ***Important:*** It is forbidden to place the meter signal wires near (less than 5 cm) power cables or other equipment cables.

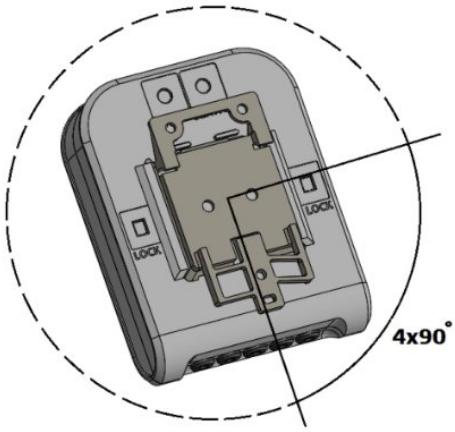
5.4.1 Mounting of the calculator

The electronic unit (calculator) of the meter is mounted in a heated room. The temperature of the working environment should not be higher than 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. The meter should be installed 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 °:





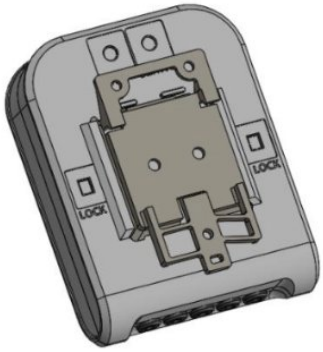
* auxiliary holder is supplied separately

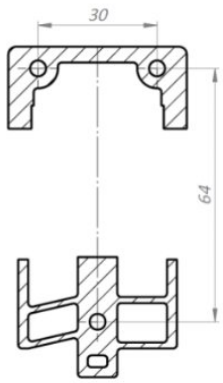
The possible ways of the mounting of the electronic unit:

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

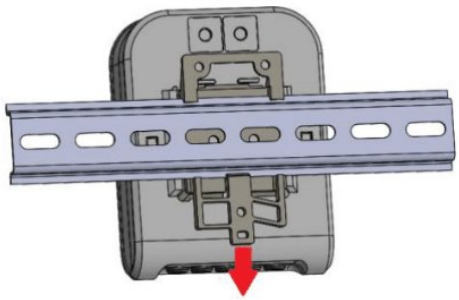


- On a wall:





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



! ***Important:*** *It is prohibited to 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 5 °C. In this case, it is recommended to mount the electronic unit so that to provide for an air space of at least 5 cm between the unit and the wall surface.*

5.4.2 Mounting of flow sensors

The installation and overall dimensions of the primary flow sensors are provided in Annex B.

No straight sections are required.

It is recommended to 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 can be mounted in any positions.

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 shall correspond to the total length of the sensor with regard to the thickness of gaskets.

It is recommended to select the flow sensor installation place as far as possible from potential sources of vibration (for example, pumps).

When installing the sensors, attention should be paid to the gaskets in order to ensure that they do not protrude inward the pipeline.

Tighten the connection nuts to the torque, depending on the size of the connection thread:

G3/4“	G1“	G1 ¼“	G1 ½“
30 Nm	35 Nm	45 Nm	50 Nm

It is prohibited to lay the wires of the flow sensor near (closer than 5 cm from) power cables or cables of other devices.

5.4.3 Installation of temperature sensors

Temperature sensors are installed with their placement heads upward, perpendicularly 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 centreline (see in the figures in Annex C). When the meter is fitted with flow sensors with flanges G3/4“ and G1“, one temperature sensor is installed in the housing of the flow sensor.

It is prohibited to lay the wires of the temperature sensors near (closer than 5 cm from) power cables or cables of other devices.

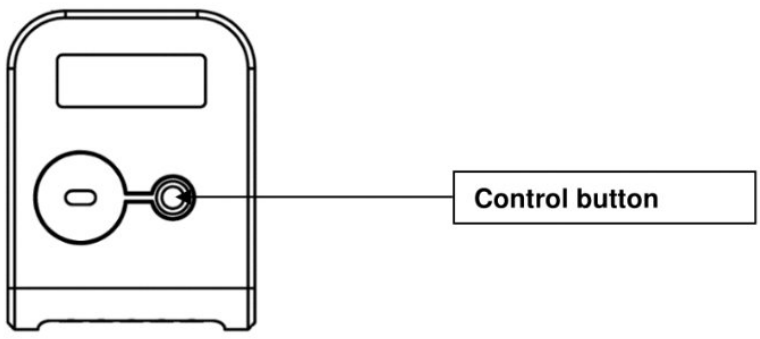
5.5 Check of installation and parameter setting

If the meter (calculator, flow and temperature sensors) is installed correctly, when there is flow, the display of the meter should represent the flow and temperature readings. In case the readings of the measured channels are not displayed, the installation of electrical circuits must be checked.

6. OPERATION PROCEDURE

6.1.Control

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.



6.2 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 flowing (in the right direction), it is represented by an arrow →; when the flow flowing in the opposite direction, it is represented by the arrow ←. When there is no flow, no arrow is displayed. The purpose of other symbols is described in Sections 6.3.1 – 6.3.3.

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 (Paragraph 6.3).

6.3. Menu structure

The diagram of the review of readings of the electronic unit in the operating mode is shown in Fig. 6.1. The main integral readings (1.2) or error (1.1) will always be shown if the button was not pressed for more than 5 minutes.

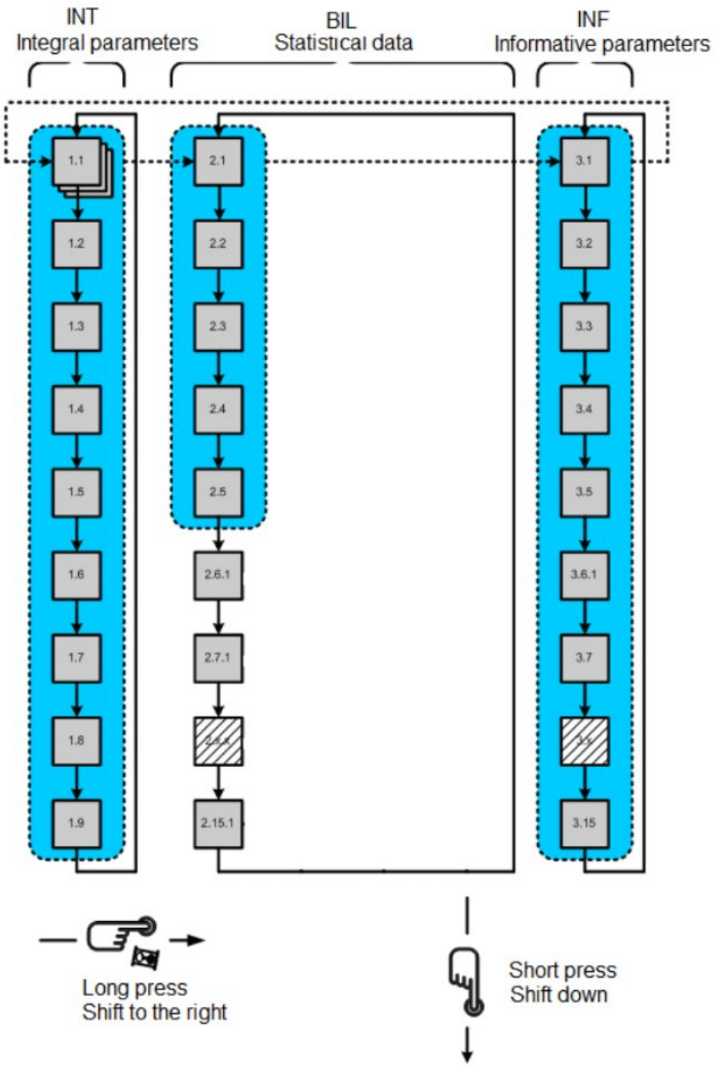


Fig. 6.1 The diagram of the review ot readings in the operating mode.

6.3.1. 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 "☼" 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 "☼" shows that the tariff is linked with a cooling energy meter

2.4	Settlement day integral Tariff 2 energy and date	2 00000.000 MWh BIL 2021.01.01 BIL	Changes every second
2.5	Settlement day integral heat carrier volume and date	m³ 00000.000 BIL 2021.01.01 BIL	Changes every second
2.6	Settlement day integral pulse input 1 value and date	1 m³ 00000.000 BIL 2021.01.01 BIL	Changes every second
2.7	Settlement day integral pulse input 2 value and date	2 m³ 00000.000 BIL 2021.01.01 BIL	Changes every second
2.8	Previous month integral energy and date	M 00000.000 MWh BIL 2021.01.01 BIL	Changes every second
2.9	Previous month integral cooling energy and date	M 00000.000 MWh BIL ☼ 2021.01.01 BIL	Changes every second
2.10	Previous month integral Tariff 1 energy and date	1 M 00000.000 MWh BIL 2021.01.01 BIL	Changes every second
2.11	Previous month integral Tariff 2 energy and date	2 M 00000.000 MWh BIL 2021.01.01 BIL	Changes every second

2.12	Previous month integral heat carrier volume and date	M m³ 00000.000 BIL 2021.01.01 BIL	Changes every second
2.13	Previous month integral pulse input 1 value and date	1 M m³ 00000.000 BIL 2021.01.01 BIL	Changes every second
2.14	Previous month integral pulse input 2 value and date	2 M m³ 00000.000 BIL 2021.01.01 BIL	Changes every second
2.15	Previous month maximum power value and date	M 0.000 kW BIL MAX 2021.01.01 BIL	Changes every second
2.16	Previous month minimum (or maximum cooling) power value and date	M 0.000 kW BIL MIN 2021.01.01 BIL	Changes every second
2.17	Previous month maximum flow-rate value and date	M m³/h 0.000 BIL MAX 2021.01.01 BIL	Changes every second
2.18	Previous month supply heat carrier maximum temperature value and date	1 M 0.0 °C BIL MAX 2021.01.01 BIL	Changes every second
2.19	Previous month return heat carrier maximum temperature value and date	2 M 0.0 °C BIL MAX	Changes every second

		2021.01.01 BIL	
2.20	Previous month maximum recorded temperature differential	1-2 M 0.0 °C BIL MAX 2021.01.01 BIL	Changes every second
2.21	Previous month supply heat carrier minimum temperature value and date	1 M 0.0 °C BIL MIN 2021.01.01 BIL	Changes every second
2.22	Previous month return heat carrier minimum temperature value and date	2 M 0.0 °C BIL MIN 2021.01.01 BIL	Changes every second
2.23	Previous month minimum recorded temperature differential and date	1-2 M 0.0 °C BIL MIN 2021.01.01 BIL	Changes every second
2.24 … 2.590	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	Flow rate	m^3h 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: 2037.03 INF	

3.7	Device current date (real-time calendar)	2021.07.24 **INF**	
3.8	Device current time (real time)	15-07-32 **INF**	
3.9	Reporting date of the year	↔ ----. 01. 31 **INF**	
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: **1-2** L1 10.0 °C **INF MAX** when >10.0 oC: **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 07-23 h **INF MAX** when the tariff is directly activated by the pulse input: **1-2** L1 In1 **INF**	Possible setting: One of measured parameters, 1 or 2 pulse input (if it is configured as an input) or off (OFF)
3.12	Tariff 2 configuration	Similarly to Tariff 1, only “L1” changes to “L2”	Similarly to Tariff 1
3.13	1st pulse input/output configuration	Input (volume pulses): **1** **m³** In 0.001 °C **INF** Input (tariff activation): **1** **m³** In L2 **INF** Output (energy): **1** out 0.001 MWh **INF**	Inputs can be configured to control only the water quantity (the maximum pulse resolution is indicated on the screen 0.00001 m3) or control one of the tariffs. Outputs can be configured for the water quantity (m3), heating (illlustrated case) or cooling “☼” energy or output of the status of one of the tariffs

		Output (tariff status): 1 out L1 INF	
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 MBus 1 address	1 buSA 1 INF	
3.16	Wire interface MBus 1 speed	1 2400E bPS INF	Bits per second. “E” – parity Even
3.17	Wire interface MBus 2 address	2 buSA 1 INF	When a second wire interface is also included
3.18	Wire interface MBus 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	User identification number	C: 0000000 INF	Transmitted in MBus telegrams
3.21	Device programme 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 (look at 6.4.2)
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 (look at 6.4.2)
3.27	For activating the RF interface installation mode by the press-button (press and hold)	1 InStALL M INF	The startup is password protected (see p.6.4.2). The number indicates the operating mode of the RF interface: 1- S1 mode 2- T1 mode The flashing letter M is only activated when the RF interface is activated

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.

6.3.2. Viewing of calculator readings in the test mode

The diagram of the review of calculator readings in the test mode is shown in Fig. 6.2.

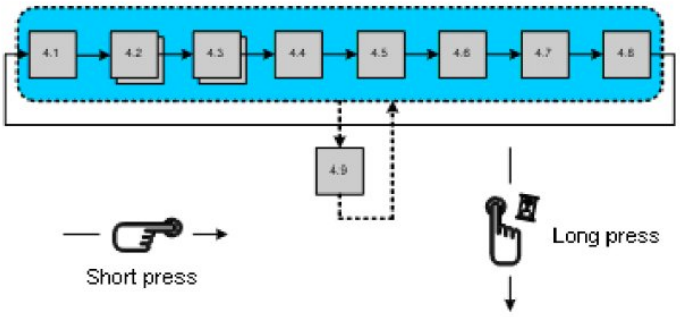


Fig. 6.2. The diagram of the review of electronic unit readings in the test mode.

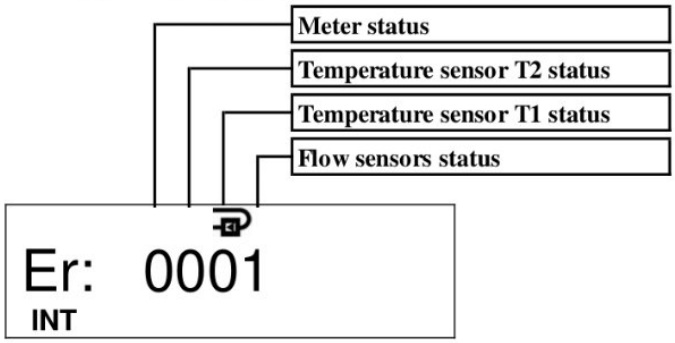
Display readings in the test mode

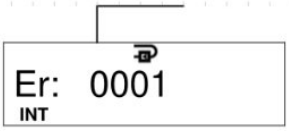
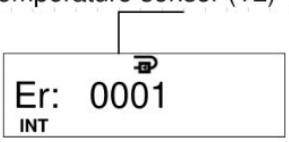
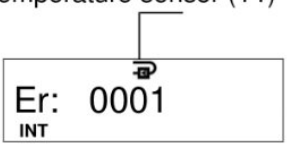
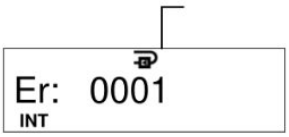
ID	Parameter	Value	Notes
4.1	High- resolution energy	TEST 000000.00 Wh TEST PULSE Wh	Updated every second. Indicated as “Pulse Wh”, if the energy test pulse output is activated (“Pulse m”^{3} – in the case of volume pulse output)
4.2	High-resolution integrated volume	TEST m^3 00.000000 TEST PULSE Wh	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	Flow rate	TEST m^{3}h 0.000 INF	
4.7	To activate energy pulses output via optical interface (when volume pulse output is active)	TEST tESt on Wh	Activated by pressing and holding the button
	To activate volume pulse output via optical interface (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^3/h 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.

6.3.3. 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 power suppy – when meter is powering externaly) 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 8 - the sensor is disconnected* C - the sensor is short-circuited *
Status of the supply heat carrier temperature sensor (T1) 	0 - normal operation 8 - the sensor is disconnected* C - the sensor is 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 *

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

Error codes sum up if there are 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 $q > 1.2 \cdot q_s$" is recorded additionally.

6.4. Test mode control
6.4.1. Specifications of the test mode

Test mode (TEST) is intended for quick testing.
Test mode can by activated bay the control batton, through optical interface or by the jumper SERVICE.
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 SERVICE).

The resolution of energy and flow-rate indicators in the test mode (TEST) is presented in Table 6.1.

Table 6.1

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		

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 6.2.

Table 6.2

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/imp	0,5 kJ/imp	0,1 kcal/imp
1	0,002	0,2 Wh/imp	1 kJ/imp	0,2 kcal/imp
1,5	0,004	0,2 Wh/imp	1 kJ/imp	0,2 kcal/imp
2,5	0,005	0,5 Wh/imp	2 kJ/imp	0,5 kcal/imp
3,5	0,02	1 Wh/imp	5 kJ/imp	1 kcal/imp
6	0,02	1 Wh/imp	5 kJ/imp	1 kcal/imp

6.4.2. Activation of the test mode by the control button

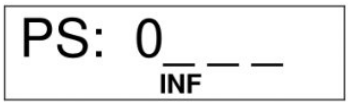
The test mode (TEST) can be activated by the button (or through the optical interface with the programme HEAT3-SERVICE). In this case, the water volume simulation feature is not available. Therefore, the test mode does not interfere with the normal operating mode (measured energy and volume are summed 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 m3” (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.**

6.4.3. Activation Test and Service mode by the jumper SERVICE

In this case, the test mode (TEST) is activated through the optical interface (with the programme HEAT3-SERVICE) or by the press-button:

- volume test pulses are generated via the optical interface (the button can be used to switch to the output of energy test output pulses);
- energy test pulses are generated at pulse output 1 and volume check pulses at pulse output 2,
- can simulate the volume of water to determine the energy measurement error (the simulation is started by a long press of the button and lasts for 150 seconds);
- the possibility of service configuration.

The test mode functions specified in Paragraph 6.4.2 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).

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 will display “TEST”. This mode via optical interface allows changing the configuration parameters of the meter similarly to the transport mode (see Paragraph 5.2.2).

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 150 seconds, 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.

6.4.4. 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 presses 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.

7. VERIFICATION

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

8. 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: -25 – +35 C

– humidity: max. 60%.

Annex A (continued)

Table A1.
Destination and marking of the extra cables of the heat meter

Destination of the cable	Marking of the cable***	Destination of the wire	Colour of the wire
Mbus interface	MBUS	Line	brown
		Line	white
1st pulse input/output	PULS1	Pulses (+)	brown
		Common (-)	white
2nd pulse input/output	PULS2	Pulses (+)	brown
		Common (-)	white
Pulse inputs/outputs	PULS	Pulses1 (+)	yellow
		Common1 (-)	green
		Pulses2 (+)	brown
		Common2 (-)	white
MODBUS interface	MODBUS	Line A	brown
		Line B	white
		24 V AC/DC*	yellow
		24 V AC/DC*	green
BacNet interface	BacNet	Line A	brown
		Line B	white
		24 V AC/DC*	yellow
		24 V AC/DC*	green
For external power supply from 24V AC/DC source	12-36 V AC 12-42 V DC	24 V AC/DC	brown
		24 V AC/DC	white

* Intended for powering the meter - when the meter is powered from an external power supply

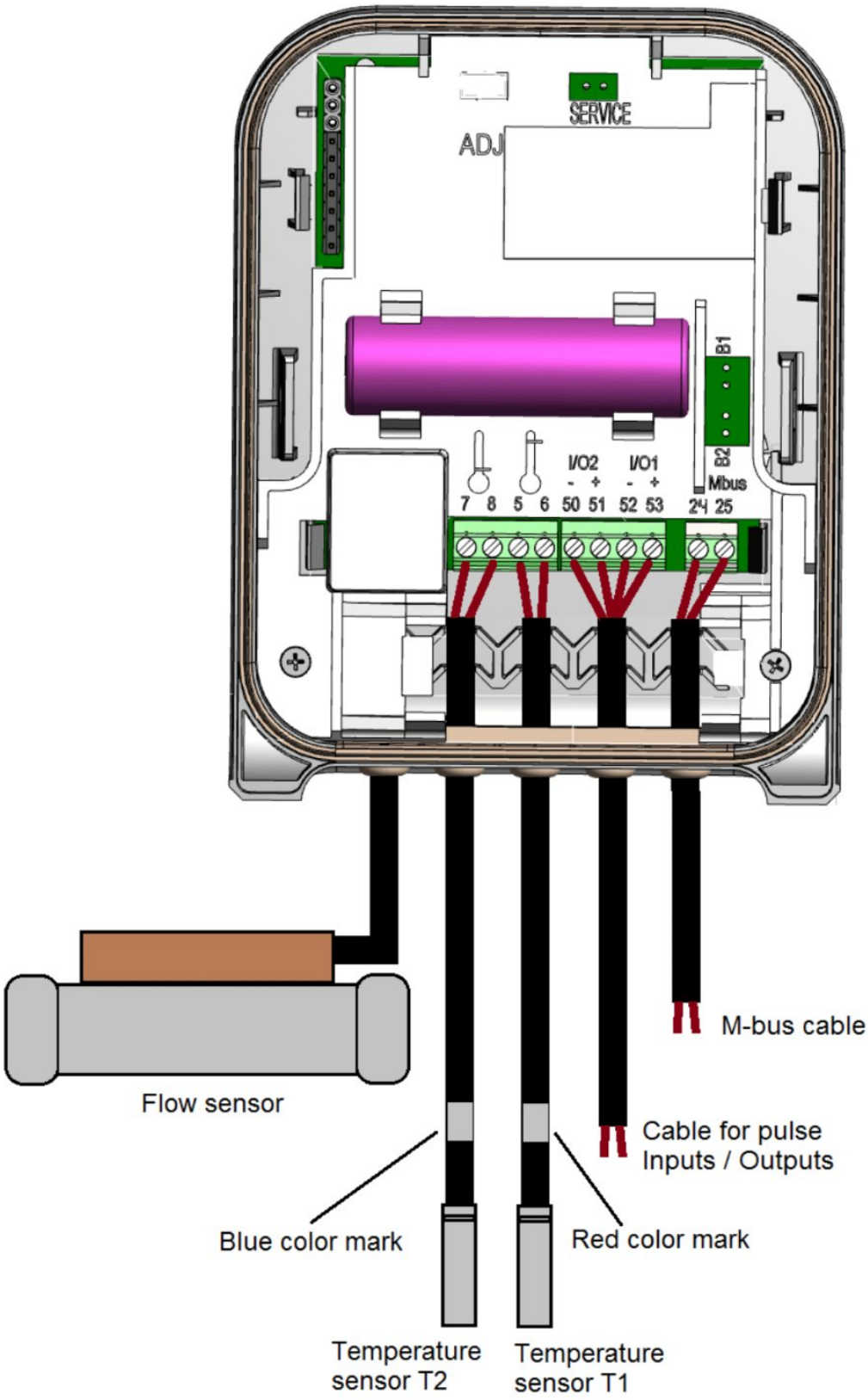


Fig. A2. Meter connection diagram.
Option with Mbus interface and supply from battery

Annex A (continued)

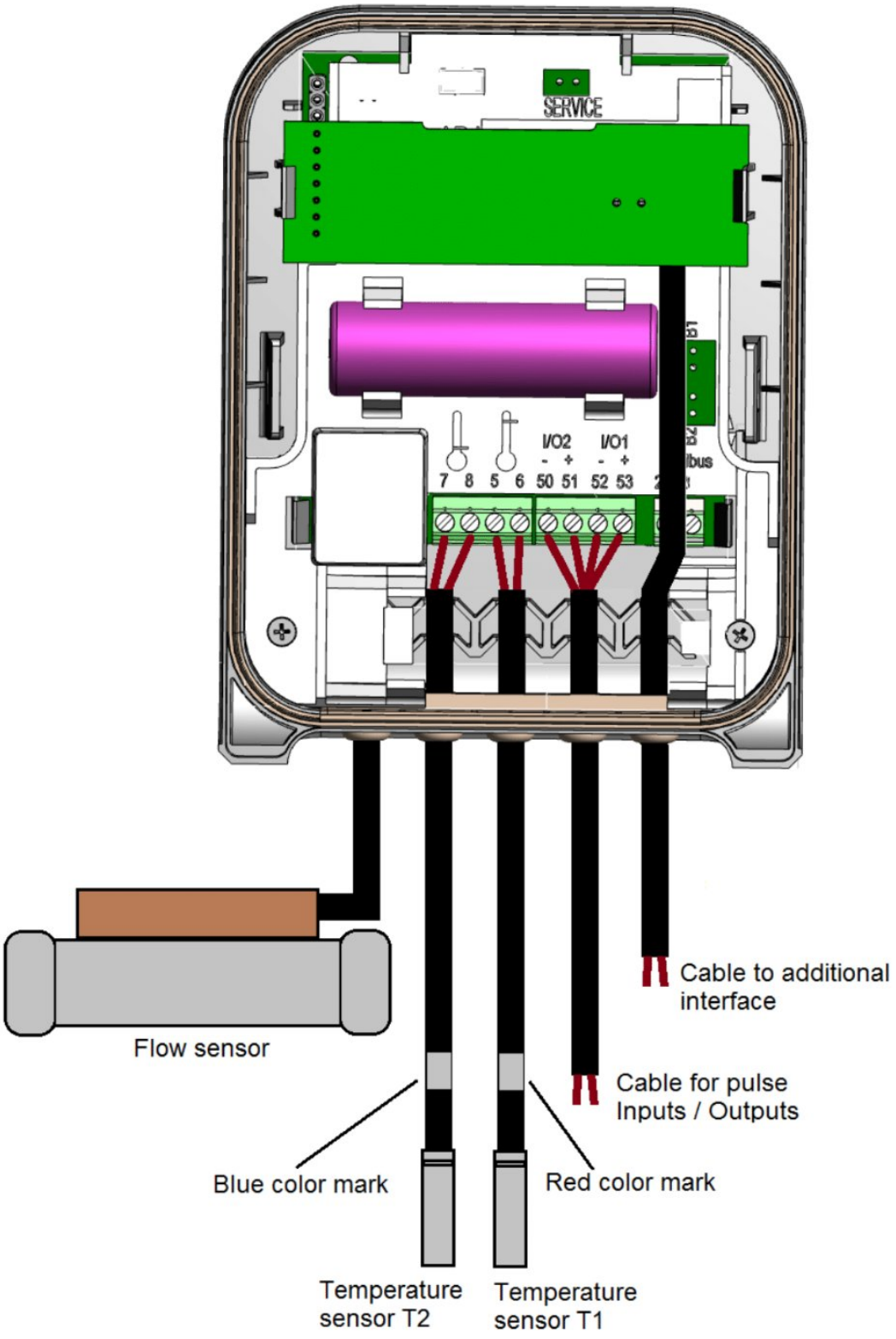


Fig. A3. Meter connection diagram.
Option with additional interface and supply from battery
(interface module mounting connectors is available when the module is removed)

Annex A (continued)

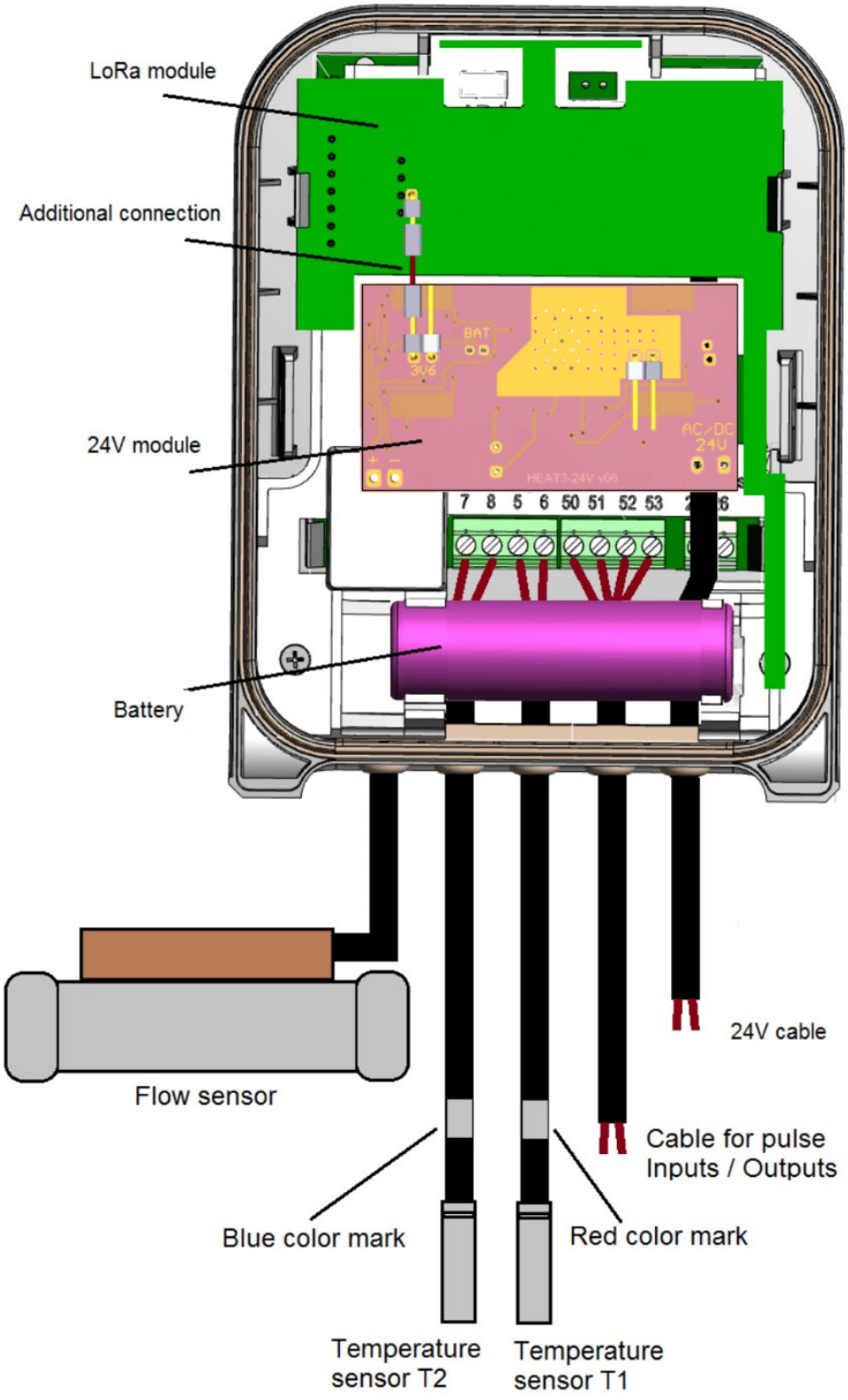


Fig. A4. Meter connection diagram.
Option with LoRa interface and 24V external power supply module.
The 24V power supply module is mounted on the battery holder and connected to the B1 connector of the meter. A backup battery is connected to the BAT connector of the module. The 24V power cable is connected to the "24V" terminals of the module (connections are made before mounting the module, as the connectors and terminals are on the other side of the module). The LoRa interface module is connected to the 24V power supply module connector by an additional connection cable.

Annex A (continued)

Table A2.

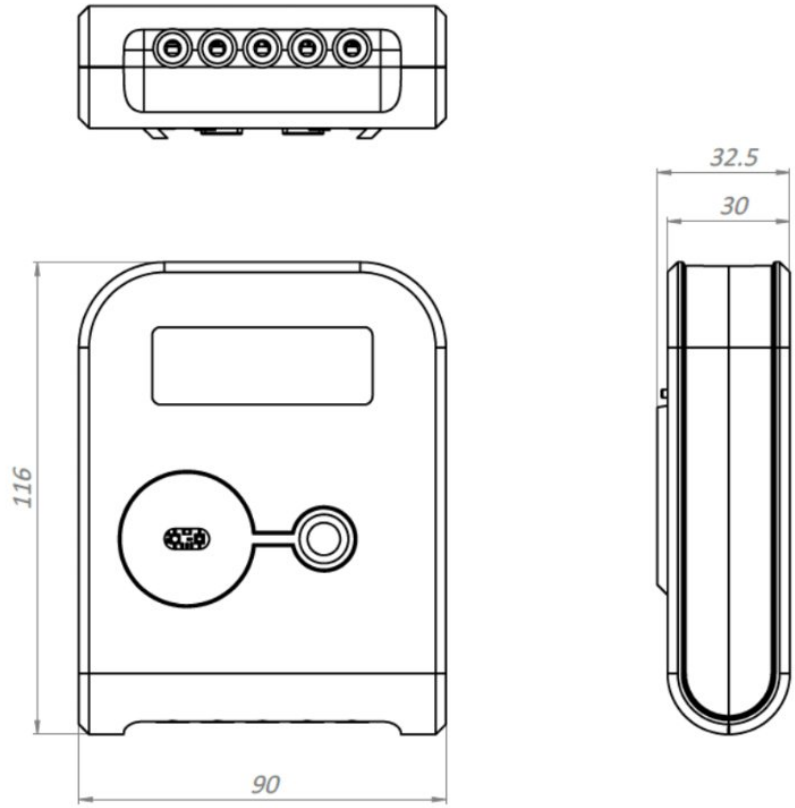
Numbering of calculator terminals

Terminal N.	Destination
5, 6	The heat carrier supplied temperature sensor (T1)
7, 8	Returnable heat carrier temperature sensor (T2)
50	Common terminal for 2nd additionl pulse input/output (GND)
51	2nd additionl pulse input/output (In/Out2) (Volume output for TEST mode)
52	Common terminal for 1st additionl pulse input/output (GND)
53	1st additionl pulse input/output (In/Out1) (Energy output for TEST mode)
M bus	M-bus data lines (bipolar)

Terminal N.	Destination
60, 61	12-24 V DC power supply voltage for MODBUS and BACnet (bipolar)
90	MODBUS or BACnet Line +
91	MODBUS or BACnet Line -

Annex B. Dimensions of the meter

B1. The overall dimensions of calculator



B2. Sizes and dimensions of heat meter

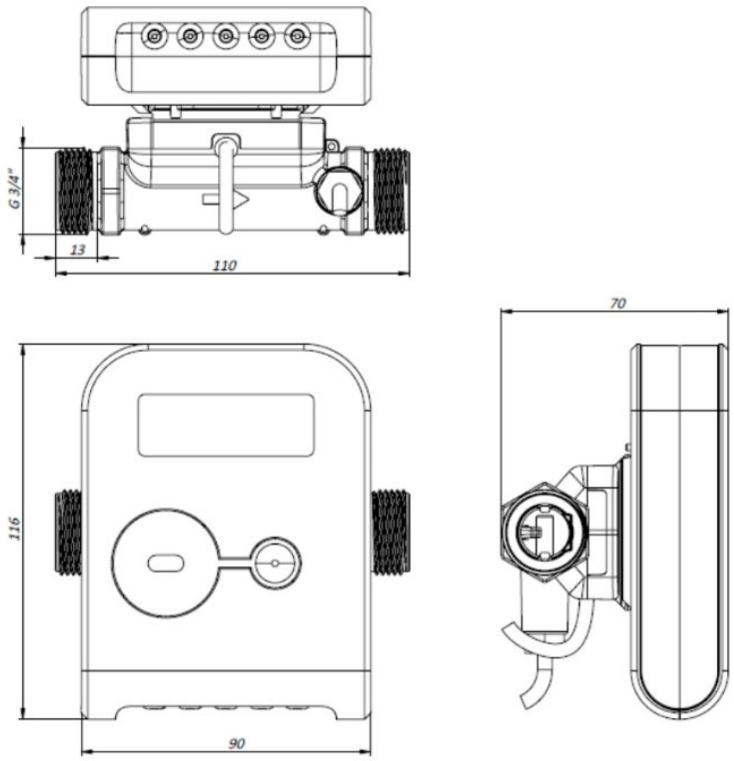


Fig. B2.1 Flow sensor q_p= 0.6/1/1.5 m^3/h Length L=110 mm

Annex B (continued)

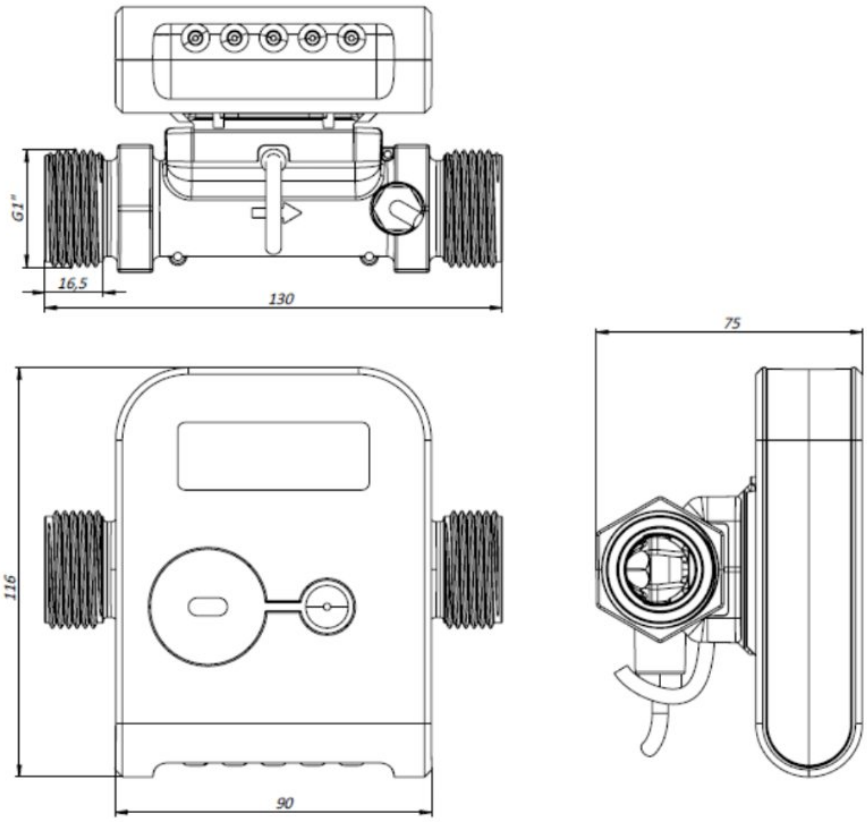


Fig. B2.2 Flow sensor q_p= 2.5/1.5 m^3/h Length L=130 mm;

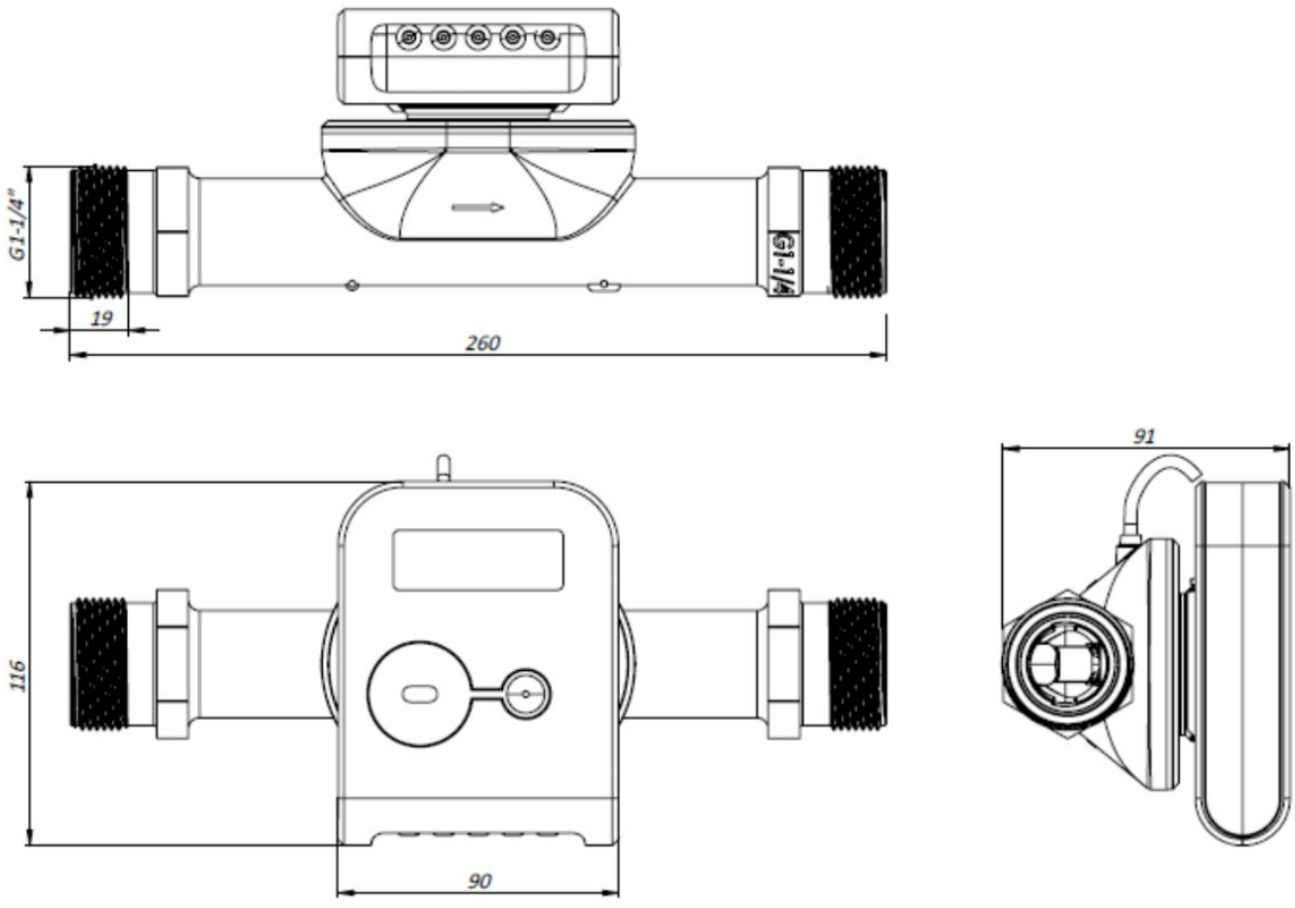


Fig. B2.3 Flow sensor G1 ¼“ Length L=260 mm

Annex B (continued)

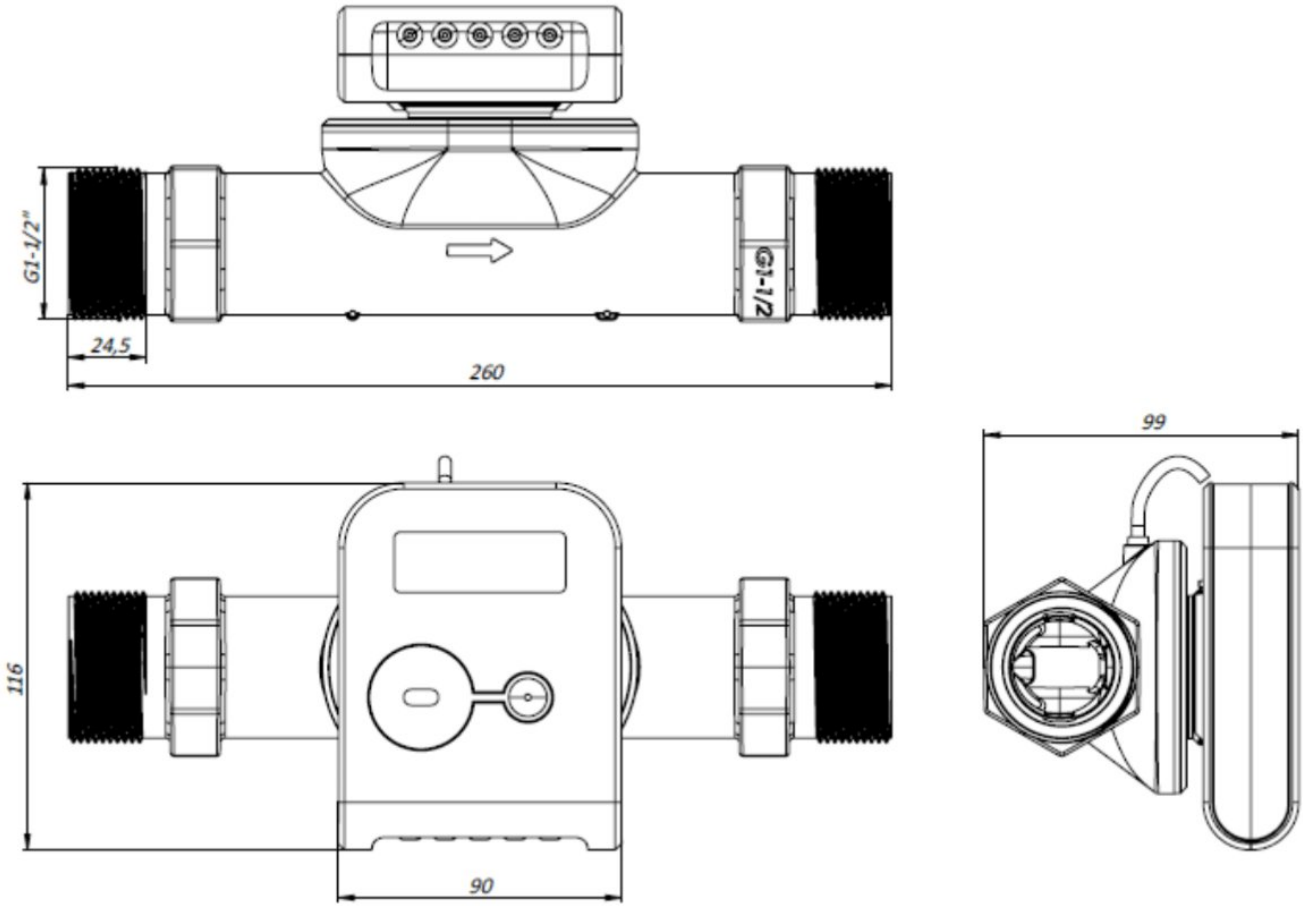


Fig. B2.4 Flow sensor G1 ½“ Length L=260 mm

B3. Overall dimensions of temperature sensors

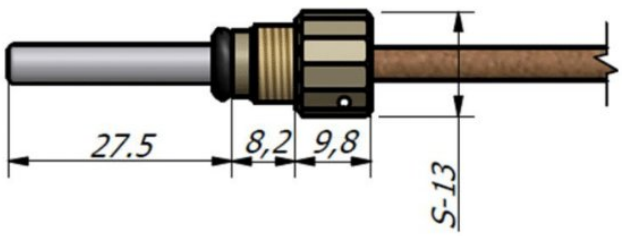
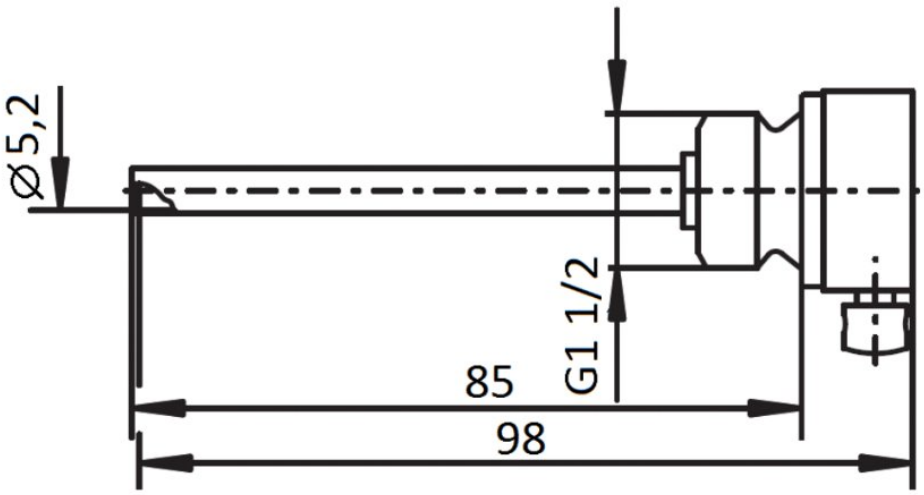
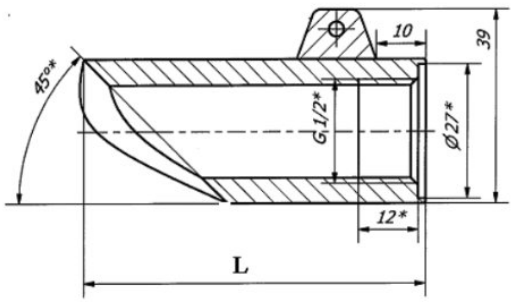


Fig. B3.1 Overall dimensions of the DS type temperature sensor

Annex B (continued)



a) Dimensions of the temperature sensor pocket



Nominal pipe diameter, mm	L, mm
DN20	79.3
DN25	69
DN32	59

when pipe DN < 65 mm

b) Dimensions of the mounting sleeve for the temperature sensor pocket

Fig. B3.2 Dimensions of the mounting sleeve for the temperature sensor socket

Annex C. Installation of the temperature sensor and sealing

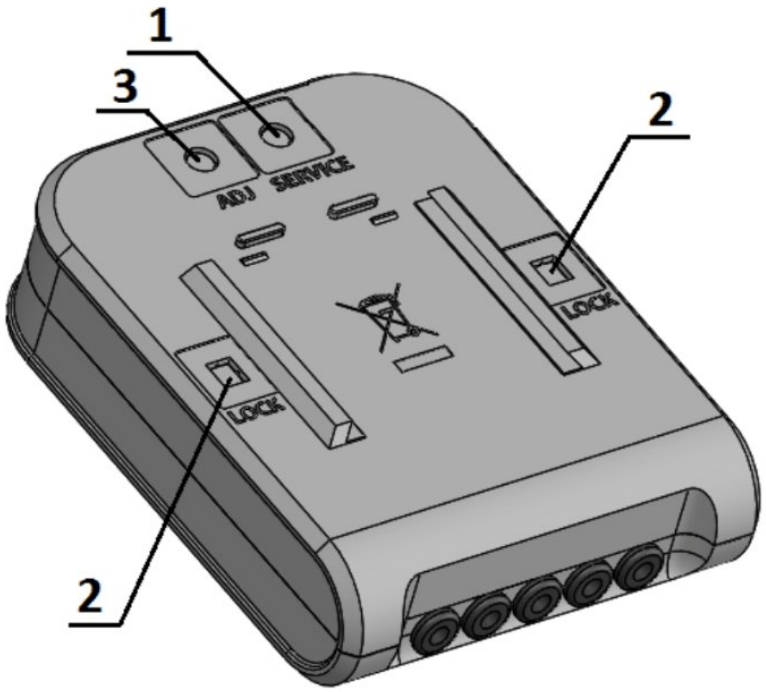


Fig. C1 The sealing diagram of calculator (at the back side of the box):
It shall be sealed additionally only if the breakable partitions are damaged (1 – the supplier's seal is attached after installation; 2 – verification seal stickers are attached – for version with permanently connected temperature sensors or supplier's seal - for version with changeable temperature sensors)

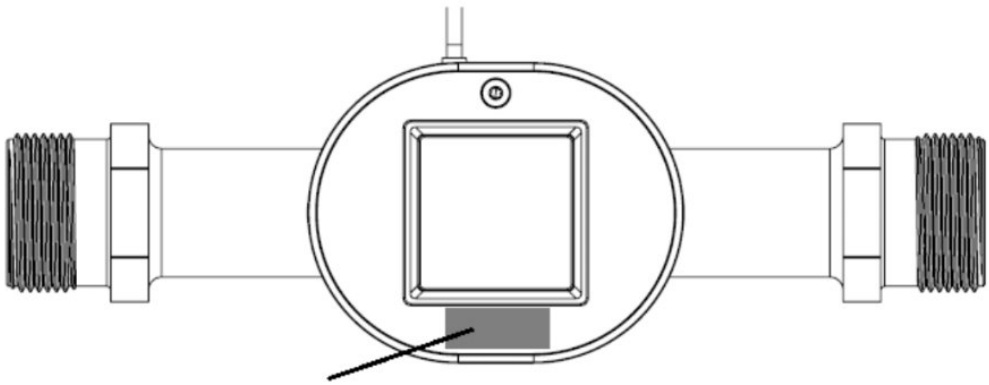
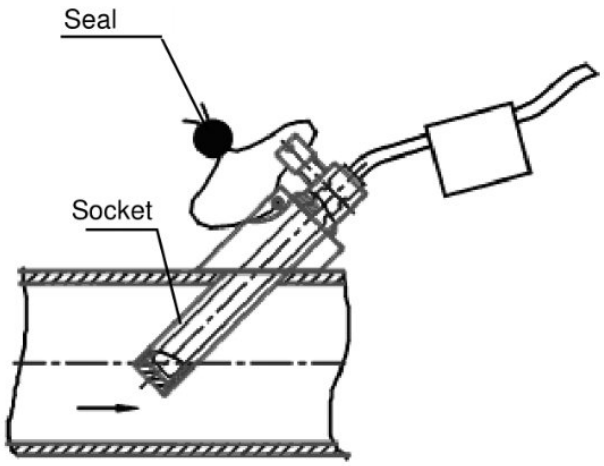
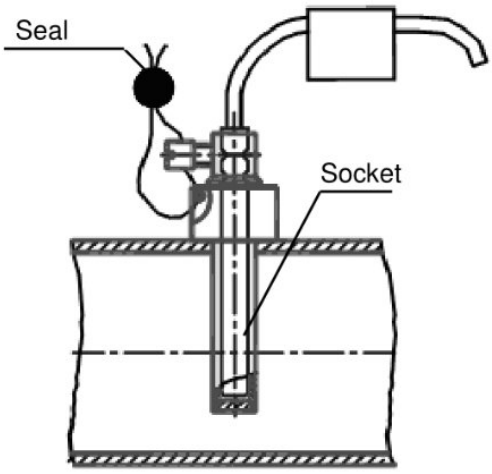


Fig. C2 Flow sensors qp = 3,5 / 6 m3/h sealing (sealing not applicable for qp = 0,6 / 1 / 1,5/ 2,5 m3/h)

Annex C (end)

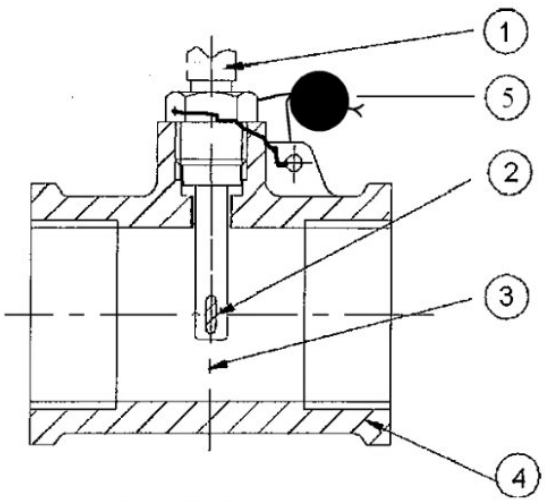


a) turned to an angle of 45°

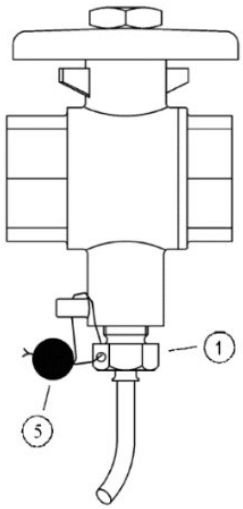


b) perpendicular

a) Installation of the temperature sensor in a pipeline with a protective pocket and a sealing scheme



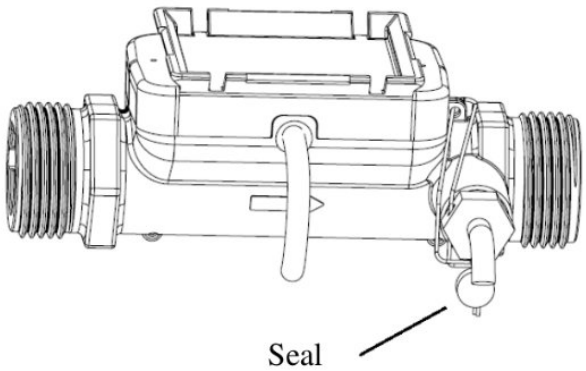
when using a T-piece



when using a valve T-piece

1 – temperature sensor; 2 – measuring element; 3 – sensor centreline; 4 – pipe; 5 – mounting seal

b) Direct installation of the temperature sensor in the pipeline and sealing scheme



c) Installation of the DS type temperature sensor in the flow sensornd its sealing diagram.

Fig. C3 The diagrams of the installation of temperature sensors in the pipeline and their sealing

MANUFACTURER'S WARRANTY

The manufacturing plant warrants the compliance of the parameters of the meter with the technical requirements specified in Section 2 of this document provided that the user observes the transportation, storage, and operation conditions.

The warranty time is 12 months from the start of the operation but not later than 18 months from the day of manufacture.

The address of the manufacturer:

UAB "Axioma Metering", Veterinaru str. 52, Biruliskes, LT-54469 Kaunas region, Lithuania
tel. +370 37 360234; fax. +370 37 360358.