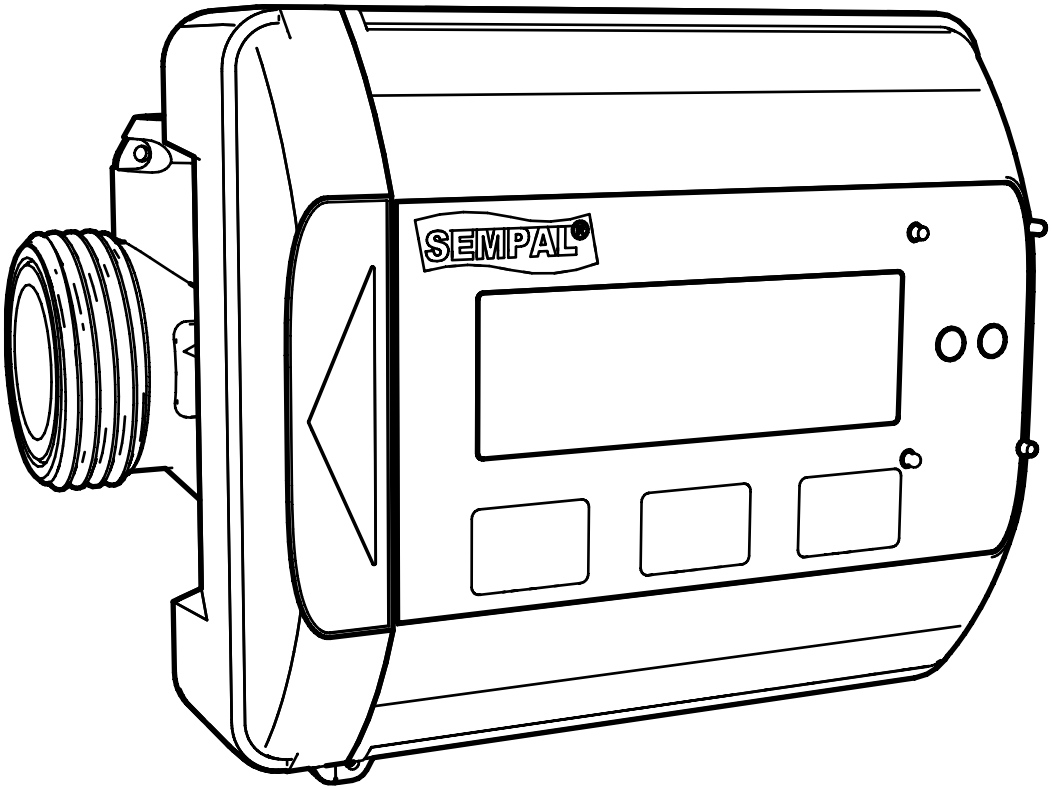
S10F (S1F modification)

Technical description S1.D.002
User manual S1.D.004



S/N: _____

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The quality system of the company "SEMPAL Co. LTD" is certified in accordance with the standards **ISO 9001:2015, ISO 14001:2015, ISO 45001:2023**.

Table of Contents

Abbreviations

MT – Measurement transducer with ultrasonic sensors
RTD - Resistive Temperature Detectors
TS - Temperature sensor
FS – flow sensor

1 Common information

S10F (S1F) Water meter is an ultrasonic water meter. The meter is intended for measuring the volume of water in cold and hot water supply systems and water heating systems.

The meter consists of:

- calculator
- measurement transducer (MT)
- resistive temperature detectors (RTD).

That is, if any of its parts is separated from the meter and lead seals are damaged, the meters will become unsuitable for commercial use and warranty therefore will be lost.

The meter employs ultrasonic principle of the flow rate measurement. Ultrasonic waves are in turn transmitted downstream and upstream the flow; current volumetric water flow rate is measured based on the difference between the propagation times of said waves.

The temperature (in hot water supply systems) is measured by Pt1000 platinum temperature sensor (RTD). The meter is delivered without RTD (for the temperature of water up to 70 °C) or with one calibrated RTD of 5 mm diameter. This RTD is installed in the measurement transducer.

The measured water volume is displayed in m^3. Indicator displays 8 significant digits.

The indicator will never be turned off thus allowing to monitor operation of the meter and to take readings without pressing any pushbuttons.

Additional measured and displayed parameters (measurement units are shown in brackets) includes:

- flow rate (m^3/h or l/h)
- accumulated volume (m^3)
- accumulated mass (t) – for meters with RTD only

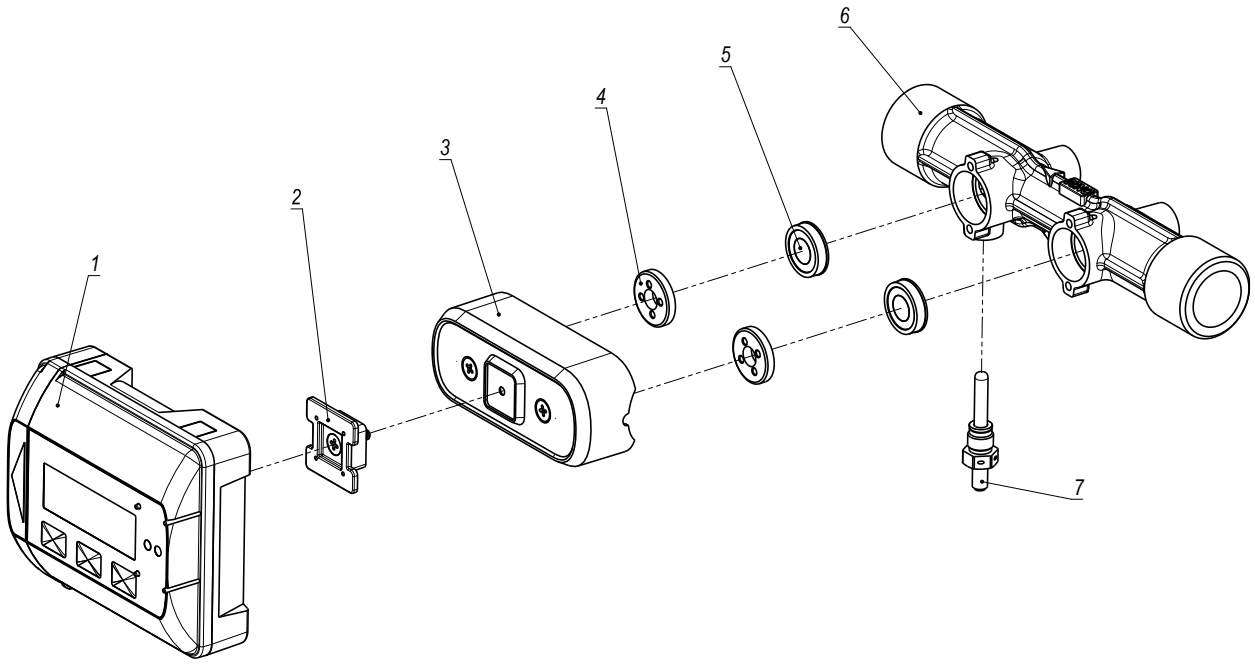
The meter includes 4 tariff counters to accumulate data on the volume.

The meter may be equipped (in the course of its manufacture) by an additional communication module extending communication ability of the meters (M-Bus, RS232, Modbus, …) thus allowing to connect two additional flow rate meters with output pulse signals to register water consumption.

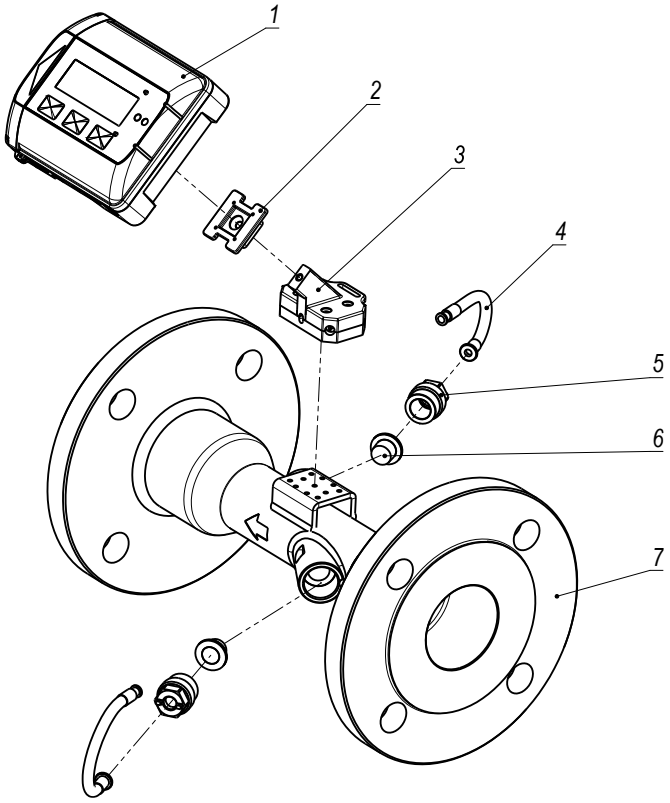
Besides the built-in communication modules, data may be obtained from the meter through an iRDA head at the rate of 9600 baud. EN1434 A mode and proprietary protocols are supported.

This technical description is intended for operating service units, installers and for verifying and testing organizations.

1.1 Structure of the meters

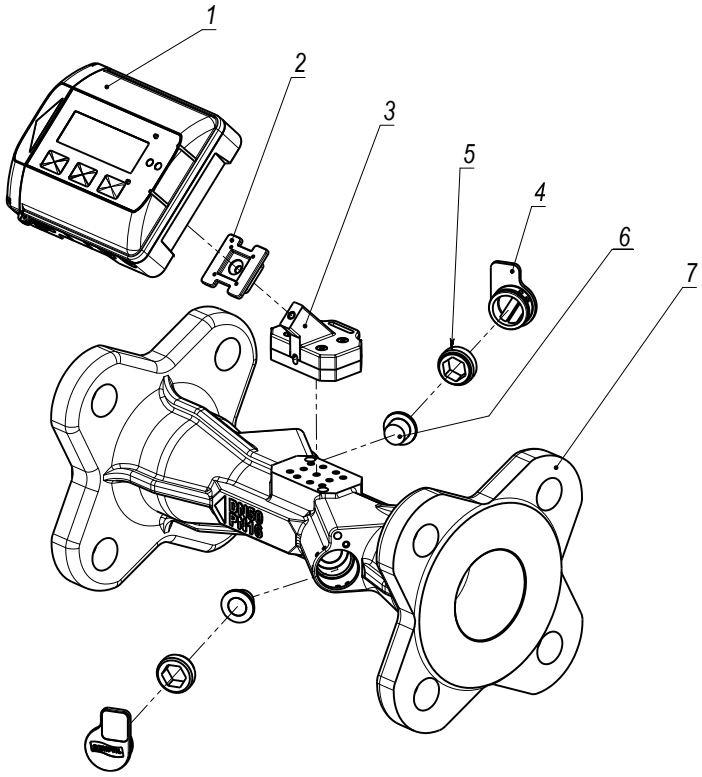


Item no.	Description	Item no.	Description
1	Calculator	5	Flow sensors
2	Calculator mounting bracket	6	Flow section body
3	Flow section cover	7	Temperature sensor
4	Flow sensor nuts		



Item no.	Description	Item no.	Description
1	Calculator	5	Flow sensor nuts

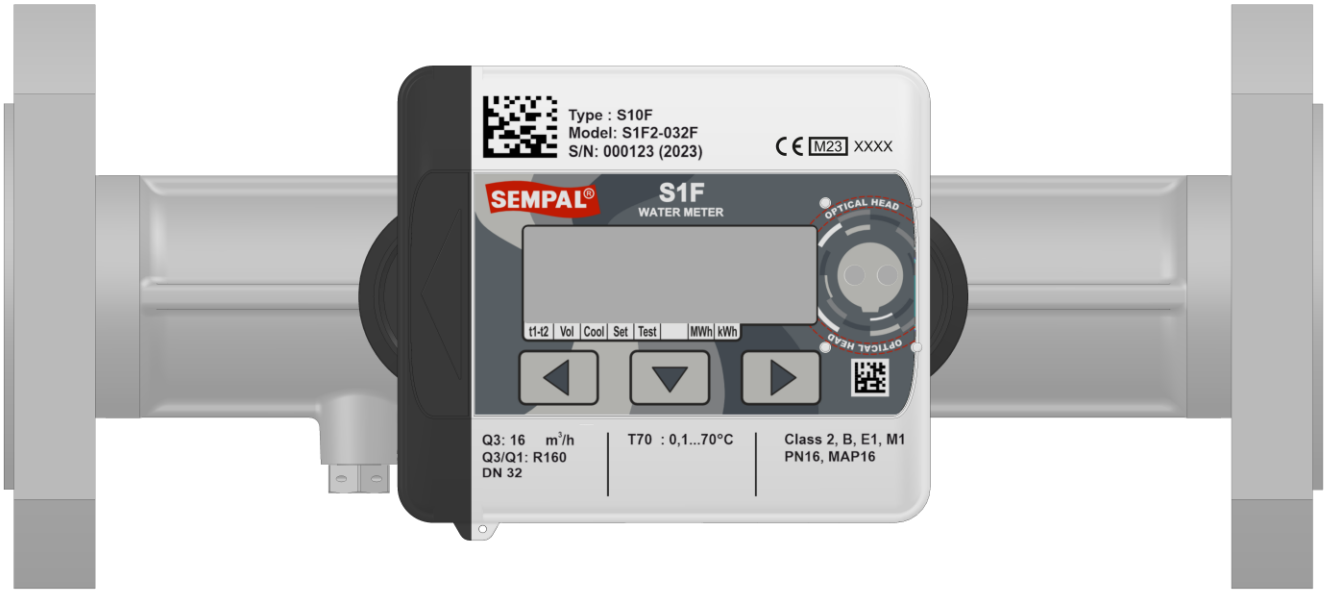
2	Calculator mounting bracket	6	Flow sensors
3	Mounting base	7	Flow section body
4	Protective hose		



Item no.	Description	Item no.	Description
1	Calculator	5	Flow sensor nuts
2	Calculator mounting bracket	6	Flow sensors
3	Mounting base	7	Flow section body
4	Protective end-cap		

The general view of meters various models is shown on Figure:

a)


Type : S10F
Model: S1F2-032F
S/N: 000123 (2023)
CE M23 XXXX
SEMPAL
S1F
WATER METER
OPTICAL HEAD
t1-t2 Vol Cool Set Test MWh kWh
Q3: 16 m³/h
Q3/Q1: R160
DN 32
T70 : 0,1...70°C
Class 2, B, E1, M1
PN16, MAP16

b)


SEMPAL
S1F
WATER METER
OPTICAL HEAD
t1-t2 Vol Cool Set Test MWh kWh
Q3 : 25 m³/h
Q3/Q1: R400
DN50
T70 : 0,1...70°C
Class 2, B, E1, M1
PN16, MAP16
DN50
PN16

c)

d)

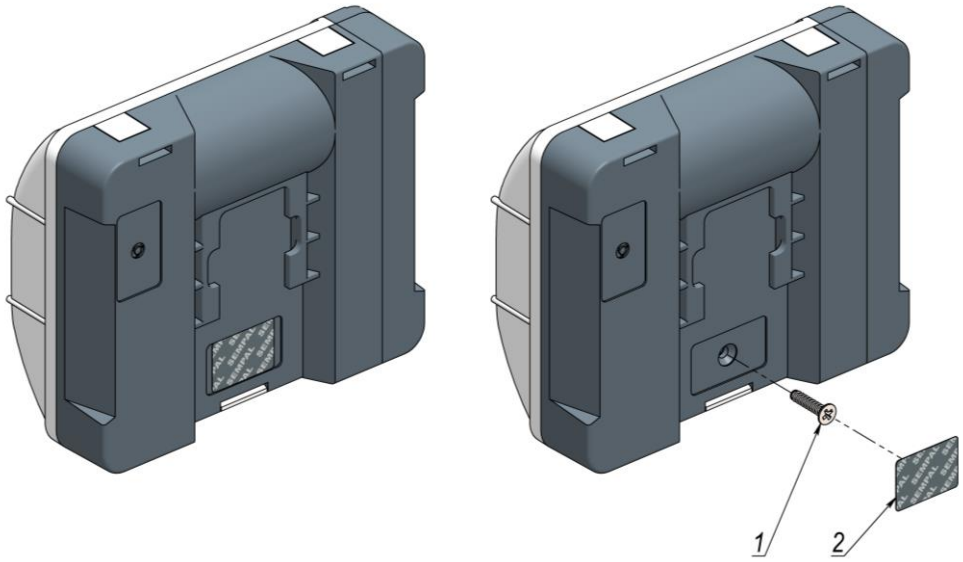
Meters general view of: a) 015B, 020C, 020D, 025C, 025E, 020G-040G; b) 020F-040F, 025H; c) 50C…100C; d) 50F…100F models

1.2 Security sealing

1.2.1 Calculator security sealing

The upper cover of the calculator is connected with the lower one by means of three snaps that are not sealed. To seal the calculator a fastening screw is used, head of which is covered with a sealing sticker.

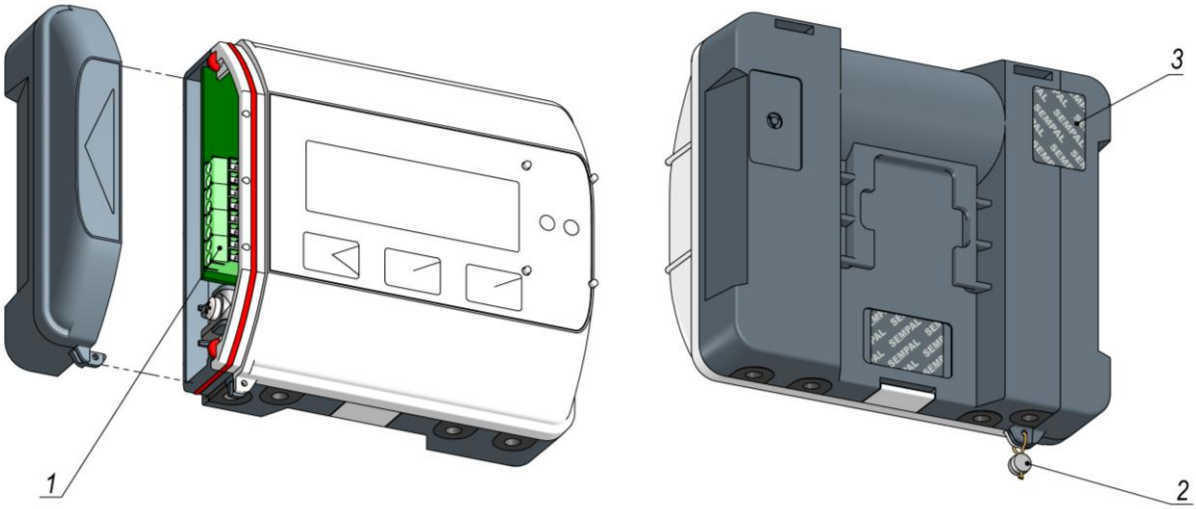
If the screw is not removed, the calculator may be disassembled only by breaking the snaps.



1 – Fastening screw, 2 – Security sealing sticker

If the snaps or the sealing sticker is damaged, the meter may not be used for billing and its warranty will become null and void.

The side cover providing access to communication module contacts will be sealed by an organization registering the instrument.



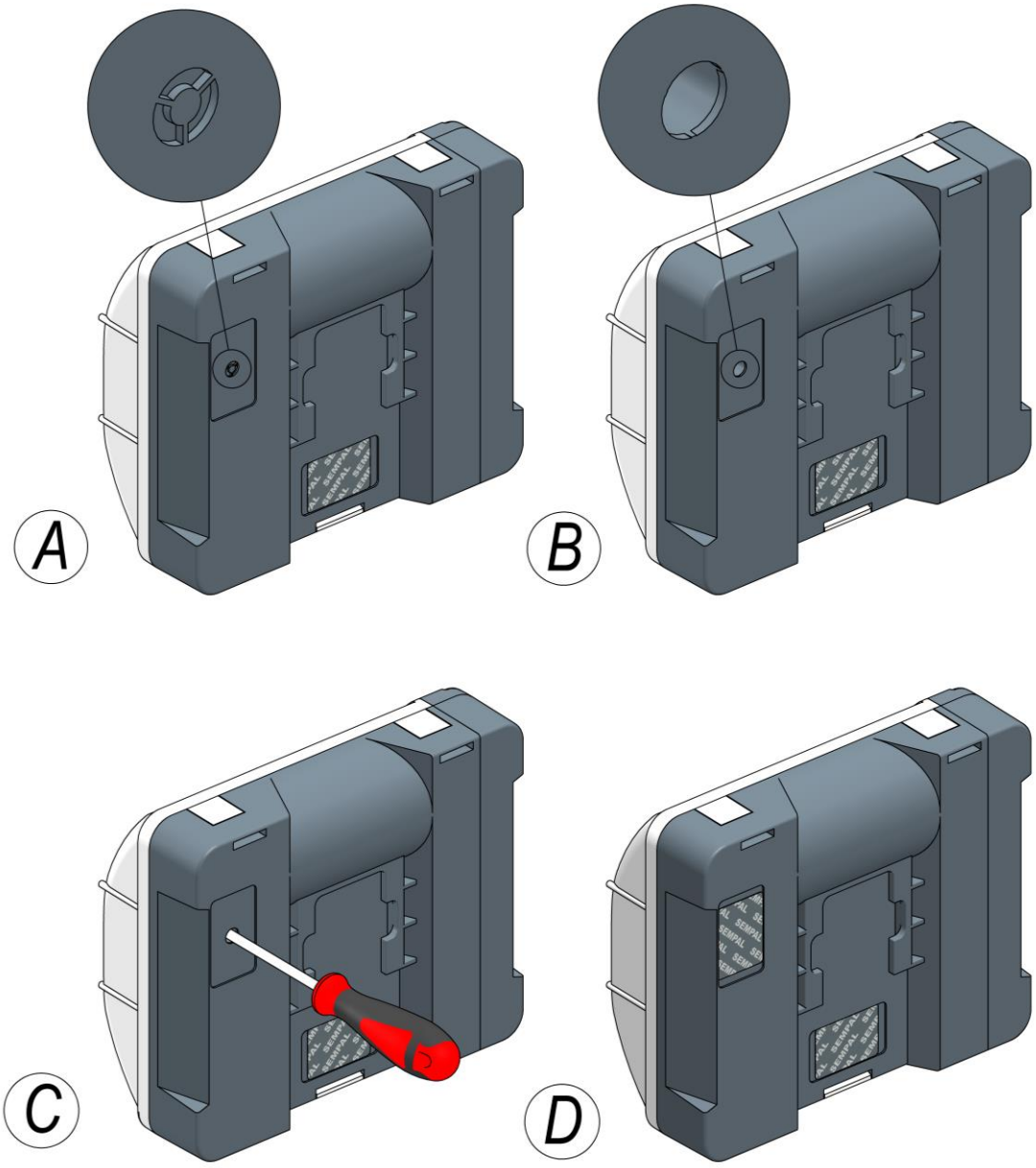
1 - Contacts for the communication module connection; 2, 3 – Lead sealing

1.2.2 Transition to Setup and Test modes

Setup mode is used for initial setting of the instrument, while Test mode is used for its regular verifications.

Entering the Setup mode does not require further verification of the device.

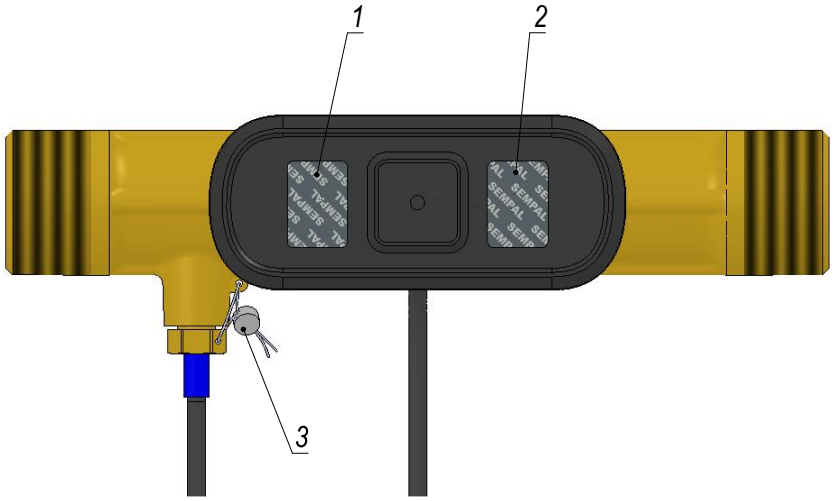
Transition to these modes will be carried out by depressing a special pushbutton located on the lover calculator cover. After manufacture, this pushbutton is hidden under a solid plastic protecting element. Access to the pushbutton will be provided only if such protecting element is broken. Such protecting element will be glued with a sealing label after the check.



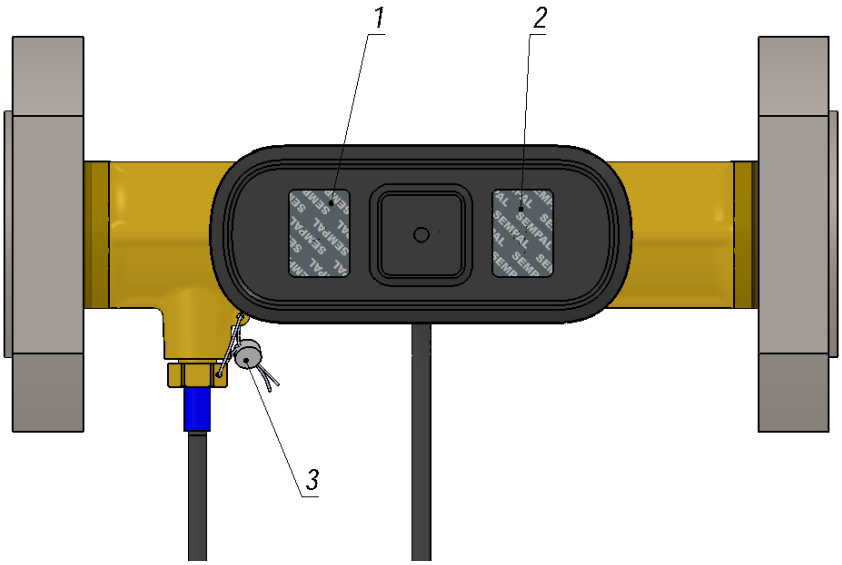
A – status of the protecting element after manufacture; B- status of the protecting element when broken; C – depressing the pushbutton (hole diameter 3 mm); D – installed security sealing sticker

1.2.3 Flow and temperature sensors security sealing

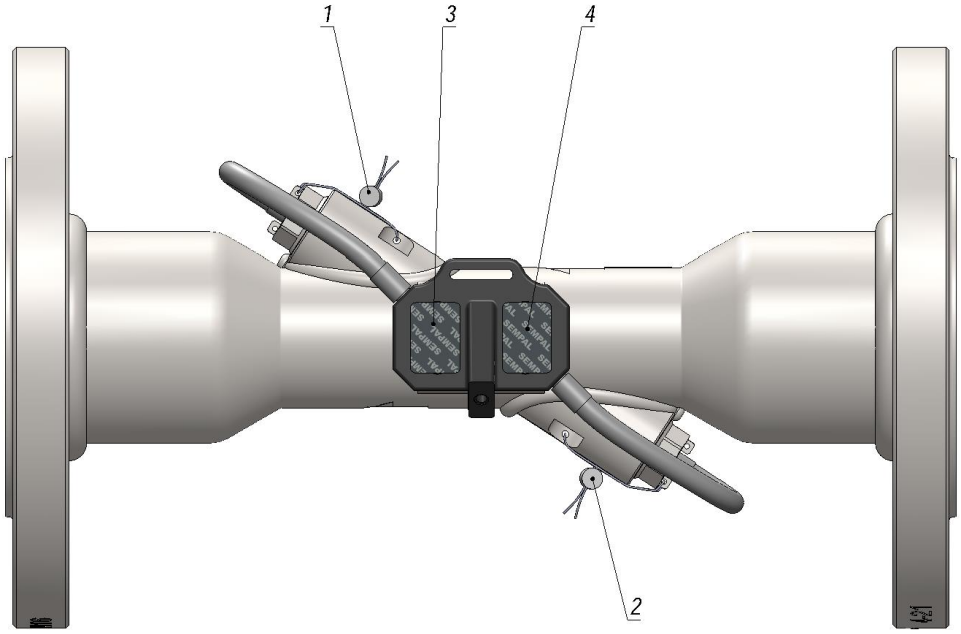
Security sealing schemes:



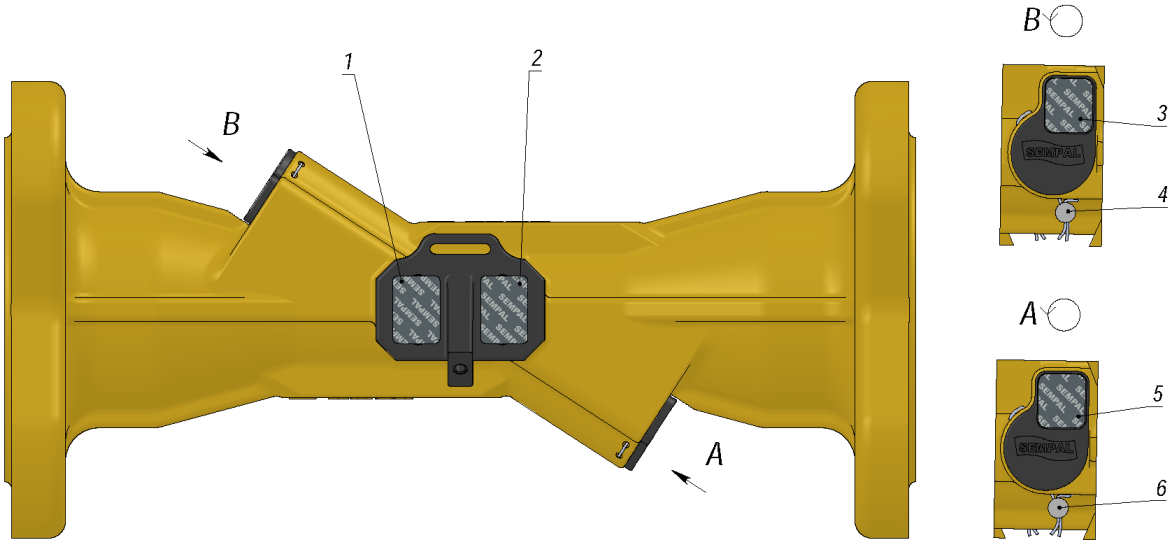
Models 015B, 020C, 020D, 025C, 025E, 020G-040G (1-factory installation, 2, 3-optional installation)



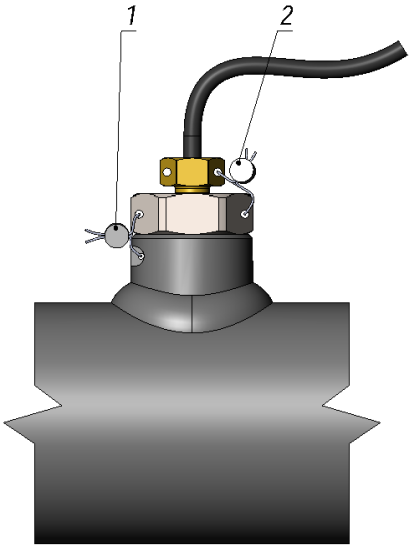
Models 020F-040F, 025H (1-factory installation; 2, 3-optional installation)



Models 050F-100F (3-factory installation; 1, 2, 4-optional installation)



Models 050C-100C (1, 3, 5-factory installation; 2, 4, 6-optional installation)



Models 050C-100C, 050F-100F (1, 2-optional installation)

1.3 Metrological parameters

Temperature measurement range	Θ: 0,1 … 90 °C
Temperature class	T30, T50, T70, T90
Temperature sensor	Pt1000 - EN60751
Rating of the characteristics	As provided for OIML R 49
Accuracy class	2
Flow sensitivity class	U0D0
Climatic environment class	OIML R 49 class O
Life time	16 years
Operating time on failure	150000 hours

Water meters meet the requirements of the MID 2014/32/EU
Water meters are not designed to measure reverse flow
Installation position: H

Type of measure-ment transducer (MT)	Minimum flowrate Q_1, m^3/h	Ttransi-tional flowrate Q_2, m^3/h	Permanent flowrate Q_3, m^3/h	Overload flowrate Q_4, m^3/h	R	Pressure loss class $\Delta p^{1)}$	MT connection	L, mm	Modifica-tion
015B	**0,016**	**0,025**	**2,5**	**3,125**	**160**	**Δp25**	**G ¾ B**	**110**	**S1F**
020C	**0,02**	**0,032**	**4**	**5**	**200**	**Δp25**	**G 1 B**	**130**	**S1F**
020D	**0,025**	**0,04**	**2,5**	**3,125**	**100**	**Δp25**	**G 1 B**	**130**	**S1F**
020F	**0,025**	**0,04**	**4**	**5**	**160**	**Δp25**	*Flange* **EN 1092**	**190**	**S1F**
020G	**0,025**	**0,04**	**4**	**5**	**160**	**Δp25**	**G 1 B**	**190**	**S1F**
025C	**0,032**	**0,05**	**6,3**	**7,875**	**200**	**Δp25**	**G 1 ¼ B**	**160**	**S1F**
025F	**0,032**	**0,05**	**6,3**	**7,875**	**200**	**Δp25**	*Flange* **EN 1092**	**260**	**S1F**
025G	**0,032**	**0,05**	**6,3**	**7,875**	**200**	**Δp25**	**G 1 ¼ B**	**260**	**S1F**
025E	**0,05**	**0,08**	**10**	**12,5**	**200**	**Δp25**	**G 1 ¼ B**	**260**	**S1F**
025H	**0,05**	**0,08**	**10**	**12,5**	**200**	**Δp25**	*Flange* **EN1092**	**260**	**S1F**
032F	**0,063**	**0,101**	**10**	**12,5**	**160**	**Δp40**	*Flange* **EN 1092**	**260**	**S1F**
032G	**0,063**	**0,101**	**10**	**12,5**	**160**	**Δp40**	**G 1 ½ B**	**260**	**S1F**
040F	**0,1**	**0,16**	**16**	**20**	**160**	**Δp40**	*Flange* **EN 1092**	**300**	**S1F**
040G	**0,1**	**0,16**	**16**	**20**	**160**	**Δp40**	**G 2 B**	**300**	**S1F**
050C	**0,063**	**0,1**	**25**	**31,25**	**400**	**Δp40**	*Flange* **EN 1092**	**270**	**S1F**
050F	**0,063**	**0,1**	**25**	**31,25**	**400**	**Δp40**	*Flange* **EN 1092**	**270**	**S1F**
065C	**0,1**	**0,16**	**40**	**50**	**400**	**Δp40**	*Flange* **EN 1092**	**300**	**S1F**
065F	**0,1**	**0,16**	**40**	**50**	**400**	**Δp40**	*Flange* **EN 1092**	**300**	**S1F**
080C	**0,158**	**0,252**	**63**	**78,75**	**400**	**Δp40**	*Flange* **EN 1092**	**300**	**S1F**
080F	**0,158**	**0,252**	**63**	**78,75**	**400**	**Δp40**	*Flange* **EN 1092**	**300**	**S1F**
100C	**0,25**	**0,4**	**100**	**125**	**400**	**Δp40**	*Flange* **EN 1092**	**360**	**S1F**
100F	**0,25**	**0,4**	**100**	**125**	**400**	**Δp40**	*Flange* **EN 1092**	**360**	**S1F**

Notes: [1)]Δp values for DN15 – DN25 are given without taking into account the mesh filter the type of which if necessary is chosen by the consumer so that the pressure loss in the water meter including the filter does not exceed Δp63 (0.063 MPa = 0.63 bar between Q_1 and Q_3) .

Q_1 – minimum flow rate
Q_2 – transitional flow rate
Q_3 – permanent flow rate
Q_4 – overload flow rate
Δp – pressure loss (calculated basing on Q_3)
$R=Q_3/Q_1$

At flowrates less than the minimum (Q_1) and above the maximum (Q_4) the error of measurement is not normalized.

The maximum water working pressure is 1.6 MPa.

The limits of the permissible relative error of the meters for the flowrange ($Q_2 \le Q \le Q_4$) are ± 2% in the temperature range from 0.1 °C to 30 °C, and ± 3% for temperatures above 30 °C.

The limits of the permissible relative error of the meters for the flowrange ($Q_1 \le Q \le Q_2$) are ± 5% regardless of the temperature range.

On special order water meters with permissible relative error limits of ± 1% for the flowrange ($Q_2 \le Q \le Q_4$) in the temperature range from 0.1 °C to 30 °C, and ± 2% for temperatures above 30 °C can be produced. For the flowrates range ($Q_1 \le Q \le Q_2$) the limits of the permissible relative error of such meters are ± 3% regardless of the temperature range.

All meter soft is metrologically significant. Soft protection is carried out by checking the coincidence of the soft identifier with the declared one.

The degree of soft protection against accidental and intentional changes corresponds to group "C" according to WELMEC 7.2.

The degree of influence of the soft on the calculator metrological characteristics is specified as calculator permissible error limits.

Soft name	*Identification*	*Version No*	*Digital software identifier (text appeared on meter display)*
Water meter S10F soft	S1F	Ver.3.053	C2333EF84

1.4 Configurations

The meter can be delivered in several configurations.

Features of configurations are given in the table:

Availability of indicator and keyboard	Configuration number	Temperature of the water, °C	RTD number
+	1	0…90	1
–			
+	1/1	0…70	0
–			

1.5 Electrical parameters

Calculator	
Indicator	Consists of two areas: Main LCD – 8 significant digits. It is operated permanently. Menu line: a text line. It is operable only during the navigation through menu.
Flowrate measurement units	m^3/h or l/h
Archiving	1680 hours (70 days), 500 days, 36 months, 16 years. User actions log – 100 entries
Clock/Calendar	Real time clock (clock deviation does not exceed 3 seconds a day); calendar with consideration of leap years, summer/winter time, accounting month commencement date
Data exchange through iRDA optical port	**Used heads - IEC 62056-21 standard with a maximum speed of at least 9600 baud,** with echo suppression - EN1434 protocol for iRDA, mode A with CRC (read only) - proprietary protocol – reading and configuring
Communication modules	- wired M-Bus. Load: 1 unit (1.5 mA). EN 1434-3, EN 13757-2 and EN 13757-3. Transfer rate may be selected from the sequence: 300, 600, 1200, 2400, 4800 and 9600 baud. - RS232. Transfer rate is 9600 baud, 8 bit, parity check – none, 1 stop bit. Proprietary protocol. - pulse output. One active pulse output. Maximum frequency is 100 Hz. Weight of a pulse and data to be transferred are adjustable - WM-Bus (бездротовий M-Bus). Частота 868 МГц. C1 protocol. Data transfer is 1 time per 15 seconds. T1 protocol. Data transfer is 1 time per 15 seconds. - RS485 Modbus. Modbus RTU protocol. Transfer rate may be selected from the sequence: 1200, 2400, 4800, 9600, 19200, 38400, 56000, 57600, 115200 baud.
Pulse signal inputs	Pulse signal inputs (up to 2 inputs) may be used only if the communication module support this function. Such inputs are used to measure water volumes by meters with electrically isolated outputs. Active input: maximal frequency – 100 Hz Passive input: the loading resistance of 680 kOhm is connected with +3 V. Maximum pulse signal frequency is 1 Hz.
Electromagnetic compatibility	Meets requirements of OIML R 49, class E1
Power supply voltage	3.3-3.7 V normal power supply 3.05-3.3 V the low battery icon appears on the indicator 3.05 V the indicator switches off

Temperature measurement	
Pt1000, two-wire connection	
Measurement range	+0,1 °C …+90 °C
Temperature class	T30, T50, T70, T90

Battery	3.6 V DC, 1 lithium cell of C size
Replacement interval	16 years[1] More frequent replacement may be needed when communication modules are used or data are read frequently or when the meter is used at a high ambient temperature.
Lithium content	2.5 g

[1] Under the following operating conditions:

- frequency of integration 4 seconds
- duration of menu navigation - 5 minutes a day
- reading the hourly archive once an hour (via one of the communication units)
- reading of the current state once a minute (through one of the communication units)
- reading all available information via the iRDA port once a month

1.6 Feature of design

Climatic Environment class OIML R 49, class B

	Protection class	Ambient temperature	Classification with respect to environment	
Class	IP65	5…55 °C	Non-condensed humidity	Indoors
Measurement transducer (assembled)	IP68		Condensed humidity	

Water temperature	0,1…90 °C	If the water temperature is below 15°C installation of the calculator on a wall will be obligatory requirement (to avoid moisture condensing).

Storage temperature	-25…+60 °C (MT should be dry)
Working pressure	16 bar
Testing pressure	25 bar during 1 minute
Cable length to measurement transducer	1 m (cannot be disconnected)
Cable length to RTD (non disconnectable)	1.15, 2, 3 m - for DN15…40 (mounted into MT) - for DN50 and more – mounted into pipe

1.7 Materials

Wetted parts (depends on MT type):

Flow section body	CW617N, AISI304
Reflectors	AISI304
Flow sensors	Titanium
Sealing elements	Silicone rubber, EPDM
Measuring tube	PPSU
Flow section cover, calculator, wall mounting bracket	ABS+PC
Cabels	Cable: Silicone + PTFE

2 Meter type and configuration

The meter type is indicated on the upper cover of the calculator and may not be changed.

2.1 Meter type

S1F			□□□□
Meter configuration			
Temperature range 0…90 °C (configuration 1)		**1**	
Temperature range 0…70 °C (configuration 1/1)		**2**	
Type of flow measurement transducer (see item 1.3)			

An example of the meter type for 0…90 °C: **S1F1-020A**
An example of the meter type for 0…70 °C: **S1F2-020A**

2.2 Water meter configuration

Configuration will be shown in the menu line on the instrument indicator.

Cfg –	□□	□ –	**1**	□	– □	**1**	□ –	□	□
Communication module (item 2.3)									
Not installed	**00**								
RS232	**10**								
M-Bus	**20**								
Pulse output	**30**								
WM-Bus protocol C1	**40**								
WM-Bus protocol T1	**41**								
RS485 Modbus	**50**								
Pulse inputs in the communication module									
No pulse inputs		**0**							
Pulse inputs of IB, IB class		**1**							
Pulse inputs of IC, IB class		**2**							
Number of RTD (no digit means RTD absence)				**1**					
Integration periodicity (item 2.3)									
Integration period, s / Flow rate measurement period, s									
2 / 0.5					**1**				
4 / 1					**2**				
8 / 1					**3**				
16 / 2					**4**				
System of flow rate units									
m^3/h							**1**		
l/h							**2**		
Tariffing (item 3.5)									
Not used								**0**	
Q (flow rate)								**2**	
T1 (temperature)								**4**	
Time								**6**	
Region code									
Ukraine									**1**

The meter is configured when put into operation by means of SmpSetup program (operable in Windows 7 and higher) or from the meter's keyboard. Any configuration can be changed only when the instrument is in **Setup** mode.

2.2.1 Integration periodicity

Integration periodicity determines the time interval to calculate volume, and information updating on the indicator

Periodicity of the flow rate measurement will depend on the integration periodicity.

Temperature measurement periodicity is always equal to 32 seconds.

2.2.2 System of flow rate units

The meter will always measure the flow rate in m^3/h, while conversion to any other units will be made for indication purposes only.

Volume will always be displayed in **m^3**.

Number of digits displayed on the indicator will depend upon the selected measurement units

Total number of significant digits of the indicator will always be equal to 8. Only the number of figures after the decimal point will be changed:

Number of digits (figures after decimal point)		
m^3	l/h	m^3/h
3	0	3

Temperature will always be displayed with 0.01°C resolution.

2.2.3 Tariffing

The instrument is provided with 4 tariff cells. Depending on the tariffing mode, different parameters will be stored in T1…T4 cells. Regardless of the mode, the tariffed value will be accumulated in any case in the basic adder and will additionally be accumulated in tariff counters. The tariffing will be described in more details below (item 2.5).

2.2.4 Region code

The region code determines initial settings of time zone, usage of daylight saving time, etc.

2.3 Communication modules

The Communication module is installed in the course of instrument manufacture and cannot be changed by the user

2.3.1 Pulse inputs.

Communication module may be delivered either with pulse signal inputs or without them (depends of type of module).

The meter will support up to 2 pulse signal inputs. Each of the inputs may be connected with an additional water meter with pulse signal outputs, for which the volume will be accumulated.

The following options of delivery of pulse inputs are possible:

	Input 1	Input 2
Input 1 – active, input 2 – passive	IC	IB
Both inputs - passive	IB	IB

Parameters of pulse signal inputs:

active input (IC)

Pulse input class	IC (for active pulse output)
Maximal pulse frequency	100 Hz
Pulse duration	≥ 4 ms
Meter Powering:	
Voltage	3.6 V
Maximal supply current	7 µA
Maximal voltage at the input	3.6 V
Voltage of «1»	2 V
Voltage of «0»	0.5 V
State of the inactive output (flowrate is equal 0)	«1»

Output cascade of flowmeter must be galvanically isolated

passive input (IB)

Pulse signal input class	IB
Maximum pulse repetition rate	1 Hz
Pulse duration	≥ 100 ms
Loading resistor (boosting to 3 V voltage)	680 kOhm

Must be used only with galvanically isolated contacts

RS232 Communication module

TxD, RxD and GND signals are applicable.

Port parameters:

Dara transfer speed	9600 baud
Data length	8 bit
Parity check	None
Stop bit	1
Protocol used	Proprietary

M-Bus Communication module

Load	1 unit (1.5 mA)
Data length	8 bit
Parity check	Even
Stop bit	1
Speed	300, 600, 1200, 2400, 4800, 9600 baud
Addressing	Primary and secondary

WM-Bus Communication module

Frequency	868 MHz
Protocol	C1, 1 time per 15 sec frequency rate T1, 1 time per 15 min frequency rate

RS485 Modbus Communication module

Protocol	Modbus RTU
Baud rate	1200, 2400, 4800, 9600, 19200, 38400, 56000, 57600, 115200
Parity check	Even, Odd, None
Stop bit	1
Power supply	External, direct current, non-stabilized 5…24 V
Line termination	120 Ohm, disconnectable

Module of pulse output signal

The module forms active pulse output of OD.

Output class	OD
Pulse length	4 ms ± 1%
Max frequency	100 Hz
Power source voltage (VCC)	3.0 …5.0 V
Output voltage	(VCC – 0.1) V
Output resistance	100 Ohm
Supply current	3 μA
Galvanically isolated	Yes

There are no pulse inputs in this module.

2.4 Setup and Test service modes

The meter has two service modes: **Setup** and **Test**.

Setup mode will be used for initial setting of the instrument, while **Test** mode will be used for periodical verifications of the instrument.

These modes may be accessed by means of a special covered pushbutton placed on the rear instrument cover. When the instrument leaves the production line, said pushbutton is covered with a plastic protecting element to be broken if access to the pushbutton is needed. Further, this hole will be covered with a special sealing sticker.

To enter into **Setup** mode, you have to press the pushbutton and hold it depressed for 5 – 15 seconds. The indicator during such operation will display

If you release the pushbutton during the above-mentioned time interval, the instrument will switch over to **Setup** mode

If the pushbutton will be held depressed for another time interval (from 15 to 30 seconds), message on the indicator will be changed as follows:

On release the pushbutton during the above-mentioned time interval, the instrument will switch over to **Test** mode.

If you continue to hold the pushbutton depressed, the indicator will be switched to the standard display mode and operating mode of the instrument will not change.

Configuration of the meter will be set before registration of the meter. Configuration can be set only in **Setup** mode.

When the meter leaves the production line, a special transport mode is set. This mode is equivalent to **Setup** mode, but unlike it, flow rate and temperature will be measured once every 60 seconds. The indicator is switched off and will be switched on when any pushbutton will be depressed.

2.5 Tariffing

The instrument has 4 tariff counters. Each tariff counter includes an adder (T1… T4) and a threshold (TT1… TT4). Logics of their operation depend on the type of the selected tariffing mode.

Regardless of the tariffing type, data is **ALWAYS** accumulated in the basic adder (thermal energy, volume, …) and is **additionally** summed in tariff adders in the events when a condition for relevant tariff is met.

Threshold values is set in the same units that are used to display data on the indicator.

2.5.1 Tariffing mode 0

When such mode is set, no tariffing will be carried out.

2.5.2 Tariffing mode Q (code 2 in configuration)

Volumetric flow rate is analyzed.

Tariff counters will accumulate the volume.

q ≤ L1	Basic register only
L1 < q ≤ L2	Basic register and T1
L2 < q ≤ L3	Basic register and T2
q > L3	Basic register and T3
q < q1	Basic register and T4. Values when the flow rate is below q1, but exceeds the sensitivity threshold will be added here

L1<L2<L3

2.5.3 Tariffing mode T1 (code 4 in configuration)

Water temperature is analyzed.

Tariff counters will accumulate the volume.

t ≥ L1	Basic register only
L2 ≤ t < L1	Basic register and T1
L3 ≤ t < L2	Basic register and T2
L4 ≤ t < L3	Basic register and T3
t < L4	Basic register and T4

L1>L2>L3>L4

2.5.4 Tariffing mode Time (code 6 in configuration)

Tariffing is made depending on the time of the day.

Tariff counters will accumulate the volume.

Tariff threshold contain time of the day: hours and minutes

L1 ≤ time < L2	Basic register and T1
L2 ≤ time < L3	Basic register and T2
L3 ≤ time < L4	Basic register and T3
L4 ≤ time or time < L1	Basic register and T4

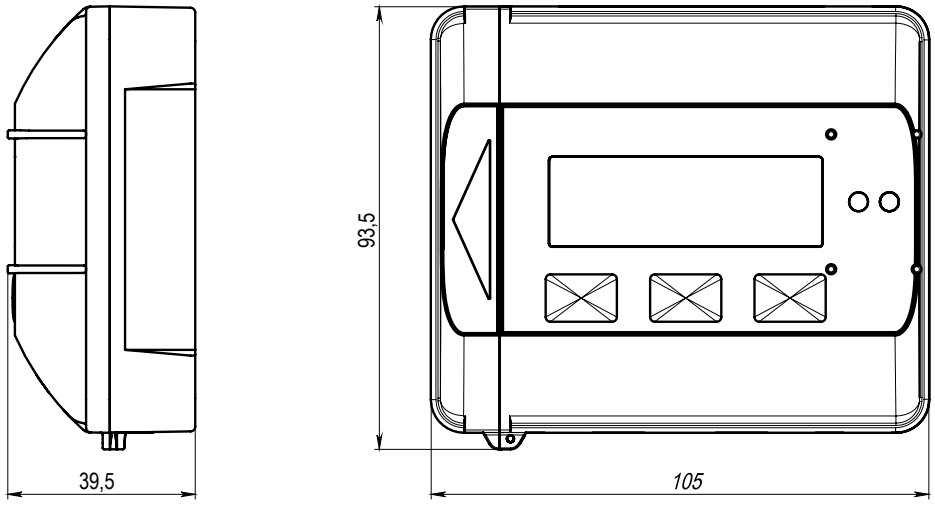
L1<L2<L3<L4

If some of the thresholds are not defined and if time is in interval between maximal threshold and TT1, then accumulation are produced in basic register and T4. For example, if L3 and L4 are not defined, then if time exceeds L2 or less L1, accumulation will be in T4.

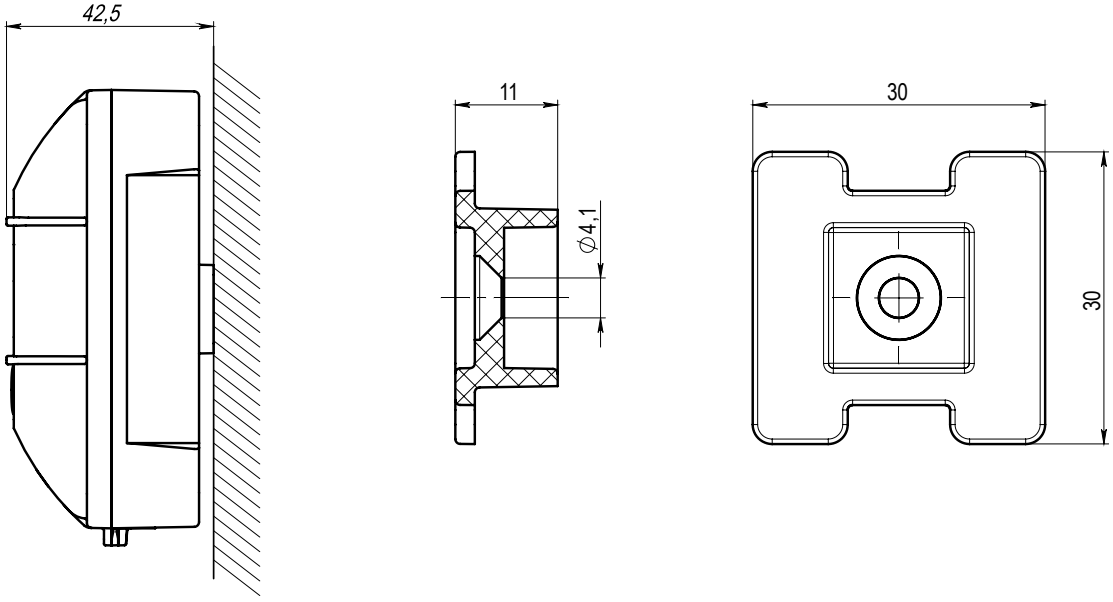
The maximum time value that can be set in L1 = 23:55.

3 Overall dimensions and marking

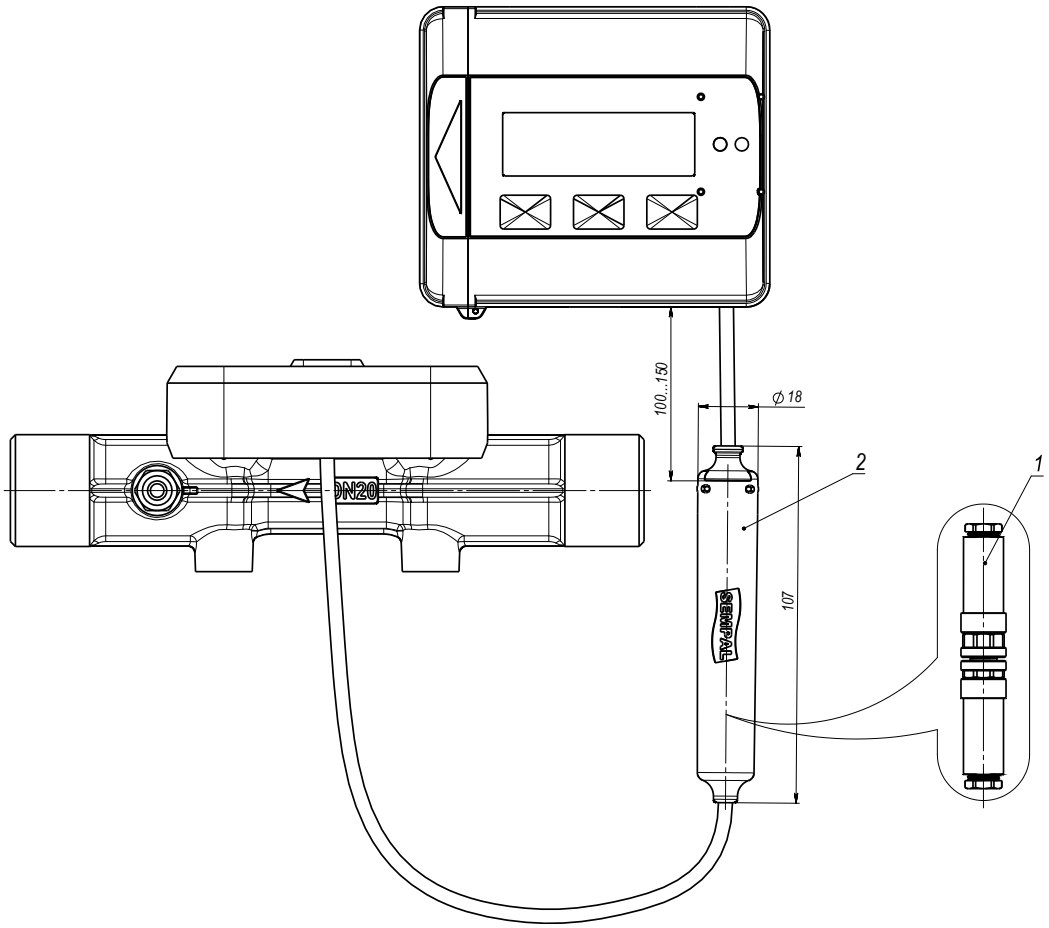
3.1 Calculator



Calculator dimensions



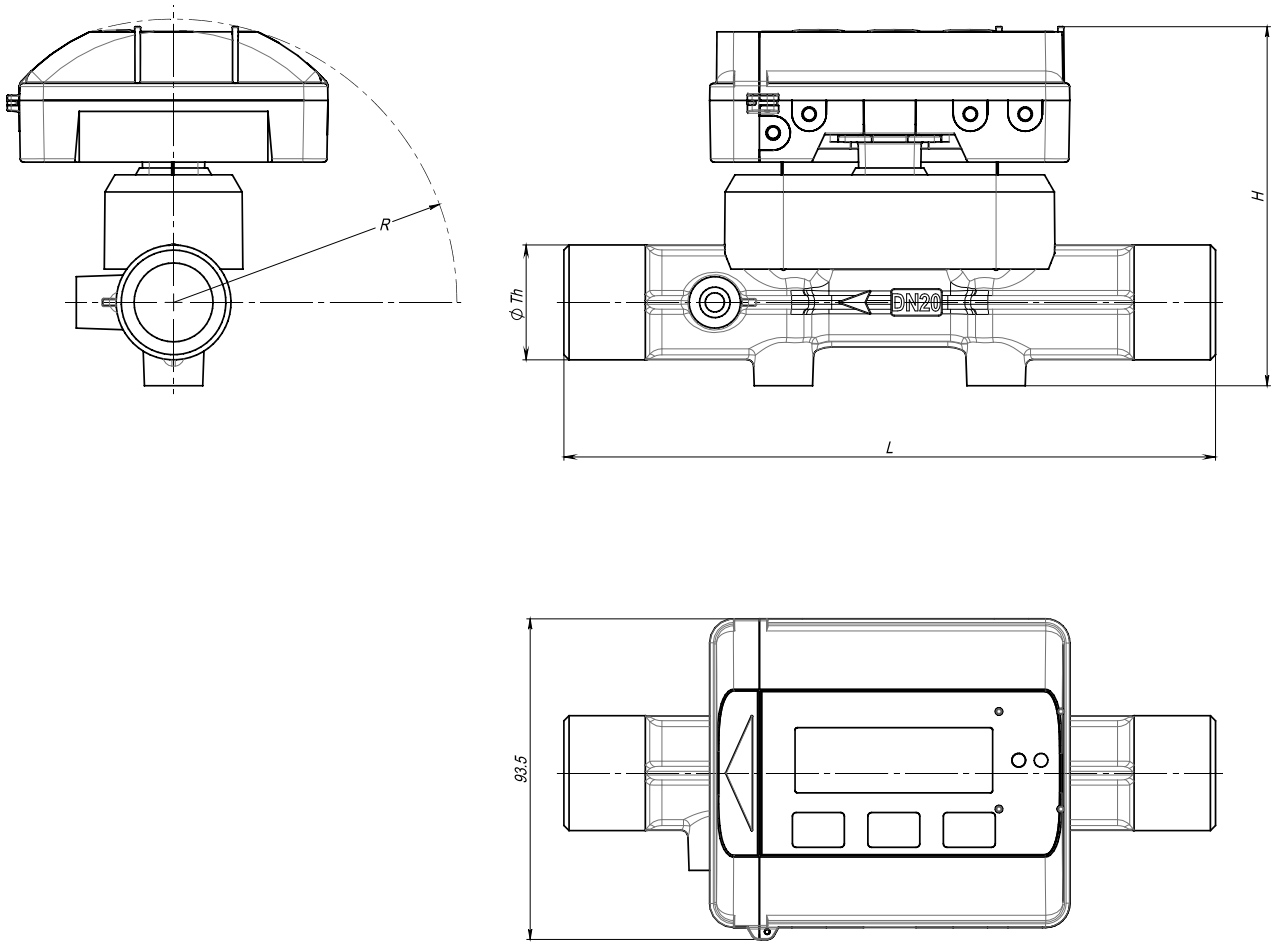
Wall mounting



The calculator can be supplied with a plug-in connection (IP68) on the flow cable (item 1) and a protective capsule (item 2) for the possibility of the connection sealing.
An example of a seal is shown in Fig. below (pos. 3)

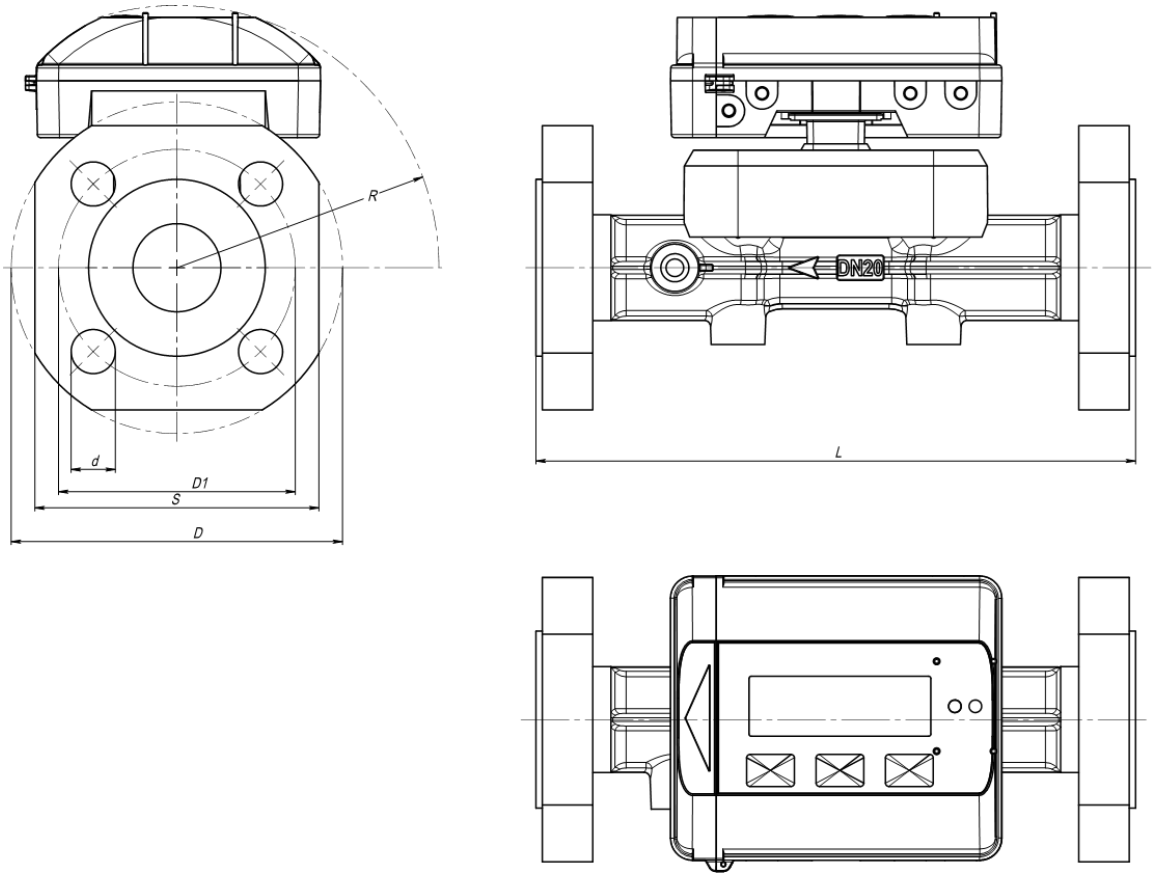
3.2 Measurement transducers of DN15…DN40 with thread connectivity and DN20…DN100 with flange connectivity.

The dimensions and designs of measurement transducers with DN15 - DN100 standard sizes:

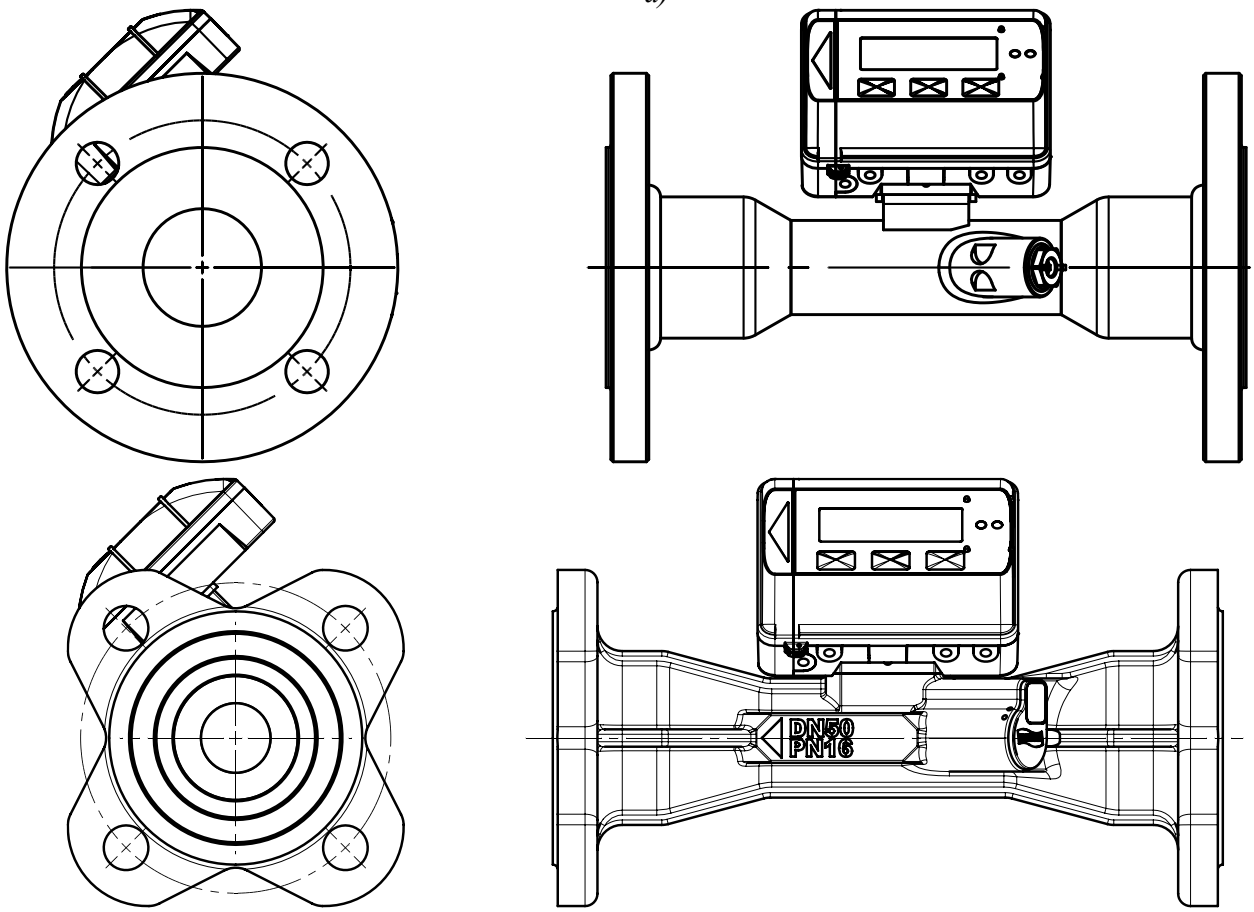


MT type	L, mm	R, mm	H, mm	Th, мм
015B	110	83	105	G ¾ B
020 (C, D)	130	83	105	G 1 B
020G	190	83	105	G 1 B
025C	160	85	110	G 1 ¼ B
025 (G, E)	260	85	110	G 1 ¼ B
032G	260	87	116	G 1 ½ B
040G	300	91	124	G 2 B

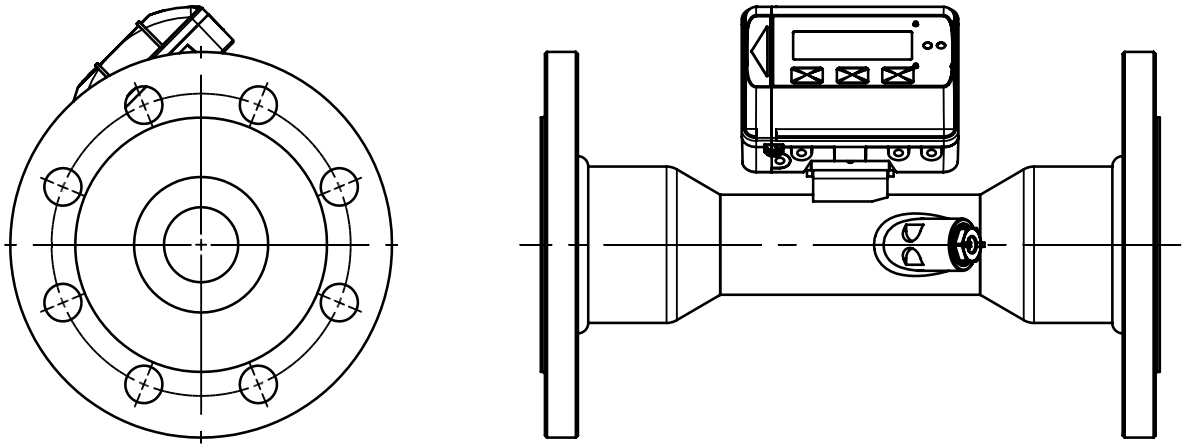
DN15-DN40 measurement transducers with threaded connection



a)



b)



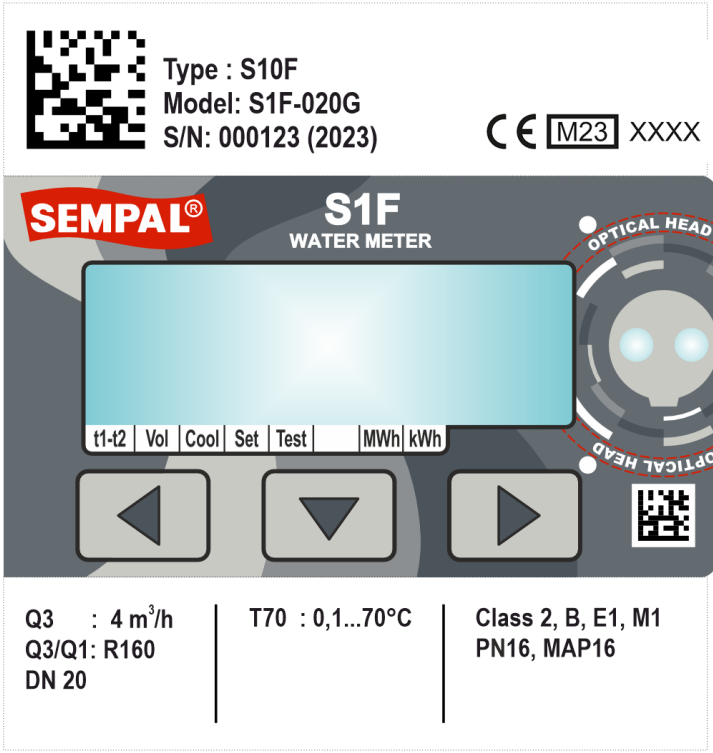
c)

MT type	**L, *mm***	**D, *mm***	**D1, *mm***	**d, *mm***	**Holes quantity, *pcs***	**S, *mm***	**R, *mm***
020F	190	105	75	14	4	90	83
025 (F, H)	260	115	85	14	4	100	85
032F	260	140	100	18	4	115	87
040F	300	150	110	18	4	125	91
050F	270	160	125	18	4	140	110
065F	300	185	145	18	8	-	115
080F	300	200	160	18	8	-	120
100F	360	220	180	18	8	-	125

Flow measurement transducer with threaded and flange connection: a) - 020F-040F measurement transducer; b) – 050F measurement transducer; c) – 065F-0100F measurement transducer;

3.3 Marking

Sample of meter marking*:*



4 Completeness

Completeness of water meters:

Name and notation	Number	Additional Information
S1F Water meter	Complete set	Execution and completeness - according to the order
S1F calculator, with integral cables from the measurement transducer and resistive temperature detector RTD	Complete set	See notes 1, 2, 3.
Straight pipe sections	Complete set	according to the order
Packaging	Complete set	
Modem		according to the additional order
Tee or ball valve		according to the additional order
Infrared optoelectronic head iRDA		according to the additional order
Device enclosure		according to the additional order
S1F Water meter. User manual	1 pcs.	
Spare parts, tools and accessories		Completeness and quantity - according to the additional order. See note 4

Notes.

1. Measurement transducers are delivered with fittings, gaskets and fasteners according to the drawings

2. Delivery of external RTD is carried out according to the order:

– For meters with measurement transducers of DN 15, 20, 25 RTD is equipped by adapter, gasket and union

– For meters with measurement transducers of DN 32...100 RTD is equipped by sleeve, hub, gasket

2. Spare parts, tools and accessories may include sets of items listed in this table.

5 Installation

5.1 Installation requirements

Prior to the meter installation, the system must be flushed to remove big pieces of iron scale, stones and the like. Flushing must be made with a repair insert.

Only new sealing elements included into the delivery set must be used for measurement transducer installation.

Before tightening the screw connections to make sure that progress is sufficient to seal the thread

To facilitate maintenance of the meter, it is advisable to install ball valves before and after the meter.

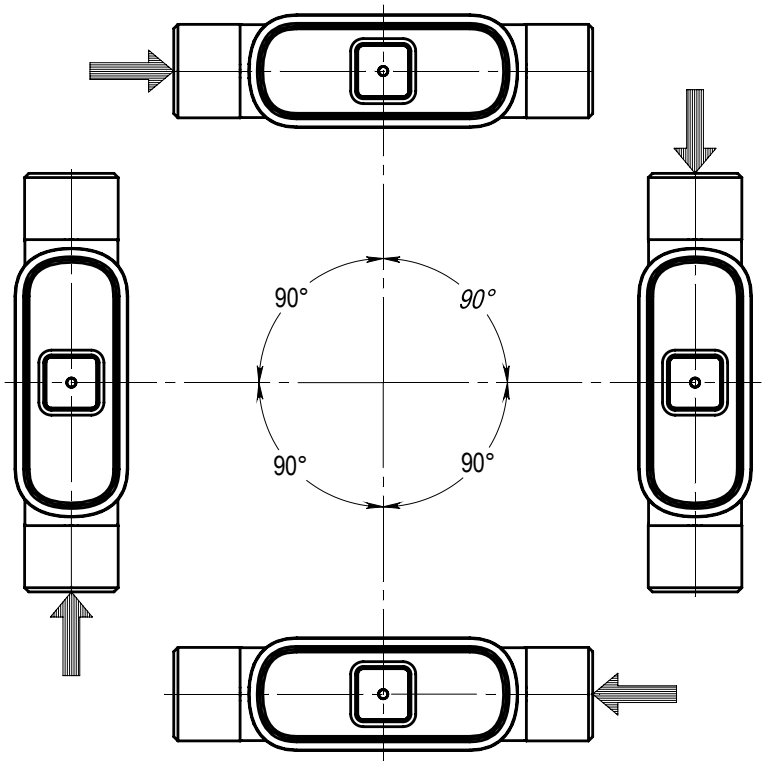
Installation of measurement transducer will depend upon the meter configuration to be read on the indicator.

Operating conditions

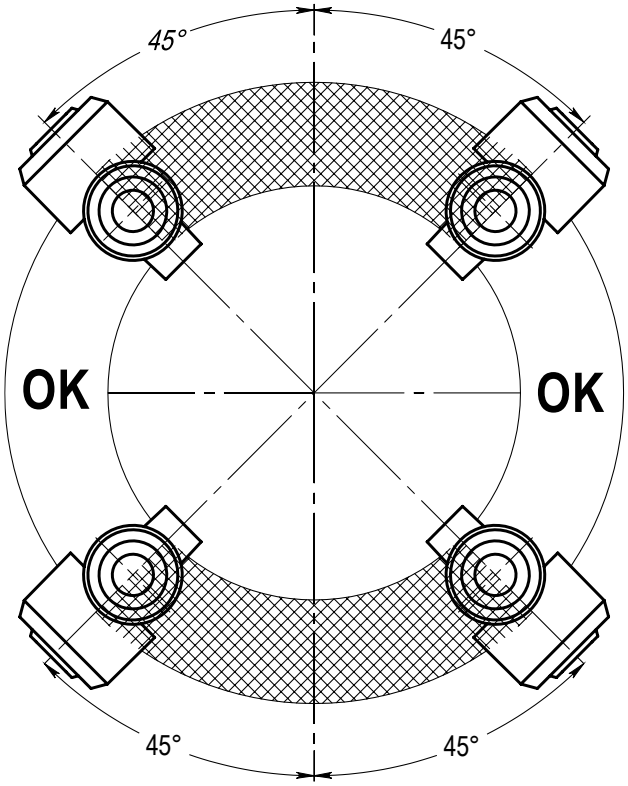
Ambient temperature	5…55 °C (indoors installation) The temperature must not exceed 30 °C for maximum lifetime of the battery
Water temperature	0,1…90 °C when the calculator is installed on a wall 15…90 °C when the calculator is installed onto the measurement transducer
Pressure in the system	1…16 bar

Warning! It is mandatory to install a strainer in front of the measurement transducer of the water meters up to DN25

5.2 Measurement transducer location in a pipeline



Measurement transducer may be installed vertically, horizontally or at any arbitrary angle. When installing a measurement transducer in a downward flow, there is a mandatory requirement - that the pressure at the outlet of the measurement transducer should be at least 2 bar.



The degree of purification of the water in the system can cause the formation of scale, visible sediment, layering, and dirt on the surfaces of the measurement transducer. Therefore, during installation, it is necessary to avoid the measurement transducer position, in which sediment may form on the working surfaces of flow sensors and mirrors for DN15...DN40.

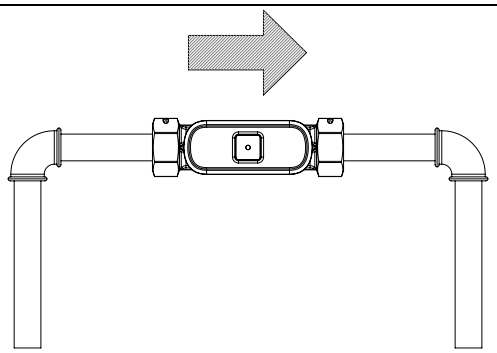
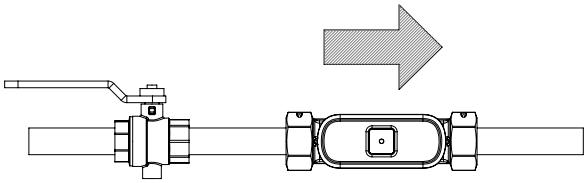
When installed horizontally, the measurement transducer should not be turned relative to the flow axis by more than 45º.

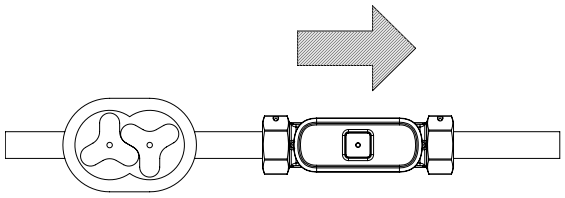
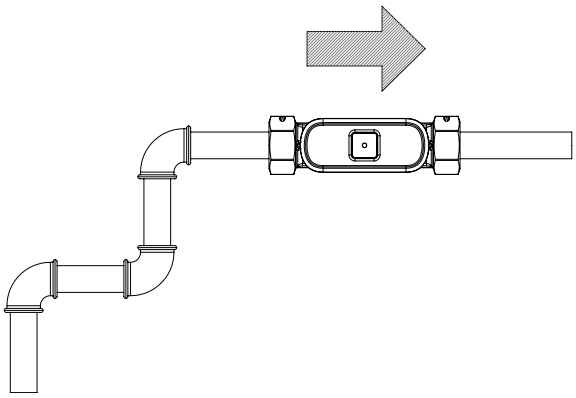
5.3 Requirements for straight pipe sections

Measurement transducers do not require to have straight pipe sections before and after of measurement transducer.

Such straight pipe sections are required only in the case of strong flow disturbance in front of measurement transducer. Such disturbances may be caused by a pump, double turn in different planes, availability of shutoff fittings (fully opened full-bore ball valve excluded).

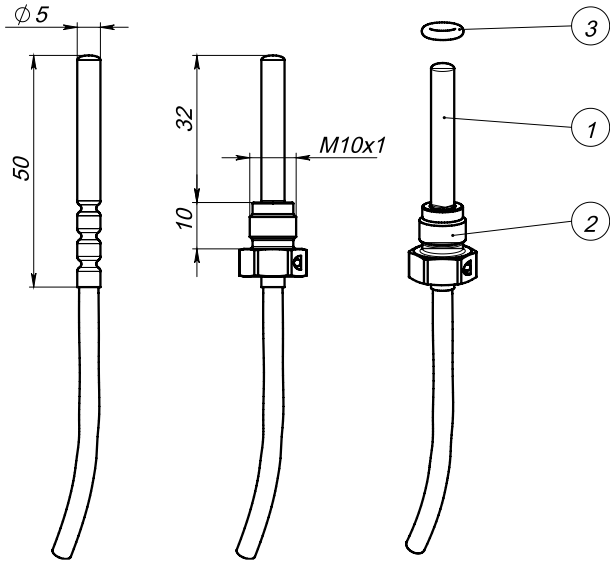
Internal diameter of straight pipe section must not differ by more than ±5% from the nominal value of DN.

 Installation at the highest point of the system is not allowed	 Installation after the valve at a distance shorter than 5D without straight pipe sections prohibited (fully opened full-bore ball valve excluded)

 Installation after the pump at a distance shorter than 5D is not allowed	 Installation at a distance shorter than 5D to a double bend is not allowed

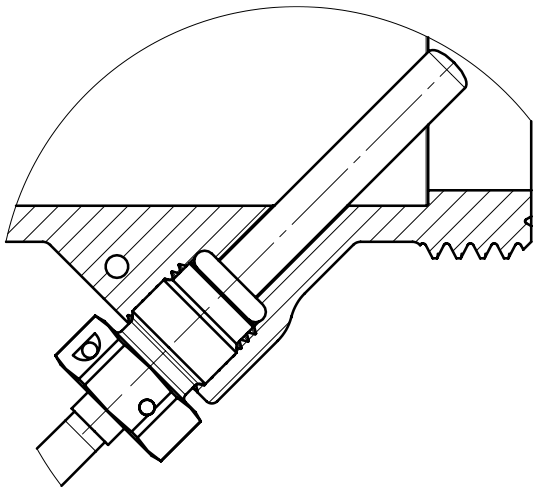
5.4 RTD installation

For the hot water meter (water temperature more than 70 °C) the device is equipped with one RTD.



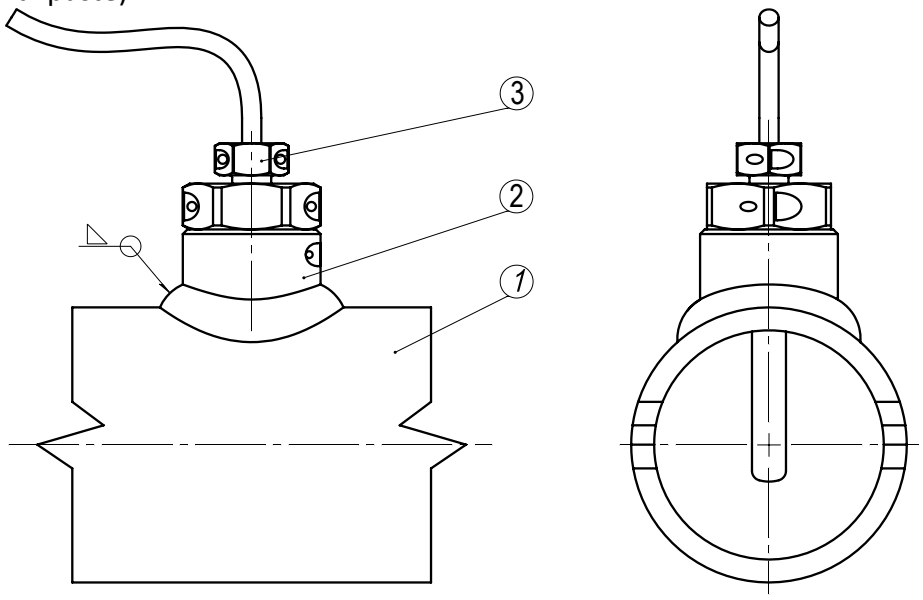
1 – RTD, 2 – RTD holder, 3 – sealing ring

For DN15…40 T1 can be installed into flow section body (see figure).

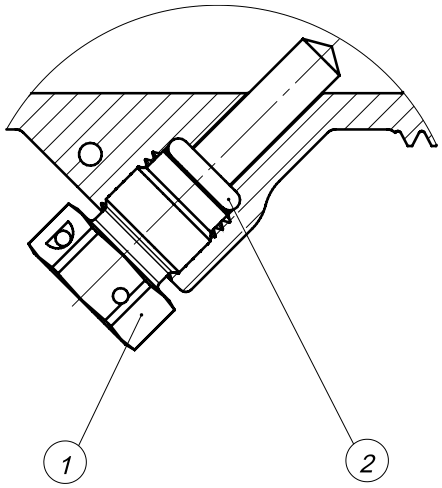


For DN50…100 installations of both RTD is carried out by means of a protective sleeve (pos.3), fig. below, and a welded lug (pos.2) of the corresponding size which are included in the delivery set. Welding of the lug to the pipeline (pos.1) is performed at the place of installation.

When using a sleeve, it is necessary to provide airless contact of a bottom of a protective sleeve and RTD by filling of backlashes with high-temperature thermally conductive substance (for example, transformer oil or thermal paste).

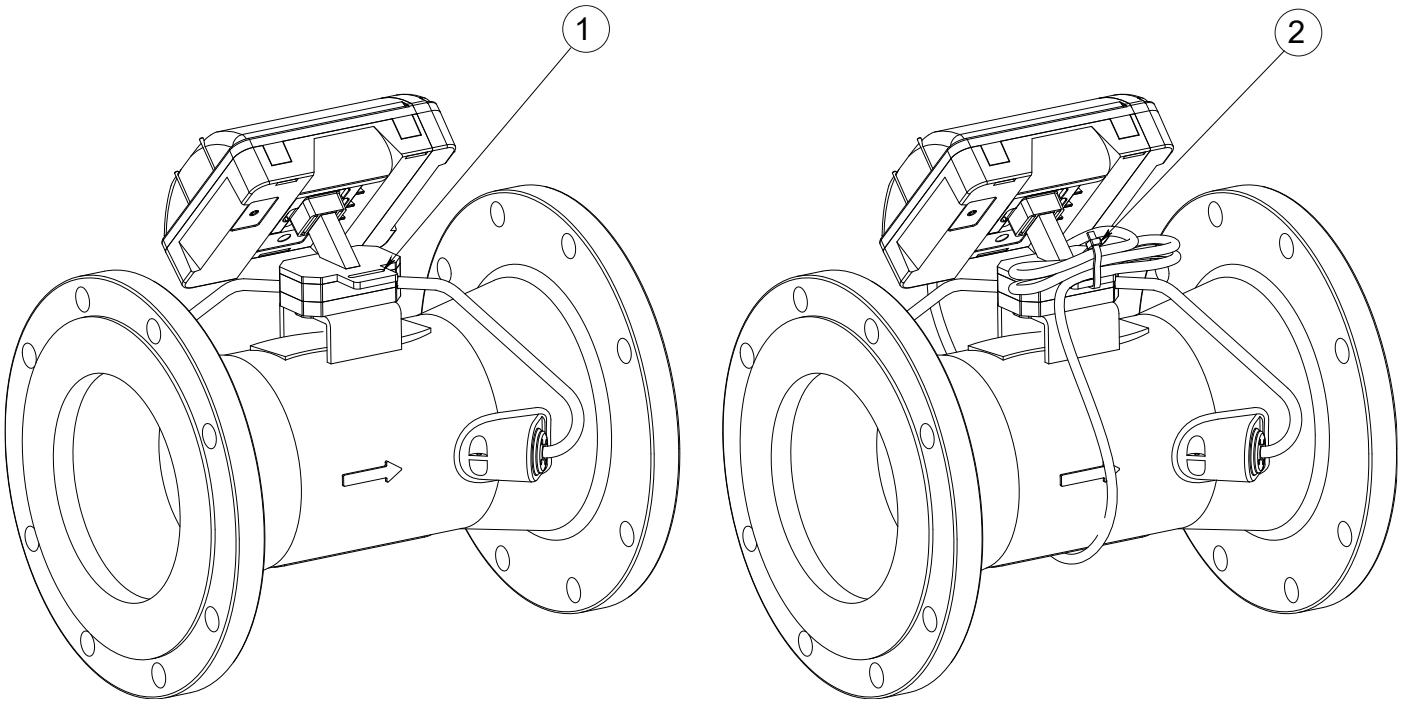


If temperature sensor T1 from complete set of DN15…40 has to be installed separately (not inside measurement transducer), orifice in the measurement transducer must be plugged with a blind plug from the complete set of the meter.



1 - blind plug, 2 – sealing ring

5.5 Laying cables



Laying cables from the calculator for DN50…100

1 - place of cable laying

2 - a plastic zip tie from the meter complete set

5.6 Commissioning

After installation, you must fill the system with water and configure the calculator to work in the desired configuration.

5.6.1 Filling the system

Open the valves, check the system for leaks and remove air from the system.

The air must be removed until the indication of flow measurement errors disappears and the flow displayed on the indicator stabilizes.

After that it is possible to seal all parts of the water meter.

5.6.2 Setting up the calculator

At release the calculator is entered into a transportation mode (it. **Error! Reference source not found.**). This mode is equivalent to the **Setup** mode and differs only in the reduced power consumption.

In this mode, you can edit the installation settings of the device.

The following parameters must be set for commissioning:

- Flow rate system units
- reporting date of the month (report date)
- configure pulse inputs, if any, and to be used
- configure the tariff, if necessary
- After completing the configuration of the device, when the correctness of all entered data is checked, you need to exit the **Setup** mode as indicated in the menu description. At this time the device will pass to a normal mode of work and will start accumulation of integral parameters and archive.
- Further entry into the **Setup** mode is possible only as described in 7.2.3.

5.7 Maintenance

5.7.1 After installation of the meter welding works or freezing of the meter are not allowed. The meter must be dismounted for welding work.

5.7.2 It is forbidden to dismount flow sensors from the flow meter section. In this case, the warranty is void.

In cases where the flow area needs to be cleaned, it must be dismounted and cleaned with any household liquid detergent that is designed to remove layers at a frequency determined by local conditions (see it. 7.2).

6 Calculator

6.1 Performance of measurements

Measurement cycle of a meter consists of two independent cycles – integration cycle and temperature measurement cycle. The integration cycle is the periodicity with which the data summation in the meter's storage is performed.

The temperature measurement cycle during a normal measurement mode will always be equal to 32 seconds.

The integration cycle may be changed in the course of the meter setting (see it.2.2.1). Flow measurement cycle depends on the integration cycle:

Periodicity of integration, sec	Periodicity of the flow rate measurement, sec
2	0.5
4	1
8	1
16	2
32	4

When the meter is shipped, its integration cycle will be set to 16 seconds. Periodicity of the flow rate measurement then will be once every two seconds.

If shorter measurement cycles are installed, you must take into account that service life of the battery will be shorter as a result.

6.2 Working modes of the meter

There are several modes of operation of the meter:

- Transportation
- Normal
- Setup
- Verification (Test)

6.2.1 Transportation mode

This mode is set when the meter leaves the production line. It is intended for maximum curtailment of the consumption.

The transportation mode is equivalent to **Setup** mode except for the periodicity of measurement and the indicator work.

In this mode, the integration cycle and temperature measurement cycle will be equal to 60 seconds each. The indicator is turned off. When any pushbutton is depressed, the indicator will be turned on. It will be turned off again 5 minutes thereafter, if no pushbutton is depressed.

When the possibility of correct flow rate measurement (measurement transducer is filled with water) appears, periodicity of measurement becomes equal to that in normal operation mode.

If absence of water in measurement transducer is registered for 5 minutes, the meter will be switched over to the transportation mode again.

Being in this mode is not limited in time.

6.2.2 Normal mode

This is the main working mode of the meter.

The integration cycle here is set to a value to be determined by the user. The temperature measurement cycle will be 32 seconds.

Indicator is on.

All measured parameters are archived and tariffed in this mode.

6.2.3 Setup mode

This mode is intended for initial meter setting.

Periodicity of measurements in this mode will correspond to the periodicity of measurements in the normal mode.

Integral parameters in this mode will be accumulated but will not be memorized. That is, when this mode is turned on, the integral parameters will have the same meaning as of immediately before entering this mode.

No archive is kept.

Log of user's actions is kept.

Duration of this mode will not exceed 2 hours if no pushbuttons are depressed. When this period expires, the instrument will automatically be switched over to the normal operation mode. If any introduced changes require archive emptying and initial parameters resetting, these will be performed automatically, without additional requests of the user.

6.2.4 Test mode

This mode is intended for verification of the meter.

In this mode, integration cycle is 2 seconds, while periodicity of flow rate measurement will be 2 times a second. The temperature measurement cycle will be 2 seconds.

It is made to accelerate the verification process.

Integral parameters will not be memorized in this mode. That is, when you exit from this mode, the integral parameters will restore the values they have prior to entering this mode.

Duration of this mode will not exceed 8 hours if no pushbuttons are depressed.

6.3 Meter's functions

6.3.1 Logging

The meter will keep a log of user's actions to register everything that can influence over the measurement result. The log record includes the date of the event and its description.

The following events will be registered in the log:

Entering into and exiting from **Setup** and **Test** modes;

Editing of any parameters while in **Setup** mode

Depth of the logging: 100 entries

In addition, every entry into service modes will increment the relevant entry counter. Readings of these counters may be seen on the indicator and their current status may be read through any available interface.

6.3.2 Maximum values

The meter will register maximum values of flow rate. Such values will be memorized in all archive types. This means that hourly, monthly and yearly maximum values will be stored.

Such maximum values will be calculated as the maximum for averaged measurement results during a fixed time interval. Possible values of the averaging interval: 1, 2, 3, 4, 5, 10, 15, 20, 30 minutes. When the meter is shipped, the averaging time is set to 30 minutes.

6.3.3 Archiving

When operated in the normal mode, the meter will keep the following archives:

Archive type	Depth
Hourly	1680 hours (70 days)
Daily	500 days
Monthly	36 months (3 years)
Yearly	16 years

The following data will be placed into archives:

- date
- volume and mass (if temperature is measured)
- tariff counters (4 items) (if used)
- volumes by pulse signal inputs (if used)
- maximum values of volume

– codes and durations of errors registered during the time interval corresponding to the archive type .

6.4 Processing errors

The meter in the course of its operation will continuously monitor correctness of measurements made. If any errors are detected, they will be displayed in the main area of the indicator. If that is the case, the measured parameter will appear in turn with the error code with 4-second interval. The measured parameter will be displayed for 4 seconds followed by indication of the error for another 4 seconds. If several errors are detected simultaneously, they will be displayed in turn.

An example of a displayed error

Any error code consists of three groups of digits (from the left to the right)

Error group

Error No.

Channel No. where the error took place

In the above example, error code indicates the following: error group – temperature measurement (1), error code – 1 (RTD wiring break), Channel – 1 (error took place in RTD1).

More detailed description of any error may be seen in the instrument menu. In this case, the menu line will contain a text describing the error, while the main display will show the error code.

Error codes

Information on the indicator	Text in the menu line	Description
Error111	Err. Break TS1	RTD 1 wiring break
Error121	Err. Short TS1	RTD 1 short-circuit
Error131	Err. Coeff. TS1	Erroneous calibration coefficients RTD1
Error141	Err. TS1 low	Temperature RTD1 is below the permitted limit (-49 °C)
Error151	Err. TS1 high	Temperature RTD1 is above the permitted limit (+150 °C)
Error311	Err. No water	No water
Error321	Err. Low signal	Low signal level
Error331	Err. Temper. FS	Determination of the water temperature in measurement transducer is impossible
Error341	Err. High speed FS	Flow rate exceeds a permitted limit
Error351	Err. Reverse flow	Reverse flow

6.4.1 System errors

System errors means errors in the calculator hardware, which make measurement impossible completely and cannot be remedied in site. To remedy any system errors (or faults causing system errors), the instrument will be sent to the manufacturing enterprise.

The system errors will be displayed on the indicator as follows:

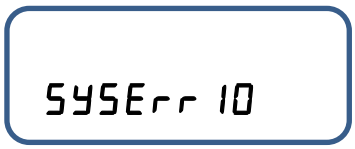


Figure denotes the error number.

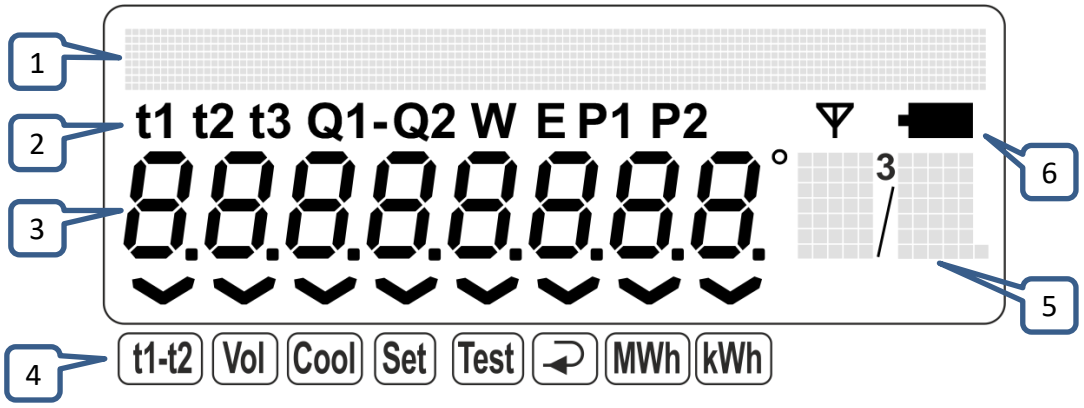
6.4.2 Setting date and time

The instrument will be shipped with pre-set date and time corresponding to the relevant time zone of the supplying country.

Where necessary, date and time may be set by **SmpSetup** program. If no data is set, the following message will appear on the indicator

6.5 Indicator and keyboard

6.5.1 Indicator



1 – Menu line
2 – Displayed value
3 – Main screen
4 – Mode indicators
5 – Measurement units
6 – Battery charge indicator

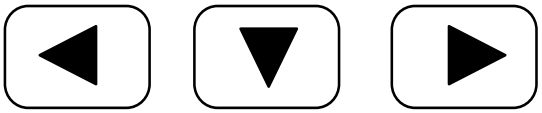
Indicator is divided into two areas: main screen and menu line.

Main screen is operable always (except for transportation mode), while the menu line will be displayed only when work with menu is commenced. The menu will remain active for 2 minutes, if no pushbutton is depressed. If no pushbuttons were depressed for 2 minutes, the menu line will be turned off and the instrument will be switched over to the main indication mode.

Mode indicators in the bottom section of the indicator extend the displaying ability of the indicator main screen.

6.5.2 Keyboard

The meter is equipped with a keyboard comprising three pushbuttons: ‘to the right’, ‘down’ and ‘to the left’.



"Left" "Down" "Right"

When navigating the menu, the menu item number is displayed on the left side of the line. The number of each subsequent menu attachment (next menu level) is separated from the previous by a dot.

6.6 Meter control menu

The meter is controlled by long (3… 5 seconds) or short (1… 2 seconds) button presses.

Long presses are used in the following cases:

◀ ▶	Transitions between titles

◀	Go from **any** menu item to the **energy** display item (E) of the main menu
▼	Go from **any** menu item to the **title** of the current menu branch

With short presses, the following happens:

- "Down" button - go to the next menu item;
- "Left" button - returns to the previous item (if necessary, for example, or reset the previous value);
- when selecting one of the parameters from the list, which consists of three or more positions: button "Right" - the beginning of the search, "Down" - alternate search, "Left" - fix the selected parameter;
- when selecting one of the two parameters: "Down" - alternate search. Go "Left" or "Right" is already performed with the selected parameter value.
-
- **Number editing.**
- **"**Right" button - start editing the next digit (flashing of the selected digit with a frequency of 1 Hz)
- The "Down" button changes the selected digit
- after selecting the desired digit, the "Right" button moves to the next digit. After reaching the last digit, the first digit is selected again
- finish editing - on the "Left" button.

6.6.1 Short description of the menu

The "Control" menu allows the representative of the servicing, or inspecting organization to check up correctness of setting of metering parameters. Menu items 2.1, 2.2 help to assess the facts of authorized or unauthorized access to these parameters. Section 2.9 to see for the configuration of the device.

The "**Setup**" menu is used to set the configuration of the meter and enter it in the metering process.

IMPORTANTLY! Exiting the "**Setup**" menu requires special attention, because each time you enter the "**Setup**" mode (for example, when you mistakenly exit the mode and then enter it) the counter increases by one the number of entering into this mode. Each additional entry into this mode may be revised by the inspector as an attempt of falsification.

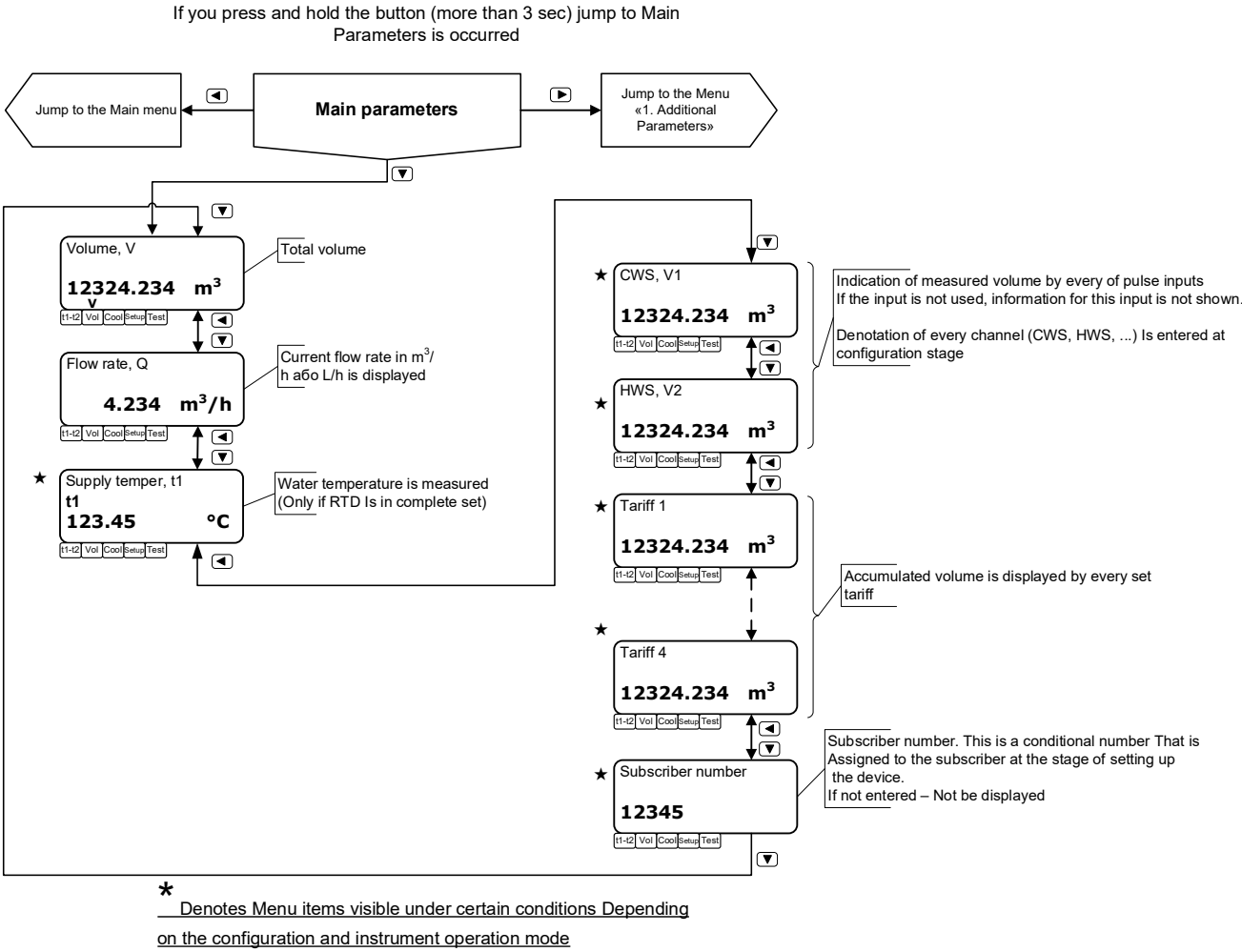
When exiting the "**Installation**" mode through this menu item, you can:

- return to the beginning of the menu if you need to check something again or correct it
- before entering into metering, save or reset ("Exit without reset" or "Exit with reset") integral parameters

When you log in (exit Installation mode), you are prompted to confirm the action. If everything is done correctly and there is confidence in the correctness of the entered data, you must select "Yes" and click "Right".

Thus, the device will be registered and it will exit the "**Setup**" mode.

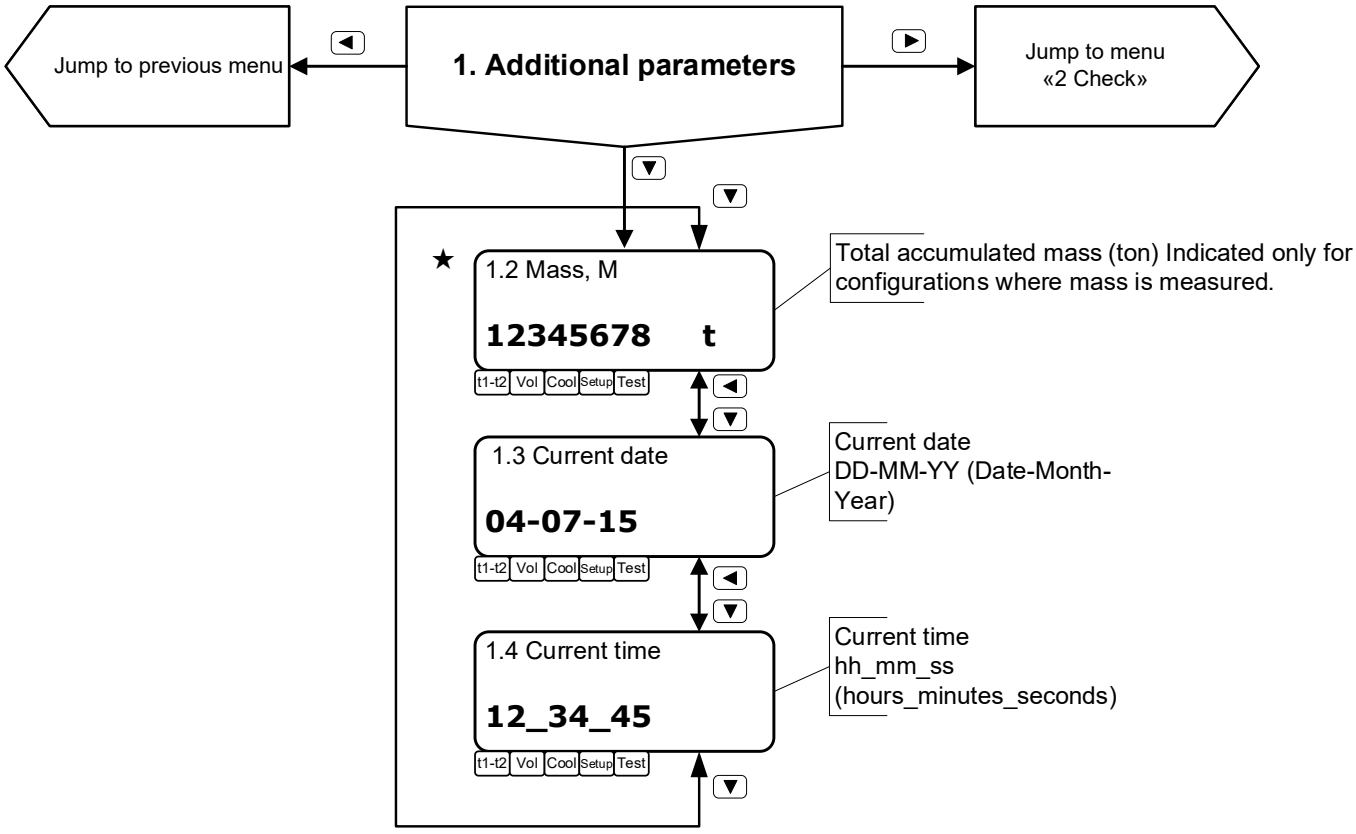
6.7 Information displayed in main mode



* Denotes Menu items visible under certain conditions Depending on the configuration and instrument operation mode

6.8 Additional Parameters Menu

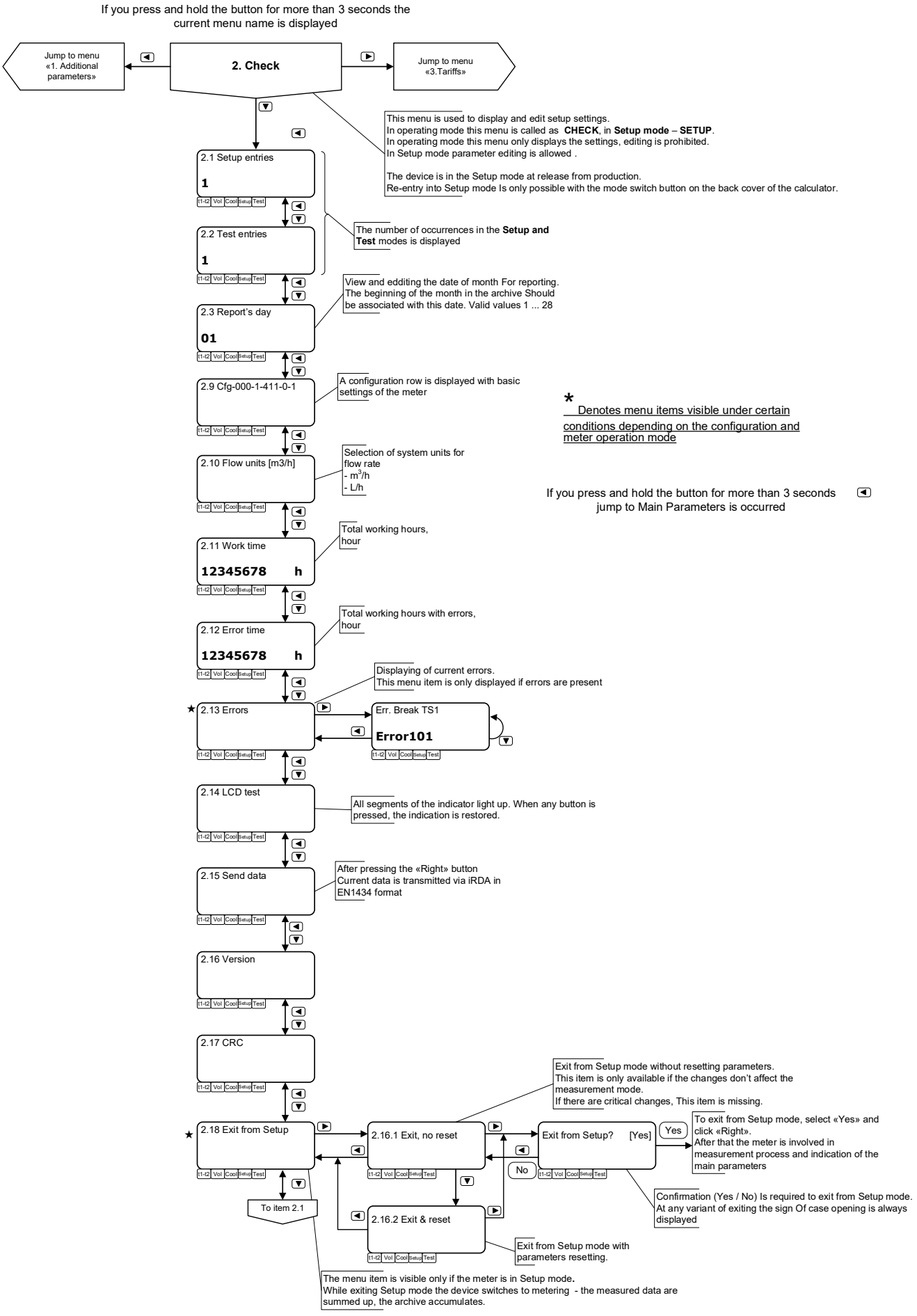
If you press and hold the button for more than 3 seconds the current menu name is displayed



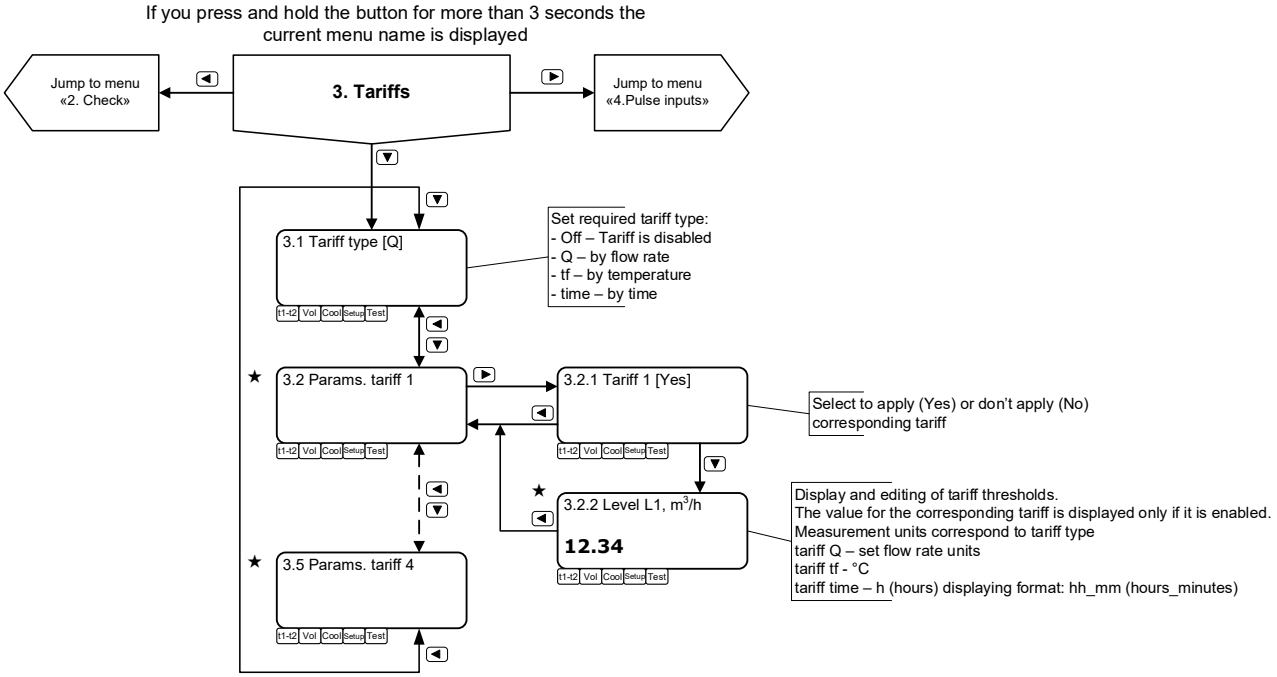
* Denotes menu items visible under certain conditions depending on the configuration and meter operation mode

6.9 Menu Check (Setup)

If the device is in normal mode, this menu is called "Control" and if in "Setup" mode, then this menu is called "Setup"



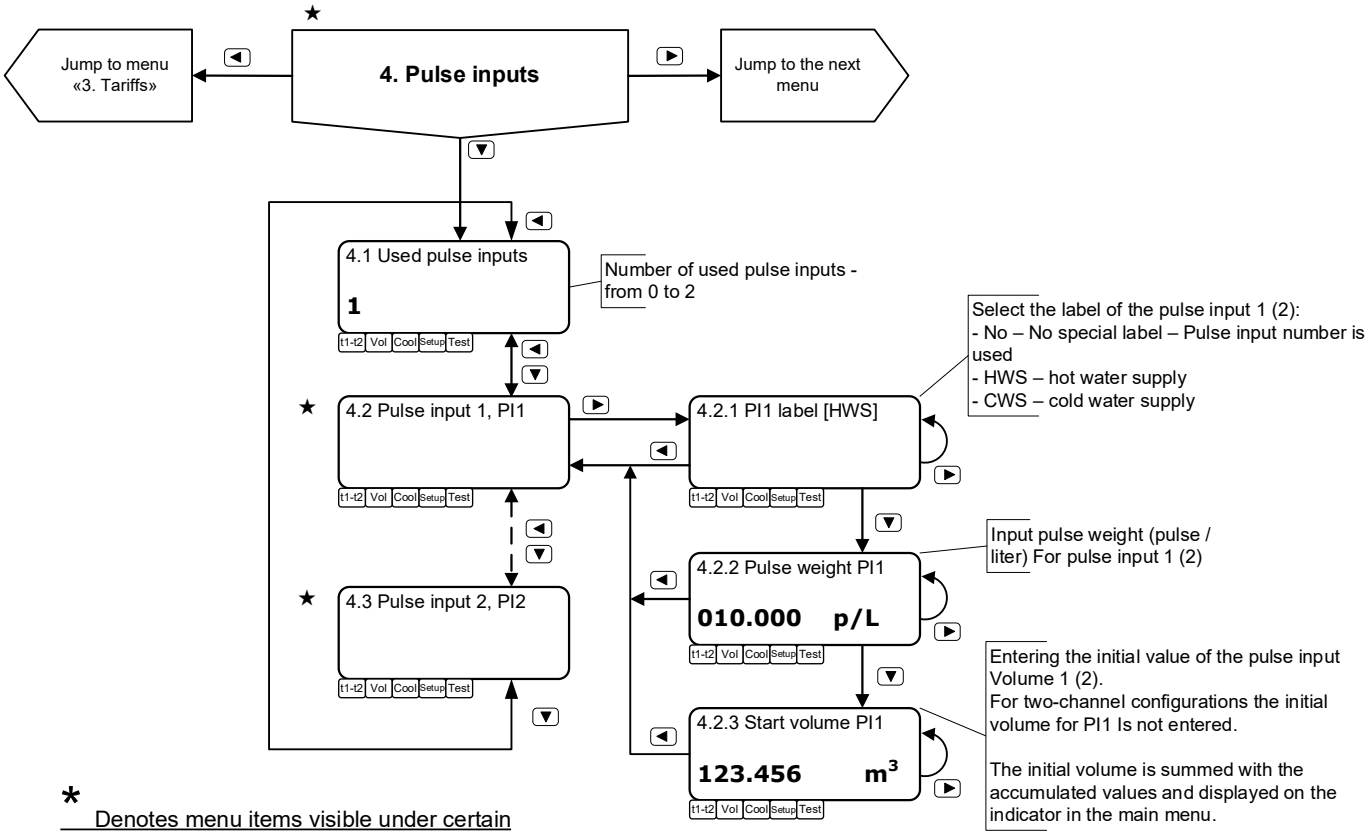
6.10 Tariffs menu



* Denotes menu items visible under certain conditions depending on the configuration and meter operation mode.

6.11 Pulse inputs menu

If you press and hold the button for more than 3 seconds the current menu name is displayed



* Denotes menu items visible under certain conditions depending on the configuration and meter operation mode.

7 Maintenance

7.1 Execution of maintenance.

Maintenance is executed by a representative of the service organization. During the completing of maintenance work, it is necessary to follow the safety measures that are given in the Chapter **Error! Reference source not found.**.

Two types of meter maintenance are regulated:

Maintenance No. 1 is carried out at the end of the heating season and includes an external inspection and check of the operation of the device.

During maintenance No. 1 we should visually check:

- absence of leakage in the places of measurement transducer installation in the pipeline;
- reliability of contact connections;
- absence of chips and cracks on plastic parts;
- integrity of insulation of connecting cables;
- possibility of outputting measurement information to external devices.

If the water is insufficiently purified (scaling, visible sediment, layering, dirt, etc.) it is recommended to clean the measurement transducer and the filter with a periodicity determined by local operating conditions (see it. 7.2).

Maintenance No. 2 is carried out before the periodic verification of the meter.

Maintenance No. 2 is carried out by:

- operations provided for by maintenance No.1;
- inspection of the internal surface of the measurement transducer for the presence of layering;
- in the case of significant layering, disassembly and cleaning of the measurement transducer, dismantling and cleaning of the RTD is required (it. 7.2).

7.2 Cleaning of measurement transducer.

If water purification systems do not comply with the requirements of water quality standards, layers (fouling, scum, dirt, etc.) appear on the working surfaces of measurement transducer, then correct operation of the devices will be impaired. In this case, the measurement transducer should be cleaned from layers with a periodicity determined by local conditions.

The criterion for cleaning is the appearance of an error message with 311 or 321 codes on the device indicator (Error 311, Error 321).

To clean measurement transducer:

- dismantle the measurement transducer from the pipeline and perform an inspection of the internal surface of the measurement transducer;
- if necessary, clean the inner surface of the measurement transducer and the surface of the flow sensors using weak solutions of alkalis or acids (for example, vinegar 9%), synthetic detergents.

Then rinse with water.

In the case of a high degree of pollution, it may be necessary to disassemble the measurement transducer. After that, it is mandatory to provide meter verification. Therefore, such work can be carried out either by the manufacturer or by certified authorized service and verification centers, and such work is not a warranty type of work.

7.3 Verification.

Meters are submitted for verification after technical maintenance No. 2. The period between verifications is no more than 4 years. The calculator, measurement transducer in assembly with RTD are submitted for verification.

7.4 Battery.

The battery has a 48-month warranty as a component of the meter. During this period, the battery can be replaced if it is compatible with the calculator with which it was shipped.

7.5 Typical malfunctions.

A list of typical malfunctions and methods of their elimination are given in the table:

External manifestation of malfunction	Probable cause	Method of elimination
1. There is no indication when pressing the buttons	The battery is completely discharged or not installed	Replace (install) the power battery
2. The calculator does not respond to button presses	Faulty calculator	Repair the calculator

Note: calculator repair and battery replacement is carried out by specialists of the manufacturing company.

8 Manufacturer’s warranty

The manufacturer warrants operation of the meter for 4 years following the shipment date of the meter to a user.

The warranty provides for replacement of any defective parts and checking operability of the instrument within the premises of a service center of the manufacturing enterprise.

The warranty covers defects of any component parts of the instrument included into the delivery set if caused by workmanship defects, defects of materials and component items.

Any failed instrument must be delivered to the manufacturing enterprise for testing and repairing.

The calculator may not be opened (integrity of seal lead may not be damaged) under any circumstances prior to redelivery of the instrument to the manufacturing enterprise.

Warranty will not include any indemnification of any costs related to de-installation, return and reinstallation of the instrument, as well as indemnification of any consequential damages related to the failure.

If any defect is found during the warranty term, the user will be obliged to produce the claim to the manufacture enterprise at the following address:

LLC FIRM “SEMPAL Co LTD”,
11, René Descartes str., Kiev, Ukraine, 03062,

Phone: +38 (044) 3371188, (044) 3551188
+38 (098) 1638888, (050) 1428888

No claims related to the water meter will be recognized in the following cases:

Installation and commissioning works have been carried out by any organization not authorized by the manufacturing enterprise to carry on such works;

Integrity of lead seals on the calculator is damaged;

Expiry of the warranty period;

Infringement by user of the operation, storage and transportation rules as prescribed in operating documentation.

in the presence of layers (plaque, scale, dirt, etc.) on the working surfaces of measurement transducer, which require cleaning (п. 7.2)

If the warranty period expires or if the right for free of charge warranty services is lost, the manufacturing enterprise will carry out paid repair of the meters.

9 Storage, transportation, utilization

9.1 Packaging

Packaging (transport packaging) is performed according to the drawings of the manufacturer.

Marking of transport containers is performed according to the drawings of the manufacturer and contains manipulation signs "CAREFULLY FRAGILE", "PROTECT FROM MOISTURE", "TOP".

The components of the meters are packed in boxes of the manufacturer. Upon agreement with the customer, delivery of measurement transducer without transport packaging or in the customer's packaging is allowed.

9.2 Storage conditions

In unheated storage, the shelf life is not more than 5 years at an air temperature of -25 ° C to +60 ° C without moisture condensation.

During long-term storage in unheated storage, the meters must be packed in an additional cover made of polyethylene film.

It is allowed to transport meters by all types of transport in packing, on condition of protection against direct influence of atmospheric precipitations.

9.3 Utilization of the meter parts

Meter parts	Materials	Utilization method
Lithium battery C	Lithium and thionyl chloride 2.5 g of lithium	Certified places for storage of lithium batteries
Printed circuit board without LCD	Metallized glass fiber laminate with components installed thereon	Metal extraction from the printed circuit boards
Liquid crystal display	Glass and liquid crystals	LCD recycling
Cables to temperature sensor and flow sensor	Copper and silicone casing	Cable recycling
Upper calculator cover Lower calculator cover Calculator holder	Polycarbonate Acrylonitrile-butadiene-styrene Polycarbonate	Plastics recycling
Measurement transducer pipe section	Brass	Metal recycling
Package	Cardboard	Waste paper recycling

10 Parameters and characteristics of the component parts of the meter

Place for pasting parameters and characteristics

11 Certificate of acceptance and initial verification

A place for pasting the acceptance certificate

12 Data on commissioning, repairs, reconfiguration

Date	Action title	Who is responsible for completing	Signature and stamp

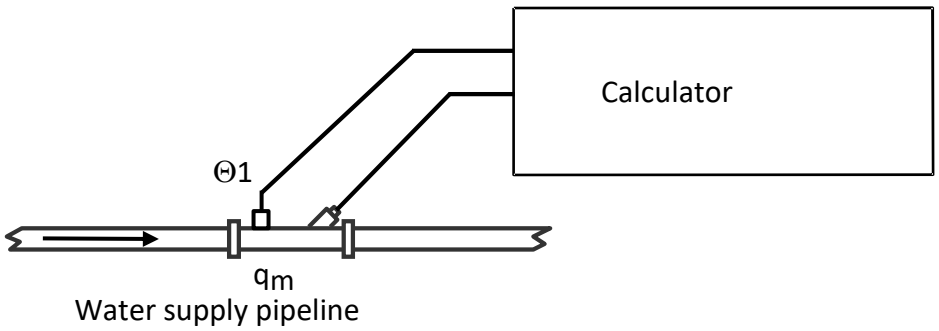
13 Data for periodic verifications

Factory number	Date of verification	The term of the next verification	Signature of authority	Stamp

Appendix A.
Simplified scheme of meter installation

The following are simplified schematics of installation of the meter.

Configuration 1



Configuration 1/1