



SINGLE-PHASE ELECTRONIC ENERGY METER AIST A100

USER MANUAL

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Introduction

This operating manual (hereinafter referred to as the OM) contains information about the single-phase electronic electricity meter “AIST A100” (hereinafter referred to as the meter), necessary to ensure full use of its technical capabilities, correct operation and maintenance.

The operating manual is intended for personnel performing installation, operation, repair and maintenance of the meter.

1. Purpose

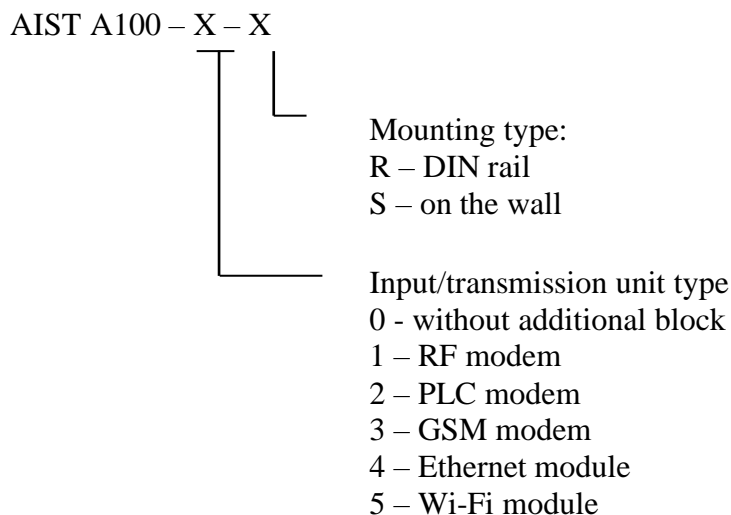
A single-phase electric energy meter is designed to measure and record active energy in single-phase alternating current circuits and transmit telemetric information about consumed electric energy when used in automated data collection systems (ADCS).

To display information, the meter uses a liquid crystal display (LCD), which indicates:

- current tariff numbers (up to 4 tariffs);
- displays active energy of the forward and reverse directions, combined values, as well as total energy values for each tariff and total for all tariffs;
- current value of active power in the load in kW;
- network voltage (V);
- current consumption (A);
- network frequencies;
- current time;
- current date - day, month, year;

The meter can be used either as part of a system together with other devices and components, or independently.

The structure of the symbol for the "AIST A100" meter is shown in Figure 1.



Drawing1. Structure of the counter symbol

An additional data input/transmission unit can be installed in the meter: PLC modem, GSM modem, RF modem, Ethernet module.

In terms of current and voltage, only one modification is possible for single-phase AIST A100 meters, as indicated in Table 1:

Table 1. Current and voltage division for single-phase meters AIST A100 (one modification)

Nominal voltage, V	Nominal (max) current, A	Active energy accuracy class
230	5(60)	1

An example of a meter entry is a single-phase active energy meter AIST A100 with a PLC-modem data input/transmission unit (2), with a wall mount (S):

"Single-phase active electric energy meter AIST A100-2-S".

2. Safety requirements

Before using the meter, please read the operating documentation for the meter.

Only persons who have undergone special training and have a certificate entitling them to perform technical maintenance and repair of meters are allowed to perform

installation, maintenance and repair of meters.

3. Technical and metrological characteristics

The main technical and metrological characteristics of the AIST A100 meter are given in Table 2.

Table 2.Main technical and metrological characteristics of the meter

Name of the characteristic	Meaning
Active energy accuracy class	1
Basic, I_b (maximum) current, A	5 (60)
Nominal voltage value (U_{nom}), In	230
Starting current (sensitivity threshold):	$0.004 \cdot I_b$
Set operating voltage range, V	from 0.9 to $1.1 \cdot U_{nom}$
Extended voltage range, V	0.8 to $1.15 \cdot U_{nom}$
Power consumption, V·A, no more than: <ul style="list-style-type: none"> ▪ along the voltage circuit ▪ along the current circuit 	5 0.2
Nominal value of the electrical network frequency, Hz	50
Maximum number of tariffs	4
Minimum tariff duration, min	15
Exchange rate via RS-485 interface, bit/s	1200~9600
Accuracy of the built-in clock when the counter is turned on and at normal temperature, better, c/day.	□ 0.5
Liquid crystal display (LCD): <ul style="list-style-type: none"> ▪ number of indicated digits ▪ price per unit of the least significant digit when displaying energy, kWh 	8 0.01
Meter constant, imp./(kWh)	1200
Mean time between failures, h	at least 160,000
Service life of the power supply of the counter clock, years	at least 10
Additional data input/transmission blocks	RF modem, PLC modem, GSM modem, Ethernet module, Wi-Fi module
Temperature range, °C	from - 40 to +55
At temperatures from - 20 to - 40 □C, partial loss of LCD functionality is allowed.	
Overall dimensions (height×width×depth), mm:	190×113×75
Weight of meters, kg	no more than 2.8

4. Completeness

The meter complete set is shown in Table 3.

Table 3 Counter completeness

Name	Quantity, pcs.
1. Electronic electricity meter "AIST A100"	1
2. Operation manual	1
3. Passport	1
4. Packaging	1

5. Main functions

The single-phase electronic electric energy meter "AIST A100" performs the following functions:

- Voltage measurement.
- Current measurement.
- Calculation of active energy and power.
- Registration of energy consumption.
- Counting time and calendar date.
- Exchange of information with the hub via data transmission units (DTU).
- Accumulation of data in non-volatile memory.

Consumer and service data are displayed on the liquid crystal display (LCD) located on the front panel of the meter.

The meter can be operated autonomously or in an automated system for collecting data on consumed electricity.

It is possible to configure the meter parameters using a computer or a manual interrogation and programming device (MPD).

The meter allows you to monitor electricity consumption taking into account the developed tariff structure.

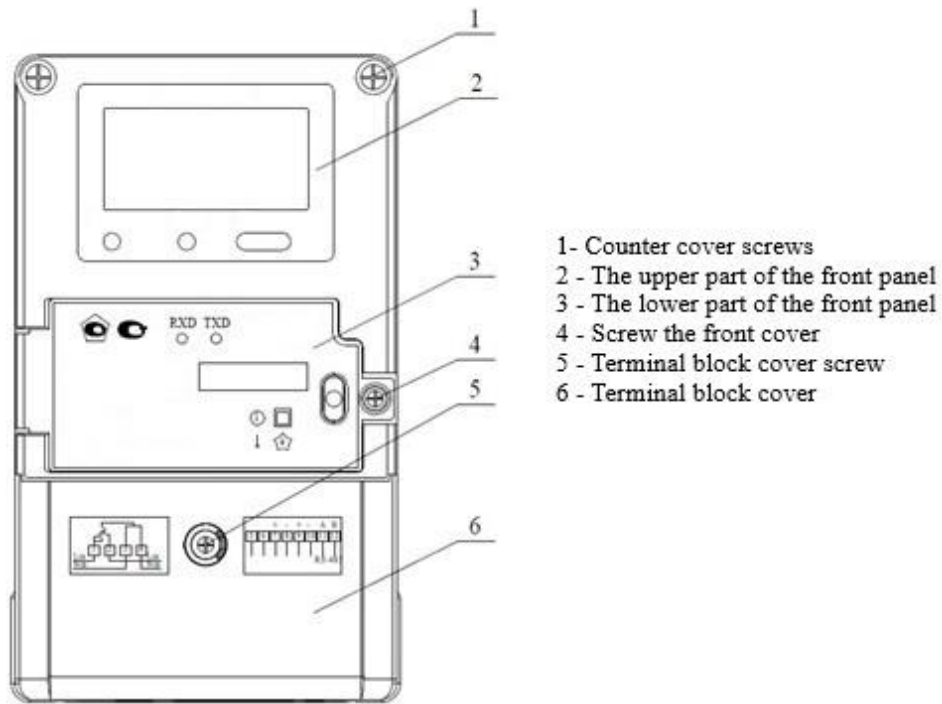
It is possible to receive information about the emergency state of your own network.

6. Counter device

6.1 Design and appearance

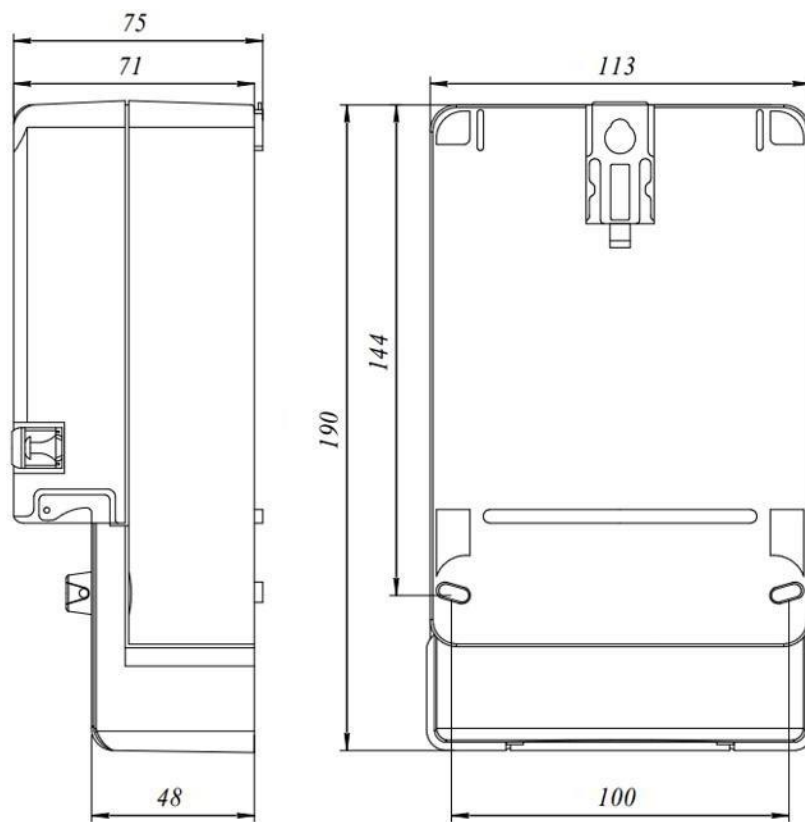
The counter is made in a plastic case.

The appearance of the counter is shown in Figure 1.



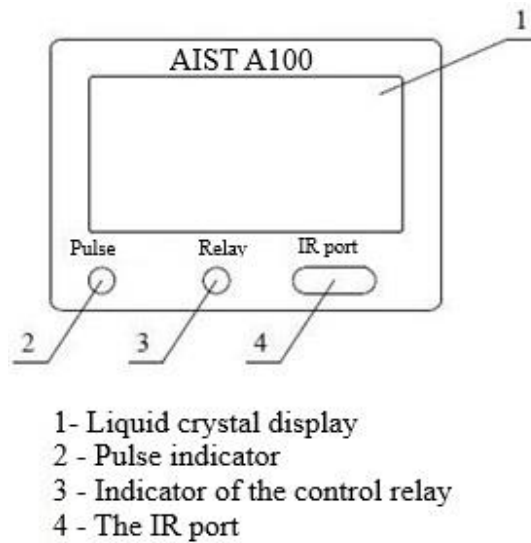
Drawing2. Appearance of the counter

The overall dimensions of the meter are shown in Figure 3.



Drawing3. Overall dimensions

The appearance of the upper and lower parts of the front panel of the meter is shown in Figures 3,4.



Drawing4 Front panel of the counter (upper part).

The meter's main terminals, designed for connection to the electrical network, are made of a highly conductive electrical alloy. They are housed in a housing made of impact-resistant, fire-resistant plastic, which ensures high insulation resistance.

The external appearance of the meter terminal block is shown in Figure 5.

Additional contacts of the terminal block are intended for pulse outputs and digital interfaces (Figure 6).

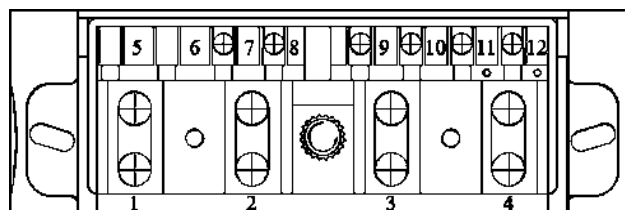
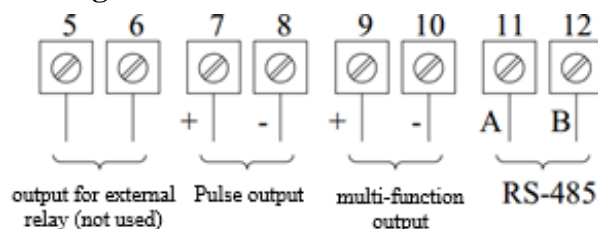


Figure 5. Terminal block of the meter



Drawing6. Additional contacts of the terminal block

The calibration outputs can be tested using an open collector transistor; to ensure its operation, it is necessary to apply the supply voltage according to the circuit shown in Figure

7.

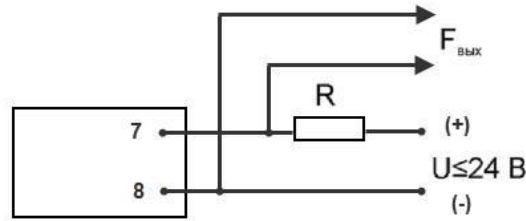


Figure 7. – Connection to the test output device

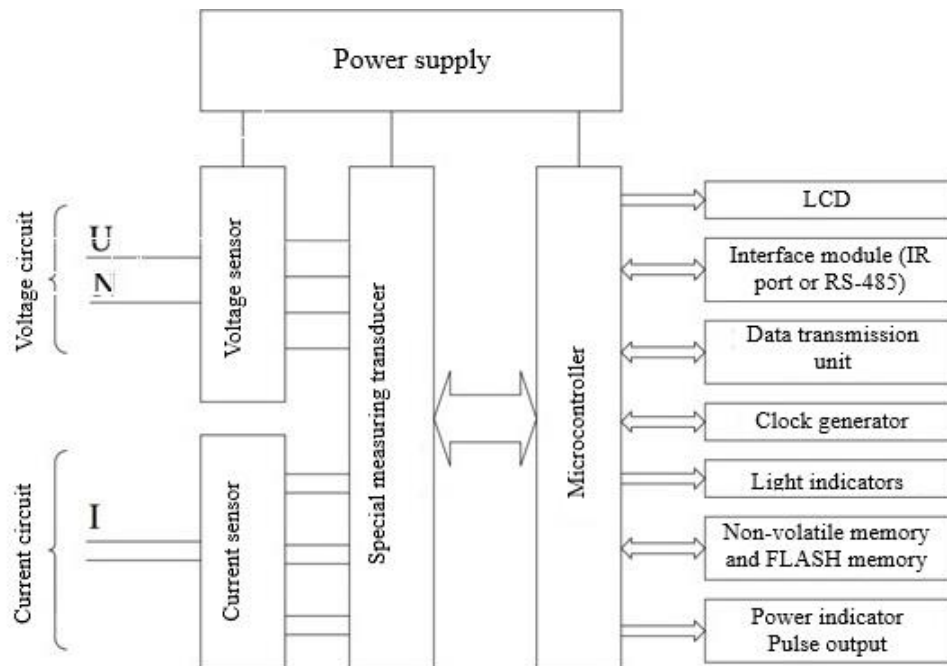
The signal form F_{out} is rectangular pulses of negative polarity with an amplitude equal to the supplied supply voltage U .

The value of electrical resistance R , in kOhm, in the load circuit of the test output device is determined by the formula:

$$R = \frac{U}{I}, \text{ where } U \leq 24 \text{ V is the supply voltage; } I \leq 30 \text{ mA is the current.}$$

6.2 Operating principle

The operating principle of the counter is explained by the structural diagram shown in Figure 11.



Drawing 11. Structural diagram of the counter

Currents and voltages in the measured network are fed through the corresponding terminals and input elements to the corresponding inputs of the analog-to-digital converter (ADC). The measuring converter converts the analog voltage and current signals into digital values and also calculates the energy consumed.

The central processor receives measurement results and stores them in non-volatile memory, maintains communication via interfaces, and displays information on a liquid crystal display.

Measured data, configuration parameters, status and other information are stored in non-volatile memory and can be displayed on the meter's liquid crystal display.

The power supply is used to convert the alternating voltage of the network into direct voltage, which is necessary to power the microcontroller and operate the microcircuits.

The AIST Meter Configurator software allows you to configure meter parameters and read data. The computer can communicate with the meter via either an optical or digital port. To ensure safety and reliability, an identification procedure is required before configuring the meter parameters.

6.3 Control relay

The meter has a built-in power relay, which can be controlled remotely via a command in the meter's protocol format. The relay on/off command is sent via the RS-485 interface or via an additional data input/transmission unit installed in the meter.

During the switching-on procedure, after the corresponding command has been sent to the meter, it is also necessary to press the control button on the meter panel and hold it for two seconds - this is an additional measure of protection against erroneous switching on of the meter.

Thanks to the power relay built into the meter, remote control of consumers is possible.

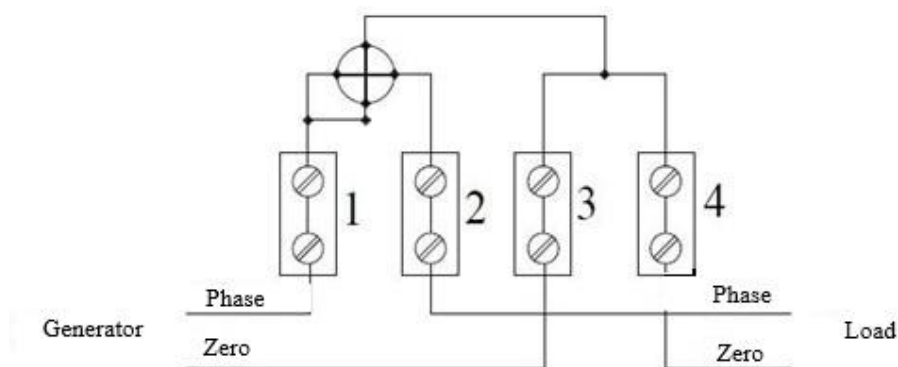
7. Preparation for operation

It is necessary to remove the meter from the transport packaging.

After unpacking, you should inspect the meter externally, ensure there is no mechanical damage, and check the specification and model of the device.

Install the meter at the operating location in accordance with the diagram shown on the protective cover or indicated in Figure 12.

ATTENTION! All installation work must be performed with the power disconnected.



Drawing12. Connection diagram

8. Reading information from the meter indicators

8.1 Liquid crystal display

The meter is equipped with a liquid crystal display, which is used to display a

programmable set of measured and calculated values.

Each displayed parameter is accompanied by a symbolic explanation (hint). The LCD's appearance, with its information fields labeled, is shown in Figure 13.




Drawing13. General view of the LCD meter

The meter's LCD display changes manually by pressing the control button. The main symbols displayed on the display are shown in Table 4.

Table 4LCD symbol table

Conventional designation	Description
	Energy flow direction indicator. The position of the arrows indicates: +P – active energy consumption; -P – output (reverse) of active energy; +Q – reactive energy consumption; -Q – output (reverse) of reactive energy.
88.88.88.88	The main LCD field for displaying parameters
8.8.8.8	Displayed parameter code
Last	Indication that the data displayed is the latest
T	Current tariff
8	Tariff number
Σ	Final value
L ₁ L ₂ L ₃	Voltage phase presence indicators
kWAr/hz	Units of measurement of displayed quantities
↓	Indication of intervention
	Battery indicator
cos φ	Power factor
	Displaying the connection type
	Availability of communication via digital interfaces
HLWAN	LAN and radio modem operation indicators
Monitor	The meter is in monitoring mode
	Indication of alarm events (voltage loss, overload, presence of an internal error, etc.)

	Parameter configuration lock indicator
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Next, we'll look at examples of displaying information about measurement and calculation results. The code for the parameter being displayed is shown in the lower left corner of the screen.

220.0

v

RMS voltage in the parallel circuit of the meter, V

0056

5.183

A

0061

Current flowing in the circuit, A

Σ L1

0.0000

kW

0059

Maximum average power value, kW

L1 cosφ

0.0000

kW

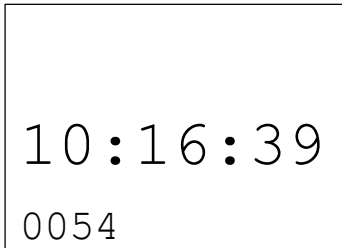
0060

Display of Power Factor, kW

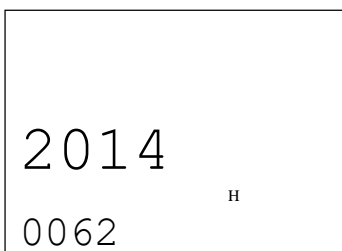
March 3,

2015

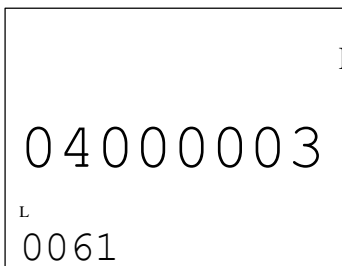
Date in hh.mm.yyyy format



Time in hh:mm:ss format



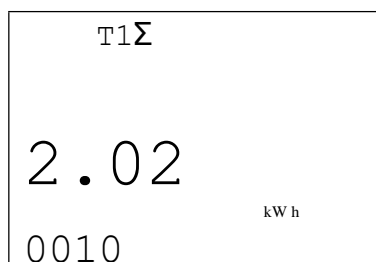
Displaying the first 4 characters of the device's serial number



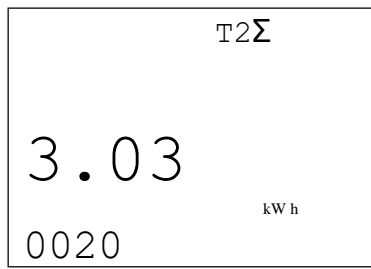
Displaying the remaining characters of the serial number

The meters are supplied with pre-installed clocks corresponding to the Moscow time zone and Moscow tariff schedules. Using the configuration program, it is possible to enable/disable the transition from summer to winter time and from "winter" to "summer".

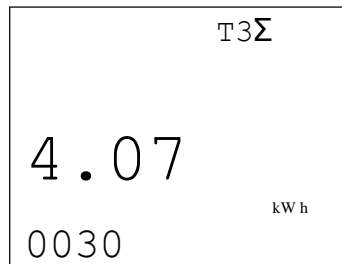
The meters can read energy consumed at four tariffs, which are switched automatically when the time is adjusted. When displaying energy for each tariff on the LCD meter, the information format corresponds to the following figures. Energy is displayed in kWh with a resolution of 0.01 (two decimal places). The tariff number is displayed at the top: "T1,2,3,4":



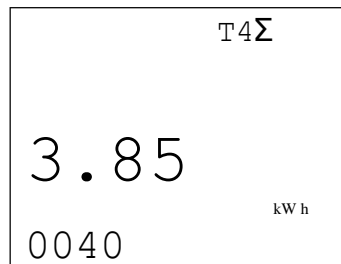
Drawing14. Displaying energy by tariff 1



Drawing15. Displaying energy by tariff 2



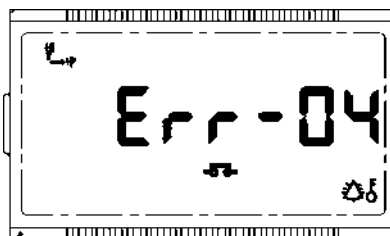
Drawing16. Displaying energy by tariff 3



Drawing17. Displaying energy by tariff 4

8.2 Error codes

During operation, if any errors occur, the meter automatically displays error codes on the display, indicating the malfunction. The display looks like this:



Drawing18. Example of error display on the LCD

Error information is presented in Table 5.

Table 5– Error codes and how to fix them

Error code	Description
01	Control circuit error
04	The built-in battery is discharged
08	Built-in clock failure

8.3 LED indicator statuses

The front panel of the meter contains LED indicators, the meanings of which are described in Table 6.

Table 6 –Counter indicators

Indicator	Description
Pulse	The LED duplicates the signal at the pulse output of the meter, i.e. it indicates that the power is consumed. another kW·hour
Relay	Indication of relay operation (the consumer is disconnected from networks)

9. Verification of the meter

Verification of the meter is carried out upon release from production, after repairs and during operation according to the verification methodology.

The inter-verification interval of the meter is 16 years.

10. Maintenance

Maintenance must be carried out by persons who have read this operating manual.

Maintenance of the meter at the installation site consists of systematic monitoring of its operation and eliminating errors and malfunctions in the meter's operation.

11. Filling

The outside of the meter has special locations for attaching control seals. Upon release from the factory, the meter bears the manufacturer's seal and a seal certifying state verification. After installation, the installation company affixes its own seal, preventing unauthorized access to the terminal block and data transmission unit.

12. Storage and transportation rules

Climatic conditions for transporting the meter:

ambient air temperature from minus 40°C to plus 55°C;

the upper limit of relative air humidity is up to 95% at plus 45°C;

atmospheric pressure from 84.0 to 106.0 kPa (from 630 to 800 mmHg).

Transportation on aircraft must be carried out in accordance with the rules for the carriage of baggage and cargo by air.

Transportation of the meter by sea must be carried out in accordance with "Rules for the Safe Carriage of General Cargo by Sea".

The meter must be stored in its packaging in the consumer's warehouse:

ambient air temperature from plus 5°C to plus 40°C;

relative air humidity from 5% to 80%;

solar radiation, 700 W/m².

There is no condensation of moisture, frost formation, or wind-driven precipitation.

A short-term increase in humidity up to 98% at a temperature of no more than +25°C, without moisture condensation, is permitted, but in total, no more than 1 month per year.

13. Disposal

The meter does not contain any hazardous or toxic substances that could harm human health or the environment, so disposal of the meter can be carried out in accordance with the rules for the disposal of general industrial waste.

When disposed of, the meter body, which is made of plastic, can be recycled.