NIK 2308...A...

WATT-HOUR METERS

OPERATIN MANUAL

AASHH.411152.095 NE

Contents

This operation manual (hereinafter referred to as the “OM”) covers NIK 2308...A... watt-hour meters (hereinafter referred to as the “meters”).

The OM describes the operation of the meters, their intended use, maintenance, storage and transportation.

When working on installations up to 1000 V, operating personnel shall be specially trained and have electrical safety permits of at least group III.

1 Description of meters and their operation

1.1. Compliance with standards

Table 1 contains a list of standards to which NIK 2308...A meters comply.

Table 1. Standards

DSTU EN 62052-11	Measuring instruments for alternating current electrical energy. General requirements, tests and test conditions. Part 11. Watt-hour meters.
DSTU EN 62053-21	Measuring instruments for alternating current electrical energy. Special requirements. Part 21. Static active energy meters (accuracy classes 1 and 2).
DSTU EN 62053-22	Measuring instruments for alternating current electrical energy. Special requirements. Part 22. Static active energy meters (accuracy classes 0.2 S and 0.5 S).
DSTU EN 62053-23	Measuring instruments for alternating current electrical energy. Special requirements. Part 23. Static active energy meters (accuracy classes 2 and 3).
DSTU EN 62059-32-1	Electricity measuring instruments. Reliability. Part 32-1. Durability. Checking the stability of metrological characteristics by means of elevated temperature.
DSTU IEC 60721-3-3	Classification of environmental impacts. Part 3-3. Classification of groups of environmental parameters and their severity. Operation under stationary conditions protected against atmospheric impacts.
DSTU IEC 62053-52	Measuring instruments for alternating current electrical energy. Special requirements. Part 52. Symbols.
DSTU EN 61140:2019	Protection against electric shock. General aspects of installations and equipment.
DSTU 8828:2019	Fire safety. General requirements.
DSTU EN 60529	Protection degrees provided by enclosures (IP code)
IEC 62056-53	Electricity metering - Data exchange for meter reading, tariff and load control - Part 53 Part: COSEM Application layer
IEC 62056-61	Electricity metering - Data exchange for meter reading, tariff and load control - Part 61 Part: Object identification system (OBIS)
IEC 62056-62	Electricity metering - Data exchange for meter reading, tariff and load control - Part 62: Interface classes
DSTU EN 62056-21	Electricity metering - Data exchange for meter reading, tariff and load control. Part 21. Direct local data exchange (EN62056-21:2002, IDT; IEC 62056-21:2002, IDT)

1.2. Purpose

Depending on the version, the meters are designed for:

- non-tariff or tariff measurement of active and reactive energy in the forward and reverse directions in three-phase four-wire AC grids, with transformer or direct connection by voltage and current;
- recording and indication of active, reactive and total energy, power factor, rms voltage and current, phase angle in three-phase four-wire AC circuits.

1.3. General description of the measuring iunstrument

Watt-hour meters NIK 2308...A... (hereinafter referred to as the meters) are static three-phase electronic meters with an electronic display and three measuring elements designed for non-tariff or tariff measurement of active and reactive electricity in the forward and reverse directions in three-phase AC grids with transformer or direct connection by voltage and current.

Meters are used to organize electricity metering in the public utilities sector and other industries. The meters can be used in automated electricity control and metering systems (AECMS). For this purpose, they have implemented the DLMS/COSEM standard with and without data encryption (and/or authentication).

A complete list of values measured by the meters, depending on the version, is given in Table 3 and Table 4.

The meters meet the requirements of DSTU EN 62052-11, DSTU EN 62053-21, DSTU EN 62053-22, DSTU EN 62053-23.

The meters are produced for active energy measurement with accuracy class 1 according to DSTU EN 62053-21 and accuracy class 0.5 S according to DSTU EN 62053-22. When measuring reactive energy, they correspond to accuracy class 2 according to DSTU EN 62053-23.

The meters meet the requirements of the national standard DSTU EN 62059-32-1 in terms of stability and metrological reliability.

The meters comply with the requirements of the Technical Regulations for Legally Regulated Measuring Instruments, approved by the Resolution of the Cabinet of Ministers of Ukraine dd. January 13, 2016, no. №94.

The design of the meters corresponds to the set of design documentation AASHH.411152.095.

The meter versions differ in the rated voltage, maximum current, ability to measure reactive energy, ability to measure energy using several tariffs, availability and type of additional interface, availability of magnetic and electromagnetic field sensors, availability of load disconnect relay, ability to measure active energy in the reverse direction, and the number of measured values.

All meters are equipped with an optical port, electrical test pulse outputs, optical test pulse outputs, which also serve as LED indicators for energy measurement (active or active and reactive). The

meters are equipped with a case opening sensor and a terminal cover opening sensor. Tariff meters are equipped with a built-in backup battery.

Depending on the version, meters can be equipped with an interface for remote data transmission: the first additional interface (either RS-485 or 4G/LTE) and the second additional RS-485 interface.

Different versions of the meters can be equipped with a relay output or a load shedding relay; a magnetic field and/or electromagnetic field sensor and outputs for discrete inputs. Different versions of meters can measure energy only in the forward direction or in both forward and reverse directions.

Resistance dividers are used as primary converters in the voltage circuit of each phase, and shunts or current transformers are used in the current circuit of each phase. All meters are equipped with an electronic display, which is a liquid crystal display (hereinafter - LCD). The sequence of data display on the display is programmable.

The meters use non-volatile memory to store data.

The meters are powered by a switching power supply that converts the rectified input voltage into the voltage required to power all meter components and modules.

To power the meters in the absence of mains voltage, a backup battery can be installed, and it is also possible to connect a service DC backup power supply (installed upon agreement with the customer). The use of the 4G/LTE interface module in the meters (see tables of versions) allows to transmit a notification about this event after the power supply voltage is lost. This feature is provided by the use of an ultra capacitor that maintains the module operation for some period after the supply voltage is lost. The notification generated in this case makes it possible to understand that the communication with this meter was interrupted due to the lack of power.

All possible versions of the meters are described in Table 2.

Table 2. Designation of versions of NIK 2308...A... meters

NIK 2308	A	X	X	X	.	1	X	X	X	.	X	.	X	X

Voltage

1	3x220/380 V
2	3x230/400 V
3	3x240/416 V
4	Wide voltage range[1] 3x57.7/100 V… 3x240/416 V
5	3x57.7/100 V[1]

Active energy measuring

1	In forward direction
2	In forward and reverse directions

Sensors

0	Version without sensors
M	Magnetic field sensor available
C	Electromagnetic field sensor available
MC	Magnetic and electromagnetic field sensors available

Relay

0	Version without relay
1	Relay output available
2	Load shedding relay available[2]

Second additional interface

0	No interface
2	RS-485 installed

First additional interface

0	No interface
2	RS-485 installed
6	4G/LTE installed

Main interface

1	Optical port interface installed

T	Can be added only to indicate tariff meters
	Space, can be added only to indicate tariff meters

Mains connection diagram

P3	Direct connection 5(120)A
P6	Direct connection 5(80) A
T	Transformer connection 5(10) A

Measured energy

R	Can be added only to indicate reactive energy meters
A	Active energy

Accuracy class of meters

NIK 2308 0.5s	Meters of accuracy class 0.5 S (only for transformer connection))

Notes:
[1] – only for transformer connection meters
[2] – only for direct connection meters

Table 3. Values measured by tariff meters[1]

No.	Measured values	AR	A
1.	Active energy (A+), kWh for each tariff and in total for all tariffs; for each phase and in total for all phases.	+	+
2.	Active energy (A-), kWh for each tariff and in total for all tariffs; for each phase and in total for all phases.	+	+
3.	Reactive inductive energy (A+R+), kvar-hours: for each tariff and in total for all tariffs; for each phase and in total for all phases.	+	-
4.	Reactive capacitive energy (A-R+), kvar-hours: for each tariff and in total for all tariffs; for each phase and in total for all phases.	+	-
5.	Reactive inductive energy (A-R-), kvar-hours: for each tariff and in total for all tariffs; for each phase and in total for all phases.	+	-
6.	Reactive capacitive energy (A+R-), kvar-hours: for each tariff and in total for all tariffs; for each phase and in total for all phases.	+	-
7.	Total energy S+, kvar-hours: for each phase and in total for all phases	+	-
8.	Total energy S-, kvar-hours: for each phase and in total for all phases	+	-
9.	Active energy |A+|+|A-|, kWh: for each tariff and in total for all tariffs; for each phase and in total for all phases.	+	+
10.	Active energy |A+|-|A-|, kWh: for each tariff and in total for all tariffs; for each phase and in total for all phases.	+	+
11.	Instantaneous voltage value for each phase, V	+	+
12.	Instantaneous current value for each phase, A	+	+
13.	Instantaneous power factor value cos φ for each phase. The arrows indicate the quadrant of the located vector	+	Only A+ or A- quadrant is displayed
14.	Instantaneous frequency value for each phase, Hz	+	+
15.	Instantaneous value of active power passing through the meter for each phase and in total for all phases, kW	+	+
16.	Instantaneous value of reactive power passing through the meter for each phase and in total for all phases, kvar	+	-
17.	Total power S+ and S- passing through the meter for each phase and in total for all phases, kVA	+	-
18.	Active power |A+|+|A-| and |A+|-|A-| passing through the meter for each phase and in total for all phases, kW	+	+
19.	Current time value	+	+

[1] AR – version that measures active and reactive energy, A - version that measures only active energy; The "+" symbol indicates that this value is measured (displayed) by the meter;

The "-" symbol indicates that this value is not measured (displayed) by the meter.

Table 4. Values measured by non-tariff meters [2]

No.	Measured values	AR	A
1.	Active energy (A+), kWh for each phase and in total for all phases.	+	+
2.	Active energy (A-), kWh for each phase and in total for all phases.	+	+
3.	Reactive inductive energy (A+R+), kvar-hours: for each phase and in total for all phases.	+	-
4.	Reactive capacitive energy (A-R+), kvar-hours: for each phase and in total for all phases.	+	-
5.	Reactive inductive energy (A-R-), kvar-hours: for each phase and in total for all phases.	+	-
6.	Reactive capacitive energy (A+R-), kvar-hours: for each phase and in total for all phases.	+	-
7.	Total energy S+, kvar-hours: for each phase and in total for all phases	+	-
8.	Total energy S-, kvar-hours: for each phase and in total for all phases	+	-
9.	Active energy |A+|+|A-|, kWh: for each phase and in total for all phases.	+	+
10.	Active energy |A+|-|A-|, kWh: for each phase and in total for all phases.	+	+
11.	Instantaneous voltage value for each phase, V	+	+
12.	Instantaneous power factor value cos φ for each phase. The arrows indicate the quadrant of the located vector	+	Only A+ or A- quadrant is displayed
13.	Instantaneous current value for each phase, A	+	+
14.	Instantaneous frequency value for each phase, Hz	+	+
15.	Instantaneous value of active power passing through the meter for each phase and in total for all phases, kW	+	+
16.	Total power S+ and S- passing through the meter for each phase and in total for all phases, kVA	+	-
17.	Active power |A+|+|A-| and |A+|-|A-| passing through the meter for each phase and in total for all phases, kW	+	+

[2] AR – version that measures active and reactive energy, A - version that measures only active energy; The “+” symbol indicates that this value is measured (displayed) by the meter;
The “-” symbol indicates that this value is not measured (displayed) by the meter.

1.4. Technical data

1.4.1 Dimensions

The overall and installation dimensions of the meters are given in “Appendix A. Overall and installation dimensions of the meters”.

1.4.2 Connection diagrams

Connection diagrams of meters are given in “Appendix B. Connection diagrams of meters” and “Appendix C. Connection of meters to the consumer grid”.

1.4.3. Technical data

The main technical data of the meters are given in Table 5, and the data of the LTE (E-UTRA) interface are given in Table 6.

Table 5. Main technical characteristics of meters

Parameters	Value, description
Accuracy class for active energy measurement (according to DSTU EN 62053-21)	1
Accuracy class for reactive energy measurement (according to DSTU EN 62053-23)	2
Accuracy class for active energy measurement (according to DSTU EN 62053-22)	0,5 S
Rated voltage (depending on the version) Un, V	3x220/380, 3x230/400, 3x240/416, 3x57.7…240/100…416[4], 3x57.7/100[4]
Permissible deviation of the mains voltage from the rated value, % of Un	minus 20 to plus 15
Starting current (sensitivity) when measuring active energy Ist, mA;	12.5 [1] 10[2] 5[3]
Starting current (sensitivity) when measuring reactive energy Ist, mA;	15.6[1] 15[4]
Base (normalized) current Ib(In), A	5
Maximum current for meters Imax, A (depending on the version)	120 80 10
Rated frequency, Hz	50
Meter constant when measuring active energy, imp/(kWh)	8000
Meter constant when measuring reactive energy, imp/(kWh)	8000
Power consumption in voltage circuits for each phase, V-A (W)	max. 10 (2)
Power consumption in current circuits for each phase (at I = Ib,In), B-A	max. 0,05
Number of LCD digits used for displaying basic information	6+3
Capacity of the counting device, kWh	999999.999

Parameters	Value, description
Tariff metering of energy consumption	According version, up to 4 tariffs and 12 tariff seasons
Load profile storage with integration period of 60 minutes, days	min. 180
Storage of energy consumption data for all tariffs at the end of the day, days	min. 180
Storage of energy consumption data for all tariffs at the end of the month, months	min. 48
Basic absolute error of the built-in meter clock, s/day	± 0.5
Operating temperature range, °C	minus 40 to plus 70
Storage temperature range, °C	minus 40 to plus 70
Relative air humidity at a temperature of plus 30 °C, %.	max. 95
Protection degree	IP54
Class for external mechanical conditions	M2
Class for external electromagnetic conditions	E2
Weight, kg	max. 1.6
Average service life before the first overhaul, years	min. 24
Mean time between failures (including maintenance), hours	min. 200,000

Note:

[1] – for direct connection meters of accuracy class 1
[2] – for transformer connection meters of accuracy class 1
[3] – for transformer connection meters of accuracy class 0.5 S
[4] – for transformer connection meters of accuracy class 1 and 0.5 S

Table 6. Technical data of LTE (E-UTRA)

Parameter	Value
GSM/GPRS cellular radio communication technology	
Transmitter/receiver frequency ranges, MHz − GSM-900 − DSC-1800	 880.1 – 915/925.1 – 960 1710 – 1785/1805 – 1880
GPRS communication class	B
Maximum output power of the transmitter, not more than, W − GSM-900 − DSC-1800	 2 1
LTE (E-UTRA) cellular radio communication technology	
Transmitter/receiver frequency ranges, MHz − Band 3 − Band 5 − Band 7 − Band 8 − Band 20	 1710-1785/1805-1880 824-849/869-894 2500-2570/2620-2690 880-915/925-960 832-862/791-821
Maximum output power of the transmitter, not more than, W (dBm)	0.2 (23)
Communication speed, baud	9600
type of antenna	structural

1.5. Resistance to mechanical impact and fire

In terms of resistance to mechanical impacts, the meters are included into class M2 of the basic requirements of Technical Regulation No. 94.

The protection degree of the meter case against penetration of solid objects and water is IP 54 (according to DSTU EN 60529:2018).

The material of the base, terminal cover and terminal board complies with UL94 - V0 standard - self-extinguishing within 10 seconds on a vertically installed sample, drops of non-burning particles are allowed.

The material of the meter case complies with the UL94-V2 standard - self-extinguishing within 30 seconds on a vertically mounted sample, drops of burning particles are allowed.

1.6. Requirements to operating conditions

The meters can be operated in regions with “cold” and “moderately cold” climate types, under climatic conditions of category 3K7 according to the classification provided for by DSTU IEC 60721-3-3 (except for the possibility of moisture condensation and ice build-up in the environment where they are operated).

The meters are designed to be installed in an explosion-proof environment, free of conductive dust and corrosive gases. The meters can be placed in unheated rooms, as well as in outdoor cabinets that provide protection against daily climatic changes and prevent moisture condensation and ice build-up. Do not install the meters in direct sunlight.

Relative humidity value at 30 °C is not more than 95 %. Temperature range:

- operation: minus 40 to plus 70 ºC;
- storage: minus 40 to plus 70 ºC;

1.7. Composition

1.7.1. Appearance

An example of the appearance of NIK 2308...A... meters and the arrangement of their controls is shown in Figure 1.

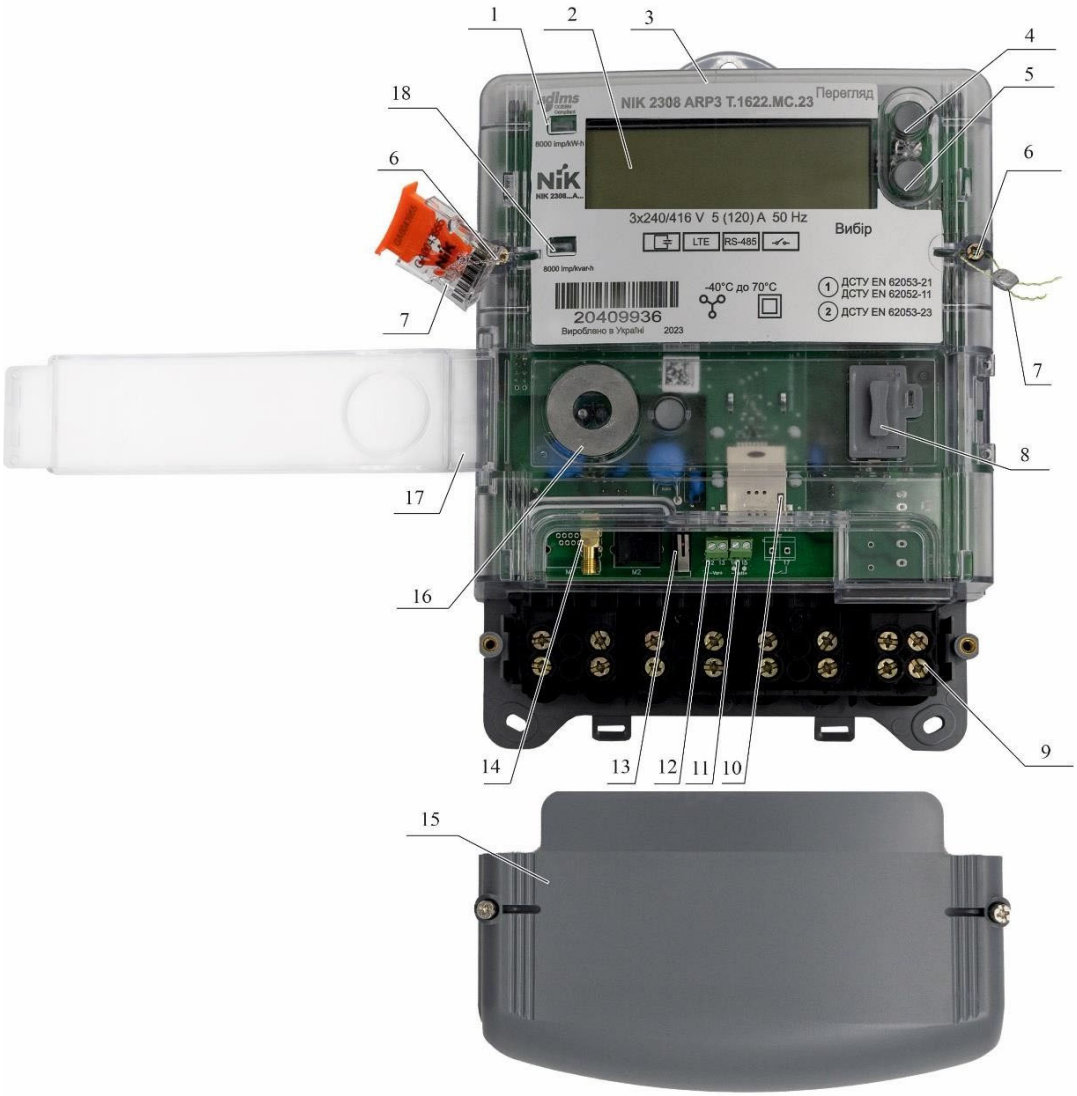


Figure 1. General view of the meter

The figure shows the following elements:

1. Optical pulse test lead for active energy.
2. Electronic display.
3. Meter case.
4. View button.
5. Select button.
6. Sealing screws.
7. Seals.
8. External backup battery.
9. Terminal block.

10. Slot for a SIM card.
11. Contacts of the electrical pulse test lead when measuring active energy.
12. Contacts of the electrical pulse test lead when measuring reactive energy.
13. Sensor for opening the cover of the terminal block.
14. Place for antenna connection.
15. Terminals cover.
16. Optical port.
17. Optical port cover.
18. Optical pulse test lead for reactive energy.

1.7.2. Design

The meters are manufactured in a plastic insulating housing of protection class II, which consists of a base and a transparent or opaque case (according to customer requirements). The design of the meter base has holes and a clamp for mounting the meters at the installation site. A printed circuit board with a display, LED indicators, sensors, other electronic components and connectors is attached to the base. Under the transparent case there is a nameplate with meter data. The nameplate is applied to the opaque case by laser engraving.

The case is attached to the base with two screws with the possibility of sealing them, for which purpose special holes are provided in the meter case. In addition, the meter case and the base are fastened with a continuous seam using laser welding.

A terminals block with primary voltage and current converters is also installed on the base. Protective partitions between the phase terminals of the terminals block ensure that a short circuit between phases is impossible. When connecting the meters, the mains and load wires are fastened to the corresponding terminals using screws. The terminal block is closed with a cover. The terminals cover is attached to the base with two screws with the possibility of sealing, for which purpose special holes are provided in the terminals cover.

The printed circuit board also contains connectors for the meter test leads, interface connectors, an SMA connector for antenna, a SIM card slot, and a connector for a service backup power supply. The availability of certain connectors is determined by the version of the meter. Access to the connectors is possible only when the terminals cover is removed.

Warning. The connector for connecting the service backup power supply is not galvanically isolated from the neutral.

The design of the housing ensures that the meter case cannot be removed without removing the terminals cover.

Numbers corresponding to the meter's serial number are marked on the base and case. The same number is indicated on the nameplate, which makes it impossible to counterfeit them. At the customer's request, a one-time numbered seal can be installed on one of the meter's tightening screws and the number of the specified seal can be applied (duplicated) on the meter housing in such a way that it covers both the case and the base of the meter housing.

Under the case there is a compartment for the optical port and a SIM card slot. This compartment is closed with a cover that can be sealed with another seal. In the upper right corner of the meter case there are mechanical View and Select buttons , designed to navigate through the meter display menu.

1.8. Operation

1.8.1. Electricity measurement

Active and reactive electrical energy is measured by analog-to-digital conversion of electrical signals coming from primary current (shunt) and voltage (resistance divider) converters to the input of the controller's analog-to-digital converter (ADC), which converts the signals into a digital code. The controller calculates the rms value of current, voltage, power, current value of power factor for each phase, as well as the value of active and reactive energy in total and for each tariff.

1.8.2. Interaction of components

The controller manages the LCD, electrical and optical interfaces, electrical and optical test pulse outputs, and processes information from mechanical buttons, meter housing and terminal cover opening sensors, and magnetic and electromagnetic field sensors.

1.8.3. Data storage

The meters use non-volatile memory to store data. The memory stores the accumulated electricity values and meter parameters. The set parameters of the meters and the accumulated energy values, under voltage losses on the meter terminals, must be stored for at least 20 years.

1.8.4. Data display

The meters use seven-segment liquid crystal displays with additional symbols as an electronic display, the appearance of which is shown in Figure 2.

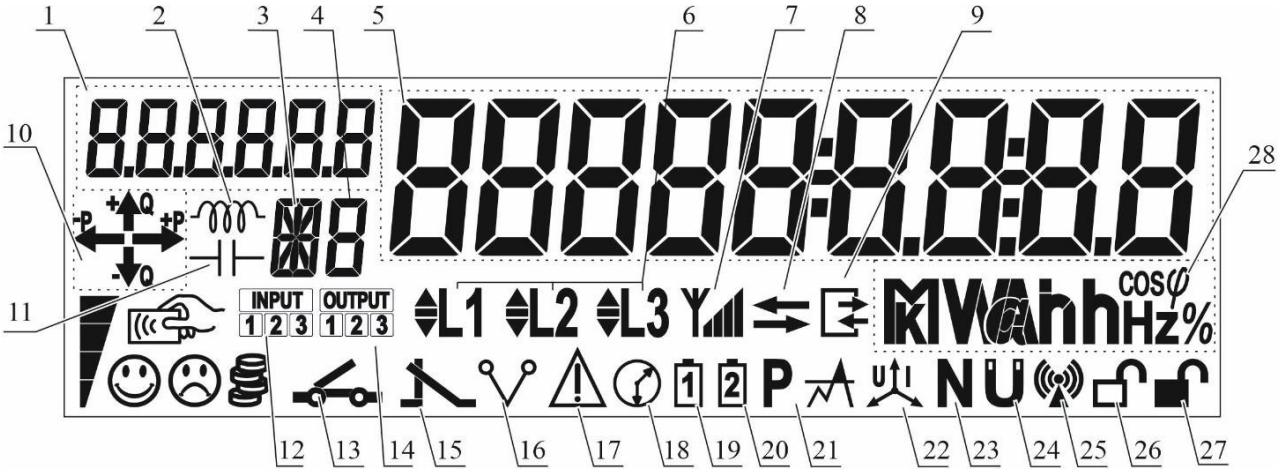


Figure 2. LCD appearance

The following symbols and groups of symbols are shown in the figure:

1. Display group for the OBIS code of the displayed parameter.
2. Indicator of reactive inductive energy.
3. Indicator of the tariff type, for example, T is used for the regular tariff.
4. Indicator of the current tariff number.
5. Display group for the value of the measured parameter.
6. Indicators of the direction of current flow on phases L1, L2, L3.
7. GPRS or 4G connection status indicator. The number of dashes indicates the quality of the connection: – 25%, –50%, – 75% and –100% .
8. Indicator of data exchange via interfaces .
9. Indicator of data exchange via optical port.
10. Group of indicators of the energy angle quadrant:
    - 10.1. active power (A+).
    - 10.2. reactive power (A-).
    - 10.3. total power vector in the first quadrant (A+R+).
    - 10.4. total power vector in the second quadrant (A-R+).
    - 10.5. total power vector in the third quadrant (A-R-).
    - 10.6. total power vector in the fourth quadrant (A+R-).
    - 10.7. reactive power (R+).
    - 10.8. reactive power (R-).
11. Indicator of reactive capacitive energy.
12. Status indicator for discrete inputs.
13. Load shedding relay status indicator: – relay is open, – relay is closed.

14. Status indicator for discrete inputs.
15. Relay output status indicator: – relay output is closed, – relay output is open.
16. Meter operation indicator according to the two-element diagram (three-phase meter).
17. Internal error indicator, blinks in case of an error or during the emergency tariff.
18. Clock failure indicator.
19. Low battery indicator for the internal backup battery. If the indicator is lit, the battery needs to be replaced.
20. Low battery indicator for the external backup battery. If the indicator is lit, the battery needs to be replaced.
21. Group of indicators for exceeding the permissible load.
22. Imbalance indicator.
23. Wrong neutral current indicator.
24. Indicator of magnetic radiation of the meter. The blinking indicator indicates the currently available magnetic radiation. After the magnetic radiation disappears, this indicator lights up continuously until it is extinguished by appropriate intervention via the software.
25. Indicator of electromagnetic radiation of the meter. The blinking indicator indicates the currently available electromagnetic radiation. After the electromagnetic radiation disappears, this indicator lights up continuously until it is extinguished by appropriate intervention via the software.
26. Meter terminals cover opening indicator.
27. Meter case opening indicator.
28. Measuring unit display group:
    - 28.1. A current in amperes.
    - 28.2. V voltage in volts.
    - 28.3. kW active power in kilowatts.
    - 28.4. kVAr reactive power in kilovars.
    - 28.5. kWh active energy in kilowatt-hours.
    - 28.6. Hz mains frequency.
    - 28.7. cosφ power factor.

The LCD symbols not shown in the figure are not used in these meters.

1.8.5. Controls

There are two mechanical buttons on the front panel of the meters: View and Select (see Figure 1), designed to control the meter display menu. The button operation is accompanied by a sound signal from the internal speaker of the meters. The sound signal can be disabled during parameterization.

1.8.6. Relay output

Transformer-connected meters can have a relay output that allows switching AC voltage not exceeding 250 V, with a current not exceeding 5 A. Its connection diagram is shown in Figure 3, where Rn is the load connected to the relay output.

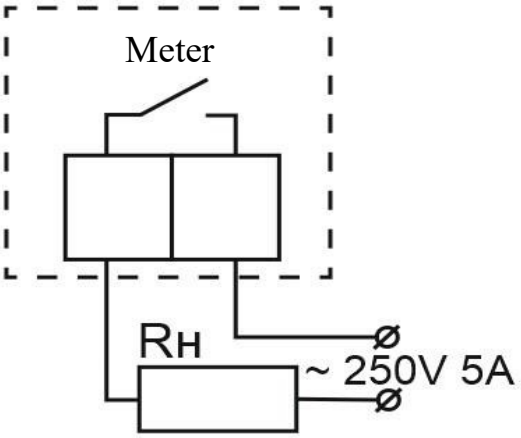


Figure 3. Connection diagram of the meter relay output

Relay operation is programmed in the following modes:

- normally open contacts are closed when the selected tariff is active;
- normally open contacts are closed in 24 programmable intervals of the day;
- contacts open at the request of the set thresholds (voltage, current, power);
- contacts open when magnetic or electromagnetic field sensors are triggered (possible only if these sensors are available);
- contacts open and close at the operator's command.

1.8.7. Load shedding relay

Depending on the version, the meters can be equipped with a load shedding relay. The triggering of this relay is programmed in the following modes:

- normally open contacts are closed when the selected tariff is active;
- normally open contacts are closed in 24 programmable intervals of the day;
- contacts open at the request of the set thresholds (voltage, current, power);
- contacts open when a magnetic or electromagnetic field sensor is triggered (possible only if these sensors are available);
- contacts open and close at the operator's command.

Possible versions of the meters with the installed load disconnect relay are given in Table 2.

1.8.8. Built-in clock

Tariff meters have a real-time clock (stabilized by a quartz resonator) with a calendar built into the

microcontroller. The clock data is used to operate the tariff system, generate average power integration periods, and register time-stamped events. The clock has the function of switching to winter and summer time. Time change can be performed automatically or by the date set during parameterization.

To reduce the dependence of the clock error on the ambient temperature, the meters are equipped with a temperature sensor.

1.8.9. Power supply of meters

The meters are powered by a switching power supply that converts the rectified input voltage into the voltage required to power all meter components and modules.

A backup battery is used to power the meter in the absence of mains voltage. The meters can operate under extreme conditions without mains voltage for at least 24 months.

Tariff meters can be additionally equipped with an external backup battery.

1.8.10. Peculiarities of the LTE cellular interface module

The use of the LTE cellular interface module in the meters (see the table of versions) allows to transmit a notification about this event after the power supply voltage is lost. This feature is provided by the use of an ultra capacitor that maintains the module operation for some time after the supply voltage is lost. The message generated in this case makes it possible to understand that the communication with this meter was interrupted due to the lack of power.

1.8.11. Push notifications

The meters have the ability to send push notifications to the server due to the design features of the LTE modem and the advanced functions of the device software. Push notifications are sent during the following events:

- switching the meter on or off;
- voltage loss on one, several or all phases;
- voltage on any of the three phases.

The sent notification contains the following parameters:

- meter serial number;
- active and reactive energy;
- voltage and current of each phase as of the time of sending the notification;
- current errors in the meter.

These parameters can only be changed during the meter's factory parameterization. The IP address and port of the server can be changed via the UNIK 3.0 software.

When any of the above events is triggered, except for the meter switching on, one notification is sent. When the meter is switched on, there will be two notifications. The first notification is sent when the meter is powered on, the second - when the voltage on three phases appears, after the metrology is fully

started.

1.8.12. Grid quality analysis

The meter software allows you to keep a profile of the average voltage values for a given period (you can set from 1 to 86,400 seconds, the default is 10 minutes). It is also possible to monitor and record in the appropriate logs the occurrence of events in the grid related to voltage quality. Thus, the meters can monitor voltage quality, namely:

- record the number of short-term and long-term undervoltage events for each phase when the voltage drops below the specified threshold during the specified recording periods for short-term and long-term events, respectively;
- record the number of short-term and long-term overvoltage events for each phase when the voltage exceeds the specified threshold during the specified recording periods for short-term and long-term events, respectively;
- record the duration of the last short-term and total duration of long-term undervoltage for each phase when the voltage drops below the specified threshold during the specified recording periods for short-term and long-term events, respectively;
- record the duration of the last short-term and the total duration of long-term overvoltage for each phase when the voltage is above the specified threshold during the specified recording periods for short-term and long-term events, respectively;
- record the average value of the last short-term undervoltage for each phase when the voltage drops below the specified threshold during the specified recording period for short-term events;
- record the average value of the last short-term voltage overvoltage for each phase when the voltage is above the specified threshold during the specified recording period for short-term events;
- record in the event log up to 295 events of voltage loss, undervoltage, overvoltage, restoration for each phase when the voltage is over or under the specified threshold during the specified recording period (the date and time of the event start, as well as the average voltage, current, power factor at which the corresponding trigger was triggered are recorded);

The threshold values and the duration of the recording periods of these events are configured during the meters parameterization using the appropriate software.

1.9. Parameterization of meters

During the parameterization, the meter configuration constants are entered into the meter memory. Parameterization is performed via the optical port in two stages:

- factory parameterization;
- customized parameterization.

The meter has two access levels for changing and reading data and settings, which can be accessed only after entering a password:

- Operator access level - all parameters can be changed except for the barcode and meter version, the user password can be changed, but the factory password cannot be changed.
- User access level - you can only read data from the meter about its parameters and settings.

1.9.1. Customized parameterization

During parameterization at the consumer's site, constants are written to the meter memory via the electrical interface or radio channel to adapt the meter to local operating conditions.

An example of the information written to the meter memory is shown in Table 7. The parameterization of meters at the consumer's site is carried out by the energy supply company or an authorized organization using special software. Parameterization is possible only using a password with operator access rights.

Table 7. Data stored in the meter memory

Parameter	Value	
	default	permissible
Exchange rate between the meter and the installed interface: RS-485 LTE	 9600 baud 9600 baud	 1200 to 19200 baud 9600 baud
Exchange rate for optical port	9600 baud	9600 baud
Time to disconnect when the interface is inactive	120 s	1 to 250 s
Meter address: - high «HI» - low «LOW»	generated based on a meter serial number	 0 to 65535 11 to 26
User password	1111111111111111	1 to 16 symbols
Operator password	2222222222222222	1 to 16 symbols
Meter location (Street)	-	0 to 100 symbols
Meter location (House) Meter location (Suite) Meter location (Owner)	- - -	0 to 100 symbols 0 to 100 symbols 0 to 100 symbols
Values of voltage thresholds for which, when exceeded for a period of time not less than the set one, the indication is switched on and the event is recorded in the meter memory:		
- for directly and combined connected meters		

Umax	253 V	40 to 600
Umin	176 V	40 to 600
- for meters connected using transformer		
Umax	67 V	40 to 600
Umin	46 V	40 to 600
Time after which the voltage exceeding the thresholds is indicated and the event is recorded in the meter memory	5 s	1 to 250 s
Relay triggering	Off	On or off
Sound signal in the meter	On	On or off
Daylight saving time settings	automatic switching	- automatic transition; - switching on the specified date; - do not switch
Number of tariffs	4	
Number of week profiles	10	
Number of tariff seasons	12	
Number of day profiles	16	
Holidays	30	

1.10. Description of interfaces

The meters have electrical pulse test leads, an optical port interface, optical pulse test leads that also serve as LED energy measurement indicators and pins for digital inputs. Up to two additional interfaces can be installed in the meters, depending on the version. The type and availability of interfaces is coded in the meter modification indicated on the nameplate and in the data sheet (see Table 2).

The description of possible meter interfaces is given in Table 8.

Data from the meters can be read simultaneously via all available interfaces.

Table 8. Possible interfaces

Interface	Description
RS-485	Asynchronous interface for a half-duplex multipoint “common bus” communication line, in which data is transmitted using differential signals. The interface has galvanic isolation of the communication line. The interface is compliant with ANSI TIA/EIA-485-A:1998 standard. Communication rate is 1200 to 19200 baud.
LTE	The interface is designed for LTE cellular networks [3]. Communication rate is 9600 baud.

Discrete inputs	Insulation strength of discrete inputs: • for the power supply mains - 4kVac • for low-voltage interfaces - 1kVdc Maximum frequency of the signal sent to the digital input: 4 Hz. Passive state: the input is not connected to the common wire (COM). Active state: the input is connected to the common wire (COM).

1.11. Tariff module

The tariff module of the meter software can support up to 4 tariffs and records the energy measured by the meters in the active and reactive energy registers separately for each of the 4 tariffs.

The validity of each tariff during the year is scheduled in time using an annual tariff plan. The annual tariff plan consists of daily tariff plans, weekly tariff plans, and seasonal tariff plans.

1.11.1. Active tariff

All tariffs are numbered from 1 to 4. At any given time of the day, only one rate out of four possible rates can be active. This rate is called active, unlike other rates that are not active at this moment.

1.11.2. Daily tariff plan

A daily tariff plan is a numbered sequence and time of activation of a particular tariff during the day. The tariff module allows you to configure up to 12 changes of the active tariff during the day and supports up to 16 different tariff plans. The numbering of the tariff plans is from 1 to 16. Each tariff change during the day is set using the moment of tariff activation (hours, minutes, seconds) and the number of this tariff (from 1 to 4).

1.11.3. Weekly tariff plan

The weekly tariff plan allows you to assign one of the 16 possible daily tariff plans to each day of the week. The tariff module of the meter supports up to 10 different tariff plans. Weekly tariff plans are numbered from 1 to 10. For each day of the week, the number of the selected daily tariff plan is indicated. The change of daily tariff plans during the week occurs when the day changes, at 00:00:00 according to the built-in real-time clock. The currently valid weekly tariff plan is called the active one.

[3] To communicate with the meter, you need to get from the cellular provider a static IP address.

1.11.4. Seasonal tariff plan

The tariff module of the meter allows you to divide the calendar year into seasons (up to 12 different tariff seasons are supported), and assign a tariff plan to each of them. A seasonal tariff plan (or tariff season) describes the sequence and time of change of weekly tariff plans during the season. Tariff seasons are numbered from 1 to 12. The tariff season that is currently in effect is considered active. A tariff season is set using the date and time of season activation and its tariff plan number.

1.11.5. Lists of holidays

The tariff module allows you to support up to 30 special tariff plans for special days (they are numbered from 1 to 30), the activation moment of which is set for a specific date in the month-day format, unlike regular daily tariff plans, which change sequentially when the day of the week changes. Such tariff plans allow you to set up tariff switching for special days, such as holidays. When a holiday occurs on the built-in clock and calendar, the tariff change will be performed according to the holiday daily plan, i.e. the holiday daily plan will be active, not the regular plan, which should be activated on the corresponding day of the week.

1.11.6. Setting up tariff plans

The daily, weekly, seasonal and holiday tariff plans are configured when the meters are parameterized using special software. When setting up, you set the parameters of each tariff plan for a day, week, season, and holiday, and thus set the sequence and time of activation of a particular tariff within a day, week, season, or in the event of a configured holiday.

1.11.7. Tariff schedules

The set of configured tariff plans (days, holidays, weeks, and seasons) that are currently in effect is called the active annual tariff plan or active tariff schedule. You cannot edit the active tariff schedule. The tariff module of the meter software allows you to additionally configure another, currently passive, tariff schedule. It can be activated later. This ensures the possibility of making the necessary changes to the tariff plans. The diagram of the tariff schedule is described in Appendix H.

1.11.8. Changing tariff plans

The tariff module of the meter software monitors the moments of activation of the corresponding tariffs, controlling the current time, day of the week and date using the built-in clock and real-time calendar. When the moment configured in the daily, weekly, seasonal or holiday tariff plans occurs, the corresponding tariff is activated, and it is valid until the next tariff is activated. At the same time, all accumulated data is recorded in the registers of the current tariff.

1.11.9. Emergency tariff

In the event of a failure of the built-in real-time clock, the emergency tariff is automatically activated in the meter, and all calculated energy values are recorded in the registers of the emergency tariff, and the corresponding symbol (⚠ icon and tariff number) flashes on the electronic display. The emergency tariff number is set during parameterization.

1.11.10. Accumulation of data by tariffs

Measured values of energy parameters are accumulated in the corresponding registers in the meter memory. The tariff module provides a separate set of registers for each tariff to accumulate the values of energy parameters.

1.12. Load profiles

To collect statistical energy consumption data during the meter operation, you can create a load profile in advance, at the stage of meter parameterization, i. e. a list of measured values (up to 8 values) for which the integration period is specified. The values of the measured parameters included in the load profile will be periodically (with the specified period) recorded and stored in the corresponding meter memory registers. The accumulated data can be read out of the meter using the appropriate software via the available interfaces.

The integration period during the load profile parameterization is set in minutes from a range of fixed values of 1, 2, 5, 10, 15, 20, 30, 60 minutes.

The storage depth for the load profile of each type of measured energy depends on the integration period and for the longest configured period of 60 minutes can be up to 180 days.

1.13. Tempering prtotection

1.13.1. Structural protection measures

The case and the terminals cover of the meter are fastened to the base with sealing screws. A groove around the perimeter of the base ensures overlap of the base and the case of at least 4 mm during connection, which excludes unauthorized access to the measuring part of the meters without damaging the housing. At the request of the customer, the meter housing can be welded.

There are special tides with holes on the optical port cover and on the meter housing, which allow, if necessary, to additionally seal the case with the backup battery and the optical port when closed.

1.13.2. Opening sensors for case and terminal cover

The case opening sensor is installed at the customer's request. The terminal cover opening sensor is installed on all meters. The opening of the meter case or terminal cover is detected by the case opening sensor or the terminal cover opening sensor, respectively, and is recorded in the meter event log (for more details, see F). When the case opening sensor is triggered, the "🔓" symbol appears on the display. When

the terminal cover opening sensors are triggered, the symbol "🔓"[4] appears on the display.

1.13.3. Data protection

Data protection is provided by software. The meter data is available for writing and reading via the interfaces and optical port only after entering the password. After entering the wrong password 5 times in a row, the meter is blocked for 30 minutes. Each such event is recorded in the meter's event log.

1.13.4. Magnetic field sensor

The magnetic field sensor, which can be installed in meters, is triggered when exposed to a constant magnetic field of more than 100 mT. If the exposure lasts for more than 3 seconds, a MAGN message periodically appears on the meter display, and a record of this event is recorded in the meter's event log. If within 60 seconds after the first exposure, the sensor detects repeated magnetic field effects of the same level, then 60 seconds after the last of them is completed, a record of the magnetic field effect will be generated in the event log with registration of their total duration. If the pause between the magnetic field exposures is longer than 60 seconds, each of them will be recorded in the log with a separate entry with the duration of each of them.

1.13.5. Electromagnetic field sensor

The electromagnetic field sensor, which can be equipped with meters, is triggered by exposure to an electromagnetic field with a strength of more than 10 V/m in the frequency range from 80 to 2000 MHz. If the exposure lasts for more than 3 seconds, a rAdio message periodically appears on the meter display, and a record of this event is recorded in the meter's event log. If within 60 seconds, the sensor will record repeated exposures to the electromagnetic field of the same intensity, then 60 seconds after the last exposure is over, a record of the electromagnetic field exposure will be generated in the event log with the registration of their total duration. If the pause between electromagnetic field exposures is longer than 60 seconds, each of them will be recorded in the log with a separate entry with the duration of each of them.

Notifications about sensor triggering can only be disabled using the NIK Parameterization software (using a password) by sending a special command through any available meter interface.

1.14. Labeling

The meter labeling complies with DSTU EN 62053-52, DSTU EN 62053-21, DSTU EN 62052-11, DSTU EN 62053-23 and the manufacturer's drawings.

Possible symbols indicated on the meter nameplate depending on the version are described in Table 9.

[4] Activations of terminal cover opening sensor and case opening sensor are not recorded when the meter is powered off (No supply voltage or discharged backup battery)

Table 9. Symbols on the meter nameplate

	symbol for a meter with three measuring elements;
	symbol for a meter with two measuring elements;
	symbol for meters in insulating cases of protection class II;
	symbol for meters with measuring transformers according to DSTU EN 62053-52;
	type approval mark according to DSTU 3400 and technical regulations of the Cabinet of Ministers of Ukraine No. 94

The table with the codes of the installed interfaces and relay outputs (see Table 10) includes the alphanumeric codes and symbols described in Table 9.

Table 10. Description of interface and relay codes on the nameplate

Code/Symbol	Description
RS-485, LTE	available corresponding interface;
	available optical port;
	available relay output;
	available load shedding relay;

The meter connection diagram is provided on the nameplate or on the inside of the meter terminal cover. Connection diagrams for all meter versions are given in the appendices “Appendix B. Meter connection diagrams” and “Appendix C. Meter connection to the consumer grid”.

Current and voltage transformation ratios in transformer-connected meters are shown on the display. OBIS codes for current and voltage transformation ratios are 0.4.2 and 0.4.3 respectively (see “Appendix D. Table of OBIS codes that can be displayed”). The availability of menu items with transformation factors and their values are set during the parameterization of meters.

The design of the nameplate of NIK 2308...A... meters is shown in Figure 4 and Figure 5.

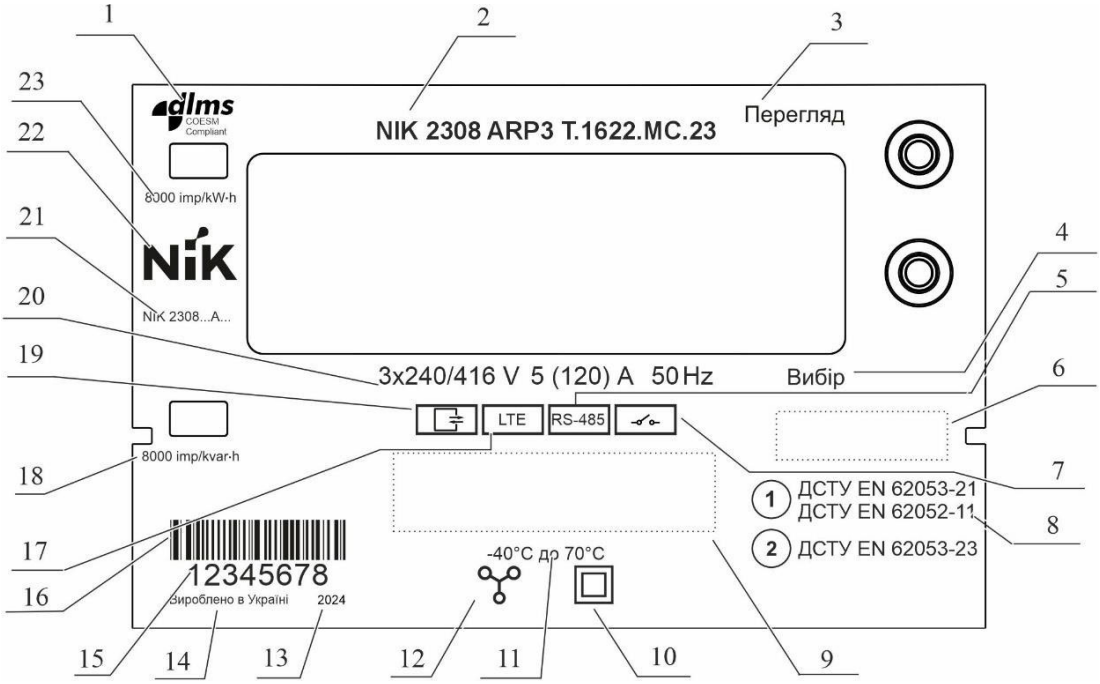


Figure 4. Nameplate marking for directly connected NIK 2308…A… meters

The figure shows the following elements:

1. DLMS mark.
2. Meter version code.
3. View button.
4. Select button.
5. Place for marking the availability and type of the second additional interface.
6. Place for the conformity assessment mark and additional metrological marking.
7. Place for marking the availability of a load-breaking relay.
8. Symbols of meter accuracy classes for active and reactive energy measurement and their corresponding standards.
9. Places for additional information marked at the request of meter owners.
10. Symbol of protection class II.
11. Set operating temperature range.
12. Symbol for the number of measuring elements.
13. Year of manufacture of the meter.
14. Inscription “Made in Ukraine”.
15. Factory number according to the manufacturer’s numbering system.
16. Place for the meter barcode.
17. Place for marking the availability and type of the first additional interface.
18. Marking of the optical test pulse output when measuring reactive energy (value of the constant of the electrical test pulse output when measuring reactive energy).
19. Place for marking the availability of an optical port.

20. Main technical data (basic and maximum current strength, rated voltage, rated frequency).

21. Meter type code.

22. Registered trademark.

23. Marking of the optical test pulse output when measuring active energy (value of the constant of the electrical test pulse output when measuring active energy).

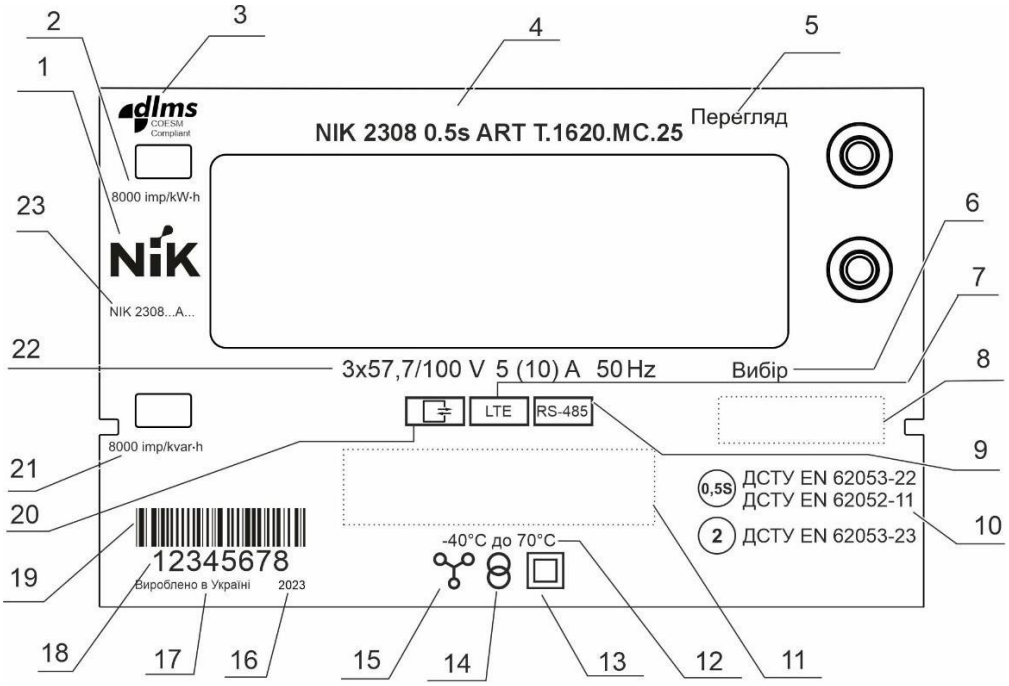


Figure 5. Nameplate marking for transformer-connected NIK 2308…A… meters

The figure shows the following elements:

1. Registered trademark.
2. Marking of the optical test pulse output when measuring active energy (value of the constant of the electrical test pulse output when measuring active energy).
3. DLMS mark.
4. Meter version code.
5. View button.
6. Select button.
7. Place for marking the availability and type of the first additional interface.
8. Place for the conformity assessment mark and additional metrological marking.
9. Place for marking the availability and type of the second additional interface.
10. Symbols of meter accuracy classes for active and reactive energy measurement and their corresponding standards.
11. Places for additional information marked at the request of meter owners.
12. Set operating temperature range.
13. Symbol of protection class II.
14. Symbol for meters connected via measuring transformers.
15. Symbol for the number of measuring elements.
16. Year of manufacture of the meter.
17. Inscription “Made in Ukraine”.
18. Factory number according to the manufacturer’s numbering system.
19. Place for the meter barcode.

20. Place for marking the availability of an optical port.

21. Marking of the optical test pulse output when measuring reactive energy (value of the constant of the electrical test pulse output when measuring reactive energy).

22. Main technical data (basic and maximum current strength, rated voltage, rated frequency).

23. Meter type code.

1.15. Delivery set

The delivery set is described in Table 11.

Table 11. Meter delivery set

Component	Quantity
AC watt-hour meter (appropriate version)	1 pc.
Quectel Y1NIK00A0AA antenna with 2 m cable	1 pc.
AASHH.411152.095 PS data sheet *	1 pc.
AASHH.411152.095 NE Operation manual*	1 pc.
Software**	1 pc.
Consumer packaging	1 pc.
Declaration of conformity	1 pc.
* Can be downloaded electronically from the manufacturer's website https://nik-el.com. Other options for the delivery of operating documentation are specified in the supply agreement. **According to the supply agreement.	

1.16. Packaging

One meter with the operating documentation is placed in a consumer packaging.

The consumer packaging with the packaged meter is sealed with adhesive tape. A packing list is glued to the top of the consumer packaging.

Another options of the meter packaging are possible at the request of the customer and shall be specified in the supply agreement.

Meters packed in consumer packaging are placed in transportation containers. The shipping documentation, including the packing list containing the following information, shall also be placed in the transport container:

- inscription “Made in Ukraine”;
- manufacturer’s trademark;
- designation and code of the meters;
- number of meters packed;
- signature or personal stamp of the packer;
- mark of the manufacturer's quality control department;
- gross weight, in kilograms;
- date of packaging.

Overall dimensions of consumer packaging do not exceed: 265 mm x 180 mm x 88 mm; Overall dimensions of the transport container do not exceed: 372 mm x 277 mm x 457 mm; Gross weight: no more than 2.0 kg.

2 Intended use

2.1. Preparing the meters for use and installation procedure

The meters should be installed in premises that meet the requirements of section “1.6 Requirements to operating conditions”.

Installation, dismantling, connection and disconnection of the meters may be performed only by an authorized organization.

The organization authorized to install, maintain and dismantle the meters is fully responsible for ensuring that its personnel have carefully studied this manual, are qualified to perform the work, and strictly comply with the requirements of local safety and electrical installation regulations.

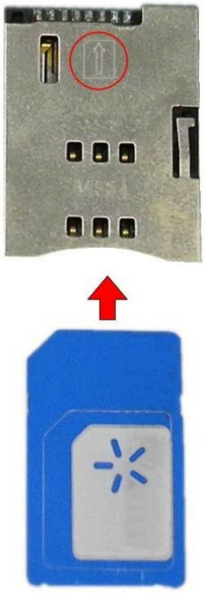
Installation, dismantling, connection, disconnection and maintenance of the meters must be carried out in accordance with the applicable electrical installation and safety regulations, only by qualified personnel in accordance with the requirements hereof.

Installation, dismantling, connection and disconnection of meters must be performed by personnel who has a qualification group corresponding to the rules for the safe operation of consumer electrical installations – at least group 3.

Installation and connection of the meter shall be performed according to the following procedure:

1. Before installing the meter, de-energize the electrical grid;
2. Unpack the meter and make sure that there is no mechanical damage and that the seals are intact.
3. For meter versions equipped with LTE module, install the SIM card in the appropriate slot of the meter. The relative position of the slot and SIM card when installing it is shown in Figure. In the figure, a red circle indicates the correct position of the SIM card. Only Mini-SIM cards should be used (ISO/IEC 7810:2003, ID-000). We do not recommend to use hybrid SIM cards with perforations of other sizes, as well as adapters for Micro-SIM and Nano-Sim cards.
4. Fasten the meter at the metering point. The meter is mounted on a DIN rail and secured with two clamps. It is also possible to install the meter at the metering point using three screws according to Figure 1. The type of DIN rail is TH/35 7.5, a standard 35 mm wide special-profile metal rail.
5. Connect the meter in accordance with the diagrams provided on the terminal cover (or on the nameplate) and in “Appendix B. Meter connection diagrams” and “Appendix C.

Connection of meters to the consumer grid". To connect transformer-connected meters with a rated voltage of a wide range (3x57.7...240/100...416V) to the grid using the delta option with two current transformers (Figure C. 4), set the meter's operation mode for three-wire grids using the UNIK software. The screws of the terminal block must be tightened using a slotted screwdriver (blade thickness 1 mm) until tight, with a torque of 3.5±0.5 N-m (for transformer-connected meters, the torque shall not exceed 2.5±0.5).



6. Fasten the terminal cover with screws until tight, with a torque of 0.5±0.1 N-m and seal it.

7. Apply voltage to the meter, and make sure that the indication on the LCD confirms the normal operation of the meter described in section "2.6 Description of the windows displayed on the screen", otherwise, adjust the connection or replace the meter.

Figure 6

When connecting the meter to the power grid, use the following types of conductors: rigid, rigid stranded, or flexible stranded. Conductor material: copper or aluminum. When connecting the meter to the electrical grid using aluminum wire, these wires shall be pressed into special sleeves that prevent corrosion of the connections in the meter terminals.

The cross-sectional diameter is selected depending on the maximum current flowing through the conductor (3 to 6 mm).

2.2. Replacing procedure for backup battery

A backup battery is used to power the meter clock.

The battery may be replaced only by the power supply company or an authorized organization.

Battery replacing procedure:

1. Cut off the seal of the optical port cover, unscrew the sealing screw;
2. Open the optical port cover;
3. Pull out the battery case;
4. Remove and disconnect the old battery and, observing the polarity, install and connect the new one.
5. Put the battery case back into the meter. If the symbol is still displayed on the LCD after replacing the battery (see “Figure 2. LCD appearance”), the installed battery is discharged or the battery polarity was not observed;
6. Set the current date and time in the meter via the optical port or other available interface;
7. Close the optical port cover on the meter, tighten the sealing screw and apply the seal.

To save the date and time settings, before replacing the battery, it is recommended to connect the meter via a service backup power supply (installed additionally by agreement with the customer). The connection diagram to the service backup power supply is given in the appendix “Appendix B Meter connection diagrams”.

2.3. Types of conductors used for meter connection

Types of conductors: rigid, rigid stranded or flexible stranded. Conductor material: copper or aluminum.

When connecting the meter to the electrical grid using aluminum wire, these wires shall be sleeved.

The cross-sectional diameter is selected depending on the maximum current flowing through the conductor (3 to 6 mm).

2.4. Using the meters

In operating mode, the meter measures active and reactive electrical energy in the forward and

reverse directions with an increasing total (depending on the version according to the table of versions).

The meters are equipped with optical pulse test leads, which are also used as LED function indicators for measuring active and reactive energy. Through special holes in the nameplate, they are led under the meter's transparent case. When a load is connected to the measured circuit, the optical pulse test leads blink with a frequency proportional to the power consumption and switch synchronously with the electrical pulse test leads.

The electrical test pulse outputs use electronic keys with optical decoupling. The maximum permissible open-circuit voltage of the key is not less than 30 V, the maximum permissible closed-circuit current of the key is not less than 30 mA.

2.5. Data reading

The information from the meters can be read:

- visually, from the electronic display;
- via any interface installed in the meter.

2.5.1. Options for reading data via interfaces

The following options for reading data via interfaces are provided:

- via RS-485 electrical interfaces;
- via 4G/LTE interface (if available);
- via optical communication interface (optical port).

For a description of the interfaces, see 1.10. For connection via the optical communication interface, the OP200 optical head (Optical-Probe or equivalent) and software are used.

2.5.2. Interface communication functions

By connecting to the meter, you can:

- read or change the tariff model of the meter;
- read the load profile of each type of energy measured;
- read the value of each type of energy for each tariff, and the total for all tariffs for the last day or month;
- read the event log;
- set the clock and calendar;
- read the values of all the quantities measured by the meter;
- read or change interface settings, display thresholds, information about the meter installation location;
- change the access password;
- switch on or off the meter's sound signal that appears when you press the buttons;

- change the tariff number or time intervals of the relay output;
- change the number and order of windows on the LCD.

2.5.3. Data exchange via the optical port

Data reading via optical communication interface in accordance with IEC 62056 21.

The meters include unauthorized data reading via an optical communication interface in accordance with IEC 62056 21 (MODE-C). OBIS codes and their values that are read from the meter in MODE-C mode without authorization are given in Appendix D.

2.5.4. Displaying total energy and total power

The meters calculate the values of each type of energy to the third decimal place, and the LCD displays the values to the second decimal place, therefore:

- the value of each type of total energy for all tariffs displayed on the meter's LCD ($W_{\Sigma LCD}$) may be greater than the value of total energy $W_{\Sigma W}$ calculated according to formula (1) by no more than 0.004 kW (2).

$$W_{\Sigma W} = W_1 + W_2 + W_3 + W_4 \qquad (1)$$

$$W_{\Sigma LCD} - W_{\Sigma W} \leq 0.004 \text{ kW} \qquad (2)$$

where W_1, W_2, W_3, W_4 – are energy values displayed on the meter's LCD for the first, second, third and fourth tariffs, respectively.

- the value of each type of energy for a certain period W_p, read from the meter using the parameterization software, may exceed the sum of the values of the energy of 30 minute intervals $W_{\Sigma 30}$, read from the meter using the parameterization software for the same period, by more than 0.048 kW(3).

$$W_p - W_{\Sigma 30} \leq 0.048 \text{ kW} \qquad (3)$$

2.6. Description of windows displayed on the screen

The liquid crystal display and the meaning of its symbols and symbol groups are described in detail in section “1.8.4 Data display”.

2.6.1. Sequence of displaying windows

After the meter is powered up, windows with data and the corresponding OBIS code are generated in the memory in a sequential order. The order of the windows depends on the meter settings. When the meter is switched on, all segments of the LCD are illuminated. In the automatic menu mode, the information on the LCD changes every 10 seconds. The type of data in the window is set when parameterizing the meters. The table with the full list of OBIS codes is given in Appendix D.

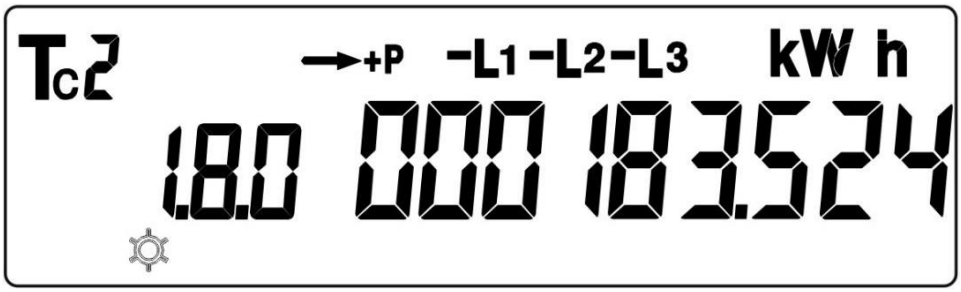


Figure 7. Exemplar displayed window

Figure 7 shows an example of one of the possible meter windows. In the table “Table D. 1. List of OBIS codes that can be displayed” (see ‘Appendix D. Table of OBIS codes that can be displayed’), you can find that the OBIS code ‘1.8.0’ in this window displays the active energy (A +) total for all tariffs. The symbol “Tc2” means that the meter is currently accumulating energy according to the second tariff. Permanently displayed symbols “L1”, “L1”, ‘L2’, ‘L3’ mean that the voltage values on the first, second and third phases are within the established limits.

2.6.2. Manual viewing of windows

The manual data viewing function allows you to display most of the stored data on the LCD using the mechanical buttons 4 and 5 (see Figure 1). The algorithm of switching the LCD windows in the meters is shown in Figure 8.

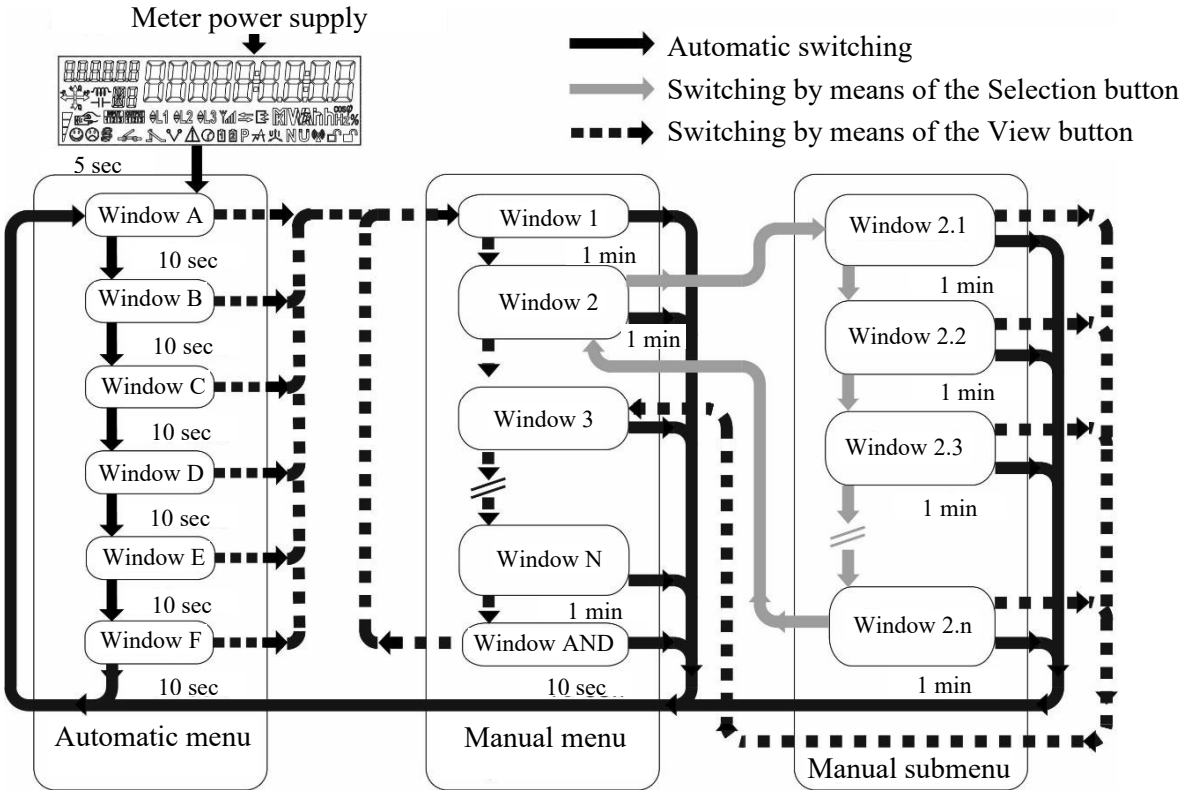


Figure 8. Window switching algorithm

The list of possible LCD windows and the order in which they are displayed is set when parameterizing the meters. Each time you press the View button, the measured values with the corresponding OBIS code and units are displayed in the windows. Pressing the Select button enters and switches windows within the submenu.

2.6.3. Indication of different meter operating modes

If one or more of the symbols “L1”, “L2”, “L3” blink synchronously in the window during the energy measurement display, the voltage in the corresponding phase has exceeded the set thresholds. The corresponding indicator blinks with a frequency of 0.5 Hz if the voltage is too low, and with a frequency of 2 Hz if it is too high.

The reverse direction of energy is displayed as a “-” sign in front of the symbols “L1”, “L2”, “L3”.

If the symbols “L1”, “L2”, “L3” alternately light up and go out in the window during the energy display, the meters are not properly connected to the network (wrong phase sequence).

If the “⚠” symbol is displayed on the LCD (see Figure 2), the meter has malfunctions, sensors (magnetic field sensor or electromagnetic field sensor) are triggered, or debt notification is detected.

If the “🔓” symbol is displayed on the LCD (see Figure 2), the meter has an open case. If the meter is sealed and the sealing screws are tightened to the stop, the meter should be sent for repair.

If the “🔓” symbol is displayed on the LCD (see Figure 2), the terminal cover is open in the meter. If the terminal cover is installed and the sealing screws are tightened to the stop, the meter should be sent for repair.

If the “🔋” symbol is displayed on the LCD (see Figure 2), the meter's clock battery needs to be replaced. The procedure for replacing the battery is described in section “2.2. Procedure for replacing the backup battery”.

2.6.4. Indication of error codes

If a malfunction occurs during the meter operation, the LCD displays a window with the error and its code. For example, opening of the terminal cover or case cover, magnetism or radio field, overvoltage or undervoltage. The error code consists of three characters.

An example of the window is shown in Figure 9.

Figure 9. Meter failure window

All error codes are listed in Appendix E. Error Codes.

2.6.5. Examples of displayed windows

The order in which the windows are displayed on the LCD screen depends on the parameterization. Each displayed OBIS code corresponds to a measured value. The meaning of each of the possible OBIS codes is given in Appendix D. Table of OBIS codes that can be displayed. By successive presses of the View button, select the OBIS code of the corresponding measured value, the value of which is to be visually read. The Select button shall be pressed if it is necessary to display the measured value separately for one specific tariff or phase.

Examples of windows displaying active energy (A+) in total by phases and tariffs, and separately by L2 phase are shown in Figure 10 and Figure 11, respectively.

The display of values and units for active energy (A-), reactive energy (R+), and reactive energy (R-) is similar.

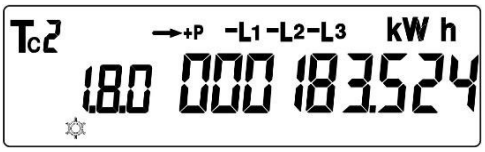


Figure 10. Active energy (A+) total for phase and for tariff

The meter can measure each of these values, depending on the meter marking, see Table 3 and Table 4.

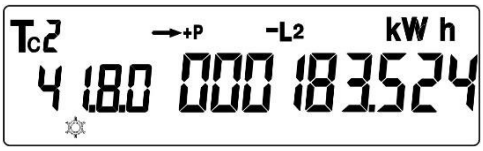


Figure 11. Active energy (A+) for the phase L2

The meter can display the current time of the meter clock, the current date, and the meter serial number. When you select the desired code (see the table of OBIS codes in Appendix D), the corresponding parameter will be displayed on the right side of the screen. Examples of displaying the current hour and current date are shown in Figure 12 and Figure 13.

Figure 12. Window for displaying the current time on the clock

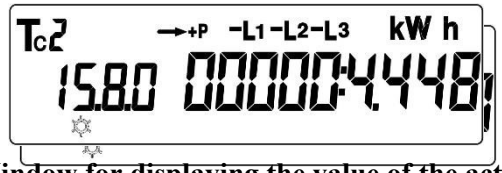


Figure 14. Window for displaying the value of the active energy module

Figure 13. Window for displaying the current date on the clock 1/1/2000

The meter can display the value of the active energy module (|A+|+|A-|) for all phases and tariffs. An example of the display window is shown in Figure 14.

3 Maintenance

3.1. General instructions

Maintenance of the meters, subject to the operating conditions, is carried out at least once every 6 years (check with the manufacturer).

Maintenance consists of verification or repair and calibration of the meter.

The verification shall be carried out by an authorized body.

The repair and calibration shall be carried out at the manufacturer's factory.

3.2. Safety measures

The meters correspond to class II in accordance with DSTU EN 61140:2019 in terms of protection against electric shock.

The insulation between all current, voltage, and ground circuits on one side and the interface and test leads on the other side can withstand a test voltage of 4 kV (rms) with a frequency of (50-2.5) Hz during 1 minute.

Insulation resistance between the housing and electrical circuits shall be not less than:

- 20 MΩ - under normal conditions;
- 7 MΩ - at an ambient temperature of (30±2) ºC and relative humidity of 90%.

The meters comply with DSTU 8828:2019 in terms of fire safety requirements.

4 Transportation and storage

4.1. Requirements to transportation and storage of meters

The conditions of transportation and storage of meters in the manufacturer's transport packaging comply with the conditions described in section “1.6 Requirements to operating conditions”.

Meters can be transported in covered railway cars, transported by road upon their protection against rain and snow, by water, and also transported in sealed heated aircraft compartments.

Transportation must be carried out in accordance with the transportation rules applicable to each type of transport.

Meters in transport packaging are resistant to ambient air temperature from minus 40 to plus 70 ºC, relative humidity up to 95% at a temperature of 30 °C and atmospheric pressure from 70 to 106.7 kPa (537 to 800 mm Hg).

Meters in transport packaging are resistant to transport shaking with a number of impacts from 80 to 120 per minute with an acceleration of $30^{m/s2}$.

5 Environmental and disposal requirements

The device must not be disposed of with household waste at the end of its service life. Disposal must be carried out in accordance with all applicable requirements of the Ukrainian legislation.

To prevent possible damage to the environment due to uncontrolled waste disposal, please separate this product from other waste and reuse it or its components. Industrial waste must be disposed of in accordance with DSTU 4462.3.01:2006.

6 Manufacturer’s warranties

The manufacturer guarantees that the meters comply with DSTU EN 62052-11, DSTU EN 62053-21, DSTU EN 62053-22, DSTU EN 62053-23, provided that the consumer complies with the installation, operation, transportation and storage conditions.

Before operating the meters, read the operating manual included in the delivery set or posted on the official website - see Table 11.

The warranty period (service life and storage period in total) is 3 years after the sale.

Meters that do not meet the requirements of the technical specifications and the valid data sheet during the warranty period must be replaced or repaired by the manufacturer or a company authorized to carry out warranty repairs.

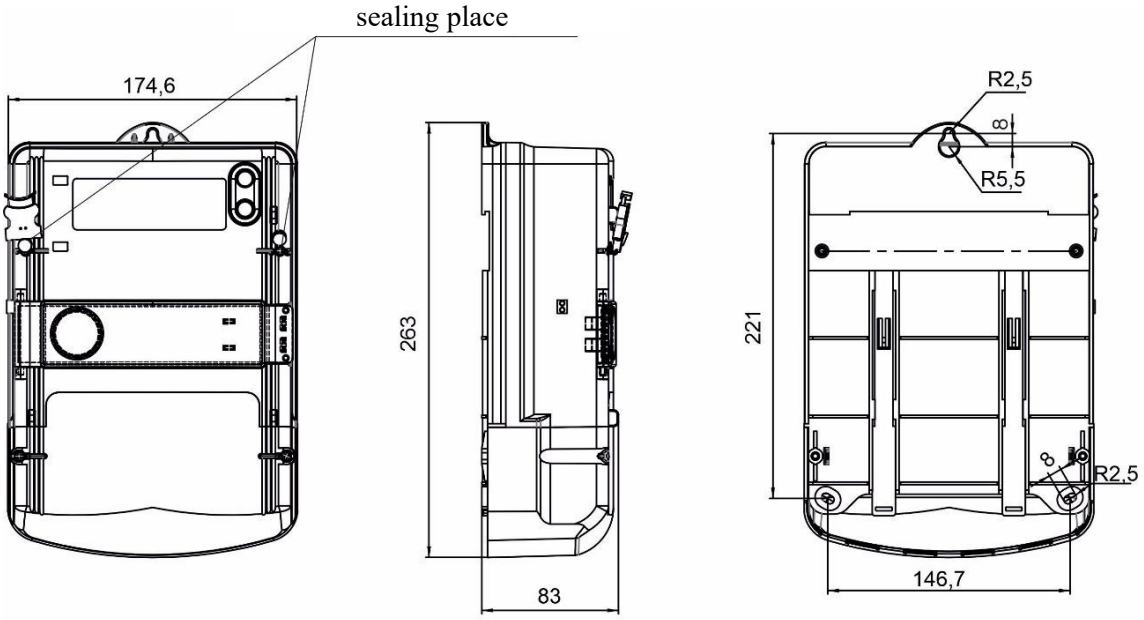
The warranty period for meters shall be extended for the period calculated from the date of consumer’s application until the defect is eliminated by the manufacturer. Upon expiry of the warranty period, during the service life of the meters, repairs are carried out by the manufacturer or service organizations. In this case, the repair is carried out at the expense of the consumer.

Meters that have been transported, stored, mounted and operated in violation of the requirements specified in the operating manual and meters that have damage to the case, base, clamp block or evidences of their thermal heating, damaged manufacturer’s seal, as well as meters which have mechanical damage resulting from any actions of the buyer or third parties, are not subject to warranty repair.

The manufacturer's warranty obligations do not apply to external backup batteries.

Please report any defects in the meters to the manufacturer, NIK-ELEKTRONIKA LLC.

Appendix A. Overall and installation dimensions of meters



Dimensions are provided for reference

Figure A 1. Overall and installation dimensions of meters

Appendix B. Connection diagrams

Figure B.1 shows the connection diagram of the interfaces and electrical pulse test leads of the directly connected meter.

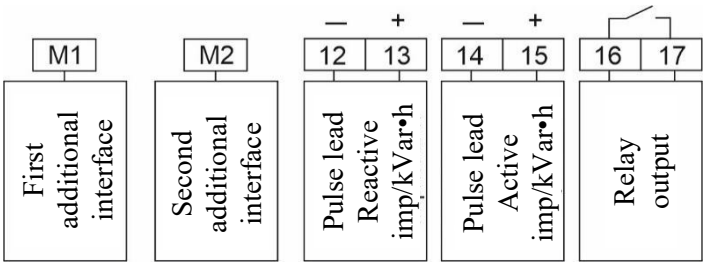


Figure B.1. Connection diagram of interfaces and electrical pulse test leads of the directly connected meter

Figure B.2 shows the connection diagram of the interfaces and electrical pulse test leads of the transformer-connected meter.

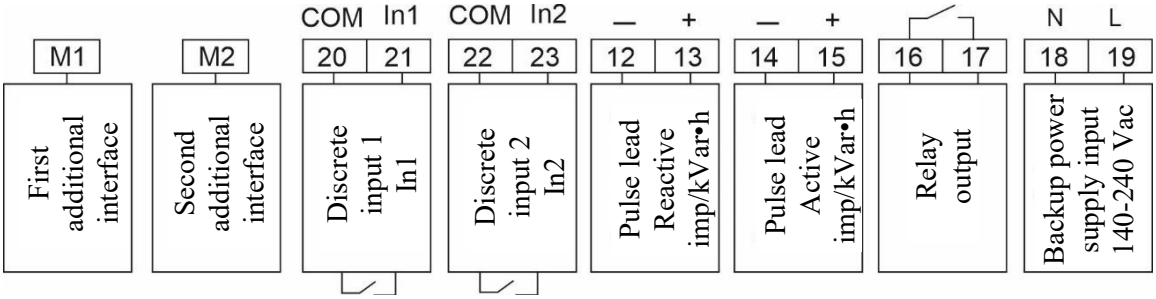


Figure B.2. Connection diagram of interfaces and electrical pulse test leads of the transformer-connected meter

Depending on the meter version, M1, M2 connectors and 12, 13, 16...17 terminals may not be installed or used.

Instead of the M1 connector, in the meter versions with 4G/LTE interface, an SMA connector is installed to connect an LTE antenna.

Figure B.3 shows the pin numbering of the RS-485 interface connector for directly-connected meters.

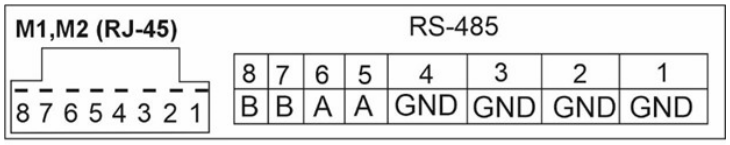


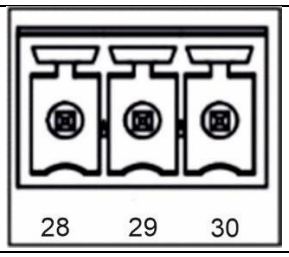
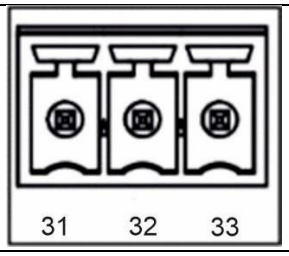
Figure B. 3. Pin numbering of RJ-45 connectors of the first and second additional interfaces for directly connected meters

The pulse outputs In1 and In2 are not galvanically isolated from each other

Table 1 shows the pin numbering of the RS-485 interface connector for transformer-connected meters.

Table 1. Pin numbering of RJ-45 connectors for transformer-connected meters

M1	Pins
	28– RS-485 GND
	29 – RS-485 A

	30– RS-485 B
M2	Pins
	31– RS-485 GND
	32 – RS-485 A
	33– RS-485 B

Appendix C. Connection of meters to the consumer's grid

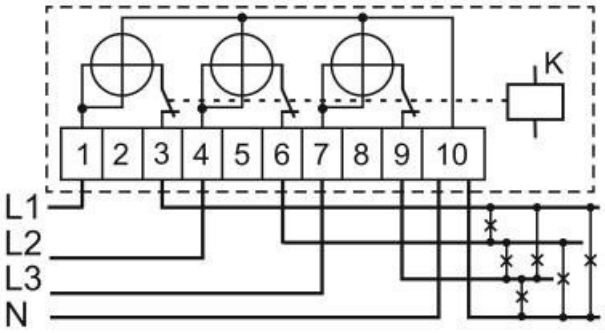


Figure C.1. . Connecting directly connected NIK 2308…A... meters

Note: the availability of relay K depends on the meter version.

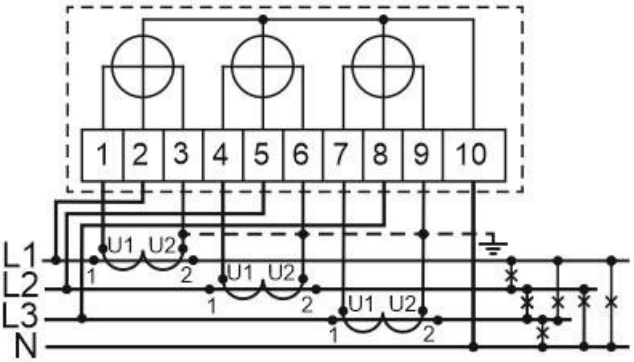


Figure C.2. Connecting transformer-connected NIK 2308…A... meters with rated voltage 3x220/380 V, 3x230/400 V, 3x240/416 V or with a wide voltage range 3x57.7…240/100…416 V

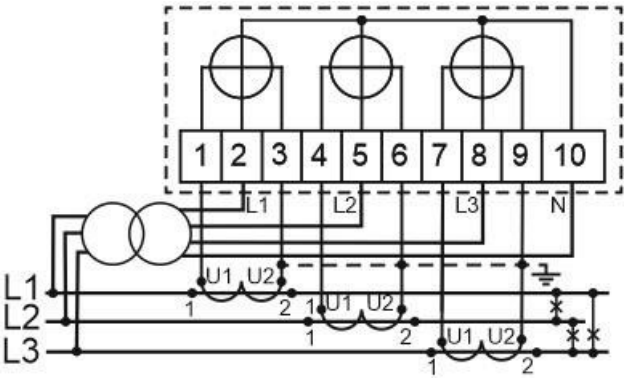


Figure C.3. Connecting transformer-connected NIK 2308…A... meters with rated voltage 3x57.7/100 BV

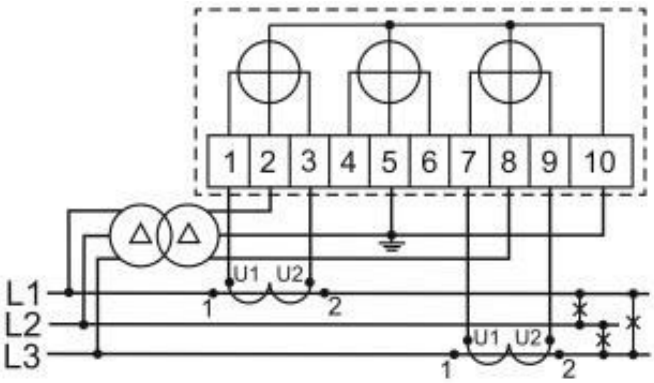


Figure C.4. Connecting transformer-connected NIK 2308…A... meters with rated voltage 3x57.7/100 V or with a wide rated voltage range 3x57.7…240/100…416 V to the grid using delta diagram

Appendix D. Table of OBIS codes that can be displayed on the screen

Table D.1. List of OBIS codes that can be displayed on the screen (the number of codes depends on the meter modification)

No.	Measured values	OBIS code
1.	Displaying the current time of the meter clock in the format “hours: minutes: seconds”	0.9.1
2.	Displaying the current date of the meter hours in the “day - month - year” format	0.9.2
3.	Displaying the unique serial number of the meter	96.1.0
4.	Displaying meter type	96.1.1
5.	Displaying software version	96.1.10
6.	Displaying software checksum	96.1.11
7.	Current transformation ratio	0.4.2
8.	Voltage transformation ratio	0.4.3
9.	Active energy (1 + 4 quadrant), kW · h (6 + 3) LCD	1.8.0
10.	Active energy (1 + 4 quadrant) of the phase L1, kW · h	21.8.0
11.	Active energy (1 + 4 quadrant) of the phase L2, kW · h	41.8.0
12.	Active energy (1 + 4 quadrant) of the phase L3, kW · h	61.8.0
13.	Active energy according to n^{th} tariff, kW · h (n - 1 to 4)	1.8.**n** (1.8.1-1.8.4)
14.	Active energy (2 + 3 quadrant), kW · h	2.8.0
15.	Active energy (2 + 3 quadrant) of the phase L1, kW · h	22.8.0
16.	Active energy (2 + 3 quadrant) of the phase L2, kW · h	42.8.0
17.	Active energy (2 + 3 quadrant) of the phase L3, kW · h	62.8.0
18.	Active energy according to n^{th} tariff, kW · h (n - 1 to 4)	2.8.**n** (2.8.1-2.8.4)
19.	Reactive energy (1 + 2 quadrant), kvar · h	3.8.0
20.	Reactive energy (1 + 2 quadrant) of the phase L1, kvar · h	23.8.0
21.	Reactive energy (1 + 2 quadrant) of the phase L2, kvar · h	43.8.0
22.	Reactive energy (1 + 2 quadrant) of the phase L3, kvar · h	63.8.0
23.	Reactive energy (1 + 2 quadrant) according to n^{th} tariff, kvar · h (n - 1 to 4)	3.8.**n** (3.8.1-3.8.4)
24.	Reactive energy (3 + 4 quadrant), kvar · h	4.8.0
25.	Reactive energy (3 + 4 quadrant) of the phase L1, kvar · h	24.8.0
26.	Reactive energy (3 + 4 quadrant) of the phase L2, kvar · h	44.8.0
27.	Reactive energy (3 + 4 quadrant) of the phase L3, kvar · h	64.8.0
28.	Reactive energy (3 + 4 quadrant) according to n^{th} tariff, kvar · h (n - 1 to 4)	4.8.**n** (4.8.1-4.8.4)
29.	Reactive energy (1 quadrant) for A+, kvar · h	5.8.0
30.	Reactive energy (1 quadrant) for A+ of the phase L1, kvar · h	25.8.0
31.	Reactive energy (1 quadrant) for A+ of the phase L2, kvar · h	45.8.0
32.	Reactive energy (1 quadrant) for A+ of the phase L3, kvar · h	65.8.0
33.	Reactive energy (1 quadrant) for A+ according to n^{th} tariff, kvar · h (n - 1 to 4)	5.8.**n** (5.8.1-5.8.4
34.	Reactive energy (2 quadrant) for A-, kvar · h	6.8.0
35.	Reactive energy (2 quadrant) for A- of the phase L1, kvar · h	26.8.0
36.	Reactive energy (2 quadrant) for A- of the phase L2, kvar · h	46.8.0
37.	Reactive energy (2 quadrant) for A- of the phase L3, kvar · h	66.8.0

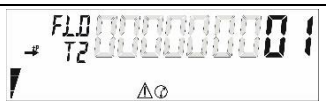
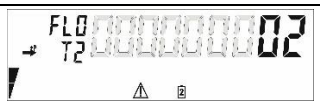
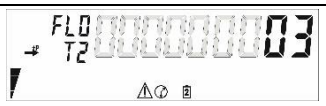
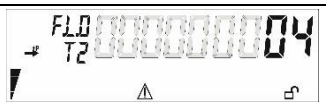
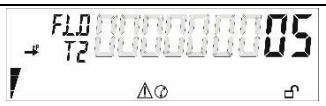
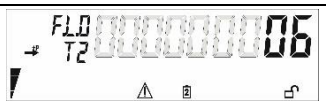
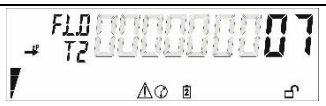
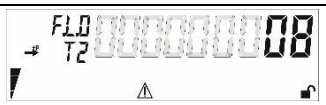
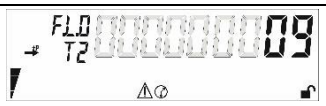
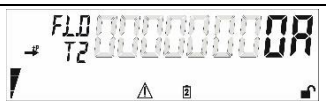
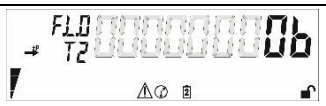
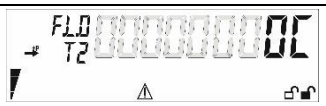
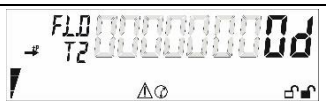
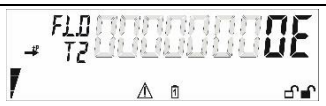
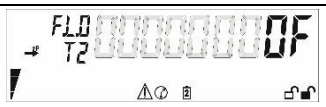
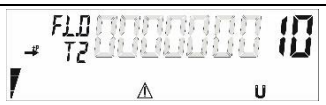
No.	Measured values	OBIS code
38.	Reactive energy (2 quadrant) for A- according to nth tariff, kvar · h (n - 1 to 4)	6.8.n 6.8.1-6.8.4)
39.	Reactive energy (3 quadrant) for A-, kvar · h	7.8.0
40.	Reactive energy (3 quadrant) for A- of the phase L1, kvar · h	27.8.0
41.	Reactive energy (3 quadrant) for A- of the phase L2, kvar · h	47.8.0
42.	Reactive energy (3 quadrant) for A- of the phase L3, kvar · h	67.8.0
43.	Reactive energy (3 quadrant) for A- according to nth tariff, kvar · h (n - 1 to 4)	7.8.n (7.8.1-7.8.4)
44.	Reactive energy (4 quadrant) for A+, kvar · h	8.8.0
45.	Reactive energy (4 quadrant) for A+ of the phase L1, kvar · h	28.8.0
46.	Reactive energy (4 quadrant) for A+ of the phase L2, kvar · h	48.8.0
47.	Reactive energy (4 quadrant) for A+ of the phase L3, kvar · h	68.8.0
48.	Reactive energy (4 quadrant) for A+ according to nth tariff, kvar · h (n - 1 to 4)	8.8.n (8.8.1-8.8.4)
49.	Total energy S+ (1 +4 quadrants), kVA · h	9.8.0
50.	Total energy S+ (1 +4 quadrants) of the phase L1, kVA · h	29.8.0
51.	Total energy S+ (1 +4 quadrants) of the phase L2, kVA · h	49.8.0
52.	Total energy S+ (1 +4 quadrants) of the phase L3, kVA · h	69.8.0
53.	Total energy S- (2 +3 quadrants), kVA · h	10.8.0
54.	Total energy S- (2 +3 quadrants) of the phase L1, kVA · h	30.8.0
55.	Total energy S- (2 +3 quadrants) of the phase L2, kVA · h	50.8.0
56.	Total energy S- (2 +3 quadrants) of the phase L3, kVA · h	70.8.0
57.	Active energy |A+|+|A-|, kW · h	15.8.0
58.	Active energy |A+|+|A-| of the phase L1, kW · h	35.8.0
59.	Active energy |A+|+|A-| of the phase L2, kW · h	55.8.0
60.	Active energy |A+|+|A-| of the phase L3, kW · h	75.8.0
61.	Active energy |A+|+|A-| according to nth tariff, kW · h (n - 1 to 4)	15.8.n (15.8.1-15.8.4)
62.	Active energy |A+|-|A-|, kW · h	16.8.0
63.	Active energy |A+|-|A-|) of the phase L1, kW · h	36.8.0
64.	Active energy |A+|-|A-|) of the phase L2, kW · h	56.8.0
65.	Active energy |A+|-|A-|) of the phase L3, kW · h	76.8.0
66.	Active energy |A+|-|A-| according to n^{th} tariff, kW · h	16.8.n (16.8.1-16.8.4)
67.	Active energy (1 quadrant), kW · h	17.8.0
68.	Active energy (1 quadrant) of the phase L1, kW · h	37.8.0
69.	Active energy (1 quadrant) of the phase L1, kW · h	57.8.0
70.	Active energy (1 quadrant) of the phase L1, kW · h	77.8.0
71.	Active energy (2 quadrant), kW · h	18.8.0
72.	Active energy (2 quadrant) of the phase L1, kW · h	38.8.0
73.	Active energy (2 quadrant) of the phase L1, kW · h	58.8.0
74.	Active energy (2 quadrant) of the phase L1, kW · h	78.8.0
75.	Active energy (3 quadrant), kW · h	19.8.0
76.	Active energy (3 quadrant) of the phase L1, kW · h	39.8.0
77.	Active energy (3 quadrant) of the phase L1, kW · h	59.8.0
78.	Active energy (3 quadrant) of the phase L1, kW · h	79.8.0
79.	Active energy (4 quadrant), kW · h	20.8.0
80.	Active energy (4 quadrant) of the phase L1, kW · h	40.8.0
81.	Active energy (4 quadrant) of the phase L1, kW · h	60.8.0
82.	Active energy (4 quadrant) of the phase L1, kW · h	80.8.0

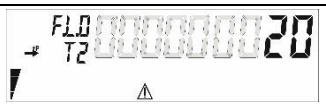
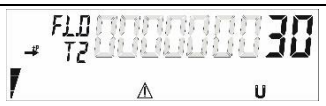
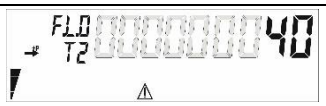
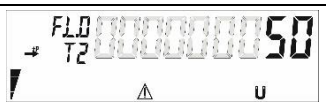
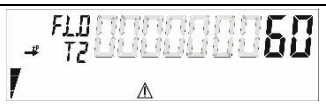
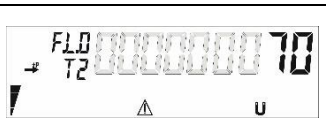
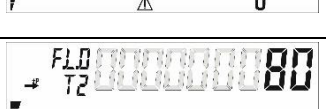
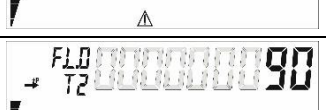
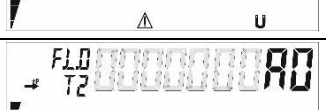
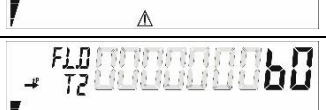
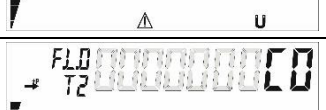
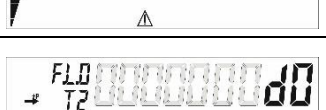
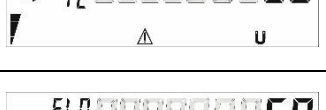
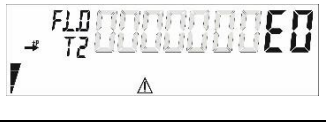
No.	Measured values	OBIS code
83.	Instantaneous active power (1+4 quadrants), kW	1.7.0
84.	Instantaneous active power (1+4 quadrants) of the phase L1, kW	21.7.0
85.	Instantaneous active power (1+4 quadrants) of the phase L2, kW	41.7.0
86.	Instantaneous active power (1+4 quadrants) of the phase L3, kW	61.7.0
87.	Instantaneous active power (2+3 quadrants), kW	2.7.0
88.	Instantaneous active power (2+3 quadrants) of the phase L1, kW	22.7.0
89.	Instantaneous active power (2+3 quadrants) of the phase L2, kW	42.7.0
90.	Instantaneous active power (2+3 quadrants) of the phase L3, kW	62.7.0
91.	Instantaneous reactive power (1+2 quadrants), kvar	3.7.0
92.	Instantaneous reactive power (1+2 quadrants) of the phase L1, kvar	23.7.0
93.	Instantaneous reactive power (1+2 quadrants) of the phase L2, kvar	43.7.0
94.	Instantaneous reactive power (1+2 quadrants) of the phase L3, kvar	63.7.0
95.	Instantaneous reactive power (3+4 quadrants), kvar	4.7.0
96.	Instantaneous reactive power (3+4 quadrants) of the phase L1, kvar	24.7.0
97.	Instantaneous reactive power (3+4 quadrants) of the phase L2, kvar	44.7.0
98.	Instantaneous reactive power (3+4 quadrants) of the phase L3, kvar	64.7.0
99.	Instantaneous reactive power for the n^{th} quadrant, kvar	n.7.0 (5.7.0-8.7.0)
100.	Instantaneous reactive power for the n^{th} quadrant of the phase L1, kvar	n.7.0 (25.7.0-28.7.0)
101.	Instantaneous reactive power for the n^{th} quadrant of the phase L2, kvar	n.7.0 (45.7.0-48.7.0)
102.	Instantaneous reactive power for the n^{th} quadrant of the phase L3, kvar	n.7.0 (65.7.0-68.7.0)
103.	Instantaneous total power S+ (1+4 quadrants), kVA	9.7.0
104.	Instantaneous total power S+ (1+4 quadrants) of the phase L1, kVA	29.7.0
105.	Instantaneous total power S+ (1+4 quadrants) of the phase L2, kVA	49.7.0
106.	Instantaneous total power S+ (1+4 quadrants) of the phase L3, kVA	69.7.0
107.	Instantaneous total power S- (2+3 quadrants), kVA	10.7.0
108.	Instantaneous total power S- (2+3 quadrants) of the phase L1, kVA	30.7.0
109.	Instantaneous total power S- (2+3 quadrants) of the phase L2, kVA	50.7.0
110.	Instantaneous total power S- (2+3 quadrants) of the phase L3, kVA	70.7.0
111.	Instantaneous active power |A+|+|A-|), kW	15.7.0
112.	Instantaneous active power |A+|+|A-|) of the phase L1, kW	35.7.0
113.	Instantaneous active power |A+|+|A-|) of the phase L2, kW	55.7.0
114.	Instantaneous active power |A+|+|A-|) of the phase L3, kW	75.7.0
115.	Instantaneous active power |A+|-|A-|), kW	16.7.0
116.	Instantaneous active power |A+|-|A-|) of the phase L1, kW	36.7.0
117.	Instantaneous active power |A+|-|A-|) of the phase L2, kW	56.7.0
118.	Instantaneous active power |A+|-|A-|) of the phase L3, kW	76.7.0
119.	Instantaneous active power for the n^{th} quadrant, kW	n.7.0 (17.7.0-20.7.0)
120.	Instantaneous active power for the n^{th} quadrant of the phase L1, kW	n.7.0 (37.7.0-40.7.0)
121.	Instantaneous active power for the n^{th} quadrant of the phase L2, kW	n.7.0 (57.7.0-60.7.0)
122.	Instantaneous active power for the n^{th} quadrant of the phase L3, kW	n.7.0 (77.7.0-80.7.0)
123.	Current for the phase L1, A	31.7.0
124.	Current for the phase L2, A	51.7.0
125.	Current for the phase L3, A	71.7.0

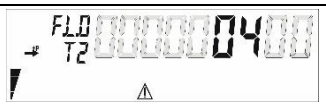
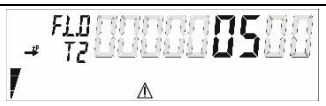
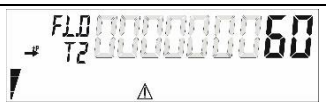
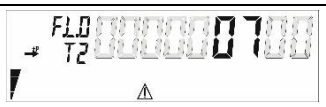
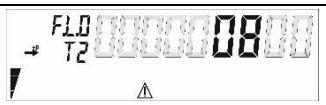
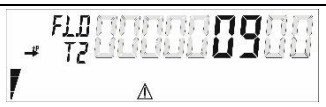
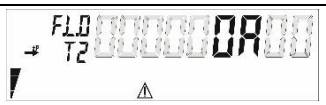
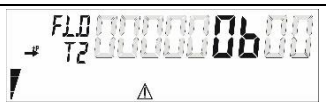
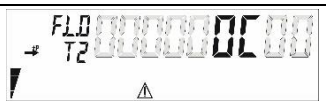
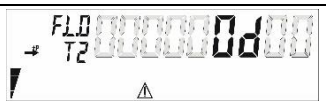
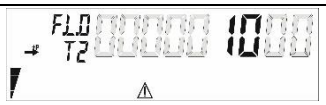
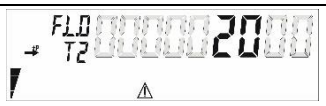
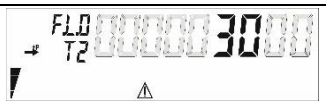
No.	Measured values	OBIS code
126.	Voltage for the phase L1, V	32.7.0
127.	Voltage for the phase L2, V	52.7.0
128.	Voltage for the phase L3, V	72.7.0
129.	Power factor for the phase L1	33.7.0
130.	Power factor for the phase L2	53.7.0
131.	Power factor for the phase L3	73.7.0
132.	Frequency value for the fundamental harmonic of the phase L1, Hz	34.7.0
133.	Frequency value for the fundamental harmonic of the phase L2, Hz	54.7.0
134.	Frequency value for the fundamental harmonic of the phase L3, Hz	74.7.0
135.	Angle between phases L1 and L2	81.7.10
136.	Angle between phases L1 and L3	81.7.20

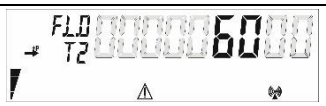
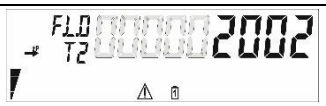
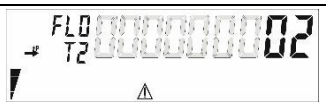
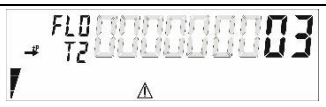
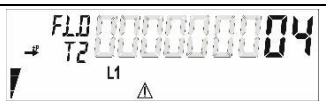
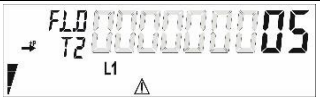
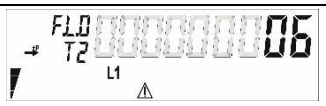
Appendix E. Error codes

Table E.1. Meter error codes

Accident log 1 (OBIS code 0.0.97.98.0.255)		
Value	Description	
00 00 00 01	Wrong time	
00 00 00 02	Low battery	
00 00 00 03	Wrong time + Low battery	
00 00 00 04	Open terminal cover	
00 00 00 05	Open terminal cover + Wrong time	
00 00 00 06	Open terminal cover + Low battery	
00 00 00 07	Open terminal cover + Low battery + Wrong time	
00 00 00 08	Open case cover	
00 00 00 09	Open case cover + Wrong time	
00 00 00 0A	Open case cover + Low battery	
00 00 00 0B	Open case cover + Low battery + Wrong time	
00 00 00 0C	Open case cover + Open terminal cover	
00 00 00 0D	Open case cover + Open terminal cover + Wrong time	
00 00 00 0E	Open case cover + Open terminal cover + Low battery	
00 00 00 0F	Open case cover + Open terminal cover + Low battery + Wrong time	
00 00 00 10	Magnetic sensor triggered	

00 00 00 20	Association authentication error	
00 00 00 30	Association authentication error + Magnetic sensor triggered	
00 00 00 40	Decryption authentication error	
00 00 00 50	Decryption authentication error + Magnetic sensor triggered	
00 00 00 60	Decryption authentication error + Association authentication error	
00 00 00 70	Decryption authentication error + Association authentication error + Magnetic sensor triggered	
00 00 00 80	Repeated attack	
00 00 00 90	Repeated attack + Magnetic sensor triggered	
00 00 00 A0	Repeated attack + Association authentication error	
00 00 00 B0	Repeated attack + Association authentication error + Magnetic sensor triggered	
00 00 00 C0	Repeated attack + Decryption authentication error	
00 00 00 D0	Repeated attack + Decryption authentication error + Magnetic sensor triggered	
00 00 00 E0	Repeated attack + Decryption authentication error + Authentication error associations	
00 00 00 F0	Repeated attack + Decryption authentication error + Association authentication error + Magnetic sensor triggered	
00 00 01 00	Software error	
00 00 02 00	RAM error	
00 00 03 00	Software error + RAM error	

00 00 04 00	Non-volatile memory error	
00 00 05 00	Non-volatile memory error + Software error	
00 00 06 00	Non-volatile memory error + RAM error	
00 00 07 00	Non-volatile memory error + Software error + RAM error	
00 00 08 00	Measuring system error	
00 00 09 00	Measuring system error + Software error	
00 00 0A 00	Measuring system error + RAM error	
00 00 0B 00	Measuring system error + RAM error + Software error	
00 00 0C 00	Measuring system error + Non-volatile memory error	
00 00 0D 00	Measuring system error + Non-volatile memory error + Software error	
00 00 0E 00	Measuring system error + Non-volatile memory error + RAM error	
00 00 0F 00	Measuring system error + Non-volatile memory error + Software error + RAM error	
00 00 10 00	Unexpected device reboot event	
00 00 20 00	Attempted fraud	
00 00 30 00	Attempted fraud + Unexpected device reboot event	
00 00 40 00	Radio sensor triggered	
00 00 50 00	Radio sensor triggered + Unexpected device reboot event	

00 00 60 00	Radio sensor triggered + Attempted fraud	
00 00 70 00	Radio sensor triggered + Attempted fraud + Unexpected device reboot event	
00 00 20 02	Attempted fraud + Low battery	
Accident log 2 (OBIS code 0.0.97.98.1.255)		
00 00 00 01	Complete power loss	
00 00 00 02	Power restored	
00 00 00 03	Power restored + Complete power loss	
00 00 00 04	No voltage on phase L1	
00 00 00 05	No voltage on phase L1 + Complete power loss	
00 00 00 06	No voltage on phase L1 + Power restored	
00 00 04 00	Current reversal	

Appendix F. List of events

Table F. 1. List of events that can be recorded in the meter event log

No.	Event	Quantity
1	WDT operation[1]	20
2	Switching the meter on	20
3	Switching the meter off	20
4	Opening the terminal cover[2]	20
5	Closing the terminal cover[2]	20
6	Opening the case cover[2]	20
7	Closing the case cover[2]	20
8	Setting the clock before a shift	20
9	Setting the clock after a shift	20
10	Cumulative time of electromagnetic field exposure[2]	-
11	Start of the electromagnetic field exposure[2]	20
12	End of the electromagnetic field exposure[2]	20
13	Resetting the electromagnetic field displaying[2]	20
14	Cumulative time of magnetic field exposure[2]	-
15	Start of the magnetic field exposure[2]	20
16	End of the magnetic field exposure[2]	20
17	Resetting the magnetic field displaying[2]	20
18	Voltage loss on phase L1	15
19	Voltage loss on phase L2	15
20	Voltage loss on phase L3	15
21	Undervoltage on phase L1	15
22	Undervoltage on phase L2	15
23	Undervoltage on phase L3	15
24	Overvoltage on phase L1	15
25	Overvoltage on phase L2	15
26	Overvoltage on phase L3	15
27	Voltage restoration on phase L1	15
28	Voltage restoration on phase L2	15
29	Voltage restoration on phase L3	15
30	Load shedding relay[2]	15
31	Backup battery status	15
32	Incorrect password entered	15
33	Clearing the load profile	15
34	Parameterization (change of tariff model)	15

Notes:

[1] WDT – watchdog timer, hardware system hang-up control.

[2] If appropriate sensors and relays are available.

Appendix G. Schematic tariff schedule of meters

Figure G.1 shows a simplified schematic meter's tariff schedule configuration and use.

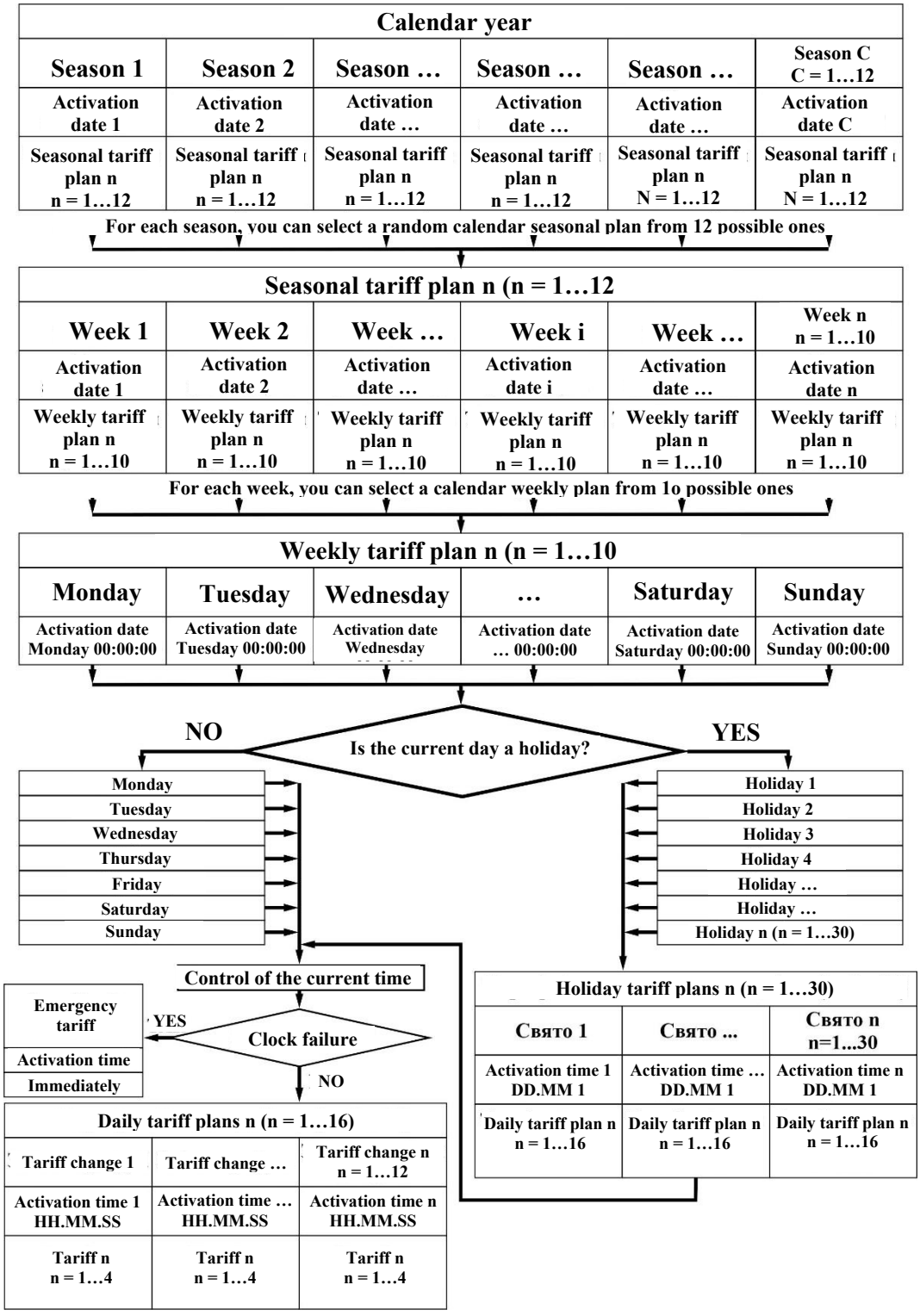


Figure G.1. Simplified schematic tariff schedule