

# POLY PHASE ELECTRONIC ELECTRICITY METER

## ZE311



The electricity meter ZE311 is a one- to four-tariff meter is designed to measure power consumption in the residential, commercial and light industrial use. The device is designed for direct connection to the grid. Measures active energy in classes A or B as per EN 50470-1 and EN 50470-3 in the direction of consumption and supply. Its structure is designed to connect to the network TN-C as per ČSN 332000-3.

Tariff registers are controlled by internal timer clock. Measured values of energy (up to 4 tariffs, consumption and supply, the sum of all energy tariffs; max. power, exceeding the number of contracted power, the sum of the ten largest exceeding the contracted rate), along with possible other data (attempt to manipulate the meter such as the opening of the housing or terminal cover, change parameters, detection of an external magnetic field, etc..) stored in the memory and if necessary displayed on the LCD. Furthermore, the display shows the currently active tariff, bar graph indicating the power measured values, energy flow direction, date and time of the internal clock. The display rotates automatically or is controlled by 3 buttons from which one is sealed. The meter is equipped with an internal battery that maintains operation of the internal timer clock and enabling meter readout energy registers even during power outages.

The meter can be equipped with load profile recorder, contains an optical interface and can be equipped with pulse output S0 and RS485 communication interface. It can also be equipped with an integrated output to drive an external contactor steering force connect or disconnect certain electrical appliances.

ZE311 series electricity meters were approved by the Certificate of the Gauge Type Approval No. 0115-CS-C017-08 dated 15th May 2008, and there was given the mark of the type approval TCM 221/09-4591 by the notified person No.: 1383.

Before granting the mark of the approval (TCM) this series of the electricity meters was subjected to the tests, which confirmed compliance with the following standards: ČSN EN 50470-1; ČSN EN 50470-3; ČSN EN 62056-21; ČSN EN 62053-31, Part 31; DIN 73857-3; DIN 73857-5, ČSN EN 62059-41, Part 41 and Government Regulation NV 464/2005 Coll.



## Technical data

### Basic data

Measurement	Active energy in poly phase four-wire distribution network, measurement of import and export energy. Ability to display sum of absolute values of both ones ( $A =  +AL1  +  +AL2  +  +AL3  +  -AL1  +  -AL2  +  -AL3 $ ) or to display energy import only ( $A =  +AL1  +  +AL2  +  +AL3 $ ) (it is not calculated with energy export – also LED doesn't emit pulses for export). Possibility of profile measurement.
Measurement Method	Electronic meter with shunts or current transformers on current inputs
Accuracy Class	A or B
Reference Voltage $U_n$	3 x 230/400 V
Range of Operation Voltage	0.75 $U_n$ to 1.15 $U_n$
Reference Frequency $f_n$	50 Hz
Starting Current ( $I_{st}$ )	15 mA, 20 mA, 25 mA
Minimum Current ( $I_{min}$ )	200 mA, 250 mA
Reference Current ( $I_{ref}$ )	5 A
Maximum Current ( $I_{max}$ )	60 to 100 A (with step of 5 A)
Consumption in Voltage Circuits	
- active power input at $U_n$	$\leq 0,8$ W
- apparent power input at $U_n$	$\leq 8$ VA
Consumption in Current Circuits	$\leq 0,01$ VA at ( $I_{ref}$ )
Constant of the Electricity Meter	1 000 imp/kWh
Test Output	LED (visible spectrum)

### LCD

Display Range	8
Resolution of Energy Displayed on LCD	1 kWh
Number of Decimal Places in Trial Mode	3
Signalling Registration of the Electricity Meter Under Load (indication of output and direction of energy flow)	Optical – Integrated in Display, Proportional Display
Legible Display of Values	-33 °C to +60 °C

### Interface:

A. Optical Output Interface	IR interface as per ČSN EN 62056-21
B. Impulse Output (for measurement of el. energy) - optional	Impulse equipment of class A es per ČSN EN 62053-31
Designation of Terminals of Impulse Output	Terminals 20(+) and 21(-)
Output Constant S0 – Open Collector	100 imp/kWh, 500 imp/kWh, 1 000 imp/kWh
Supply Voltage	Nominal 24 V DC, max. 30 V DC
Maximum Current	5 to 15 mA DC
C. Electric Output Interface RS485 – optional	Readout es per ČSN EN 62056-21
Designation of Terminals of RS485	Terminals 20/13(B) and 21/15(A)

### Weight and dimensions

Weight	1.1 kg
External Dimensions Including the Cover of the Terminal Board	W. 174 x h. 263 cm
Diameter of Current Connecting Terminals	Min. Ø 6.8 mm, alternatively Ø 9.6 mm
Connection Screws in the Terminal Board	Combined cross PZ2/SL
Screws in the Cover of the Terminal Board	Combined cross PZ2/SL Ø of bore for seal 2.5 mm
Auxiliary Terminals	The device includes auxiliary terminals 2, 5, 13, 15, 20 and 21 that enable reliable connection of individual wires with cross-section of 0.75 – 2.5 mm <sup>2</sup> with passage of wires with Ø 3.5 mm <sup>2</sup>
Cross Installation	Horizontally 150 mm; vertically 210, 210 or 230 mm

### Impact of Surroundings

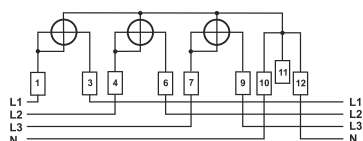
Protection Class	Protection class II
Ingress Protection	IP 54 (IP 53 Meter with Buttons)
Operation and Storage Temperature	-40 °C to +70 °C and -40 °C to +75 °C

## Main Functional Characteristics

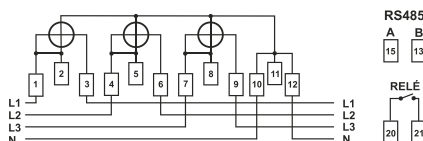
- Up to 4 tariff registers.
- Universal definition of tariff switch programs or external tariff control.
- Tampering detection and event logging (external magnetic field, optionally meter case/terminal cover tampering).
- Ability to display energy values with up to 3 decimal places.
- Registration of power peaks.
- Optionally possibility of readout during power outage.
- Optionally possibility of event recorder, historical data and consumption profile.
- Self-diagnostics.

## Wiring Diagram

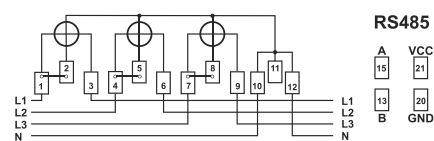
Options (voltage terminal 2, 5 and 8 can be missed out in all variants):



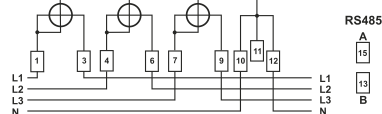
Meter with current shunts



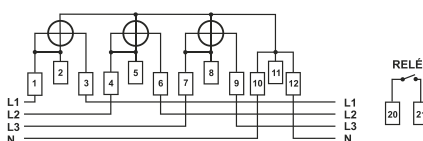
Meter with current shunts and RS485



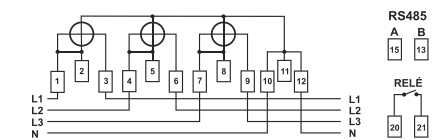
Meter with current transformers and RS485



Meter with an internal power supply (from phase L1) RS485



Meter with current shunts, auxiliary voltage terminals and relay output



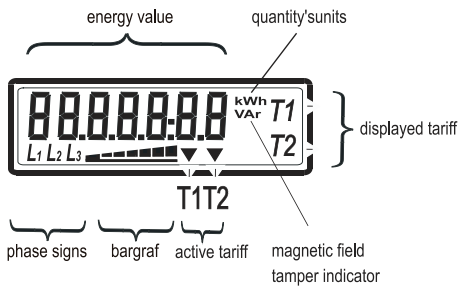
Meter with current shunts, auxiliary voltage terminals, relay output and an active RS485 (with internal power from phase L1)

## Legend:

1	Input of phase L1
2	Voltage L1
3	Output of phase L1 – power terminal - $I_{max}$ - 100 A
4	Input of phase L2
5	Voltage L2
6	Output of phase L2 – power terminal - $I_{max}$ - 100 A
7	Input of phase L3
8	Voltage L3
9	Output of phase L3 – power terminal - $I_{max}$ - 100 A
10, 11, 12	Neutral wire N
13, 15	Terminals of tariff switching, optional Terminals of RS485 interface – 13(B), 15(A)
20, 21	Terminals of impulse output S0 - 20(+), 21(-), optional Terminals of RS485 interface – 20(B), 21(A) alternatively switching relay contacts

### Display description

Electricity meter of ZE311 series is provided with LCD. The operation temperature, range for the correct function is  $-33\text{ }^{\circ}\text{C}$  to  $+60\text{ }^{\circ}\text{C}$ . After the connection of the electricity meter to the electrical network, permanent backlight will occur and there will be an approx. 8 s test of all segments of the LCD.



The symbol ▼ indicates the active tariff, where the electricity meter reads consumption or supply. The active tariff is displayed with the applicable symbol T1 or T2 on the device label. The symbol T1 or T2 on the LCD indicates the tariff, to which the currently displayed data apply (e.g. consumption measured in that tariff).

### Orientation Values of Current in Each Phase (total output in all phases) Indicated by the Bar Graph Segments

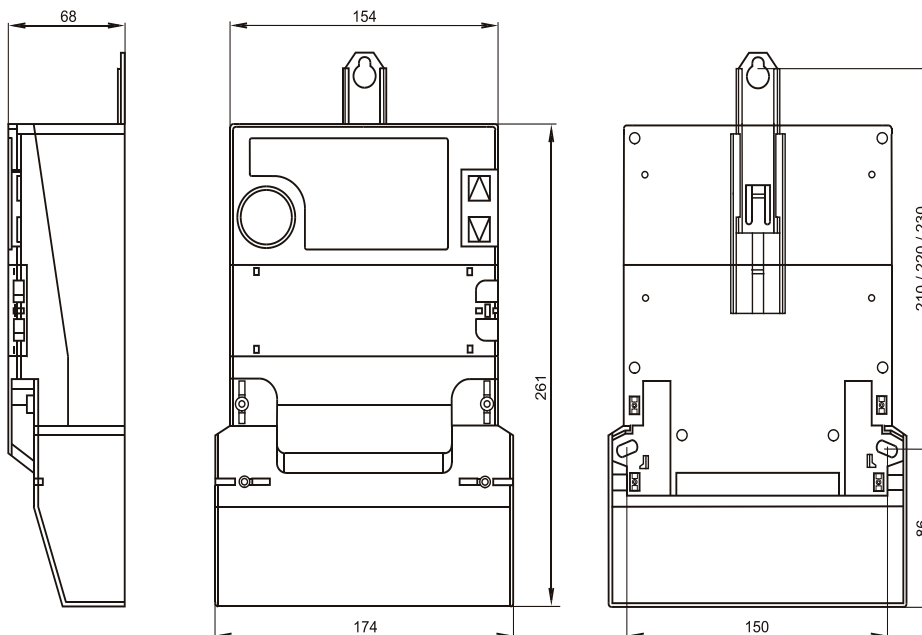
segment 1	Starting power	segment 5	2,23 A (1 536 W)
segment 2	0,035 A (24 W)	segment 6	8,90 A (6 144 W)
segment 3	0,14 A (96 W)	segment 7	36,60 A (24 576 W)
segment 4	0,56 A (384 W)		

The bar graph on the LCD always indicates an orientation size of the instantaneous total output in all phases. If current is (in all phases simultaneously) below the start-up value, the bar graph is not indicated. The bar graph is flashing if supply exceeds consumption. Supply in individual phases is indicated by the symbols of occurrence of voltage (L1, L2, L3).

The phase symbols (L1, L2, L3) indicate the status of connection of the electricity meter as follows:

L1, L2, L3 permanently displayed	the electricity meter is connected correctly, all phases present,
Any of them not displayed	the applicable phase is missing,
The display rotates L1 →L2→L3	all phases present, incorrect order of phases,
The bar graph is flashing and L1 or L2 or L3	in the applicable phase, is reverse direction of current (supply).

### Dimensional sketch



## MAINTENANCE AND STORAGE

### Care and maintenance

The device is a maintenance-free product with established minimum operation service-life of 15 years. For possible cleaning of the outside surface from dust and other impurities, the manufacturer does not recommend using organic solvents, aggressive chemicals and abrasive cleaning agents. It is necessary to comply with the required storage temperatures; a failure to comply with them can result in shortening the service-life of the electronic components. Furthermore, the product shall be protected against wet and humid conditions. The device is designed for internal use, ie. it may only be used in places providing additional protection against the effects of external environment (eg. in the building or in a locker). Precipitations, humidity and liquids including minerals cause corrosion of electric circuits if the device becomes wet. The product may not be placed on and dried by placement on a source of heat or inserted into a source of heat (e.g. microwave oven, classic oven or radiator / heater). The product can be overheated and some of its parts could explode. It may not be exposed to excessive heat; it can result in deformation of covers. The device is not kept in cold premises, especially with the follow-up repeated warming (to the nominal operation temperature). Humidity can condensate in the device and damage electronic components or isolation properties of the product can deteriorate.

### Service

The service shall be ensured by the company: ZPA Smart Energy a.s., Komenského 821, 541 01 Trutnov, Czech Republic, Trademark Smart Energy, Tel. + 420 499 907 111, E-mail [zpa@zpa.cz](mailto:zpa@zpa.cz), [www.zpa.cz](http://www.zpa.cz).

### Battery replacement

The battery can be replaced after disassembly of the cover of the terminal board (it cannot be realized without violating the seals of the cover of the terminal board).

### Transport

For the preparation, the device shall be packed either in the original package, in which it was delivered by the manufacturer, or in such package, which cannot cause damage resulting from handling or transport.

## SAFETY

### Warnings of the manufacturer

The product is capable of safe operation. The manufacturer has issued the EU Declaration of Conformity as per Act 90/2016 Coll. Despite this fact, the manufacturer warns about the risk, however, of a possible danger resulting from incorrect handling or incorrect use of the product:

- Installation and maintenance must be performed by a competent person with the applicable electrotechnical qualifications as per Announcement Nr. 50, § 5.
- The product may not be used for other purposes than it is produced for.
- The product may not be wilfully modified contrary to the type design.
- The product may not be operated with different voltage, current and frequency than it was produced or expertly modified for.
- The product must be located and secured so that manipulation by persons without electrotechnical qualification, especially children, is hindered or, as the case may be, disabled.
- Before each new commissioning, e.g. after a repair, maintenance etc., Ingress Protection and all measures for securing safety must be renewed / restored within the full range and revision shall be realized by a revision technician.
- During the operation, it is necessary to ensure that in the area where the product is installed there is no danger of fire or explosion in case of creation of gases, vapours of flammable liquids and occurrence of flammable dust.
- Each handling of the product by a competent person, with the exception of measurement with insulated tips of a measuring device, must be realized without voltage.
- The product may not be operated in the conditions and environment, which do not guarantee safe operation (e.g. location on flammable base, cover from flammable material, imperfect Ingress Protection against penetration of foreign particles or, as the case may be, against water or other liquids).
- The product must be placed and operated in an indoor environment, ie. in places providing additional protection against the effects of external environment (eg. in the building or in a locker).
- The product may not be operated in the premises with bigger oscillation and vibrations than it is specified in this Service and technical manual.

If the user does not respect any of the aforesaid warnings and if a failure occurs in causal relationship with such non-compliance, responsibility of the manufacturer for defect shall not be established. A failure to comply with the recommended storage and operation conditions of equipment identified by the manufacturer in the paragraph Care and maintenance can have a negative impact on service-life of the equipment.

For general information and other useful information to facilitate the work.

### Responsibility

The owner of the device shall be responsible for ensuring that all the persons engaged in work and handling with the product:

- Are competent and qualified in compliance with national regulations.
- Have read and understood the applicable parts in this document.
- Strictly comply with safety regulations and operation data in individual chapters.

Furthermore, the owner of the device bears the following responsibilities:

- For protection of persons.
- For prevention of damage to material.
- For training of staff.

## Safety instructions

The following safety regulations shall be complied with in all circumstances:

- The wires, to which the device is connected, may not be alive during the installation or during the replacement. Hot contacts are dangerous to life. That is why the applicable fuses of the power supply should be removed and stored in a safe place so that they could not be replaced by a person without responsibility without awareness of the others until the work is finished.
- Local safety regulations shall be complied with. The installation of meters must be realized exclusively by an expert, qualified and trained person.
- Secondary circuits of current transformers must be exposed to short-circuit (in the cover of the terminal board) without exception before opening. High voltage occurring by interrupting the circuits of the current transformer is dangerous to life and damages the transformer.
- Transformers in the system of medium or high voltage must be grounded on one side or in a neutral point on the secondary side. In the opposite case, they can be charged to voltage that exceeds the isolation strength of the device, and are also dangerous to life.
- During the installation, the device must be kept firmly; otherwise it could cause injury if it falls.
- Meters may not be installed, which fell down, even if they do not show any visible marks of damage. They must be returned for repeated testing either to the responsible repair department or directly to the manufacturer. Internal damage may cause functional failures or a short circuit.
- The device may not be, in any way, cleaned under running water or by means of high-pressure equipment. Penetration of water can cause a short circuit. It is necessary to respect the Ingress protection of the device.

## LIQUIDATION

On the basis of the data identified in the certificate ISO 14001, the components used in the device are separable to a great extent and, therefore, they can be accepted for the applicable liquidation or recycling. At the end of its service-life, the device shall be handed over to specialized firms that are engaged in the separation of used materials and their follow-up recycling. Unused device shall be liquidated ecologically and in compliance with the Waste Act.

The device does not include any radioactive, carcinogenic or other materials having a negative impact on human health or the environment. All plastic materials can be recycled.

Packing boxes can be recycled and at the end of the service-life, they shall be submitted to specialized companies as a source of secondary raw materials or energy.

### Liquidation and legal regulations concerning protection of the environment

For the liquidation of the product it is necessary, without exception, to comply with local regulations for the protection of the environment.

Components	Liquidation
Printed circuit boards, LCD, LED	Electronic waste. Liquidation in compliance with local regulations
Battery	Dangerous waste. Liquidation in compliance with local regulations
Metal parts	Sort out and hand over to the waste collection centre for liquidation in compliance with local regulations
Plastic components	Sort out and hand over for liquidation or re-granulation in compliance with local regulations