



# CERTIFIKÁT EÚ SKÚŠKY TYPU

## EU – Type-examination certificate

Číslo dokumentu: **SK 18-MI003-SMU019** **Revízia 3**  
*Document number:* **SK 18-MI003-SMU019** **Revision 3**  
*Document number:* **SK 18-MI003-SMU019** **Revision 3**  
Revízia 3 nahrádza certifikát zo dňa 4. decembra 2020  
*Revision 3 replaces the certificate issued by December 4, 2020*

V súlade: nariadením vlády Slovenskej republiky č. 145/2016 Z. z. o sprístupňovaní  
*In accordance with:* meradiel na trhu v znení nariadenia vlády SR č. 328/2019 Z. z., ktorým sa  
preberá smernica Európskeho parlamentu a Rady 2014/32/EU o harmonizácii  
právných predpisov členských štátov týkajúcich sa sprístupnenia meradiel  
na trhu  
*Government Ordinance of the Slovak Republic No. 145/2016 Coll. Relating to the making  
available on the market of measuring instruments as amended by Government Ordinance  
of the Slovak Republic No. 328/2019 Coll., which Implemented the Directive 2014/32/EU  
of the European Parliament and of the Council on the harmonisation of the laws of the Member  
States relating to the making available on the market of measuring instruments*

Žiadateľ/Výrobca: **Applied Meters, a.s.**  
*Issued to (Manufacturer):* **Budovateľská 50, 080 01 Prešov, Slovenská republika**

Druh meradla: Elektromery na meranie činnnej elektrickej energie (MI-003) / jednofázový  
*Type of instrument:* statický elektromer  
*Active electrical energy meters / single-phase static electricity meter*

Označenie typu: **AMS B2**  
*Type designation:*

Základné požiadavky: príloha č. 1 a príloha č. 5 (MI-003) k nariadeniu vlády SR č. 145/2016 Z. z.  
*Essential requirements:* v znení nariadenia vlády SR č. 328/2019 Z. z.  
*Annex No. I and Annex No. V (MI-003) to Government Ordinance of the Slovak  
Republic No. 145/2016 Coll. as amended by Government Ordinance of the Slovak  
Republic No. 328/2019 Coll*

Platnosť do: **16. februára 2028**  
*Valid until:* **February 16, 2028**

Notifikovaná osoba: **Slovenský metrologický ústav 1781**  
*Notified body:* **Slovak Institute of Metrology 1781**

Dátum vydania: **6. decembra 2021**  
*Date of issue:* **December 6, 2021**

Základné charakteristiky, popis meradla a podmienky schválenia sú uvedené v prílohe, ktorá je súčasťou  
tohto certifikátu. Certifikát vrátane prílohy má spolu 25 strán.  
*Essential characteristics, instrument description and approval conditions are set out in the appendix hereto, which  
forms the part of the certificate. The certificate including the appendix contains 25 pages.*



Ing. Viliam Mazúr  
zástupca notifikovanej osoby  
*representative of notified body*

## History of the Certificate

Issue of the Certificate	Date	Modifications
SK18-MI003-SMU019	17 February, 2018	Initial certificate
SK18-MI003-SMU019	July 26, 2019	Revision 1
SK18-MI003-SMU019	December 4, 2020	Revision 2
SK18-MI003-SMU019	December 6, 2021	Revision 3

## 1 Provisions and standards used for assessment

### 1.1 Generally binding instructions.

The mentioned type of measuring instruments has been assessed from the point of view of requirements for the given measuring instrument type established by the Government Ordinance of the Slovak Republic No. 145/2016 Coll. Relating to the making available on the market of measuring instruments as amended by Government Ordinance of the Slovak Republic No. 328/2019 Coll. (hereinafter referred to as the Government Order), which implemented the Directive 2014/32/EU of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of measuring instruments.

Essential requirements for the given measuring instrument type are in the Annex No. 1 “Essential requirements” and in the Annex No. 5 (MI-003) “Energy meters for measuring active energy” of the Government Ordinance.

### 1.2 Harmonised standards and normative documents

- EN 50470-1 Electricity metering equipment (a.c.) – Part 1: General requirements, tests and test conditions – Metering equipment (class indexes A, B and C) (2006).  
 EN 50470-3 Electricity metering equipment (a.c.) – Part 3: Particular requirements – Static meters for active energy (class indexes A, B and C) (2006).

### 1.3 Other instructions used

- EN 62052-11 Electricity metering equipment (a.c.) – General requirements, tests and test conditions – Part 11: Metering equipment  
 EN 62053-21 Electricity metering equipment (a.c.) – Part 21: Particular requirements – Static meters for active energy (classes 1 and 2)  
 WELMEC 7.2 Software Guide  
 WELMEC 11.1 Common application for utility meters, (2020)  
 WELMEC 11.3 Guide for sealing of Utility meters (Issue 1) (2020)



## 2 Type marking

### Single-phase static electricity meter

**Type: AMS B2**

Accuracy class:	A or B
Mechanical environment class:	M1
Electromagnetic environment class:	E2
Climatic environment class:	from -40°C to +70°C

### Marking of construction of the energy meter type AMS B2:

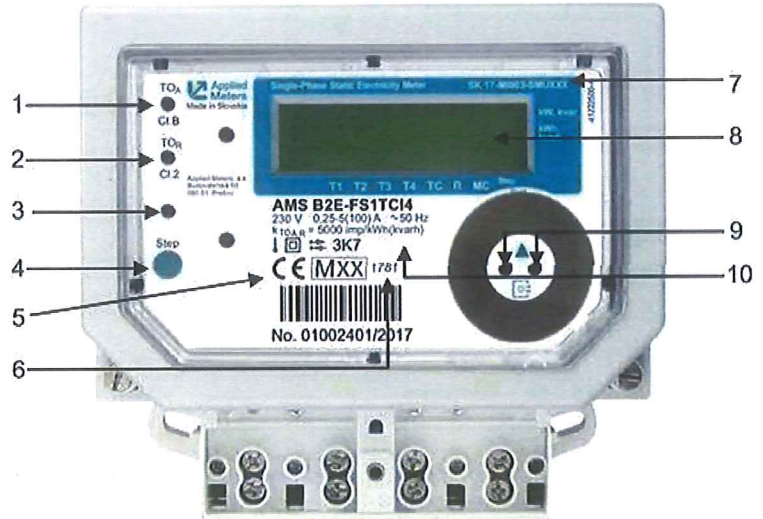
AMS B2<sub>X1-FX3 X4 X5 X6 I X8</sub>

AMS B2	Type marking
<b>X<sub>1</sub></b> current overload:	<b>4</b> – 400 %; <b>5</b> – 500 %; <b>6</b> – 600 %; <b>8</b> – 800 %; <b>A</b> – 1000 %; <b>B</b> – 1200 %; <b>D</b> – 1600 %; <b>E</b> – 2000 %;
<b>F</b> execution:	<b>F</b> - multifunctional energy meter with LCD and Real Time Clock;
<b>X<sub>3</sub></b> measured energy:	<b>A</b> - active energy; <b>R</b> – active + reactive energy; <b>S</b> – active + reactive + apparent energy
<b>X<sub>4</sub></b> connection to network:	<b>1</b> – single-phase two-wires;
<b>X<sub>5</sub></b> current converter:	<b>S</b> – shunt, <b>T</b> - transformer
<b>X<sub>6</sub></b> terminal version:	<b>C</b> – BS terminal, unbalanced connection <b>D</b> – DIN terminal, unbalanced connection
<b>I</b> type of used processor	Texas Instruments
<b>X<sub>8</sub></b> special modules:	<b>4</b> – RS 485 interface; <b>E</b> - interface for external tariff control, <b>Y</b> – Relay <b>M</b> – Mesh interface <b>A</b> - external antenna <b>S</b> – supply control switch



**Single-phase static energy meter type AMS B2.**  
**(General form and overall dimensions)**

- Representation of the meter:



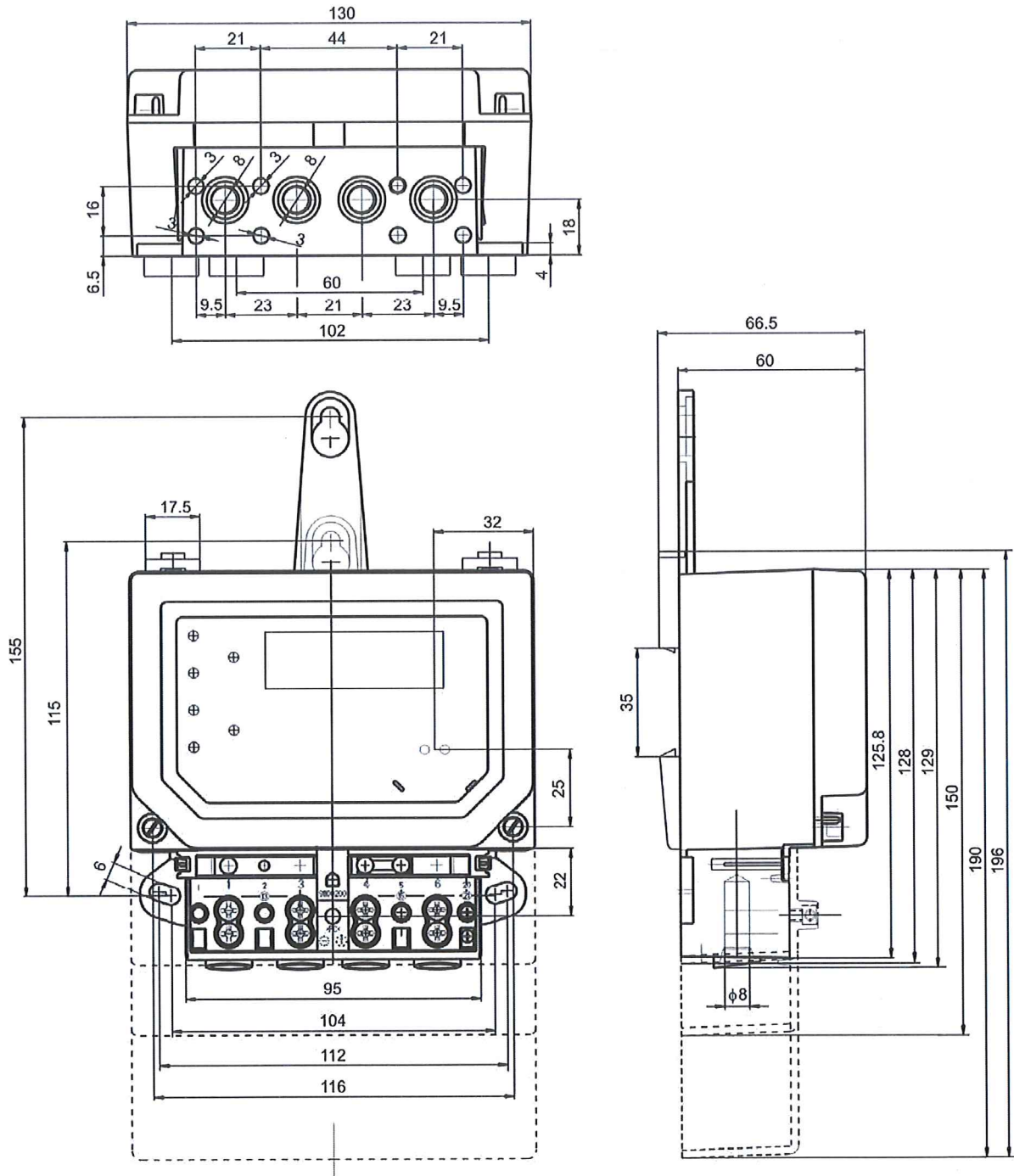
**Legend:**

1. Test output – active energy;
2. Test output – reactive energy;
3. Mains voltage;
4. Step control button;
5. Conformity with the approved type;
6. Notified body;
7. EU type certificate number;
8. Display;
9. Optical communication interface;
10. Field for type, version and technical data;



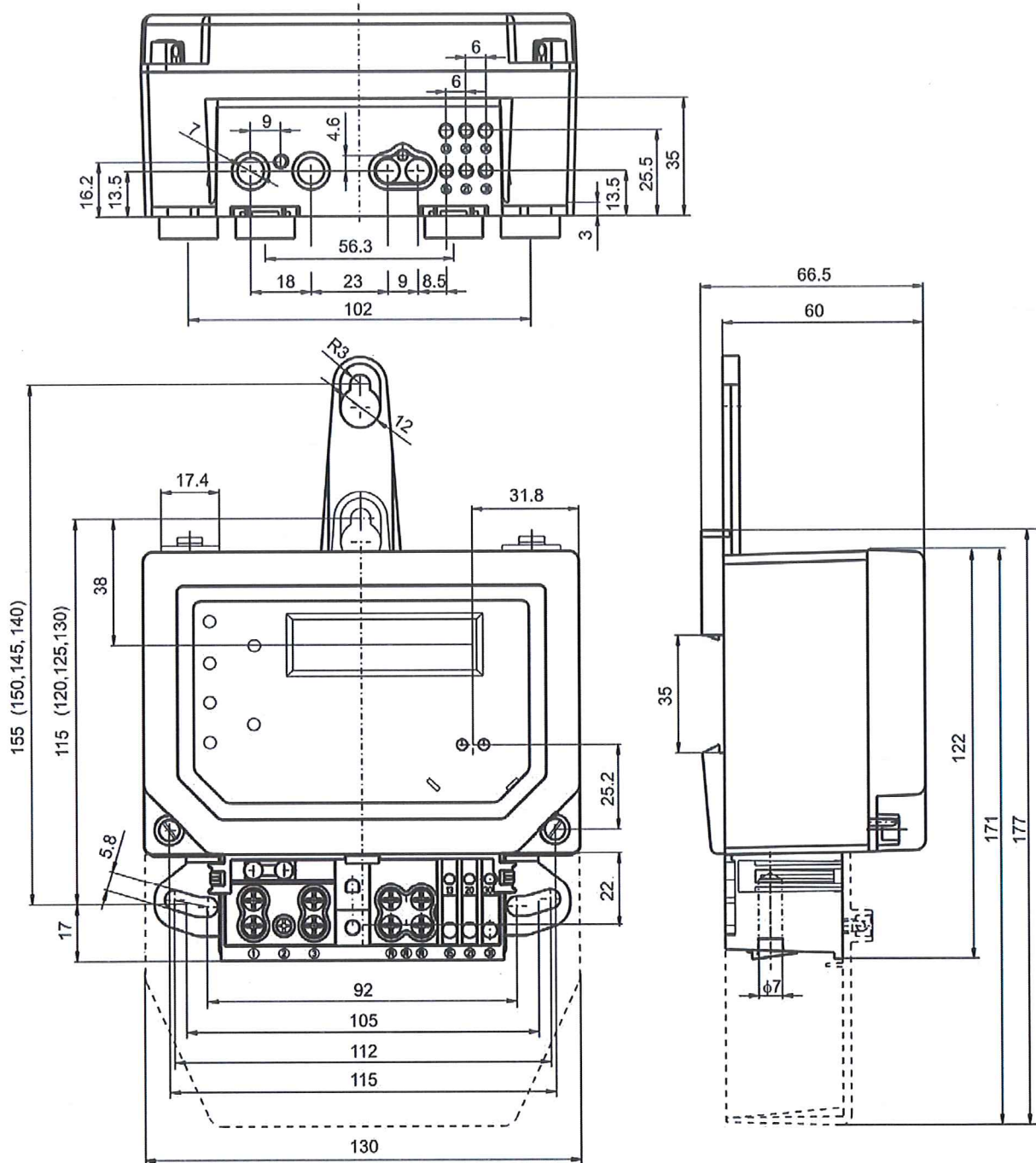
**Dimension drawing of the electrometer AMS B2.**

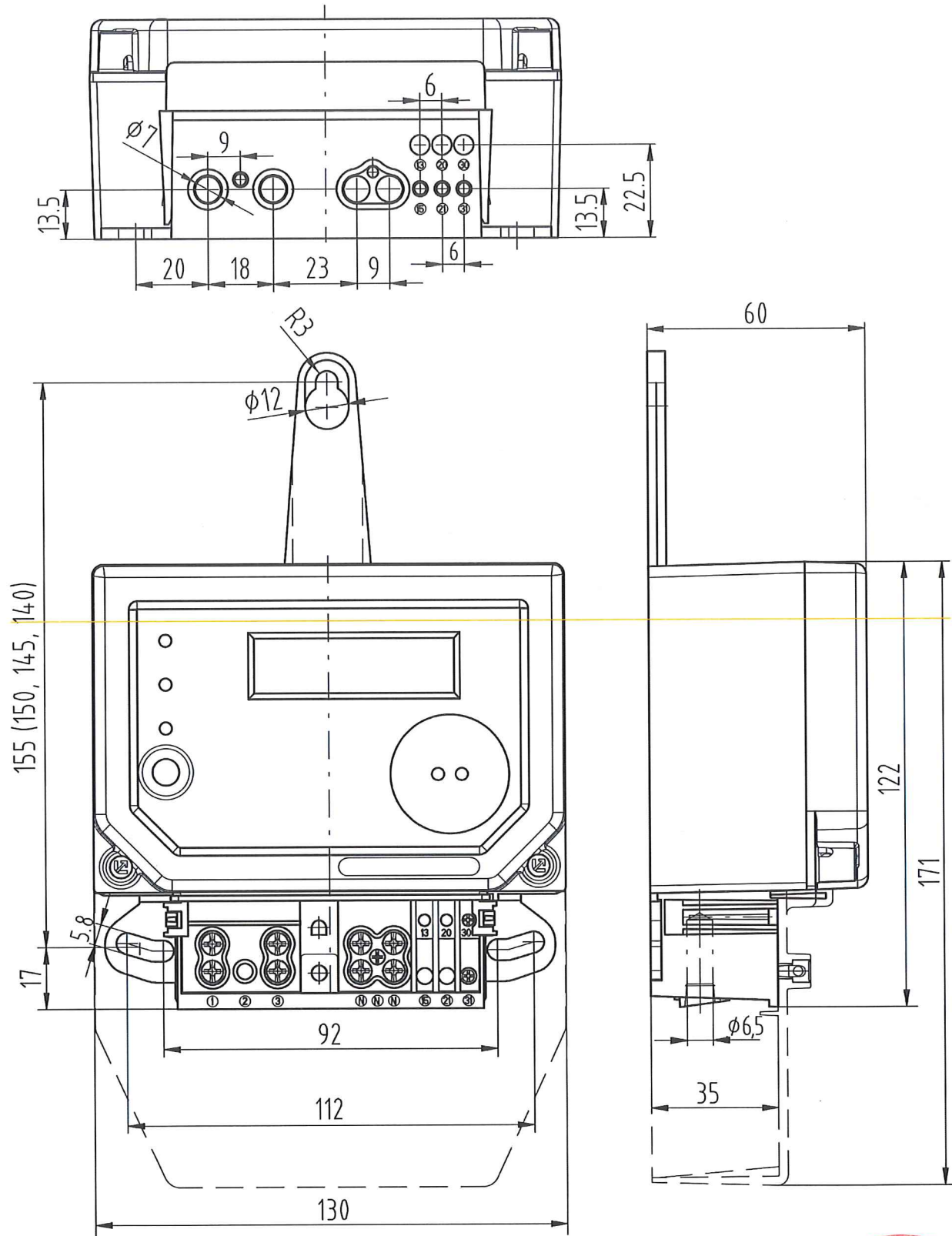
**Meter with BS terminal**





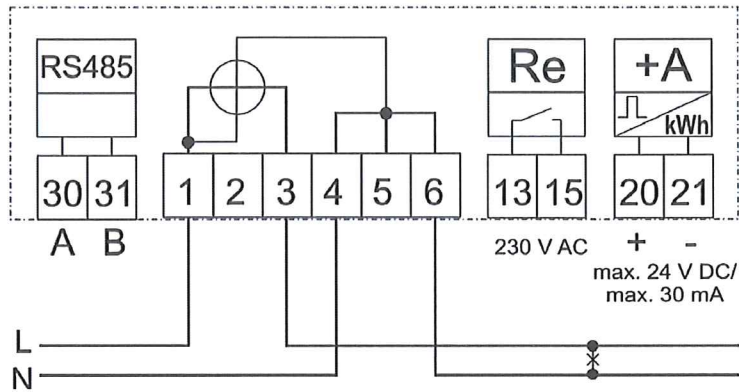
**Meter with DIN terminal**



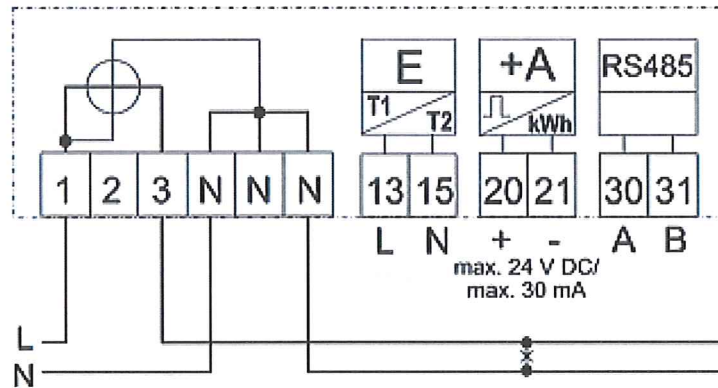




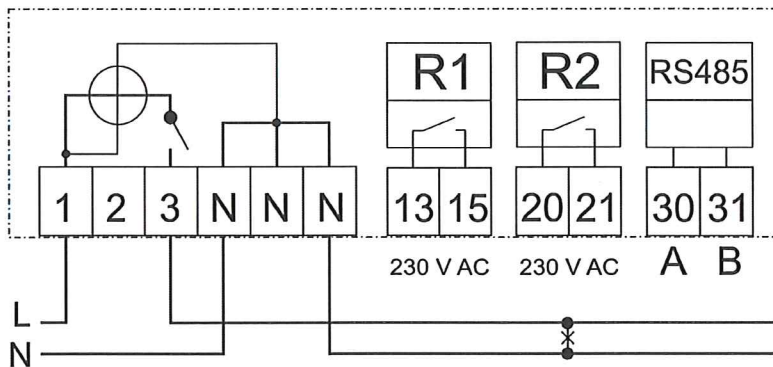
**Internal tariff control, direct connection diagram, BS terminal, unbalanced connection, SO output, output relay R1 and RS485 interface.**



**External tariff control, direct connection diagram, DIN terminal, unbalanced connection, SO output, RS485 interface.**

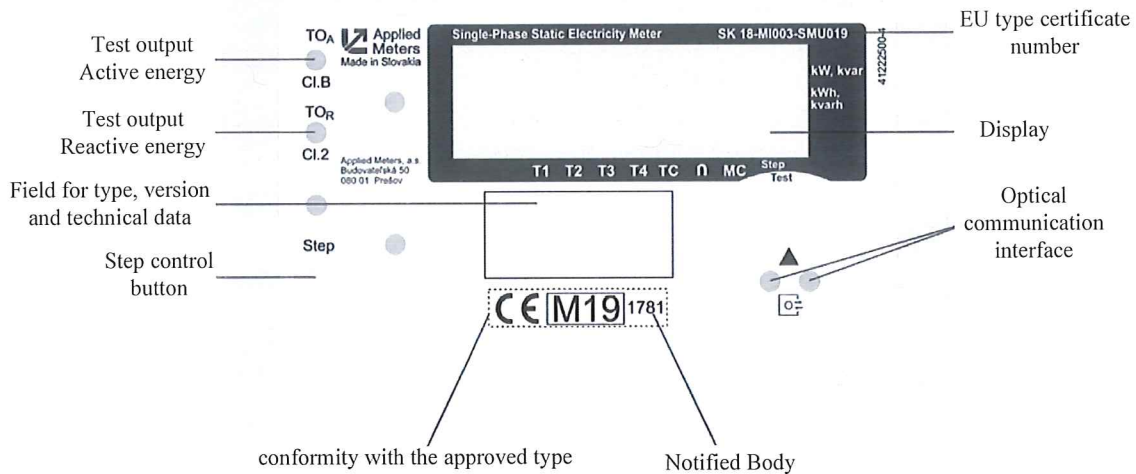


**Internal tariff control, DIN terminal block, unbalanced connection, with supply control switch, two output relays R1 and R2 and RS485 interface**

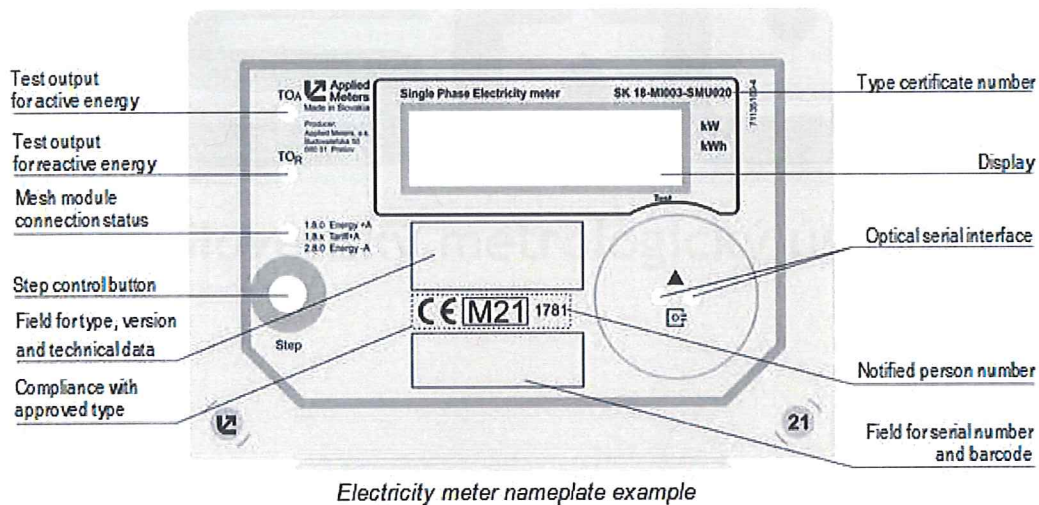


**Label of energy meter type AMS B2**

**Label under transparent cover insertion**



**Laser described cover**



**3 Measuring instrument description**

**3.1 Technical description of measuring instrument**

Single phase AMS B2x-Fx static energy meters are programmable for direct measurement of active electrical energy in two-wire networks at 50 Hz with LCD display. The meters are designed for indoor mounting.

In addition to basic measurement of active energy, meters allow the measurement of:

- Reactive and apparent energy in both directions;
- Outside tariff control (two tariffs) or internal tariff control with ToU clocks (four tariffs);
- Total maximum of mean active (maximum demand), reactive and apparent power in both directions;
- Total maximum of active power in tariffs;
- Total instantaneous active, reactive and apparent power in both directions;

- Instantaneous voltage and current values, power factor, frequency;
- Historical records of the measured quantities (energy, maximum demand, voltage and current);
- Logging load profile (P.01, P.02, P.03) and events in one or four logbooks (it depends on a software version).

Measurement of active energy can be performed in two modes:

- Total - measurement as a one-way machine, (i.e. sum of absolute energy values regardless of direction);
- Separate - measurement of consumption - Supply;

The meters allow you to view:

- Energy, power, voltage, current, frequency, power factor, internal status and internal error messages, firmware version, serial number, date, time, and event counter on LCD;

The meters are directly connected to the circuit.

Meters can be equipped with a switch (SCS - Supply control switch) and two auxiliary relays. The communication (data and parameters readout and parameters change) is available via optical serial interface and RS485 or MESH wireless interface.

### 3.2 Structure

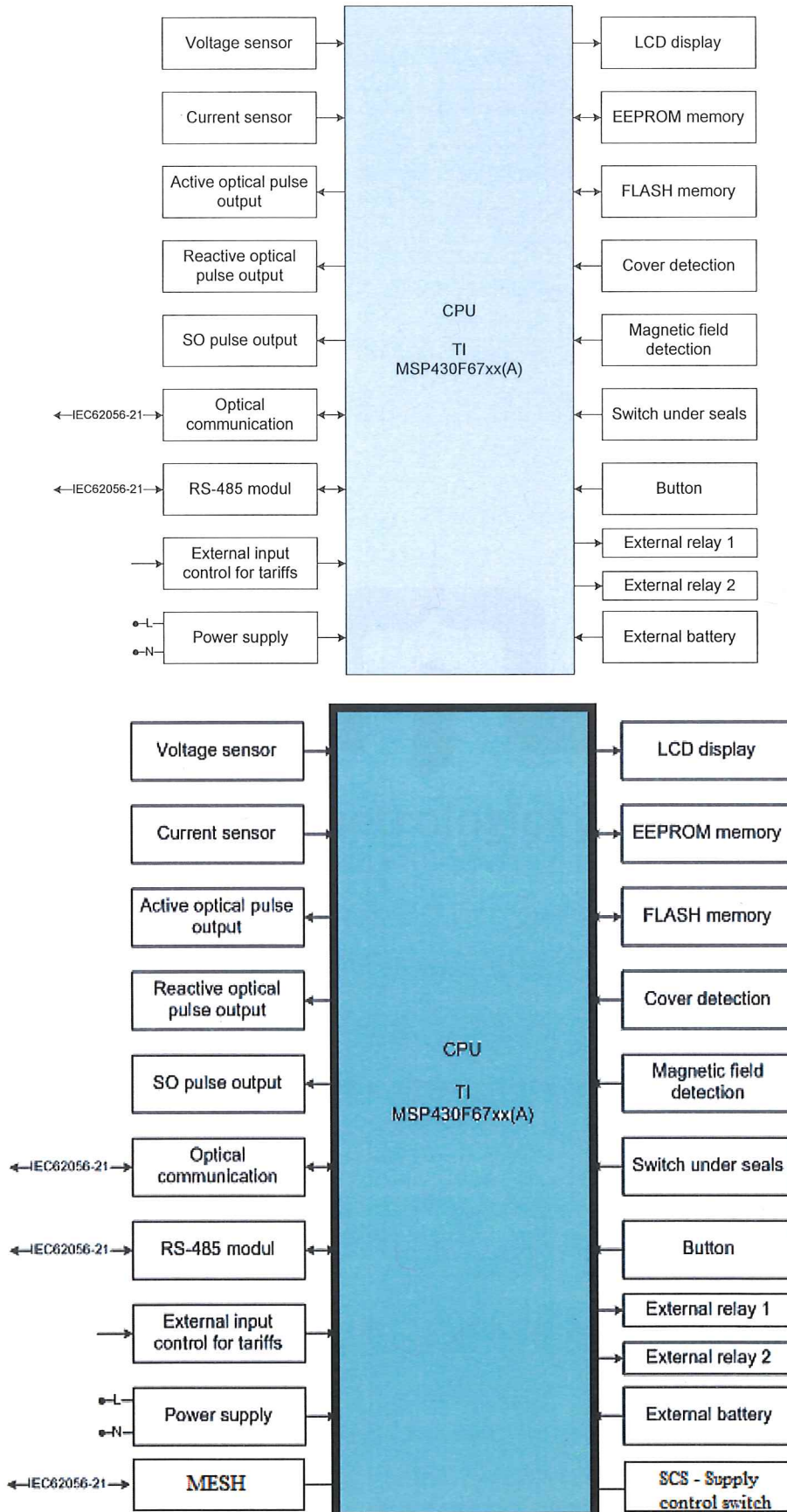
The construction of a single-phase static energy meter type AMS B2, with the exception of sensors of input voltage and current inputs, has:

- LCD display
- optical test output for active energy and reactive energy;
- electrical test output for active or reactive energy
- LCD display mode control button
- two external relays
- SCS – supply control switch
- Interfaces:
  - o optical communication interface
  - o RS-485 communication interface;
  - o MESH wireless communication interface;
  - o interface for external tariff control;
- Detectors: removal of terminal cover and main cover, magnetic field sensor;
- Memories: EEPROM and FLASH integrated on a printed circuit board.

System power is from the wires during normal mode, while in the sleep mode, the system is powered by battery.



**Block diagram of the meter:**



The meter's measurement system is located on a printed circuit board using SMT technology.

The meter uses voltage and current measurement for calculating power and integrates this power over time to determine the total amount of energy. The principle of analogue-to-digital converters integrated in the MSP430F67xx processor is used for measurement.

A shunt or a current transformer can be used as the input current sensor. The input voltage is sensed by a resistive voltage divider.

The data is displayed on seven- or eight-digit LCD display. The LCD Display Control Mode Input provides a mechanical button accessible from the front of the meter marked "Step".

The meter has the following input / output elements and circuits:

**Test outputs TO<sub>A</sub> and TO<sub>R</sub>** - TO<sub>A</sub> is LED for active power. The LED flicker frequency depends on the meter's constant (imp. /kWh) and is proportional to the measured active energy. In no load condition the LED shines without flickering. TO<sub>R</sub> is a reactive energy LED. The flicker frequency of the LED depends on the meter's constant (imp / kvarh) and is proportional to the measured reactive energy. In no load condition the LED shines without flickering.

**The energy flow direction** - is indicated by arrows on the vector diagram displayed on the LCD.

**SO pulse output** - the meter can be equipped with a pulse output which is parameterized for energies + A; - A; + R; -R. It is implemented as a passive SO output (open collector).

**Detection of magnetic field disturbance** - the violation indicates an arrow above the sign  $\cap$  or just sign  $\cap$  on the display (depends on the display), if the violation takes longer than the set time. Duration, a record will be created with the date and time of the start of the violation and records (with date and time of starting and ending of violation) will be created in logbook P.205 (or P.98 – depends on software version) and an arrow or sign  $\cap$  will be on the display.

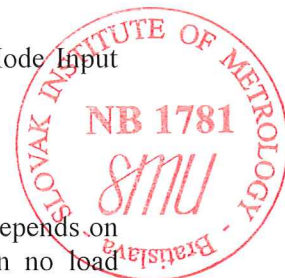
**Terminal board cover disturbance detection** - Disruption by removing the terminal cover indicates an arrow above the "TC" (Tcover) mark on the display, a record will be generated with the date and time of the beginning of the violation and a record (with date and time of removing and closing of terminal board cover) will be generated in logbook P.204 (or P.98 – depends on software version).

**Meter cover disturbance detection** - Disruption by removing the electric meter's cover indicates an arrow above the "MC" (Cover) mark on the display, a record will be generated with the date and time of the beginning of the violation and a record (with date and time of removing and closing of cover) will be generated in logbook P.204 (or P.98 – depends on software version).

**Optical communication interface** for two-way communication according to EN 62056-21, mode C, default with a communication speed 300 / 9 600 bauds. The proposed speed (implicitly 9,600 Baud) can be parameterized and can have values (according to EN 62056-21): 300, 600, 1200, 2400, 4800, 9600, 19200 baud.

RS 485 output - the communication protocol is the same as for the optical interface, i.e., EN 62056-21, mode C, the proposed communication speed can be parameterized.

**MESH wireless communication interface** - The communication module is an additional equipment designed by internal PCB with MESH communication module. The module complies with EU RED (Radio equipment Directive), EN 300 220, EN 301 489 and EN 60950 standards. Communication protocol is the same as for the optical interface, i.e. EN 62056-21, mode C, with the same proposed communication speed as for RS 485. A connector for connecting an external antenna can be connected to the electricity meter terminals. All necessary module settings can be parameterized by the program AMsoft PFO. The RF channel, output power and data transfer speed must be set the same for all



devices on the network. All setting options are listed in the following table, the default settings are highlighted.

RF channel	Transfer speed	Power
1: 868,050 MHz	19,0 kbit/s	1 / 10 / 25,119 / 316,228 / 501,187 mW
2: 868,150 MHz	76,8 kbit/s	
3: 868,250 MHz		
4: 868,350 MHz		
5: 868,450 MHz		
6: 868,550 MHz	19,0 kbit/s	
7: 868,650 MHz	76,8 kbit/s	
8: 868,750 MHz		
9: 868,850 MHz		
10: 868,950 MHz		
11: 869,050 MHz	19,0 kbit/s	
12: 869,150 MHz	19,0 kbit/s	
13: 869,525 MHz	76,8 kbit/s	1 / 10 / 25,119 mW
14: 869,750 MHz	19,0 kbit/s	
15: 869,850 MHz	76,8 kbit/s	
16: 869,950 MHz	19,0 kbit/s	
17: 869,475 MHz	1,2 kbit/s	1 / 10 / 25,119 / 316,228 / 501,187* mW
18: 869,575 MHz		

When recording the channel/power setting, the meter checks the correctness of the combination and automatically sets the maximum allowed transmission speed.

The meter can be equipped with a third additional LED, the flashing frequency of which depends on the connection status of the module as follows:

- **Permanently lit**  
The module is directly connected to one readout device (gateway) and at least one other gateway is available for alternative connection.
- *Note: The LED is permanently lit even during parameter changes using the AMsoft PFO program.*
- **Flashing 5 times per second**  
The module is directly connected to one readout device.
- **Flashing 2 times per second**  
The module is connected to another module and at least one other module is available for an alternative connection.
- **Lights up for 1 second (on for 1 second, off for 1 second)**  
The module is connected to one other module and no other module is available for an alternative connection.
- **Permanently off**  
The module is not connected to any other device.



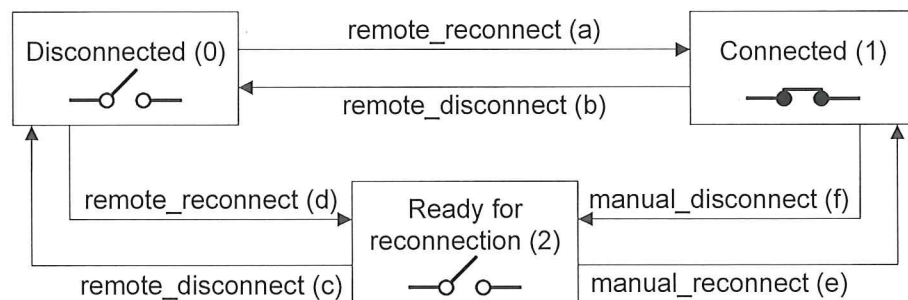
**Output relay** - The meters can be equipped with two output relays, which copy the tariffs T1, T2, T3 or T4 or as a switch-disconnector (description below). The function is programmable using the AMsoft PFO program. If the relays are in the tariff switching function, then if the tariff is active, the contact is closed or open depending on the setting. A closed or open contact can be indicated by an arrow on the LCD. Relay 1 is connected to terminals 13 and 15, if no external tariff control is used. Relay 2 is connected to terminals 20 and 21 if the meter does not have an SO output.

**External input of the tariff control** - The meter may have input for external signal tariff control. There is a programmable choice between external tariff control or internal clock control.

**LCD display mode control button** - LCD display mode control button is accessible from the front of the meter through the meter cover and is marked as Step. Duration of the button pressing determines which of the LCD displaying modes will be called (cyclic, ident, step, relay test mode, history display mode, mode of manual control of the SCS, LCD test or test mode).

**SCS - Supply control switch** - One of the three devices can be set to the switch function: SCS, relay 1, relay 2. The disconnection method is defined by several modes (mode\_0 – mode\_6). The individual modes combine different SCS functions: remote via communication channel (remote disconnect, remote reconnect), manually using the button (manual disconnect, manual reconnect) and locally by function of the meter (local disconnect, local reconnect). The change in the state of the SCS is recorded in the logbook.

SCS status diagram



**Local disconnection function (so - called limiter)** - The limiter is a function of monitoring the measured quantity, which, when a certain value is reached, based on the set parameters, ensures the execution of a local function. When the set value is reached, it records an event (flag in the status register, event in the log). To ensure hysteresis, the value (and evaluation time) for the ascending phase and the descending phase of exceedance are set separately. If the same evaluation value is set for both phases, then it behaves as without hysteresis. All necessary parameters can be set using the AMsoft PFO program.

- The meter allows:
  - Working with up to 20 energy registers, which can be selected according to customer requirements from 55 registers;
  - Load profile measurement. The meter has three functional profiles (so-called load profile, network analysis and daily);



- Monitor the operation of some important circuits (non-volatile memory, microprocessor and its peripherals, oscillator, RTC status, battery voltage), and prepare information in the form of internal error messages;
- Record operational events (phase failure, removal of terminal block cover, magnetic field violation, removal of meter cover, CRC1 checksum error, CRC2 checksum error).
- Each occurrence of defined events of an electric meter is recorded in the event profile as separate records.

Each meter is equipped with a label that displays mandatory data (technical data, type approval number) and customer-requested data (wiring diagram, customer logo). The pattern of the label is given in chapter 2.

The assembly of the meter is located in a full-plastic housing. The case is fastened using fastening screws. The manufacturer declares the degree of protection IP53 under the conditions that the meter is mounted at three points, on a flat plain pad (panel) in the vertical position. The protective insulation class of the meter is II. The housing consists of the bottom, the terminal block, the terminal cover, the lid and the lid liners. The lid liner is made of clear polycarbonate that is inserted into the lid. The case enables sealing at two locations of the meter's lid and at one end of the terminal cover. In a case of ultrasonically welded base and cover, there are two possible ways of sealing, by so called "void" sticker or by two screws with blind plugs (using of sealing wire and seal is also possible).

### **3.3 Processing of measured values – hardware, software.**

The meter reads electrical voltages and currents through input circuits that suitably adjust the signal for the inputs of the measuring circuits. As a current sensor, a shunt or a current transformer can be used. The input voltage is sensed by a resistive voltage divider. The meter uses a voltage and current measurement to calculate the power, which then integrates in time to determine the total amount of energy. The principle of analogue-to-digital converters integrated in the MSP430F67xx processor is used for measurement.

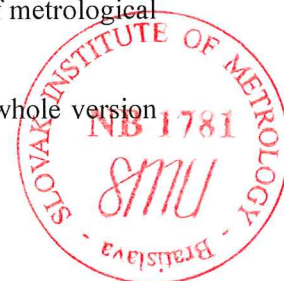
The meter has indicating elements; LCD display and pulse output (optical and SO) for active energy and / or reactive energy; interfaces: button, optical communication interface and RS-485 communication interface, MESH interface, output relays, supply control switch, interface for external tariff control; detectors: terminal cover removal and main cover removal, magnetic field sensor; memories: EEPROM and FLASH integrated on the circuit board.

The meters can be equipped with software that forms a single unit and ensures the execution of all the functions of the meter connected to the control of the input pulses, calculation and archiving of the measured energy and power, displaying the data, operating the communication interfaces and so on. The meter has all parameters, constants related to energy measurement, and performance or service functions stored in non-volatile memory. Parameter changes are possible via the communication interface via the manufacturer's communication program.

The software provides access to the meter's parameters in maximum six levels (0, 1, 2, 5, 6, 8. The 8<sup>th</sup> level is only manufacturer access).

The password P1, P1a is required by meter from the parameterization program for specific access level, when any specific parameter is changed. The password P2 is the security algorithm in the software used for increasing of parameters security. After sealing the meter no change of metrological relevant parameters or version of used software (firmware) is possible.

The check sum is displayed on the LCD. The software of the meter is identified as a whole version number and the corresponding checksum:





Type of meter:	PCB	Version:	Checksum:
AMS B2x-Fx (shunt)	41019260	135.00	0x459E
AMS B2x-Fx (current transformer):	41019260	135.50	0x5921
AMS B2x-Fx (shunt)	41019290/41020900	135.10	0x4BD9
AMS B2x-Fx (current transformer):	41019290/41020900	135.60	0x440B
AMS B2x-Fx (shunt)	41019280/41020800	135.20	0x4BE0
AMS B2x-Fx (shunt):	41019280/41020800	135.21	0x4BE1
AMS B2x-Fx (current transformer):	41019280/41020800	135.70	0x5F63
AMS B2x-Fx (shunt)	41020920	135.30	4E9B

**Software specification:** (refer to WELMEC guide 7.2):

- Software type: P
- Risk Class: C
- Extension: S
- not applicable: L/D/T

### 3.4 Indication of measurement results

The meter has a standard 7- or 8-digit LCD display for displaying measured data. The step display input control is accessible from the front of the meter. It has a test outputs TO<sub>A</sub> and TO<sub>R</sub> (LED diode) to verify the accuracy of the meter.

**First type of LCD display consists of several symbols in the following groups:**

- Measured / calculated values are displayed in the field with 7 digits (dimension 8x4mm);
- Displaying of OBIS codes (the field with 4 digits);
- Energy flow direction, energy measurement quadrant, active energy consumption (▶), the active energy supply or reverse connection of wires (◀); reactive energy consumption (▲), reactive energy supply (▼), status when the meter is power supplied or status when the energy meter does not record energy (the current is less than the starting current of the meter) is indicated by permanent and simultaneous illumination of 4 arrows – symbols for the energy flow directions (↔).
- Active rate T1 to T4 can be indicated by arrows.
- Indication of the measured energy quadrants on the display:

Quadrant	Active energy	Reactive energy
QI	▶ +A	▲ +R
QII	◀ -A	▲ +R
QIII	◀ -A	▼ -R
QIV	▶ +A	▼ -R



Arrows on LCD can show different functions of meter.



**Second type of LCD display consists of several symbols in the following groups:**

- Measured/calculated values are displayed in the field with 8 digits (dimensions 8x3,8 mm).
- Displaying of OBIS codes– the field with 4 digits (dimensions 5x2,3 mm).
- Energy flow direction, energy measurement quadrant, active energy consumption (➔), active energy supply or reverse wire connection (➡); reactive energy consumption (⬆), reactive energy supply (⬇). No load status or the energy meter status when the meter does not register the energy (current is lower than the energy meter Starting current) is indicated by permanent and simultaneous light of four arrows for the energy flow direction (⚡). Indication of the measured energy quadrants on the display is stated in the following table:

Quadrant	Active energy	Reactive energy
QI	➔ +A	⬆ +R
QII	➡ -A	⬆ +R
QIII	➡ -A	⬇ -R
QIV	➔ +A	⬇ -R

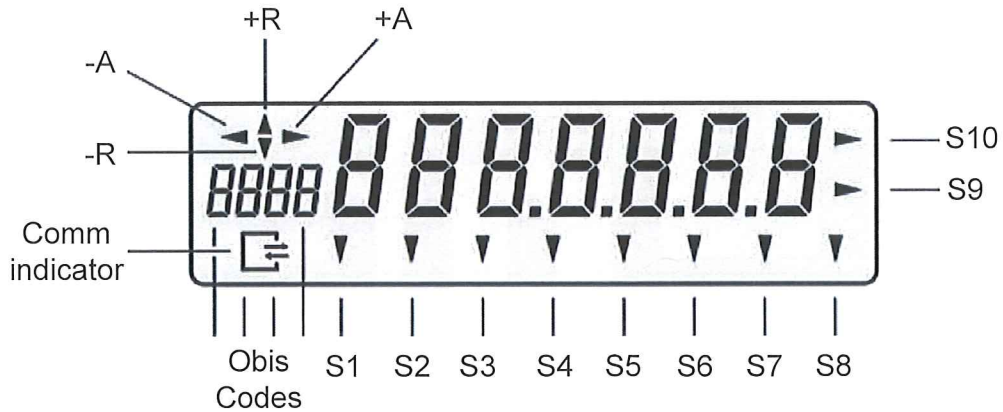
- Active tariff T1 - T4 is indicated by symbols T1, T2, T3, T4 on LCD.
- Tampering by magnetic field is indicated by symbol ∩.
- Communication is displayed by symbol .
- Battery status is indicated by symbol .
- Units of measured values - kW, kWh, kvar, kvarh, kVA, kVAh, A, V.
- Arrows on the both LCD versions allow indication of different statuses on LCD. For each arrow it is possible to set one of the following functions:

Function	Description
Magnet	Indication of magnetic field influence
Terminal Cover	Indication of terminal cover opening
Main Cover	Indication of meter cover opening
T1	Active tariff T1
T2	Active tariff T2
T3	Active tariff T3
T4	Active tariff T4
kWh	Units kWh
kW	Units kW
kvarh	Units kvarh
kvar	Units kvar
Hz	Units Hz
V	Units V
A	Units A
kVA	Units kVA
kVAh	Units kVAh
Power Unit	Units kW, kVar, kVA
Energy Unit	Units kWh, kVarh, kVAh
Bar1	Barograph Level 1
Bar2	Barograph Level 2
Bar3	Barograph Level 3
Bar4	Barograph Level 4
Bar5	Barograph Level 5
Bar6	barograph Level 6
R1	Indication for relay 1

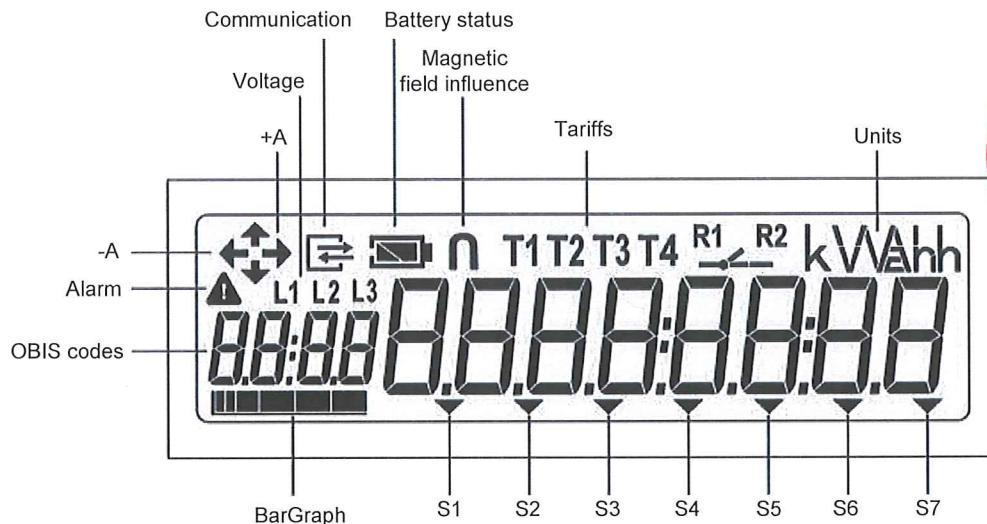


R2	Indication for relay 2
R3	SCS – Supply control switch
Step	Indication of Stepping display mode
Test	Indication of Testing display mode
Battery	Low battery indication
Warning	Indication of tampering (meter cover, terminal cover, magnet)
L1	Indication of L1 voltage presence
ON	Power on indication
Mode	LCD mode – Step, Test, Back-up, Cyclic
Supply	Indication of reverse current direction

**Display of meter type AMS B2 LCD D7**



### Display of meter type AMS B2 LCD D8



### 3.5 Optional equipment and functions subject to Government Ordinance of SR No. 145/2016 Coll. as amended by Government Ordinance of the Slovak Republic No. 328/2019 Coll. (Directive 2014/32/EU) requirements

Fundamental functions of the measuring instrument which has to meet requirements of the Government Ordinance are as follows:

- Measurement of the active energy in the summary mode;
- Measurement of the active energy in the separate mode - consumption and supply in four tariffs.

### 3.6 Integral equipment and functions not subject to Government Ordinance of SR No. 145/2016 Coll. (Directive 2014/32/EU) requirements

Additional functions integrated in the measuring instrument which are not subject to requirements of the Government Ordinance and do not influence the measurement of active energy, are measurements and calculations of:

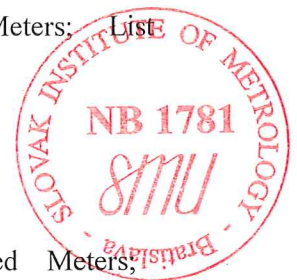
- Measurement of reactive energy in both directions;
- Measurement of apparent energy in both directions;
- Measurement of the total maximum of mean active, reactive and apparent power in both directions,
- Measurement of total instantaneous active, reactive and apparent power in both directions;
- Measurement of instantaneous voltage and current values, power factor, frequency.

### 3.7 Technical documentation

Technical documentation:

- User Guide for Single-phase static multifunctional energy meters for measuring active, reactive and apparent energy with LCD, internal clock and data profiles AMS B2x-Fx (document Applied meters, No. 1\_03/02\_M\_slo\_2019/04)
- User's Manual for single-phase multifunctional static electricity meters for active, reactive and apparent energy with LCD, internal clock and data profiles AMS B2x-Fx (document Applied Meters, no. 1\_03/2\_MD7k\_eng\_2021/11)

- Description of the software – AMS B2x-Fx - Single-phase static multifunctional energy meters for measuring active, reactive and apparent energy with LCD, internal clock and data profiles (document Applied Meters No. 71713500\_71713550 Rev.1)
- Description of the software – AMS B2x-Fx - Single-phase static multifunctional energy meters for measuring active, reactive and apparent energy with LCD, internal clock and data profiles (document Applied Meters no. 71713500\_71713550 Rev.2)
- List of objects and access levels for firmware 135.00, 135.10, 135.50 a 135.60
- List of objects and access levels for firmware 135.21 (BLG)
- List of objects and access levels for firmware 135.20 a 135.70 (GEN)
- List of objects and access levels for firmware 135.30
- List of OBIS - AMx\_B2\_LP\_GENv1.xls (document Applied Meters; List of objects, their OBIS codes and access levels); List\_of\_OBIS\_-\_AMx\_B2\_LP\_BLG2019v4.xls (document Applied Meters; List of objects, their OBIS codes and access levels)
- List\_of\_OBIS\_-\_AMS\_B2\_LP\_GEN\_MESH\_v30.xls (document Applied Meters; List of objects, their OBIS codes and access levels)



Technical Drawings:

- Wiring diagram for AMS B2x (document Applied meters No. 71019260)
- Bill of materials - static energy meter AMS B2 (document Applied Meters, No. 21019260)
- Circuit board – static energy meter AMS B2 (document Applied meters; No. 21019260 Components Bottom, Components Top.pdf)
- Wiring diagram for AMS B2x – 100 pin (document Applied meters No. 71019270)
- Bill of materials – static energy meter AMS B2x (document Applied meters No. 21019270)
- Circuit board – static energy meter AMS B2x (document Applied meters No. 2101927x components top); (document Applied meters No. 2101927x components Bottom)
- Wiring diagram for AMS B2x – 128 pin (document Applied meters No. 71019280)
- Bill of materials – static energy meter AMS B2x (document Applied meters No. 21019280)
- Circuit board – static energy meter AMS B2x (document Applied meters No. 21019280 components top); (document Applied meters No. 21019280 components Bottom)
- Wiring diagram for AMS B2x – 100 pin (document Applied meters No. 71019290)
- Bill of materials – static energy meter AMS B2x (document Applied meters No. 21019290)
- Circuit board – static energy meter AMS B2x (document Applied meters No. 2101929x components top); (document Applied meters No. 2101929x components Bottom)
- Wiring diagram for AMS B2x – 100 pin (document Applied meters No. 71020900)
- Bill of materials – static energy meter AMS B2x (document Applied meters No. 21020900)
- Circuit board – static energy meter AMS B2x (document Applied meters No. 2102090x components top); (document Applied meters No. 2102090x components Bottom)
- Wiring diagram for AMS B2x – 128 pin (document Applied meters No. 71020800)
- Bill of materials – static energy meter AMS B2x (document Applied meters No. 21020800)
- Circuit board – static energy meter AMS B2x (document Applied meters No. 2102080x components top); (document Applied meters No. 2102080x components Bottom)
- Block diagram for AMS B2x – 128 pin (document Applied meters no. 71020820)
- Bill of materials – static energy meter AMS B2x (document Applied meters No. 21020820 BoM 30.11.2021)
- Circuit board – static energy meter AMS B2x (document Applied meters no. 21020820 components top); (document Applied meters no. 21020820 components Bottom)
- Block diagram for AMS B2x – 100 pin (document Applied meters no. 71020920)
- Bill of materials – static energy meter AMS B2x (document Applied meters No. 71020920)
- Circuit board – static energy meter AMS B2x (document Applied meters no. 71020920 components top); (document Applied meters no. 71020920 components Bottom)

A detailed list of the technical documentation is given in the evaluation report No. NO 521/21/B/ ER

## 4 Technical characteristics

Measured energy:	Active energy
Range:	
- Reference voltages $U_n$ :	220 V; 230 V; 240 V(-30,+15 %)
- Reference frequency $f_{ref}$ :	50 Hz ( $\pm 2\%$ )
Meter for direct connection:	
- Starting current $I_{st}$ :	$\leq 0,02$ A
- Minimal current $I_{min}$ :	0,25 A; 0,5 A
- Transient current $I_{tr}$ :	0,5 A; 1 A
- Reference current $I_{ref}$ ( $I_{ref} = 10I_{tr}$ ):	5 A; 10 A
- Maximum current $I_{max}$ :	60 A (DIN terminal); 100 A (BS terminal)
- Overload:	400 %; 500 %; 600 %; 800 %; 1000 %; 1200 %; 1600 %; 2000 %
Working temperature range:	-40 °C to +70 °C
Mechanical class:	M1
Protection class:	IP53
Electromagnetic class:	E2

### 4.1 Additional technical characteristics

Type:	AMS B2
Constant of pulses:	
- testing output $k_{TO}$ :	From 1 to 30000 imp/kWh or kvarh (default value 5000 imp./kWh or kvarh);
Self-consumption:	
- of voltage circuit:	$\leq 3,0$ VA/1,7 W; $\leq 3,3$ VA/1,4 W;
- of current circuit:	$\leq 0,02$ VA;
Average temperature coefficient [%/K]:	$\leq 0,04$ %/K;
Weight:	$\leq 0,6$ kg;
Protection class:	IP53;

## 5 Metrological characteristics

Accuracy class: A or B (according to 50470-3)

**Supplementary Metrological characteristics:**

1 or 2 (according to EN 62053-21)

2 or 3 (according to IEC 62053-23);

**6 Results of conformity assessment**

By comparing the values observed on the instrument samples have been confirmed characteristics of the type of instrument with the Government Ordinance (Annex no. 1 “Basic requirements” and annex no. 5 “energy meters for measuring active energy” (MI-003)); EN 50470-1 and EN 50470-3 relating to the product.

The test results and findings are processed in the evaluation report No. NO-521/21/B/ER. These Protocols are stored in the file No. NO-521/21, and are annexes of this report.

**7 Data placed on the measuring instrument**

At each instrument, or in product documentation, according to Annex No. 1 to Government Ordinance, EN 50470-1 and EN 50470-3 shall be given at least the following information:

- Manufacturer name, trade name or register trade mark of the manufacturer, and settlement, place of business or address in state language;
- Marking of the type;
- Number of EU type examination certificate;
- Mark of conformity 'CE', the supplementary metrology mark "M";
- Number of phases and the number of wires for which the meter is determined (using a graphic symbol);
- Connection diagram;
- Serial number and year of manufacture;
- Reference voltage;
- Current measuring range;
- Reference frequency;
- Meter constant;
- Unit of measured energy;
- Accuracy class of the meter;
- Operating temperature range of the meter, or class environment;
- Insulation type (using the graphic symbol);

**8 Instrument protection**

Instrument prior to the D or F conformity assessment is secured following way:

- Protection against the penetration into the measuring system of energy meter is assured by two possible ways - sealing of a position of two screws with sealing wire and seal, by which the cover of energy meter is screwed to the base. (Sealing is performed after the verification of the energy meter is performed) and by ultrasonically welding the base with the cover and sticking over the connection so called “void” sticker or by two screws with blind plugs (using of sealing wire and seal is also possible).



- Protection against access to the meter terminal block is provided by sealing position of one screw that secure the terminal cover. (Sealing is performed after the electricity meter is plugged in the network).

## 9 Conditions for conformity assessment of produced meter with approved type

Measuring instruments placed on the market in accordance with procedure for conformity assessment according to the Annex No.2 (Module D or F) of Government Ordinance should be in compliance with the technical description by the item 3 of this Annex and at test should be in compliance with the requirements determined in Annexes No. 1 and No. 5 of Government Ordinance; EN 50470-1 and EN 50470-3.

A metrological test may only be performed by a producer, or a notified body respectively in line with the conformity assessment procedure according to the D or F Annexes of the Governmental ordinance respectively.

## 10 Requirements for the manufacture, installation and special conditions of use

### Installation data and installation requirements

Installation requirements are in the manufacturer's documentation referred to in Section 3.7.

### Terms of Use

The measuring instrument should be used within the recommendations of a producer or manufacturer: Operations manual for single-phase static energy meter AMS B2 (referred to in Section 3.7).

## 11 Maximum permissible error (MPE) of the meter type AMS B2

The total error under certain load must be calculated by the following formula:

$$e_c = \sqrt{e^2(I, \cos \varphi) + \delta^2(T, I, \cos \varphi) + \delta^2(U, I, \cos \varphi) + \delta^2(f, I, \cos \varphi)}$$

where:

- $e(I, \cos \varphi)$  = meter error at a certain load;
- $\delta(T, I, \cos \varphi)$  = additional error in % as a result of changes in temperature at the same load;
- $\delta(U, I, \cos \varphi)$  = additional error in % as a result of voltage changes at the same load;
- $\delta(f, I, \cos \varphi)$  = additional error in % as a result of frequency changes at the same load.

Single-phase static energy meter AMS B2; voltage 230V; current 0,25-5(60)A; frequency 50Hz; class B for active energy; constant 5000 imp./kWh; No. 01002402.





Total error rate in % for AMS B2 single-phase energy meter

$I_{\min} \dots I_{\max}$ PF=1;0,5i; 0,8k		±4,0 %	±3,5 %	±2,5 %	±2,0 %	±2,0 %	±2,5 %	±3,5 %	±4,0 %
Prúd	P.F.	-40°C	-25°C	-10°C	5°C	30°C	40°C	55°C	70°C
$I_{\min}$	1	<b>1,32</b>	<b>0,93</b>	<b>0,76</b>	<b>0,41</b>	<b>0,23</b>	<b>0,43</b>	<b>0,69</b>	<b>0,88</b>
$I_{tr}$	1	<b>1,27</b>	<b>1,07</b>	<b>0,77</b>	<b>0,43</b>	<b>0,25</b>	<b>0,42</b>	<b>0,70</b>	<b>0,89</b>
$I_{tr}$	0.5i	<b>1,26</b>	<b>0,93</b>	<b>0,72</b>	<b>0,39</b>	<b>0,27</b>	<b>0,46</b>	<b>0,69</b>	<b>0,87</b>
$I_{tr}$	0.8k	<b>1,31</b>	<b>1,05</b>	<b>0,79</b>	<b>0,44</b>	<b>0,22</b>	<b>0,41</b>	<b>0,69</b>	<b>0,92</b>
10. $I_{tr}$	1	<b>1,28</b>	<b>1,11</b>	<b>0,78</b>	<b>0,45</b>	<b>0,25</b>	<b>0,44</b>	<b>0,70</b>	<b>0,88</b>
10. $I_{tr}$	0.5i	<b>1,24</b>	<b>1,04</b>	<b>0,75</b>	<b>0,41</b>	<b>0,24</b>	<b>0,40</b>	<b>0,64</b>	<b>0,80</b>
10. $I_{tr}$	0.8k	<b>1,26</b>	<b>1,11</b>	<b>0,79</b>	<b>0,46</b>	<b>0,25</b>	<b>0,44</b>	<b>0,73</b>	<b>0,93</b>
$I_{\max}$	1	<b>1,31</b>	<b>0,83</b>	<b>0,83</b>	<b>0,56</b>	<b>0,26</b>	<b>0,38</b>	<b>0,77</b>	<b>0,89</b>
$I_{\max}$	0.5i	<b>1,26</b>	<b>1,11</b>	<b>0,91</b>	<b>0,54</b>	<b>0,23</b>	<b>0,54</b>	<b>1,05</b>	<b>1,66</b>
$I_{\max}$	0.8k	<b>1,34</b>	<b>1,26</b>	<b>0,84</b>	<b>0,62</b>	<b>0,41</b>	<b>0,49</b>	<b>0,73</b>	<b>0,70</b>

Assessment was performed by: Mr. Juraj Slučiak