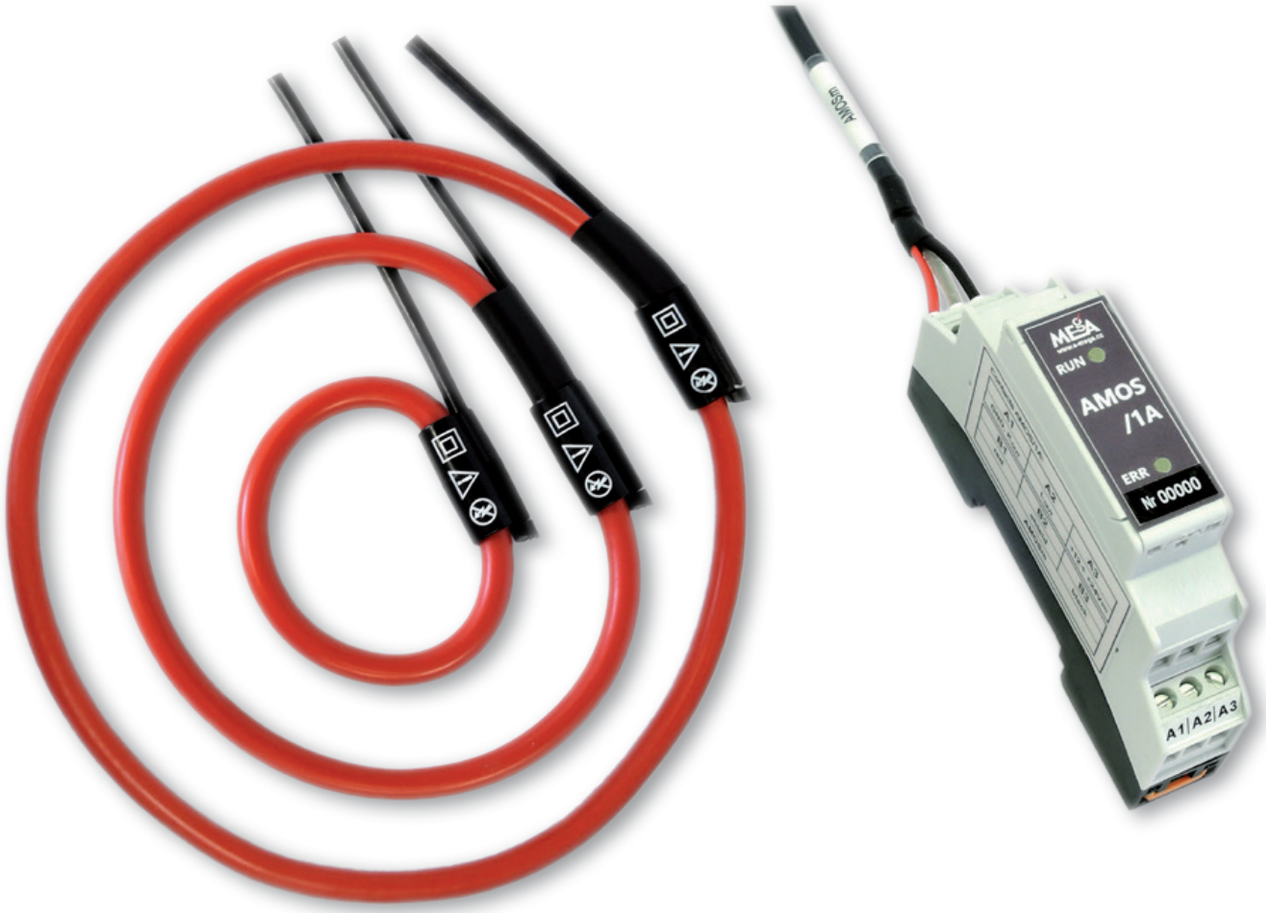
AMOS/1A single-phase flexible sensor with a current output

User manual



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AMOS/1A single-phase flexible sensor with a current output

DESCRIPTION

The AMOS/1A single-phase flexible sensor is designed for measurement of alternating current with the grid frequency. It includes a current output with the rated current of 1 A, which enables its connecting to measuring instruments with standard current inputs. It is designed for fixed measuring instruments in power supply facilities. It consists of two construction parts, a flexible part sensing the alternating current based on the Rogowski coil principle and a coder unit with the integrator and trans-resistance converter functions.

The flexible sensing part features low diameter, resistance against water and effects of outside alternating magnetic fields, good flexibility, a patented solution of discontinuity of the sensing part and a protected design of the closure. It is produced with three lengths of the sensing part, **AMOS M standard** with the sensing part length of 40 cm, **AMOS M long** with the length of 60 cm and **AMOS M short** with the length of 20 cm.

The converter unit has high efficiency even with the output power of 2.5 VA, a wide range of DC supply voltage and a compact design. The operating status of the flexible sensor AMOS/1A is signalled by the green **RUN** LED, overloading or an error state is signalled by the red **ERR** LED.

DESIGN

The AMOS/1A single-phase flexible sensor with current output is designed for primary currents of 100 A, 150 A, 250 A, 400 A, 600 A, 1,000 A, 1,500 A and 3,000 A.

The diameter of the flexible sensing part, with double insulation differentiated by colour, is 8 mm and the diameter of the free end of the closure is 10 mm. The positive direction of installation of the sensing part on a conductor with current to be measured is expressed by the symbol displayed on the closure, which also states CAT IV 300 V and the Safety Class II. It enables the safe use of the AMOS/1A sensor in transformer stations. The closure consists of two parts, which are completely inserted in each other in the operating state. The closure is provided with a flexible element with a lock to prevent loosening of the two parts.

The input cable of the sensing part has a standard length of 2 m. The cable has high voltage strength and is well flexible in the entire operating temperature range. It is marked with an AMOSm tag at its end and has three terminals differentiated by colour and provided with sleeve connectors (red, black and transparent - shielding) which are connected to the input terminals of the converter unit.

An optional plastic U-clip of a specified width to be slid onto busbar can be supplied for fixing the flexible sensing part on 10 and 5 mm wide busbars. Inserting the closure of the flexible sensing part into the clip groove secures the position of the sensing part on the busbar and reduces the direct contact of the sensing part of the flexible sensor with the busbar, which reduces possible temperature load of the sensing part. Also, the closure of the sensing part is protected against accidental disconnecting. A binding tape is used for fixing of the flexible sensing part on a segment-type or round conductor of a LV cable. A fixing tape installed above the flexible element of the closure is used to secure the closure of the flexible sensing part against accidental releasing. The use of the U-clip and the cable tie can be seen in Fig. 2 and Fig. 3.

The converter unit of the AMOS/1A single-phase flexible sensor with current output is designed for fixed installation on a TS35 DIN rail and has the width of a single module (18 mm). The converter unit has Safety Class III and, when installed according to the standard EN 61010-1, ed.2, it must be positioned in a defined safe aerial and surface distance from live parts. The converter unit has three **B** input terminals to which the flexible sensing part is connected, and three **A** terminals to which power supply and the output circuit with the rated current of 1 A are connected. The converter unit panel contains, in addition to the name and serial number of the instrument and the manufacturer's mark, two signalling LEDs, **RUN** and **ERR**. The side walls of the converter unit are provided with a label containing basic technical and legal information, and a label describing the connection of contacts, refer to Fig. 1.

TECHNICAL PARAMETERS

General

Rated input current I_n:	$100\,A_{AC}$, $150\,A_{AC}$, $250\,A_{AC}$, $400\,A_{AC}$, $600\,A_{AC}$, $1000\,A_{AC}$, $1500\,A_{AC}$, $3000\,A_{AC}$ [1)]
Rated output current I_n OUT:	$1\,A_{AC}$
Rated frequency:	50 Hz
Measuring range:	max. $1.25\,I_n$
Load impedance range:	$R_L = 0$ to $2.5\,\Omega$, to the common terminal
Band width:	2.5 kHz at $R_L = 1\,\Omega$
Maximum rated load S_{max}:	2.5 VA
Internal impedance of current output:	> 1 kΩ
Precision class:	0.5 %
Amplitude error:	≤ 0.5 % I_n for the range from 5 % to 120 % I_n
Phase error:	≤ 1 ° for the range from 5 % to 120 % I_n
FS safety factor:	2
Rated short-term thermal current I_{th}:	$10 \times I_{jm}$
Rated dynamic current I_{dyn}:	$2{,}5 \times I_{th}$

Note: [1)] A single value only

Power supply

Supply DC voltage U_N:	10 V_{DC} to 28 V_{DC}
Consumption at I_n and $R_L = 2.5\,\Omega$:	≤ 5 W
Idle consumption:	70 mA at $U_N = 12$ V 50 mA at $U_N = 24$ V
Overall efficiency at I_n and $R_L = 1.0\,\Omega$:	42 %
Overall efficiency at I_n and $R_L = 2.5\,\Omega$:	60 %

Environmental conditions

The single-phase flexible sensor with current output is designed for interior use

Altitude:	up to 2,000 m
Operating temperature:	-25 °C to +60 °C
Temperature range with non-destructive effects:	-40 °C to +70 °C
Relative humidity:	10 % to 95 %, non-condensing
Pollution degree:	2
IP rating:	IP20

Flexible sensing part

Sensing part length:	400 mm / 600 mm / 200 mm
Sensing part diameter:	8 mm
Diameter of inserted section of the closure:	10 mm
Permitted radius of bend of the sensing part:	≥ 20 mm
Supply cable length:	2 m [2)]
Supply cable diameter:	4.8 mm
Rated phase voltage of measured conductor:	230 V_{AC}
Maximum phase voltage of measured conductor:	300 V_{AC}
Measuring category:	CAT IV / 300 V, CAT III / 600 V
Impulse withstand voltage:	6 kV
Sensor safety class:	II, sensing part of AMOS/1A
Maximum temperature of conductor with measured current:	+120 °C
Insulation temperature class:	+120 °C

[2)] A maximum of 5 m can be ordered

[3)] The negative pole of the power supply is connected to the common terminal of the converter

Converter unit

Converter unit dimensions:	90 × 60 × 18 mm
Converter unit installation:	DIN rail, TS35
Converter safety class:	III, converter unit of AMOS/1A

Fig. 1: Data label and a label displaying the connecting of contacts of the AMOS/1A converter unit

Fig. 2: Fixing the flexible sensing part on the busbar using the U-clip

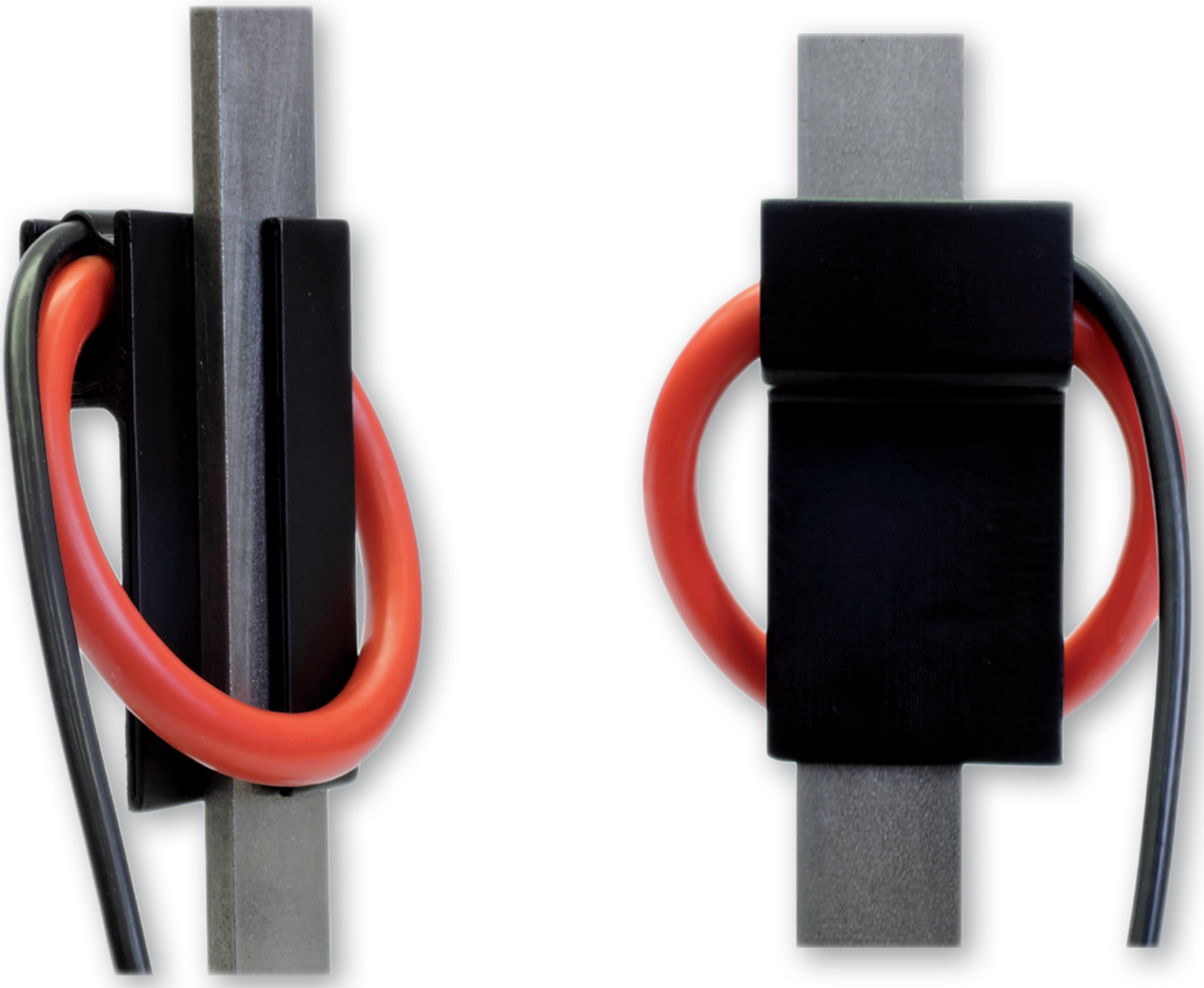


Fig. 3: Attaching the flexible sensing part on a conductor of an LV cable

CAUTION

The meaning of symbols used in the manual for the AMOS/1A single-phase flexible sensor with current output:

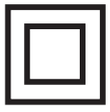
Warnings draw attention to facts presenting safety risks to the operator.

Cautions contain conditions and facts that can damage the AMOS/1A single-phase flexible sensor with current output

Do not install around non-insulated hazardous live conductors which can cause electrical shock, burning or arc discharge

CAT IV Overvoltage category, characterizing the state of transient overvoltage. General LV distribution network from a transformer station to fuses at the electricity meter

CAT III Overvoltage category, characterizing the state of transient overvoltage. General low-voltage installations in buildings behind fuses at the electricity meter.



Safety class II, double or increased insulation

IP code Degree of ingress protection

The product is intended for recycling and collection points

CE Declaration of Conformity – European Community

INSTALLATION AND COMMISSIONING

Any use of the AMOS/1A single-phase flexible sensor with current output in a way not specified by the manufacturer can impair protection provided by the AMOS/1A sensor.

- Installing the AMOS/1A flexible sensor with current output on live conductors may only be done on a voltage-free system.
- The AMOS/1A single phase flexible sensor with current output can be positioned on live parts of LV circuits as well
- Installation and removal of the AMOS/1A flexible sensor in hazardous environments may only be performed by qualified personnel equipped with personal protection equipment against risk of electric shock and trained in providing first aid.
- In **CAT III** installations it is not permitted to connect the AMOS/1A flexible sensors to phase voltages higher than 600 V_{AC}, otherwise there is a risk of electric shock.
- In LV grids between MV/LV transformers and clients' electric meters characterized by the overvoltage category of **CAT IV** it is not permitted to connect the AMOS/1A flexible sensors to phase voltages higher than 300 V_{AC}, otherwise there is a risk of electric shock.
- In case of a mechanical damage, even to just the top layer of the insulation of the flexible sensing part, which can show by a change in colour of the

sensor section surface, such a damaged AMOS/1A flexible sensor must be immediately disassembled and sent for repair.

- The AMOS/1A flexible sensors may only be maintained and repaired by the manufacturer or service organizations trained by the manufacturer.

Accessories for installation of the AMOS/1A flexible sensor shall be prepared before the start of installation

Binding and securing tapes shall be prepared for installation of the flexible sensing part on a segment conductor of a LV cable or on a round-section conductor. A corresponding U-clip shall be prepared for installation of the flexible sensing part on 5 or 10 mm wide busbars.

Installation of a single or three flexible sensors and possibly an MEg101.7 power supply on TS35 DIN rail requires preparation of a DIN rail of the overall length determined by summing up the data from the Measurement and Power Supply columns.

Measurement		Power supply
single-phase	three-phase	MEg101.7
$18 + 20^{*)} = 38$ mm	$3 \times 18 + 20^{*)} = 74$ mm	108 mm

*) Each side of a DIN rail is provided with a 10 mm high edge with an opening designated for its attachment on panel.

Note: In practice, a three-phase measurement set with AMOS/1 A flexible sensors can be used with a MEg44DIN measuring instrument (108 mm) with a MEg101.4 direct current power supply (108 mm). The length of the entire set is $(3 \times 18 + 20) + 108 + 108 = 290$ mm.

Installation procedure:

1. Switch off voltage of the LV box and check the voltage-free state according to local operating instructions.
2. Check that the value of rated current of the AMOS/1A single-phase flexible sensor with current output stated on the data label of the converter unit matches the rated value of current measured at the place of measurement.
3. Check correct connection of the sensing part cable leads with the **B** terminals of the converter unit. Red lead – **B1**, transparent lead (shielding) – **B2**, black – **B3**.
4. Deflect the flexible element of the closure of the flexible sensing part, slide the free end of the closure out of the closure part with the cable and wind the free end around the conductor with current to be measured according to the arrow on the pictogram indicating the direction of current.
5. Insert the free end of the closure of the flexible sensing art into the part of the closure with the cable.

6. a) When measurement is installed on a segment-type conductor or a round-section conductor, insert a securing tape above the flexible section of the closure, wind it around the closure and tighten. This action will prevent accidental releasing of the closure, securing the correct inserting of both parts of the closure.

   Use the binding tape to attach the closed coil of the flexible sensing part to a selected point of a measured conductor by the side opposite to the closure so that the closure is isolated from other conductors with flowing alternating current.

   b) The procedure described in a) can be used for installation of measurement on a busbar. A U-clip of he corresponding width can be inserted at a selected point onto a 5 or 10 mm busbar. The closure of the flexible sensing part is inserted into the groove of the set U-clip. The shape of the clip limits possible direct contact with the busbar, and the inserted closed closure of the flexible sensing part is secured against accidental opening.

7. Horizontally attach a DIN rail with openings in the 10 mm long side edges at a suitable place on the vertical wall of the box no further than 2 m from the place of attachment of the coil of the flexible sensing part. Screws or rivets shall be used for attachment of the DIN rail on the LV box.

8. Set a converter unit or units on the DIN rail.

9. Connect the negative (grounded) pole of supply voltage to the **A1** contact of the converter unit, and connect the positive pole of supply voltage in the range between 10 to 28 V to the **A3** contact of the converter unit.

10. The **A1** and **A2** contacts of the converter unit are the output contacts of the AMOS/1A flexible sensor with the rated current value of 1 A. The measuring **K** pole is grounded on the **A1** contact common with the grounded terminal of the negative power supply, and the measuring **L** pole is on the **A2** contact, corresponding to the end of the secondary current circuit.

Example of connecting three AMOS/1A flexible sensors to the MEg101.7 source with recommended connection components is shown in Fig. 6.

The power supply of the MEg101.7 source can also be used with three-phase connection by connecting the voltage phases L2 and L3 to the power clips 25/L2 and 27/L3.

A front view of the converter unit and the procedure for opening and closing the closure of the flexible part of the AMOS/1A sensor are illustrated on the back page of the manual.

When disconnecting the coil, the flexible element is deflected from the axis of the sensing part. Thanks to the flexibility of the coil, it is possible to disconnect it with one hand.

Commissioning

When supply voltage at the **A1** and **A3** of the installed flexible sensor is switched on, the **RUN** LED goes on and the converter unit supplies the connected output current circuit with current corresponding to current measured by the flexible part of the sensor.

If the load resistance R_L is higher than 2.5 Ω, deformation of output current can occur.

Even when the output current circuit of the AMOS/1A flexible sensor is disconnected at the **A1** and **A2** terminals, there is no risk of a failure or overheating of the AMOS/1A flexible sensor.

The **RUN** LED signals the function and power supply to the converter unit.

The **ERR** LED signals thermal overloading or insufficient or unbalanced supply voltage.

MAINTENANCE REQUIREMENTS

⚠ Repairs of the AMOS/1A single-phase flexible sensor with current output during the warranty period may only be carried out by a manufacturer's skilled and trained person or by the manufacturer's service organizations. For the contact information of the manufacturer's service, visit www.e-mega.cz.

The AMOS/1A single-phase flexible sensor with current output shall not be exposed to the impact of chemical substances.

The AMOS/1A single-phase flexible sensor with current output shall only be transported in its original packaging

When contaminated, the AMOS/1A single-phase flexible sensor with current output shall be thoroughly cleaned using a cloth, without any cleaning agents.

DISPOSAL

When the AMOS/1A single-phase flexible sensor with current output is put out of operation, it shall be recycled in waste collecting facilities according to applicable regulations for handling of electronic waste.

WARRANTY

It is not permitted to disassemble the AMOS/1A single-phase flexible sensor with current output during the warranty period.

The AMOS/1A flexible sensor is covered by a 24-month warranty from the date of purchase, however no longer than 30 months from the date of release from the manufacturer's warehouse. Defects originating during this period as a demonstrable result of defective design, manufacturing or using improper material will be repaired free of charge by the manufacturer or its service organization.

The warranty becomes void if the user carries out unauthorized modifications or changes on the AMOS/1A single-phase flexible sensor with current output or connects it improperly or in the case of incorrect or rough handling or if the equipment is operated in discord with the stated technical conditions and user description.

Defects on the AMOS/1A single-phase flexible sensor with current output and its accessories originated during the warranty period shall be claimed by the user with the manufacturer or with the service organization authorized by the manufacturer.

The manufacturer bears no responsibility in any case for subsequent damages caused by using the AMOS/1A single-phase flexible sensor with current output. Under no circumstances this warranty gives rise to manufacturer's liability exceeding the price of the AMOS/1A single-phase flexible sensor with current output.

LIST OF COMPONENTS OF THE AMOS/1A SINGLE-PHASE FLEXIBLE SENSOR WITH CURRENT OUTPUT

1 pc AMOS/1A single-phase flexible sensor with current output

1 pc securing band of the closure of the flexible sensing part of AMOS/1A: WT-100MC-UV (100 × 2,5 mm)

1 pc binding band of the flexible sensing part of AMOS/1A for attachment on cable: WT-300HD-UV (300 × 7,6 mm)

Optionally:

n pc U-clip for 5 mm thick busbar

n pc U-clip for 10 mm thick busbar

n pc binding band of the flexible sensing part of AMOS/1A for attachment on cable: WT-300HD-UV (300 × 7,6 mm)

1 pc power supply MEg101.7 / 24 V

1 pc TS35 DIN rail of specified length with openings for fixing.

ORDERS

An order must contain the following information:

- Quantity of AMOS/1A single-phase flexible sensors with current output.
- Length of sensing part (short – 20 cm, standard – 40 cm, long – 60 cm).
- Rated current I_n (100 A, 150 A, 250 A, 400 A, 600 A, 1,000 A, 1,500 A, 3,000 A)
- Requested optional accessories

MANUFACTURER

MEgA – Měřící Energetické Aparáty, a.s.
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664 31 Česká
Czech Republic
tel. +420 545 214 988
e-mail: mega@e-mega.cz
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Fig. 4: Assembly of the AMOSm/1A

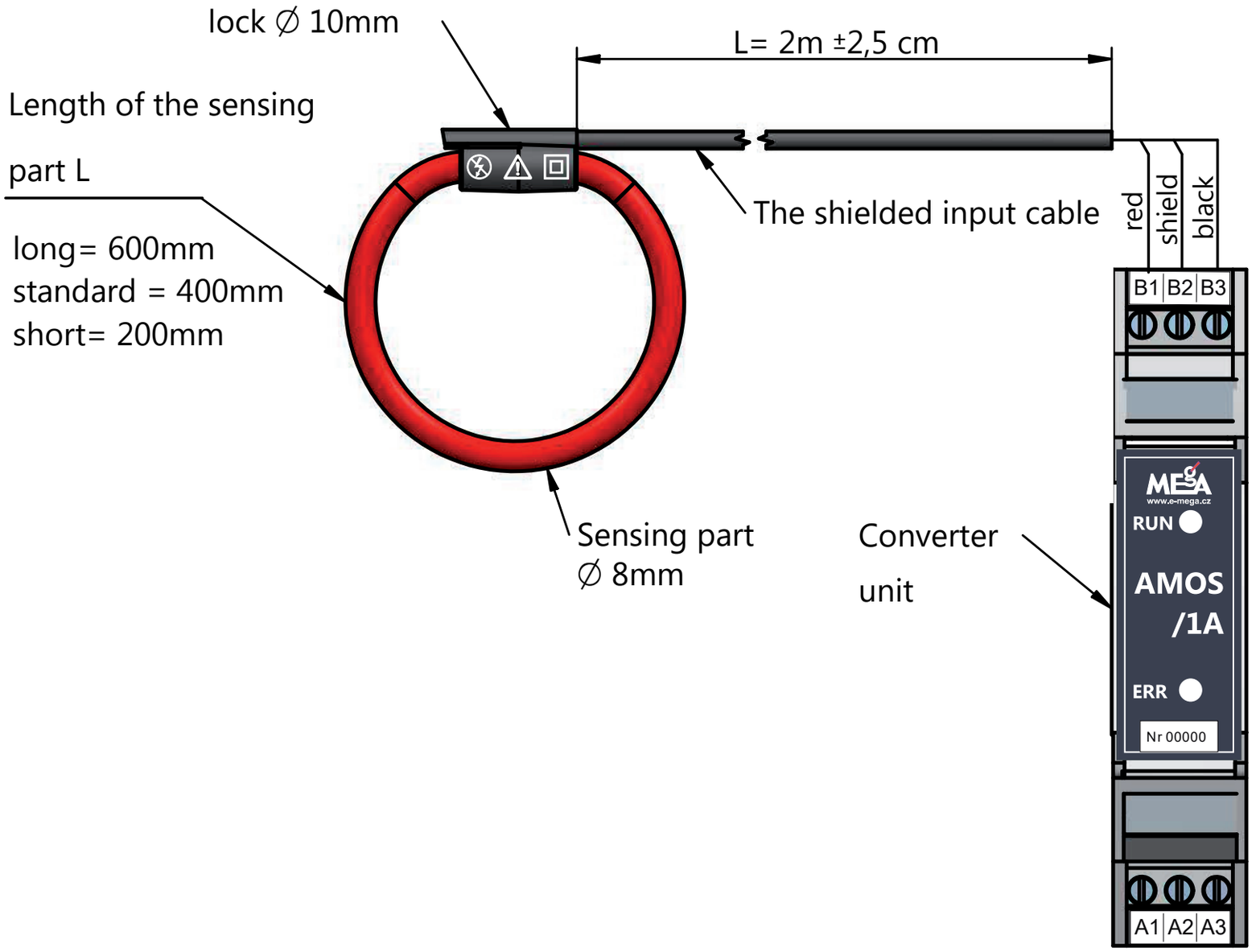


Fig. 5: Drawing with dimensions of the converter unit

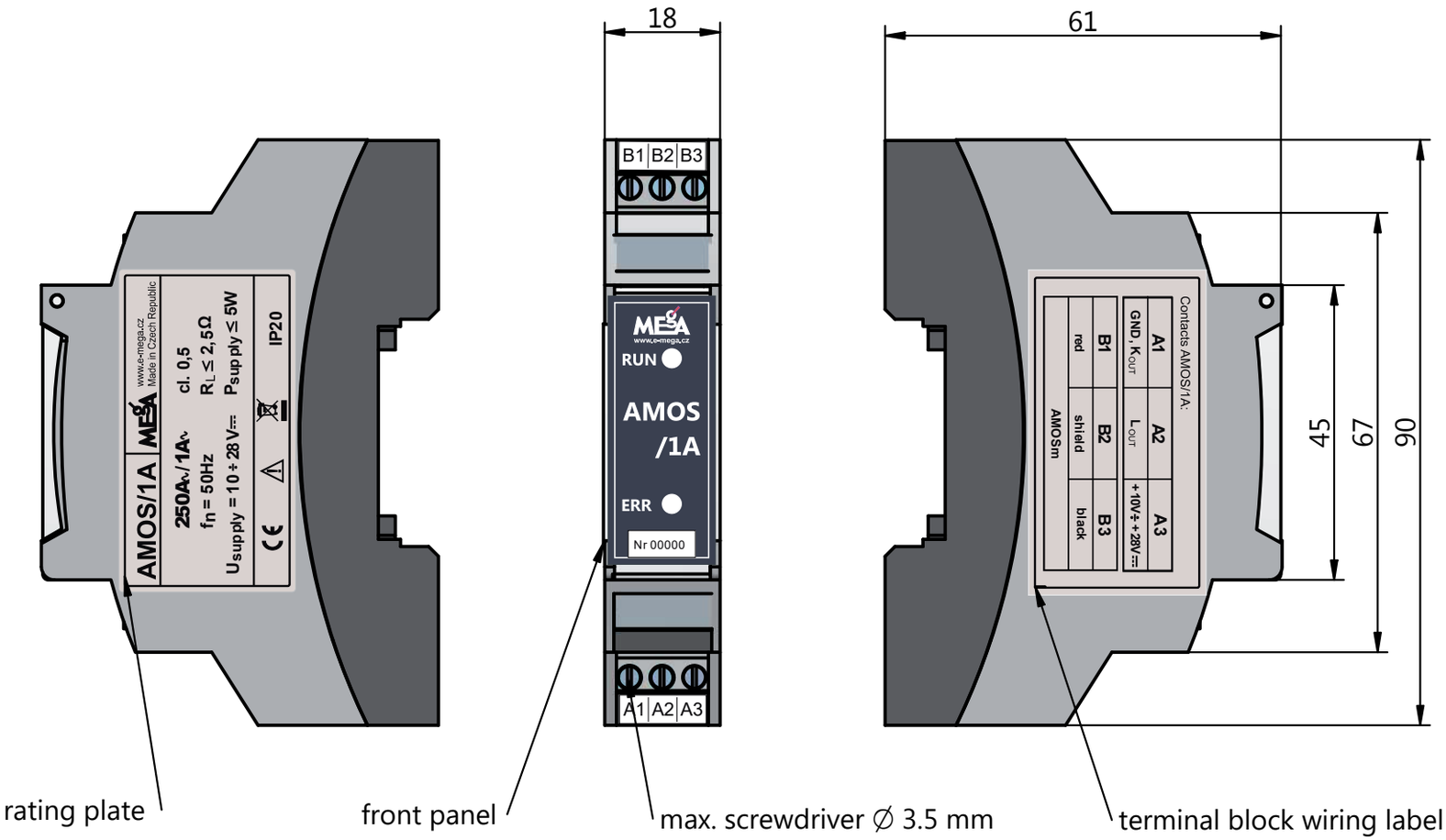
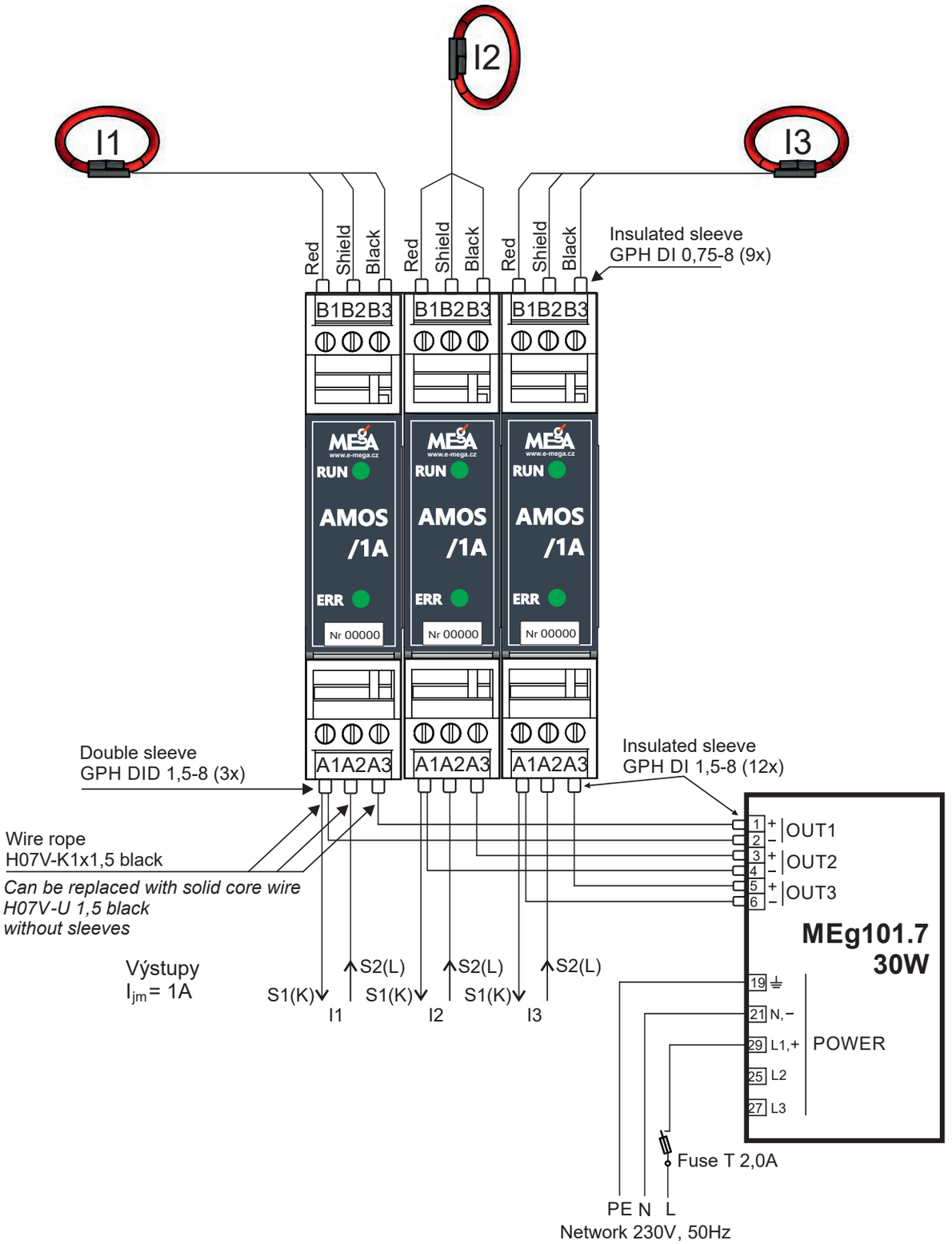


Fig. 6: Connection of AMOS/1A sensors to the MEg101.7 source



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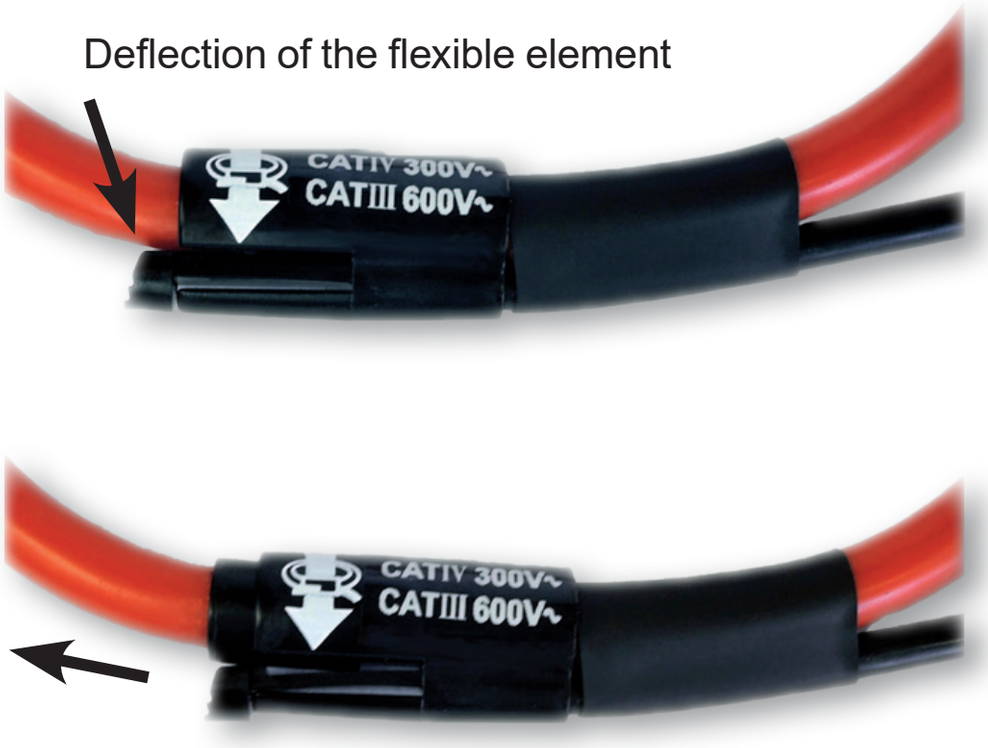

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