



Portable PQ monitor MEg38 set



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1/ INTRODUCTION

The portable PQ monitor MEg38 set is intended for measuring and recording up to four voltages and four currents, active and reactive powers and energies in three-phase LV, MV and HV networks. It analyses voltage quality parameters on the voltages inputs U1, U2 and U3 in accordance with ČSN EN 50160 ed.3 and measurement methods of class S of ČSN EN 61000-4-30 ed.2. In the functions of quality measurement and recorder, it evaluates all quantities without gaps and interruptions. The MEg38 set can be used also for oscillographic recording of measured quantities.

The PQ monitor MEg38 set consists of three units. The measuring unit MEg38/M with USB2.0 communication and galvanically isolated RS485 communication has automatic identification of connected current sensors. You can choose between flexible sensors AMOSm and clamp-on current transformers MT-ChA whose measuring ranges are chosen programmable. The unit MEg38/M is placed in an all-plastic, waterproof and insulating case provided with a polyurethane sleeve to increase resistance to mechanical shocks. The unit MEg38/M is characterized by small dimensions and met requirements for the measurement category IV and increased insulation. This together with the AMOSm sensors or clamp-on transformers MT-ChA allows direct measurements on live parts in up-to-date space-saving LV boxes. To measure secondary currents of instrument current transformers, use clamp-on transformers MT-ChA.

The measuring unit MEg38/M is power supplied by the interruptible power supply unit MEg38/Z with the voltage $12V_{DC}$ or by three-phase uninterruptible power supply unit MEg38/N when the measurement is required also during voltage interruptions. The unit MEg38/N includes also GPRS remote communication, GPS time signal receiver, galvanically isolated RS485 communication and input and output two-state signal. In areas with insufficient GSM signal or GPS signal intensity, you can install the power supply unit MEg38/N in a suitable place using a cable extension. Through RS485 technological communication, you can connect the MEg38 set or the separate unit MEg38/M to a local information system.

2/ PRINCIPLE OF MEASUREMENT

Measured voltages and currents are sampled in parallel with a frequency of 256 times higher than the frequency of the supply network and the phase lock loop is controlled by the U1 channel voltage.

The frequency measurement is derived from the U1 channel voltage after higher frequency components are filtered out. Beside the standard prescribed evaluation of ten-second frequency values, the frequency value for 10 minutes is calculated based on the arithmetic mean.

During 10-period windows follow-up without delays, the frequency analysis is carried out for 128 harmonic and 128 centred interharmonic groups of all measured quantities.

40 harmonics are used to evaluate quality parameters of the voltages U1, U2 and U3 in class S.

To evaluate all ten-minute values, aggregation is applied using the square root of the arithmetic mean of the squares of 10-period values.

The ten-minute voltage value is aggregated from all 10-period voltage values, whose measurement was started in the evaluated ten-minute interval.

At the same time, a positive and negative voltage deviation is aggregated in the ten-minute interval from the 10-period voltage values. The positive deviation is evaluated from 10-period values higher than the agreed voltage value and the negative value from 10-period values lower than the agreed voltage value.

Negative and positive sequence components of the three-phase voltage, from which the voltage unbalance value is aggregated for the 10-minute interval, are evaluated from 10-period voltage values according to a standardized relation. Identically, the current unbalance is calculated from the currents I1, I2 and I3.

Components of individual harmonic voltages and currents are evaluated in the monitor MEg38/M of class S for 40 harmonics. The ten-minute value of each harmonic component is aggregated from 10-period values of the harmonic component and adjacent interharmonic components.

The same procedure is used to evaluate ten-minute values of centred interharmonic groups when all interharmonic components existing between the individual harmonics except for interharmonic components adjacent to harmonic components are aggregated into the individual groups.

The signal is calculated in MEg38/M from four interharmonics components being closest to the load management system signal frequency. A three-second value is aggregated from fifteen successive 10-period values. The three-second values are compared with the maximum allowable value for 24 hours.

The measuring unit MEg38/M measures and evaluates short-term flicker level P_{st} for the voltages U1, U2 and U3 in class S according to IEC 61000-4-15 ed. 2, and then the long-term flicker level P_{lt} is evaluated.

An active and reactive power and then active and reactive energy are evaluated from the values calculated in the frequency domain. During calculating the reactive energies, inductive and capacitive reactive energies are evaluated at delivery or consumption of the active energy. The designation of energies recorded in the set of six registers respects the defined quadrants of the active and reactive energy according to IEC 62053-23.

Voltage events are evaluated in the monitor MEg38/M from the voltages $U_{\text{rms1/2}}$ calculated over a half period for the elapsed period. Voltage dips, overvoltages and interruptions are evaluated with the time of origin of events, duration and residual or maximum voltage, as specified in the standard. Besides, courses of the voltage $U_{\text{rms1/2}}$ and currents are recorded up to the preset maximum time interval, including pre-trigger and post-trigger in length of 50 periods. When a voltage event occurs, the function “flag” is enabled, which indicates continuous phenomena prescribed by the standard.

The monitor MEg38/M evaluates also interruptions of the measurement due to loss of power.

In the function of recorder, average values of all selected measured quantities are recorded for a preset measuring interval from 1 sec to 15 minutes, including harmonics up to order 64, which are evaluated without gaps and interruptions. They are either the phase voltages U1, U2, U3 or U4 or delta voltages U12, U23 and U31, phase currents I1, I2, I3 and I4, active phase powers P1, P2 and P3, reactive phase powers Q1, Q2 and Q3, apparent phase powers S1, S2 and S3, true power factors PF1, PF2 and PF3, selected harmonic components of phase voltages and currents up to order 64.

3/ TECHNICAL PARAMETERS

Reference conditions

Ambient temperature:	23 °C ± 2 °C
Relative humidity:	40 % až 60 %
Counter-clockwise system of voltages U1, U2, U3	

Measuring unit MEg38/M

Frequency

Measuring range:	42,5 Hz to 57,5 Hz
Measurement uncertainty:	± 10 mHz

Voltage measurement U1 - U3 LV

Nominal voltage $U_{\text{nom}}^{1)}$:	230 V	MV and HV	100 V
Measuring range:	$2 U_{\text{nom}}$		$2 U_{\text{nom}}$
Measurement uncertainty:	0.05 % of value + 0.1 % U_{nom}		0.05 % of value + 0.1 % U_{nom}
Temperature coef. / 10 °C:	0.05 % U_{nom}		0.05 % U_{nom}

Note: ¹⁾The range is selected electronically

Flicker, U1 - U3

Measuring range: 0,4 to 4,0

Measurement uncertainty: $\pm 7.5\%$ of value

Voltage dips and overvoltages U1 - U3

Measuring range²⁾: $5\% U_{nom}$ to $140\% U_{nom}$, 0.02 sec to 60 sec

Measurement uncertainty: $\pm 0.5\% U_{nom}$, ± 20 msec

Voltage interruptions U1 - U3

Measuring range²⁾: 0.02 sec to 180 sec

Measurement uncertainty: ± 20 msec

Voltage unbalances U1 - U3

Measuring range: 1 % to 5 % u_2

Measurement uncertainty: $\pm 0.1\%$

Voltage harmonics components U1 - U3

Measuring range: 10 % to 100 % of class 3 EN 6000-2-4 ed. 2 (tab. 2, 3 & 4)

Measurement uncertainty: half of class II. ČSN EN 61000-4-7

Voltage interharmonics components U1 - U3

Measuring range: 10 % až 100 % of class 3 ČSN EN 6000-2-4 (tab. 2, 3 & 4)

Measurement uncertainty: half of class II. ČSN EN 61000-4-7

Level of voltage signals in supply voltage U1 - U3

Measuring range: 1 % to 15 % U_{nom}

Measurement uncertainty: $\pm 5\%$ of value from $3\% U_{nom}$ to $15\% U_{nom}$

$\pm 0.1\% U_{nom}$ from $1\% U_{nom}$ to $3\% U_{nom}$

Voltage deviations U1 - U3

Parameters to measure deviations are in accordance with parameters to measure voltages U1 - U3.

Current measurements I1 - I4³⁾

Measuring range: 0 % to 120 % I_{nom}

Measurement uncertainty: $0.1\% I_{nom}$

Temperature coefficient: $0.05\% I_{nom} / 10^\circ\text{C}$

Shape coefficient: up to 2.0

Current harmonics I1 - I3

Measuring range: 10 % to 100 % of class 3 ČSN EN 6000-2-4 ed. 2

Measurement uncertainty: class II ČSN EN 61000-4-7

Active power, active energy³⁾

Measurement uncertainty: class B in each of four quadrants of the technical metrology regulation TPM 2440-08 ČMI

Reactive power, reactive energy³⁾

Measurement uncertainty: according to Tab. 8 f), class 0.5 in each of four quadrants of the technical metrology regulation TPM 2440-08 ČMI

Data memory:	128 MB, type NAND
Voltage input impedance:	1.5 M Ω
Power supply:	from 8 V _{DC} / 150 mA to 15 V _{DC} / 100 mA
Operating temperature:	-25 °C to +60 °C (also from OFF state)
Communication interface:	USB 2.0, RS485
Dimensions:	155 × 104 × 36.5 mm, with connectors 175 × 125 × 36.5 mm
Weight:	0.45 kg (measuring cables 1.5 m)
Ingress protection rating:	IP65
Measurement category:	CAT IV
Version:	Increased insulation

Notes: ²⁾ For uninterruptible power supply ³⁾ Without sensors

Power supply MEg38/Z

U _{IN} :	230 V ± 10 %, 50 Hz, 12 W
U _{OUT} / I _{OUT} :	12 V _{DC} / 500 mA
Operating temperature:	0 °C to + 50 °C
Dimensions:	65 × 50 × 45 mm (80.5 mm – plug)
Weight:	0.3 kg
Ingress protection rating:	only for indoor use

Feeder MEg38/N

U _{IN} for power supply inputs U1, U2, U3:	85 V to 460 V, 50 Hz, 5 VA
U _{OUT} / I _{OUT} :	9 V _{DC} / 150 mA
Duration of uninterruptible power supply of MEg38/M: 1 min (without GPRS data transfer and GPS synchronisation)	

Input:

galvanically isolated
 IN–: 0 V
 IN+: 12 V
 Insulation voltage: 1 kV

Output:

galvanically isolated switching contact
 max. DC/AC voltage: 30 V
 max. switched current: 1 A
 max. switched power: 30 W

Operating temperature:	- 25 °C to + 60 °C
Communication interface:	USB 2.0, RS485
GPRS communication:	GSM 900 / 1800 MHz, GPRS class 10 Supported protocols UDP, TCP, IEC60870-5-104
Dimensions:	155 × 104 × 35.5 mm, with connectors 175 × 125 × 35.5 mm
Weight:	0.8 kg
Ingress protection rating:	IP 65
Version:	Increased insulation

Current sensor AMOSm

Rated current $I_{nom}^{4)}$:	10 A, 30 A, 100 A, 300 A, 1000 A
Linearity error:	0.5 % I_{nom} for $I_{nom} = 10 A$ 0.2 % I_{nom} for $I_{nom} = 30 A$ to 3000 A
Basic error:	1.0 % I_{nom} (for correct position of closure)
Additional error of closure position:	1.0 % I_{nom}
Frequency error:	0.5 % I_{nom} for f from 50 Hz to 400 Hz 1.0 % I_{nom} for f from 40 Hz to 50 Hz, 400 Hz to 2000 Hz
Phase error:	2° for f from 50 Hz to 1000 Hz
Loop length:	30 cm
Loop diameter:	8 mm
Diameter of free part of closure:	10 mm
Permitted radius of loop curvature:	> 20 mm
Temperature:	-25 °C to +60 °C
Rated voltage of measured current wire without its own insulation:	230 V
Ingress protection rating:	IP65
Measurement category for sensor loop:	IV
Safety class of the version:	II

Note: ⁴⁾ The range is selected electronically.

Clamp-on transformer MT-ChA

Rated current $I_{\text{nom}}^{4)}$:	5 A, 1 A
Range of measurement:	5 % to 120 % I_{nom}
Error:	0.5 % of range for $I_{\text{nom}} = 1 \text{ A}$ 0.2 % of range for $I_{\text{nom}} = 5 \text{ A}$
Phase shift:	$\leq 0.5^\circ$ for $f = 50.0 \text{ Hz}$
Frequency error:	0.2 % of range for $f = 40 \text{ Hz}$ to 100 Hz 1.0 % of range for $f \leq 1 \text{ kHz}$
Measurement category:	300 V, CAT IV 600 V, CAT III
Double insulation	
Dimensions:	135 × 51 × 35 mm
Max. diameter of measured wire:	20 mm
Weight:	0.2 kg
Consumption:	5 $V_{\text{DC}}/5 \text{ mA}$

Note: ⁴⁾ The range is selected electronically.

4/ CONSTRUCTION OF THE SET MEG38

The PQ monitor MEg38 set consists of three units and two types of electric current sensors, from which two differently powerful sets can be assembled. The MEg38/M is a measuring unit, the MEg38/N is an uninterruptible power supply unit including GSM communication and GPS receiver, and the MEg38/Z is an interruptible power supply unit for MEg38/M.

The MEg38 set assembled from the units MEg38/M and MEg38/N including accessories is designed to meet the rated voltages up to 300 VAC, requirements of the measurement category IV and increased insulation. In this way, demanded safety of the operator and high reliability of the function is ensured even when it is measured in unprotected LV circuits of stations and substations. This set is also waterproof and dustproof, with increased overvoltage immunity. The set of the units MEg38/M and MEg38/N can be used advantageously for measurements in areas without GSM and GPS signals when the units are interconnected through one extension cable and the unit MEg38/N with antennas is located in an area with HF signals of both the systems. The set of MEg38/M and MEg38/N is equipped with a galvanically isolated input and output signal.

The set of MEg38/M and MEg38/Z is cheaper and more space-saving. It allows you to realize measuring methods of class S with no possibility to measure when the supply voltage is interrupted. Without additional measures, it is not designed for measurements in unprotected LV circuits and as well parameters of the working environment are more moderate.

Both of the sets can be connected into a local technological network via RS485 communication interface.

The units MEg38/M and MEg38/N have connectors and terminals located only on the top and right side, which allows you to install them both horizontally and vertically. Since the preferred and mechanically more stable position is horizontal, their indicating elements are on the right side to be more often visible during installation of the measurements.

To measure currents, flexible sensors AMOSm and clamp-on transformers with MT-ChA compensation are intended. Both of the sensor types can measure currents of live parts. The sensors AMOSm are used for alternating currents from 10 A to 3000 A, the clamp-on transformers MT-ChA derived from the clamp-on transformers Chauvin-Arnoux are used for measuring currents of rated value 1 A to 5 A.

The clamps MT-ChA can be used also for indirect current measurements in secondary circuits of instrument current transformers. To the inputs I1 -I3 and I4, various types of current sensors can be independently connected.

All components of the MEg38 set have insulating, waterproofing surface and are frostproof, and the measuring and power wires, including used permanently installed cables are with double insulation and are intended to be installed in LV boxes.

4.1 Measuring unit MEg38/M

The measuring MEg38/M according to Fig. 1 has three waterproof connectors on its top side. The first from the left is a Mini USB Buccaneer, then it is a connector to connect a triple of flexible sensors AMOSm or a triple of clamp-on transformers MT-ChA to measure the currents I1 -I3, and the last is a connector to measure the current I4 using the flexible sensor AMOSm or clamp-on transformer MT-ChA. From the right side of the measuring unit MEg38/M, a power and communication connector goes out for the supply voltage $12 V_{DC}$, RS485 communication interface and GPS time synchronisation signal. Five measuring cords long 1.7 m with double frostproof insulation go out through a waterproof grommet under this connector. Four red cords terminated with safe banana plugs are labelled U1, U2, U3 and U4 at their ends. The black cord terminated with a safe banana plug is labelled N at its end.

There are five LEDs on the right side of the unit MEg38/M in a vertical row. The upper, separately located, orange LED labelled RUN indicates the correct function of all measuring functions of the unit by permanent lighting. The LED RUN goes out shortly to indicate that measured data are read when the measurement is interrupted. The LED RUN indicates oscillographic recording of the measured quantities without measuring functions by alternate lighting.

Four green LEDs U1, U2, U3 and U4 indicate by permanent lighting that input voltages are in the preset tolerances. If the measured voltage is outside the preset tolerances, the cor-

responding LED flashes alternately. If the measured voltage is in the range of interruption, the corresponding LED does not light.

The designation MEg38/M is on the front panel of the unit. The identification on the rear panel includes information about the manufacturer and the prescribed information about the product including the supply voltage input and protection. There is also a section with serial numbers of the units and current sensors, with which the PQ monitor MEg38 set was calibrated.

The total length of cables of the triple of current sensors and the individual current sensors is 1.7 m. The measured currents are labeled at the connector, mandatory data are given as well, including the serial number (S.N.). The flexible sensors AMOSm have a digit in the arrow showing the positive direction, indicating an order number of the measured current.

Beside the serial number and mandatory data, the clamp-on transformers MT-ChA have also the positive current direction indicated by an arrow with an integrated order number of the measured current. Cables are provided with insulation suitable to be used in LV boxes.

The triple of sensors has a common cable long 0.2 m at the beginning, followed by a plastic hub, from which three cables go out long 1.5 m and terminated with firmly attached current sensors.

The connectors on the measuring unit MEg38/M do not allow confusion of connected accessories. During the programming process, connected sensors are tested, which allows to select their measuring ranges by SW. The voltage inputs are also selected by SW for LV or MV and HV range.

4.2 Uninterruptible power supply unit MEg38/N

There are four connectors on top of the unit MEg38/N, the first from the left is the USB communication connector intended for local operation and service. The following connector allows you to connect external antennas of GSM and GPS systems. The third connector in row is for local, technological, galvanically isolated communication via RS485 interface. The last fourth connector is used to connect the galvanically isolated input and output signal.

There is a connector with the uninterruptible $12V_{DC}$ supply voltage, internal RS485 communication and GPS signal on the right side up. There is a waterproof bushing with four power frostproof, double insulated cords long 1.7 m under the power connector on the right side. Three red power cords are provided with safe banana plugs at their ends, they are labelled U1, U2 and U3. The fourth black power cord is also provided with a safe banana plug at its end and is labelled N.

There is a LED RUN on R.H. side of the unit MEg38/N indicating the mains power supply and operating conditions of the unit. The power supply is indicated by long lighting and the operating conditions by subsequent one or more flashings. If there is no power from supply

network and the set MEg38 is power supplied from the internal accumulator, no longer lighting is generated and there are longer gaps between the flashings. One flashing indicates a correct operating condition of the unit MEg38/N, two flashings indicate a function failure of GSM, three flashings indicate a function failure of RS485 communication and four flashing indicate a function failure of GPS.

The unit MEG38/N is also provided with a polyurethane sleeve in a different colour.

By default, there is a five-wire power cable long 0.2 m, terminated with a pin connector on the side to MEg38/N and with a socket connector on the side to MEg38/M.

If necessary, you can move the unit MEg38/N away from the place of measurement using an extension interconnecting cable long 10 m.

4.3 Power supply MEg38/Z

The power supply unit MEg38/Z, see Fig. 3, is a modified AC-DC adapter with installation to a LV socket with the output voltage $12 V_{DC}$ and the power 6 VA. The power supply unit has a connector on its 1.7 m long cable to connect the supply voltage to the unit MEg38/M. There are information about the input and output of the power supply unit given next to the serial number on the label of the power supply unit MEg38/Z in addition to the mandatory information about the manufacturer and the product.

The red LED indicates that the supply voltage is connected.

Warning!

For the interruptible power supply of the measuring unit MEg38/M, only the power supply unit MEg38/Z delivered by the manufacturer can be used. If another type of the power supply is used, the accuracy and especially safety of measurement is not guaranteed.

5/ ASSEMBLY, INSTALLATION

5.1 MEg38/M and MEg38/Z set

In areas without water influence, at positive temperatures and single-phase power supply from protected LV circuits, the set of the measuring unit MEg38/M and the power supply MEg38/Z can be used to record electric quantities and measure the voltage quality without measuring events when the AC supply voltage drops under 140 V. This system allows also technological communication via galvanically isolated RS485 interface.

To assemble the set, connect the cable connector of the power supply unit MEg38/Z to the powered connector $12 V_{DC}$ of the measuring unit MEg38/M and plug the power supply unit into the protected LV socket. The red LED lights up on the power supply and the orange LED RUN lights up permanently on the measuring unit MEg38/M.

5.2 MEg38/M and MEg38/N set

The set of the measuring unit MEg38/M and the power unit MEg38/N must be used for measurements at negative ambient temperatures, in the environment with dust or condensation or water influence, when GPRS remote transmission of measured data and remote programming of the measurement is used when GPS signal time synchronisation is required or two-state input or output signal is used. It is possible also in this set, to use local technological communication via RS485 interface, however in this case of the power supply unit MEg38/N, where are extended possibilities like use of addressing, compression or preprocessing of the measured data.

To assemble the set, connect the power cable connector of the power supply unit MEg38/N to the powered connector 12 VDC of the measuring unit MEg38/M. If communication functions of the sets are not utilized, then use the power cable long 0.2 m.

The power cable long 0.2 m is also used when you need to use technological local communication with a local measuring or information system via galvanically isolated RS485 interface of the unit MEg38/N. The power cable long 0.2 m is to be used also when it is required to use a galvanically isolated input or output two-state signal. The wiring of sockets of RS485 connectors and IN/OUTs of the power supply unit MEg38/N is in Tab. 1.

Tab. 1: Signals on connectors of the power supply unit MEg38/N

Connector RS485

Socket	1	2
Signal	a	b

Connector IN-OUT

Socket	1	2	3	4
Signal	IN-	IN+	OUT-	OUT+

The power cable long 0.2 m is also to be used for GPRS remote communication through GPRS system or for GPS signal receiving if the level of these signals is sufficient in the place of installation and antennas built-in the power supply unit can be used.

If the GSM or GPS signal level is low, the external combined antenna of the GSM and GPS systems can be connected to the connector GSM GPS of the unit MEg38/N or the magnetic external antenna GSM if only GPRS is used.

When the signal level of the GSM and GPS systems is low in the place of installation, it is also possible to use an interconnecting cable long 10 m and put the power supply unit MEg38/N into areas with a sufficient signal intensity to enable receiving by antennas built-in in the unit MEg38/N.

The advantage of the use of the power cable long 0.2 m is the possibility to connect the power cords U1, U2 and U3 of the power supply unit MEg38/N to the measured voltages. When it is measured in MV and HV networks, it is useful to use a three-phase power supply or an uninterruptible AC power supply unit.

To connect the power supply, at first connect the black power cord to the neutral conductor of the three-phase LV network or to the earthed pole of the uninterruptible AC power sup-

ply unit. Then connect the red power cords U1, U2 and U3 using the grips with fuses to the phase LV voltages. When the first supply voltage is connected to the power unit MEg38/N connected with the measuring unit MEg38/M, the LED RUN of the power supply unit MEg38/N lights up with repeated longer lighting and subsequent short flashing. One flashing means that the function of the GPS system, RS485 local technological communication and GPS system is correct. A poor signal or a GPS system failure is indicated by repeated double flashing after longer lighting. A communication failure of the RS485 interface is indicated by repeated triple of flashing after longer lighting, and a poor signal or a GPS system failure is indicated by repeated four flashings after longer lighting. When the power turns off, the measuring unit MEg38/M is power supplied by the energy from the accumulator of the power supply unit MEg38/N for one minute. In this condition, the LED RUN of the power supply unit MEg38/N does not light for a long interval and only flashes repeatedly. The energy from the power supply unit MEg38/N does not supply circuits of the GSM and GPS systems.

The power supply of the measuring unit MEg38/M is indicated by the permanently lighting LED RUN.

5.3 Installation of measuring circuits of MEg38/M

Connect a triple of sensors to the measuring unit MEg38/M into the connector I1 I2 I3. The triple of clamp-on transformers 3MT-ChA is used for the rated currents of 1 A and 5 A and the triple of flexible transformers 3AMOSm is used for the rated currents of 10 A, 30 A, 100 A, 300 A, 1000 A. When the current I_4 shall be measured, the sensor measuring the current I_4 can be selected independently of the type of the current sensors I1, I2, I3. Each sensor can be installed also onto live conductor so that the positive direction of the current is in the direction of arrow, see Fig. 4, and the sensors with the number 1, 2, and 3 are to be installed on conductors with the currents I1, I2 and I3. In LV networks, they are phase conductors L1, L2 and L3, and in MV or HV networks, they are conductors of secondary circuits of current transformers installed in the phases L1, L2 and L3.

To connect voltage measuring circuits of the measuring unit MEg38/N to the measured voltages, at first connect the black measuring cord N to the neutral conductor of the LV network or to the ground of the MV and HV networks. Then using grips with fuses in LV networks, connect the red measuring cord U1 to the phase L1, the cord U2 to the phase L2 and the cord U3 to the phase L3.

In case of a single-phase measurement, the measured phase voltage must always be connected to the input U1, from which the frequency measurement and phase lock look is derived.

When the voltage U_4 must be measured, e.g. between the neutral conductor and the ground or a phase voltage of another voltage system shall be measured with common grounded neutral conductor, use the red measuring cord U4. If this cord is not used for measurement, it is suitable to connect it with the black measuring cord. If the measured voltages are in the

preset tolerances, the corresponding LEDs U1, U2, U3 and U4 light permanently. If voltages are outside the tolerance, the corresponding LED flashes alternately or does not light.

Finally, connect the communication USB cable to the USB connector and program the measuring unit MEg38/M using the user program MEg38 installed in your PC, see the MEg38 program manual. After the programming is completed, disconnect the communication USB cable from the measuring unit MEg38/M.

If any of the connectors of the measuring unit MEg38/M is not used for measurements, it must be covered with the screw-on cap.

6/ MAINTENANCE INSTRUCTIONS

The portable PQ monitor MEg38 set does not require any mechanical maintenance during operation when operating conditions are observed. For its long-term function with defined technical parameters it is necessary to prevent chemicals from attacking components of the PQ monitor MEg38 set that could cause damage.

In demanding climatic and operating conditions, the manufacturer recommends you to check the accuracy of measurement every 3 years of operation. While checking the accuracy of measurement, check also the condition of internal accumulator of the power supply unit MEg38/N. It is recommended to check the lithium battery of the measuring unit MEg38/M generating the internal time signal every six years.

If the accumulator capacity is lost or battery is discharged, the respective components must be replaced either by the manufacturer or by a service firm specified by the manufacturer.

You can order the measurement accuracy check or recalibration also at the manufacturer.

Repairs of the PQ monitor MEg38 set are carried out by the manufacturer or by the service firm authorised by the manufacturer.

When the monitor is transported for repair, it must be delivered properly packed and together with the order and a defect description.

!Warning!

When any mechanical damage is found out, e.g. damage of the top insulation layer of the loop of the flexible current sensor AMOSm, which proves with a contrast change of the surface colour of the sensor, or any damage of another part of the units and accessories of the PQ monitor MEg38 set, it is necessary to disassemble the set immediately and repair.



When the PQ monitor MEg38 set is used in a different way than it is specified by the manufacturer, the protection provided by the monitor MEg38 can be impaired.

7/ CONTENTS OF THE SET MEG38

The portable PQ monitor MEG38 set includes:

- Measuring unit MEG38/M,
- power supply unit MEG38/N:
 - without communication,
 - with GPRS communication,
 - with GPRS communication and GPS time synchronization,
- power supply MEG38/Z,
- interconnecting cable / 10 m,
- triple of flexible current sensors 3AMOSm,
- flexible current sensor AMOSm,
- triple of clamp-on current transformers 3MT-ChA,
- clamp-on current transformer MT-ChA,
- set of grips with fuses /IV (3 + 1 red, 1 black),
- set of magnetic contacts $\varnothing 7$ mm, L10 mm (3 + 1 red, 1 black),
- set of magnetic contacts $\varnothing 11$ mm, L35 mm (3 + 1 red, 1 black),
- crocodile clip (3 + 1 red, 1 black),
- communication cable PQ (USB/5 m/EMC),
- adapter to measure in one-phase socket,
- transport textile bag.

8/ GUARANTEE

A two-year guarantee is provided for the PQ monitor MEG38 set since the date of sale, but no more than 30 months after its dispatch from the manufacturer. Defects incurred during this period provably due to defective construction, defective design or improper materials will be repaired by the manufacturer or his service firm free of charge.

The guarantee is voided also during the guarantee period if the user carries out unauthorized modifications or changes on the PQ monitor MEG38 set, connects the instrument incorrectly, handles it incorrectly or roughly or the instrument was operated contrary to the technical specification.

Defects of the PQ monitor MEG38 set and its accessories incurred during the guarantee period shall be claimed by the user to the manufacturer or the service firm authorised by them. Claims without the enclosed letter of guarantee shall not be admitted.

9/ ORDERING

State the quantity of the PQ monitor MEg38 sets and specify the individual sets in the order.

The manufacturer will assemble the ordered set and check for correct function.

10/ MANUFACTURER

MEgA – Měřící Energetické Aparáty, a.s.

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Fig. 1: Drawing of Measuring unit MEg38/M

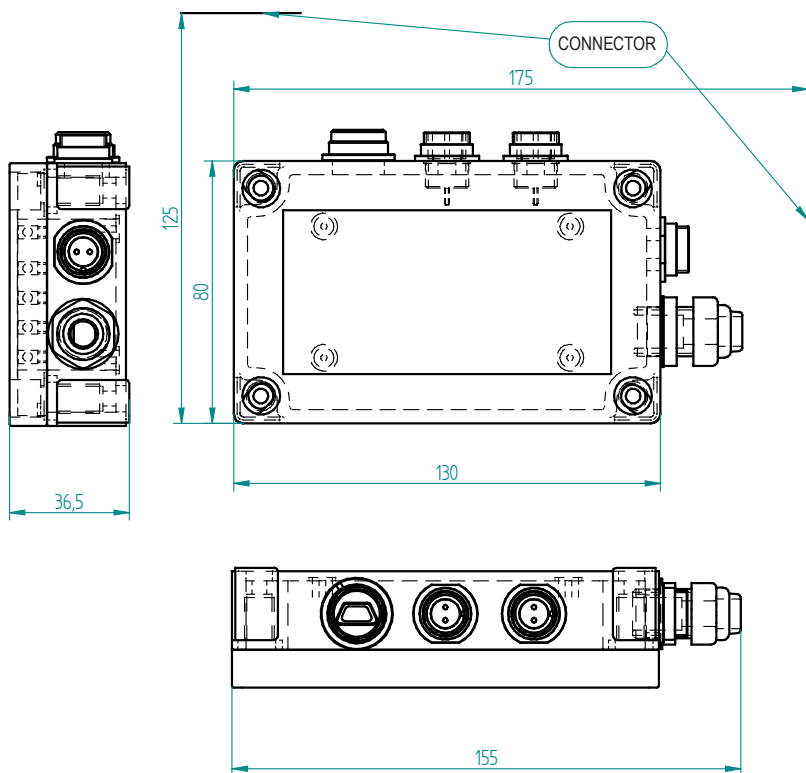


Fig. 2: Drawing of Power supply unit MEg38/N

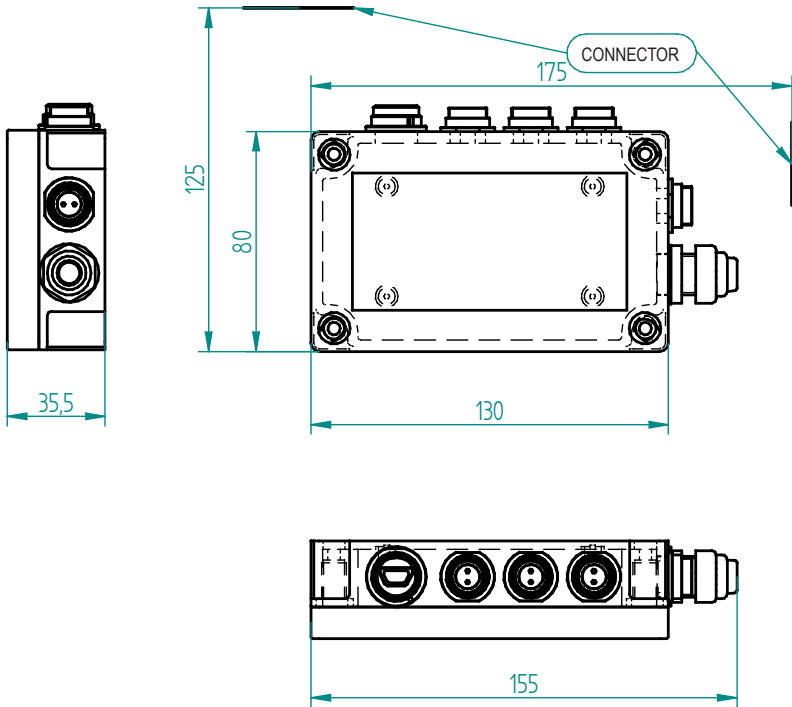


Fig. 3: Drawing of Power supply MEg38/Z

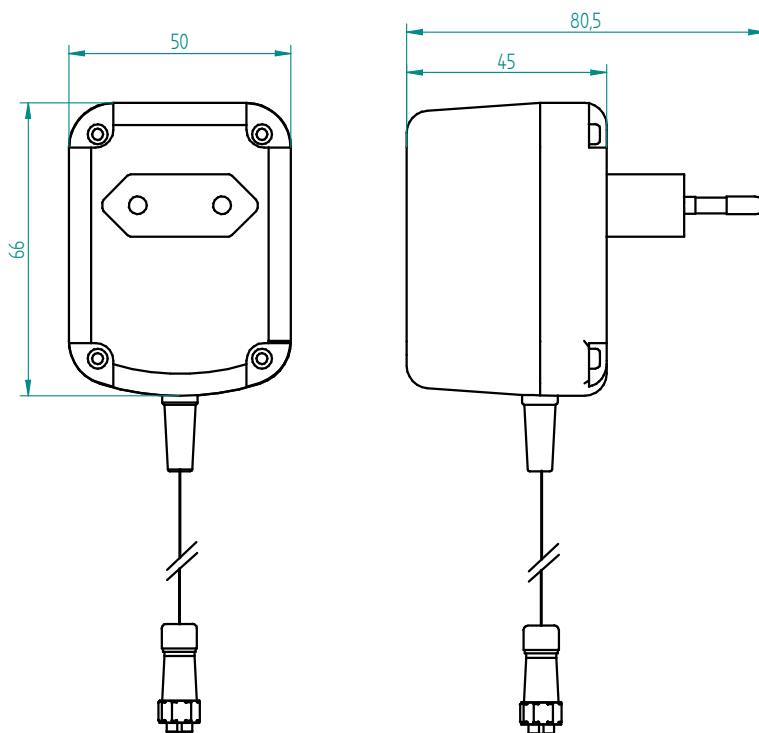
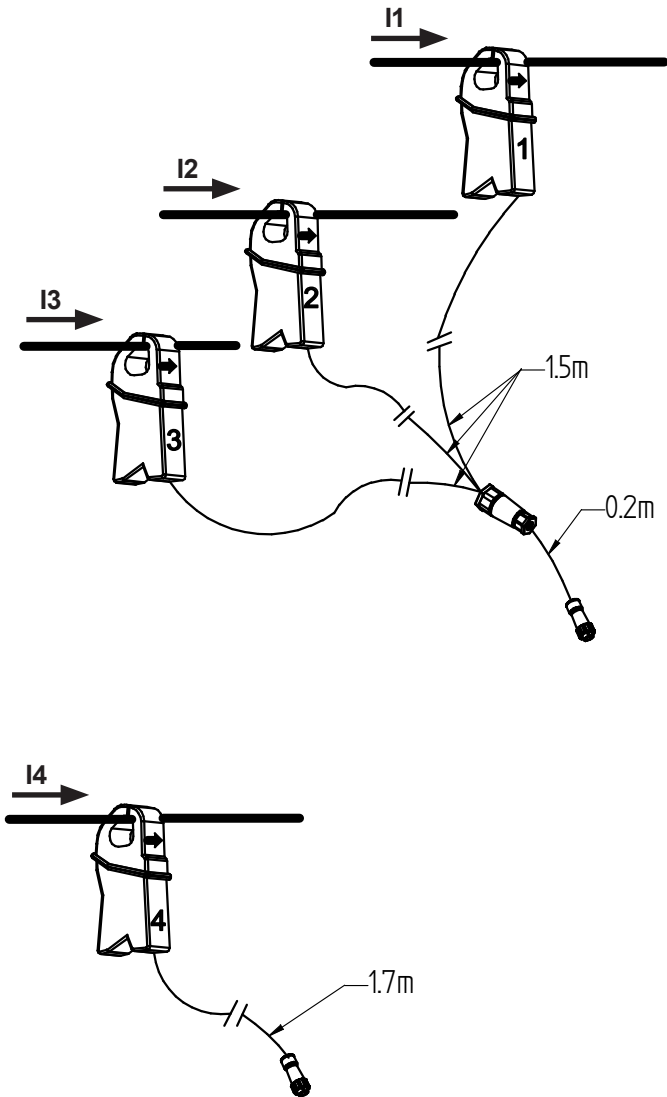


Fig. 4: Positive directions of measured currents





Portable PQ monitor MEG38 set



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