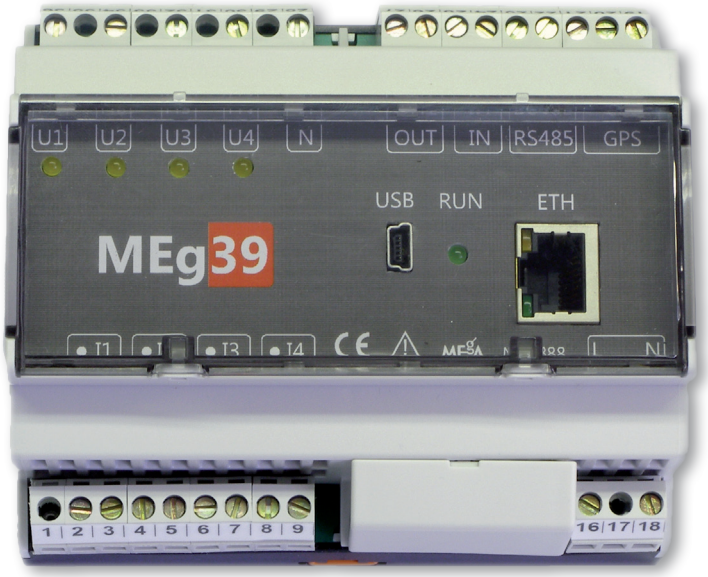
PQ monitor MEg39

User manual



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PQ monitor MEg39

INTRODUCTION

PQ monitor MEg39 measures four voltage and four current values at LV, MV, HV levels. It provides the functions of recording, electricity meter and analysis of voltage quality, all performed simultaneously. In the recording function, PQ monitor MEg39, hereinafter referred to as the monitor, processes all measured values, evaluates powers, energy and harmonics up to the order of 64. In the function of class A voltage quality analyser, the monitor evaluates all parameters for measured three voltages and three currents, as stipulated by the standard. It analyses harmonics and centered subgroups of interharmonics up to the order of 125. When recording events, the monitor, aside from recording the course of $U_{RMS1/2}$ and $I_{RMS1/2}$, makes an oscillographic record of all four values of voltage and current. The monitor can operate as an oscillograph with the function of recording the voltage values U1 to U4 and current values I1 to I4 into data memory; an oscillographic record can be triggered by voltage U4.

The voltage measuring inputs are designed for indirect voltage measurements by means of instrument transformers for the MV and HV levels and for direct measurements at the LV level. The current inputs are only designed for indirect measurements by means of instrument current transformers.

The monitor is supplied by power mains voltage or by DC voltage and it is resistant against short-term power outages. The device can be powered by DC 12 V from a separate UPS supply MEg101.3. This power supply is connected through the HBUS connector located in the DIN rail on which the device is installed. This bus connector enables connecting a communication unit MEg202.3, which enables remote transmission of data from the device by means of GPRS data service using the GSM mobile network. The monitor is equipped with four communication interfaces. The serial USB interface is designed for local parameterization of the device and for downloading of measured data, the Ethernet and RS485 interfaces are designed for connecting to local technological networks and the RS232 interface is reserved for service purposes.

INFORMATION ON SW

PQ monitor MEg39 package includes a CD with user programs. Parameterization of measurements, reading of measured data, displaying of direct measurements, including an oscillographic recording, are carried out by the SW PQ program. Unified program Data Viewer ensures displaying of measured data in graphic and tabular form of a data file, export of measured data and printing tasks. Functions of the mentioned programs are described in separate user manuals [1], [2]. The database based program WebDatOr, supplied separately, is ready to take care of work with data files from one or more measurement instruments, even of different types [3].

BASIC INFORMATION ON MONITOR MEg39

PQ monitor MEg39, Fig.1, is designed for fixed mounting in LV, MV and HV networks. The MEg39 unit is installed in a polycarbonate self-extinguishing box with the dimensions of 108 × 90 × 63 mm with the design for DIN rail mounting. The monitor is installed under the switchgear box cover with a possibility of sealing to restrict access to the terminals. The instrument panel can be sealed, too. Input terminals of measured voltages and currents, power supply and communication lines are realized by means of screw terminals for a wire diameter of up to 4 mm^2. Measured voltages are led to the corresponding terminals **U1** (36), **U2** (34), **U3** (32), **U4** (30) and **N** (28). The four yellow LEDs **U1**, **U2**, **U3** and **U4** signalize by permanent light the presence of input voltages within preset tolerances. If a measured voltage is beyond preset tolerances, the corresponding LED flashes shortly, see the description of LED voltage indicators in Table 1. The unit panel also contains a green LED indicator **RUN**, signalizing the operation of the MEg39 unit.

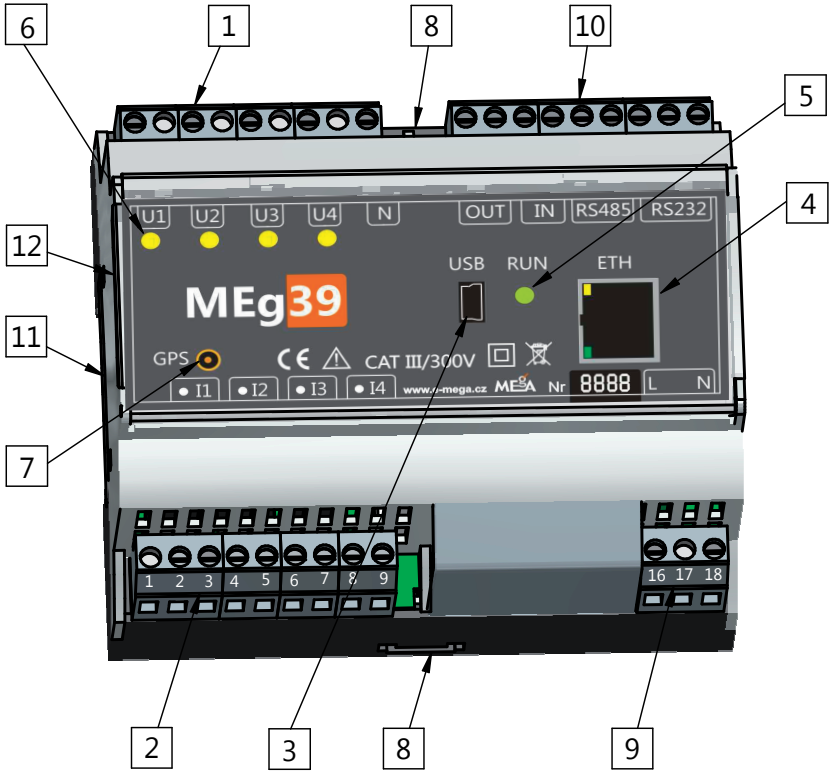
Measured currents are led to the pairs of terminals **I1** (2,3), **I2** (4,5) and **I3** (6,7), **I4** (8,9) whilst the current input terminal is marked by a dot.

Supply voltage is connected to the terminals **L** (16) and **N** (18).

Two-value input signal is led to the **IN** (24,25) terminals, the 25 terminal is positive. The output signal **OUT** (26,27) is realized by means of the relay contact.

The miniUSB connector located on the panel of the unit is designed for local communication. Remote communication is realized by means of the RS485 interfaces at the terminals 22 and 23. Furthermore, it is possible to use the Ethernet interface, whose RJ45 connector is located at the panel of the unit and it enables using the functions provided by the built-in webserver.

Fig. 1 – Designation of elements of PQ monitor MEg39 – description in Table 1



Tab. 1: Description of device components

Item	Name	Description
1	Voltage inputs	Terminals for connecting signals of the secondary windings of instrument voltage transformers for the MV and HV levels or for direct connecting of phase voltages at the LV level.
2	Current inputs	Terminals for connecting signals of the secondary windings of instrument current transformers. The input is marked with a dot.
3	miniUSB connector	USB 2.0 interface connector for local communication

Item	Name	Description
4	RJ45 connector	ETHERNET 100BaseTx interface connector for connecting in local network. • The green **LINK_LED** signalizes data line speed (lit 100 Mbit/s / not lit 10 Mbit/s) • The orange **ACTIVITY_LED** light signalizes a data transmission in progress
5	Status of LED indicator **RUN**	Short flashing – the monitor is performing measurements according to the programmed parameterization. Repeated short flashing – the monitor has been programmed but is not measuring yet, because the preset time of measurement start has not come yet or the supply has not switched on due to programmed measurement with delayed start. Alternating light 1:1 – oscillographic recording.
6	Status of measured voltages U1, U2, U3, U4	Signalization of the status of voltage at the inputs U1, U2, U3 and U4 during measurement at the LV level (Y-connection) or U1-U2, U2-U3, U3-U1 during measurement at the MV and HV level (delta connection). Light: • constant – voltage is within the preset tolerance range (0.9 U_n to 1.1 U_n) • one flash – voltage is within the preset range of interruption • two flashes – voltage is within the preset range of dip • three flashes – voltage is the preset range of swell.
7	GPS antenna connector	Connector for connecting a coaxial cable of antenna for receiving GPS time synchronization signal.
8	DIN rail lock	Orange locks situated at the top and bottom of the device must be unlocked for dismantling the device from the DIN rail.
9	Power supply terminals	Terminals for connecting power supply voltage

Item	Name	Description
10	Input and output signal terminals	Terminals for connecting two-state signals and data interfaces RS485 and RS232.
11	HBUS bus connector	Bus connector for interconnecting with UPS supply MEg101.3 and communication unit MEg202.3 (HBUS is installed between the device base and DIN rail)
12	Rating plate	The rating plate contains data valid for the specific version of the monitor

⚠⚠ SAFETY INFORMATION

- **This information must be read very carefully.**
- Warnings warn of issues representing safety risks to operating personnel.
- Cautions state conditions and issues that could result in damage to the monitor.

Warning

- **Attention! Operating personnel performing installation of the device into circuits with live parts must be equipped with and use during installation personal protective means and other safety equipment.**
- **Any use of PQ monitor MEg39 in a way for which it has not been designed by the manufacturer can impair the protection provided by the PQ monitor MEg39.**

- Personnel performing installation of the device must be qualified for work under and near hazardous voltage. They must also be trained in providing first aid.
- The monitor can only be operated by qualified personnel.
- Maintenance and repairs of the monitors can only be carried out by the manufacturer or service organizations trained by the manufacturer.
- It is not permitted to use any other accessories than those included in supply of a monitor.

Caution

The meaning of symbols used in the user manual and in descriptions of the PQ monitor MEg39:

⚠	Note in documentation / Warning, risk of danger
⚠	Warning, electric shock hazard
CAT III	Overvoltage category, characterizing the state of temporary overvoltage. Usually for LV installations in buildings, behind electric energy meter fuses
⧈	Safety class II, double or reinforced insulation
IP code	Degree of protection by cover
	Product is designated for recycling and waste-collecting facilities
CE	Declaration of compliance – European Community

⚠⚠ The maximum voltage to the common conductor can be 300 V_{AC} otherwise there is a risk of damage to the monitor

Fig. 2: Dimensions of the device

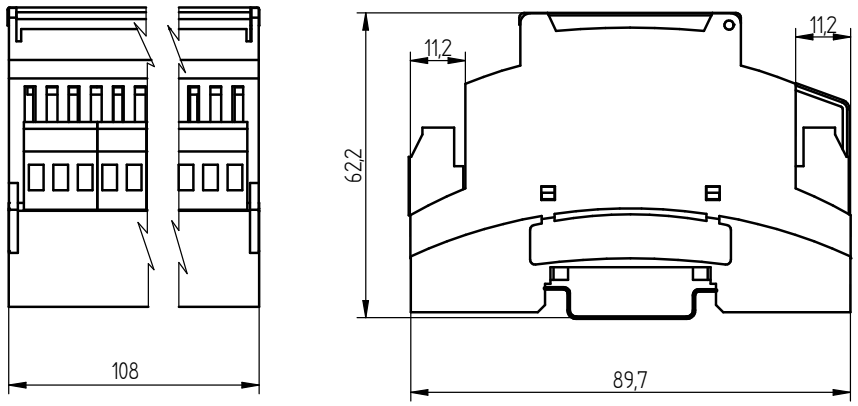
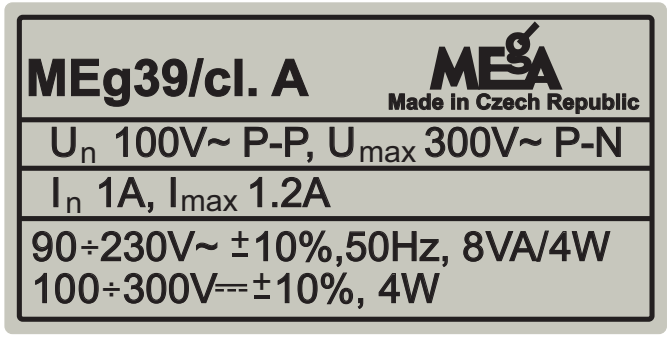


Fig. 3: Design of rating plate for measurements at the MV and HV voltage level



Explanation to the rating plate

The rating plate of the monitor, see Fig. 3, is located on the left side of the cover. In addition to manufacturer's identification data and monitor designation, it includes specification of power supply voltage range and consumption for the stated power supply voltages.

Voltage inputs:
Measurement at the MV and HV levels are delta U1-U2, U2-U3 and U3-U1 with the rated value of 100 V, voltage U4 is measured against the N input with the rated voltage of 100 / √3 V.
The maximum voltage value at the inputs U1, U2, U3 and U4 against N is 300 V_{AC}.

Connected to the current inputs I1, I2, I3 and I4 are the secondary windings of instrument current transformers with the rated current of 1 A.
The measuring range of the current inputs is up to 1.2 I_n.

MEASURING CONNECTION WITH INSTRUMENT MEASURING TRANSFORMERS IN A MEASURING CHAIN

In MV and HV networks, measurements are indirect via measuring instrument transformers.

For three-phase voltage measurement it is necessary to connect voltages U1, U2 and U3 in the left rotation direction, at which the device is calibrated.

When measuring is performed at the MV level and the voltage input U4 is not used, it is recommended to connect this input with the N input.

Fig. 4: Three-phase measuring of line to line voltages and phase currents in MV and HV voltage with earthed center

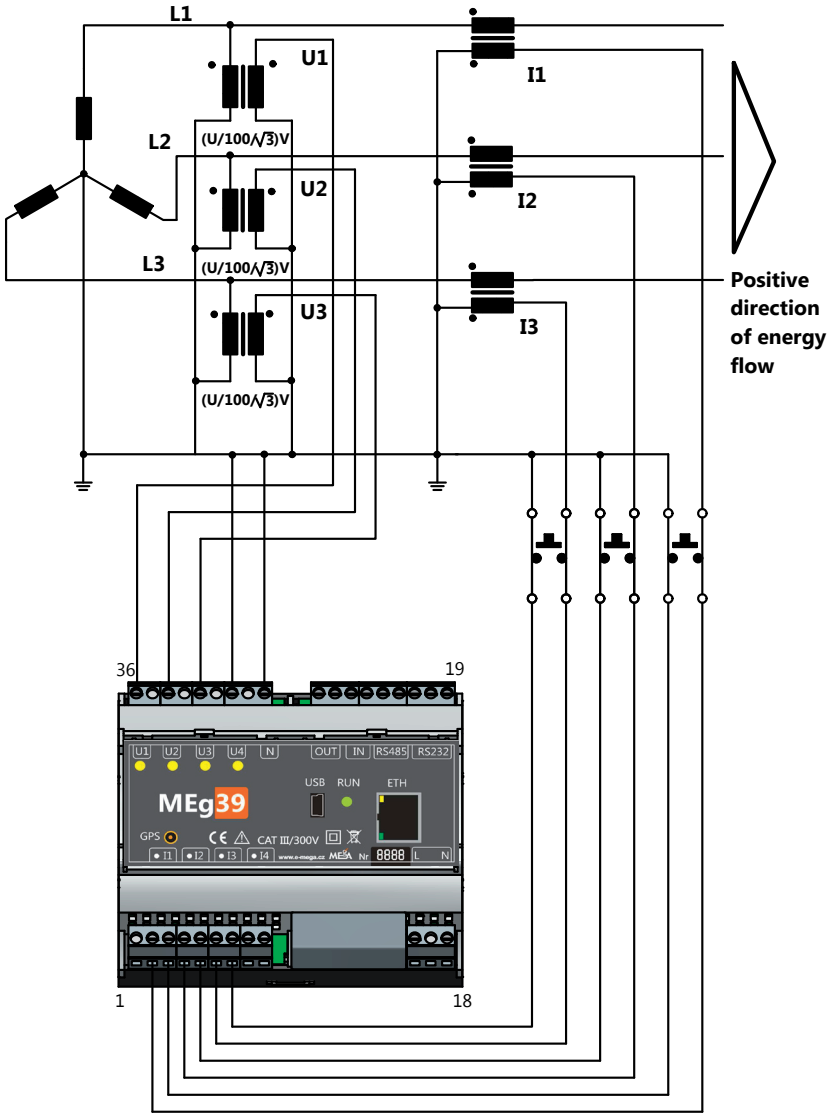


Fig. 5: Measurement of line to line voltages, U0 voltage, phase currents, I0 current in a compensated MV network

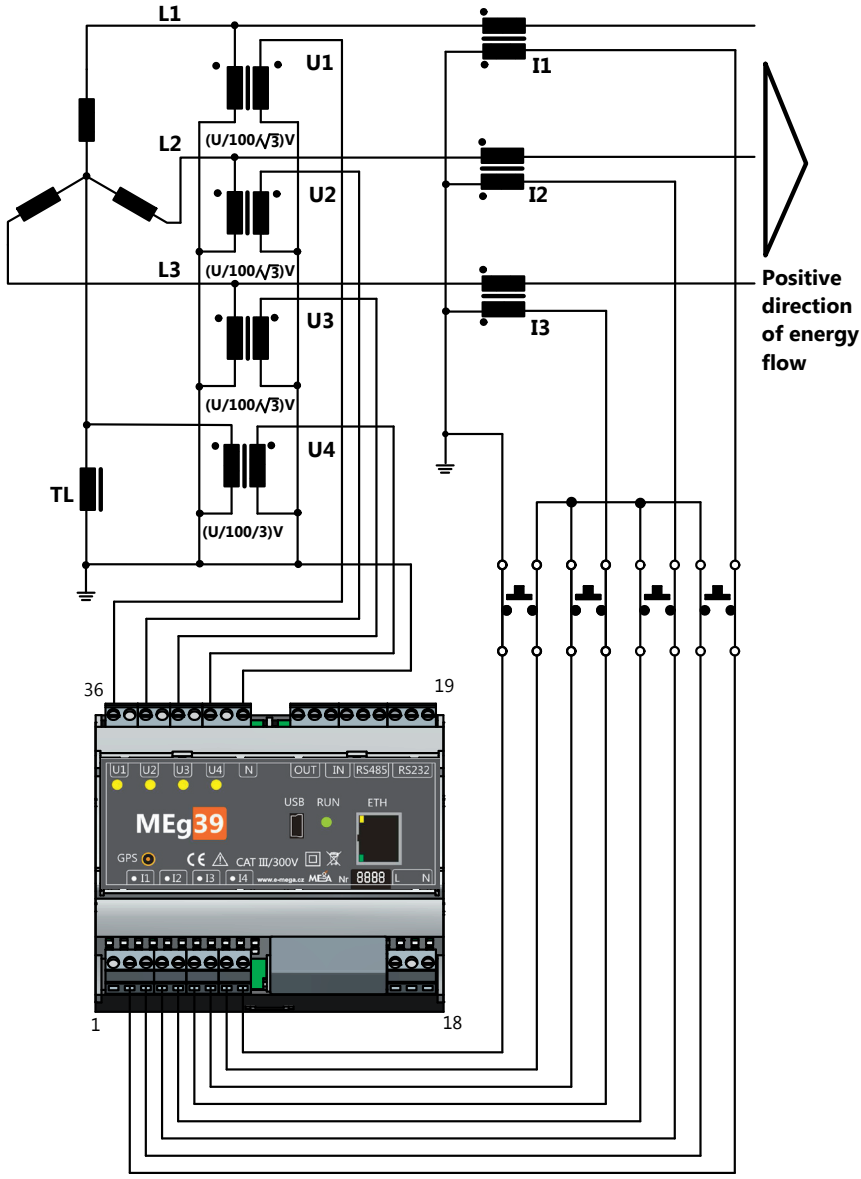


Fig. 6: Measurement of line to line voltages and phase currents in the Aron connection at the MV network

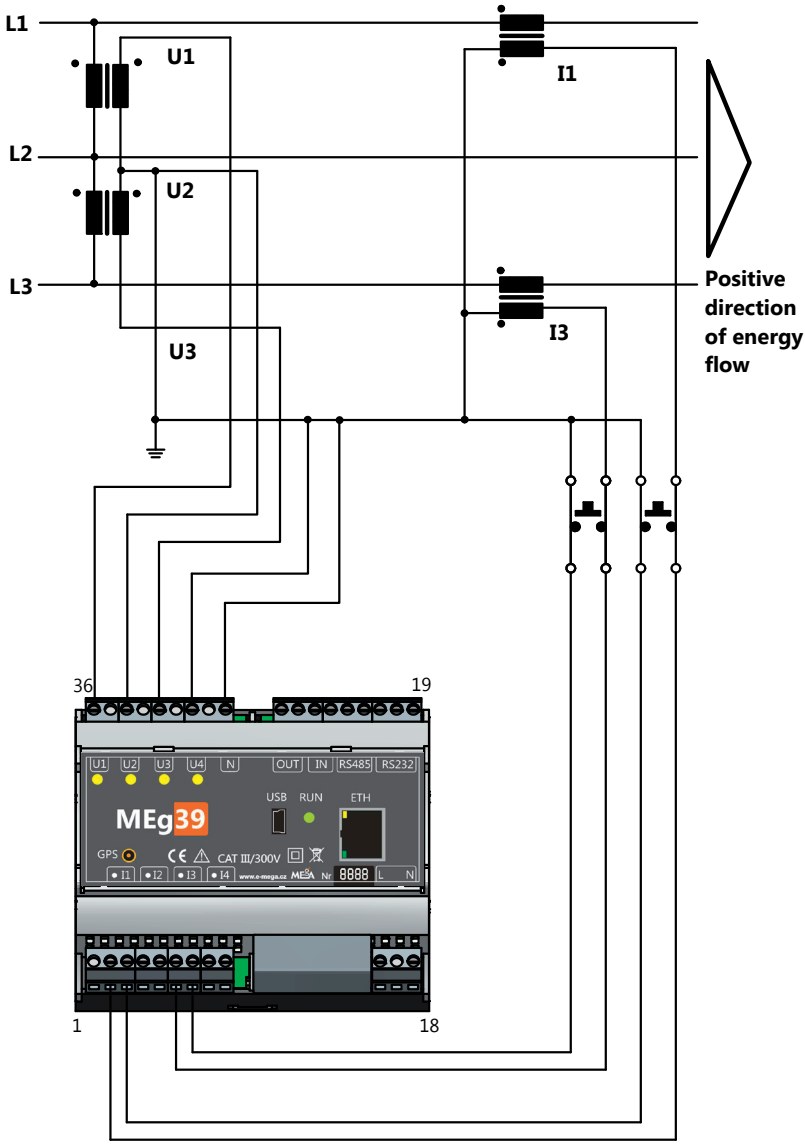


Fig. 7: Measurement of phase voltages, voltage between neutral conductor and ground and phase currents including phase currents difference

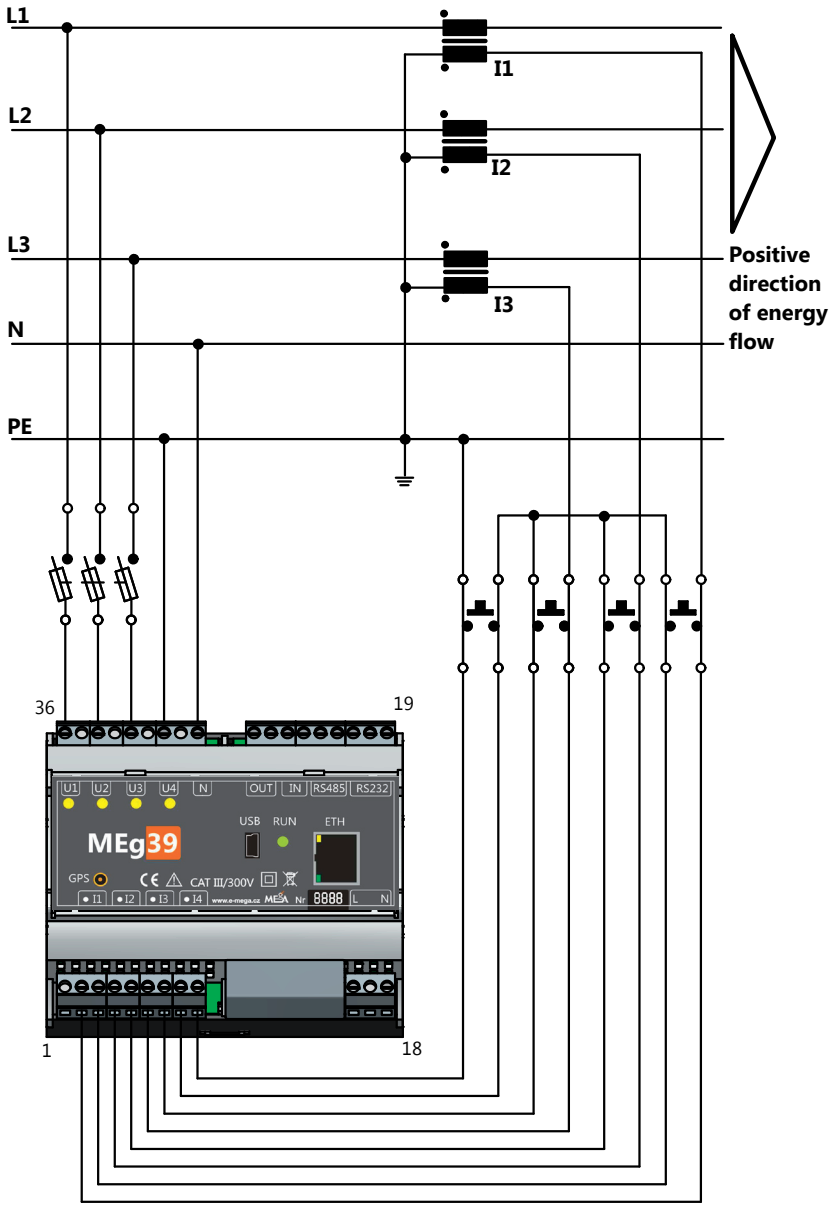


Fig. 8: Three-phase measurement of voltage and current at the LV output and measurement of phase voltage and current of another LV output

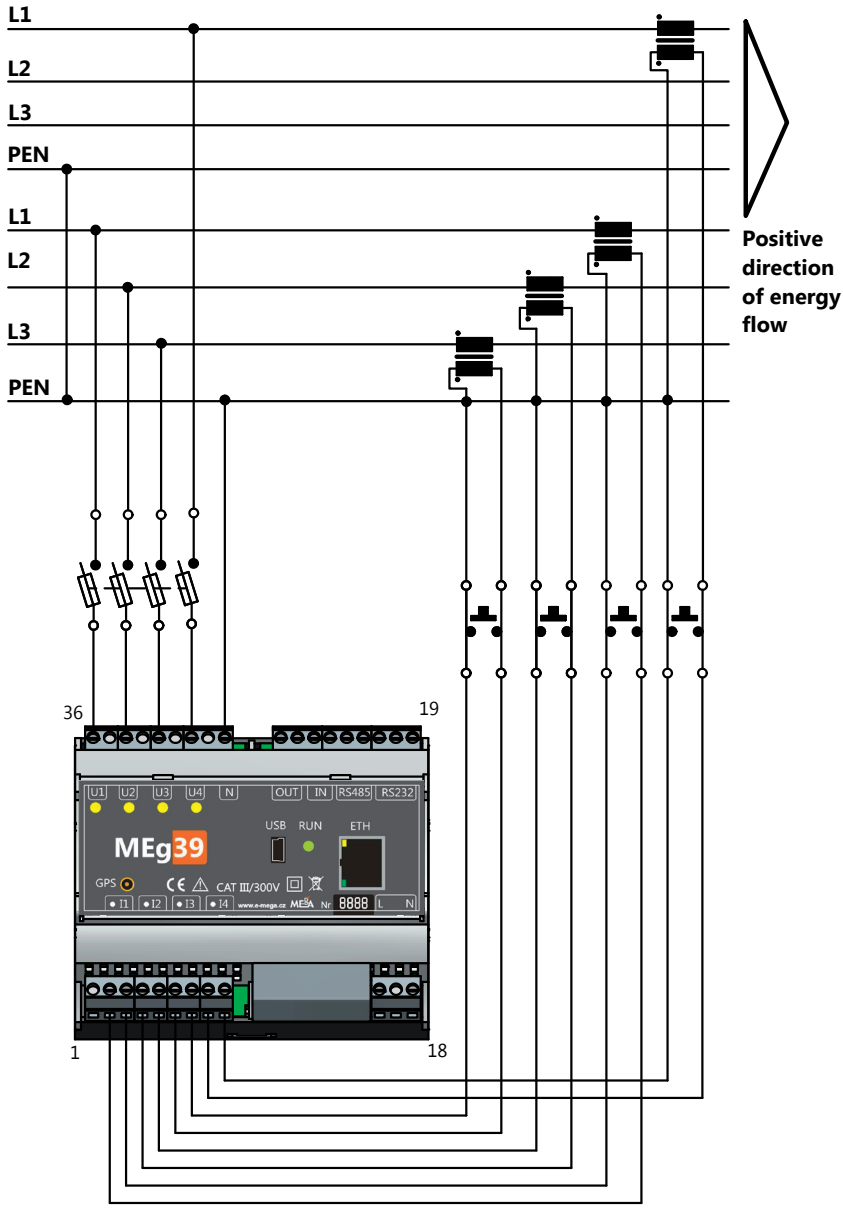
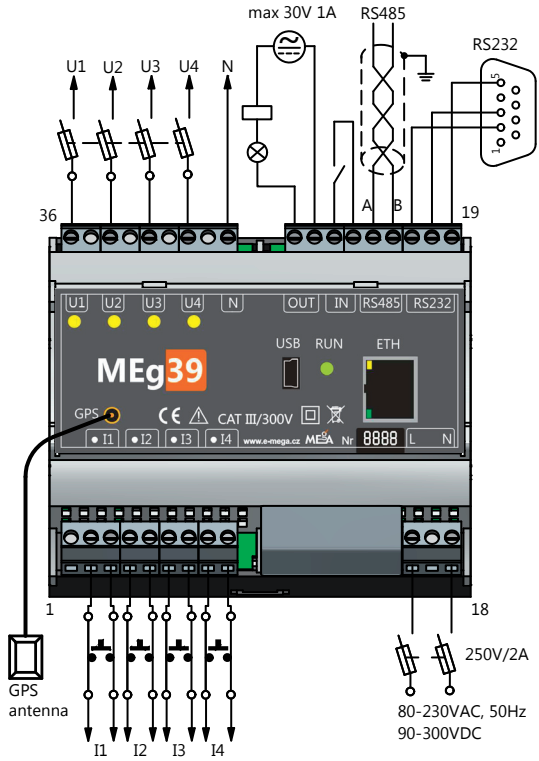


Fig. 9: Connection of device terminals



Tab.2: Description of the function of MEg39 terminals

Terminal number	Function
1	-
2	I1 current input
3	I1 current output
4	I2 current input
5	I2 current output
6	I3 current input
7	I3 current output

Terminal number	Function
8	I4 current input
9	I4 current output
10	-
11	-
12	-
13	-
14	-
15	-
16	L (power supply)
17	-
18	N (power supply)
19	RS232 GND
20	RS232 Tx (DTE)
21	RS232 Rx (DTE)
22	RS485 B (negative idle level of signal)
23	RS485 A (positive idle level of signal)
24	IN_GND
25	IN+
26	OUT
27	OUT
28	N
29	-
30	U4
31	-
32	U3
33	-
34	U2
35	-
36	U1

MEASURED DATA

The range of measured data depends on connection for measurement and measurement parameterization. Measured data are divided into data of continuous phenomena of voltage quality, event data and recorder data.

Data of continuous phenomena of voltage quality (aggregation interval 10 min):

- Time of evaluation
- Voltage unbalance
- Frequency
- Voltage magnitude
- Voltage deviations U_{over}, U_{under}
- Flicker P_{st} and P_{lt}
- THD_U
- DC component, fundamental harmonic up to 125^{th} harmonic of voltage
- Centered subgroups of interharmonic component of voltage up to the order of 125
- Level of voltage signals
- Flagged data
- Currents
- Basic to 125^{th} harmonics of currents
- Centered subgroups of interharmonic I up to the order of 125

Data at events :

- Time of event
- Event duration
- Moments when the limits for interruption, dip and swell of voltage and current are exceeded
- Residual and maximum values of voltage and current
- Curves of voltages $U_{RMS1/2}$ and currents $I_{RMS1/2}$
- Oscillogram of voltage and current curves during event
- Harmonic voltages and currents during event

Recorder data (aggregation interval from 1 s to ¼ h pursuant to measuring parameterization):

- Time of evaluation
- Voltage
- Currents
- Active powers
- Reactive powers
- PF
- THD_U
- THD_I
- Harmonic components of voltages up to the order of 64.
- Harmonic components of currents up to the order of 64.
- Active and reactive energy (6 registers for each phase)

The above stated data of continuous phenomena of voltage quality are stipulated for the voltages U1, U2, U3 and currents I1, I2, I3.

The above stated recorded data of events starting from an exceeding of the defined limits for voltages U1 to U4 and for currents I1 to I3 are recorded for all the stated values.

The above stated recorder data apply to voltages U1 to U4 and currents I1 to I4.

INSTALLATION OF MONITOR, PREPARATION FOR MEASUREMENT

⚠ Connecting of power supply and measuring voltage circuits must be done in voltage-free state.

⚠ It is not permitted to connect the voltage inputs to phase voltages higher than 300 V_{AC} and line to line voltages higher than 520 V_{AC} in CAT III overvoltage category circuits.

⚠ Installation of the MEg39 monitor may only be performed by qualified personnel equipped with personal protective means against electric shock and trained in providing the first aid.

Monitor MEg39 is to be installed on DIN rail TC35, while due to reasons of safety against electric shock and increased resistance against external machanical impacts, requires covering of cover with terminals by cover panel. DIN rail should be preferentially in horizontal position, labels on device panel are readable from left to right.

On DIN rail can be installed also power supply MEg101.3a or MEg101.3b and GPRS communication unit type MEg202.3 if needed. Units are interconnected using HBUS connector.

Power supply connecting

⚠ MEg39 monitor can be supplied either directly by AC voltage or by DC voltage connected to power supply terminals **16** and **18** or by DC 12 V from the UPS MEg101.3 via the HBUS. Connected to terminals **16** and **18** can be AC voltage within the range from 90 V to 230 V or DC voltage from 100 V to 300 V, independent on polarity.

1. Terminals **16** and **18** of the monitor MEg39 are connected via the two-pole LV fuse disconnector with fuses 2 A / 500 V to the terminals **L** and **N** of the network and their connection is made with cables certified for installation in a LV cabinet.
2. After a temporary state with a duration of ca 1 s, when the processor is checking the function of all circuits, it is necessary to check the LED **RUN** status according to a previously programmed measuring mode, see in Tab. 1.

Connecting of measured voltages

⚠ Measured voltage must always be led to the reference voltage input U1.

⚠ The monitor MEg39 can be used for single-phase measurements, too.

3. For indirect measurements at the MV and HV level, the measuring voltage inputs are connected according to the wiring diagrams in Fig. 4 to Fig. 6 to the output terminals of voltage instrument transformers.

   For direct measurements at the LV level, the measuring voltage inputs are connected to measured voltages at phases L1, L2 and L3 via the three-pole fuse disconnector with fuses 2 A / 500 V, see in Fig. 7.

   When measuring phase voltage of another, non power-connected branch of the LV network by means of the measuring input **U4**, it is necessary to insert a one-pole fuse disconnector with a fuse between the **U4** input of the MEg39 monitor and the measured voltage, see in Fig. 8.

4. When the fuse disconnector is switched „ON", check the function of the LEDs **U1**, **U2**, **U3** and **U4**, which signalize the status of measured voltage at the corresponding inputs.

Connecting measured currents

Connecting current circuits must be performed either with the power switched off or with short-circuited secondary winding of the current instrument transformer.

All current inputs of the monitor MEg39 have the same value of rated current of either 1 A or 5 A, depending on an order.

The type and rated value of primary current of the current instrument transformer is set by the user according to voltage level and required measured current at the place of installation.

5. Currents indirectly measured by measuring instrument transformers are connected via short-circuited current double terminals to the current inputs **I1**, **I2**, **I3** and **I4**, as the case may be, of the monitor MEg39 according to Fig. 4 to Fig. 8. The secondary winding of the current transformer inserted in the L1 phase is connected to the **I1** input, The secondary winding of the current transformer inserted in the L2 phase is connected to the **I2** input, The secondary winding of the current transformer inserted in the L3 phase is connected to the **I3** input. Similar procedure is used for connecting the current input I4, as necessary.

⚠

To ensure a reliable function of the connection, it is recommended to earth the secondary circuit of each instrument transformer. Earthing of the secondary circuit is carried out at one point.

Start of measurements and check of correct wiring

6. Displayed on PC with opened Power Quality Monitor program [1] in the drop-down menu of connected devices is a pictogram of communication connection with the monitor, FW version and the monitor serial number. Captions of all buttons in the window are in bold letters, see in Fig. 10.

   If the program Power Quality Monitor is launched and the monitor is disconnected or connected improperly, PC displays the window with the empty drop-down menu and the buttons are inactive, see in Fig. 11.

7. Pressing the button **Settings MEg** displays in the program window the parameterization of measurements, where it is necessary to fill in first the identification data of measurement and then, according to measuring connection, to select one-phase or three-phase measurement, voltage level (in the case of MV/HV), transformer ratio of the instrument current transformers and other measurement parameters, as the case may be, see in [1].

   An example of measurement parameterization is in Fig. 12

8. Pressing the button **Start of measurement** deletes all previously measured data stored in the device memory and launches measurements according to the newly selected parameterization. Pressing the button **Measurement** and selecting the RMS menu displays the window of measured values, their time courses and the phasor diagram. An example is in Fig. 13. It is necessary to check the measured values and the correct direction of installation of the current transformers.

9. Pressing the menu button **Measurement** and selecting the **Samples** menu displays harmonic components of measured voltages and currents, oscillographic curves and a phasor diagram showing the orientation of current directions to voltage directions. An example is in Fig. 14.

⚠

During measurement of line to line voltage and phase currents at the MV level there is a phase shift between voltage and current by ca 30°. This does not necessarily apply to the I4 current..

Fig. 10: The main window of SW PQ when communication with MEg39 has been established

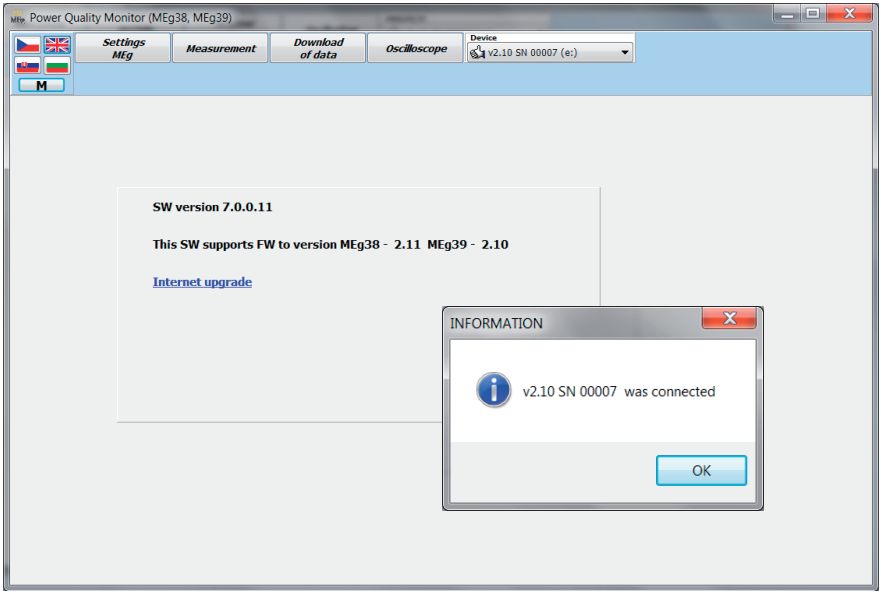


Fig. 11: The main window of SW PQ when communication with MEg39 has not been successfully established

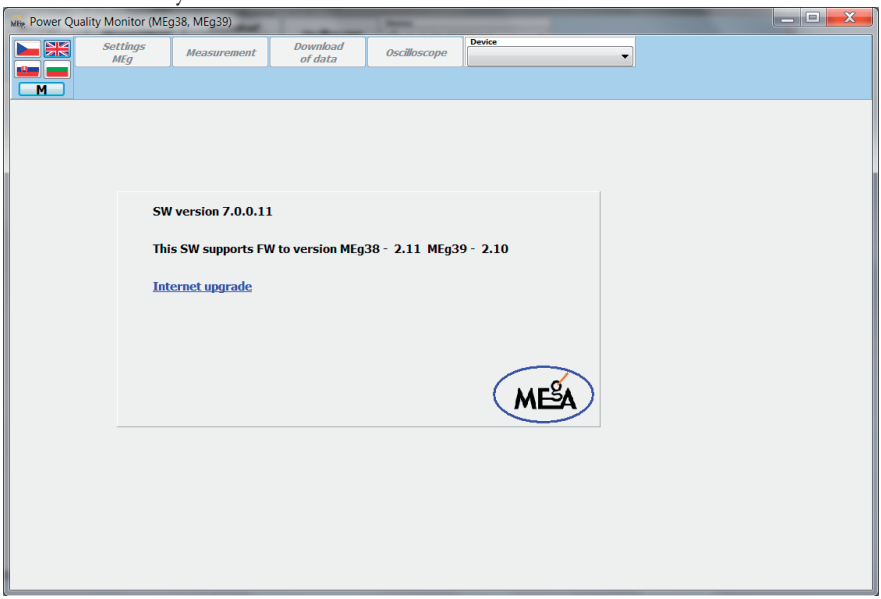


Fig. 12: An example of settings - measurement parameterization

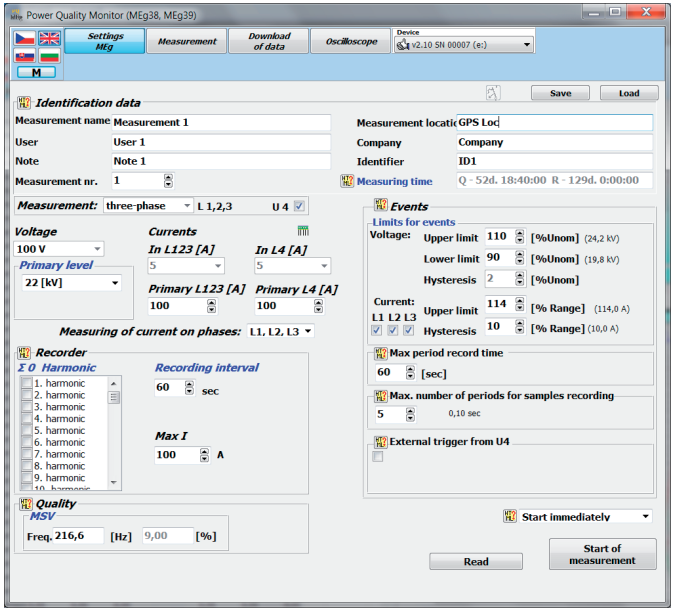


Fig. 13: Measuring and inspection of connected values, a time course of effective values

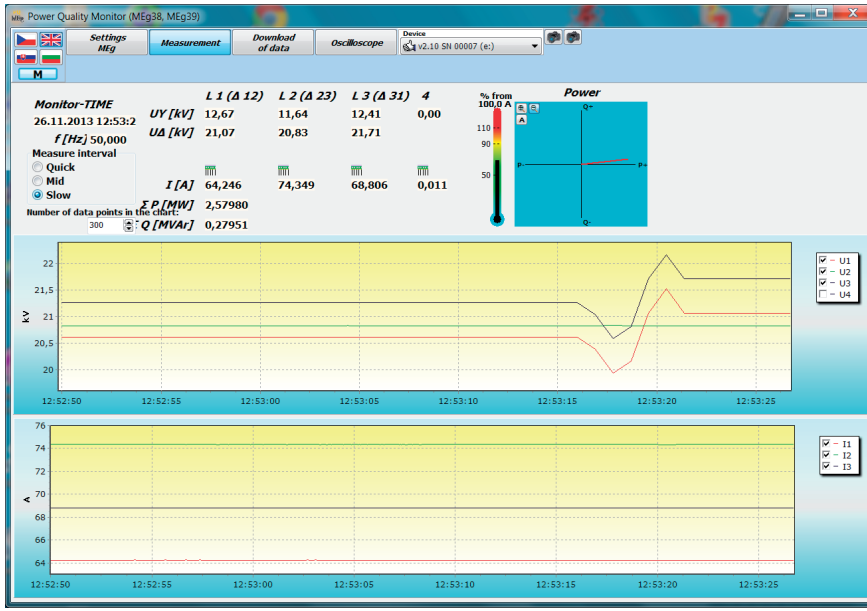
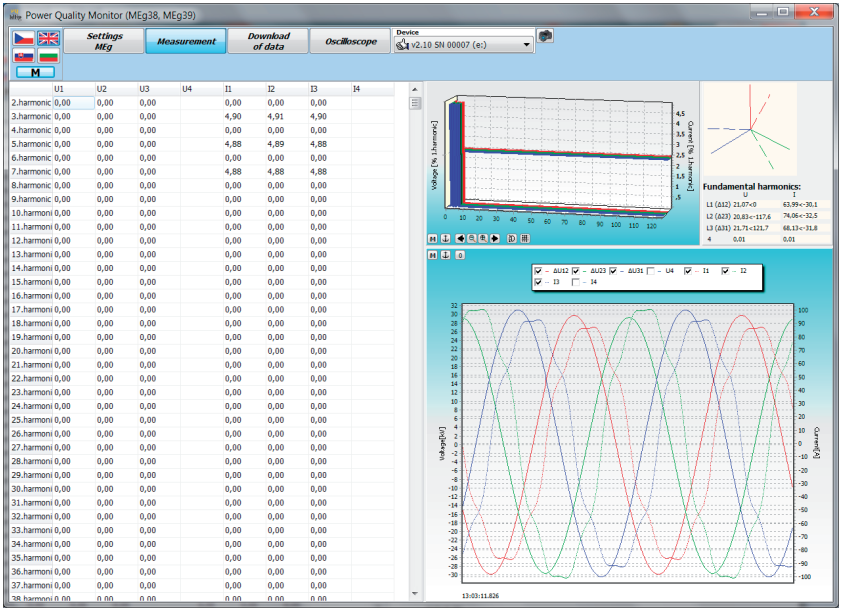


Fig. 14: Measurement and inspection of connected values, oscillographic curves and FFT



MAINTENANCE

⚠ Caution

- Repairs of the monitory during the valid warranty period may only be performed by trained and qualified personnel of the manufacturer or service organizations of the manufacturer.
- The monitor must not be exposed to effects of chemicals
- The monitor may only be transported in the original transport packaging supplied by the manufacturer
- Re-calibration of PQ monitors MEg39 class A is recommended every two years and PQ monitors MEg39 class S every three years from the date of purchase or previous calibration.

When used properly and in accordance with this manual, the monitor does not require any special maintenance. Only when the device is dirty, it should be cleaned thoroughly by moist cloth without any cleaning agents.

BATTERIES

Used in the monitor are the following batteries:

- lithium battery CR2032 for real time clock circuit,
- supercapacitors with the declared operation life of 10 years.

DISPOSAL

When the monitor is put out of operation, it must be disposed of properly by recycling in waste collecting facilities according to the regulations for electronic waste handling.

WARRANTY

A warranty period of 24 months from the date of sale is provided for the monitor but no longer than 30 months after shipping from the manufacturer. Defects occurring during this warranty period and provably due to defective design, faulty craftsmanship or material defects shall be repaired by the manufacturer or manufacturer's service organization free of charge.

ORDERING

An order must contain quantity of PQ monitors MEg39, class A or S, requiren nominal voltage level (LV or MV/HV) and required nominal current range (1 A or 5 A).

Optional accessories:

- GPS antenna with 5 m or 10 m cable
- HBUS bus connector for connecting the communication unit and uninterruptible power supply
- uninterruptible power supply MEg101.3
- communication unit MEg202.3 for remote data transmission by means of the GPRS service

TECHNICAL PARAMETERS

General information

The stated uncertainties of measurement apply to the reference conditions.

The development and production of the monitor is in accordance with the standard of ISO 9001.

Reference conditions

Ambient temperature:	23 °C ± 2 K
Relative humidity:	40 % to 60 %

Left-direction voltage system at the inputs U1, U2 and U3.

Supply voltage:	230 V_{AC}, 50 Hz

Operating conditions

Operating temperature:	-20 °C to +55 °C
Settle time:	10 minutes
Relative humidity:	10 % to 90 %, non-condensing

Storage

Storing temperature:	-30 °C to +60 °C

Protection against effects of water and chemicals

Protection against long-term effect of UV-radiation

Design data

Dimensions:	110 × 90 × 63 mm
Weight:	0.4 kg
Protection:	IP00 according EN 60 529
	IP20 when installed into LV switchgear with cover panel above device terminals
Overvoltage category:	CATIII / 300 V according to EN 61010-2-030
Safety class:	II, reinforced insulation

EMC

EN 61326-1:2006
Electrical equipment for measurement, control and laboratory use – EMC requirements Part 1: General requirements 31

Voltage on network terminals, electromagnetic interference

EN 55011 ed.3:2010
Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement

Emitted high-frequency electromagnetic field

EN 61000-4-3 ed.3:2006
Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test

Power supply

Supply voltage terminals 16, 18:	90 V_{AC} to 230 V_{AC} ± 10 %, 50 Hz 100 V_{DC} to 300 V_{DC} ±10 %
HBUS supply voltage:	8 V_{DC} to 12 V_{DC} (max 13 V_{DC}) from uninterruptible power supply MEg101.3
Consumption:	8 VA, 4 W / 230 V_{AC} 4 W / 300 V_{DC} 2 W / 12 V_{DC}
Fuse type:	FSK 00.1/500 mA-T, The fuse is located under the plastic cover located next to the power terminals 16 and 18. ⚠ The fuse can be changed only with the power supply voltage disconnected at terminals 16 and 18. Fuse is not connected in the circuit of power supply voltage 12 V over HBUS connector.
Backup supply without UPS:	3 s with charged supercapacitors, charging time – 5 min

Data memory

Capacity:	512 MB

Measuring characteristics

A/D convertor:	16 bit
Sampling frequency:	256 samples a period
Antialiasing filter:	digital filter of the FIR type
Phase lock:	controlled by passage of basic harmonic voltage U1 through zero
Aggregation intervals:	quality function – pursuant to the standard of EN 61000-4-30, ed. 2 recorder function – from 1 sec to 1/4 hour
Aggregation synchronization:	pursuant to the standard of EN 61000-4-30, ed. 2,
Time base:	±1 sec in 24 hours at operating temperature, when GPS signal not connected

Voltage inputs U1, U2, U3 and U4

SW setting of voltage level:	LV	MV and HV
Rated phase voltages U_n P-N:	230 V_{AC}	100 / √3 V_{AC}
JRated delta voltages U_n P-P:	400 V_{AC}	100 V_{AC}
Measuring range of phase voltages:	300 V_{AC}	190 V_{AC}
Maximum input voltage P-N:	300 V_{AC}	
Uncertainty of voltage measurement with f = 50 Hz:	0.05 % rdg ± 0.025 % U_n	
Frequency range:	up to 7.2 kHz	
Input resistance:	1.68 MΩ	
Temperature coefficient:	0.05 % / 10 K	
Measurement:	direct	indirect
Max. voltage transforming ratio:	none	999 kV / 100 V (optional SW PQ)

Current inputs

Rated current value I_n:	1 A or 5 A
Current measuring range:	5 % I_n to 120 % I_n
Frequency range:	40 Hz to 7.2 kHz
Current measurement uncertainty I_n = 1 A, 5 A:	0.05 % rdg. ± 0.025 % I_n (45 Hz to 60 Hz)
Temperature coefficient:	0.02 % / 10 K
Harmonic measurement uncertainties I_n = 1 A, 5 A:	± 5 % I_{harm} at I_{harm} ≥ 3 % I_n a ± 0.15 % I_n at I_{harm} < 3 % I_n

Uncertainties of measurement and measuring parameters of voltage quality in the testing states 1, 2, 3 according to the standard EN 61000-4-30, ed. 2

LV, MV, HV level, f = 50 Hz

Parameter	Class	Uncertainty	Measuring range
Frequency	A	± 2 mHz	42.5 Hz – 57.5 Hz
Voltage	A	± 0.1 % U_n	10 % U_n – 150 % U_n
Flicker P_{st}	A	5 % P_{st} IEC 61000-4-15, ed. 2	P_{st} (0.2 – 10.0) 1 – 4 000 changes/min
Flicker $P_{inst, max}$	A	8 % P_{st}	P_{st} = 1.0 sinus, right-angle
Voltage phenomena	A	Amplitude: ± 0.2 % U_n Duration: ± 1 period	5 % U_n – 150 % U_n 0.02 sec – 60 sec
Interruption	A	Duration: ± 1 period	0.02 sec – 180 sec
Asymmetry	A	± 0.1 %	0.5 % u_2 – 5 % u_2 0.5 % u_0 – 5 % u_0
Harmonic voltages	A	5 % U_{harm}, $U_{harm} \geq 1$ % U_n 0.05 % U_n, $U_{harm} < 1$ % U_n	10 % – 200 % class 3 IEC 61000-2-4
Interharmonic voltages	A	5 % U_{harm}, $U_{harm} \geq 1$ % U_n 0.05 % U_n, $U_{harm} < 1$ % U_n	10 % – 200 % class 3 IEC 61000-2-4
Signals in voltage	A	± 5 % U_{sig} for 3 % $U_n \leq U_{sig} \leq 15$ % U_n, ± 0.15 % U_n pro 1 % $U_n \leq U_{sig} \leq 3$ % U_n	0.5 % U_n – 15 % U_n
Voltage deviations	A	± 0.1 % U_n	10 % U_n – 150 % U_n
Time base[1)]	S	± 1 sec in 24 hrs	-

[1)] without GPS connection

REFERENCES

[1] User description of SW PQ, www.e-mega.cz

[2] User description of Data Viewer, www.e-mega.cz

[3] User description of WebDatOr, www.e-mega.cz

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PQ monitor MEg39
User manual

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