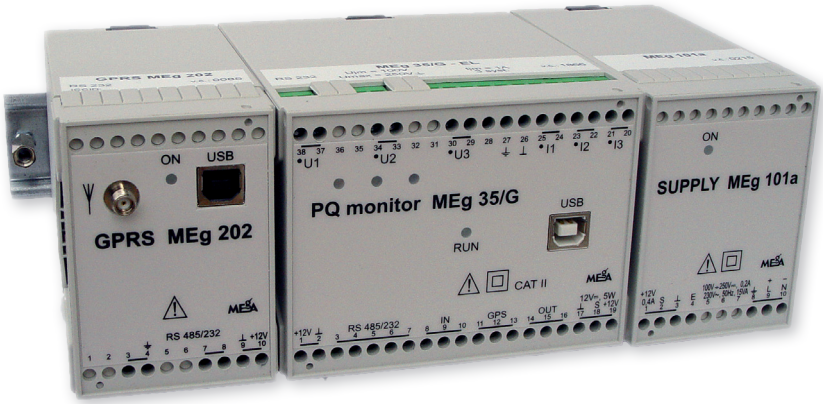
PQ monitor MEg35/G



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PQ MONITOR MEg35/G

1/ CHARACTERISTICS

The PQ monitor MEg35/G is a multi-function measuring instrument with galvanicly separated inputs to be used for permanent measurement and long-term recording of three voltages and three active currents, active and reactive power and energies in three-phase HV and MV networks. Complying with the ČSN EN 50160 standard and according to methods of the international standard IEC 61000-4-30 it analyses all parameters of voltage quality on U1, U2 and U3 inputs. It registers voltage events (voltage dips, swells and interruptions) and records not only the characteristics of voltage events defined by the standard but also the shapes of voltages and currents at the beginning and at the end of each event – the so-called initial and final details. The initial detail of an event also covers the section of time prior to the origination of the event (pretrigger) while the final detail also covers the section of time after the event (posttrigger).

Based on the measured shapes of the currents, the PQ monitor MEg35/G enables the direction of the origination of an event as well as of flicker to be assessed.

The PQ monitor MEg35/G has been designed for being installed on a DIN bar TC35 and it is manufactured in two design modifications. The basic version MEg35/G with current inputs 1 A or 5 A shall be used for the measurement at HV and MV substations of distribution companies. The version MEg35/G-EL consisting of a basic unit and of a unit of the sensor MEg35/S shall be used for the measurement at customers in circuits with electricity meters for invoicing purposes. The reasons are as follows: maintaining the accuracy of measurement, securing the supply from measuring voltage inputs, problems of dimmensions and securing the sealed spaces.

The PQ monitor MEg35/G is supplied from the supply source MEg101. The version MEg101/a shall be used for supplying with AC voltage from 85 V_{ef} to 265 V_{ef} and with DC voltage from 100 V to 250 V. The version MEg101b shall be used supplying with DC voltage from 100 V to 250 V. The version MEg101b shall be used for supplying with DC voltage from 18 V to 60 V. The supply source MEg101a-EL is to be used for supplying the monitor MEg35/G-EL from measuring voltage circuits. The basic element of the MEg101 supply source is the voltage converter which converts the DC or the AC supply voltage to the output DC voltage with magnitude 12 V. When the supply voltage has been interrupted, the output voltage is generated from the internal accumulator during 15 minutes. This enables the PQ monitor MEg35/G to measure and registrate short-term events and short-term voltage interruptions.

Communication units can be used for remote communication. The unit MEg201 is to be used for LAN networks with ETHERNET communication and the unit MEg202 for GPRS communication. Beside the communication module, this unit also comprises devices for controlling the flow of data being transmitted.

The basic unit of MEg35/G includes a servicing communication interface USB II and an interface for communication RS232 or RS485. The basic unit of MEg35/G also disposes of two input and of two output galvanicly separated two-state signals.

2/ PRINCIPLE OF MEASUREMENT AND OF DATA PROCESSING, ORGANIZATION OF DATA MEMORY

The basis of the measurement of three voltages and three currents is their sampling with a frequency looped on the frequency of the reference voltage channel U1. The frequency is calculated from the data of the reference channel U1. During subsequent intervals (without pauses) with length of 10 periods and by using two synchronously controlled A/D converters with resolution 16 bit it samples, at the same time, the voltage signal and the corresponding current signal from which the total number of 512 complex harmonic components with step 5 Hz will be calculated after the transformation into the frequency area has been made. From the point of view of the multiple of 50 Hz, the matter thus concerns 51 harmonic components and 461 interharmonic components for each channel being measured. The calculation of the magnitudes of voltages U1 to U3, of currents I1 to I3 and of "control signals" (ripple control) is carried out from absolute values of the full spectrum. The active and the reactive power of individual components as well as unbalances are calculated from complex components. Antialiasing filters are installed in all measuring channels.

The data from channels U1, U2 and U3 for the evaluation of voltage events and of flicker are processed in the time area. The TRMS for the time of the elapsed period, i. e. $U_{rms(1/2)}$ is calculated each 10 ms.

Corrections of DC components and corrections of the gain of voltage and current measuring channels as well as of frequency characteristics including corrections of possible phase shifts between individual measuring channels are used in these calculations. Tables of calibration constants are a part of the configuration.

The FLASH type data memory with range 8 MB, resistant to supply outages, is divided into four circular areas. The first area is to be used for recording the time development of RMS values of voltages, currents and power being measured in a complex form. The second area serves for storing detailed data about the voltage quality. The third data area contains unified data with a list of events according to the methodology set by the ČSN EN 50160 standard and the fourth area contains a detailed record of the time development of RMS values of voltages $U_{RMS(½)}$ on channels U1, U2, U3 and I1, I2, I3.

The basic setting of ranges of circular areas of the memory with total capacity 8 MB is as follows:

- Recording of average RMS values of three voltages, three currents, three real and three imaginary components of power; when the recording is made with a one minute step the data memory will be sufficient for recording during 30 days;
- Recording of data on voltage quality during 50 days at least without extension;
- Recording of a list of events with the capacity of more than 910 events;
- Recording of a detailed development of events for more than 180 last events.

3/ DESCRIPTION OF MEASURING AND INPUT/OUTPUT FUNCTIONS OF THE PQ MONITOR MEg35/G

3.1. Function of a time recorder

When the monitor operates in this function, average RMS values of all the three voltages, three currents and three active and reactive power values (U1, I1), (U2, I2), (U3, I3) calculated from all periods during the chosen interval of recording are recorded into the memory. Real power factors and energies are then calculated by using of a higher SW based on the recorded data.

3.2. Voltage quality function

The following ten-minute data are recorded here:

- average frequency, maximum and minimum frequency in a 10 s interval, derived from U1,
- number of cases of exceeding the 10 s values of frequency for four limits defined by the ČSN EN 50160 standard,
- values of voltage unbalances calculated from negative-sequence and positive-sequence components of phase as well as of phase-to-phase voltages,
- average, maximum and minimum (0.2 s) RMS values of voltages U1 to U3 and average and maximum (0.2 s) RMS values of currents I1 to I3,
- average values of harmonic components of voltages U1 to U3 and currents I1 to I3 in the range of the 2nd up to the 25th harmonic component,
- average values of the basic harmonic component of voltages U1 to U3 and currents I1 to I3,
- values Umax95 and Umin95 of voltages U1 to U3,
- values of Pst and Plt flicker of voltages U1 to U3,
- magnitude of THD of voltages U1 to U3 in relation to harmonic components and to all interharmonic components, magnitude of THD of currents I1 to I3,
- magnitudes of ripple control signals on voltages U1 to U3.

The voltage quality function may be used both during single-phase and two-phase measurements, input U1 is used as a reference channel in all cases.

3.3. Function of recording the events

The function of recording the events operates over the quantities U1 to U3 and I1 to I3. Each new event is recorded into a list of events and into a detailed record.

Beside the parameters of events unified by the ČSN EN 50160 standard, i.e. the time of originating and ending of an event with resolution to 10 ms, the list of events includes the values of the maximum deviations of voltages U1 to U3 from the nominal value.

A detailed list of events includes the shapes of RMS values calculated for voltages U1 to U3 and currents I1 to I3 after each 10 ms for the elapsed 20 ms. The total time of recording the initial detail of an event is 0.6 s, out of which the interval of 0.2 s is recorded prior to the origination of the event. The total time of recording the final detail of an event is 0.6 s, out of which the interval of 0.2 s is recorded after the event has been ended. The number of recorded unified events may be higher than the number of those recorded in detail.

3.4. Function of the oscilloscopic measurement

This function serves for checking the correct connection of the set of the PQ monitor MEg35/G. A notebook with series interface USB II is used for displaying the shapes of voltages U1 to U3 and currents I1 to I3. The recording with duration of 2 periods (40 ms) may be started individually or repeatedly.

3.5. Communication function

The communication interface of the PQ monitor MEg35/G for servicing activities is a series interface USB II with the data transmission rate 115.2 kbit/s. The interface RS232 or the interface RS485 are available in the basic unit for remote communication purposes. Both these interfaces become automatically blocked when the interface USB II is functioning. Connection into LAN networks is made by using the LAN unit MEg201 converting the RS485 communication onto the protocol Ethernet 2.0/IEEE 802.3. The remote communication by using the GPRS means is provided by the MEg202 unit with a communication module and a processor controlling the flow data being transmitted.

3.6. External input, relay output

External galvanicly separated inputs are two-state ones and they enable DC and AC voltages up to 24 V to be connected. The decision making level is the 3.5 V level. The external input may generate an event without recording its detail.

Relay outputs are made by the opening and the closing contact of the relay. One or more of the following meanings may be programmably assigned to the relay outputs:

- voltage U1 to U3 outside pre-chosen tolerances,
- frequency outside pre-chosen tolerances,
- Pst flicker higher than 1.0,
- any harmonic component has exceeded the pre-chosen limit,
- THD has exceeded the pre-chosen limit,
- unbalance has exceeded the pre-chosen limit.

3.7. Signalization by LED diodes

The indication of the state of the PQ monitor MEg35/G is signalized by diode RUN lighting permanently when the monitor is operating. LED diodes U1, U2 and U3 indicate, by permanent lighting, the state of voltages U1, U2, U3 in a preset tolerance band (90% U_{nom} to 110% U_{nom}) and by intermittent lighting with frequency f = 1 Hz they signalize that the corresponding voltage is outside the preset tolerance band.

4/ TECHNICAL DATA

The set of the PQ monitor MEg35/G is made by the unit of the MEg35/G monitor. The MEg201 unit shall be used when the communication is realized by using a LAN network and the MEg202 unit shall be used in the case of GPRS communication. The MEg101a or the MEg101b supply sources serve for supplying the set of the MEg35/G monitor. Its variant MEg35/G-EL is intended to be used for the measurement of voltage quality at the electricity meter. The voltage and current inputs of this variant are connected to the terminal box of electricity meter via the MEg35/S sensor. The supply of the unit of the MEg35/G-EL monitor from voltage inputs being measured is provided by the supply source MEg101a-EL.

4.1. Jednotka PQ monitoru MEg35/G a snímače MEg35/S

Measurement of voltages U1, U2, U3:

Unom phase / Unom phase-to-phase:	57.735 V / 100 V
Range of voltage measurement:	0.05 U_{nom} to 2 U_{nom}
Highest permissible voltage:	2.5 × U_{nom}
Accuracy of voltage measurement:	±0.1 % of the indicated value, ±0,1 % U_{nom}
Impedance of voltage input:	≥360 kΩ
Resistance between voltage inputs:	≥1000 MΩ
Temperature coefficient:	better than 0,05 % U_{nom} / 10 °C
Category of measurement:	CATII

Measurement of currents I1, I2, I3:

Inom of the current:	5 A / 1 A
Range of current measurement:	0.05 I_{nom} až 2 I_{nom}
Accuracy of current measurement:	0.1 % of the indicated value and 0.1 % I_{nom} at 0.05 I_{nom} to 2I_{nom}
Resolution:	0.1 % I_{nom} or better

Impedance of current input:	<2 mΩ (5 A) / 10 mΩ (1 A)
Temperature coefficient:	better than 0.1 % I_{nom} / 10 °C
Permissible current overloading:	30 × I_{nom} during 1 s
Highest permissible voltage of current inputs to ground:	50 V

Measurement of frequency

Nominal value:	f_{nom} = 50.0 Hz
Range of frequency measurement:	42.5 Hz to 57.5 Hz
Accuracy of frequency measurement:	better than 10 mHz in the range 48 Hz to 52 Hz
Resolution:	1 mHz

Measurement of power factor

Range of power factor measurement:	0 to 1.0 in all four quadrants
Accuracy of power factor measurement:	better than 0.25 % at U_{nom} and I_{nom}

Measurement of power

Range of power measurement:	Up to 1.2 P_{nom}
Accuracy of power measurement:	0.5 % P_{nom} at f = 50 Hz, 0.8 U_{nom} to 1.2 U_{nom}, 0.05 I_{nom} to 1.0 I_{nom}

Measurement of voltage unbalance

Range of voltage unbalance measurement:	0 to 5 %
Accuracy of voltage unbalance measurement:	0.15 %
Resolution of voltage unbalance measurement:	0.01 %

Measurement of the coefficient of flicker

Range of the flicker measurement:	0.05 to 4.0
Accuracy of flicker measurement:	0.05
Resolution of flicker measurement:	0.01

Measurement of harmonic and interharmonic components

Accuracy of measurement of harmonic and interharmonic voltages:	5 % U_{meas} at U_{meas} ≥3 % U_{nom} 0.05 % U_{nom} at U_{meas} <3 % U_{nom}
Accuracy of measurement of harmonic and interharmonic currents:	5 % I_{meas} at I_{meas} ≥3 % I_{nom} 0.15 % I_{nom} at I_{meas} <3 % I_{nom}
Range of measurement of harmonic voltages:	0 to 12.5 % U_{nom}
Range of measurement of harmonic currents:	0 to 25 % I_{nom}
Resolution of measurement of harmonic voltages:	0.01 % U_{nom}

Resolution of measurement of harmonic currents: 0.05 % I_{nom}

Measurement of the voltage of signals at the supply voltage of chosen frequency

Range of measurement:	0 to 9 % U_{nom}
Accuracy of measurement:	7 % of the measured value

Voltage dips and swells, voltage interruptions

Range of measurement:	0 to 2 U_{nom}
Accuracy of measurement:	0.2 % U_{nom} + 0.1 % of the measured value

Fast voltage changes

Frequencies of occurrence per hour for four levels ΔU_{max}	3 % U_{nom}, 2.5 % U_{nom}, 1.5 % U_{nom}, 1 % U_{nom}

Reference ambient conditions

Ambient temperature:	23 °C ±2 °C
Relative humidity:	40 % to 60 %
Atmospheric pressure:	86 kPa to 105 kPa

Without frost, bedewing, rain and sunshine

Operating ambient conditions

Operating temperature:	-20 °C to +60 °C (also from switched-off state)
Operation:	in indoor space
Relative humidity:	20 % to 90 %
Altitude:	up to 2000 m
Operating position:	arbitrary
Protection class:	IP40
Category of measurement:	CAT II
Contamination class:	2

Data memory

Type:	non-volatible, Flash-type
Capacity:	8 MB

Real time clock

Autonomous with possible synchronization by GPS signal

Deviation at autonomous regime: max. 1 s / 24 h,

Supply backed up by Li battery CR ½ AA

GPS – synchronization of internal time of MEg35/G

Series, galvanicly separated interface RS232/RS485 – 9600Bd

Protocol NMEA 0183 or DICOM TXD.

Communication

USB II, RS232, RS485 – 115.2 kbit/s as standard
ETHERNET, LAN MEg201 unit – option
GPRS, unit MEg202 – option

Input and output signals

Signal IN	U0:	0 V to 2 V
	U1:	5 V to 20 V
	Insulation voltage:	50 V
Signal OUT	galvanicly separated closing contact of the relay	
	Max. DC/AC voltage:	30 V
	Max. switched/permanent current:	1 A
	Max. switched power:	30 W

Supply of MEg35/G

U_{nom}:	+12 V
Supply voltage range:	+ 10.8 V to 13.2 V
Maximum power input of the set of MEg35/G:	5.5 W (including communication unit)
Maximum power input of the unit of MEg35/G:	2 W

A supply source with internal accumulator MEg101 a or MEg101b shall be used for supplying the MEg35/G set.
Supply of additional units from MEg35/G (U / I_{max}): 12 V_{DC} / 300 mA

Safety

ČSN EN 61010-1 “Safety requirements on electric measuring, control and laboratory equipment”
ČSN EN 60950 “Safety of equipment for data processing”

EMC

ČSN EN 61326-1 for industrial environment
IEC 1036 “Magnetic induction 0.5 mT of external origin at reference frequency 50 Hz of arbitrary direction”
External electric field 10 kV/m at reference frequency 50 Hz of arbitrary direction
ČSN EN 61000-4-2 “Electrostatic discharges 15 kV/air”
ČSN EN 61000-4-3 “Electromagnetic h. f. field 80 MHz to 1000 MHz + 1400 MHz to 2000 MHz”
ČSN EN 61000-4-5 “Transient voltages 1.2/50 µs with magnitude 4 kV”
ČSN EN 61180 “Transient voltages with magnitude 6 kV”

Dimensions and weight, design

Length × width × height:	100 × 75 × 110 mm
Weight:	0.5 kg

The unit has been designed for being installed on a DIN bar, type TC 35 (35 × 7,5 mm).

4.2. Sensor MEg35/S

Voltages being measured U1, U2, U3

U_{nom}phase/U_{nom}phase-to-phase:	57.735 V / 100 V
Range of voltages being measured:	0 to 2 U_{nom}
Highest permitted voltage:	2.5 × U_{nom}
Impedance of voltage input:	≥370 kΩ, with connected MEg35/G-EL
Resistance between voltage inputs:	≥1000 MΩ

Currents being measured I1, I2, I3

I_{nom} of the current:	5 A / 1 A
Range of currents being measured:	0 to 2 I_{nom}

Supply of MEg35/G-EL

The supply source with the internal accumulator MEg101a-EL shall be used for supplying the MEg35/G-EL.

The supply voltage for the supply source for MEg35/G-EL is obtained by rectifying U1 and U2 against voltage U3.

Dimensions and weight, design of the version for the terminal box of electricity meter ZS1b

Length × width × height (three-system):	220 × 47 × 22 mm
Length × width × height (Aron connection):	150 × 47 × 22 mm
Weight:	0.25 kg

Current conductors shall be pulled through holes on of the sensor

Diameter of the hole:	5 mm
Length of the:	20 mm

Voltage conductors shall be connected with two screws into the terminal which is ended with metallic points for the connection into voltage terminals of the terminal box of electricity meter.

Diameter of the hole of voltage terminal:	6 mm
Depth of the hole of voltage terminal:	16 mm
Diameter of the metallic point:	4 mm
Length of the metallic point:	20 mm

4.3. Supply sources MEg101a, MEg101a-EL and MEg101b

Input of supply sources SUPPLY MEg101a, MEg101a-EL

Unom:	230 V_{ef}
Supply voltage range:	85 V_{ef} až 265 V_{ef}, 100 V_{DC} až 250 V_{DC}
P_{max}:	10 VA
Fuse type:	0.5 A-T
Insulation voltage:	3 kV

Input of supply source SUPPLY MEg101b

Supply voltage range:	18 V_{DC} to 60 V_{DC}
P_{max}:	10 VA
Fuse type:	1 A-T
Insulation voltage:	1500 V

Output of supply sources SUPPLY MEg101a, MEg101a-EL, MEg101b

$U_{nom\ output}$:	12 V
$I_{max\ output}$:	400 mA
Duration of supply interval at supply voltage interruption and at maximum consumption:	1/4 hours

The accumulator will be totally discharged after four ¼ h supply intervals.

Maximum duration of charged state of the accumulator:	10 hours

Mechanical dimensions of supply sources SUPPLY MEg101a, MEg101a-EL, MEg101b

Length × width × height:	55 × 75 × 110 mm
Weight:	0.35 kg

The unit has been designed for being installed on a DIN bar, type TC 35.

Operating ambient conditions for supply sources MEg101a, MEg101a-EL, MEg101b

Operating temperature::	-20 °C to +60 °C
Operation:	in indoor space
Relative humidity:	20 % to 90 %
Altitude:	up to 2000 m
Operating position:	arbitrary
Protection class:	IP20
Safety of the source:	(ČSN EN 61010-1, ČSN EN 61326-1)
Contamination class:	2

4.4. Communication unit MEg201

Communication:

Ethernet 2.0/IEEE 802.3 10 Base-T or 100 Base-TX (auto-sensing), connector RJ45
Supported by protocols ARP, UDP, TCP, ICMP, Telnet, TFTP, AutoIP, DHCP, HTTP, SNMP
Configuration by using of the built-in www server.

Supply: +5 V to +12 V / max. 200 mA

Dimensions and weight, design:

Length × width × height:	55 × 75 × 110 mm
Weight:	0.2 kg

The unit has been designed for being installed on a DIN bar, type TC 35.

4.5. Communication unit MEg202

Communication:

GSM 850/900/1800/1900 MHz, GPRS class 10
Supported by protocols UDP, TCP, SMTP, FTP

Supply: +12 V / max. 200 mA

Dimensions and weight, design:

Length × width × height:	55 × 75 × 110 mm
Weight:	0.2 kg

The unit has been designed for being installed on a DIN bar, type TC 35.

5/ DESIGN

5.1. 5.1. Design of the unit of MEg35/G, substation

PQ monitors MEg35/G and MEg32/G-EL (Fig. 1) are intended for a fixed mounting in HV and MV networks. The description of front type-indicating "plates" of the units of the MEg35/G set is given in Fig. 2. The unit of MEg35/G is placed in a plastic, self-extinguishing case made of ABS with dimensions 100 × 75 × 110 mm and it has been designed for being installed on a DIN bar. Voltages and currents being measured, supply and communication facilities are connected by means of bolted-type terminals for conductor cross section of up to 4 mm2. The voltages being measured are connected to terminals U1 (38, 37), U2 (34, 33), U3 (30, 29). The first voltage terminal is marked with a point. The magnitude of voltages U1, U2, U3 is signalized by LED diodes marked with symbols U1, U2 and U3. The currents being measured are connected to the pairs of terminals I1 (25, 24), I2 (23, 22) and I3 (21, 20). The input current terminal is marked with a point. A LED diode RUN is also on the panel of the unit signalizing the operation of the MEg35/G unit. The version and the serial number of the unit, the nominal range of currents and voltages as well as the type of communication are indicated on a label glued on the upper side of the unit:

Table 1: Table of terminals of units of MEg35/G and MEg35/G-EL monitors

1	Voltage +12 V for supplying MEg201 and MEg202 communication units
2	⊥. Common conductor of the MEg35/G set, ⊥. for supplying MEg201 and MEg202
3	RxD – RS232, B – RS485
4	TxD – RS232, A – RS485
5	CTS – RS232
6	RTS – RS232
7	GND1 Common conductor of separate circuits for communication
8	D1 – Input signal
9	D2 – Input signal
10	GND2 – Common conductor of input signals
11	GPS DATA – Signal
12	GPS 1 s – One-second signal, active ascending edge
13	GPS GND3 – Common conductor
14	SW1 – Opening contact
15	SW0 – Common conductor for output signals

16	SW2 – Closing contact
17	⊥ Common conductor of the MEg35/G set – GND
18	S – signalization of supply from accumulator when the supply voltage has been interrupted
19	Voltage +12 V for supplying MEg35/G and communication units
20	I3 – Output of the current
21	I3 – Input of the current
22	I2 – Output of the current
23	I2 – Input of the current
24	I1 – Output of the current
25	I1 – Input of the current
26	Terminal for the shielding of current signals of MEg35/G-EL
27	Protecting conductor of MEg35/G and MEg35/G-EL units
29	End voltage terminal U3
30	First voltage terminal U3
33	End voltage terminal U2
34	First voltage terminal U2
37	End voltage terminal U1
38	First voltage terminal U1

The unit of MEg35/G and/or the connected communication units MEg201 or MEg202 are supplied from terminals +12 V (19) and ⊥ (17). The signal S (18) signalizes the supply from the accumulator when the voltage of the supply source has been interrupted. The supply voltage of the communication unit MEg201 is +5 V to +12 V and that of the communication unit MEg202 is +12 V and it is taken from terminals +12 V (1) and ⊥ (2) of the unit of MEg35/G. Two double-value input signals are applied to terminals IN (8, 9, 10) – with a common conductor. They are galvanicly separated from circuits of the unit of MEg35/G. Two output signals out (14, 15, 16) are formed by the closing and the opening contact of two relays.

A connector USB type USB1 is used for servicing communication. The remote communication is realized – according to the order – by interfaces RS485 or RS232 on terminals 3 to 7 of the unit of MEg35/G. Signals of the RS485/232 interface are transmitted into the MEg201 or the MEg202 unit.

The panel of the unit of MEg35/G is covered with a cover preventing unauthorized manipulations with input and output signals of the MEg35/G unit.

5.2. Design of the unit of MEg35/G-EL and of the MEg35/S sensor, customer

The unit of the MEg35/G-EL monitor has the same marking of terminals as the version MEg35/G and the dislocation and marking of signalization elements and of other design elements are also identical. The connection with the exception of terminal 26 "Shielding of current signals" is also the same. The voltage and current inputs of the unit of MEg35/G-EL are connected to measuring circuits of the electricity meter via the sensor MEg35/S (Fig. 4) which is mechanically fixed to voltage terminals in the terminal box of electricity meter ZS1 by means of measuring voltage contacts U1, U2 and U3.

In three-system connection the conductors with voltages being measured U1, U2, U3 of the measuring voltage transformers shall be connected into voltage terminals of the MEg35/S sensor having two screws. Conductors with currents being measured I1, I2, I3 of the measuring current transformers shall be pulled through holes $I1_{inp}$, $I1_{outp}$, $I2_{inp}$, $I2_{outp}$ and/or $I3_{inp}$, $I3_{outp}$, of the MEg35/S sensor and connected under double current terminals in the terminal box of electricity meter. The MEg35/S sensor is also provided with middle holes corresponding to middle current terminals in the terminal box of electricity meter.

In Aron type connection two variants of terminal boxes ZS1b are used: the old shortened terminal box ZS1B made of bakelite or a new three-system plastic terminal box with normal length. In Aron type connection the voltage conductors, in normal as well as in shortened version of the MEg35/G sensor, are connected to voltage terminals U1, U2 and U3. Conductors with currents being measured I1 and I3 of the measuring current transformers shall be pulled through holes $I1_{inp}$, $I1_{outp}$ and $I3_{inp}$, $I3_{outp}$ of the MEg35/S sensor. Holes for the current I2 are omitted in the shortened terminal box.

The descriptions of contacts of the MEg35/S sensor for three-system and for Aron type connection are given in Fig. 1.

Marking of conductors in colour:

Three-system connection	Aron type connection, normal	Aron type connection, shortened
I1m – yellow	I1m – yellow	I1m – yellow
°I1m – blue	°I1m – blue	°I1m – blue
I2m – brown	not connected	I3m – rose
°I2m – grey	not connected	°I3m – white
I3m – rose	I3m – rose	not connected
°I3m – white	°I3m – white	not connected

The output voltage signals of the MEg35/S sensor are present on contacts U1m, U2m, U3m and /or on the grounding terminal. Terminals Z12 and Z3 serve for supplying the set with the unit of MEg35/G-EL and with the communication unit MEg202 or 201. Terminals 1V, 1M and 1N as well as terminals 2V, 2M, 2N and 3V, 3M, 3N serve for connecting output voltage signals to measuring voltage transformers either directly or across the protection of the electricity meter. The conductors of output current signals of the MEg35/S sensor are soldered directly into the plate of the sensor. By means of a shielded cable they are applied to current inputs I1, I2 and I3 of the unit of MEg35/G-EL and the shielding shall be connected to its terminal 26. Description of the installation is in chapter 6.

For the measurement in Aron type connection scheme, the MEg35/S sensor is delivered in shortened version without the voltage terminal N and without holes for pulling through the conductors with current I3.

The MEg35/S sensor is always placed in a sealed space and it is connected to the terminal box of electricity meter. The unit of MEg35/G-EL, the MEg202 communication unit and the supply source MEg101 are installed on a DIN bar, type TC 35 situated on the instrument panel of the case of the electricity meter. The whole set MEg35/G is covered with a cover that can be sealed, with a transparent panel preventing unauthorized manipulations with terminals and connecting conductors – see Fig. 5.

5.3. Design of MEg201 and MEg202 communication units

Communication units MEg201 and MEg202 (their panels can be seen in Fig. 2) are built-in in a plastic self-extinguishing case made of ABS with dimensions 55 × 75 × 110 mm, designed for being installed on a DIN bar, type TC 35. Bolted-type terminals are situated in one row, the maximum cross section of connected conductors is 4 mm2. The supply voltage +5 V to +12 V for the MEg201 unit or +12 V for the MEg202 unit is applied to terminal (10) and a common conductor of the MEg35/G set to terminal (9). The communication between MEg201 or MEg202 communication units and the unit of MEg35/G is realized via the RS485/232 interface on terminals 4 to 8. Communication between the LAN network and the MEg201 unit is realized by using connector ETH, type RJ45 placed on the panel of the MEg201 unit. The LED diode ON signalizes the availability of the supply voltage +5 V and the LED diode COM signalizes the communication.

The connection of MEg201 and MEg202 units with the units of MEg35/G and/or MEg35/G-EL is shown in Fig. 8.

Tab. 2: Table of terminals of communication units

MEg201 unit

1	+ pole of the switching contact
2	- pole of the switching contact
3	Free
4	Common conductor for communication GND1, MEg201
5	Free
6	Free
7	Signal TxD / A
8	Signal RxD / B
9	Common conductor of the MEg35/G set – GND
10	Voltage +5 V to +12 V for supplying LAN MEg201

MEg202 unit

1–3	Free
4	Common conductor for communication GND1, MEg202
5	Free
6	Free
7	Signal TxD
8	Signal RxD
9	Common conductor of the MEg35/G set – GND
10	Voltage +12 V for supplying LAN MEg202

5.4. Design of supply units MEg101a and MEg101b

Supply sources MEg101a and MEg101b are built-in in a plastic self-extinguishing case made of ABS with dimensions 55 × 75 × 110 mm, designed for being installed on a DIN bar, type TC 35. Bolted-type terminals are situated in one row, the maximum cross section of connected conductors is 4 mm^2. Their description can be found in Table 3, their connection is shown in Fig. 8.

AC or DC supply voltage is applied to terminals marked as L or + (9) and N or – (10). Terminal (8) serves for shielding and h. f. grounding of the MEg101 supply source including the unit of MEg35/G, by using its common conductor ⊥ (17). The interconnection of terminal (8) of the MEg101 supply source with ground is necessary for suppressing

interferences.

If the voltage is present at the output of the supply source, the LED diode ON on its panel is lighting. The converter provides energy for supplying the units of the MEg35/G set, as well as for charging up the accumulator of the supply source MEg101. The output voltage +12 V supplying the units of the MEg35/G set is available on terminals +12 V (1) and on the common conductor (3) of the supply source MEg101. The signal on terminal S (2) signalizes the supplying of the MEg35/G set from the accumulator when the supply voltage has been interrupted.

At the absence of the input supply voltage, the function of the converter can be switched-off by connecting terminal E (4) with the common conductor of the MEg35/G set. The discharging of the accumulator can thus be prevented.

Table 3: Table of terminals of MEg101a and MEg101b units

1	Output voltage +12 V/0.4 A for supplying MEg35/G
2	Signal of the input voltage interruption
3	⊥ common conductor of the MEg35/G set – GND
4	Signal E By connecting it with the common conductor of the MEg35/G set – GND at the absence of the input voltage, the generation of the output voltage will be blocked
5	Free
6	Free
7	Free
8	Protecting conductor and h. f. grounding of the supply source unit
9	Positive pole of DC input supply voltage or one pole of AC input supply voltage
10	Negative pole of DC input supply voltage or the second pole of AC input supply voltage

Using the PQ monitor set in another way than in that for which it has been intended may result in impairing the protection provided by the equipment.

6/ INSTALLATION

6.1. Description of the installation of the MEg35/G set

The installing of the set of the PQ monitor MEg35/G includes the installation of the unit of MEg35/G, of the unit of the MEg101 supply source and of one of communication units MEg201, MEg202. The MEg35/G set is usually installed into the panel of the switchboard of the transformer station or substation. Measuring voltage transformers and measuring current transformers, most often in three-phase connection, are the source of signals being measured. A three-phase measurement of currents is advantageous because the PQ monitor MEg35/G also registers current events. At MV level the PQ monitor MEg35/G indirectly measures, according to the standard, phase-to-phase voltages (100 V) and phase currents (5 A/1 A). A secured supply with DC or AC voltage is often available at the place where the PQ monitor MEg35/G is to be installed. A supply with AC unsecured voltage may also be used when the required back-up supply at a voltage interruption is provided by the accumulator of the MEg101 unit. The version MEg101a shall be used for AC supply voltage in the range of 85 V_{ef} to 265 V_{ef} or DC voltage 100 V to 250 V. The version MEg101b shall be used for the supply with DC voltage 18 V to 60 V. The facilities of LAN networks already established in energy objects may be used for remote communication of the PQ monitor MEg35/G. In this case the communication unit MEg201 usually connected to the unit of MEg35/G by using the RS485 protocol shall be used in the MEg35/G set. Or, it is also possible to use the communication GPRS with the MEg202 unit which is connected to the unit of MEg35/G by using the RS232 protocol. Examples of the interconnection of supply source units, of the PQ monitor MEg35/G and of the communication unit can be seen in Fig. 8.

The mutual agreement of data on labels on the upper sides of the units shall be checked before installation. The agreement of nominal values of quantities being measured and of values of instrument transformers shall be checked, too. According to the nominal value of the currents a drill template of the switchboard case shall then be glued on the chosen place of installation (see Fig. 7a). Holes of prescribed dimensions shall be bored at marked points. The hole for the antenna or the hole for the cable to LAN network are bored only when using the respective communication. For passing of the currents being measured, one hole with diameter 12 mm shall be bored at amperage of 1 A while 3 holes with diameter 10 mm shall be bored at amperage of 5 A. The MEg35/G set assembled and interconnected at manufacturer's premises, installed on a DIN bar, shall be fixed onto the panel of the case. A three-system connection of circuits of the set of the PQ monitor MEg35/G into the circuits of the electricity meter not used for invoicing purposes shall be realized according to Fig. 9. Fig. 10 shall be used in the case of Aron type connection. Current circuits of the PQ monitor MEg35/G – after short-circuiting the current circuits in the terminal box of

electricity meter – shall be connected in series with current terminals of the electricity meter ZS1b. Voltage circuits of the PQ monitor MEg35/G shall be connected in parallel to terminals of secondary voltages of the instrument transformer in the case and, through a separate three-pole disconnector OPV10/3 with a fuse, they will be applied to voltage inputs of the unit of MEg35/G.

The supply voltage shall be applied to terminals L (9) and N (10) of the supply source unit by using again one or two disconnectors OPV10/1 – according to the type of the supply voltage. When supplying with DC ungrounded voltage, both poles must be protected. So that the functioning of the equipment and of its overvoltage protection devices may be correct, it is necessary to ground terminal (8) of the MEg101 source and terminal (27) of the unit of MEg35/G.

When using the communication via the LAN network with protocol TCP/IP, the communication cable must be laid up to the ETH connector and shall be pulled through the hole under the MEg201 unit. When using the GPRS communication the antenna cable shall be pulled through the hole for the antenna and the antenna shall be put on the place with a sufficient by high level of the signal.

6.1.1. Procedure of installing the MEg35/G set

The MEg35/G set includes the unit of MEg35/G, the supply source MEg101 and the communication unit MEg201 or MEg202. The units are fixed on a DIN bar and are interconnected.

1. Checking the data on labels (U_{nom}, I_{nom}, communication, source version).
2. According to the value of I_{nom} a chosen drill template shall be glued on the place of installation.
3. Boring of marked holes, removal of the template.
4. Fixing of the DIN bar with units on the panel of the case.
5. Fixing of the DIN bar for fuse disconnectors.
6. Fixing of the three-pole disconnector of voltages being measured and connecting it to the first terminals with this voltage in the case.
7. Fixing of one or two single-pole disconnectors according to the type of supple voltage and connecting it/them to the supply voltage.
8. Opening of all disconnectors and equipping them with fuses PV10 1A, disconnectors shall be left opened.
9. Interconnection of non-connected terminals of the three-pole disconnector with voltage inputs U1, U2, U3 of the MEg35/G unit.

10. Short-circuiting of current circuits of instrument current transformers and connection of current inputs of MEg35/G into current circuits of the electricity meter. The disconnection of short-circuits then follows.
11. a) Connection of the non-connected terminal of the single-pole disconnector and of the neutral conductor of the mains supply with input terminals L and H of the supply source.
    b) Connection of non-connected terminals of two single-pole disconnectors of the DC supply with input terminals L and H of the supply source.
12. Grounding of terminal (8) of the MEg101 supply source and of terminal (27) of the unit of MEg35/G.
13. Connection of the LAN network into the ETH connector of the MEg201 unit or of the GPRS antenna into the MEg202 unit.

6.2. Description of the installation of the MEg35/G-EL set

The installation of the set of the MEg35/G-EL monitor includes, beside installing the MEg35/G unit, the MEg101 supply source and usually the MEg202 communication unit, also the installation of the MEg35/S sensor. The MEg35/G-EL shall be most often installed into electricity meter cases VSM-N or USM-E3S or into universal cases. Orientational placing of the units on the DIN bar and of the MEg35/S sensor in electricity meter cases can be seen in Fig. 6. When the MEg35/G-EL set is to be installed into standardized electricity meter cases VSM and USM, the manufacturer delivers, together with the sensor, a unified cabling for interconnecting the MEg35/S sensor with the units of the set. The units of the MEg35/G-EL set are fixed on the DIN bar and mutually interconnected by the manufacturer.

When installing the MEg35/G-EL set into universal cases the cabling is delivered in the length specified by the customer. When there is no access into universal cases from behind, a supporting part made of Al (see Fig. 7b) is delivered together with the drill template.

The measuring connection of the MEg35/G-EL set at the interface distribution-customer is made either as Aron type or it is a three-system one. Connection diagrams are shown in Figs 11 to 16. Phase-to-phase voltages and phase currents are measured. Three currents in three-phase connection and two currents in Aron type connection are being measured. According to the length of terminal box of electricity meter, in Aron type connection the connection of the current I3 is different in the sensor of normal length and of shortened length. Colour marking of the conductors with current signals is described in Chapter 5.2. The MEg35/S sensor is identical for measurements with Inom = 5 A or 1 A. The

distinguishing of amperage is realized in the unit MEg35/G-EL. Usually, supply voltage is not available in electricity meter cases and, therefore, the voltage being measured shall be used for the supply. The supply source unit will then be in version MEg101a-EL. However, when the mains supply voltage 230 VAC is available, this voltage should be preferably used. In the case of the supply with mains voltage the supply source will be in version MEg101a. When installing the MEg35/G-EL set at the interface distribution-customer, the GPRS MEg202 unit with external antenna shall be nearly exclusively used for remote communication.

The mutual agreement of data on labels on the upper sides of the units shall be checked before installation. The agreement of nominal values of quantities being measured and of values of instrument transformers shall be checked, too. According to the type of the electricity meter case a drill template (see Fig. 7b) shall be glued on the chosen place of installation (see Fig. 6). Holes of prescribed dimensions shall be bored at points marked on the template and the template shall be removed. The set of units of MEg35/G-EL fixed on the DIN bar and mutually interconnected shall then be screwed into the bored holes.

When using the supply from voltages being measured, a three-pole fuse disconnector OPV10/3 has to be installed. It shall be connected to direct outputs of the instrument voltage transformers (in front of the protecting elements of the electricity meter). Fuse disconnectors shall be equipped with fuses PV10 1 A and the disconnectors will be left in opened position. In this case, the following terminals of the MEg35/S sensor prepared for installation on the terminal box of electricity meter ZS1b must be interconnected by the manufacturer: 1M with 1N, 2M with 2N and 3M with 3N. These terminals shall be connected with output terminals of the three-pole fuse disconnector. The supply terminals Z12 and Z3 of the MEg35/S sensor shall then be connected with terminals L (9) and N (10) of the unit of the supply source for MEg35/G-EL and terminals U1m, U2m and U3m of the MEg35/Ssensor shall be connected, according to the circuit diagram, with measuring voltage terminals U1, U2 and U3 of the unit of MEg35/G-EL.

In the case of external supply, one (mains supply) or two (DC supply) disconnectors OPV10/1 again with fuses PV10 1 A shall be installed before installing the MEg35/S sensor. The disconnectors shall be left in open position. When supplying from the mains, the output terminal of the disconnector and the unprotected neutral conductor shall be connected with terminals L (9) and N (10) of the supply source MEg101a. When supplying with DC voltage, the output terminals of both disconnectors shall be connected to terminals L (9) and N (10) of the supply source MEg101a. In this case the MEg35/S sensor prepared for installation on the terminal box of the electricity meter ZS1b has fuses with wire outlets FSK 00.1 500 mA T installed between terminals 1V and 1M, 2V and 2M, 3V and 3M. The supply terminals Z12 and Z3 of the MEg35/S sensor shall then be connected with terminals L (9) and N (10) of the unit of the MEg101a supply source

and terminals U1m, U2m and U3m of the MEg35/S sensor shall be connected, according to the circuit diagram, with measuring voltage terminals U1, U2 and U3 of the unit MEg35/G-EL.

When using a shortened terminal box of electricity meter for Aron type connection, shortened MEg35/S sensors shall be used. When using the terminal box for a three-system connection with normal length, three-system MEg35/S sensors with normal length shall be used although the electricity meter is connected according to Aron type connection scheme.

The currents being measured are transformed by the MEg35/S sensor onto signals which are, under a three-phase connection, applied through a shielded cable to current inputs I1, I2 and I3 of the unit of MEg35/G-EL. In the case of Aron type connection the currents being measured in the first and the third phase are transformed through the MEg35/S sensor onto signals applied to inputs I1 and I3 of the unit of MEg35/G-EL. The shielding of the cable is connected to terminal (26) of the unit of the MEg35/G-EL monitor, the shielding need not be connected to the MEg35/S sensor. The amperage of the unit of the MEg35/G-EL monitor shall be chosen according to the nominal value of the secondary current of instrument current transformers.

For GPRS communication, angle connector of the antenna cable shall be pulled through the hole for the antenna in the panel of the electricity meter case and it shall be connected to the antenna connector of the GPRS unit for testing the communication. During the installation of the cover that can be sealed the antenna connector must be loosened.

Prior to connecting the MEg35/S sensor on the terminal box of electricity meter ZS1b, **current circuits** of the measuring current transformers **shall be short-circuited** in it and **voltages being measured shall be disconnected** in protecting elements of voltage circuits of the electricity meter. All outgoing voltage terminals of the terminal box of electricity meter applying the voltage into the electricity meter must be loosened and all current conductors between the terminal box of electricity meter and the electricity meter itself must be loosened, too. The metallic points of the MEg35/S sensor shall then be inserted into voltage terminals and fixed by both screws. Current conductors shall be pulled through the holes in the MEg35/S sensor and fixed under the double current terminal of the terminal box of electricity meter. The **short-circuited connections** of current circuits of the instrument current transformers **shall then be loosened** and opened protecting elements of voltage circuits of both the electricity meter and the PQ monitor **must be closed**. In the case of external supply the opened supply disconnectors must be closed as well.

6.2.1. Procedure of installing the MEg35/G-EL set

The set of MEg35/G-EL includes the unit of MEG35/G-EL, the supply source MEg101a-EL or MEg101a and the communication unit MEg202. The units are fixed on the DIN bar and are interconnected. The MEg35/S sensor with cabling for the given electricity meter case is also here.

1. Checking the data on labels (U_{nom}, I_{nom}, communication, source version) and checking the length of the MEg35/S sensor (Aron, three-system).
2. According to the type of the electricity meter case and the possibility of access a chosen drill template shall be glued on chosen place of the pull-out panel.
3. Boring of marked holed, removing of the template.
4. Fixing of the DIN bar with units on the pull-out panel of the electricity meter case. Fixing the Al supporting part into the universal case without the possibility of access from behind, removal of units of the MEg35/D-EL set from the DIN bar, fixing the DIN bar on the Al supporting part and putting the units on the DIN bar.
5. Supply from voltages being measured
   5.1. Installing of the three-pole disconnector OPV10/3 and connecting it to direct outputs of instrument voltage transformers.
   5.2. Opening of the three-pole disconnector and equipping it with fuses PV10 1A.
   5.3. Checking the interconnection of connections 1M with 1N, 2M with 2N and 3M with 3N of the MEg35/S sensor.
   5.4. Connecting the contacts 1N, 2N, 3N of the MEg35/S sensor with output terminals of the three-pole disconnector OVP10/3.
   5.5. Connecting the terminals Z12 and Z3 of the sensor with terminals L (9) and N (10) of the supply source MEg101a-EL.
   5.6. Connecting the terminals U1m, U2m, U3m of the sensor with voltage inputs U1, U2 and U3 of the unit of MEg35/G-EL according to the circuit diagram.
6. External supply
   6.1. Supply from the mains:
   MEg101a
   Installing of the single-pole disconnector OVP10/1 and connecting it to the phase of mains voltage, the disconnector is opened.
   Connecting the second terminal of the disconnector to input L (9) of the MEg101a supply source.
   Connecting the terminal N (10) of the source to the neutral conductor of the network N.
   Supply with DC “floating” voltage:
   over 100 V – MEg101a, below 60 V – MEg101b
   Installing of two single-pole disconnectors OPV10/1 and connecting them to the positive and the negative pole of the source of DC voltage, the disconnectors are opened.

Connecting the second non-connected terminals of single-pole disconnectors to supply terminals L (9) and N (10) of the supply source MEg101a or MEg101b.

6.2. Equipping the opened single-pole disconnectors with fuses PV10 1 A, the disconnectors are opened.
6.3. Checking the installation of fuses with wire outlets FSK 00.1 500 mA T between terminals 1V and 1M, 2V and 2M, 3V and 3M of the MEg35/S sensor.
6.4. Connecting the terminals U1m, U2m, U3m of the MEg35/S sensor with voltage inputs U1, U2 and U3 of the unit of MEg35/G-EL.

7. Applying the current signals of the MEg35/S sensor through the shielded cable to input current terminals of the unit of MEg35/G-EL (I1, I2, I3 for three-system connection, I1 I3 for Aron type connection).
8. Connecting the shielding of the cable with current signals to terminal (26) of the unit of MEg35/G-EL.
9. Pulling the angle connector of the antenna cable through the hole for the GPRS antenna and connecting it into the antenna connector of the MEg202 unit for checking the communication.
10. Short-circuiting the current circuits in the terminal box of electricity meter ZS1b, opening the voltage terminals of the terminal box of electricity meter.
11. Disconnecting the current and voltage conductors between the terminal box of electricity meter and the electricity meter itself from the terminal box of electricity meter ZS1b.
12. Installing the connected MEg35/S sensor by using metallic points into voltage terminals of the terminal box of electricity meter.
13. Connecting voltage conductors from the electricity meter into double voltage terminals of the MEg35/S sensor.
14. Pulling the current conductors from the electricity meter through the corresponding holes on the MEg35/S sensor and connecting them into double current terminals in the terminal box of electricity meter ZS1b.
15. Opening the short-circuits in the current circuits of instrument current transformers in the terminal box of electricity meter and connecting voltage terminals of the terminal box of electricity meter.

6.3. Checking the function of the connected MEg35/G set

After the measuring, communication and supply circuits have been connected and the supply switched-on, the LED diode RUN, after the transitory intermittent lighting (for about 10 s), starts to light permanently on the unit of MEg35/G. If the voltages being

measured are within the permitted tolerances Unom ±10%, the LED diodes of voltage inputs of MEg35/G will also start to light permanently. The LED diodes ON of the supply source will also light permanently and after 1 minute necessary for establishing the GPRS communication the LED diode ON of the communication unit MEg201 will light permanently as well. A notebook with activated user program "PQ monitor" shall be connected to the unit of MEg35/G via the servicing USB communication. After having chosen the page "Measuring instrument", function "On-line measurement", the voltage magnitude and a correct direction of rotation shall be checked. The magnitudes of phase currents shall be checked, too. After the servicing USB communication has been ended and the communication cable removed, the communication will be automatically switched-over onto the RS 485 or RS 232 communication and the function of the remote communication can be checked by means of the communication unit.

A detailed description of the user program "PQ monitor" and of the testing of communication means is given in a separate manual.

After the installation has been ended and the function checked (including the checking of the communication), the units of the set of the PQ monitor MEg35/G shall be covered with a cover that can be sealed and screwed to the DIN bar. For units of the MEg35/G-EL set a cover that can be sealed, having a plexi front part and a hole for the antenna, shall be used. The GPRS antenna shall be connected into the connector in the hole for antenna connector of the MEg202 unit. The dipole of the antenna shall be located at a convenient place only after the communication has been set and after the level of the GPRS signal has been checked.

Attention!

After switching-off the supply from the supply source MEg101, the source supplies energy with the voltage of 12 V from its internal accumulator. This also serves for supplying the MEg35/G set at the supply voltage interruption. Before the switching time lasting 15 minutes elapses, this supply can be blocked by a short-time connection of contact E (4) with the common conductor (3) of the MEg101 supply source.

7/ DEMANDS ON MAINTENANCE

7.1. PQ monitor MEg35/G

The set of PQ monitor MEg35/G has no demands on forced ventilation, it does not comprise any moving control elements and, except for a routine cleaning of the surface, it has no special demands on maintenance. Only soft materials shall be used for cleaning the surface.

The preventive inspection includes:
- checking the mechanically undamaged state of the units,
- checking the undamaged state of used seals,
- checking the remote communication.

It is recommended to carry out preventive inspections after each 3 years of operation.

The intervals of checking the accuracy of measurement shall be specified by the user of the PQ monitor according to the importance of the measurement and to characteristic features of the location where the monitor has been installed. It is recommended to check the accuracy of measurement each 3 years.

It is not permitted to remove the cover of the monitor unit on installed or connected monitors. The removal of the cover is dangerous to life.

8/ CONTENT OF THE MONITOR SET

8.1. Content of the set of the MEg35/G monitor

Unit of the PQ monitor MEg35/G
Unit of the supply source MEg101a or MEg101b
User guide for PQ monitor
Program on CD

Optional parts of the set:

Clamping to a DIN bar
Communication cable USB – PQ/2 m/EMC
Communication unit MEg201
Communication unit MEg202
Cover that can be sealed, with or without a plexi front part

8.2. Content of the set of the MEg35/G-EL monitor

Unit of the PQ monitor MEg35/G-EL
Unit of the MEg35/S sensor
Unit of the supply source MEg101a or MEg101a-EL
Sensor MEg35/S
User guide for PQ monitor
Program on CD

Optional parts of the set:

Communication unit MEg201
Communication unit MEg202
Clamping to a DIN bar
Al supporting part under the DIN bar
Unified cabling for the case VSM or USM
Cover that can be sealed, with or without a plexi front part
Communication cable USB – PQ/2 m/EMC

Disconnectors and material necessary for installation shall be delivered by the organization which is in charge of the installation.

9/ DELIVERY

The place of delivery is the address of the manufacturer if not otherwise stated.

The set of the PQ monitor in version MEg35/G or MEg35/G-EL is delivered in a paperboard package provided with a label containing basic data.. Delivery note and certificate of warranty with indicated date of sale are component parts of the delivery.

10/ WARRANTY

It is not permitted to open the units of the set of the MEg35/G or the MEg35/G-EL monitor during the warranty period.

A warranty in the length of two years since the date of sale is provided for PQ monitors in versions MEg35/G or MEg35/G-EL. Defects originating during this period as a demonstrable result of a defective design, manufacturing or using unproper material will be repaired free of charge by the manufacturer. The place of fulfilment of warranty obligations is the seat of the manufacturer.

The warranty becomes unvalid if the user has broken the seal or carried out unpermitted modifications or changes on the PQ monitor and/or its accessories, if he connects it incorrectly, or when the PQ monitor or its accessories have been operated out of keeping with technical conditions.

The defects on the PQ monitor MEg35/G or MEg35/G-EL and on its accessories originating during the warranty period shall be claimed by the user to the manufacturer of the monitor. The claim without the attached certificate of warranty will not be accepted.

The manufacturer bears in any case no responsibility for subsequent damages caused by using the PQ monitor and its accessories. No responsibility which would exceed the price of the PQ monitor MEg35/G follows for the manufacturer from this warranty.

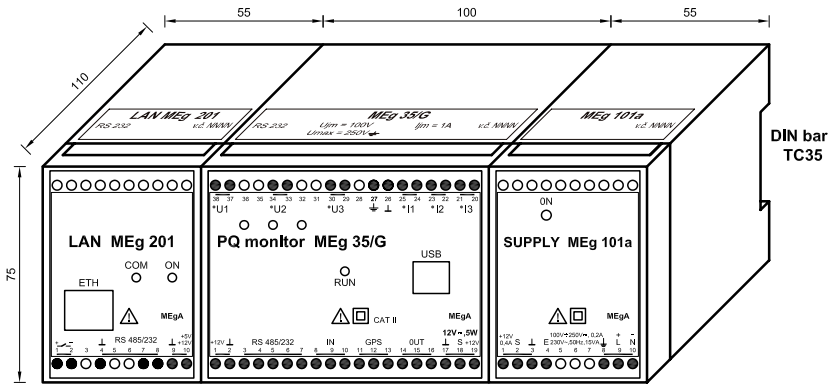
11/ MANUFACTURER

MEgA – Měřící Energetické Aparáty, a.s.

664 31 Česká 390, Czech Republic

tel: +420 545 214 988 • mail: mega@e-mega.cz • web: http://www.e-mega.cz

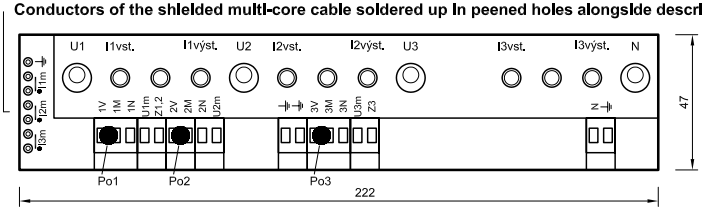
Fig. 1: Sets of PQ monitor MEg35/G and MEg35/G-EL

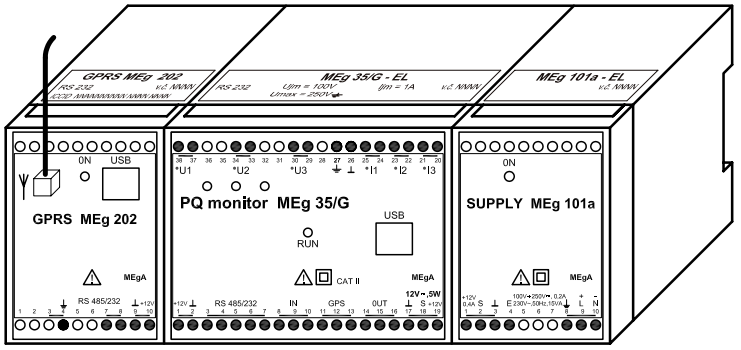


Text on upper labels (3 pieces) - see detail
ATTENTION! Overall dimensions of the set including the cover that can be sealed:
h = 96, w = 243, d = 117.5 mm

MEg35/S

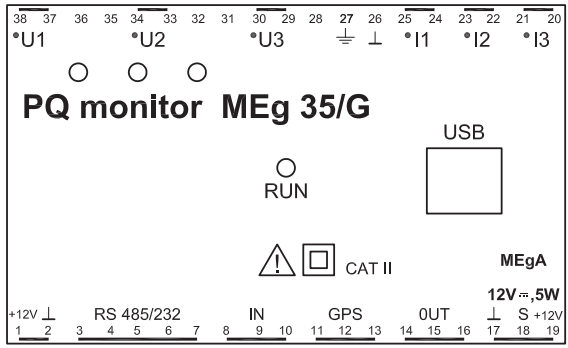
Conductors of the shielded multi-core cable soldered up in peened holes alongside descriptions

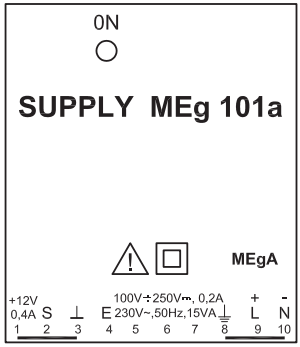


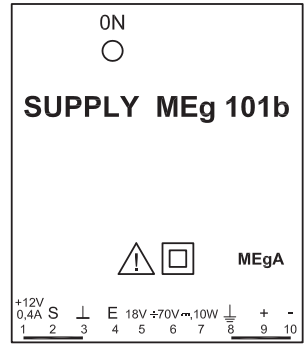


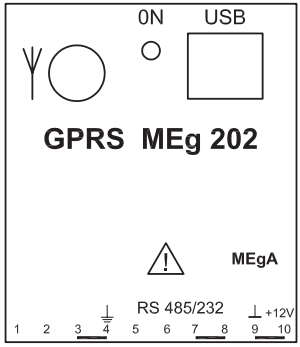
ATTENTION! Antenna connector increases the depth of the set by 12 mm

Fig. 2: Examples of type-indicating “plates”









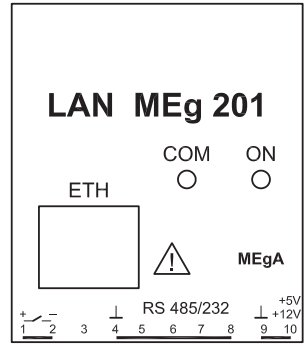
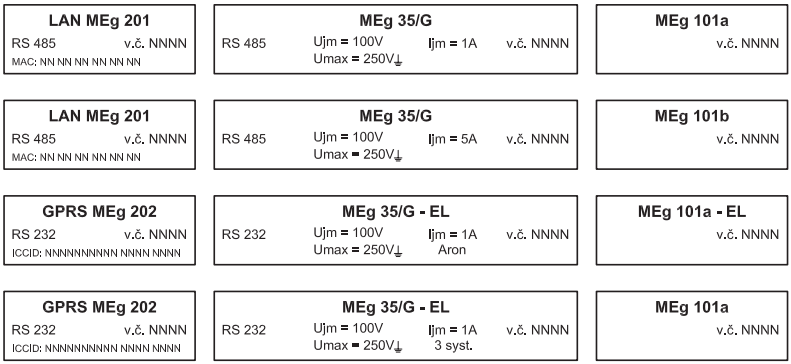
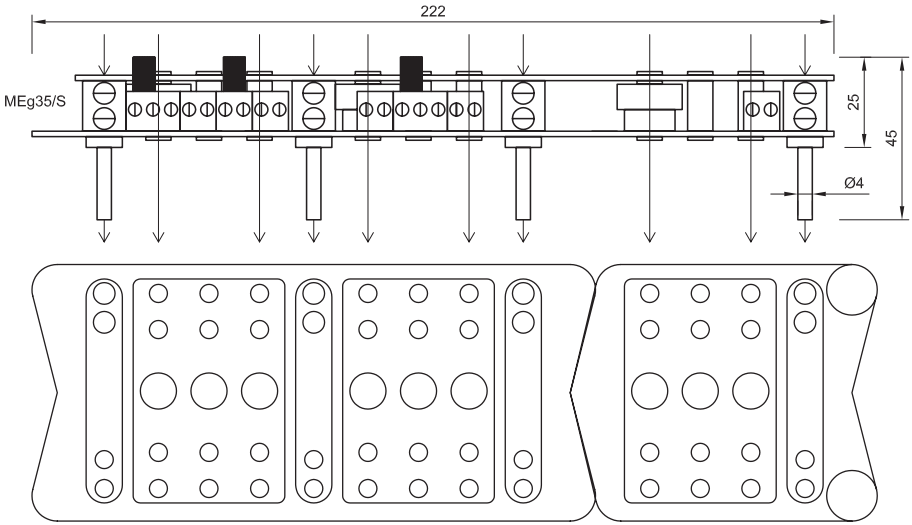


Fig. 3: Examples of used labels



Obr. 4 : Fig. 4: Assembly of the MEg35/S-H sensor in its upper version[1)] and of the terminal box of electricity meter ZS1b



[1)] Two versions of the sensor are distinguished according to the position of the MEg35/S sensor towards the terminal box of electricity meter ZS1b: upper version MEg35/S-H and lower version MEg35/S-D.

Fig. 5: Cover of the MEg35/G-EL set with the possibility of being sealed

version 1 – installation in the customer's object
version 2 – installation in the object of ČEZ

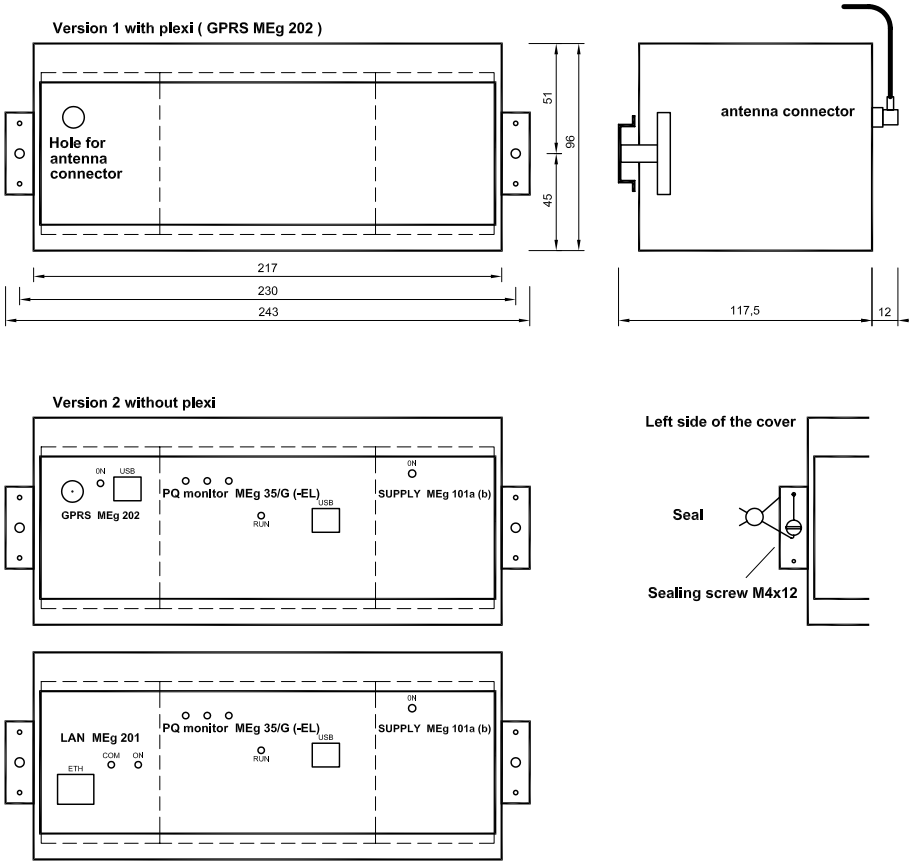


Fig. 6: Placing of the units of MEg35/G in electricity meter cases

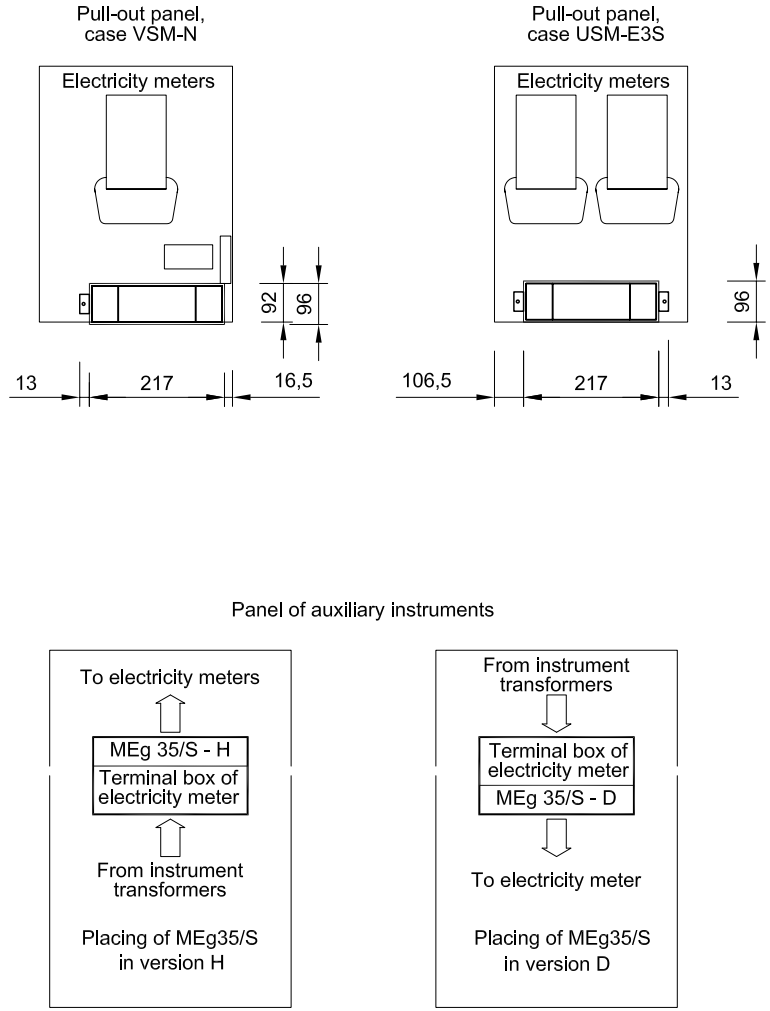
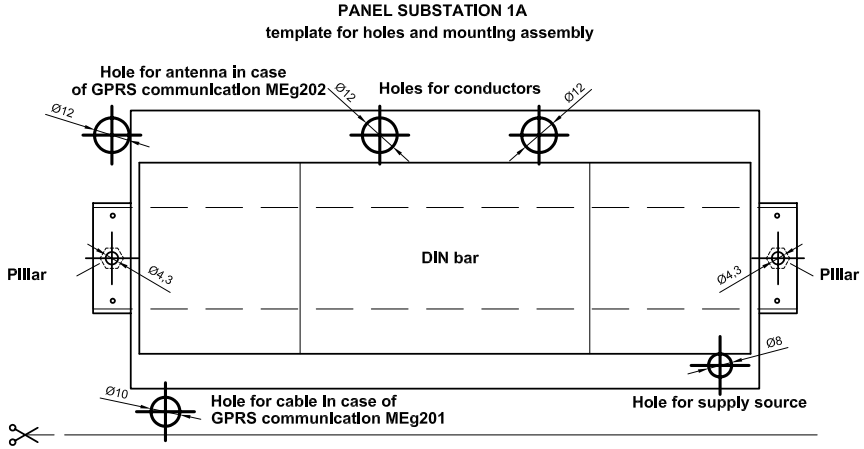


Fig. 7:

a) Drill templates for installing into switchboards in transformer stations



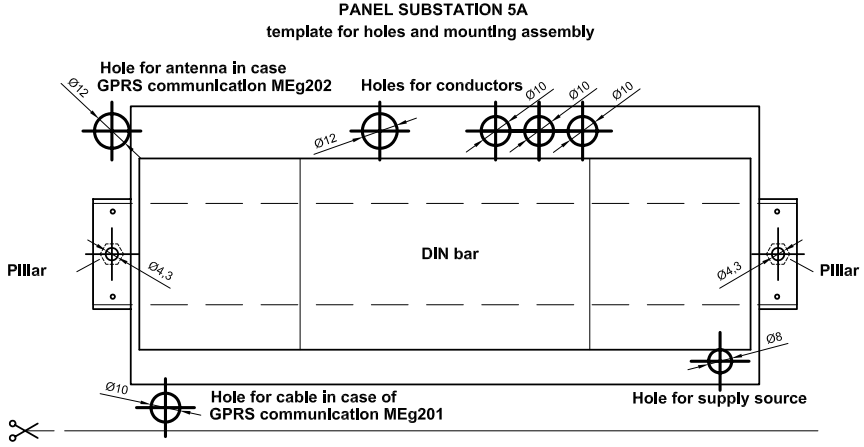
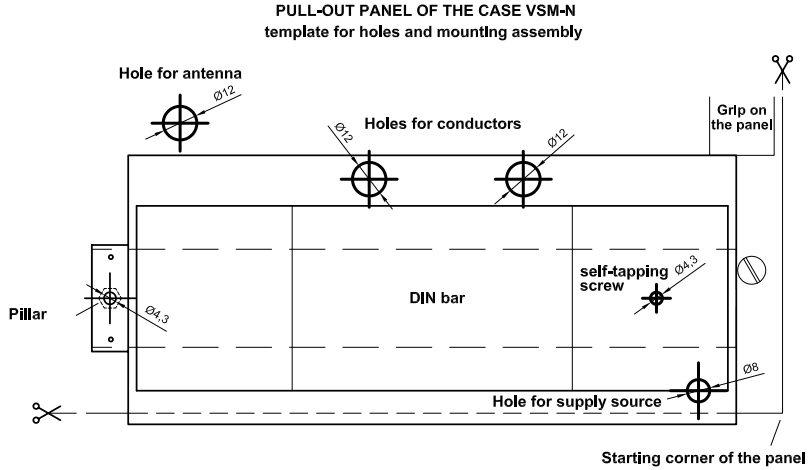


Fig. 7:

b) Drill templates for installing into cases VSM and USM



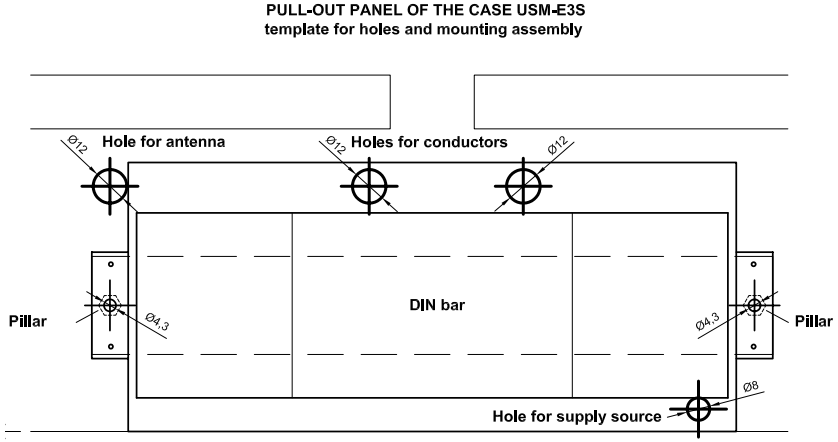
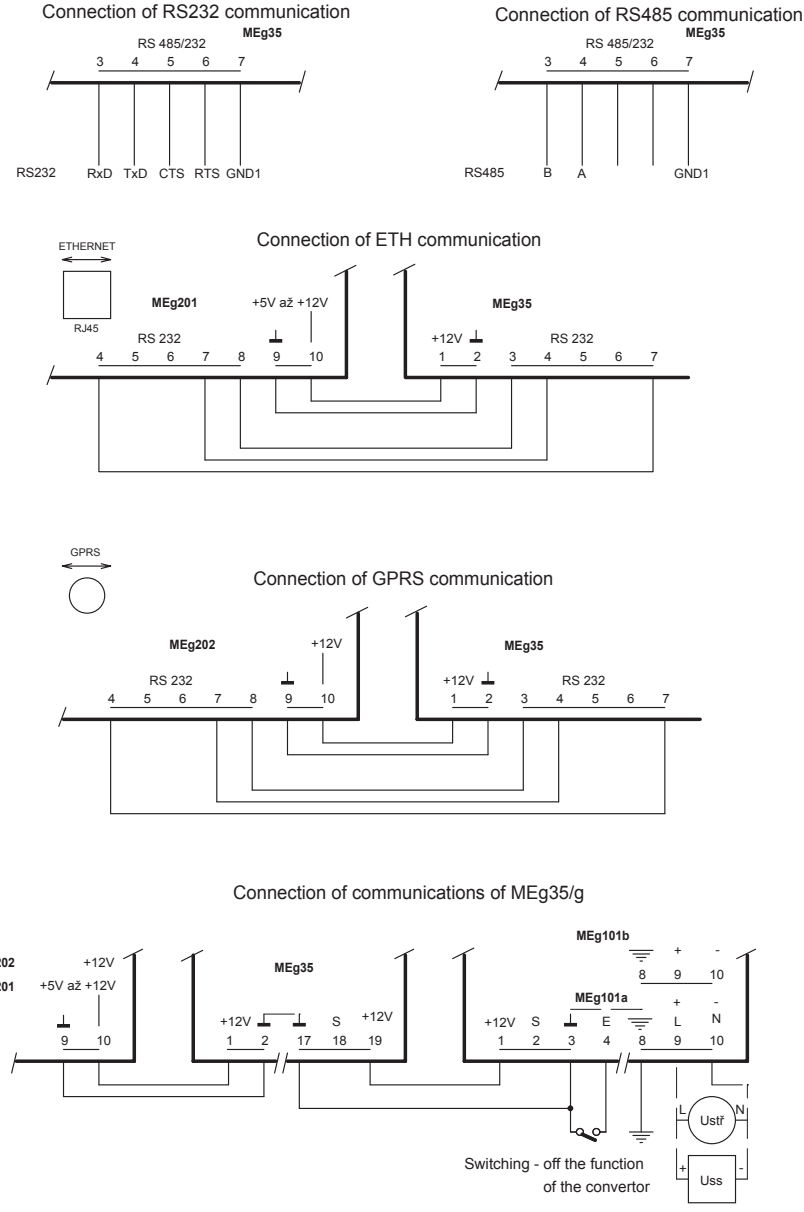


Fig. 8: Interconnection of units of MEg35/G sets fixed on the DIN bar



Connection of the supply set of the PQ monitor MEg35/G

Fig. 9: Three-system connection of measuring circuits of the MEg35/G set in the transformer station

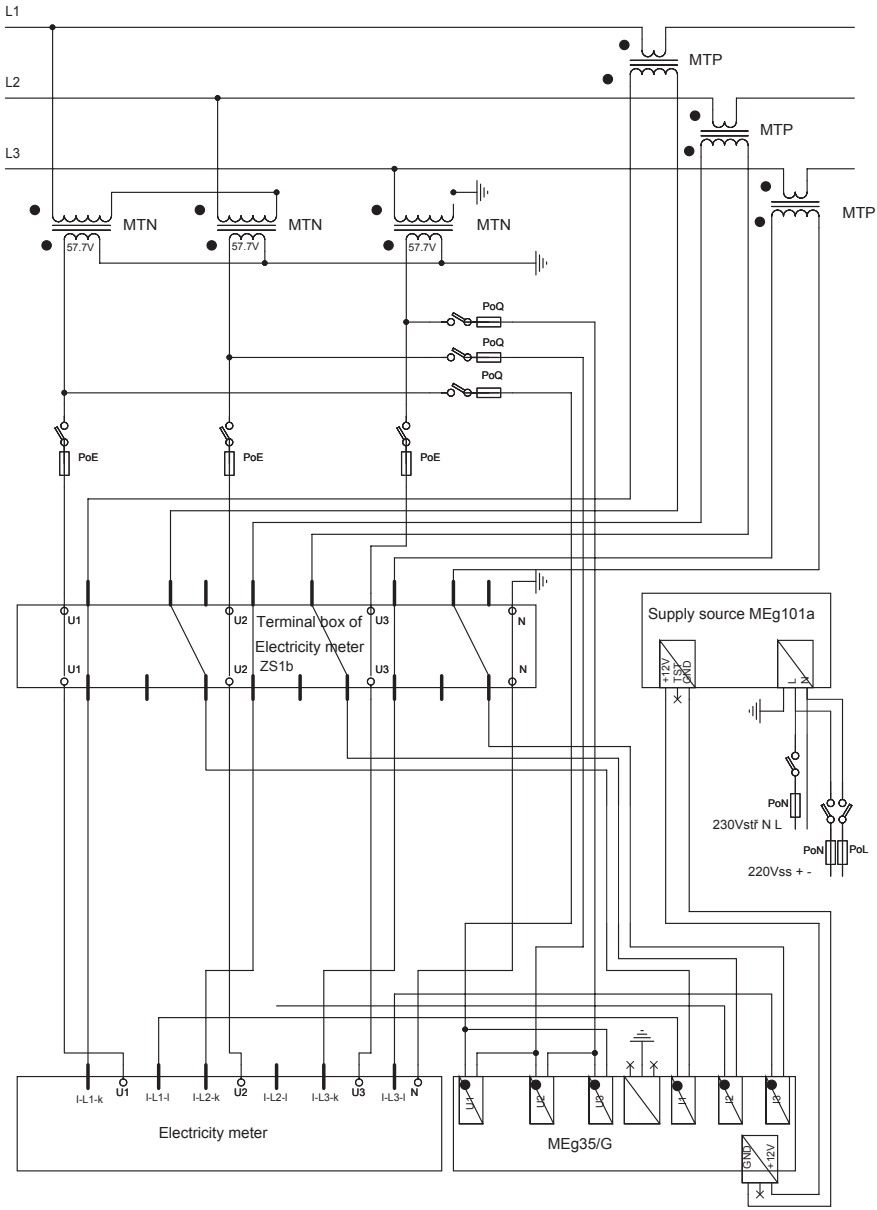


Fig. 10: Aron type connection of measuring circuits of the MEg35/G set in the transformer station

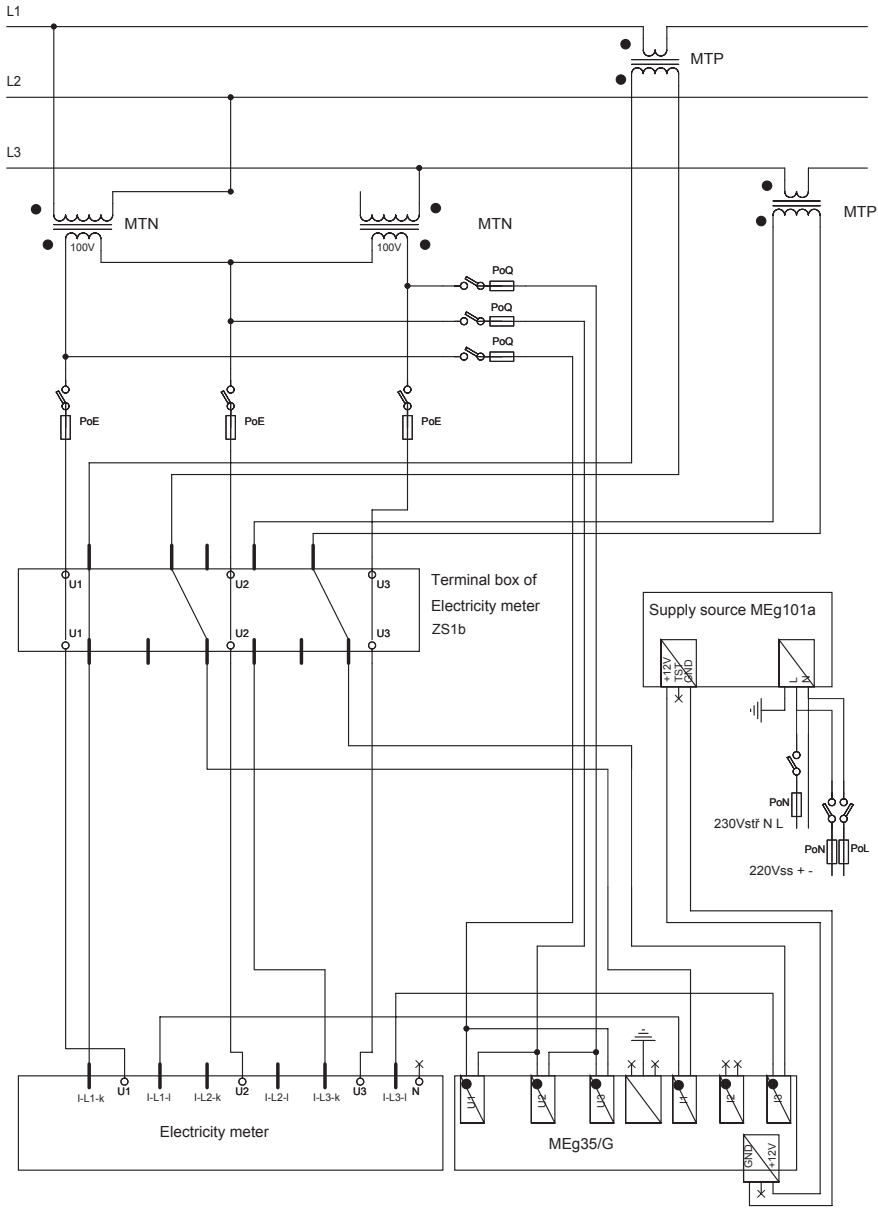


Fig. 11: Three-system connection of measuring circuits of the MEg35/G-EL set for the customer with external supply

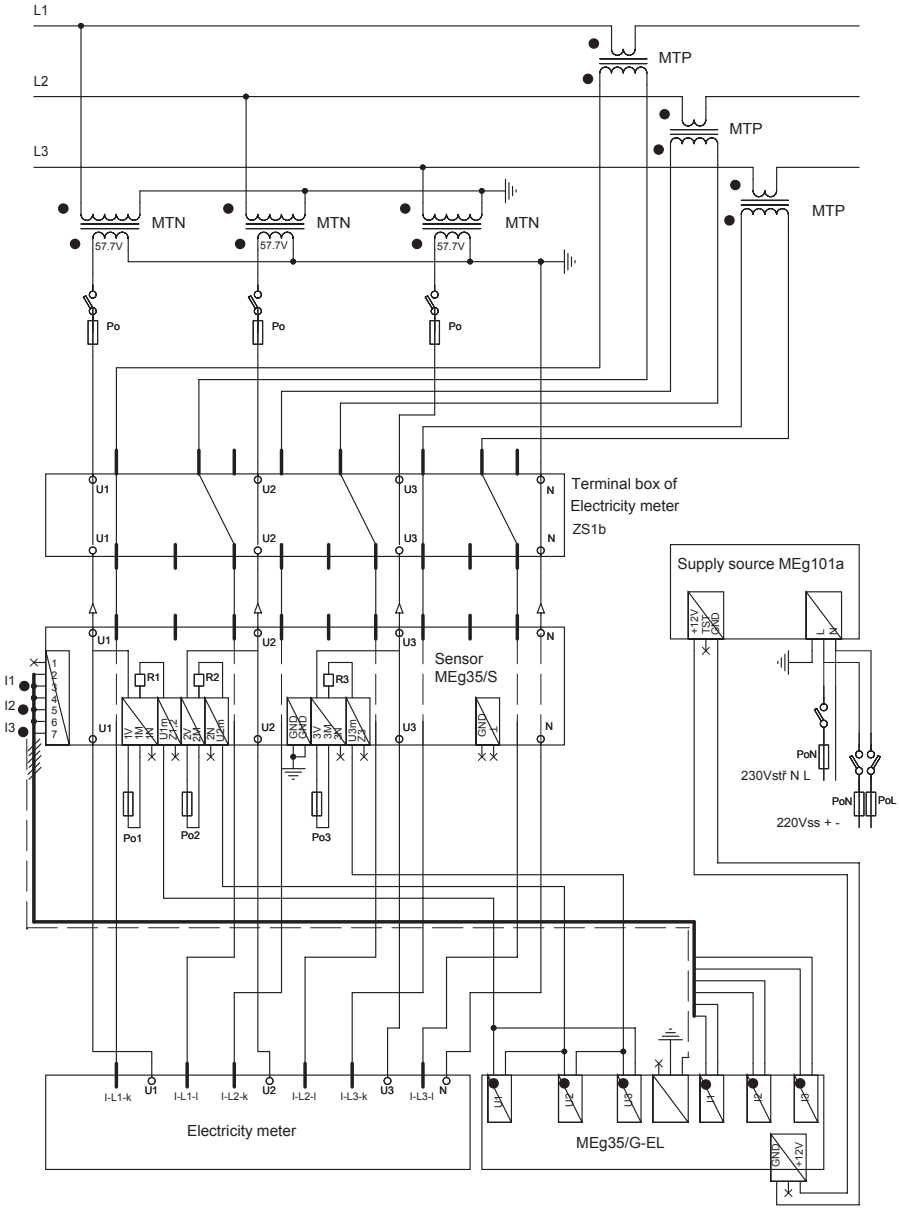


Fig. 12: Three-system connection of measuring circuits of the MEg35/G-EL set for the customer with supply from measuring voltage circuits

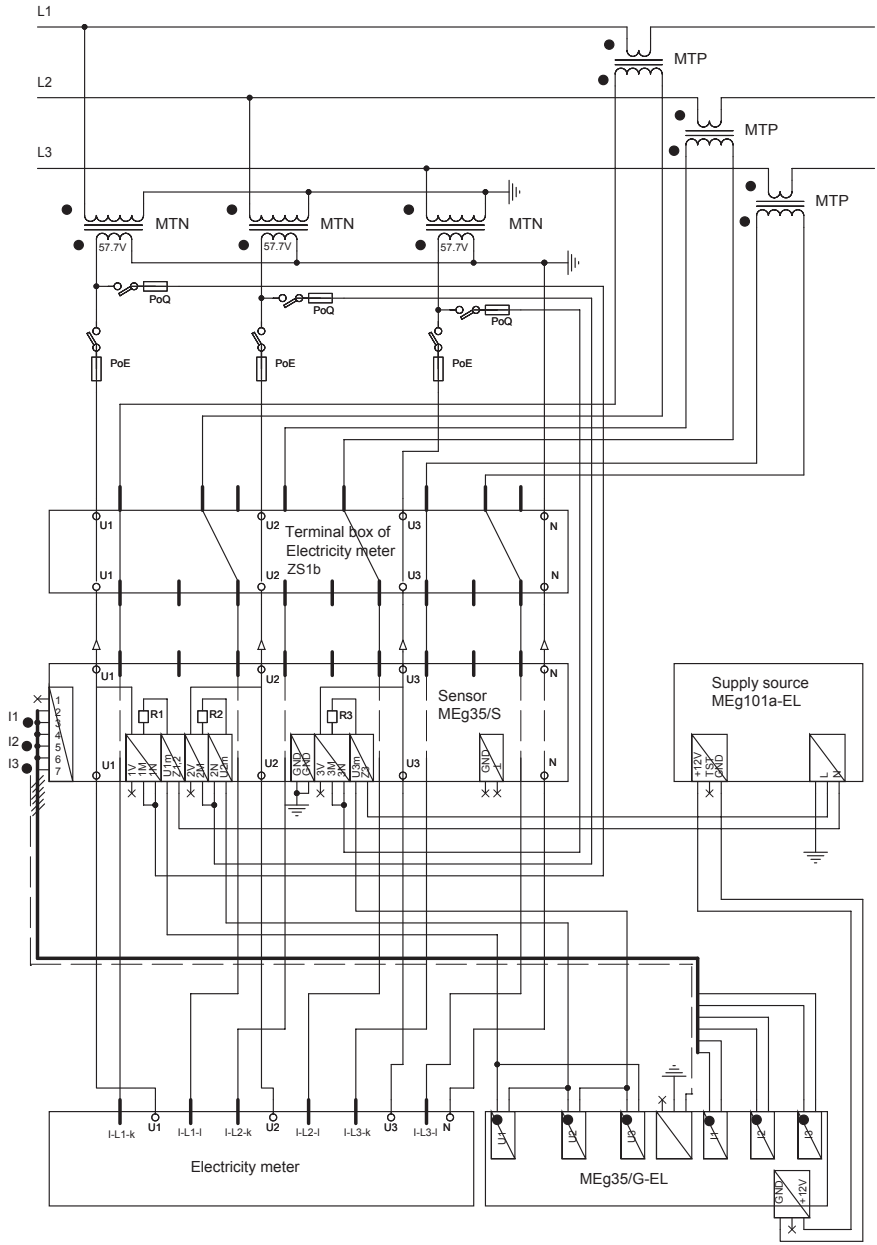


Fig. 13: Aron type connection of measuring circuits of the MEg35/G-EL set with shortened terminal box ZS1b and MEg35/S sensor for the customer with external supply

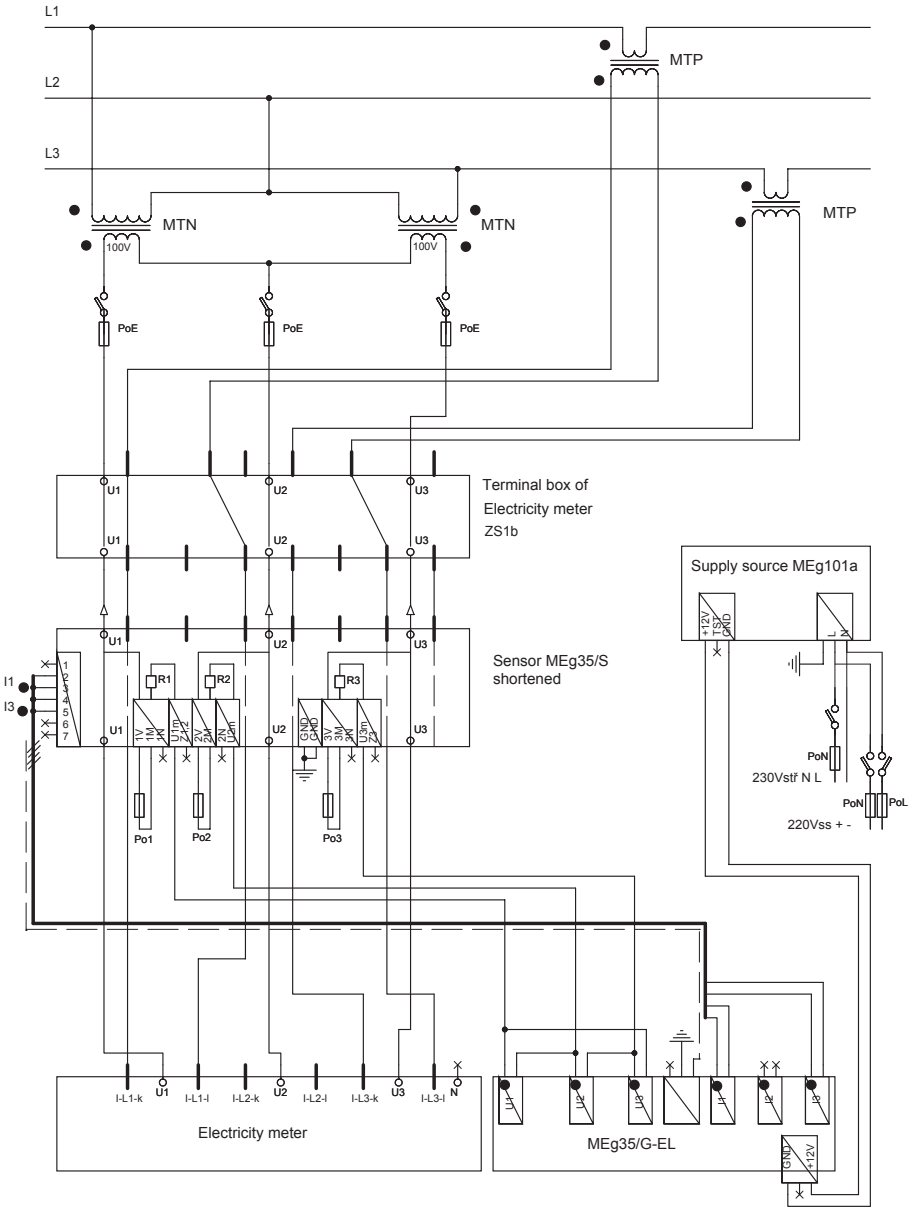


Fig. 14: Aron type connection of measuring circuits of the MEg35/G-EL set with shortened terminal box ZS1b and MEg35/S sensor with supply from measuring voltage circuits

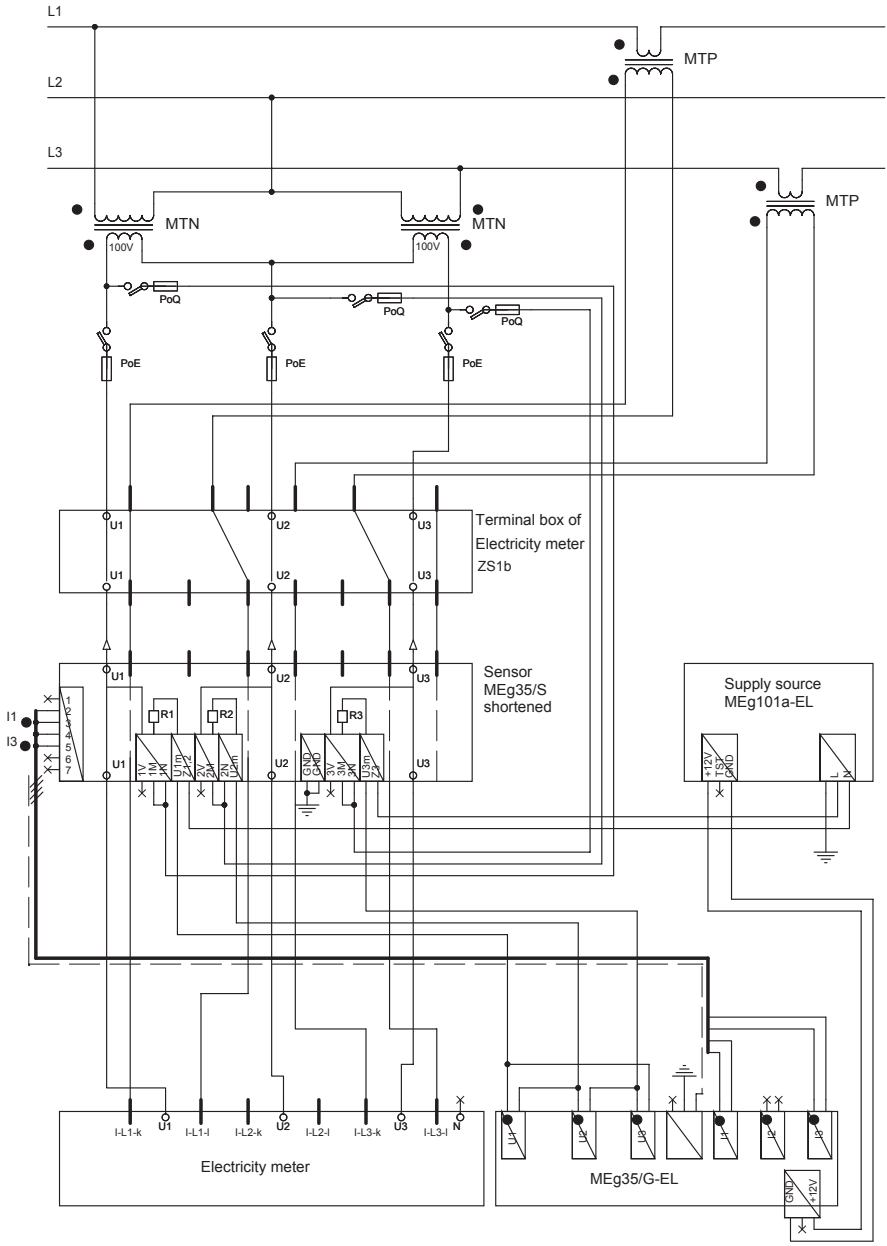


Fig. 15: Aron type connection of measuring circuits of the MEg35/G-EL set with normal terminal box ZS1b and MEg35/S sensor for the customer with external supply

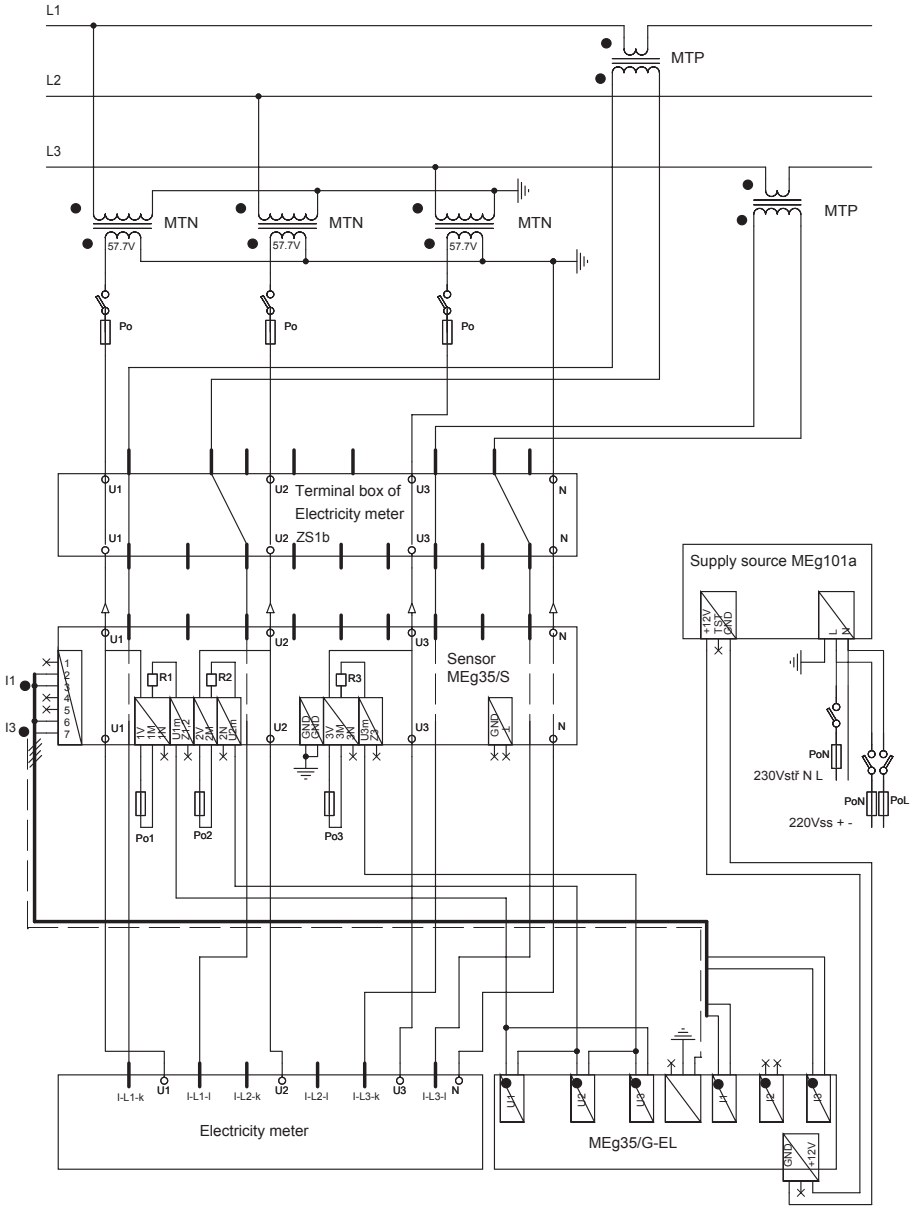
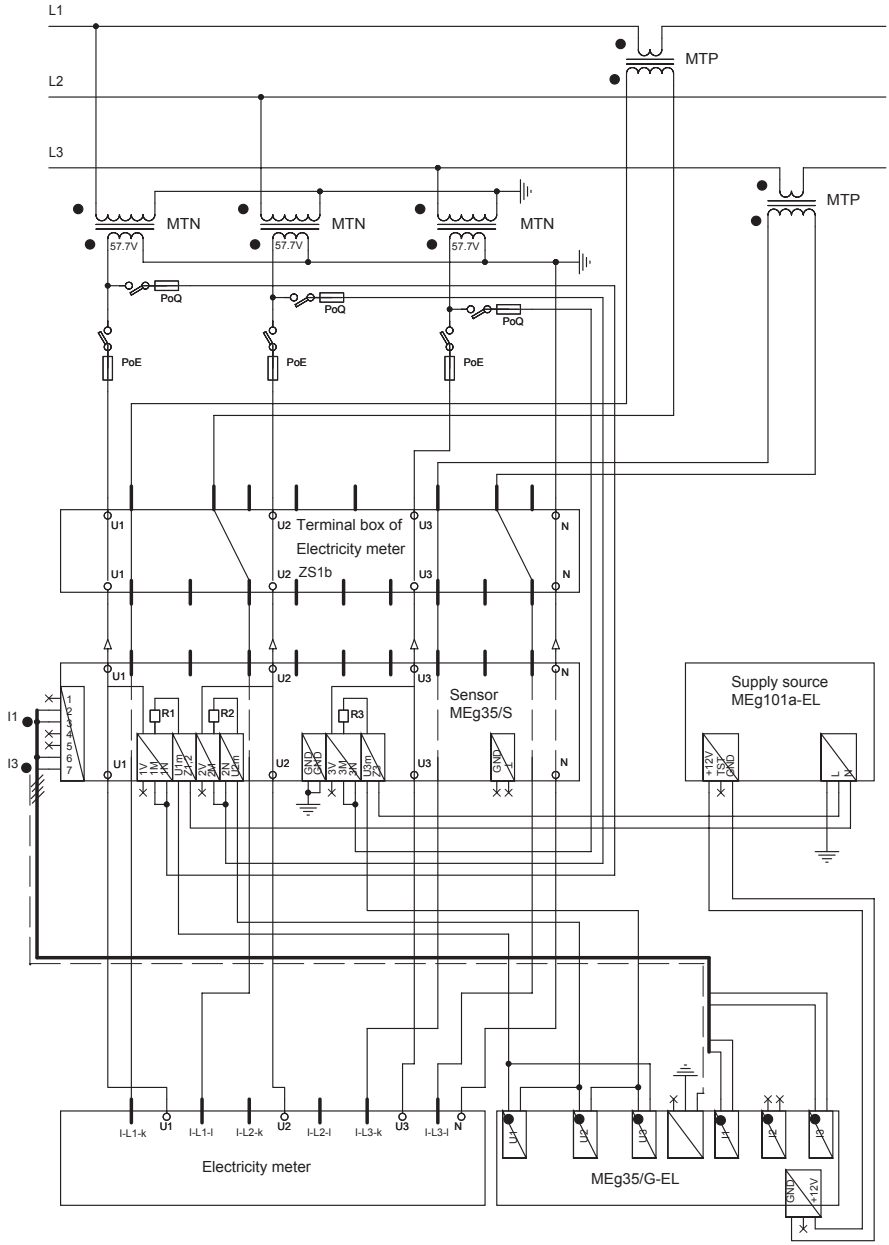


Fig. 16: Aron type connection of measuring circuits of the MEg35/G-EL set with normal terminal box ZS1b and MEg35/S sensor for the customer with external supply



MEg 201

Communication unit (converter TCP/IP<>RS485)

USER DESCRIPTION OF SETTING AND INSTALLATION

Basic description

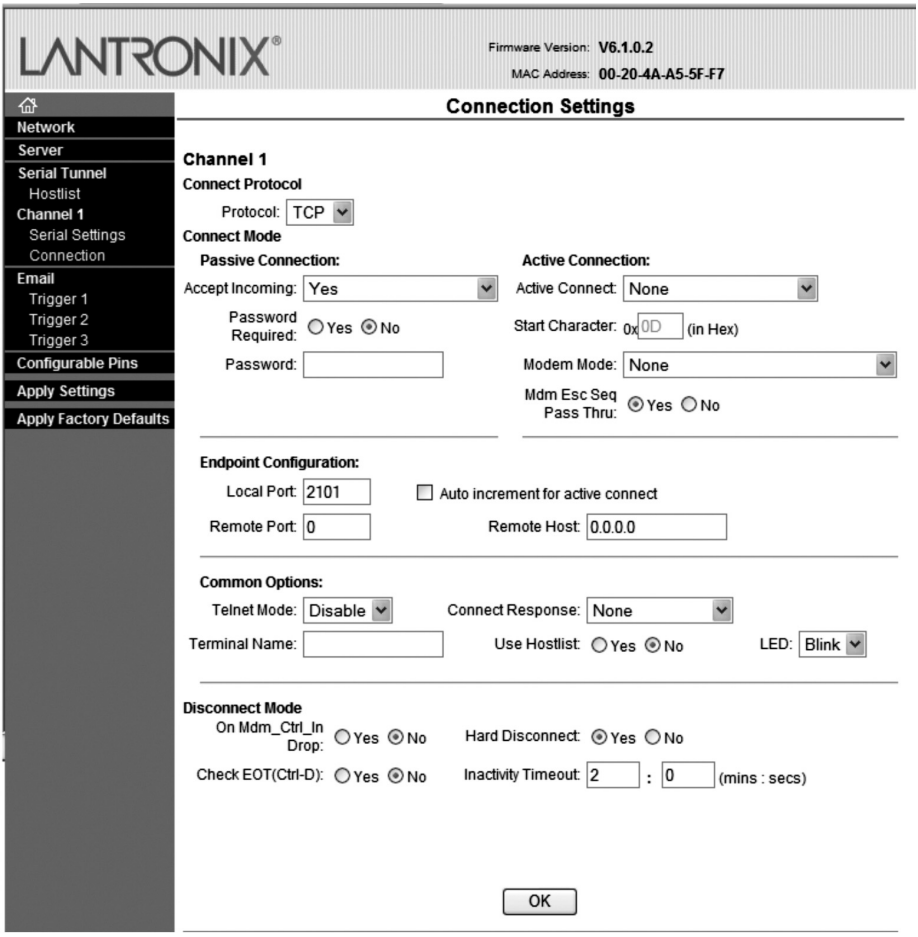
For the communication from the TCP/IP network with other instruments the MEg201 communication unit makes use of the converter Lantronics which converts the protocol TCP/IP into RS485. Basic functional setting of the unit is carried out during its manufacturing. If need be, this setting may be changed by using the browser. Implicit log in data have been maintained – user: root; password: not set up, remains empty. From the point of view of safety these data should be changed according to local practice.

For easier connection, each unit is marked with the number of the MAC address on the label.

The setting of the IP address is, by the manufacturer, left by assigning DHCP. The communication port for the communication with the instruments is set to 2101. If it would be necessary to change the setting of number of the port, this change would have to be made also in programs which communicate with the connected instruments (program for PQ monitors, setting program PKJS.exe for service SAM-PQ (PKJ.exe) – see description of the SAM-PQ service).

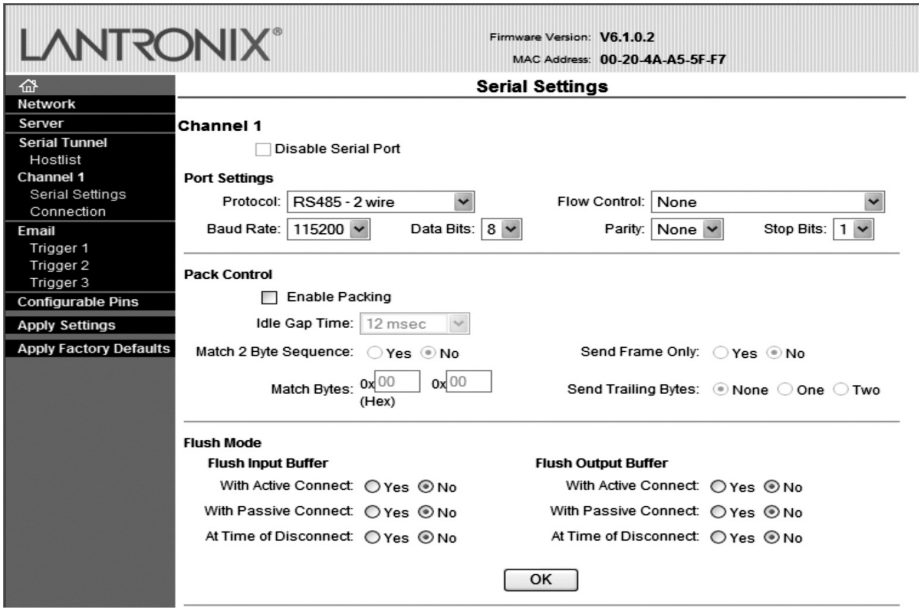
Setting of the unit

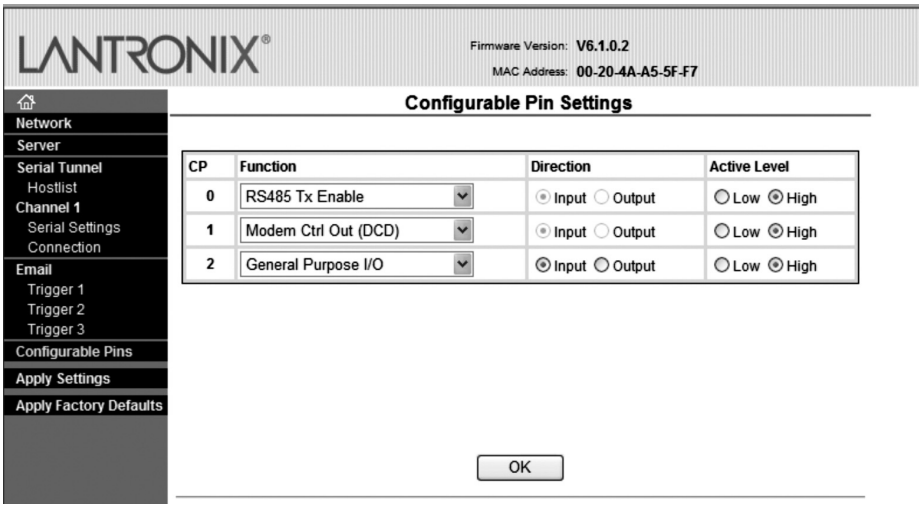
After the IP address has been set up into the browser, the setting program Lantronics will be displayed. Implicit setting of the connection by MEgA is as follows:



The setting of the series channel depends on the used instrument.

For MEg35 instruments the setting is as follows:





Interconnection between the unit and the instrument

	MEg201	MEg 35	MEg 40
terminal	8	3	RxD
terminal	7	4	TxD

The connection may be tested by using the programs for connected instruments in section Others – Parameters – Communication.

MEg 202

Communication unit (GPRS)

USER DESCRIPTION OF SETTING AND INSTALLATION

Basic description

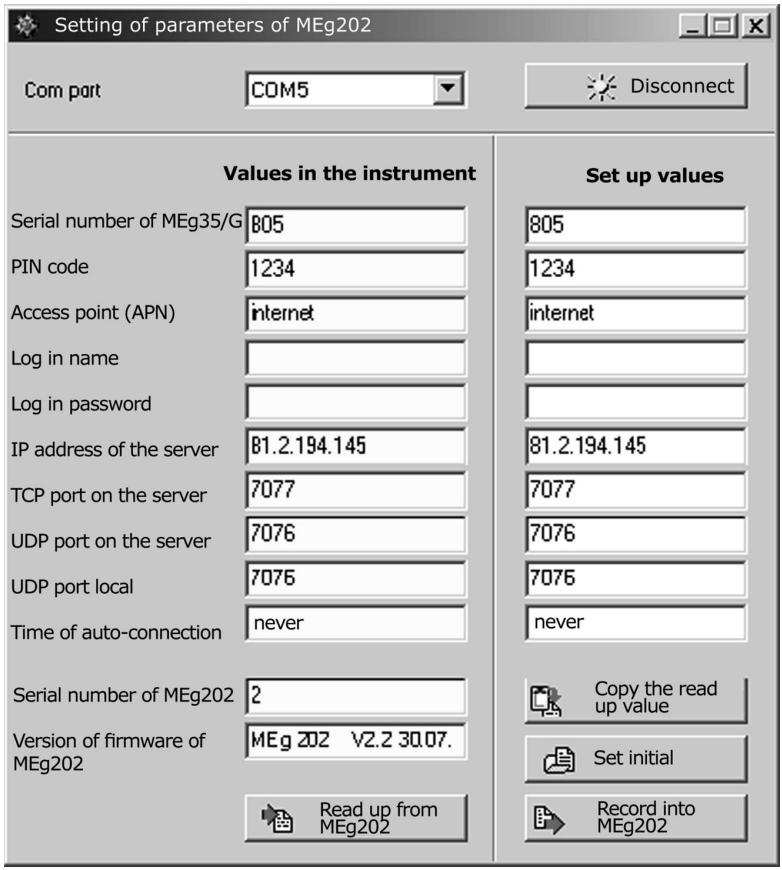
The MEg202 communication unit serves for the transmission of data from instruments with a series communication link RS232 or RS485 through the GPRS network of mobile operators. According to configuration, the instrument then becomes a part of a private computer network or of the public Internet network.

The MEg202 unit includes a processor which communicates with the connected instrument and – so that the transmission of data through the GPRS network may be optimum – pre-processes the data read out from the measuring instrument.

Basic functional setting of the unit is carried out during its manufacturing. If need be, this setting may be changed by using the program M202Param described bellow.

Setting of the unit

The setting of parameters of the MEg202 unit can be realized by using the program M202Param (see figure bellow).



The setting is carried out through the servicing USB connector of the MEg202 unit. After it has been connected to the computer, a virtual COM port shall be created. It must be chosen in the upper part of the main window of the program and the button *Connect (Připojit)* shall be pressed. It is then possible to read out actual parameters from the MEg202 unit by using the button *Read up from MEg202 (Načíst z MEg202)*. The values read up from the MEg202 unit are displayed in the left column. The values which should be saved into the instrument are edited in the right column. By using the button *Copy the read up data (Zkopírovat načtené)* the values from the left column (read up from MEg202) will be transferred into the right column for editing. By means of the button *Set initial (Nastavit výchozí)* the default values of parameters of the program will be recorded into the right column for editing. By using the button *Record into MEg202 (Nahrát do MEg202)* the set up values from the right column will be saved into the MEg202 unit and, for checking purposes, they will be read out from the unit at once and displayed in the left column.

The values of all parameters will be saved into the unit by using the button *Record into MEg202 (Nahrát do MEg202)*. If it is necessary to change, for example, only one parameter it can be done in such a way that the values will be first read up from MEg202 – button *Read up from MEg202 (Načíst z MEg202)*, then they will be copied for editing – button *Copy the read up values (Zkopírovat načtené)*, the required parameter will be changed and then saved into MEg202 – button *Record into MEg202 (Nahrát do MEg202)*.

For the inventory of parameters of individual instruments, the program M202Param saves the values of all parameters read up from the connected MEg202 units into the file M202Param.csv which can be opened in a table editor (e. g. Microsoft Excel). The data in the file M202Param.csv are always updated after the values from the unit according to its serial number have been read out. After saving the data into MEg202 by means of the button *Record into MEg202 (Nahrát do MEg202)* the values are automatically read out again and, consequently, they are updated in the file M202Param.csv as well. Beside all data displayed in the program M202Param in the left column, the time of reading out the values from MEg202 (marked as *Time of validity – Čas platnosti* in the file) is also being saved.

Interconnection between the unit and the instrument

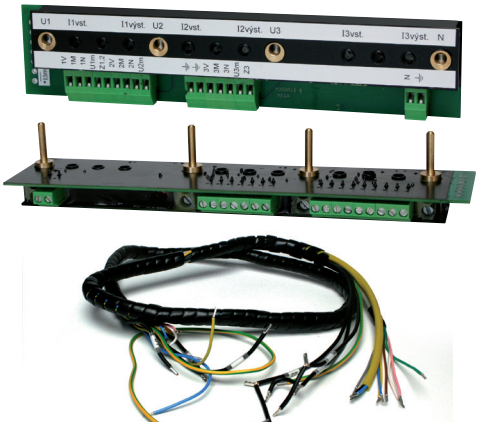
	MEg202	MEg 35
+12 V	10	19
0V	9	17
Rx	8	3
Tx	7	4
GND	4	7

After the set of the MEg202 unit and of the instrument MEg35/G has been switched-on, the LED diode on the front panel is blinking. Within one minute it would have to start to light permanently. This signifies that the communication with MEg35/G is O. K. and that GPRS has been activated successfully. The signalization by the diode is as follows:

- it is blinking regularly 01010101 Meg35/G does not communicate
- it stops lighting for a while 11110011 GPRS not activated
- combination 01010001 combination of the above problems

PQ monitor MEg35/G

PQ monitor device, power source, communication unit
Antena for GPRS communication unit MEg202
Basic mounting accessories



Sensor MEg35/S
Cable connection between PQ monitor MEg35/G-EL and sensor MEg35/S

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