



SO-52v11-eME

power quality analyzer and recorder

Application

The SO-52v11-eME power quality (PQ) analyzer measures and calculates required values for PQ assessment according to the IEC 50160 standard and other relevant regulations, instructions, agreements and directives.

The analyzer may be applied in power switching substations of all voltage levels and industry installations in which permanent PQ assessment is required as well as disturbances identification and recording. The device is designed for operation in harsh environmental conditions.

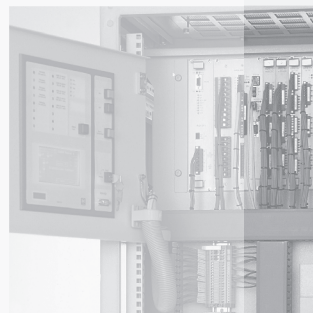
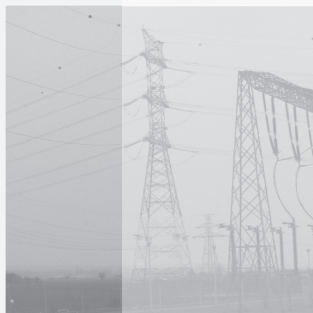
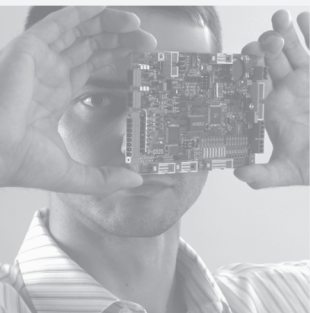
Functionality

Measurements and calculations for PQ assessment are realized according to the A-class of the IEC 61000-4-30 standard, in one or two synchronously operating channels. One channel comprises 4 inputs for voltage measurements and 4 current inputs. In both one and two channel versions all measurement inputs are simultaneously sampled.

The device also analyzes and records events emerging from parameters exceeding, defined according to standards or configurable thresholds. Measurement data or calculations are stored in the analyzer memory for at least 40 days. They are saved in COMTRADE or PQDIF files and transmitted by means of an Ethernet, RS or GPRS connection to a power quality data server.

The SO-52v11-eME is equipped with network fiber-optic communication channels which enable data transmission to a host PQ assessment system and on-line cooperation with SCADA and DCS systems.

The SO-52v11-eME is designed to measure values and calculate parameters required for power quality assessment in bays of switching substations, according to standards, directives and agreements. Its unique feature is an event recorder with the transient-type disturbances analysing and the multiple communication channels.





Communication

The device, using secure network connections in the Ethernet or GPRS/LTE technologies, cooperates with a remote or local SYNDIS PQ server with implemented software for power quality assessment or other systems of this purpose. It is also possible to apply connections in the RS-485 standard. The SO-52v11-eME analyzer may be connected with other devices of substation automation system by the IEC 61850 standard or any other communication protocol. The device cooperates on-line with SCADA systems, supervision centers and wind farms' DCS systems.

Configuration

The device is equipped with user-friendly configuration software to enable easy, remote or local parameterization of analyzer operation. The following settings may be adjusted: triggering parameters for the recording function, thresholds of transients and disturbances detection, input ranges, measured parameters and types of their aggregations. The analyzer may be configured for power quality assessment in one or two channels, 4 currents and 4 voltages in each of them.

Characteristics

- The A-class measurements and recording of power quality parameters
- detection and recording of 'transient' fast disturbances
- remote or local cooperation with a power quality analysis server
- power quality assessment for four voltages and four currents – the one-channel version
- power quality assessment for eight voltages and eight currents – the two-channel version
- optional configuration for analyses of voltages, currents and fast disturbances
- COMTRADE and PQDIF file formats for data sets with defined aggregation time
- flexible measurements' configuration
- a meter function; on-line data transmission to a substation system in any standard
- 0,2 S class optional power measurement according to IEC 62053-22
- capability of data collecting from other measurement devices and systems
- configurable event thresholds of power quality parameter
- analyzer internal memory operation in the round or linear mode
- IEC 61850, DNP 3.0 or any other protocol for on-line cooperation with any substation system
- possibility of installation in a power substation bay of LV, MV, HV voltage level
- extended communication options; Ethernet channels, GPRS, RS-485
- NTP server-based 10ms precision synchronization or GPS with 40μs precision
- configurable internal data memory of 4GB capacity
- internal software and configuration remote and local upgrade
- event log recording device operation
- oscilloscope functionality and phasor chart for installation correctness monitoring

Compliance with standards

| | |
|-----------------|--|
| IEC 50160 | power quality parameters assessment |
| IEC 61000-4-30 | the A-class methods of power quality measuring and assessing |
| IEC 61000-4-7 | harmonic and interharmonic measurement |
| IEC 61000-4-15 | compliance with the methodology of flicker measurements |
| IEC 60870-2-1 | the A-class EMC properties for the fourth degree of exposure levels |
| IEC 60870-2-2 | the C2-class of environmental conditions and the Cm-class of mechanical exposure |
| IEC 61850-3 | cooperation with SAS devices |
| IEC 60870-5-104 | communication with substation systems |

Measurements and calculations

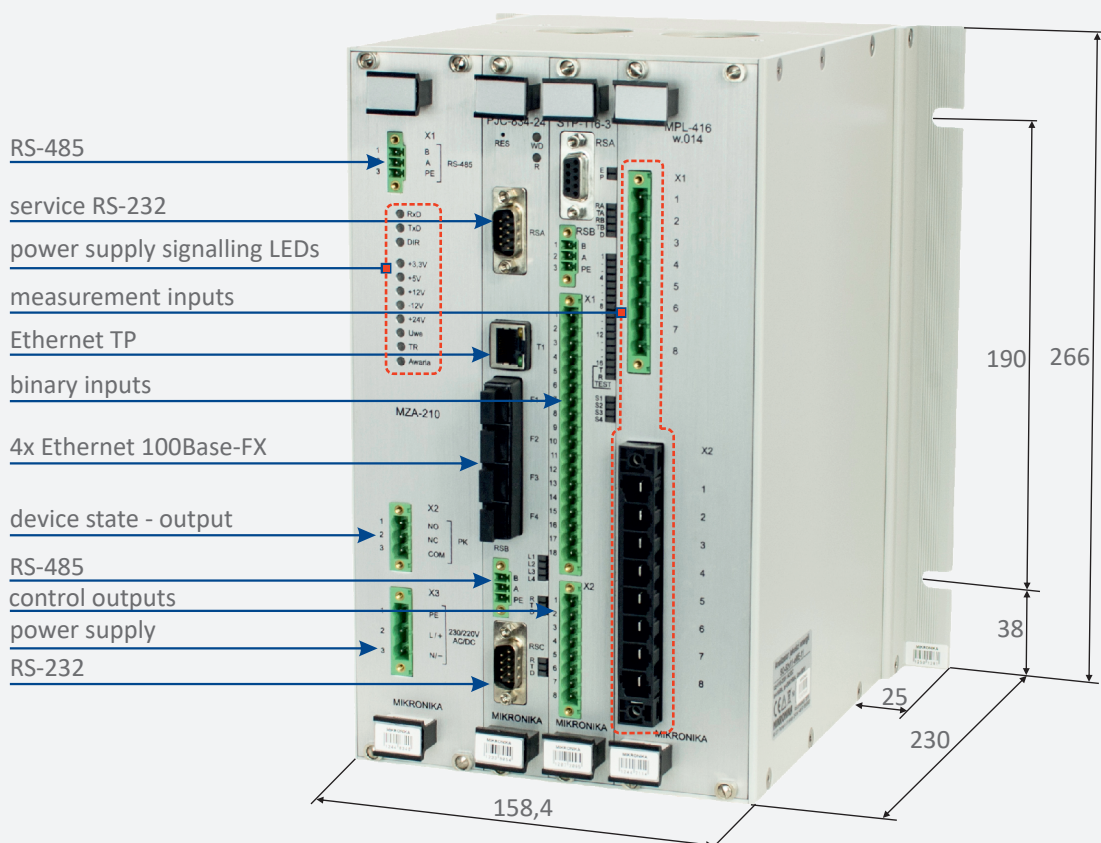
- network frequency, $\Delta f = \pm 0.005 \text{ Hz}$ measurement uncertainty
- voltages and currents, $\Delta U = \pm 0.06\% U_n$ and $\Delta I = \pm 0.06\% I_n$
- flicker factor (Pst, Plt), according to IEC 61000-4-15
- voltage and current harmonics up to the 50th, according to IEC 61000-4-7, class I
- voltage and current interharmonics, according to IEC 61000-4-7, class I
- THD and TIHD factors for voltage and current, TDD factor
- zero and negative components of asymmetry, $\Delta U_0 = \pm 0.05\% U_1$ and $\Delta U_2 = \pm 0.05\% U_1$
- symmetrical components of voltages and currents
- value of signalling voltages indicators in transmission over supply lines
- voltage interruptions, dips and swells, current surges
- voltage over and underdeviations
- rapid voltage changes (RVC)
- active, reactive, apparent, three-phase powers, power factors, $\text{tg } \varphi$
- powers and harmonic angles of voltage and current
- 'K-Factor' calculated according to IEEE C57.110 and 'Factor k' calculated according to BS 7821

Binary inputs and outputs

The device is able to identify states of 16 binary inputs. They may be applied to acquire substation primary equipment states or to trigger recordings. The 4 signal output indicators are designed to indicate states or disturbances in a network. The functionality of inputs and outputs is user configurable. They may be applied to take states of primary equipment into consideration of a PQ assessment system..

Construction

The construction of the device is modular '6U' type, for wall mounting or on racks. It may be equipped with a signalling terminal and a sealed cover to protect the access to the connectors.





Technical data

Device features

| | | | |
|-----------------------------|------------------------------|-----------------------|-----------------------------|
| Enclosure | 6U enclosure | Structure | one or two channels |
| Voltage measurement (*) | 4x 0÷57.7/100V AC or 230V AC | Binary inputs | 16/32 inputs 24V or 220V DC |
| Current measurement (*) | 4x 0÷1A or 0÷5A | Outputs indicator | 4 outputs 0.2A/220V DC |
| Voltage constant overloads | 3x nominal range | Internal recorder | 4GB |
| Current temporary overloads | 100x or 20x nominal range | Transmission channels | 1x RS-485, 1x RS-232 |
| Transient recording | sampling 2.5MHz | Network connections | 4x 100MB FX, 1x 100MB TP |
| PQ parameters | sampling 12.8kHz | Modem | GSM/GPRS (optional) |

(*) the one-channel SO-52v11-eME measures voltages and currents using one measurement module 4xU and 4xI. The two-channel version is equipped with two such modules.

Main and reserve supply

| | |
|---------------------------|--------------------------|
| Main supply voltage Up | 220V DC, +15/-20% |
| Reserve supply voltage Ur | 230/220V AC/DC, +15/-20% |
| Optional supply | 24÷48V DC |
| Power consumption | 20VA |

Electromagnetic compatibility

| PARAMETER | STANDARD | TEST LEVEL |
|------------------------------------|-----------------------|---------------------------------------|
| Electrostatic discharges (ESD) | IEC 61000-4-2 level 4 | 15kV - air, 8kV - contact, class A |
| Immunity to electromagnetic field | IEC 61000-4-3 level 4 | 10V/m 80MHz, 80MHz..1GHz 80%, class A |
| Surge resistance 1.2/50 – 8/20 µs | IEC 61000-4-4 level 4 | 4.0 kVp, class A |
| Immunity to conducted disturbances | IEC 61000-4-5 level 4 | class A |
| Immunity to fast transient states | IEC 61000-4-6 level 4 | ±4,0 kV, class A |
| Immunity to magnetic fields | IEC 61000-4-8 | class A |
| Voltage dips | IEC 61000-4-11 | 60% for t = 1s, class A |
| Electromagnetic emission | IEC 61000-6-4 | 30 MHz ≤ f ≤ 1 GHz, class A |

Insulation

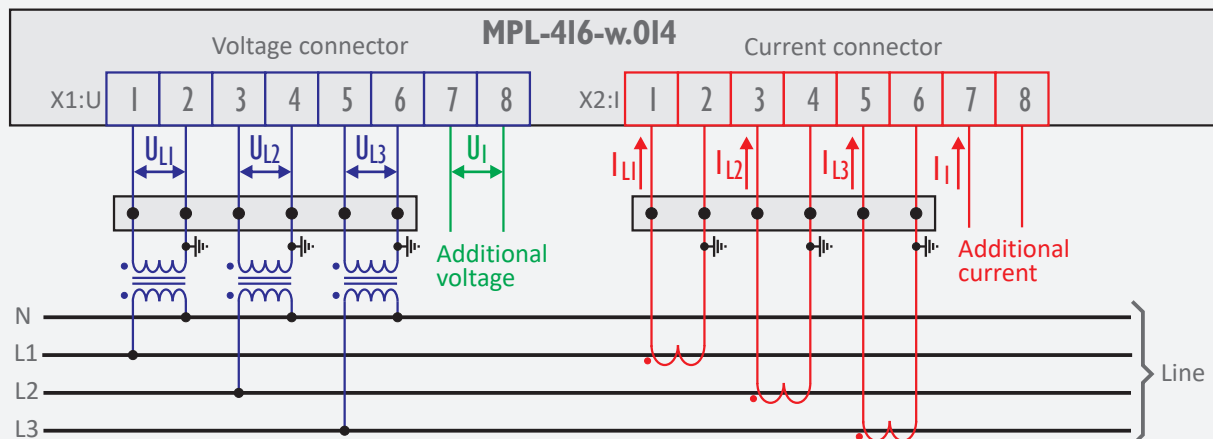
| PARAMETER | STANDARD | LEVEL |
|-------------------|---------------|---------------|
| Voltage withstand | IEC 60255-27 | 2kV; 1min/RMS |
| Surge immunity | IEC 60870-2-1 | 5kV; 1.2/50µs |

Operation and storage conditions

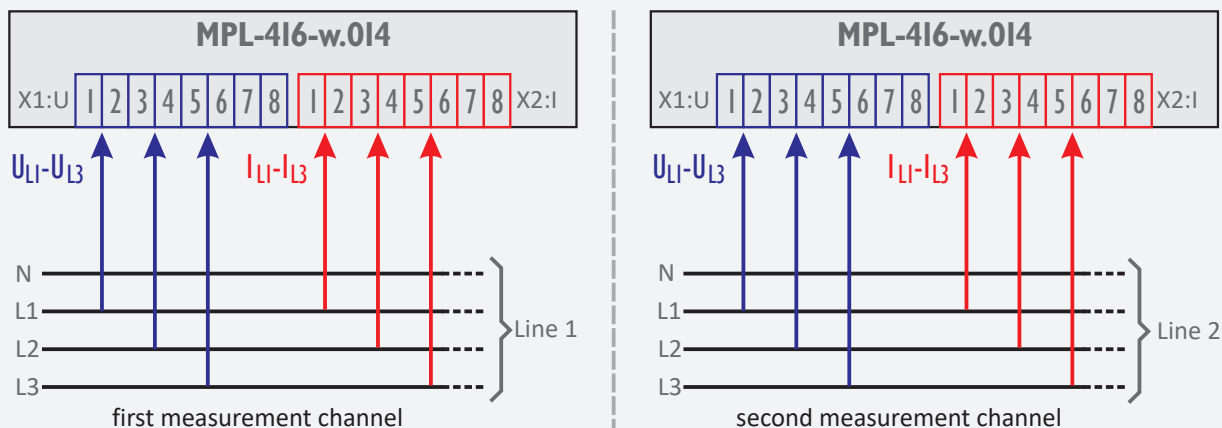
| PARAMETER | STANDARD | TEST LEVEL |
|--------------------------------------|------------------------|---|
| Operation temperature: -20°C to 55°C | IEC 60688 group III | (-20°C to 55°C), 96-hour test |
| Storage temperature: -40°C do 70°C | IEC 60870-2-2 class C3 | - |
| Water and dust protection | IEC 60529 | IP51 |
| Humidity | IEC 60870-2-2 class Cm | 10 ÷ 95 % |
| Vibrations | IEC 60870-2-2 class Cm | Half-sinusoid duration time 11 [ms] max. acceleration 300 [m/s²] |

Applications

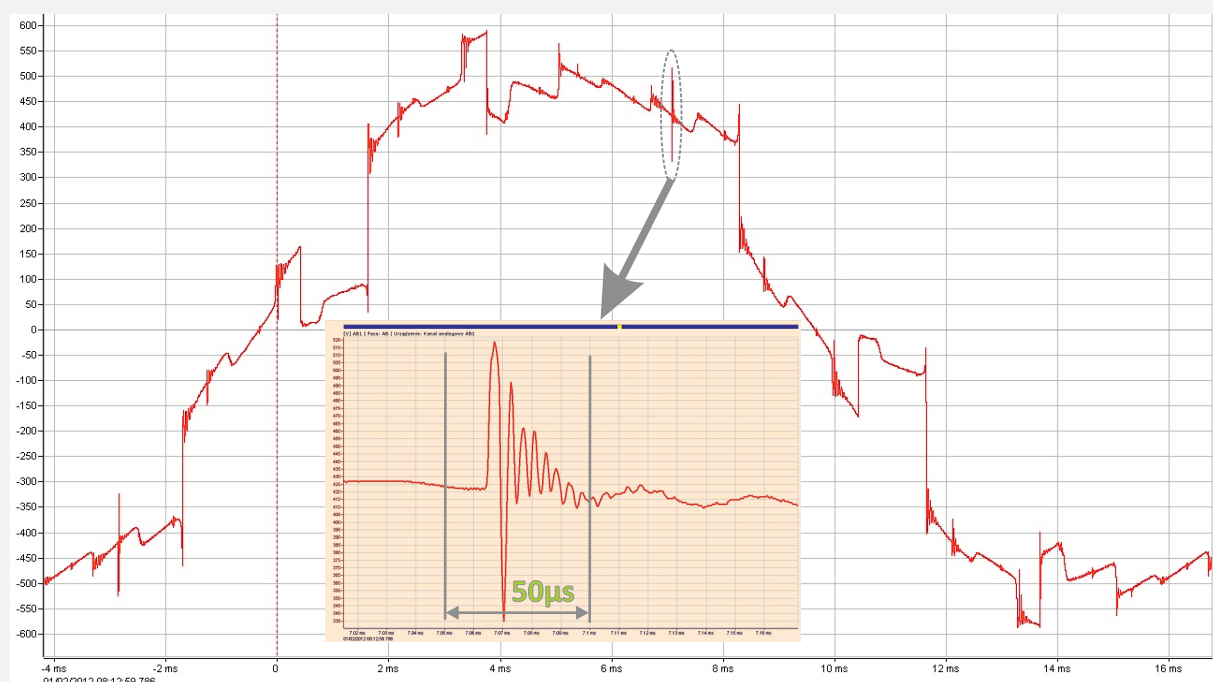
SO-52v11-eME-1; one measurement channel for voltage and current, one PQ assessment module



SO-52v11-eME-2; two measurement channels for voltage and current, two PQ assessment modules

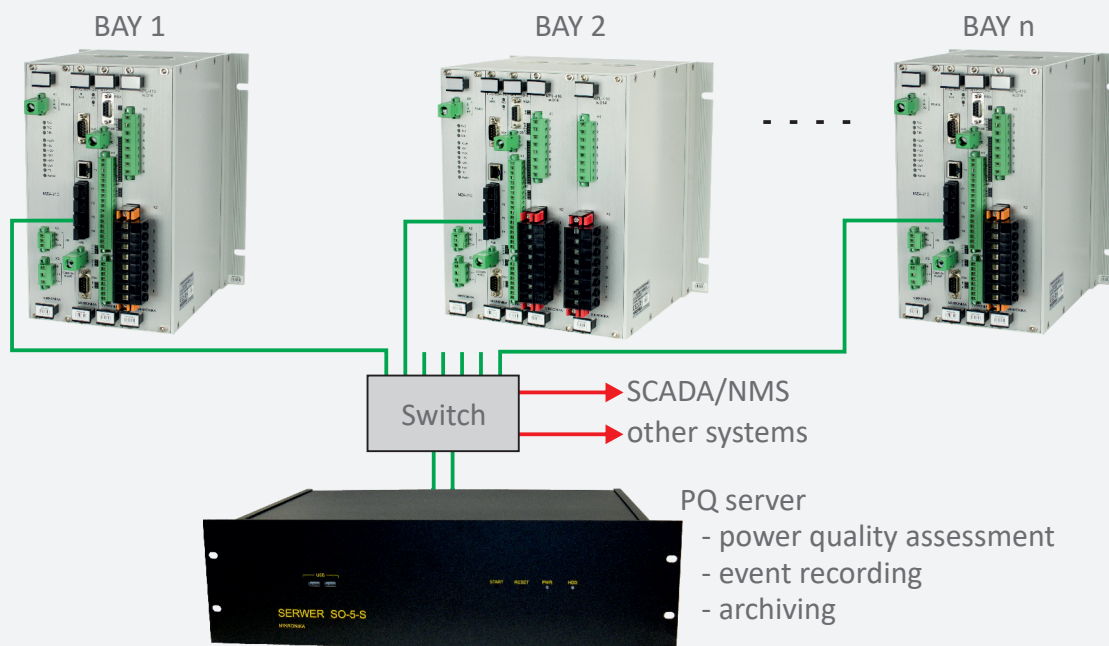


Transient - type disturbances recording



PQ analyzers in LAN network

The SO-52v11-eME power quality analyzers may be easily connected to a LAN network. A 100MB multi-mode fiber-optic connection is recommended.



Selection key

SO-52v11-eME-nx

Additional options:

- 1 - module with 16 binary inputs, 4 signalling outputs
- 2 - module with 32 binary inputs

Power quality analyzer configuration type:

- 1 - 4 voltage inputs, 4 current inputs
- 2 - 8 voltage inputs, 8 current inputs, two simultaneous power quality assessment modules
- T1 - 4 voltage inputs, 'transient' recording, 4 current inputs
- T2 - 8 voltage inputs, 'transient' recording, 8 current inputs
- T8 - 8 voltage inputs, 'transient' recording

Hardware specification:

E - power quality analyzer

Software and controller functionality options:

eM - specialized version:

Device symbol:

SO-52v11 - modular system