

PQM4000

Class A DIN 192x144 power quality analyzer

- Two different models, for CTs or current clamps
- Harmonics and interharmonics measurement
- Data recording for further EN 50160 analysis
- Data recorded in standard PQDIF and CSV file formats
- Embedded web server
- Communication on Ethernet, RS485 and WIFI (on request)
- USB host port for data transfer
- Integrated GPS for accurate timing
- 1024x600 high resolution TFT display with capacitive touch
- Internal rechargeable backup battery
- Class A for voltage and current characteristics according to **IEC/EN 61000-4-30:2015 Ed.3**



» General features

PQM4000 is a high-end power quality analyzer, able to monitor and record the major power quality parameters. It provides an accurate measurement, voltage and current characteristics are monitored according to Class A specification. At the same time it acts as event/fault recorder, capable to store a high number of voltage events and disturbances, frequency variations, inrush current, etc. Additional PQ data can be recorded, such as Flicker, Unbalance, Harmonics and Interharmonics, Mains Signalling. It also provides standard power measurement data for three-phase systems. Extra voltage and current measurement channels give the possibility to monitor Neutral Potential and Earth Leakage current.

PQM4000 is available in 2 models: one for external standard CTs with 1 or 5A output and another one for current clamps with 1 or 3V output. In this way maximum flexibility is granted even on existing plants.

The powerful recording features give the possibility to capture and record all types of standard and PQ data simultaneously. All this information can be recorded for long time period due to the high memory capacity, in this way a complete EN 50160 analysis can be performed. Events and disturbances provide also waveform recording together with RMS values. Recordings can be transferred in different ways: user can download them directly through web interface or set an automatic scheduled data upload to a remote server or transfer it to a USB flash drive.

PQM4000 includes different communication ports so the user can access it in different ways. The Ethernet ports on the front and rear panels allow complete control on the instrument: web access for real-time monitor, device setup, stored data transfer, maintenance operations. An additional RS485 port gives the possibility to interconnect the device with slower monitoring systems, such as PLC. The integrated GPS receiver provides accurate time information regardless of the location where the meter is installed in a distributed monitoring system.

Moreover, different I/O channels are provided to enhance the instrument features. It is provided with a high resolution TFT display with touch screen which allows a fast and direct instrument management. User-friendly multilingual interface is common to its web server, very useful for on-site instrument operations.

» Benefits

- Additional voltage and current measurement channels in comparison with other standard three-phase devices.
- Current inputs for CTs or for clamps to grant an accurate current measurement.
- Continuous monitoring of the power quality and Class A certified measurements for voltage and current characteristics.
- Simultaneous recording of events, Min/Avg/Max LOG and energy counters.
- Several possibilities for instrument data transmission: Ethernet, WIFI, Modbus RTU/TCP, USB.
- User-friendly instrument web interface with multilingual pages.

» Applications

- Power monitoring & control systems
- Switchboards, gensets, motor control centers, etc.
- Individual machine load monitoring
- Power demand analysis and management
- Harmonics monitoring
- Remote metering and cost allocation
- Motor inrush current studies

» Related products

- *PQM-Tool* Class A monitoring software tool
- *PQM-Analyzer* for data analysis according to EN 50160
- *PQM-Clamp Linearization Tool* to define and upload clamp linearization table

» Main features

Measurements

- Voltage direct connection up to 1000 VLL or through PT for MV and HV systems.
- 4th voltage channel for measurement of potential difference between Neutral and Protective Earth.
- 5 current channels to be used with CTs or clamps according to the model.
- 4th current channel dedicated for Neutral current measurement: the current measuring range (CT or Clamp primary and secondary) can be programmed together with the main three-phase channels.
- 5th current channel reserved for Earth Leakage monitoring, with separate current measuring range setup to ensure different sensitivity from the main channels.
- Demand values of currents, powers and true power factors calculated on a programmable time period (only DMD or DE version).
- Display of daily demand graphic with programmable power limit to monitor overconsumption (only DMD or DE version).
- Voltage and current harmonics up to 63rd.
- Voltage Even & Odd harmonic distortion parameters (only ENH or DE version).
- Current Total, Even & Odd demand distortion parameters (only ENH or DE version).
- Three-phase 3 and 4 wire or single-phase operating mode.
- Suitable for 50 and 60 Hz systems.
- Fast simultaneous sampling on all 9 channels, at 1024 samples/cycle.
- All measured voltage characteristics certified according to IEC/EN 61000-4-30:2015 Ed.3, Class A.
- All measured current characteristics according to IEC/EN 61000-4-30:2015 Ed.3, Class A (CT instrument model certified).
- Measurement of additional power quality parameters, such as K Factor.
- CLAMP instrument model allows to upload one or more current clamp linearization tables for increased accuracy (optional).

Recordings & data storage

- Voltage event recording (sags, swells, interruptions) with storage of $\frac{1}{2}$ c RMS values and waveforms.
- Sag/swell recording on 4th voltage channel with storage of $\frac{1}{2}$ c RMS values and waveforms.
- Rapid Voltage Changes measurement and event recording.
- Power frequency variation monitoring and recording with $\frac{1}{2}$ c RMS values and waveforms.
- Slow event recording on Frequency, Unbalance Ratio, Flicker, Voltage THD and Mains Signalling variations.
- Up to 4 thresholds programmable for slow frequency events: 2 High threshold levels and 2 Low threshold levels (only ENH or DE version).
- Overcurrent recording on three-phase current channels with storage of $\frac{1}{2}$ c RMS values and waveforms.
- Data LOG function for Min/Avg/Max values of selectable parameters, at programmable rate.
- Energy counter LOG at programmable rate.
- Functional event LOG to report the changes of device operating status, useful to keep the instrument condition under control.
- Digital input status change LOG.
- Demand LOG function at programmable rate (only DMD or DE version).
- Demand MAX values of currents, powers and true power factors with a timestamp stored for different time periods -previous month, actual month, previous week, actual week, previous day, actual day- (only DMD or DE version).
- Automatic data upload to FTP server started by frequency events or scheduled at preset time day by day.
- Recordings containing big amount of data $\frac{1}{2}$ c RMS with waveform and Min/Avg/Max are recorded directly in standard PQDIF files.
- For other type of recordings like slow events and LOG files, data is provided in standard CSV files.
- In case of a failure on the PQM auxiliary power line, the monitoring and recording functions remains active due to the backup battery.

Inputs & outputs

- 4 isolated digital inputs for remote management of control signals.
- 4 isolated digital outputs for alarm signalling or energy pulse generation.
- 4 isolated analog outputs for real time parameter variation transmission.

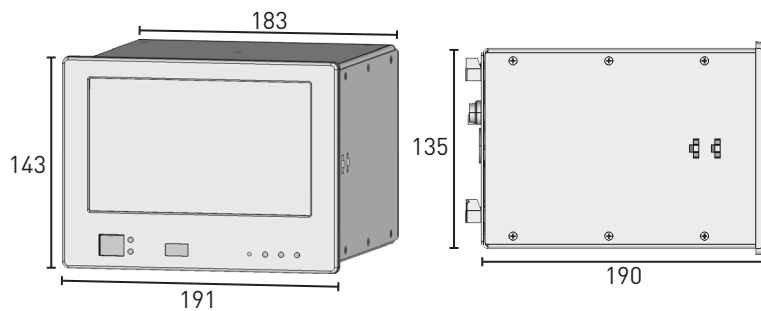
Communication

- Two Ethernet ports, one designed for a permanent installation on the instrument rear and one for occasional connections on the front panel.
- RS485 port for data reading in Modbus RTU.
- On request WIFI port, programmable in different modes: as Access Point to take advantage of the broadcasted WIFI network or as Client mode for a standard WIFI connection.
- Front USB host port useful to transfer in a simple way data recorded from the instrument to an external device, but also to save setup or to upgrade instrument firmware.

Data analysis

- Standard file formats gives the possibility to have a quick view and analysis on all stored data without any special software.
- PQM-Analyzer software is provided to perform statistical analysis and generate reports on recorded data according to EN 50160 PQ standard.

» Technical drawing (mm)



Front part (LxH): 191x143 mm (3U)
 Rear part (LxHxD): 183x135x190 mm (terminals excluded)
 Rear part (LxHxD): 183x135x206 mm (terminals included)

» Parameters overview

The following table shows all parameters which can be measured, monitored, recorded and associated to analog & digital outputs.

The **VERSIONS** column shows the available parameters (•) according to the instrument version.

The **APPLICATIONS** column indicates all parameters which can be displayed, recorded or involved in the event detection process, refer to the following detailed description:

- **Real time:** real time parameters shown in Web server (Real Time and Graphics sections) as well as in Modbus TCP by a reading command. In case of Demand MAX values, data is stored with timestamp (**S**).
- **Events:** parameters monitored for event capture.
- **Logging:** parameters programmable according to the logging type: **M**=Min/Avg/Max value logging, **D**=Demand value logging, **E**=Energy counter logging.
- **Analog outputs:** parameters to be associated to analog outputs.
- **Digital outputs:** parameters to be associated to digital outputs, according to the mode: **A**=Alarm, **P**=Pulse.

All the parameters indicated in the **APPLICATIONS** column are available according to the set wiring mode.

| PARAMETERS | VERSIONS | | | | APPLICATIONS | | | | |
|---|----------|-----|-----|----|--------------|--------|---------|----------------|-----------------|
| | BASIC | DMD | ENH | DE | Real time | Events | Logging | Analog outputs | Digital outputs |
| Voltages (ULN, ULL, U4N, U4L) | • | • | • | • | ✓ | ✓ | M | ✓ | A |
| System Voltage [U Σ] | • | • | • | • | ✓ | | M | ✓ | A |
| Phase Sequence | • | • | • | • | ✓ | | M | | |
| System Frequency (F) | • | • | • | • | ✓ | ✓ | M | ✓ | A |
| Currents (IL) | • | • | • | • | ✓ | ✓ | M | ✓ | A |
| Line 4 Current, Earth Leakage, System Current (I4, I5, I Σ) | • | • | • | • | ✓ | | M | ✓ | A |
| Powers (PL, P Σ , SL, S Σ , QL, Q Σ) | • | • | • | • | ✓ | | M | ✓ | A |
| Power Factors (TPFL, TPF Σ , DPFL) | • | • | • | • | ✓ | | M | ✓ | A |
| Voltage Symmetrical Components (U0, U1, U2) | • | • | • | • | ✓ | | M | ✓ | A |
| Voltage Unbalance Ratios (u0, u2) | • | • | • | • | ✓ | ✓ | M | ✓ | A |
| Current Symmetrical Components (i0, i1, i2) | • | • | • | • | ✓ | | M | ✓ | A |
| Current Unbalance Ratios (i0, i2) | • | • | • | • | ✓ | | M | ✓ | A |
| Voltage Underdeviations (UdevULN, UdevULL) | • | • | • | • | ✓ | | M | ✓ | A |
| Voltage Overdeviations (OdevULN, OdevULL) | • | • | • | • | ✓ | | M | ✓ | A |

| PARAMETERS | VERSIONS | | | | APPLICATIONS | | | | |
|--|----------|-----|-----|----|--------------|--------|---------|----------------|-----------------|
| | BASIC | DMD | ENH | DE | Real time | Events | Logging | Analog outputs | Digital outputs |
| Short Term Flickers (PstL) | • | • | • | • | ✓ | | M | | |
| Long Term Flickers (PltL) | • | • | • | • | ✓ | ✓ | M | | |
| Voltage Total Harmonic Distortions (THDULN, THDULL) | • | • | • | • | ✓ | ✓ | M | ✓ | A |
| Voltage Even & Odd Harmonic Distortions (eHDULN, oHDULN, eHDULL, oHDULL) | | | • | • | ✓ | | M | ✓ | A |
| Current Total Harmonic Distortions (THDIL) | • | • | • | • | ✓ | | M | ✓ | A |
| Phase 4 Current Total Harmonic Distortion (THDI4) | | | • | • | ✓ | | | ✓ | A |
| Current Total, Even & Odd Demand Distortions (TDDIL, eDDIL, oDDIL) | | | • | • | ✓ | | M | ✓ | A |
| K Factors (KL) | • | • | • | • | ✓ | | M | ✓ | A |
| Mains Signallings 1...5 (ULN-MS1...5) | • | • | • | • | ✓ | ✓ | M | | |
| Current Demands (ILDMD, I4DMD, I5DMD, IΣDMD) | | • | | • | ✓ | | D | | A |
| Active Power Demands (+PLDMD, -PLDMD, +PΣDMD, -PΣDMD) | | • | | • | ✓ | | D | | A |
| Reactive Power Demands (+QLDMD, -QLDMD, +QΣDMD, -QΣDMD) | | • | | • | ✓ | | D | | A |
| Apparent Power Demands (+SLDMD, -SLDMD, +SΣDMD, -SΣDMD) | | • | | • | ✓ | | D | | A |
| True Power Factor Demands (+TPFLDMD, -TPFLDMD, +TPFΣDMD, -TPFΣDMD) | | • | | • | ✓ | | D | | A |
| Current Demand MAX (ILDMDMAX, I4DMDMAX, I5DMDMAX, IΣDMDMAX) | | • | | • | S | | | | |
| Active Power Demand MAX (+PLDMDMAX, -PLDMDMAX, +PΣDMDMAX, -PΣDMDMAX) | | • | | • | S | | | | |
| Reactive Power Demand MAX (+QLDMDMAX, -QLDMDMAX, +QΣDMDMAX, -QΣDMDMAX) | | • | | • | S | | | | |
| Apparent Power Demand MAX (+SLDMDMAX, -SLDMDMAX, +SΣDMDMAX, -SΣDMDMAX) | | • | | • | S | | | | |
| True Power Factor Demand MAX (+TPFLDMDMAX, -TPFLDMDMAX, +TPFΣDMDMAX, -TPFΣDMDMAX) | | • | | • | S | | | | |
| Voltage Harmonics & Interharmonics (ULN Ha&IHa, ULL Ha&IHa) | • | • | • | • | ✓ | | M | ✓ | A |
| Current Harmonics & Interharmonics (IL Ha&IHa) | • | • | • | • | ✓ | | M | ✓ | A |
| UL Angle Relative to U1 - On Fundamental (AngU1U2, AngU1U3, AngU1U4) | • | • | • | • | ✓ | | | ✓ | A |
| IL Angle Relative to U1 - On Fundamental (AngU1I1, AngU1I2, AngU1I3, AngU1I4, AngU1I5) | • | • | • | • | ✓ | | | ✓ | A |
| Imported & Exported Active Energy (+kWh, -kWh) | • | • | • | • | ✓ | ✓ | E | | P |
| Imported & Exported Apparent Energy - IND/LAGG. (+kVAh-L, -kVAh-L) | • | • | • | • | ✓ | ✓ | E | | P |
| Imported & Exported Apparent Energy - CAP/LEAD. (+kVAh-C, -kVAh-C) | • | • | • | • | ✓ | ✓ | E | | P |
| Imported & Exported Reactive Energy - IND/LAGG. (+kvarh-L, -kvarh-L) | • | • | • | • | ✓ | ✓ | E | | P |
| Imported & Exported Reactive Energy - CAP/LEAD. (+kvarh-C, -kvarh-C) | • | • | • | • | ✓ | ✓ | E | | P |

» Specifications

| | |
|--|--|
| POWER SUPPLY | |
| Auxiliary power voltage: | 100...240 VAC 50/60 Hz / 65...250 VDC 19...60 VDC on request |
| Auxiliary power consumption: | 15 W |
| Fuse (according to the power supply): | 250 VAC / 500 mA T type delayed (35 A breaking capacity) with 100...240 VAC 50/60 Hz 15 W / 65...250 VDC power supply 250 VAC / 3 A T type delayed with 19...60 VDC power supply |
| Backup battery: | Li-Ion, 2500 mAh (>15 min autonomy) |
| MEASUREMENT INPUTS | |
| Voltage inputs for direct connection: | Phase-neutral (L-N): max 580 V RMS CAT III Phase-phase (L-L): max 1000 V RMS CAT III |
| Voltage input crest factor: | 2 |
| CT inputs (only CT instrument model): | max 7 A RMS for FS = 5 A, max 1.2 A RMS for FS = 1 A |
| CT burden (only CT instrument model): | 0.04 VA |
| Current clamp inputs (only CLAMP instrument model): | max 1.5 V RMS for FS = 1 V, max 4.5 V RMS for FS = 3 V |
| Current input crest factor (only CT instrument model): | 3 |
| Input impedance (for direct voltage inputs): | >6 MΩ |
| Frequency range: | 42.5...57.5 Hz / 51...69 Hz |
| Frequency reference channel: | Phase 1/Line 12 voltage |
| Sampling: | Simultaneous, 51.2 kHz @50 Hz |
| ACCURACY | |
| Three phase voltage: | ±0.1% Un over 10 ... 150% Un range |
| 4th voltage: | ±0.2% measurement |
| Currents: | ±0.2% measurement (device) |
| Powers: | ±0.2% measurement |
| Frequency: | ±10 mHz |
| Harmonics: | Class 1 (IEC/EN 61000-4-7) |
| Internal clock (RTC): | <1 s for 24h period without synchronisation <5 ms with GPS synchronisation <500 ms with NTP synchronisation |
| Active energy (FS = 5 A): | Class 0.2S, compliant to IEC/EN 62053-22 |
| Reactive energy: | Class 1, compliant to IEC/EN 62053-23 |
| I/O CHANNELS | |
| Digital inputs: | 4 optoisolated 24 VDC |
| Digital input delay time (1...4): | max 10 ms |
| Digital input consumption (1...4): | max 7 mADC |
| Analog outputs: | 4 optoisolated 4...20 mADC / max load 500 Ω |
| Analog output reaction time: | max 200 ms |
| Digital outputs: | 4 passive optoisolated 24 VDC / max 50 mA |
| Digital output reaction time (DO in Alarm mode): | max 1 s |
| Digital output pulse length (DO in Pulse mode): | 50 ±2 ms ON time |
| MEMORY | |
| System memory: | 128 MB Flash, 256 MB RAM |
| Recording memory: | 16 GB |
| COMMUNICATION | |
| Ethernet ports: | 2 Auto MDIX RJ45 10/100 Base Ethernet |
| RS485 port: | 1 optoisolated, 4800...115200 bps |
| GPS port: | 1 SMA female connector |
| WIFI port (on request): | 1 SMA male connector |
| Protocols: | HTTP, FTP, SFTP, NTP, NMEA, Modbus RTU/TCP |
| RTC SYNCHRONISATION | |
| Synchronisation system: | NTP and/or GPS |
| ENVIRONMENTAL CONDITIONS | |
| Installation and use code: | PQI-A-FI1-H |
| Operating temperature (limit range): | -25 ... +55°C (FI1, 3K6) |
| Storage temperature: | -25 ... +75°C (2K3) |
| Relative humidity: | 95% max without condensing |
| Altitude: | max 2000 m AMSL |
| MECHANICAL CHARACTERISTICS | |
| Mounting: | Panel mount 192x144 DIN size |
| Size: | Front (LxH): 191x143 mm, Rear (LxHxD): 183x135x190 mm |
| Weight: | 1400 g |
| DIRECTIVE AND STANDARD COMPLIANCE | |
| Directive: | 2014/53/EU |
| Product compliance: | IEC/EN 62586-1, IEC/EN 62586-2 |
| Safety: | EN 61010-1 |
| Pollution degree: | 2 (EN 61010-1) |
| Protection degree: | IP40 front panel, IP20 rear |
| Protection against mechanical impacts: | IK06 |

| ORDER CODE | VERSION | | | | POWER SUPPLY 100...240VAC / 65...250VDC | COMMUNICATION | | | | GPS FOR SYNCHRO Integrated | MEMORY 16 GB | I/O | | |
|----------------------------------|---------|-----|-----|----|---|---------------|--------------------|------|-----|-------------------------------|-----------------|-----|----|----|
| | BASIC | DMD | ENH | DE | | ETHERNET | RS485 read-only | WIFI | USB | | | DI | DO | AO |
| FOR CTs (not included) | | | | | | | | | | | | | | |
| 1301.0002.0001 | ● | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 1301.0004.0001 | | ● | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 1301.0005.0001 | | | ● | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 1301.0007.0001 | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 1301.0008.0001 | ● | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 1301.0009.0001 | | ● | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 1301.0010.0001 | | | ● | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 1301.0011.0001 | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| FOR CLAMPs (not included) | | | | | | | | | | | | | | |
| 1302.0002.0001 | ● | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 1302.0004.0001 | | ● | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 1302.0003.0001 | | | ● | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 1302.0005.0001 | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 1302.0006.0001 | ● | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 1302.0007.0001 | | ● | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 1302.0008.0001 | | | ● | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 1302.0009.0001 | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

OPTION AVAILABLE ONLY ON REQUEST (SUBJECT TO MOQ)

19...60 VDC power supply

PQM-Clamp Linearization Tool, software to upload clamp linearization table in the instrument (only for CLAMP instrument model)

To be indicated together with the selected order code from the list above.

LEGEND

- DMD:** BASIC version + DMD & DMD MAX values, DMD value recording.
- ENH:** BASIC version + THD even & odd values (Total Harmonic Distortions) + TDD total, even & odd values (Total Demand Distortions).
- DE:** DMD version + ENH version.
- GPS FOR SYNCHRO:** GPS module for RTC synchronisation, integrated in the instrument.
- DI:** 4 digital inputs for remote management of control signals.
- DO:** 4 digital outputs for alarm or pulse emission.
- AO:** 4 analog outputs for real time parameter variation transmission.

NOTE: Subject to change without notice



Innovative Electronic Systems

Via P. Gobetti, 16/F - 28014 Maggiore (NO) - Italy - Tel.: +39 0322 89307

sales@algodue.it - www.algodue.com

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